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वार्षिक प्रगति रिपोर्ट

Annual Progress Report 2025

भाकृअनुप
ICAR

अखिल भारतीय समन्वित राई–सरसों अनुसंधान परियोजना

All India Coordinated Research Project on Rapeseed-Mustard

भाकृअनुप– भारतीय सरसों अनुसंधान संस्थान

ICAR- Indian Institute of Rapeseed-Mustard Research

(भारतीय कृषि अनुसंधान परिषद)

(Indian Council of Agricultural Research)

सेवर, भरतपुर–321303 (राजस्थान), भारत

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My profound thanks to all the collaborators from 21 coordinating and 31 voluntary centres under the umbrella of AICRP-RM programme during 2024-25. I extend my sincere appreciation to the monitoring team leaders and members for giving valuable suggestions for further improvement of the programme and express my gratitude to all the Vice-Chancellors and Directors of Research of the concerned SAUs, Directors of ICAR/other institutes, Directors of State Department of Agriculture for their valuable and timely cooperation in the successful implementation of the envisaged research and development activities.

The overall seasonal weather conditions during crop season of 2024-25 across the rapeseed-mustard production zones were quite normal and favourable for crop growth and development. Good amount of precipitation received during the monsoon season at almost all the centers. Performance of 149 strains, including 07 toria, 10 yellow sarson and 132 Indian mustard were tested in 22 performance evaluation trials consisting of toria (01), yellow sarson (02) and Indian mustard (19) at 52 locations across the 7 agro-climatic zones of the country. On the basis of superiority for seed & oil yield, earliness, quality, resistance over the best check. The 27 strains of Indian mustard were promoted for advanced stage of evaluation. Total 252.42 q breeder seed of 86 rapeseed- mustard varieties was produced, indicating a surplus availability of 157.10 q.

Higher fertility levels (150% NPK) over the recommended levels (100% NPK) increased mustard seed yield at all the locations except at Kota and Pantnagar (100% NPK+2.5 t FYM/ha). Pre-emergence application of pendimethalin 1.0 kg a.i./ha followed by post emergence application of quizalofop 50 g a.i./ha at 15-20 DAS or fluazifop-p-butyl 0.125 kg a.i./ha at 25-30 DAS recorded significantly higher seed yield and weed control efficiency. NPK consortia +ZSB biofertilizers found promising in mustard and recorded higher seed yield and net returns over no inoculation. FYM enriched with secondary and micro nutrients markedly increased mustard seed yield. Two foliar spray of nano urea and nano DAP at 25-30 and 45-50 DAS along with recommended fertility levels increased seed yield and net returns of mustard.

Moderate to severe occurrence of all major diseases was recorded at different locations during the crop season. Among AVT-I and AVT-II entries, 4205B296-01, RSPT-6, DRMRCI (Q) 172, JKJH 11, Uttara, NPJ 268, DRMR 2018-25 of *B. juncea* were found resistant to WR under both natural and artificial conditions.

Twenty-eight quality genotypes were studied for nutritional and anti-nutritional traits. Genotype GED 1, GED 2, DH-2'00'07G, PMAS 1604, PDZ 11 showed glucosinolate <30 µmol/g. Twenty-two genotype showed less than 2% erucic acid. Genotypes DH-2'00'07G, PDZ 11, PMAS 1604, are double low genotypes.

My sincere thanks and appreciation to all the principal investigators, associated scientists and other colleagues at the ICAR-IIRMR especially Drs. Bhagirath Ram, H. S. Meena, R.S. Jat, A. K. Sharma, P. D. Meena, Vinod Kumar, Anubhuti Sharma, R. L. Choudhary, Nitish Rattan Bhardwaj, M. D. Meena, B. L. Meena, L. K. Meena, R. K. Yogi, M.S. Sujith, Karnal Singh of ICAR-IIRMR and Dr. Sarwan Kumar of PAU Ludhiana for their painstaking efforts in compiling the data and timely brining out the report in the present form.

The help & cooperation rendered by Dr. A. Dhandapani, I/C Head ICM division, NAARM, Hyderabad in statistical analysis is duly acknowledged.

Last but not the least, help rendered by the technical, administrative and supporting staff of ICAR-IIRMR, particularly by Dr. Prashant Yadav, Mr. S.S. Meena, Mr. Mukesh Kumar, Mrs. Veena Sharma, Mrs. Mamta Sikarwar Mr. Prashant Kumar, Mr. Ram Singh, Ms. Vimla Meena, Dr. Guman Singh and Mr. Devki Nandan is thankfully acknowledged.

17.7.25

July 17, 2025
ICAR-IIRMR, Bharatpur

(V. V. Singh)
Director

सारांश

सारांश

मौसम

वर्ष 2024–25 के दौरान सरसों फसल के लिये मौसम अनुकूल रहा। सितम्बर माह में देश के लगभग सभी केन्द्रों में अच्छी बारिश हुई। दिसम्बर माह में हिमाचल के बजौरा केन्द्र में न्यूनतम तापमान (-) 1.2 डिग्री सेल्सियस दर्ज किया गया। इस वर्ष कीड़ों एवं बीमारियों का प्रकोप भी बहुत कम रहा, जिसके कारण फसल की पैदावार अच्छी हुई।

आनुवांशिकी एवं पादप प्रजनन

किस्मों का सुधार/विकास

अखिल भारतीय राई सरसों समन्वित परियोजना के अन्तर्गत देश के 15 राज्यों के 21 विभिन्न अनुसंधान केन्द्रों पर राई–सरसों की उन्नत किस्मों के विकास हेतु कार्यक्रम कृषि पारिस्थितिकी तंत्र की आवश्यकताओं के अनुरूप किया गया। 149 किस्मों का मूल्यांकन 52 केन्द्रों, जिसमें 31 स्वैच्छिक एवं निजी केन्द्र सम्मिलित है, पर 21 समन्वित परीक्षणों में किया गया।

जननद्रव्य संसाधन प्रबंधन

कुल 7520 प्रारूपों जिनमें तोरिया (1010), लाहा (5047), पीली सरसों (442), गोभी सरसों (619), भूरी सरसों (64), करन राई (268), तारामीरा (04), *ब्रेसिका रूगोसा* (23), *ब्रेसिका नाइग्रा* (01), *ब्रेसिका टर्निफोर्टिज* (04) एवं अन्य वन प्रजाति (38) के प्रारूपों को उचित संकरण विधि द्वारा सुरक्षित रखा गया। तोरिया (72), लाहा (203), पीली सरसों (55), गोभी सरसों (05), एवं करन राई (05) के कुल 340 नये प्रारुप को एकत्र किया गया एवं लाहा (2059), तोरिया (89), पीली सरसों (61), करन राई (07), गोभी सरसों (37) और भूरी सरसों (18) 2271 प्रारूपों का मूल्यांकन किया गया। मूल्यांकन के आधार पर विभिन्न गुणों के लिए उपयोगी जननद्रव्यों की पहचान की गई।

संकरण एवं चयन

अधिक उपज, शीघ्र पकने वाली, बीज–आकार, कीट–रोग प्रतिरोधकता, उच्चताप सहनशीलता, गुणवत्ता एवं अधिक तेल मात्रा के आधार पर तोरिया (51), पीली सरसों (107), लाहा (1284) के 1442 नए क्रॉसेस पंतनगर, भुवनेश्वर, चट्टा, हिसार, भा कृ अं सं नई दिल्ली, कानपुर, मुरेना, झाँसी, एस.के. नगर,, ढोली, लुधियाना, नागपुर, इम्फाल, जगदलपुर एवं वाराणसी में बनाए गए। तोरिया में समष्टि (पॉपुलेशन) सुधार कार्यक्रम, कम्पोजिट बनाकर एवं चयन पश्चात् समष्टि बनाकर किया गया। पीली सरसों के लिये भुवनेश्वर, मुरेना, चट्टा, पंतनगर एवं कानपुर में संकरण तथा एकल पौधे पृथक्करणीय पीढ़ियों में चयन किया गया। लाहा के 12382 एकल पौधे एवं 1478 पुंज (बल्क) पृथक्करणीय एवं अग्रिम पीढ़ियों में से चयन किये गये।

अग्रिम प्रजनन स्तर का मूल्याकंन

तोरिया के 112 प्रभेदों का कानपुर, भुवनेश्वर, जगदलपुर, पंतनगर एवं चट्टा में मूल्याकंन किया गया। पंतनगर में मानक तपेश्वरी की तुलना में 22.07 प्रतिशत पैदावार वृद्धि दर्ज की गई। पीली सरसों के कुल 90 प्रभेदों को कानपुर, पंतनगर एवं भुवनेश्वर में जॉचा गया और पंतनगर में पीताम्बरी की तुलना में 23.16 प्रतिशत अधिक उपज वृद्धि हुई। लाहा के 611 प्रभेदों को 09 केन्द्रो चट्टा, इम्फाल, हिसार, कानपुर, लुधियाना, पंतनगर, भुवनेश्वर, ढोली एवं एस़ के़ नगर पर 43 परीक्षणों में जॉचा गया। पंतनगर में पीएबी 9511 (1890) की तुलना में 25.78 प्रतिशत उपज में वृद्धि पाई गई। गोभी संरसो के कुल 94 प्रभेदों का हिसार (10), लुधियाना (66) एवं चट्टा (18) उपज में वृद्धि में मूल्यांकन किया गया। चट्टा में जीएससी –7 की तुलना में 16.60 प्रतिशत उपज में वृद्धि पाई गई।

संकर विकास

आईसीएआर–डीआरएमआर भरतपुर, आईसीएआर–आईएआरआई नई दिल्ली, पीएयू लुधियाना और सीसीएस एचएयू हिसार सहित चार केंद्रों पर ''कंसोर्टिया रिसर्च प्लेटफॉर्म ऑन हाइब्रिड्स'' के तहत 2024–25 के दौरान हाइब्रिड विकास के प्रयास जारी रहे। एक संकर आरएचएच 2101 (2700 किग्रा/हेक्टेयर) ने सर्वश्रेष्ठ चेक आरएच 749 (2336 किग्रा/हेक्टेयर) एवं डीएमएच 1 (2572 किग्रा/हेक्टेयर) को क्रमशः 15.0 और 5.0% के अंतर से उपज वृद्धि हुई। एएचटी–II जोन II में पांच स्थानों पर बीज उपज के 5 प्रतिशत से अधिक के अंतर से प्रदर्शन किया और इसलिए, असम कृषि विश्वविद्यालय, खानापारा परिसर, गुवाहाटी (एएयू, असम) में एआईसीआरपी–आरएम 2023–24 के दौरान इसकी पहचान की गई।

भारतीय सरसों के बीस प्रयोगात्मक संकर, जिनमें प्रत्येक चार केंद्रों से पांच शामिल थे, का मूल्यांकन सभी चार केंद्रों पर प्रतिकृति ब्लॉक डिजाइन में किया गया था। चार स्थानों (भरतपुर, नई दिल्ली, लुधियाना और हिसार) में औसत बीज उपज के आधार पर सीआरपीएमएलटी 1 में चार संकर आरएचएच 2404 (3125 किग्रा/हेक्टेयर), डीआरएमआरएचजे 2517 (3094 किग्रा/हेक्टेयर) डीआरएमआरएचजे 3818 (3075 किग्रा/हेक्टेयर) और आरएचएच 2407 (3060 किग्रा/हेक्टेयर) ने सर्वश्रेष्ठ चेक पायनियर 45एस46 (2926 किग्रा/हेक्टेयर) को क्रमशः 6.8, 5.7, 5.1 और 4.6 प्रतिशत के अंतर से उपज वृद्धि हुई। तीन स्थानों (नई दिल्ली, हिसार और भरतपुर) के तेल उपज प्रदर्शन औसत के आधार पर, तीन संकर किस्मों ने सर्वोत्तम उपज पायनियर 45एस46 (1256 किग्रा/हेक्टेयर) से अधिक दी, जिनमें आरएचएच 2404 (1402 किग्रा/हेक्टेयर), डीआरएमआरएचजे 3818 (1310

किग्रा / हेक्टेयर) और डीआरएमआरएचजे 2517 (1310 किग्रा / हेक्टेयर) क्रमशः 11.6, 4.3 और 4.3 प्रतिशत के अंतर से उपज वृद्धि हुई। आरसीबीडी डिजाइन (सीआरपीएमएलटी 2) में दो प्रतिकृतियों को ध्यान में रखते हुए चालीस प्रायोगिक संकरों का मूल्यांकन किया गया। चार स्थानों (भरतपुर, नई दिल्ली, लुधियाना और हिसार) पर औसत बीज उपज के आधार पर, तीन संकरोंय डीआरएमआरएचजे 2718 (3144 किग्रा / हेक्टेयर), आरएचएच 2409 (3060 किग्रा / हेक्टेयर) और आरएचएच 2417 (3040 किग्रा / हेक्टेयर) ने सर्वोत्तम चेक पायनियर 45एस46 (2945 किग्रा / हेक्टेयर) से क्रमशः 6.7, 3.9 और 3.3ः अधिक उपज दी। आरबीडी में चार स्थानों (भरतपुर, हिसार, नई दिल्ली और लुधियाना) पर आयोजित सीआरपीएमएलटी 3 में चालीस एफ1 संकरों का मूल्यांकन किया गया, जिसमें 3 मीटर लंबी युग्मित पंक्तियों का भूखंड आकार रखा गया। बीज उपज के आधार पर पांच क्रॉस से सर्वोत्तम जांच डीएमएच 1(3143 किग्रा / हेक्टेयर) प्राप्त हुई, आरएच 2299–30 / डीआरएमआरआईजे 21–31 (3541 किग्रा / हेक्टेयर), एमजेबी 37 / टीएन 3 (3509 किग्रा / हेक्टेयर), एमजेबी 36 / एम 37 (3495 किग्रा / हेक्टेयर), आरएच 2265 / पीआर–2019–9 (3456 किग्रा / हेक्टेयर), और एमजेबी 27 / आरसी 273 (3301 किग्रा / हेक्टेयर) क्रमशः 13.8, 12.7, 12.2, 10.8 और 9.7 प्रतिशत के मार्जिन के साथ। आईआईआरएमआर, सीसीएसएचएयू, आईएआरआई और पीएयू में क्रमशः 68, 46, 57 और 82 सहित दो सौ तिरपन (253) प्रायोगिक संकरों का मूल्यांकन संबंधित केंद्रों पर किया गया। प्रत्येक केंद्र ने अपने–अपने स्थान पर आशाजनक संकरों की पहचान की। 820 एफ1 संकरों का मूल्यांकन किया गया, जिनमें से आईसीएआर–डीआरएमआर में 54, सीसीएसएचएयू में 197, आईसीएआर–आईएआरआई में 376 और पीएयू में 193 सहित 820 एफ1 क्रॉस का मूल्यांकन किया गया। प्रत्येक केंद्र पर सुपीरियर क्रॉस की पहचान की गई। बैक–क्रॉसिंग के माध्यम से सीएमएस और रेस्टोरर्स को क्रमशः कुल 213 और 103 परमाणु पृष्ठभूमि में परिवर्तित किया जा रहा है। इसके अलावा कुल 434 सीएमएस और 201 रिस्टोरर लाइनों का रखरखाव किया गया। अगले वर्ष मूल्यांकन के लिए 253 प्रायोगिक संकर और 691 एफ1 क्रॉस के बीज का उत्पादन किया गया। भारतीय कृषि अनुसंधान परिषद, नई दिल्ली की प्लांट जर्मप्लाज्म पंजीकरण समिति (पीजीआरसी) द्वारा 24 मार्च, 2025 को हुई बैठक में भारतीय सरसों (डीआरएमआरआईजे 12–21) का एक सफेदरोली प्रतिरोधी जीनोटाइप पंजीकृत किया गया था। सफेद रतुआ प्रतिरोध, गुणवत्ता और अन्य कृषि संबंधी गुणों के लिए पैतृक वंशावली में सुधार के प्रयास चल रहे हैं। विविध अंतर– और अंतर–विशिष्ट संकरण से प्राप्त 40 इनब्रेड लाइनों का एक सेट, प्रत्येक केंद्र से 10, का गठन किया गया और कृषि संबंधी प्रदर्शन के लिए मूल्यांकन किया गया। आने वाले सीजन में विषम पैतृक वंशावली की पहचान करने के लिए संकरण कार्यक्रम में उसी सेट का उपयोग किया जाएगा।

प्रजनक बीज उत्पादन

कृषि मंत्रालय, भारत सरकार द्वारा वर्ष 2024–25 के लिए प्रस्तावित 86 अनुमोदित किस्मों का प्रजनक बीज विभिन्न केन्द्रों पर आवंटित किया गया। 95.32 क्विंटल प्रजनक बीज की मांग की तुलना में 252.42 क्विंटल (जिसमें पिछले वर्ष का बीज सम्मिलित है) प्रजनक बीज तैयार किया गया।

समन्वित परीक्षण

तोरिया (07), पीली सरसों (10) एवं लाहा (132) के 149 उन्नत प्रभेदों को देश के 7 कृषि जलवायु क्षेत्रों में 22 उपज परीक्षणों हेतु 52 स्थानों पर जॉचा गया। जिसके आधार सर्वोत्तम जॉच किस्म की तुलना में अधिक उपज, रोग प्रतिरोधकता एवं तेल मात्रा वाले राई सरसों के उत्कृष्ट लाहा (27) प्रभेद को अग्रिम स्तर की जाँच के लिए प्रोन्नत किया गया।

सर्वोत्तम जॉच किस्म की तुलना में 10 प्रतिशत अधिक उपज, रोग प्रतिराधकता एवं तेल मात्रा वाले राई सरसों के उत्कृष्ट प्रभेद

जोन 01	जोन 02	जोन 03	जोन 04	जोन 05	जोन 06	जोन 07
सरसों, आई.वी.टी., समय से पहले बुवाई (सिंचित)						
			केएमआर(ई) 24–1 (2903,20.1) आरएच 2399–2 (2745,13.6) डीआरएमआरएचटी 13–2 (2710,12.1) डीआरएमआरसीआई–206 (2685,11.1) केएमआर(ई) 24–2 (2697,11.6) आरएच 1999–18** (1085,13.0)	केसरी 5113 (2021,18.8) पीआरई–2022–12 (1781,10.5)		केएमआर(ई) 24–1 (1227,12.4) केएमआर(ई) 24–2 (1252,14.6) डीआरएमआरएचटी 22–125 (1194,9.3)
सरसों, आई.वी.टी., समय पर बुवाई (सिंचित)						
आरबी–118 (2158,24.8) सीएस 2009–219 (2043,18.2)		पीवाईआर 2018–1** (1113,11.2)				

एकेएमएस 1003–50 (1975,14.2) आरएल 19–237 (1965,13.6) एसकेएम 2209 (1963,13.5)						
सरसों, ए.वी.टी. I समय पर बुवाई (सिंचित)						
आरएच 2299–63 (1712,21.4) एसकेएम 2104 (1618,14.7)						
सरसों, आई.वी.टी., देरी पर बुवाई (सिंचित)						
	एसवीजेएच 78 (2459,13.9) डीआरएमआरडीआर 2141*** (2168,0.4)	आरएमडब्लूआर 19–01 (2409,11.0)		डीआरएमआरडीआर 2141*** (1710,3.4) आरएमडब्लूआर 19–01*** (1702,3.0)		
सरसों, ए.वी.टी. I, देरी पर बुवाई (सिंचित)						
	एनपीजे 267*** (958,12.2)	डीआरएमआर 2018–1 (2584,16.7)				
सरसों, आई.एच.टी. I						
			4205डी300–01 (2718,5.9) यूएस 8787** (1090,5.5)			
सरसों, ए.एच.टी.						
	एचआरएच 19290 (2931,6.3)					
सरसों आई.वी.टी., (गुणवत्ता)						
	आरएच(ओई)1702# (2913,7.9)					

कोष्ठक के अन्दर दर्शायी संख्या क्रमशः उत्पादन, तेल मात्रा किलोग्राम/हैक्टेयर एवं उपज वृद्धि है।

*** सफेद रोली प्रतिरोधी ** अधिक तेल मात्रा # सिंगल लो. प्रभेद ।

शस्य विज्ञान

वर्ष 2023–24 के दौरान सस्य विज्ञान संबंधी अनुसंधान के नौ प्रमुख क्षेत्रों पर परीक्षण किए गए। इन परीक्षणों से प्राप्त परिणामों को संक्षेप में प्रस्तुत किया गया है:

3.1 राई–सरसों आधारित फसल प्रणालियों में दीर्घकालीन उर्वरता परीक्षण

सरसों की बीज उपज में 100 प्रतिशत एनपीके की तुलना में 150 प्रतिशत एनपीके के प्रयोग से हिसार (22 प्रतिशत), लुधियाना (12 प्रतिशत), कांगड़ा (26 प्रतिशत) और भरतपुर (12 प्रतिशत) में जबकि, 100 प्रतिशत एनपीके + 2.5 टन प्रति हैक्टर गोबर की खाद के एकीकृत प्रयोग से पंतनगर (7 प्रतिशत) और कोटा (15 प्रतिशत) में उल्लेखनीय वृद्धि हुई।

3.2 राई–सरसों में खरपतवार प्रबंधन के लिए शाकनाशीयों का मूल्यांकन

वीडी चेक (खरपतवार–सहित) उपचार की तुलना में पेंडीमेथालिन 1.0 किलोग्राम सक्रिय तत्व प्रति हैक्टर बीज अंकुरण से पूर्व तथा फ्लूजीफॉप–पी–ब्यूटाइल 0.125 किलोग्राम सक्रिय तत्व प्रति हैक्टर बुवाई के 25–30 दिन बाद प्रयोग करने से हिसार और इम्फ़ाल में तथा पेंडीमेथालिन 0.75 किलोग्राम सक्रिय तत्व प्रति हैक्टर बीज अंकुरण से पूर्व तथा फ्लूजीफॉप–पी–ब्यूटाइल 0.125 किलोग्राम सक्रिय तत्व प्रति हैक्टर बुवाई के 25–30 दिन बाद प्रयोग करने से लुधियाना और पंतनगर केंद्रो पर सरसों की बीज उपज में उल्लेखनीय वृद्धि दर्ज की गई। पेंडीमेथालिन 1.0 किलोग्राम सक्रिय तत्व प्रति हैक्टर बीज अंकुरण से पूर्व तथा

क्विज़ालोफ़ॉप 0.050 किलोग्राम सक्रिय तत्व प्रति हैक्टर बुवाई के 15–20 दिन बाद प्रयोग करने से वीडी चेक (खरपतवार–सहित) उपचार की तुलना में पंतनगर और एसके नगर केंद्रो पर सरसों की बीज उपज में उल्लेखनीय वृद्धि दर्ज की गई।

पेंडीमेथालिन 1.0 किलोग्राम सक्रिय तत्व प्रति हैक्टर बीज अंकुरण से पूर्व प्रयोग करने से लुधियाना में, पेंडीमेथालिन 1.0 किलोग्राम सक्रिय तत्व प्रति हैक्टर बीज अंकुरण से पूर्व तथा क्विज़ालोफ़ॉप 0.050 किलोग्राम सक्रिय तत्व प्रति हैक्टर बुवाई के 15–20 दिन बाद प्रयोग करने से पंतनगर और एसके नगर में और पेंडीमेथालिन 1.0 किलोग्राम सक्रिय तत्व प्रति हैक्टर बीज अंकुरण से पूर्व तथा फ्लूजीफॉप–पी–ब्यूटाइल 0.125 किलोग्राम सक्रिय तत्व प्रति हैक्टर बुवाई के 25– 30 दिन बाद प्रयोग करने से हिसार और इम्फ़ाल में उच्चतम खरपतवार नियंत्रण दक्षता दर्ज की गई।

3.3 राई–सरसों की होनहार (प्रोमिसिंग) प्रविष्टियों का सस्य–मूल्यांकन

समय पर बोई गई सरसों (सिंचित/ गुणवत्ता/डबल्यूआरआर) प्रविष्टियाँ (जोन–II) : प्रविष्टि डीआरएमआर 2018–25 ने अबोहर (11.6 व 15.7 प्रतिशत) और लुधियाना (6.4 व 3.8 प्रतिशत) में क्रांति तथा बसंती चेकों की तुलना में अधिक बीज उपज दर्ज की। हिसार में, डीआरएमआर 2018–25 ने बसंती (28.4 प्रतिशत) और गिरिराज (6.6 प्रतिशत) की तुलना में अधिक बीज उपज दर्ज की गई। नई दिल्ली में, डीआरएमआर 2018–25 ने बसंती और आरएच 749 की तुलना में अधिक बीज उपज दर्ज की। चट्टा में, डीआरएमआर 2018–25 ने बसंती को छोड़कर अन्य चेकों की तुलना में कम बीज उपज दर्ज की।
प्रविष्टि एनपीजे 261 ने हिसार, लुधियाना और नई दिल्ली में बसंती, गिरिराज और आरएच 749 चेकों की तुलना सार्थक रूप से अधिक बीज उपज दर्ज की। अबोहर में, प्रविष्टि एनपीजे 261 ने क्रांति और बसंती की तुलना में अधिक बीज उपज दर्ज की। चट्टा में, एनपीजे 261 ने बसंती को छोड़कर अन्य सभी चेकों की तुलना में कम बीज उपज दर्ज की।

समय पर बोई गई सरसों (सिंचित/ गुणवत्ता) प्रविष्टियाँ (जोन–III) : प्रविष्टि डीआरएमआरसीआईक्यू 172 ने झांसी, मुरैना, पंतनगर और वाराणसी में आरजीएन 73, पीडीजेड 11 और पीएम 30 चेकों की तुलना में अधिक बीज उपज दर्ज की। कोटा में, डीआरएमआरसीआईक्यू 172 ने सभी चेकों की तुलना में कम बीज उपज दर्ज की।

एएचटी– II सरसों प्रविष्टियाँ (जोन–IV) : जलगांव में संकर चेकों की तुलना में प्रविष्टि 18जे408सी ने कम बीज उपज दर्ज की गई। मंडोर, पाली और एसके नगर में प्रविष्टि 18जे408सी ने 45एस46 और डीएमएच 1 की तुलना में अधिक बीज उपज दर्ज की गई। नागपुर में, प्रविष्टि 18जे408सी ने डीएमएच 1 से कम लेकिन 45एस46 (4.8 प्रतिशत) की तुलना में अधिक बीज उपज दर्ज की गई।

लवणीय/क्षारीय मृदाओं के लिए प्रविष्टियाँ (सभी जोन) : प्रविष्टि सीएस 2020–10 ने क्रांति, सीएस 54 और सीएस 60 की तुलना में हिसार, करनाल और लखनऊ में अधिक बीज उपज दर्ज की गई।

3.4 राई–सरसों की उत्पादकता और मृदा स्वास्थ्य को बढ़ाने में तरल जैव–उर्वरकों की प्रतिक्रिया पर अध्ययन

बीज का उपचार एनपीके कंसोर्टिया + जेडएसबी के साथ करने पर सभी 16 केन्द्रो पर बीज उपज में सार्थक रूप से उल्लेखनीय वृद्धि हुई, जो कंट्रोल (उपचार रहित) की तुलना में 11–45 प्रतिशत अधिक रही। एनपीके कंसोर्टिया + जेडएसबी के साथ बीजोप्चार करने से एसके नगर को छोड़कर सभी स्थानों पर बीजोप्चार न करने की तुलना में शुद्ध लाभ (23–47 प्रतिशत) में उल्लेखनीय वृद्धि हुई।

3.5 उच्च उत्पादकता के लिए खनिज पोषक तत्व प्रबंधन का अनुकूलन

चट्टा, रानीताल, इम्फाल, कांके, कोटा, लुधियाना, पंतनगर और धोली केन्द्रों पर 125 प्रतिशत एनपीके और झांसी, कांगड़ा, मुरैना, नागपुर और हिसार में 150 प्रतिशत एनपीके के साथ–साथ गोबर की खाद से समृद्ध '40 किलोग्राम गंधक + 5 किलोग्राम ज़िंक + 1 किलोग्राम बोरॉन प्रति हैक्टर' के प्रयोग से सभी स्थानों पर उच्चतम बीज उपज दर्ज की गई।

3.6 चावल–परती क्षेत्रों में सरसों उत्पादन के लिए प्रौद्योगिकीय अभ्युदय

धान के खड़े डंठलों/ भूमि–सतह आच्छादित भूसे के खेत में सरसों की जीरो टिल मशीन द्वारा बुवाई करने पर धोली (13.9 प्रतिशत) और इम्फाल (22.7 प्रतिशत) में पारंपरिक जुताई की तुलना में सार्थक रूप से अधिक बीज उपज और ढोली (33.7 प्रतिशत) और शिलोंगनी (5.8 प्रतिशत) में शुद्ध लाभ दर्ज किया गया। पोषक तत्व प्रबंधन प्रबंधन पद्धतियों में, एनपीके जिंक बोरॉन (50 प्रतिशत नत्रजन बुवाई के साथ तथा 50 प्रतिशत नत्रजन टॉप–ड्रेसिंग) के प्रयोग से धोली, इम्फाल और शिलोंगनी में बीज उपज और शुद्ध लाभ में उल्लेखनीय वृद्धि हुई।

3.7 राई–सरसों की उपज और गुणवत्ता पर नैनो–उर्वरकों का प्रभाव

नैनो यूरिया + नैनो डीएपी का बुवाई के 25–30 और 45–50 दिनों बाद पर्णीय छिड़काव धोली, हिसार, जोबनेर, इम्फ़ाल, कांके, कोटा, रानीताल और एसके नगर में उर्वरकों (नत्रजन व फास्फोरस) की 75 प्रतिशत अनुशंसित दर के साथ; बावल, चट्टा, झाँसी, कांगड़ा, खुदवानी, मोरेना, नागपुर, पंतनगर और शिलोंगनी में उर्वरकों (नत्रजन व फास्फोरस) की 100 प्रतिशत अनुशंसित दर के साथ करने से सरसों की बीज उपज तथा बीज में तेल की मात्रा उच्चतम दर्ज की गई।

3.8 राई–सरसों में प्राकृतिक खेती पद्धतियों का विस्तार

तीनों स्थानों (बावल, कोटा और पंतनगर) पर सरसों की सबसे कम उपज प्राकृतिक खेती पद्धतियों में दर्ज की गई, जबकि शुद्ध लाभ प्राकृतिक खेती पद्धतियों में पारंपरिक, जैविक और एकीकृत पोषक तत्व प्रबंधन पद्धतियों की तुलना में कोटा में अधिक तथा बावल में कम रहा।

3.9 अभिनव शाकनाशी सूत्रिकरण के माध्यम से ओरोबेन्की का प्रबंधन

बावल में 3 मिलीलिटर सक्रिय तत्व प्रति हैक्टर तथा दौसा में 4 मिलीलिटर सक्रिय तत्व प्रति हैक्टर की दर से बुवाई के एक दिन (24 घंटे) बाद अभिनव शाकनाशी मिश्रण (एन.एच.एफ.) का प्रयोग करने से सरसों की उच्चतम बीज उपज दर्ज की गई। बावल तथा दौसा दोनों केन्द्रों पर 3 मिलीलिटर सक्रिय तत्व प्रति हैक्टर की दर से प्रयोग करने पर ओरोबेन्की के पौधों की सबसे कम संख्या तथा उच्चतम खरपतवार नियंत्रण दक्षता दर्ज की गई।

पादप रोग विज्ञान

रोग परिदृश्य

वर्ष 2024–25 के दौरान विभिन्न स्थानों पर सफेद रोली एवं अल्टरनेरिया झुलसा रोग का प्रकोप मध्यम से तीव्र पाया गया। मुरैना, जगदलपुर और पंतनगर में बीज पत्र अवस्था पर तुलासिता रोग का प्रकोप कम से मध्यम पाया गया। चूर्णिल आसिता रोग का प्रकोप एस. के. नगर और जगदलपुर में तीव्र देखा गया। तना गलन रोग का प्रकोप हिसार, मुरैना और भरतपुर में मध्यम से तीव्र देखा गया। विभिन्न स्थानों पर तकनीकी कार्यक्रम के अनुसार अलग–अलग परीक्षण की निर्धारित तिथियों के अनुसार बुआई की गई।

ब्रेसिका प्रजनन जननद्रव्य की विभिन्न रोगों से प्रतिक्रिया

प्राकृतिक एवं कृत्रिम परिस्थितियों में उन्नत किस्म परीक्षण 1 और 2 (एवीटी 1 और एवीटी 2) की 61 जननद्रव्यों में से 4205बी296–01, आरएसपीटी–6, डीआरएमआरसीआई (क्यू) 172***#, जेकेजेएच 11, उत्तरा, एनपीजे 268 और डीआरएमआर 2018–25***# सफेद रोली रोग के प्रति प्रतिरोधी पायी गई। कृत्रिम परिस्थितियों में पंतनगर व हिसार में एनपीजे 271 और डीआरएमआरसीआई (क्यू) 181** सफेद रोली रोग के प्रति प्रतिरोधी पायी गई। डीआरएमआर 2018–1 जननद्रव्य प्राकृतिक परिस्थितियों में पंतनगर और एस. के. नगर तथा कृत्रिम परिस्थितियों में हिसार में सफेद रतुआ रोग के प्रति प्रतिरोधी पाया गया। डीआरएमआर 2018–1 पंतनगर, लुधियाना और हिसार में प्राकृतिक रोग दबाव एनडीएन के अंतर्गत भी प्रतिरोधी पाया गया।

प्रमुख बीमारियों के लिए समरूप रोग नर्सरी

प्राकृतिक परिस्थितियों में सरसों (ब्रेसिका जुंसिया) के 84 जननद्रव्य में से डीआरएमआरडीआर 2141, डीआरएमआरडीआर 2155, डीआरएमआरडीआर 2152, डीआरएमआरडीआर 2203, डीआरएमआरसीआई 203, डीआरएमआरएसजे 9, डीआरएमआर 2018–26, डीआरएमआरडीआर 2304, डीआरएमआरडीआर 2335, डीआरएमआरडीआर 2206, डीआरएमआरडीआर 2241, डीआरएमआरसीआई 202, डीआरएमआरडीआर 2227, डीआरएमआरआइजेडब्लूआर 20–30, डीआरएमआर 2020–14, डीआरएमआरआईजेडब्लूआर 20–12, डीआरएमआरसीआई 204, डीआरएमआरआईजेडब्लूआर 20–29, डीआरएमआरसीआई 205, डीआरएमआर 2020–15, डीआरएमआरडीआर 2320, डीआरएमआर 2019–20, पीआरडी–2014–15, डीआरएमआरएसजे 12, डीआरएमआर 2019–16, डीआरएमआरडीआर 2301, डीआरएमआरएसजे 14, आरएच–1700–3, डीआरएमआर 2019–15, डीआरएमआरडीआर 2315, डीआरएमआरडीआर 2352, डीआरएमआरडीआर 2317, डीआरएमआरडीआर 2319, डीआरएमआरडीआर 2322 सफेद रोली रोग के प्रति प्रतिरोधी पाये गये।

काला धब्बा की राष्ट्रीय रोग पौधशाला

सरसों के 37 जननद्रव्यों में से एक भी जननद्रव्य अल्टरनेरिया (पत्तियां व फली) रोग के प्रति प्रतिरोधी नही पाया गया। कुछ जननद्रव्य जैसे पीएबी–2014–8, डीआरएमआरआईजेडब्ल्यूआर 20–15, डीआरएमआरएसजे–349, डीआरएमआरआईजेडब्ल्यूआर 20–16, पीएबी–2014–4, डीआरएमआरआईजेडब्ल्यूआर 20–19, आरएच–1700–3, डीआरएमआरआईजेडब्ल्यूआर 20–11, पीएबी–2017–22, पीएबी–2014–18, पीएबी 2017–15 और पीएबी–2014–7 सफेद रोली रोग के लिये प्रतिरोधी पाये गये।

सफेद रोली की राष्ट्रीय रोग पौधशाला

सरसों (ब्रेसिका जुंसिया) के कुल 71 जननद्रव्यों में से डीआरएमआरआईजेडब्ल्यूआर–20–11, पीएबी 14–7, डीआरएमआरआईजेडब्ल्यूआर–20–26, डीआरएमआरसीआई (क्यू) 57, डीआरएमआरएसजे–271, डीआरएमआरआईजेडब्ल्यूआर 20–13, डीआरएमआरआईजेडब्ल्यूआर 20–24, आरएच–1700–4, डीआरएमआरसीआई 153, डीआरएमआरआईजे 12–44, डीआरएमआरआईजेडब्ल्यूआर–20–14, डीआरएमआरएसजे–206, आरएच–1700–3, डीआरएमआरसीआई 168, डीआरएमआरआईजे 12–37, डीआरएमआर 2018–41, डीआरएमआरसीआई 169, डीआरएमआर 2018–26, डीआरएमआरआईजेडब्ल्यूआर–20–15, डीआरएमआरसीआई 171, डीआरएमआरडीआर 2135, डीआरएमआर 2019–15, डीआरएमआरसीआई 182, डीआरएमआरडीआर 2141, पीएबी 14–18, डीआरएमआरआईजेडब्ल्यूआर–20–17, डीआरएमआर 2020–15, डीआरएमआरसीआई 190, डीआरएमआरडीआर 2152, आरएच–1700–1, डीआरएमआर 2018–1, डीआरएमआरआईजेडब्ल्यूआर–20–19, डीआरएमआरसीआई 191, डीआरएमआरडीआर 2155, डीआरएमआरसीआई–139, आरएच–1700, डीआरएमआरसीआई 192, डीआरएमआरएम 18–35–11, डीआरएमआरआईजेडब्ल्यूआर–20–20, डीआरएमआरसीआई–131, डीआरएमआरसीआई–132, डीआरएमआरआईजेडब्ल्यूआर–20–21,

डीआरएमआरएम 18–36–12, डीआरएमआरआईजेडब्ल्यूआर 20–23, डीआरएमआरएम 18–37–13 और डीआरएमआरएम–163 सफेद रोली रोग के लिए प्रतिरोधी पाये गये।

तना गलन की राष्ट्रीय रोग पौधशाला

सरसों (*ब्रेसिका जुंसिया*) के 37 जननद्रव्यों में से कोई भी जननद्रव्य परीक्षण किये गये सात स्थानों पर तना गलन रोग के प्रति सहनशील नहीं पाये गये।

राई–सरसों का प्रारम्भिक जननद्रव्य परीक्षण

सरसों (ब्रेसिका जुंसिया) के कुल 159 आईवीटी जननद्रव्यों में से *ब्रेसिका रापा* किस्म तोरिया के टीकेएम 24–1, पीटीसी 201–1, बीएयूटी–08–12, जेटी 17–1, पीटीसी 2021–2, टीकेएम 24–2, *ब्रेसिका रापा* किस्म पीली सरसों के वाईएसकेएम 24–1, पीवाईएस 2021–21, बीआरवाईएस 2, बीवाईएस 24, आरएमवाईएस 6, वाईएसकेएम 24–2, डीआरएमआरवाईएस 24–3, पीवाईएस 2020–3, डीआरएमआरवाईएस 202 तथा सरसों के केसरी 5113, टीएम 416, पीवाईआर 2018–1, ओआरएम 2019–31, डीआरएमआर 2019–16, पीआरइ 2021–21, आरएमडब्ल्यूआर 19–01, एनपीजे 276, डीआरएमआरआईजे 22–2, डीआरएमआरडीआर 2141, डीआरएमआरएचजे 520, पीडीजेड–22#, पीडीजेड–23#, एलईएस–71, पीएमएएस 1604, एलईएस–70 हिसार, लुधियाना, पंतनगर और एस के नगर में सफेद रोली रोग 10 प्रतिशत से कम रोग प्रकोप के साथ प्रतिरोधी पाये गये। कोई भी जननद्रव्य परिक्षण किये गये चारों स्थानों पर अल्टरनेरिया (पत्ति और फली) और चूर्णिल आसिता रोग के लिए प्रतिरोधी नहीं पाये गये।

सफेद रोली, मृदुरोमिल आसिता, काला धब्बा, चूर्णिल आसिता व तना गलन रोगों की महामारी का अध्ययन

सरसों के सभी प्रमुख रोगों की महामारी विज्ञान पर प्रयोग वरुणा और स्थानीय किस्म का उपयोग करके आठ केन्द्रों, हिसार, पंतनगर, शिलौंगनी, एस के नगर, जगदलपुर, धौली, मुरैना और झॉसी में साप्ताहिक अंतराल पर 1 अक्टूबर से 19 नवंबर तक आठ अलग–अलग तिथियों पर बुवाई का प्रयोग किया गया। कीट और रोगों के प्रबंधन हेतु किसी भी सुरक्षा उपायों को नहीं अपनाया गया।

हिसार में सफेद रोली रोग बुवाई के 46 दिनो के बाद 19 नवम्बर की बुवाई में वरूणा किस्म में पाया गया और सफेद रोली रोग बुवाई के 48 दिनों के बाद 19 नवम्बर की बुवाई में आरएच 30 में पाया गया। उच्चतम रोग दर वरूणा किस्म में 45.6 प्रतिशत रही। अल्टरनेरिया रोग बुवाई के 77 दिन बाद वरूणा और आरएच 30 किस्म में पाया गया, जिसकी बुवाई 19 नवम्बर को की गई थी। तना गलन रोग की शुरूआत बुवाई के 77 दिन बाद वरूणा किस्म में देखा गया, जिसकी बुवाई 15 अक्टूबर को गई थी और आरएच 30 में तना गलन रोग की शुरूआत 77 दिन बाद देखी गई, जिसकी बुवाई 19 नवम्बर को की गई थी। तना गलन रोग की अधिकतम रोग दर 24.1 प्रतिशत आरएच 30 किस्म में देखी गई जिसकी बुवाई 15 अक्टूबर को की गई थी। वरूणा में इस रोग की दर 26.1 प्रतिशत थी जिसकी बुवाई 15 अक्टूबर को गई थी। अधिकतम उपज 1 अक्टूबर की बुवाई में वरूणा किस्म में 3066.1 किलोग्राम/हैक्टेयर और आरएच 30 में 3078.1 क्विंटल/हैक्टेयर पायी गयी।

जगदलपुर में चूणिल आसिता रोग पहली बार बुवाई के 78 दिनों के बाद 19 नवंबर की बुवाई में वरूणा और सीजी सरसों में पाया गया। रोग की अधिकतम तीव्रता 19 नवंबर की बुवाई में 110 दिनों के बाद 85 प्रतिशत देखी गई। अल्टरनेरिया (काला धब्बा) रोग पहली बार 50 दिनो के बाद 19 नवंबर की बुवाई में वरूणा और बुवाई के 49 दिन बाद सीजी सरसों में देखा गया। अधिकतम उपज 01 अक्टूबर वरूणा की बुवाई में 1640 किलोग्राम/हैक्टेयर और सीजी सरसों की बुवाई में 1464 किलोग्राम/हैक्टेयर दर्ज की गयी।

मुरैना में अल्टरनेरिया (काला धब्बा) रोग पत्तियों पर पहली बार बुवाई के 70 दिनों के बाद 19 नवंबर की बुवाई वाली वरूणा और रोहिणी में पाया गया, जबकि फलियों पर बुवाई के 80 दिनों के बाद 19 नवंबर की बुवाई वाली वरूणा और रोहिणी में देखा गया। सफेद रोली पहली बार बुवाई के 48 दिनों बाद 19 नवंबर की बुवाई वाली वरूणा और रोहिणी में देखा गया। छाछया रोग पहली बार बुवाई के 80 दिनो के बाद 19 नवंबर की बुवाई वाली वरूणा और रोहिणी में पाया गया, अधिकतम उपज 29 अक्टूबर बुवाई वाली वरूणा में 2631.3 किलोग्राम/हैक्टेयर और 01 अक्टूबर को रोहिणी की बुवाई में 2645 किलोग्राम/हैक्टेयर दर्ज की गयी।

पंतनगर में मृदुरोमिल आसिता रोग वरूणा किस्म में पत्तियों पर पहली बार देखा गया। जिसकी बुवाई 5 नवम्बर को की गई थी। सफेद रोली रोग पहली बार 49 दिनों के बाद देखा गया, जिसकी बुवाई 19 नवंबर को गई थी। झुलसा रोग (अल्टरनेरिया) को पहली बार 53 दिन बाद देखा गया जिसकी बुवाई 19 नवंम्बर को गई थी। झुलसा रोग (अल्टरनेरिया) की अधिकतम रोग दर 85 प्रतिशत थी, जिसकी बुवाई 22 अक्टूबर को की गई थी। अधिकतम उपज 08 अक्टूबर की बुवाई में वरूणा किस्म में 3300 किलोग्राम/हैक्टेयर दर्ज की गयी।

शिलौंगनी में अल्टरनेरिया (काला धब्बा) रोग पत्तियों पर पहली बार बुवाई के 34 दिनों बाद और फली पर बुवाई के 84 दिनों के बाद 19 नवंबर की बुवाई वाली वरूणा और टीएम 2 किस्म में पाया गया। टीएम 2 में रोग की अधिकतम तीव्रता बुवाई के 100 दिनों के बाद 38.5 प्रतिशत थी, जिसकी बुवाई 19 नवंबर को गई थी। अधिकतम उपज 5 नवंबर को वरूणा की बुवाई में (1853 किलोग्राम/हैक्टेयर) और टीएम 2 में 1760 किलोग्राम/हैक्टेयर पायी गयी।

झाँसी में अल्टरनेरिया (काला धब्बा) रोग पहली बार पत्तियों पर बुवाई के 50 दिनों के बाद 5 नवंबर की बुवाई वाली वरूणा और गिरीराज में पाया गया। यह रोग फलियों पर बुवाई के 83 दिनों के बाद 19 नवंबर की बुवाई वाली वरूणा में पाया

गया। सफेद रोली रोग पहली बार बुवाई के 70 दिनों के बाद देखा गया और चूर्णिल आसिता रोग की शुरूआत बुवाई के 78 दिनों के बाद 19 नवंबर की बुवाई वाली वरूणा में पायी गई। अधिकतम उपज 22 अक्टूबर की बुवाई में गिरीराज (2550 किलोग्राम/हैक्टेयर) और वरूणा (1740 किलोग्राम/हैक्टेयर) में दर्ज की गयी।

धोली में अल्टरनेरिया (काला धब्बा) रोग पहली बार क्रमशः बुवाई के 17 और 23 दिन के बाद वरूणा और राजेन्द्र सुफलाम में देखा गया। काला धब्बा रोग की अधिकतम तीव्रता 22 अक्टूबर की बुवाई में 46.1 प्रतिशत दर्ज की गयी। अधिकतम उपज 22 अक्टूबर की वरूणा की बुवाई में 1450 किलोग्राम/हैक्टेयर और राजेन्द्र सुफलाम की बुवाई में 1630 किलोग्राम/हैक्टैयर दर्ज की गयी।

एस के नगर में सफेद रोली रोग वरूणा में पहली बार 19 नवंबर की बुवाई में 57 दिनों के बाद और जीएम 2 में 58 दिनों के बाद देखा गया। रोग की अधिकतम तीव्रता 43.2 प्रतिशत 29 अक्टूबर की बुवाई वाली वरूणा में देखी गयी। चूर्णिल आसिता रोग पहली बार बुवाई के 84 दिनो के बाद 19 नवंबर की बुवाई वाली वरूणा में और 85 दिनों के बाद जीएम 2 में पाया गया। रोग की अधिकतम तीव्रता (100 प्रतिशत) 19 नवंबर की बुवाई वाली वरूणा और जीएम 2 में देखी गयी। इसमें ये पाया गया कि किस्मों कि देरी से बुवाई करने पर छाछया रोग का प्रकोप अधिक होता है। अधिकतम उपज 1 अक्टूबर की बुवाई में जीएम 2 में 1910 किलोग्राम/हैक्टेयर और वरूणा में 1850 किलोग्राम/हैक्टेयर दर्ज हुई।

राष्ट्रीय अनुवांशिक पौधशाला

विभिन्न जननद्रव्यों जैसे कि एनआरसीएचबी 101 , रोहिणी, वरूणा, डीआरएमआरआईजे 31 (प्रबंधन परीक्षण), डीआरएमआरएमजेए 35, वायोएसआर (आरसी–डब्ल्यूआर), पीएचआर 2 (टीसी–एबी), आरएच 1222–28 (टीसी–एसआर), डीएमएच 1 (एचबी), पीडीजेड–1 (क्यू), एनआरसीवाईएस–05–02 (पीली सरसों), एनपीसी 16, डीएलएससी 1(*ब्रेसिका केरिनाटा*), जीएसएल 1(*ब्रेसिका नेपस*), पीटी 303 (*ब्रेसिका रापा*), आरटीएम 314 (*ईरूका सिटाईवा*) के शुद्व बीज को भरतपुर में संरक्षित किया गया है, ताकि इनका उपयोग विभिन्न पादप रोग विज्ञान संबंधी परीक्षणों में किया जा सके।

किसानों के खेतों में रोग प्रकोप का सर्वेक्षण

हिसार : हरियाणा राज्य के प्रमुख सरसों उत्पादक क्षेत्रों में लगभग 102 स्थानों/गांवों में भारतीय सरसों को प्रभावित करने वाले रोगों की उपस्थिति और तीव्रता का आकलन करने के लिए सर्वेक्षण किया गया। किसानों के खेतों में सफेद रोली (सफेद रतुआ) की तीव्रता 5 से 15 प्रतिशत के बीच पाई गई, हालांकि कुछ स्थानों (हिसार, अग्रोहा, मीरपुर, सिरसा, फतेहाबाद, भिवानी, सिवानी, सतनाली और महेंद्रगढ़) में इसकी तीव्रता 20 से 25 प्रतिशत तक दर्ज की गई। इसके अतिरिक्त तना गलन की उपस्थिति उन स्थानों पर 5 से 10 प्रतिशत के बीच रही, जहाँ पहले इस रोग का इतिहास था। अल्टरनेरिया ब्लाइट (काला धब्बा) की तीव्रता सर्वेक्षण किए गए क्षेत्रों में 10–15 प्रतिशत के बीच पाई गई। सरसों के तराई वाले क्षेत्रों में भू–भागों में पहली सिंचाई के बाद कुछ क्षेत्रों में जीवाणु तना सड़न रोग (बैक्टीरियल स्टॉक रॉट) प्रकोप भी देखा गया।

एस के नगर : देर से बोईगई फसल पर सफेद रोली और चूर्णिल आसिता का तीव्र प्रकोप देखा गया। समय पर बोई गई फसलों में सफेद रोली रोग दिसंबर माह के दूसरे पखवाड़े (18 दिसंबर) में दिखाई दिया और इसकी तीव्रता 23 से 36 प्रतिशत तक रही । चूर्णिल आसिता रोग जनवरी के दूसरे पखवाड़े (20 जनवरी) में सामने आया और इसकी तीव्रता 47 से 68 प्रतिशत तक पाई गई।

शिलौंगनी : असम राज्य के नवगांव, जोरहाट, उत्तर लखीमपुर और गोसाई गांव जिलों में सर्वेक्षण किया गया। अल्टरनेरिया (काला धब्बा) पत्ती झुलसा रोग दिसंबर के दूसरे पखवाड़े से दिखाई देना शुरू हुआ और फरवरी–मार्च में अपने चरम पर पहुँच गया। इस रोग की तीव्रता 25 से 44 प्रतिशत के बीच पाई गई।

धोली : बिहार के समस्तीपुर, मुजफ्फरपुर और दरभंगा जिलों में सर्वेक्षण किया गया। प्रमुख रोगों में काला धब्बा (अल्टरनेरिया ब्लाइट) रोग देखा गया जिसकी तीव्रता 14 से 66 प्रतिशत के बीच थी, जबकि तना गलन रोग की उपस्थिति 2 से 39 प्रतिशत के बीच विभिन्न किसानों के खेतों में दर्ज की गई।

जगदलपुरः रोग प्रकोप के लिए दस किसानों के खेतों का सर्वेक्षण किया गया। प्रमुख रोग चूर्णिल आसिता रोग देखा गया। इस रोग की तीव्रता विभिन्न खेतों में 14.3 से 70.6 प्रतिशत के बीच रही।

पंतनगर : तुलासिता, सफेद रोली, अल्टरनेरिया ब्लाइट, तनागलन और चूर्णिल आसिता (छाछया) जैसे रोग देखे गये। तुलासिता रोग की तीव्रता 10 से 75 प्रतिशत, तनागलन की उपस्थिति 10 से 30 प्रतिशत, सफेद रोली रोग की तीव्रता 25 से 65 प्रतिशत , अल्टरनेरिया ब्लाइट की की तीव्रता 25 से 70 प्रतिशत तथा चूर्णिल आसिता की तीव्रता 30 65 प्रतिशत तक दर्ज की गई। *ब्रैसिका रापा* में वायरल संक्रमण जैसे कि टर्निप मोजेक वायरस और टर्निप येलोज वायरस के लक्षण भी देखे गए।

भरतपुर : ब्रैसिका प्रजातियों में टीयूएमवी द्वारा उत्पन्न वायरल संक्रमण के लक्षण बुवाई के 20 दिन बाद विभिन्न परीक्षणों में विशेष रूप से पछेती फसल में 40 से 70 प्रतिशत तक देखे गए।

कीट विज्ञान

वर्ष 2024–25 में विभिन्न ब्रासिका प्रजातियों पर सरसों एफिड/माहू की मध्यम से उच्च जनसंख्या का विकास देखा गया। परीक्षण की गई 153 प्रविष्टियों में से कोई भी एफिड के लिए प्रतिरोधी नहीं पाई गई, संकमण सूचकांक < 2.0 सरसों माहू के प्रति 29 प्रविष्टियॉ मध्यम प्रतिरोधी पाई गई। इनमें शामिल प्रविष्टियॉ आरएच 1999–18, जे डी 6, केएमआर(ई) 24–2, पीएम 25, एनपीजे 274, एनजेआई 24–401, एनपीजे 278, आरएल 19–237, आरएल 19–162, आरसीसी 4 (जेडसी), केएमआर 24–4,

एसकेएम 2209, आरएयूआरडी 14–18, एनपीजे 280, आरएच 2265, आरकेएम 588, आरएच 2299–64, आरएच 1424, एनपीजे 281, आरएयूआरडी 14–18, डीआरएमआरआईजे 22–2, आरएच 2370, एनपीजे 280, आरजीएन 592, एनपीजे 276, ओआरएम 2019–30, 4205डी300–01, केबीएच–5256 और पीएम 30 में अच्छे पाए गए। इसी तरह एवीटी 1 और एवीटी 2 की 46 प्रविष्टियों में से कोई भी एफिड के लिए प्रतिरोधी नहीं पाई गई, संकमण सूचकांक $<$ 2.0 सरसों माहू के प्रति 8 प्रविष्टियॉ मध्यम प्रतिरोधी पाई गई। इनमें शामिल प्रविष्टियॉ बसंती,सीएस–60, डीआरएमआरएचटी 18–65, एनपीजे 268, एनआरसीएचबी–101(जेडसी), वरुणा, आरएच 2299–63 और एनपीजे 271 में अच्छे पाए गए। कृत्रिम परिस्थितियों में परीक्षण की गई एवीटी 2 की सभी प्रविष्टियॉ सवेंदनशील पाई गई।

कीटों के कारण सबसे अधिक उपज नुकसान लुधियाना में आरएच 1975 (35.9 प्रतिशत), बीपीएम 11 (28.0 प्रतिशत) और पीबीआर–357 (25.8 प्रतिशत) और ढ़ोली में आरएच 1975(25.45 प्रतिशत) एवं बीपीएम 11 (24.5 प्रतिशत) जबकि क्रमशः शिलांगनी में टीएस 38 की उपज में 21.09.प्रतिशत, नई दिल्ली में बीपीएम 11 (20.56 प्रतिशत), हिसार में बीपीएम 11 (17.6 प्रतिशत) और पंतनगर में वरूणा (17.6 प्रतिशत) का उपज में नुकसान हुआ।

अधिकांश केंद्रों पर सरसों एफिड की मध्यम से उच्च आबादी दूसरे से 13 वें सप्ताह में दर्ज की गई और 7 वें से 11 वें सप्ताह के दौरान चरम सीमा पर थी। लुधियाना में बंदगोभी की सुंडी की कम से मध्यम गतिविधि, समय पर और देर से बोई गई स्थितियों के तहत 5 वें से 12 वें सप्ताह दोनों में दर्ज की गई थी। इसके बाद यह देर से बोए गई स्थितियों के तहत 8 वें से 14 वें सप्ताह से सक्रिय रहा। तथा शिलांगनी में 49 वें– 7 वें सप्ताह पिस्सू भृंग की सक्रियता कम पायी गई। मुरैना में चितकबरा कीट की संख्या 49 वें–13 वें सप्ताह में कम पायी गई। 50 वें–13 वें सप्ताह के दौरान लेडीबर्ड बीटल शिकारियों को कम से मध्यम सक्रियता देखी ।

पंखदार चेंपा की आबादी सात केंद्रों द्वारा दर्ज की गई थी। पंखदार चेंपा पहले लुधियाना में 43 वें सप्ताह की शुरुआत में दिखाई दिया। यह 50 वें से 1 वें सप्ताह से अधिकांश केंद्रों पर बढ़ना शुरू हुआ और 6 वें से 10 वें सप्ताह तक अपने चरम पर पहुंच गया। 9 वें सप्ताह के दौरान एसकेनगर में उच्चतम चोटी (6447.6 चेंपा/ ट्रैप) पर दर्ज की गई थी। 12 वें सप्ताह के बाद चेंपा की आबादी में गिरावट की एक सामान्य प्रवृत्ति देखी गई जो 15 वें सप्ताह के बाद अधिकांश केंद्रों से गायब हो गई।

हिसार, मुरैना, एसके नगर, ढोली, शिलांगनी और लुधियाना में सैलिसिलिक एसिड के 1.0 और 1.5 मिली मोलर पर बहिर्जात अनुप्रयोग के परिणामस्वरूप, बिना छिड़काव की तुलना में, एफिड की संख्या काफी कम रही । हालांकि, यह थियामेथोक्साम 25 डब्ल्यूजी @ 0.1 ग्राम/ ली पानी, की तुलना में एफिड आबादी को दबाने में उतना प्रभावी नहीं था, लेकिन इसके परिणामस्वरूप, बिना स्प्रे की तुलना में, जनसंख्या विकास धीमा रहा ।

एफिड के पौधों पर रस चूसने के परिणामस्वरूप मेजबान पौधे के जैव रासायनिक मापदंडों में परिवर्तन हुआ। हिसार में, विभिन्न जीनोटाइप में एफिड के रस चूसने के बाद पेरोक्सीडेज गतिविधि में 22.6–35.5 प्रतिशत की वृद्धि दर्ज की गई थी। इसी तरह, एफिड फीडिंग के बाद ग्लूकोसाइनोलेट्स की मात्रा, कुल फिनोल, ऑर्थो–डायहाइड्रोक्सी फिनोल और फ्लेवोनोल्स की मात्रा में वृद्धि देखी गई। पंतनगर और लुधियाना में लगभग समान परिणाम प्राप्त किए गए थे। सामान्य तौर पर, सरसों और गोभी सरसों में एफिड फीडिंग के बाद अधिकांश रक्षा संबंधी यौगिकों का प्रेरण था।

किसानों के खेतों में किए गए सर्वेक्षण से विभिन्न स्थानों पर कीटों की गतिविधि अवधि में भिन्नता पाई गई। हिसार में सरसों माहू जनवरी से मार्च तक कम गतिविधि के साथ सक्रिय रहा, जनवरी में फ्ली बीटल और दिसंबर में पेंटेड बग की गतिविधि देखी गई। मुरैना में माहू दिसंबर के पहले पखवाड़े से फरवरी के पहले पखवाड़े तक कम स्तर पर सक्रिय रहा, और पेंटेड बग अक्टूबर के दूसरे पखवाड़े से दिसंबर तक मध्यम स्तर तक सक्रिय रहा। पंतनगर में सरसों माहू 45 वें से 13 वें सप्ताह तक कम स्तर पर और सॉफ्लाई 45 वें से 11 वें सप्ताह तक सक्रिय रहे। एसके नगर में सरसों माहू दिसंबर के दूसरे पखवाड़े से फरवरी तक कम सक्रियता दिखाता रहा और कोक्सिनेलिड भी इसी अवधि में सक्रिय रहे । शिलांगनी में माहू और सॉफ्लाई दिसंबर के दूसरे पखवाड़े में कम स्तर पर सक्रिय रहे। लुधियाना में सरसों माहू फरवरी के पहले पखवाड़े से मार्च के दूसरे पखवाड़े तक मध्यम गतिविधि के साथ सक्रिय रहा, वहीं पत्तागोभी इल्ली और कोक्सिनेलिड फरवरी के दूसरे से मार्च के दूसरे पखवाड़े तक सक्रिय पाए गए।

पादप कार्यिकी

विभिन्न कृषि–जलवायु क्षेत्रों में सरसों की किस्मों को प्रतिकूल परिस्थितियों (एबायोटिक स्ट्रेस) के प्रति सहनशीलता के लिए आंकने हेतु तीन प्रयोग किए गए। एक प्रयोग का उद्देश्य था सूखा तनाव को कम करने में बायोस्टिमुलेंट्स की प्रभावशीलता का मूल्यांकन करना, जबकि दूसरा प्रयोग भारतीय सरसों में अंतिम अवस्था पर तापीय तनाव को कम करने के लिए माइक्रोबियल फॉर्मूलेशन की जांच पर केंद्रित था।

प्रथम प्रयोग में, 35 सरसों की किस्मों का अंकुर अवस्था में उच्च तापमान सहनशीलता के लिए प्रयोगशाला एवं फील्ड स्थितियों में मूल्यांकन किया गया। चयन मानदंडों के अनुसार, जिन किस्मों में अंकुर मृत्यु दर $\leq$ 20% और 10 अंकुरों का सूखा भार $\geq$ 35 मि.ग्रा. था, उन्हें सहनशील माना गया। हालांकि, प्रयोगशाला स्थितियों में कोई भी किस्म इन मानदंडों पर खरी नहीं उतरी। फील्ड में पीआरओ 5111 (26.1 ग्राम), डीआरएमआरसीआई 125 (25.8 ग्राम), और एनजेआई 24–401 (25.4 ग्राम) ने अधिकतम सूखा भार दर्शाया, जिनमें अंकुर मृत्यु दर $\leq$ 20% थी, लेकिन फिर भी कोई किस्म चयन मानकों पर खरी नहीं उतरी।

द्वितीय प्रयोग में सरसों की 31 किस्मों का पांच स्थानों पर फील्ड स्थितियों में सूखा सहनशीलता के लिए मूल्यांकन किया गया। आरएच 2265, डीआरएमआर 21–17, डीआरएमआर 2020–3, डीआरएमआरसीआई 148, आरजीएन 229, डीआरएमआर 2019–7 और डीआरएमआरसीआई 161 किस्में बहु–स्थानों पर उच्च सूखा सहनशीलता ($<$ 20% बीज उपज में कमी, DSI $\leq$ 0.5, YSI $\geq$ 0.9) के साथ सामने आईं। इन किस्मों में उच्च सापेक्ष जल मात्रा, क्लोरोफिल मात्रा और SPAD मान के साथ–साथ प्रति पौधा कुल सिलीक्वा, प्रति सिलीक्वा बीज संख्या और 1000–बीज भार में अपेक्षाकृत कम गिरावट दर्ज की गई। तृतीय प्रयोग में, 31 सरसों की किस्मों का अंतिम अवस्था पर उच्च तापमान सहनशीलता के लिए पांच स्थानों पर फील्ड स्थितियों में मूल्यांकन किया गया। सहनशील किस्मों की परिभाषा $\leq$ 20% बीज उपज में कमी, HSI ≤ 0.5 और YSI ≤ 0.9। ऐसी किस्मों में शामिल आरकेएम 599, एनपीजे 267, पीआरएल 2022–5, डीआरएमआरडीआर 2195, ओआरएम 2019–30 और एनपीजे 276, (भरतपुर केंद्र पर), तथा डीआरएमआर 2018–1 (हिसार केंद्र पर)। हालांकि, ढोली, मंडोर और लुधियाना केंद्रों पर कोई सहनशील किस्म नहीं पाई गई।

बायोस्टिमुलेंट्स की प्रभावशीलता का मूल्यांकन करने के लिए (दो बार फोलियर स्प्रे के माध्यम से), सूखा सहनशील किस्मों को पांच स्थानों (भरतपुर, ढोली, हिसार, मंडोर और लुधियाना पर परीक्षण किया गया। परिणामों से पता चला कि बायोस्टिमुलेंट्स ने बीज उपज और जैविक उपज में सुधार किया, और सापेक्ष जल मात्रा, झिल्ली स्थिरता, प्रकाश–संश्लेषणिक रंगद्रव्य, मुख्य शाखा पर सिलीक्वा की संख्या, प्रति पौधा कुल सिलीक्वा, प्रति सिलीक्वा बीज और 1000–बीज भार जैसे गुणों पर सकारात्मक प्रभाव डाला। अधिकतम उपज सुधार भरतपुर और ढोली में सोडियम थायोसल्फेट (5 mM) तथा हिसार और मंडोर में ऑर्थोसिलिसिक एसिड (5 मि.ली.) से देखा गया। भरतपुर और हिसार में सोडियम थायोसल्फेट तथा मंडोर में ऑर्थोसिलिसिक एसिड के साथ सबसे अच्छा लाभ–लागत (B:C) अनुपात दर्ज किया गया। इसके अतिरिक्त, अंतिम अवस्था पर तनाव–अनुकूल माइक्रोबियल फॉर्मूलेशन की प्रभावशीलता का मूल्यांकन हिसार और लुधियाना में तीन सरसों किस्मों पर फील्ड प्रयोगों द्वारा किया गया। बीज उपचार के रूप में यह फॉर्मूलेशन प्रयोग किया गया। परिणामों में यह पाया गया कि इसने झिल्ली स्थिरता, सापेक्ष जल मात्रा, प्रकाश–संश्लेषणिक रंगद्रव्य, 1000–बीज भार, जैविक उपज और बीज उपज को सामान्य और विलंबित बुआई स्थितियों में बेहतर बनाया। यद्यपि विलंबित बुआई में सभी लक्षणों में कुछ गिरावट देखी गई, फिर भी अधिकांश मामलों में माइक्रोबियल उपचार ने जैविक व बीज उपज में सुधार किया। हालांकि, लुधियाना केंद्र में बीपीएम 1825 किस्म की सामान्य बुआई पर जैविक उपज में गिरावट दर्ज की गई।

जैव रसायन

आईवीटी–एवीटी गुणवत्ता परीक्षणों का मूल्यांकन भरतपुर, पंतनगर, हिसार, लुधियाना और वाराणसी में किया गया। 28 जीनोटाइप में तेल की मात्रा 35.75 (डीआरएमआर सीआई (क्यू) 181) (सीवी $\leq$ 0.02) से लेकर 41.08 (एलईएस 68) (सीवी $\leq$ 0. 01) तक है। तेल स्थिरता सूचकांक जो एमयूएफएः पीयूएफए का अनुपात है, यह 0.70 (आरजीएन–73) (सीवी $\leq$ 0.07) से लेकर 1.71 (पीएमएएस 1604) (सीवी $\leq$ 0.11) तक है। प्रविष्टियों का फैटी एसिड प्रोफाइल के लिए भी विश्लेषण किया गया और इसमें पामिटिक एसिड 2.29 प्रतिशत (आरएच 749 (जेडसी) (सीवी $\leq$ 0.19) से 4.61 प्रतिशत (पीडीजेड 11)) (सी.वी $\leq$ 0.20) तक था। स्टैरिक एसिड 0.82 प्रतिशत (आर.एच.–749(जेडसी)(सीवी $\leq$ 0.36) से लेकर 2.36 प्रतिशत (पीएम–30(एनसी)) (सी.वी $\leq$ 0.16) ओलेइक एसिडः 13.63 प्रतिषत (आर.एच.–749(जेडसी)) (सीवी $\leq$ 0.32) से 49.71 प्रतिशत (पीएमएएस–1604) (सी.वी. $\leq$ 0.01) तक पाया गया है। लिनोलेइक एसिडः 15.86 प्रतिशत (आर.एच.–749(जेडसी)) (सीवी $\leq$ 0.05) से 40.31 प्रतिशत (पीडीजेड (डीएलसी)–11) (सी.वी. $\leq$ 0.06)लिनोलेनिक एसिडः 9.83 प्रतिशत (डीआरएमआरसीआइ(क्यू) –179) (सीवी $\leq$ 0.11) से 20.73 प्रतिशत (आर.एच. (ओइ)–1704) (सी.वी. $\leq$ 0.09) ईकोसोनोइक एसिडः 0.97 प्रतिशत (एलइएस–70)(सीवी $\leq$ 0.73) से 2.09 प्रतिशत (वरूना) (सी.वी. $\leq$ 1.24) एरुसिक् एसिडः 0.11 प्रतिशत (पीडीजेड –23रु)(सीवी $\leq$ 1.16) से 48.18 प्रतिशत (आर.एच.–749 (जेडसी)) (सी.वी. $\leq$ 0.06)। ω6ः ω3 अनुपात 1.10 (आर.एच.–749(जेडसी))(सीवी $\leq$ 0.23) से 3.76 (डीआरएमआरसीआइ(क्यू) –179) (सी.वी.$\leq$ 0.23) तक है। एसएफएःमुफाःपुफ़ा अनुपात 01:05:05 (बीपीएमक्य –47 (फिलर)) से 01:21:09 (आरजीएन–73) के बीच है। संतृप्त और असंतृप्त का अनुपात 0.03 से 0.07 तक पाया गया। आईवीटी/एवीटी प्रविशिटयो का पोषकीय परीक्षण किया गया जिसमें कुल प्रोटीनः 30.84 प्रतिशत (वरूना) (सीवी $\leq$ 0.05) से 33.96 प्रतिशत (आरजीएन–73) (सी.वी.$\leq$ 0.01) कुल एंटीऑक्सीडेंट क्षमता 14.50 (डीआरएमआरसीआइ(क्यू) –179)(सी.वी.$\leq$ 0.03) से लेकर 19.69 (एलइएस–70) मिलीग्राम प्रति ग्राम (सी.वी. $\leq$ 0.10) β कैरोटीन की मात्रा 3.35 प्रतिशत (डीआरएमआरसीआइ(क्यू) –179) (सी.वी.$\leq$ 0.09) से लेकर 4.90 प्रतिशत (वरूना) (सी.वी.$\leq$ 0.12) दर्ज की गई। कुल सिनैपिक एसिड की मात्रा 1.90 प्रतिशत (पीएमएएस–8)(सी.वी. $\leq$ 0.06) से लेकर 2.45 प्रतिशत (पीडीजेड (डीएलसी)–11) के बीच है (सी.वी. $\leq$ 0.14) बीस आईवीटी/एवीटी गुणवत्ता परीक्षणों का पोषक अवरोधक तत्वों के लिए भी विश्लेषण किया गया है। जिसमें ग्लूकोसाइनोलेट और फाइटिक एसिड विश्लेषण भी किए गए है। जिसमें पीएमएएस–7, पीडीजेड(डीएलसी)–11, पीएमएएस–1604, और जीइडी–2$ की कुल ग्लूकोसिनॉलेट मात्रा $\leq$ 30 माइक्रोमोल प्रति ग्राम से कम पायी गई। यह 13.73 माइक्रोमोल प्रति ग्राम (जीइडी–1$)(सी.वी. $\leq$ 0.24) से 81.79 माइक्रोमोल प्रति ग्राम (एलइएस–71) (सी. वी.$\leq$ 0.06) तक पाया गया। फाइटिक एसिड की मात्रा 2.12 (आरएच (ओई) 1704) (सीवी $\leq$ 0.15) से 3.07 (पीडीजेड 11

(डीएलसी)) (सीवी ≤ 0.16) और इसका औसत मूल्य 2.50 प्रतिशत डीआरएमआरसीआई (क्यू) 198, बीपीएमक्यू 47 (फिलर), आरएच (ओई) 1702, पीएम 34 (एलआर), पीएमएएस 1604, पीएमएएस 1602 में पाया गया।

अग्रिम पंक्ति प्रदर्शन

वर्ष 2024–25 में तिलहनों के अग्रिम पंक्ति प्रदर्शन और अन्य संबंधित गतिविधियों की योजना के तहत 20 राज्यों के 168 जिलों मे राई सरसों के 10571 अग्रिम पंक्ति प्रदर्शन, 56 अखिल भारतीय राई–सरसों समन्वित अनुसंधान परियोजना के केन्द्रों/भारतीय कृषि अनुसंधान परिषद और कृषि विश्वविद्यालय/गैर सरकारी संस्थाओं/एफ.पी.ओ द्वारा आयोजित किये गये। जिसमें उत्तरप्रदेश में सर्वाधिक 2110 एवं राजस्थान, आसाम, मध्य प्रदेश तथा जम्मू एवं कश्मीर में क्रमशः 2013, 1691, 1441, 545 अग्रिम पंक्ति प्रदर्शनो का आयोजन किया गया।

सिंचित अवस्था में राई–सरसों की अधिकतम औसत पैदावार 2,418 किलोग्राम प्रति हैक्टेयर पंजाब में प्राप्त हुई। इसके बाद मध्य प्रदेश, राजस्थान, पश्चिम बंगाल, उत्तरप्रदेश, उत्तराखण्ड, बिहार, जम्मू एवं कश्मीर, हिमाचल प्रदेश, छत्तीसगढ़, असम, महाराष्ट्र, उडीसा, में क्रमशः 2,338; 2,121; 2,097; 1,916; 1,732; 1,646; 1,587; 1,552; 1,314; 1,335 ;1,210 ;1,046 एवं 8,57 किलोग्राम प्रति हैक्टेयर औसत पैदावार दर्ज की गई। सम्पूर्ण तकनीकी प्रदर्शनों से उपज में अधिकतम बढोत्तरी 79.00, 60.46, 56. 38, 51.25, 42.82, 39.56, 28.33, 23.18, 21.21, 19.36, 12.57 एवं 8.72 प्रतिशत क्रमशः महाराष्ट्र, जम्मू एवं कश्मीर, उडीसा, असम, छत्तीसगढ़, हिमाचल प्रदेश, उत्तरप्रदेश, मध्य प्रदेश, पश्चिम बंगाल, बिहार, राजस्थान तथा पंजाब में प्राप्त हुई। अधिकतम अतिरिक्त औसत शुद्व लाभ 29,353, 27,520, 22,667, 22,430, 21,943, 21,827 20,436, 19,597, 13,134, 13,093, 12,375, 11,775 एवं 11,416 रूपये प्रति हैक्टेयर, जम्मू एवं कश्मीर, मध्य प्रदेश, उत्तर प्रदेश, महाराष्ट्र, छत्तीसगढ़, हिमाचल प्रदेश, पश्चिम बंगाल, असम, उत्तराखण्ड, बिहार, उडीसा, राजस्थान एवं पंजाब में प्राप्त हुई। सिंचित अवस्था में पूरे पैकेज प्रदर्शनों के तहत आईपी में छत्तीसगढ़ में 11,411 रुपये प्रति हेक्टेयर से लेकर बिहार में 40,754 रुपये प्रति हेक्टेयर तक उत्पादन लागत आई।

बारानी अवस्था में राई–सरसों की अधिकतम औसत पैदावार 1,459 किलोग्राम प्रति हैक्टेयर राजस्थान में प्राप्त हुई। इसके बाद, बिहार, झारखण्ड, हिमाचल प्रदेश, जम्मू एवं कश्मीर, उत्तराखण्ड, मणिपुर, असम, मेघालय त्रिपुरा, अरुणाचल प्रदेश एवं उडीसा में क्रमशः 1,347; 1,330; 1,279; 1,221; 1,118; 996; 974; 961; 914; 803 एवं 755 किलोग्राम प्रति हैक्टेयर औसत पैदावार दर्ज की गई। अधिकतम 72.00 प्रतिशत तक उपज में बढोत्तरी अरुणाचल प्रदेश में प्राप्त हुई। इसके बाद, त्रिपुरा, उडीसा, झारखण्ड, जम्मू एवं कश्मीर, असम, उत्तराखण्ड, हिमाचल प्रदेश, राजस्थान, मेघालय, मणिपुर एवं बिहार में क्रमशः 58.13; 50.09; 47. 61; 40.66; 33.24; 28.80; 27.9; 27.42; 26.44; 21.76 तथा 4.58 प्रतिशत तक उपज में बढोत्तरी दर्ज की गई। अधिकतम अतिरिक्त औसत शुद्व लाभ 22,286; 20,079; 17,698; 16,579; 13,638; 13,490; 12,212; 10,999; 10,614; 9,760; 8,643 एवं 2,319 रूपये प्रति हैक्टेयर, झारखण्ड, राजस्थान, अरुणाचल प्रदेश, जम्मू एवं कश्मीर, उत्तराखण्ड, हिमाचल प्रदेश, त्रिपुरा, उडीसा, मणिपुर, असम, मेघालय, बिहार में प्राप्त हुई। असिंचित अवस्था में पूरे पैकेज प्रदर्शनों के तहत आईपी में राजस्थान में 14,502 रुपये प्रति हेक्टेयर से लेकर त्रिपुरा में 36,302 रुपये प्रति हेक्टेयर तक उत्पादन लागत आई।

सम्पूर्ण तकनीकी प्रदर्शनों में भारतीय राई की 19, गोभी सरसों एवं तोरिया की 4 तथा पीली सरसों की 3 उन्नत प्रजातियों को 13 राज्यों में सिंचित अवस्था में प्रयोग किया गया। सिंचित अवस्था में किसान की स्थानीय प्रजाति की तुलना में पंजाब में 100 प्रथम पंक्ति प्रदर्शनों में पीबीआर–357 प्रजाति का प्रयोग था जिससे 12 प्रतिशत उपज बढोत्तरी के साथ अधिकतम उपज 2,775 किलोग्राम प्रति हैक्टेयर प्राप्त हुई। इसके बाद उत्तर प्रदेश में 30 प्रदर्शनों में प्रदर्शित आर.एच –749 प्रजाति से 48.55 प्रतिशत उपज बढोत्तरी दर्ज की गई। न्यूनतम –0.33 प्रतिशत उपज बढोत्तरी पंजाब में 08 प्रदर्शनों में प्रदर्शित आर.एल.सी –3 प्रजाति से दर्ज की गई। जबकि न्यूनतम औसत पैदावार 1036 किलोग्राम प्रति हैक्टेयर महाराष्ट्र में 200 प्रदर्शनों में प्रदर्शित पीडीकेवी कार्तिक प्रजाति मे दर्ज की गई। हालांकि महाराष्ट्र में टीएम–108–1 किस्म मे सर्वाधिक 80.20 प्रतिशत तक उपज बढोत्तरी के साथ औसत पैदावार 1,056 किलोग्राम प्रति हैक्टेयर दर्ज की गई।

उत्तर प्रदेश में पीली सरसों की पीताम्बरी किस्म से 40 प्रतिशत, हिमाचल प्रदेश में गोभी सरसों की एचपीजीएस–2 किस्म से 48.67 प्रतिशत, उत्तर प्रदेश में तोरिया की तपेश्वरी किस्म से 71.25 प्रतिशत का अधिकतम उपज बढोत्तरी सिंचित स्थिति के तहत दर्ज दर्ज की गई। असिंचित अवस्था में राजस्थान में प्रदर्शित बृजराज प्रजाति से अधिकतम औसत पैदावार 1,930 किलोग्राम प्रति हैक्टेयर के साथ 29 प्रतिशत तक उपज में बढोत्तरी दर्ज की गई। मणिपुर में 25 प्रदर्शनों में प्रदर्शित एन.आर.सी.एच.बी.–101 प्रजाति से न्यूनतम औसत पैदावार 996 किलोग्राम प्रति हैक्टेयर के साथ 21.76 प्रतिशत तक उपज में बढोत्तरी प्राप्त हुई। तथापि, झारखण्ड में बीबीएम–1 किस्म ने 1,361 किग्रा/हैक्टेयर की औसत पैदावार के साथ 59.55 प्रतिशत तक उपज में बढोत्तरी प्राप्त हुई।

असिंचित अवस्था में उत्तराखंड में पीली सरसों की पी.पी.एस.–1, ओडिशा में तोरिया की सुश्री जम्मू–कश्मीर में भूरी सरसों की शालीमार सरसों–2, हिमाचल प्रदेश में गोभी सरसों की एचपीजीएस–2 एवं राजस्थान में तारामीरा की आर.टी.एम.–1355 प्रजातियों से उपज में बढोत्तरी क्रमशः 27.68, 50.09, 15.86, 34.11 एवं 28.43 प्रतिशत तक प्राप्त हुई।

विभिन्न केंद्रों द्वारा भारतीय सरसों के लिए 06 घटक प्रौद्योगिकियों के साथ कुल 420 एफएलडी किए गए। घटकों में, हिसार केंद्र द्वारा 45 और 60 दिनों में 2 ग्राम/किलोग्राम बीज की दर से कार्बेन्डाजिम के साथ बीज उपचार और 0.1 प्रतिशत कार्बेन्डाजिम के दो पर्णीय छिड़काव से क्रमशः आरएच 1706 और आरएच 725 किस्मों के साथ 2,650 किग्रा/हेक्टेयर की अधिकतम औसत उपज प्राप्त हुई। हालाँकि, ओडिशा में, समय पर सिंचाई की स्थिति में बीज उपचार + देर से सिंचाई + पीपी+ सल्फर विधि से 51.30 प्रतिशत की अधिकतम उपज वृद्धि देखी गई, साथ ही हरियाणा के हिसार केंद्र में आरएच 1706 किस्म के साथ 23,313

रुपये/हेक्टेयर की उच्चतम एएनएमआर भी प्राप्त हुई। इसके अलावा, बावल केंद्र ने बेहतर प्रबंधन पद्धतियों, सल्फर अनुप्रयोग–100 किग्रा/एकड़ की दर से जिप्सम अनुप्रयोग और स्केलेरोटिनिया रोग प्रबंधन (क्रमशः 45 और 65 डीएएस घटकों पर 1 प्रतिशत घोल में बाविस्टीन (कार्बेंडाज़िम) के दो स्प्रे) के साथ उन्नत किस्म में एफपी की तुलना में 11.3 प्रतिशत, 8.7 प्रतिशत और 8.66 प्रतिशत की उपज वृद्धि दिखाई। इसके अलावा, गुजरात केंद्र द्वारा प्रदर्शित / 40 किग्रा/हेक्टेयर की दर से सल्फर अनुप्रयोग के परिणामस्वरूप 11 प्रतिशत उपज वृद्धि और 9,726 रुपये/हेक्टेयर का एएनएमआर हुआ।

Summary

Summary

Seasonal Conditions

Weather was favourable for the mustard crop during the crop season 2024-25. Good rains were received during monsoon in the month of September at all the centres. The extremely low temperature, (-) 1.2^{0}C was reported at Bajaura centre in the month of December, 2024. Incidence of diseases and pest was very low resulting high production of the crop.

Genetics and Plant Breeding

Varietal Improvement

Twenty-one centres across 15 states, carried the varietal development activities as per the approved technical programme. The salient achievements during the year 2024-25 in toria (*Brassica rapa* var toria), yellow sarson (*B. rapa* var yellow sarson), gobhi sarson (*B. napus*), Indian mustard (*B. juncea*), karan rai (*B. carinata*) and taramira (*Eruca sativa*) are discussed below:

Genetic Resource Management

A total of 7520 accessions comprising toria (1010), Indian mustard (5047), yellow sarson (442), gobhi sarson (619), brown sarson (64), karan rai (268), taramira (*Eruca sativa*) (04), *B. rugosa* (23), *B. nigra* (01), *B. tournifortii* (04), *Crambe abyssinica* (07) , *S. alba* (05), *Sinapis alba* + *B. juncea* (Hexaploid) (02), *Crambe sp* (01), *B chinenesis (01)*, *B. fruiticulosa* (04), *Camelina sativa* (02), *Capsella bursapastoris* (02), *Diplotaxis assurgens* (02), *Diplotaxis tenuisilique (01), Erucastrum spp* (02), *Biscutella sp* (01), *Diplotaxis viminea (01), Lepidium sp* (03), *Diplotaxis muralis (01), R caudatus* (01) *B. chinensis* (01) and *Dilotaxis erucoides* (01) were maintained through appropriate mating system at Bhubaneshwar, Dholi, Hisar, Pantnagar, Ludhiana, Kanpur, Hisar, IARI, New Delhi, Jhansi, Kangra, Pantnagar, Chatha-Jammu, Nagpur and SK Nagar (Table 2.1.1). In addition, 340 new accessions comprising toria (72), Indian mustard (203), yellow Sarson (55), gobhi sarson (05), and karan rai (05) were collected. Further, 2271 accessions consisting of 2059 Indian mustard, 89 toria, 61 yellow sarson, 7 karan rai, 37 gobhi sarson, and 18 brown sarson, accessions were evaluated. On the basis of germplasm evaluation, promising accessions were identified for seed yield, earliness, yield components, thermo-tolerant (early and terminal stages), resistance/tolerance to diseases/pests and quality traits in toria at Bhubaneshwar, Dholi, Chatha-Jammu, Pantnagar, Imphal, New Delhi, Ludhiana, SK Nagar, Varanasi and Kanpur.

Creation of genetic variability through hybridization/ mutagenesis and selection

Creation of variability is the essence and backbone of the breeding programme. To cater the need of diverse agro-climatic conditions of the country, 51 crosses were attempted in toria, 107 in yellow sarson at Pantnagar, Bhubneshwar, Chatha-Jammu, Imphal, and Kanpur and 1284 in Indian mustard at Bhubaneshwar, Chatha-Jammu, Imphal, Hisar, IARI New Delhi, Ludhiana, Kanpur, Pantnagar, SK Nagar, Dholi, Jhansi, Nagpur, Imphal and Varanasi to improve seed yield, earliness, seed size, component traits, disease/pest resistance, heat tolerance suitable for late sown condition, normal sown, drought tolerance, "0" and "00" quality characters, gene Pyramiding of AB/WR, introgression of *AB* resistance and high oil content (Table 2.1.2). Selection of superior plants/bulks at different centres was practised in toria, yellow sarson, Gobhi sarson, Brown sarson, *B. carinata* and Indian mustard. In toria, development of composite populations after the selection was the main objective. In yellow sarson, hybridization and selection from segregating generations were attempted at Kanpur, Bhubaneshwar and Pantnagar. In Indian mustard, 12382 single plants were selected at New Delhi, Hisar, Jhansi, Bhubaneshwar, Chatha-Jammu, Pantnagar, Ludhiana, SK Nagar, Jagdalpur, Varanasi, Dholi, Imphal, Nagpur, Kangra and Kanpur. In Indian mustard, about 1478 bulks were selected from segregating and advanced generations.

Evaluation of advanced breeding lines

The advanced breeding lines were evaluated under different station/state /preliminary yield trials at various centres have been presented in Table 2.1.3. 112 strains of toria were tested at

Kanpur, Bhubaneshwar, Chatha-Jammu, Dholi, and Pantnagar. The yield superiority in toria station trial was up to 22.07 over the check (Tapeshwari) at Pantnagar. In yellow sarson, 90 strains were tested at Kanpur, Pantnagar and Bhubaneshwar. The yield superiority in station trial I up to 23.16 % over the check Pitambari was recorded at Pantnagar. In Indian mustard, 611 strains were evaluated at 09 centres; Chatha, Imphal, Hisar, Kanpur, Ludhiana, Pantnagar, Dholi, Bhubaneshwar and SK Nagar in 43 trials. Seed yield superiority up to 25.78 % over the check PAB-9511 (1890) was recorded at Pantnagar. Ten strains at Hisar, 66 strains at Ludhiana and 18 strains at Chatha of gobhi sarson were evaluated for seed yield and its component characters. Seed yield superiority up to 16.60 % over the check GSC 7 was recorded at Ludhiana.

Hybrid development

Efforts for hybrid development continued during 2024-25 under "Consortia Research Platform on Hybrids", at four centres including ICAR-DRMR Bharatpur, ICAR-IARI New Delhi, PAU Ludhiana and CCS HAU Hisar. One Hybrid RHH 2101 (2700 kg/ha), out yielded the best varietal check; RH 749 (2336 kg/ha) by the margin of more than 15% and hybrid check; DMH-1 hybrid check (2572 kg/h) by margin of more than 5% of seed yield over five locations in AHT-II Zone II and hence, identified during AICRP-RM 2023-24 at Assam Agricultural University. Khanapara Campus, Guwahati (AAU, Assam).

Twenty experimental hybrids of Indian mustard, comprising five from each of four centers were evaluated in replicated block design at all four centers. On the basis of mean seed yield over four locations (Bharatpur, New Delhi, Ludhiana and Hisar) in CRPMLT 1, four hybrids; RHH 2404 (3125 kg/ha), DRMRHJ 2517 (3094 kg/ha), DRMRHJ 3818 (3075 kg/ha) and RHH 2407 (3060 kg/ha) out-yielded the best check Pioneer 45S46 (2926 kg/ha) by a margin of 6.8, 5.7, 5.1 and 4.6%, respectively. On the basis of oil yield performance mean of three locations (New Delhi, Hisar and Bharatpur); three hybrids out yielded the best check Pioneer 45S46 (1256 kg/h), namely; RHH 2404 (1402 kg/h), DRMRHJ 3818 (1310 kg/ha) and DRMRHJ 2517 (1310 kg/h) with a margin of 11.6, 4.3 and 4.3 percent, respectively. Forty experimental hybrids were evaluated in RCBD design (CRPMLT 2) keeping two replications. On the basis of mean seed yield over four locations (Bharatpur, New Delhi, Ludhiana and Hisar), three hybrids; DRMRHJ 2718 (3144 kg/ha), RHH 2409 (3060 kg/ha) and RHH 2417 (3040 kg/ha), out-yielded the best check Pioneer 45S46 (2945 kg/ha) by a margin of 6.7, 3.9 and 3.3% respectively. Forty F_1 crosses were evaluated in CRPMLT 3 conducted at four locations (Bharatpur, Hisar, New Delhi and Ludhiana) in RBD keeping plot size of 3m long paired rows. On the basis of seed yield five crosses out yielded the best check DMH 1 (3143 kg/ha) namely; RH 2299-30/ DRMRIJ 21-31 (3541kg/ha), MJB 37/ TN 3 (3509kg/ha), MJB 36/ M 37 (3495 kg/ha), RH 2265/ PR-2019-9 (3456 kg/ha), and MJB 27/ RC 273 (3301 kg/ha) with margin of 13.8,12.7, 12.2, 10.8 and 9.7 percent respectively. Two hundred fifty-three (253) experimental hybrids including 68, 46, 57 and 82 at IIRMR, CCSHAU, IARI, and PAU, respectively were evaluated at respective centers. Each center identified promising hybrids at their location. Eight hundred twenty (820) F_1 crosses including 54 at ICAR-IIRMR, 197 at CCSHAU, 376 at ICAR-IARI and 193 at PAU were evaluated. Superior crosses were identified at each center. CMS and restorers are being converted in total 421 and 178 nuclear backgrounds, respectively, through back-crossing. In addition to this a total of 213 CMS and 103 restorer lines were maintained. Seed of 253 experimental hybrids and 691 F_1 crosses was produced for evaluation in the next year. A set of 60 lines shared during last year & comprising CMS, maintainer and restorer, 15 from each collaborative center were utilized and maintained. A white rust resistant genotype of Indian mustard (DRMRIJ 12-21) was registered by Plant Germplasm Registration Committee (PGRC) of Indian Council of Agricultural Research, New Delhi in its meeting held on March 24, 2025. Efforts are underway to improve parental lines for white rust resistance, quality and other agronomic traits. A set of 40 inbred lines derived from diverse inter- and intra-specific hybridization, 10 from each centre, was constituted and evaluated for agronomic performance.

Breeder seed production

Indents of 95.32 q breeder seed of 86 Rapeseed-Mustard varieties were received from Department of Agriculture and Cooperation (DAC), Ministry of Agriculture and Farmers Welfare, Govt. of India for production during 2024-25. The allocation was made to 22 centers for the production of 95.32 q of 86 Rapeseed-Mustard varieties during 31st Annual Group Meeting was held at AAU Guwahati, Assam. Against the indent of 95.32q, 252.42q Breeder Seed was produced, indicating a surplus availability of 157.10q. Breeder seed of 01 varieties RVT-2 of toria; 02 varieties Vasundhra, and Urvashi of Indian mustard; 01 variety Subinoy of yellow sarson could not be produced. Further, less quantity of PDZM 35 and PDZM 36 of Indian mustard and T-9 of toria were produced. In addition, 39.45q breeder seed of 09 varieties was also produced by different centers. The center and variety wise details of breeder seed production are presented in Table 2.2.

Coordinated Trials

Performance of 149 strains including 07 of Toria, 10 of yellow sarson and 132 of Indian mustard was tested in twenty-two performance evaluation trials consisting of toria (01), yellow sarson (02) and Indian mustard (19) at 52 locations across the 7 agro-climatic zones of the country. On the basis of superiority for seed/oil yield/ earliness/quality/ resistance over the best check 27 strains of Indian mustard were promoted for advanced stage evaluation.

Rapeseed-Mustard strains promoted for advance stage testing on the basis of higher seed /oil yield/quality/ disease resistance (2024-25)

Zone I	Zone II	Zone III	Zone IV	Zone V	Zone VI	Zone VII
Early Mustard, IVT, Irrigated						
			KMR(E) 24-1 (2903,20.1) RH 2399-2 (2745,13.6) DRMRHT-13-2 (2710,12.1) DRMRCI-206 (2685,11.1) KMR(E) 24-2 (2697,11.6) RH 1999-18** (1085,13.0)	Kesari 5113 (2021,18.8) PRE 2022-12 (1781,10.5)		KMR(E) 24-1 (1227,12.4) KMR(E) 24-2 (1252,14.6) DRMRHT-22-125 (1194,9.3)
Mustard, Timely Sown, Irrigated, IVT						
RB-118 (2158,24.8) CS 2009-219 (2043,18.2) AKMS 1003-50 (1975,14.2) RL-19-237 (1965,13.6) SKM 2209 (1963,13.5)			PYR-2018-1** (1113,11.2)			
Mustard, AVT-I, Timely Sown (Irrigated)						
RH 2299-63 (1712,21.4) SKM 2104 (1618,14.7)						
Mustard, Late Sown, Irrigated, IVT						
	SVJH 78 (2459,13.9) DRMRDR 2141*** (2168,0.4)	RMWR 19-01 (2406,11.0)		DRMRDR 2141*** (1710,3.4) RMWR 19-01*** (1702,3.0)		
Mustard, AVT-I, Late Sown (Irrigated)						
	NPJ 267** (958,12.2)	DRMR 2018-1 (2584,16.7)				

Mustard, Initial Hybrid Trial (IHT)						
	RHH 2402** (1191,10.4)		4205D300-01 (2718,5.9) US 8787** (1090,5.5)			
Mustard, Advance Hybrid Trial (AHT-I)						
	HRH 19290 (2931,6.3)					
Mustard, Quality, IVT						
	RH (OE) 1702# (2913, 7.9)					

Figures in parenthesis indicate seed yield/ oil yield** (kg/ha), percent superiority over best check
** promoted on the basis of oil yield, *** promoted on the basis of white rust resistance
# Single low strain

Crop Production

Nine experiments on different agronomic aspects were conducted during the year 2024-25 and summarized here;

3.1 Long-term fertility experiment on cropping systems involving rapeseed-mustard

Seed yield of mustard increased significantly with the application of 150% NPK at Hisar (22%), Ludhiana (12%), Kangra (26%) and Bharatpur (12%), whereas, 100% NPK+FYM 2.5 t/ha recorded higher yield at Pantnagar (7%) and Kota (15%) over the application of 100% NPK.

3.2 Evaluation of herbicides for weed management in rapeseed-mustard

Pendimethalin 1.0 kg a.i./ha (PE) *fb* fluazifop-p-butyl 0.125 kg a.i./ha 25-30 DAS (PoE) at Hisar and Imphal, and pendimethalin 0.75 kg a.i./ha (PE) *fb* fluazifop-p-butyl 0.125 kg a.i./ha 25-30 DAS (PoE) at Ludhiana and Ranital recorded significantly higher seed yield over the weedy check plots. Pendimethalin 1.0 kg a.i./ha (PE) *fb* quizalofop 0.050 kg a.i./ha 15-20 DAS (PoE) recorded markedly higher seed yield at Pantnagar and SK Nagar over the weedy check. Weed control efficiency was recorded highest with pendimethalin 1.0 kg a.i./ha (PE) at Ludhiana; pendimethalin 1.0 kg a.i./ha (PE) *fb* quizalofop 0.050 kg a.i./ha 15-20 DAS (PoE) at Hisar, Pantnagar, SK Nagar; pendimethalin 1.0 kg a.i./ha (PE) *fb* fluazifop-p-butyl 0.125 kg a.i./ha 25-30 DAS (PoE) at Ranital and Imphal.

3.3 Agronomic evaluation of promising rapeseed-mustard entries

Timely sown, irrigated/quality/WRR entries (Zone-II):

The entry DRMR 2018-25 recorded higher seed yield over Kranti and Basanti at Abohar (11.6 & 15.7%) and at Ludhiana (6.4 & 3.8%). At Hisar, DRMR 2018-25 recorded higher seed yield over Basanti (28.4%) and Giriraj (6.6%). At New Delhi, DRMR 2018-25 recorded higher seed yield over Basanti and RH 749. At Chatha, DRMR 2018-25 recorded lower seed yield compared to checks except Basanti. The entry NPJ 261 recorded significantly higher seed yield at Hisar, Ludhiana and New Delhi over the checks; Basanti, Giriraj and RH 749. At Abohar, entry NPJ 261 recorded higher seed yield over Kranti and Basanti. At Chatha, NPJ 261 recorded lower seed yield compared to checks except Basanti.

Timely sown (irrigated/quality) mustard entries in Zone-III

The entry DRMRCIQ 172 recorded higher seed yield at Jhansi, Morena, Pantnagar and Varanasi over the checks RGN 73, PDZ 11 and PM 30. At Kota, DRMRCIQ 172 recorded lower seed yield compared to checks.

AHT-II mustard entries in Zone IV

The entry 18J408C recorded lower seed yield at Jalgaon compared to hybrid checks. At Mandore, Pali and SK Nagar entry 18J408C recorded higher seed yield compared to 45S46 and DMH 1. At Nagpur, 18J408C recorded higher seed yield over 45S46 (4.8%) but, lower than DMH 1.

Saline/alkaline entries at across the zones

The entry CS 2020-10 recorded higher seed yield at Hisar, Karnal and Lucknow compared to Kranti, CS 54 and CS 60.

3.4 Response of macro and micro nutrient bio-fertilizers in enhancing rapeseed-mustard productivity and soil health

Seed inoculation with **NPK consortia+ZSB** significantly increased seed yield at all the 16 locations ranging from 11-45% over the no inoculation. Seed inoculation with **NPK consortia+ZSB significantly also increased net economic returns (23-47%) over no inoculation at all the locations except at SK Nagar**.

3.5 Optimization of mineral nutrient management for higher productivity

Application of 125% RDF at Chatha, Ranital, Imphal, Kanke, Kota, Ludhiana, Pantnagar and Dholi, and 150% RDF at Jhansi, Kangra, Morena, Nagpur and Hisar along with the application of FYM enriched '40 kg S+5.0 kg Zn+1.0 kg B/ha' recorded highest seed yield at all the locations.

3.6. Technological advancement for mustard production in rice-fallow areas

Zero tilled sowing of mustard under anchored rice straw recorded significantly higher seed yield at Dholi (13.9%) and Imphal (22.7%), and net return at Dholi (33.7%) and Shillongani (5.8%) compared to conventional tillage. Among nutrient management practices, application of NPKZnB (50% N basal+50% N top dressing) recorded higher seed yield and net returns at Dholi, Imphal and Shillongani.

3.7. Effect of nano-fertilizers on yield and quality of rapeseed-mustard

Application of 75% RDF (NP) at Dholi, Hisar, Jobner, Imphal, Kanke, Kota, Ranital and SK Nagar, and 100% RDF (NP) at Bawal, Chatha, Jhansi, Kangra, Khudwani, Morena, Nagpur, Pantnagar and Shillongani along with two foliar sprays of nano urea+nano DAP (25-30 and 45-50 DAS) recorded significantly higher seed yield and oil content of mustard.

3.8 Scaling of natural farming practices in rapeseed-mustard

The natural farming practices recorded lowest seed yield of mustard at all three locations while, net returns accrued higher at Kota but, lower at Bawal center compared to conventional, organic and INM practices.

3.9 Management of *Orobanche* through novel herbicide formulations

Novel herbicide formulations (NHF) applied after one day (24 hrs.) of sowing @ 3 ml a.i./ha at Bawal and 4 ml a.i./ha at Dausa recorded highest seed yield of mustard. The lowest number of Orobanche plants and highest weed control efficiency were recorded with 3 ml a.i./ha both at Bawal and Dausa centres.

Plant Pathology

Disease Scenario

During 2024-25, moderate to severe occurrence of Alternaria blight and white rust diseases was recorded at different locations. Low to moderate incidence of downy mildew was observed at the cotyledonary stage at MOR, JAG and PNT. Powdery mildew severity was high at SKN and JAG. Moderate to severe incidence of Sclerotinia rot was observed at HSR, MOR and BPR. Different trials were sown on dates as per technical program at different locations.

Screening of *Brassica* breeding material

Among 61 AVT-I and AVT-II entries, 4205B296-01, RSPT-6, DRMRCI (Q) 172***#, JKJH 11, Uttara, NPJ 268, DRMR 2018-25***# of *B. juncea* were found resistant to WR both under natural and artificial conditions. NPJ 271 and DRMRCI (Q) 181**, were found resistant to WR at PNT and HSR under artificial conditions. DRMR 2018-1 was found resistant to WR at PNT and SKN under natural conditions and at HSR under artificial conditions. DRMR 2018-1 was also found resistant under NDN at PNT, LDH and HSR.

Uniform Disease Nursery for major diseases

Among 84 entries, DRMRDR 2141, DRMRDR 2155, DRMRDR 2152, DRMRDR 2203, DRMRCI 203, DRMRSJ 9, DRMR 2018-26, DRMRDR 2304, DRMRDR 2335, DRMRDR 2206, DRMRDR 2241, DRMRCI 202, DRMRDR 2227, DRMRIJWR 20-30, DRMR 2020-14, DRMRIJWR 20-12, DRMRCI 204, DRMRIJWR 20-29, DRMRCI 205, DRMR 2020-15, DRMRDR 2320, DRMR 2019-20, PRD-2014-15, DRMRSJ 12, DRMR 2019-16, DRMRDR 2301, DRMRSJ 14, RH-1700-3, DRMR 2019-15, DRMRDR 2315, DRMRDR 2352, DRMRDR 2317, DRMRDR 2319, DRMRDR 2322 of *B. juncea* showed resistance reaction to WR under natural conditions.

National Disease Nursery (NDN) for Alternaria blight

Among 37 entries, none of the entries showed resistance to AB on leaves and Pods. Entries, PAB-2014-8, DRMRIJWR 20-15, DRMRSJ-349, DRMRIJWR 20-16, PAB-2014-4, DRMRIJWR 20-19, RH-1700-3, DRMRIJWR 20-11, PAB-2017-22, PAB-2014-18, PAB-2017-15, PAB-2014-7 of *B. juncea* showed WR resistant reaction.

National Disease Nursery (NDN) for white rust

Among 71 entries, DRMRIJWR-20-11, PAB 14-7, DRMRIJWR-20-26, DRMRCI (Q) 57, DRMRSJ-271, DRMRIJWR-20-13, DRMRIJWR-20-24, RH-1700-4, DRMRCI 153, DRMRIJ-12-44, DRMRIJWR-20-14, DRMRSJ-206, RH-1700-3, DRMRCI 168, DRMRIJ 12-37, DRMR 2018-41, DRMRCI 169, DRMR 2018-26, DRMRIJWR-20-15, DRMRCI 171, DRMRDR 2135, DRMR 2019-15, DRMRCI 182, DRMRDR 2141, PAB 14-18, DRMRIJWR-20-17, DRMR 2020-15, DRMRCI 190, DRMRDR 2152, RH-1700-1, DRMR 2018-1, DRMRIJWR-20-19, DRMRCI 191, DRMRDR 2155, DRMRCI-139, RH-1700, DRMRCI 192, DRMRM 18-35-11, DRMRIJWR-20-20, DRMRCI-131, DRMRCI-132, DRMRIJWR-20-21, DRMRM 18-36-12, DRMRIJWR-20-23, DRMRM 18-37-13, DRMRM-163 of *B. juncea* were found resistant to WR.

National Disease Nursery (NDN) for Sclerotinia rot

Among 37 entries, none of the entries showed tolerance to SR at the tested locations.

Screening of IVT entries of Brassica against different diseases

Among 159 IVT entries, TKM 24-1, PTC-2021-1, BAUT-08-12, JT-17-1, PTC 2021-2, TKM 24-2 of *B. rapa var Toria*; YSKM 24-1, PYS 2021-21, BRYS 2, BYS-24, YSKM 24-2, DRMRYS 24-3, PYS 2020-3, RMYS 6, DRMRYS 202 of *B. rapa* var Yellow sarson; Kesari 5113, RMYS 6, TM 416, DRMR 2019-16, NPJ 276, PRL 2022-1, DRMRDR 2141, RMWR 19-01, DRMRIJ 22-2, DRMRCI (Q) 197, PMAS 1604, PMAS 1602, PDZ-22#, PRE 2022-12, LES-70, PDZ-23#, LES-71 of *B. juncea* were found resistant to WR with <10% severity at HSR, LDH, PNT and SKN. None of the entries showed resistant reaction against ABL, ABP and PM at the tested locations.

Epidemiology of major rapeseed-mustard diseases

Experiment on epidemiological studies of rapeseed-mustard diseases was conducted at HSR, PNT, SHL, SKN, JAG, DOL, MOR and JHS using cv. Varuna and local variety sown on 8 different dates starting from October 01 to November 19 at weekly interval without adopting any protection measures against pest and diseases.

HSR: WR appeared first at 46 DAS on Nov 19 sown Varuna. WR appeared first at 48 DAS on Nov 19 sown RH 30. Highest WR severity of 45.6% was observed in Nov 19 sown Varuna. AB appeared first 77 DAS on Nov 19 sown Varuna and RH 30. SR disease initiation was observed 77 DAS in Oct 15 and Nov 19 sown Varuna and 77 DAS in Nov 19 sown RH 30. Maximum incidence was 24.1 % in Oct 15 sown RH 30 while in Varuna it was 26.1% in Oct 15 sown crop. Maximum yield was 3066.1 kg/ha in Varuna and 3078.1 kg/ha in RH 30 in Oct 1 sown crop.

JAG: PM appeared first at 78 DAS on Nov 19 sown Varuna and CG Sarson. Highest PM severity was 85% at 110 DAS in Nov 19 sown crop of Varuna. AB appeared at 50 DAS on Nov 19 sown Varuna and 49 DAS on CG Sarson. Maximum yield was recorded in Oct 1 sown Varuna (1640 kg/ha) and CG Sarson (1464 kg/ha).

MOR: AB appeared first on leaves at 70 DAS on Nov 19 sown Varuna and Rohini, whereas AB on pods was seen at 80 DAS on Nov 19 sown Varuna and Rohini. WR appeared first at 48 DAS on Nov 19 sown Varuna and Rohini. PM initiated at 80 DAS in Nov 19 sown crop. Maximum yield was recorded in Oct 29 sown Varuna (2631.3 kg/ha) and Oct 1 sown Rohini (2645 kg/ha).

PNT: Downy mildew disease first appeared 10 DAS on Nov 5 sown Varuna. WR disease first appeared 49 DAS on Nov 19 sown crop. AB disease was first noticed at 53 DAS on Nov 19 sown crop. Maximum AB severity observed was 85% on Oct 22 sown crop. Maximum yield was recorded in Oct 8 sown crop (3330 kg/ha).

SHL: ABL observed first on leaves at 34 DAS and on silique at 84 DAS on Nov 19 sown Varuna and TM 2. Maximum disease severity was 38.5% (100 DAS) on Nov 19 sown TM 2. Maximum yield was recorded in Nov 05 sown Varuna (1853 kg/ha) and TM 2 (1760 kg/ha).

JHS: AB appeared first on leaves at 50 DAS on Nov 5 sown Varuna and Giriraj, whereas AB on pods was seen at 83 DAS on Nov 19 sown Varuna. WR appeared first at 70 DAS on Nov 19 sown Varuna. PM initiated at 78 DAS in Nov 19 sown Varuna. Maximum yield was recorded in Oct 22 sown Giriraj (2550 kg/ha) and Varuna (1740 kg/ha).
DOL: AB was first observed at 17 DAS and 23 DAS on Varuna and Rajendra Suflam, respectively. Maximum AB severity observed was 46.1%. Maximum yield was recorded in Oct 22 sown Varuna (1450 kg/ha) and Oct 22 sown Rajendra Suflam (1630 kg/ha).
SKN: WR was observed first at 57 DAS on Varuna and 58 DAS on GM 2 on Nov 19 sown crop. Maximum white rust severity was 43.2% on Oct 29 sown Varuna. Powdery mildew disease first appeared at 84 DAS on Nov 19 sown Varuna and at 85 DAS on Nov 19 sown GM 2. The maximum disease severity was observed in Nov 19 sown cv. Varuna (100%) and GM 2 (100%), which clearly indicates that late sown crop encountered with higher PM incidence. Highest yield was observed in Oct 01 sown GM 2 (1910 kg/ha) and Varuna (1850 kg/ha).

National Genetic Stock Nursery

Pure seed of different check genotypes viz, NRCHB 101 & Rohini (SC), Varuna, DRMRIJ 31 (Mgt trials), DRMRMJA 35, BIOYSR (RC-WR), PHR 2 (TC-AB), RH 1222-28 (TC-SR), DMH 1 (HB), PDZ 1 (Q), NRCYS-05-2 (YS), NPC 16, DLSC 1 (Bc), GSL 1 (Bn), PT 303 (Br), RTM 314 (Es) maintained at Bharatpur for their utilization in different Plant pathological trails.

Survey of farmer's field for disease outbreak

HSR: A survey was carried out to assess the prevalence and severity of diseases affecting Indian mustard across approximately 102 locations/villages in major mustard growing areas of Haryana state. The severity of white rust ranged from 5 to 15 per cent in farmer's field, although, from some locations (Hisar, Agroha, Mirpur, Sirsa, Fatehabad, Bhiwani, Siwani, Satnali and Mahendergarh) severity levels were 20 to 25%. Additionally, the incidence of Sclerotinia rot varied between 5 to 10 per cent at some of the locations with a prior history of this disease. Alternaria blight disease severity was found to be between 10-15 per cent across the surveyed location. Bacterial stalk rot was detected in a few areas following the first irrigation in low lying regions of mustard growing areas.
SKN: White rust was and powdery mildew was observed in severe form on late sown crops. On timely sown crops, White rust disease appeared during second fortnight of December month (18th Dec.) and 23-36% severity was observed. Powdery mildew disease appeared during second fortnight of January month (20th Jan.) and 47-68% severity was observed.
SHL: Survey was conducted in Nagaon, Jorhat, North Lakhimpur and Gossaigaon districts of Assam. The Alternaria leaf blight started appearing from second fortnight of December and reached its peak in February-March and disease severity ranged from 25 to 44%.
DOL: Survey was conducted in Samastipur, Muzaffarpur and Darbhanga districts of Bihar. Major diseases observed were Alternaria blight with disease severity varying between 14 to 66% and Sclerotinia rot with disease incidence varying between 2 to 39% in different famer's fields.
JAG: Survey of ten farmer's fields for disease outbreak was conducted. Major disease observed was powdery mildew. Severity of powdery mildew varied between 14.3 to 70.6% in different fields.
PNT: Downy mildew, white rust, Alternaria blight, Scleotinia rot and powdery mildew were observed. Downy mildew severity ranged between 10 to 75%. Sclerotinia rot incidence varied between 10 to 30%. White rust severity varied between 25 to 65%. Alternaria blight severity varied between 25 to 70%. Powdery mildew severity varied between 30 to 65%. In *Brassica rapa*, symptoms of viral infections such as Turnip mosaic virus (TuMV) and Turnip yellows virus (TuYV) were observed.
BPR: In *Brassica* species, symptoms of viral infection primarily caused by TuMV between 40 to 70% was observed at 20 DAS particularly in late sown crop in the experimental field.

Entomology

The crop season 2024-25 witnessed moderate to high population development of mustard aphid on different Brassica species. Out of 153 IVT entries, 29 entries were found to be moderately resistant to mustard aphid since these recorded Aphid Infestation Index (AII) < 2.0. These included RH 1999-18, JD 6, KMR (E) 24-2, PM 25, NPJ 274, NJI24-401, NPJ 278, RL-19-237, RL-19-162,

RCC-4 (ZC), KMR-24-4, SKM-2209, RAURD-14-18, NPJ-280, RH-2265, RKM-588, RH 2299-64, RH 1424, NPJ 281, RAURD-14-18, DRMRIJ-22-2, RH 2370, NPJ-280, RGN-592, NPJ 276, ORM-2019-30, 4205D300-01, KBH-5256 (NC) and PM 30 (NC) were comparatively better since these recorded. AII of < 2.0. Similarly, in AVT-I and AVT-II entries out of all the 46 entries screened, none was found to be resistant while eight entries viz. Basanti (WRR Check), CS-60 (LR), DRMRHT-18-65, Kranti (NC), NPJ-268, Varuna, RH-2299-63 and NPJ-271 recorded AII <2.0. Among the 10 AVT-II entries screened under artificial conditions, all were found susceptible.

The highest yield losses were observed in RH 1975 (35.9%), BPM 11 (28.0%) and PBR 357 (25.8%) at Ludhiana and RH 1975 (25.45%) and BPM 11 (24.50%) at Dholi (Table 5.2). It was followed by 21.09% yield loss in TS 38 at Shillongani and 20.56% in BPM 11 at New Delhi, 17.60% in BPM 11 at Hisar and 17.6% in Varuna at Pantnagar.

Moderate to high population of mustard aphid was reported at many centres from 1st to 13th standard week with peak during 7th to 11th standard week. Low to moderate activity of cabbage caterpillar was recorded both under timely and late sown conditions at LDH. It remained active from 5th-12th standard week under timely and late sown conditions. Cabbage aphid remained active from 8th-14th SMW at Ludhiana under late sown conditions. At Shillongani, low to moderate activity of sawfly was observed from 49th SMW to 7th SMW at Shillongani while flea beetle remained active from 49th SMW to 11th SMW. Mustard aphid at this centre remained active from 51st SMW to 13th SMW although it remained at low levels. Low population of painted bug was observed from 42nd-48th standard week at MOR while mustard aphid remained active from 49th to 13th SMW though at low levels. The activity of coccenellid predators was low to moderate during 50th -13th standard week.

The alate aphid population was recorded by seven centres. Alate aphid appeared as early as 43rd week at LDH. It started increasing at most of the centres from 50th -1st std. week and reached its peak from 6th 10th std week. The highest peak (6447.6 aphids/ trap) was recorded from SKN during 9th std. week. After 12th std. week a general trend of decline in aphid population was observed which disappeared from most of centres after 15th standard week.

Exogenous application of salicylic acid at 1.0 and 1.5 mM resulted in significantly lower aphid population compared to control at HSR, MOR, SKN, DOL, SHL and LDH. Although, it was not as effective in suppressing the aphid population as thiamethoxam 25 WG @ 0.1 g/l water but it resulted in slow population development compared to control.

Aphid herbivory resulted in changes in biochemical parameters of host plant. At HSR, 22.6–35.5% increase in peroxidase activity was recorded after aphid feeding in different genotypes. Similarly, increase in myrosinase activity and total phenols, ortho-dihydroxy phenols and flavonols content was observed after aphid feeding. On the other hand, a reduction in total glucosinolates content was observed which ranged from -6.1 to -21.7 in different genotypes. Almost similar results were obtained at PNT and LDH. In general, there was an induction of most of the defense related compounds after aphid feeding in *B. juncea* and *B. napus*.

Survey and surveillance at farmer's fields revealed variable activity period of insect-pests at different locations. At Hisar, mustard aphid remained active from January to March with low activity. Some activity of flea beetle was observed during January while painted bug activity was observed during December. At Morena, mustard aphid remained active from first fortnight of December to first fortnight of February though at low levels. Painted bug remained active from second fortnight of October to second fortnight of December with low to moderate levels. At Pantnagar mustard aphid remained active at low levels from 45th SMW to 13th SMW while sawfly remained active from 45th to 11th SMW. At SK Nagar low activity of mustard aphid was observed from 2nd fortnight of December to 2nd fortnight of February while coccinellids remained active at low levels from first fortnight of December to 2nd fortnight of February. At Shillongani, mustard aphid and sawfly remained active at low levels during second fortnight of December. At Ludhiana, mustard aphid remained active first fortnight of February to second fortnight of March at low to moderate levels. Low activity of cabbage caterpillar and coccinellids was observed from second fortnight of February to second fortnight of March.

Plant Physiology

Three experiments were conducted to evaluate mustard genotypes for abiotic stresses under different agro-climatic zones. One experiment aimed to assess the effectiveness of biostimulants in mitigating drought stress, while another focused on testing microbial formulations to alleviate heat stress at the terminal stage in Indian mustard.

In the first experiment, thirty-five mustard genotypes were evaluated for high-temperature tolerance at the seedling stage under both laboratory and field conditions. According to the selection criteria, genotypes with seedling mortality ≤20% and dry weight ≥35 mg per 10 seedlings were considered tolerant under controlled conditions. However, the results revealed that none of the genotypes met these criteria in laboratory conditions. In the field, the highest dry matter of 10 plants was observed in PRO 5111 (26.1 g), followed by DRMRCI 125 (25.8 g) and NJI 24-401 (25.4 g), all with seedling mortality ≤20%. Despite this, none of the genotypes met the selection thresholds in field conditions either. In the second experiment, thirty-one genotypes of *Brassica juncea* were evaluated for drought tolerance under field conditions across five locations. The genotypes RH 2265, DRMR 21-17, DRMR 2020-3, DRMRCI 148, RGN 229, DRMR 2019-7, and DRMRCI 161 showed high drought tolerance at multiple locations, exhibiting ≤20% seed yield reduction, DSI ≤0.5, and YSI ≥0.9. These genotypes also maintained higher relative water content, chlorophyll content, and SPAD values, with relatively low reductions in total siliquae per plant, seeds per siliqua, and 1000-seed weight. In the third experiment, thirty-one mustard genotypes were assessed for high-temperature tolerance at the terminal stage under field conditions across five locations. Tolerant genotypes—defined as those with ≤20% seed yield reduction, HSI ≤0.5, and YSI ≥0.9—included RKM 599, NPJ 267, PRL 2022-5, DRMRDR 2195, ORM 2019-30, and NPJ 276 at the Bharatpur center, and DRMR 2018-1 at the Hisar center. However, no tolerant genotypes were identified at the Dholi, Mandore and Ludhiana centers.

To evaluate the efficacy of biostimulants through foliar spray (two applications), drought-tolerant varieties were tested at five locations (Bharatpur, Dholi, Hisar, Mandore and Ludhiana). Results revealed that biostimulants effectively enhanced seed yield and biological yield by positively influencing various traits, including relative water content, membrane stability, photosynthetic pigment levels, siliquae on the main shoot, total siliquae per plant, number of seeds per siliqua, and 1000-seed weight. The maximum yield improvement was observed with sodium thiosulphate (5 mM) at Bharatpur and Dholi, and with orthosilicic acid (5 ml) at Hisar and Mandore. The best benefit-cost (B:C) ratio was recorded with sodium thiosulphate at Bharatpur and Hisar, and with orthosilicic acid at Mandore. Additionally, field experiments were conducted to evaluate the effectiveness of a stress-adaptive microbial formulation at the terminal stage in three mustard varieties at Hisar and Ludhiana. The microbial formulation was applied as a seed treatment. The results showed that it had a positive effect on membrane stability, relative water content, photosynthetic pigment levels, 1000-seed weight, biological yield, and seed yield under both normal and late-sown conditions. Although all traits showed some reduction under late sowing, the microbial treatment improved biological and seed yield in most cases. An exception was noted for BPM 1825 at the Ludhiana center, where biological yield declined under normal sowing after microbial treatment.

Biochemistry

IVT/AVT quality trials were evaluated at Bharatpur, Pantnagar, Hisar, Ludhiana and Varanasi. **Oil content** among 28 genotypes ranges from 35.75 (DRMR CI (Q) 181) (CV ≤ 0.02) to 41.08 (LES 68) (CV ≤ 0.01). **Oil stability index** which is the ratio of **MUFA: PUFA**, it ranged from 0.70 (RGN73) (CV ≤ 0.07) to 1.71 (PMAS 1604) (CV ≤ 0.11). Entries were also analyzed for fatty acid profile and it has **Palmitic acid** ranged from 2.29% (RH 749 (ZC)(CV ≤ 0.19) to 4.61% (PDZ11))(CV ≤ 0.20). **Stearic acid**: 0.82% (RH 749 (ZC)) (CV ≤ 0.36) to 2.36 (PM 30 (NC)) (CV ≤ 0.16). **Oleic acid** ranged 13.63% (RH 749 (ZC)) (CV ≤ 0.32) to 49.71% (PMAS 1604) (CV ≤ 0.01). **Linoleic acid**: 15.86% ((RH 749 (ZC)) (CV≤ 0.05) to 40.31% (PDZ 11 (DLC)) (CV ≤ 0.06). **Linolenic acid**: 9.83 (DRMRCI (Q) 179) (CV ≤ 0.11) to 20.73 (RH (OE) 1704). (CV ≤ 0.09). **Eicosanoic acid**: 0.97 (LES 70) (CV ≤ 0.73) to 2.09 (Varuna) (CV ≤ 1.24). **Erucic acid**: 0.11 (PDZ 23#) (CV ≤ 1.16) to 48.18 (RH 749 (ZC)) (CV ≤ 0.06). **ω6: ω3 ratio** ranged from 1.10 (RH 749

(ZC)) (CV ≤ 0.23) to 3.76 (DRMRCI (Q) 179) (CV ≤ 0.23). **SFA: MUFA: PUFA** ratio ranged between 01:05:05 (BPMQ 47 (Fillar) 01:21:09 (RGN 73). **Saturated and unsaturated ratio** ranged between 0.03 to 0.07. Nutritional Profiling of entries of IVT/AVT quality trials observe **total protein ranged** from 30.84 (Varuna) (CV ≤ 0.05) to 33.96 (RGN 73) (CV ≤ 0.01). **Total antioxidant capacity** ranged from 14.50 (DRMRCI (Q) 179) (CV ≤ 0.03) to 19.69 (LES 70) mg/g AAE (CV ≤ 0.10). **β- carotene** ranged from 3.35 (DRMRCI (Q) 179) (CV ≤ 0.09) to 4.90 (Varuna) (CV≤0.12). **Total sinapine content** ranged from 1.90 (PMAS 8) (CV ≤ 0.06) to 2.45 (PDZ 11 (DLC)) (CV ≤ 0.14). Estimation of anti-nutritional factors in quality breeding materials includes total glucosinolate content and phytic acid analysis. **Total Glucosinolate** mean values for six centers (Bharatpur, Pantnagar, Ludhiana, Hisar and BHU) were <30 µmol/g in genotypes PMAS 7 (22.95), GED-1$ (13.73 µmol/g), GED 2$ (16.00 µmol/g), DH-2'00'7G (17.74 µmol/g), PDZ 11 (DLC) (21.16 µmol/g), PMAS 1604 (27.80 µmol/g) genotypes. Glucosinolate ranged from 13.73 µmol/g (GED-1$) (CV ≤ 0.24) to 81.79 µmol/g (LES 71) (CV ≤ 0.06). **Phytic acid content** 2.12 (RH (OE) 1704) (CV ≤ 0.15) to 3.07 (PDZ 11 (DLC)) (CV ≤ 0.16) and its mean values were < 2.50% in DRMRCI (Q) 198, BPMQ 47 (Fillar), RH (OE) 1702, PM 34 (LR), PMAS 1604, PMAS 1602, DRMRCI (Q) 197, RH (OE) 1704, PDZ 23#, RH 749 (ZC), LES 68, RGN 73, Varuna, DRMRCI (Q) 172, RH (OE) 1710 DRMRCI (Q) 181 and DRMRCI (Q) (Table 15-21).

Frontline demonstrations

Under the scheme "Frontline demonstrations and other related activities of Oilseeds" funded under the NFSM-Oilseed by DAC&FW, Ministry of Agriculture and Farmers' Welfare, Govt. of India, 10571 frontline demonstrations (FLDs) were conducted in 168 districts across 20 states during 2024-25 through 56 cooperating centres of AICRPRM/ ICAR institutes/ Ag. University. The maximum FLDs were conducted in Uttar Pradesh (2110) followed by Rajasthan (2013), Assam (1691), Madhya Pradesh (1441) and Jammu & Kashmir (545).

The maximum average yield of 2,418 kg/ha from the IP under irrigated condition was in Punjab followed by 2,338 kg/ha in Madhya Pradesh; 2,121 kg/ha in Rajasthan; 2,097 kg/ha in West Bengal; 1,916 kg/ha in Uttar Pradesh; 1,732 kg/ha in Uttarakhand; 1,646 kg/ha in Bihar; 1,587 kg/ha in J&K; 1,552 kg/ha in Himachal Pradesh; 1,314 kg/ha in Chhattisgarh; 1,210 kg/ha in Assam; 1,046 kg/ha in Maharashtra; 857 kg/ha in Odisha. The maximum yield gap of 79.00% was recorded in Maharashtra followed by 60.46 % in Jammu & Kashmir; 56.38% in Odisha; 51.25% in Assam; 42.82% in Chhattisgarh; 39.56% in Himachal Pradesh; 28.33% in Uttar Pradesh; 23.18% in Madhya Pradesh; 21.21% in West Bengal; 19.36 % in Bihar; 12.57% in Rajasthan; 8.72% in Punjab. The maximum ANMR/ha were Rs 29,353; Rs 27,520; Rs. 22,667; Rs. 22,430; Rs. 21,943; Rs. 21,827; Rs. 20,436; Rs. 19,597; Rs. 13,134; Rs. 13,093; Rs. 12,375; Rs. 11,775; Rs. 11,416; in Jammu & Kashmir, Madhya Pradesh, Uttar Pradesh, Maharashtra, Chhattisgarh, Himachal Pradesh, West Bengal, Assam, Uttarakhand, Bihar, Odisha, Rajasthan, Punjab, respectively. The cost of cultivation ranged from Rs. 11,411/ha in Chhattisgarh to Rs. 40,754 /ha in Bihar in IP under irrigated Whole package demonstrations.

The maximum average yield of 1,459 kg/ha from the IP of WP demonstrations under rainfed conditions was in Rajasthan followed by 1,347 kg/ha in Bihar; 1,330 kg/ha in Jharkhand; 1,279 kg/ha in Himachal Pradesh; 1,221 kg/ha in Jammu & Kashmir; 1,118 kg/ha in Uttarakhand; 996 in Manipur; 974 kg/ha in Assam; 961 kg/ha in Meghalaya; 914 kg/ha in Tripura; 803 kg/ha in Andhra Pradesh; 755 kg/ha in Odisha. The maximum yield gap of 72.00% was recorded in Arunachal Pradesh followed by 58.13% in Tripura; 50.09% in Odisha; 47.61% in Jharkhand; 40.66% in Jammu & Kashmir; 33.24% in Assam; 28.8% in Uttarakhand; 27.9% in Himachal Pradesh; 27.42% in Rajasthan; 26.44% in Meghalaya; 21.76% in Manipur; 4.58 % in Bihar. The maximum ANMR/ha were Rs 22,286; Rs 20079; Rs 17,698; Rs 16,579; Rs 13638; Rs 13,490; Rs 12,212; Rs 10,999; Rs 10,614; Rs 9,760; Rs 8,643; Rs 2,319 in Jharkhand, Rajasthan, Andhra Pradesh, Jammu & Kashmir, Uttarakhand, Himachal Pradesh, Tripura, Odisha, Manipur, Assam, Meghalaya, Bihar, respectively. The cost of cultivation ranged from 14,502 Rs/ha in Rajasthan to Rs. 36,302/ha in Tripura in IP under rainfed Whole package demonstrations.

A total of 19 improved varieties of Indian mustard, 4 each of Gobhi sarson and Toria and 3 of Yellow sarson were used in WP covering 13 states under irrigated condition. Under irrigated condition, improved variety PBR 357 demonstrated in 100 FLDs in Punjab, recorded highest average yield of 2,775 kg/ha with a yield improvement of 12% over local (FP) practice followed by RH-749 (30 FLDs) in Uttar Pradesh with average seed yield of 2,576 kg/ha with yield improvement 48.55%. The minimum yield improvement of -0.33 % was reported from RLC-3 variety from 08 FLDs in Punjab, while minimum average seed yield of 1,036 kg/ha was reported from PDKV Kartik variety from 200 FLDs in Maharashtra. However, the variety TAM-108-1 in Maharashtra, recorded highest yield improvement of 80.20% with average seed yield of 1,056 kg/ha.

The maximum yield improvement of 40% from Pitambari variety of yellow sarson in Uttar Pradesh, 48.67% from HPGS 2 variety of gobhi sarson in Himachal Pradesh, 71.25% from Tapeshwari variety of toria in Uttar Pradesh were recorded under irrigated condition.

Under rainfed condition, the demonstrations with Brijraj recorded the highest average seed yield of 1,930 kg/ha with yield improvement of 29.87% in Rajasthan. In Manipur, 25 demonstrations with NRCHB-101 recorded lowest average seed yield of 996 kg/ha with yield improvement of 21.76% over FP. However, the variety BBM-1 in Jharkhand recorded highest yield improvement of 59.55% with average seed yield of 1,361 kg/ha.

The maximum yield improvement of 27.68 % from PPS-1 variety of Yellow Sarson in Uttarakhand, 50.09% from Sushree variety of toria in Odisha, 15.86 % from Shalimar Sarson-2 variety of Brown Sarson in Jammu & Kashmir, 34.11% from HPGS 2 variety of Gobhi Sarson in Himachal Pradesh and 28.43% from RTM 1355 of taramira in Rajasthan were recorded under rainfed condition.

A total of 420 FLDs with 06 component technologies for Indian Mustard were carried out by different centres. Among the components, Seed Treatment with carbendazim @2 g/kg seed and two foliar sprays of 0.1 % carbendazim at 45 and 60 DAS by Hisar centre had maximum average yield of 2,650 kg/ha with variety RH 1706 and RH 725, respectively. However, in Odisha the seed treatment + late irrigated + PP+ sulphur method demonstrated a maximum yield increase of 51.30% under timely irrigated conditions, accompanied by the highest ANMR of Rs 23,313/ha at the Hisar centre in Haryana with RH 1706 Variety. Further, the Bawal centre showed yield enhancements of 11.3%, 8.7% and 8.66% over the FP in the Improved variety with Best Management practices, Sulphur application: Gypsum application @ 100 kg/acre and Sclerotinia Disease Management (Applied Two spray of Bavistine (Carbendazim) @ 1% solution at 45 and 65 DAS components, respectively. Moreover, the sulphur application at 40 kg/ha demonstrated by the Gujarat centre resulted in 11% yield increment and an ANMR of Rs 9,726/ha.

Monitoring Team Report

Monitoring Report

Eight teams comprising scientists from ICAR-IIRMR and other AICRP-R&M Centres were constituted to monitor coordinated trials, breeder seed production and front line demonstrations conducted at different coordinating and voluntary centres. Monitoring was conducted during Feb. – March, 2025 by the monitoring teams as per the schedule given below:

Zone	Team	Centres	Duration
I+ II	**Team Leader** Dr. R. L. Choudhary, Sr. Scientist, Agronomy, ICAR-IIRMR, Bharatpur **Team Members** Dr. Indu Rialch, Plant Breeder, PAU, Ludhiana Dr. Sarwan Kumar, Sr. Entomologist, PAU, Ludhiana	Kangra, Dhaulakuan Bajaura, Una Chatha, Ludhiana	02 - 07 March 2025
I+II + III	**Team Leader** Dr. Kartikey Srivastava, Professor, Pl. Breeding, IAS, BHU, Varanasi **Team Members** Dr. H. K. Sharma, Sr. Scientist, Pl. Breeding, ICAR-IIRMR, Bharatpur Dr. V. D. Meena, Sr. Scientist, Agronomy, ICAR-IIRMR, Bharatpur Dr. Rakesh Punia, Pl. Pathologist, CCSHAU, Hisar	New Delhi Bharatpur Modipuram Pantnagar	14- 17 February 2025
III + IV	**Team Leader** Dr. H. S. Meena. Pr. Scientist, Pl. Breeding, ICAR-IIRMR, Bharatpur **Team Members** Dr. Shubha Trivedi, Pl. Pathologist, RLBCAU, Jhansi Dr. M. S. Negi, Agronomist, GBPUA&T, Pantnagar Dr. Ashok Kumar Dehinwal, Asstt. Scientist, CCSHAU, Bawal	Kanpur, Varanasi, Jhansi, Banda, Morena	26 Feb. – 01 March, 2025
II	**Team Leader** Dr. R. S. Jat, Pr. Scientist, Agronomy, ICAR-IIRMR, Bharatpur **Team Members** Dr. Manohar Ram, Pl. Breeder, SKNAU, Jobner Dr. G. P. Gangwar, Pl. Pathologist, SDAU, S. K. Nagar Dr. Vinod Goyal, Pl. Physiologist, CCSHAU, Hisar	Hisar, Alwar, Bawal, Karnal, Sriganganagar Abohar	17-19 February 2025
III + IV	**Team Leader** Dr. Naveen Singh, Pr. Scientist, ICAR-IARI, New Delhi **Team Members** Dr. N. R. Bhardwaj, Scientist, Pl. Pathology, ICAR-IIRMR, Bharatpur Dr. B. S. Meena, Assoc. Prof. Agronomy, AU, Kota	Jobner Mandor Pali (Sumerpur) S.K. Nagar Kota, Jaipur	05- 09 February 2025
V + VII	**Team Leader** Dr. Arun Kumar, Pr. Scientist, Cytogenetics, ICAR-IIRMR Bharatpur **Team Members** Dr. Arun Kumar, Scientist, Pl. Breeding, BAU, Kanke, Ranchi Dr. Rajesh Kumar, Pl. Breeder, TCA, RPCAU, Dholi Dr. Harvir Singh, Scientist, Agronomy, ICAR-IIRMR, Bharatpur	Shillongani Kalyani, Dholi Kanke, Ranital	13-18 February 2025
VII	**Team Leader** Dr. Bhagirath Ram, Pr. Scientist, Pl. Breeding, ICAR-IIRMR, Bharatpur **Team Member** Dr. D. C. Salam, Pl. Pathologist, RRS, Jagdalpur	Bilaspur, Ambikapur, Kanker, Jagdalpur	16- 22 February 2025
VI	**Team Leader** Dr. B. L. Meena, Sr. Scientist, Plant Breeding, ICAR-IIRMR Bharatpur **Team Members** Dr. Pushparani Senjam, Jr. Breeder, CAU, Imphal Sh. Karnal Singh, Chief Tech. Officer, ICAR-IIRMR Bharatpur	Imphal, Pasighat, Bermiok, Tripura	27 Feb. - 05 March, 2025

Centre wise salient observations

Zone I

KNG

All trials allotted to this centre were conducted as per technical programme. Expression of the crop was good.

DLK

All the three trials were conducted as per technical programme. However, thinning was not done properly

BJR

Trials were well managed and conducted as per technical programme, though crop growth and expression was found sub-optimal

UNA

The trial was conducted as per technical programme. However, across the entries, a significant variation was observed in plant stand and crop growth which might be due to soil fertility gradient.

CHT

Trials were well managed and conducted as per technical programme, Expression of the crop was good.

PNT

All the allotted trials were well conducted as per the technical programme and expression of crop was very good. Monitoring team suggested to reject two trial 5.1 (A, B, C) and 5.4 of entomology due to very poor plant population However, high infestation of aphid observed in remaining entries.

Zone II

LDH

All the Plant Breeding, Agronomy, Plant Pathology and Entomology trials were conducted as per technical programme and the overall expression was good. However, poor crop germination was noticed under the trial no 3.7 (Nano- fertilizer)

ABH

All the trials were conducted as per the technical programme. Performance was good and also conducted all the FLD's.

NDH

All allotted trials were conducted as per the technical programme. Overall performance of experiments was excellent. Seed for NDN-WR (4.4) was not supplied.

MOD

Poor plant stand, improper plant spacing intercultural operations not followed properly. Hence both the trials IVT(TS) & AVT-I+II (TS) were rejected.

BAW

Conducted all the trials as per the technical programme. Excellent layout design and crop performance.

HSR

Trials were well managed and conducted as per the technical programme. Agronomy trials were not conducted properly as per protocol.

ALW

Trials were well managed and conducted as per the technical programme.

SGN

All the trials were conducted as per the technical programme and expression of the crop was good.

Zone III

BPR

All allotted experiments conducted as per the technical programme. Overall performance of all trials was very good.

MOR

All the allotted trials were well conducted as per the technical programme and expression of crop was excellent.

BND

All the trials were conducted properly as per the technical programme. The growth and expression of the crop was excellent.

KPR

All the trials were conducted as per technical programme. Overall growth and expression was good.

JHS

In plant breeding trials out of six, three trials namely IHT, AHT-I and AVT I+II (TS) were on spot rejected by the monitoring team due to very less population in majority of the entries. IVT (TS) and IVT (QM) trials were satisfactory and the growth and expression of IVT (LS) was excellent.

KOT

The trials were conducted as per the technical programme. All trials of plant breeding and agronomy conducted properly.

ZONE IV

JPR

Trial were conducted as per the technical programme and expression of the crop was good.

SKN

Trials were conducted as per the technical programme. Entries in the trial IVT(EM), except MCN (E) 24-18, look longer time to mature and them maturity was almost similar to entries raised in timely sown trials. The trial 5.2 (Assessment of yield loss by mustard aphid) was rejected due to higher incidence of white rust disease appeared in the trial even after spraying the entries with recommended dose of mancozeb.

PLI

The breeding trials were conducted as per the technical programme. These trials were very well managed and expression of the crop was very good. The agronomy trial was sown after the cut-off date of sowing mentioned in the technical programme.

MDR

Trials were conducted as per the technical programme and expression of the crop was satisfactory. IVT timely sown irrigated rejected by monitoring the due to poor plant population in some of the test entries and poor performance due to heavy infestion of *Orobanche*.

JBN

Trials were conducted as per the technical programme and expression of the crop was good. The station trials of Taramira are being conducted and the expressions of the entries were very good. The crop was infested with *Orobanche*.

ZONE V

VAR

All the allotted trials conducted as per the technical programme. Trials of early mustard, yellow sarson and IVT (Toria) were already harvested. Overall expression and growth of crop was good.

DOL

All the allotted trials of all the disciplines were conducted as per the technical programme. The crop stand was proper and the condition of the trials were good.

KNK

All the trials were conducted the experiments as per the technical programme. BBM-1 performance was very well at this centre.

BHU

All the trials were conducted as per technical programme. Breeder seed production of the Samporna variety was good. All the FLDs were conducted.

SHL

All the trials conducted as per technical programme. Under toria trial one Indian mustard entry was observed. All the FLDs were conducted.

KLN

All the allotted trials were well conducted as per the technical programme and trial performance was satisfactory.

ZONE VI

IMP

Trials were conducted as per the technical programme and expression of the crop was good.

TPR

All the allotted trials were well conducted as per the technical programme and trial performance was satisfactory.

PGT

Trials were conducted as per the technical programme but due to very poor germination the expression of the crop was not satisfactory. Hence all trials were rejected.

BMK

Trials were conducted as per the technical programme and expression of the crop was good. Centre requested to share segregating material / fixed lines to evaluate under Sikkim state.

ZONE VII

JAG

All the allotted trials were conducted as per the technical programme and expression of the crop was very good.

BLR

Trial was conducted as per the technical programme and expression of the crop was very good.

AKR

All the allotted trials were conducted as per the technical programme and expression of the crop was excellent and plant stand well managed.

KNR

All the allotted trials were conducted as per the technical programme and expression of the crop was very good.

Seasonal Conditions

1. Seasonal Conditions

Weather was favourable for the mustard during the crop season 2024-25. Good rainfall was received during monsoon in the month of September at almost all the locations. Soil moisture was sufficient at the time of sowing, and plant growth was also good at different centers. However, long spell of fog was reported in many parts of Rajasthan, Delhi, Haryana, and western UP which caused substantial loss in seed and oil yield.

Zone I

The lowest temperature -1.2 ^{0}C was reported in the month of December, 2024 at Bajaura center. Mean maximum temperature was reported 36.4 ^{0}C at Kangra. 351.2 mm rainfall was received from October to April 2024-25 at Bajaura center where as total rainfall reported from Sept 2024 to April, 2024 was 531.3 mm at Kangra center.

Table: 1.1 Weather conditions during crop season in Zone I

Location	Sep. 24	Oct.24	Nov. 24	Dec. 24	Jan. 25	Feb. 25	Mar. 25	Apr. 25
Max. Temp. (^{0}C)								
BJR	-	30.5	25.7	18.4	18.8	19.8	23.3	29.6
UNA	-	32.6	27.7	20.5	21.2	23.0	26.9	34.0
KNG	-	32.6	26.1	19.7	18.3	22.1	27.1	36.4
CHT	34.4	32.7	27.3	21.2	20.5	23.3	27.8	36.2
PNT	32.1	32.1	27.8	23.2	19.8	24.8	29.4	35.3
KAS	-	32.1	27.8	23.2	19.8	24.8	29.4	-
Min. Temp. (^{0}C)								
BJR	-	9.2	3.4	(-)1.2	1.4	2.4	4.9	9.5
UNA	-	17.2	8.9	1.4	4.4	8.3	14.4	21.5
KNG	-	19.9	13.8	6.6	6.3	9.1	12.3	19.6
CHT	24.3	18.1	11.5	4.3	5.6	7.3	10.2	16.8
PNT	25.0	20.2	13.4	7.2	8.1	8.3	12.0	18.3
KAS	-	20.2	13.4	7.2	8.1	8.3	12.0	-
Rainfall (mm) (rainy days)								
BJR	NIL	NIL	34.2 (5)	12.8 (4)	150.9 (6)	123.3(6)	30.0 (5)	NIL
UNA	-	9.0	NIL	39.8 (2)	2.0 (1)	NIL	4.8 (2)	1.2 (1)
KNG	-	NIL	NIL	4.2(1)	6.2 (3)	101.2 (5)	30.2(3)	2.0(1)
CHT	261.4 (6)	22.4(1)	NIL	31.6 (1)	6.4 (1)	86.6(3)	18.6 (3)	7.0 (1)
PNT	323.2 (8)	NIL	NIL	6.0 (1)	4.2 (1)	5.2 (1)	17.2 (2)	66.2 (4)
KAS	-	NIL	NIL	6.0 (1)	4.2 (1)	5.2 (1)	17.2 (2)	-
Max. R.H. (%)								
BJR	-	85.0	77.2	85.3	84.4	83.1	85.0	85.4
KNG	-	81.9	80.5	82.0	85.6	84.4	79.1	71.9
CHT	88.0	90.0	92.0	93.0	95.0	92.0	87.0	68.0
PNT	90.0	86.4	91.4	91.7	93.6	92.0	84.3	66.4
KAS	-	86.4	91.4	91.7	93.6	92.0	84.3	-
Min. R.H. (%)								
BJR	-	22.5	23.8	26.5	23.9	29.1	29.0	23.9
KNG		62.0	63.6	64.9	68.6	68.3	66.1	57.5
CHT	62.0	55.0	52.0	45.0	58.0	52.0	45.0	27.0
PNT	72.9	54.4	50.1	44.6	62.5	45.0	35.6	27.1
KAS	-	54.4	50.1	44.6	62.5	45.0	35.6	-
Sunshine (hours/day)								
BJR	-	7.5	6.5	5.3	4.2	5.3	6.5	-
CHT	7.6	7.1	4.0	4.0	4.5	5.2	7.1	7.7
PNT	5.5	7.2	4.4	6.5	4.4	7.6	9.0	9.4
KAS	-	7.2	4.4	6.5	4.4	7.6	9.0	-

Zone II

The mean maximum temperature varied from 17.1 ^{0}C (Ludhiana) in December, 2024 and at Abohar in January, 2025 to 39.6 ^{0}C (Bawal) in the month of April, 2025. The minimum temperature 6.1 ^{0}C was reported at Sriganganagar center during the month of December, 2024. Good precipitation was received during crop season at all the centers except Sriganganagar. Maximum morning relative humidity was observed at Bawal (94.5%) in the month of January, 2025

Table: 1.2 Weather conditions during crop season in Zone II

Location	Sep. 24	Oct. 24	Nov. 24	Dec. 24	Jan. 25	Feb. 25	Mar. 25	Apr. 25
Max. Temp. (^{0}C)								
BAW	30.8	35.8	30.6	21.2	19.3	25.6	31.3	39.6
SGN	-	34.9	28.8	21.8	21.0	24.4	30.4	-
LDH	-	33.3	26.9	17.1	18.7	22.4	28.2	37.5
ALW	32.6	32.6	27.7	22.5	23.0	25.5	31.6	-
NDH	33.3	34.7	38.8	22.0	19.8	26.0	31.9	38.9
ABR	-	33.7	27.2	18.8	17.1	-	-	-
Min. Temp. (^{0}C)								
BAW	25.0	20.4	13.9	6.5	7.0	8.6	13.3	20.8
SGN	-	17.7	9.4	6.1	8.1	13.5	17.7	-
LDH	-	20.0	14.0	8.5	7.6	10.2	12.8	20.8
ALW	23.8	19.5	13.5	9.5	11.0	11.3	17.3	-
NDH	25.2	20.5	13.5	7.1	7.6	11.3	14.6	21.1
ABR	-	18.7	12.5	4.6	17.1	-	-	-
Rainfall (mm) (rainy days)								
BAW	134.0 (5)	NIL	NIL	32.2 (2)	33.5 (3)	5.0 (1)	24.0 (3)	13.5 (2)
SGN	-	NIL	NIL	NIL	4.6 (1)	3.0 (1)	NIL	-
LDH	-	0.4	NIL	32.0	6.8	31.0	2.6	2.2
ALW	165.0	NIL	NIL	NIL	NIL	NIL	NIL	-
NDH	167.1	NIL	NIL	49.7	11.3	1.2	2.2	0.4
ABR	-	3.5	11.0	4.5	15.3	-	-	-
Max. R.H. (%)								
BAW	92.5	79.5	86.4	87.8	94.5	88.3	74.0	48.0
SGN	-	86.0	69.2	90.3	80.9	68.1	86.0	-
LDH		85.0	91.0	93.0	93.0	89.0	83.0	55.0
NDH	89.0	83.5	88.5	85.2	91.2	83.0	77.7	64.9
ABR		82.5	83.7	83.8	88.7			
Min. R.H. (%)								
BAW	63.5	30.5	31.6	46.3	63.8	46.5	25.2	20.3
SGN	-	67.5	58.8	65.4	56.5	48.6	67.5	-
LDH	-	39.0	46.0	67.0	58.0	47.0	37.0	20.0
NDH	69.7	42.9	47.9	55.0	73.6	61.9	55.7	46.2
ABR	-	32.7	36.0	39.2	54.0	-	-	-
Sunshine (hours/day)								
BAW	4.2	7.3	4.7	5.0	4.9	7.0	7.3	7.8
SGN	-	4.6	3.6	3.5	8.1	6.9	4.6	-
LDH		7.6	3.7	2.0	4.9	6.4	9.6	9.6
ALW	-	-	-	-	-	-	-	-
NDH	4.4	7.0	3.2	4.7	4.4	6.9	8.6	8.6
ABR	-	-	-	-	-	-	-	-

Zone III

Maximum temperature varied from 19.3 ^{0}C to 40.1 ^{0}C at Bharatpur in January, 2025 and April 2025, respectively. The minimum temperature ranged from 7.0 ^{0}C to 25.6 ^{0}C during the crop season. Kota center reported the highest morning humidity during January, 2025.

Table: 1.3 Weather conditions during crop season in Zone III

Location	Sep. 24	Oct. 24	Nov. 24	Dec. 24	Jan. 25	Feb. 25	Mar. 25	Apr. 25
Max. Temp. (^{0}C)								
KPR	33.1	34.4	29.8	24.2	20.8	27.1	32.5	38.0
BPR	32.3	35.1	29.8	21.3	19.3	26.3	33.1	40.1
KOT	-	35.4	31.1	24.4	21.9	28.5	35.1	-
MOR	31.7	33.6	27.6	23.8	21.9	27.8	33.6	-
JAI	-	32.6	28.5	23.8	22.1	27.8	33.8	-
JHS	32.6	35.0	30.5	25.0	23.3	28.2	34.2	37.4
Min. Temp. (^{0}C)								
KPR	25.3	21.7	13.8	8.9	7.8	10.9	14.9	21.1
BPR	25.6	21.7	14.4	7.9	7.6	10.3	13.8	22.3
KOT	-	22.6	14.6	8.3	9.4	13.9	16.1	-
MOR	25.2	22.5	24.2	8.5	9.1	12.7	16.4	-
JAI	-	19.0	11.6	7.3	7.1	11.2	15.1	-
JHS	25.4	19.8	11.8	7.1	7.0	12.7	11.8	14.8
Rainfall (mm) (rainy days)								
KPR	269.0 (10)	11.3 (2)	NIL	1.6	2.2	NIL	NIL	14.2 (2)
BPR	241.2 (11)	33.3(2)	NIL	19.4 (1)	24.4 (4)	0.2 (1)	6.4 (1)	3.4 (2)
KOT	-	16.0 (2)	NIL	13.8 (1)	4.1(1)	NIL	NIL	-
MOR	287.7	NIL	NIL	10.5	5.5	2.0	NIL	-
JAI	-	NIL	NIL	7.5	15.5	1.0	NIL	NIL
JHS	299.8	0.6	NIL	13.0	1.6	0.8	NIL	NIL
Max. R.H. (%)								
KPR	86.0	85.0	92.0	86.0	90.0	80.0	70.0	58.0
BPR	90.1	82.5	83.1	82.9	88.7	83.7	75.2	75.2
KOT	-	72.8	78.6	93.2	93.0	79.9	64.2	-
MOR	83.3	68.9	70.6	74.1	66.5	60.4	57.2	-
JAI	-	66.1	72.6	76.5	84.1	78.2	70.4	-
JHS	91.6	86.6	89.8	84.7	85.4	70.5	67.0	64.5
Min. R.H. (%)								
KPR	72.0	51.0	48.0	46.0	58.0	38.0	35.0	31.0
BPR	78.8	66.7	55.2	68.5	77.3	66.5	78.4	78.3
KOT	-	51.1	53.8	68.9	78.3	50.3	20.9	-
MOR	69.3	53.6	53.3	45.9	57.9	52.2	49.4	-
JAI	-	37.1	43.5	67.6	62.7	60.8	57.5	-
JHS	73.5	47.1	39.0	49.0	51.1	44.7	33.6	29.8
Sunshine (hours/day)								
KPR	4.7	5.0	4.0	3.8	2.9	8.2	8.8	9.0
BPR	4.6	8.0	6.5	4.7	4.7	7.6	8.9	9.3
KOT	-	8.6	8.3	5.8	6.0	8.7	9.8	-

Zone IV

The maximum temperature ranged from 26.9 ^{0}C to 36.0 ^{0}C, while minimum remained from 10.2 ^{0}C to 25.1 ^{0}C during crop season. The noon hour humidity ranged from 30.0 to 75.5% while highest morning hour relative humidity was reported at S.K. Nagar center during the month of September, 2024. Bright sunshine hours 3.7 to 11.2 were observed during the crop season.

Table: 1.4 Weather conditions during crop season in Zone IV

Location	Sep. 24	Oct. 24	Nov. 24	Dec. 24	Jan. 25	Feb. 25	Mar. 25
Max. Temp. (^{0}C)							
JUG	31.9	36.0	29.8	28.3	28.5	-	-
SKN	33.0	35.7	32.7	26.9	27.4	31.3	-
NGP	31.3	32.2	33.7	27.9	30.7	33.2	-
JAL	-	34.0	32.0	29.9	30.4	34.1	-
Min. Temp. (^{0}C)							
JUG	24.1	20.0	20.5	13.7	13.7	-	-
SKN	25.1	22.0	14.5	10.3	10.2	12.3	-
NGP	23.4	15.5	16.6	11.9	13.7	15.4	-
JAL	-	21.4	14.1	13.0	13.4	14.8	-
Rainfall (mm) (rainy days)							
JUG	267.5 (9)	88.5 (7)	NIL	NIL	NIL	-	-
SKN	190.2 (8)	7.6 (1)	NIL	NIL	NIL	NIL	-
NGP	165.8 (6)	28.2 (1)	20.2 (1)	1.4 (1)	NIL	NIL	-
JAL	-	122.1(5)	NIL	NIL	NIL	NIL	-
Max. R.H. (%)							
JUG	91.0	82.0	62.0	71.0	76.0	-	-
SKN	92.0	83.2	83.3	81.3	83.8	78.3	-
NGP	90.5	74.2	70.5	76.5	72.6	51.3	-
JAL	-	78.5	62.4	62.5	66.0	70.2	-
Min. R.H. (%)							
JUG	69.0	34.0	44.0	35.0	31.0	-	-
SKN	73.3	43.2	23.3	33.0	32.4	37.3	-
NGP	75.5	50.2	41.0	61.5	48.8	30.0	-
JAL	-	56.7	45.1	50.3	46.6	45.5	-
Sunshine (hours/day)							
JUG	5.4	9.3	11.2	6.9	8.6	-	-
SKN	-	-	-	-	-	-	-
NGP	3.7	8.6	8.1	5.8	6.8	7.8	-
JAL	-	5.2	8.2	10.9	7.6	8.7	-

Zone V

Good rain (407.0 mm) was received during the September month at Kanke center. The maximum temperature ranged from 18.7 ^{0}C to 35.5 ^{0}Cwhile minimum temperature ranged from 9.0 to 26.1 ^{0}C during the crop season. Maximum relative humidity ranged from 63.0 to 98.6% during crop season.

Table: 1.5 Weather conditions during crop season in Zone V

Location	Sep. 24	Oct. 24	Nov. 24	Dec. 24	Jan. 25	Feb. 25	Mar. 25	Apr. 25
Max. Temp. (^{0}C)								
VAR	-	33.2	28.2	23.2	18.7	26.9	32.8	-
SHL	34.3	29.7	29.2	25.2	24.1	25.8	28.3	-
SBR	32.7	30.5	28.9	24.4	20.7	26.7	31.0	34.2
DOL	33.1	32.0	30.1	25.6	20.1	26.7	30.5	-
KNK	31.9	30.8	27.0	24.7	23.1	25.8	29.8	35.5
KLN	32.8	32.1	29.1	26.8	24.7	29.1	33.8	-
Min. Temp. (^{0}C)								
VAR	-	24.9	15.0	10.1	8.4	14.1	17.8	-
SHL	24.7	21.7	17.0	13.0	12.8	14.4	16.8	-
SBR	26.1	23.6	16.9	9.6	9.0	10.9	16.8	20.3
DOL	25.5	23.3	17.9	9.5	9.3	10.3	14.6	-
KNK	22.3	19.7	13.2	8.4	6.4	14.0	17.0	21.2
KLN	25.5	23.8	17.6	12.3	11.1	15.0	19.3	-

Rainfall (mm) (rainy days)								
VAR	-	3.6	NIL	1.0	1.4	NIL	0.3	-
SHL	102.4 (8)	206.0(12)	6.0 (1)	NIL	24.0(1)	23.2 (4)	33.0 (2)	-
SBR	242.0	47.1	NIL	NIL	NIL	0.4	NIL	88.1
DOL	33.2	NIL	NIL	NIL	NIL	NIL	NIL	NIL
KNK	407.0 (13)	63.0 (4)	NIL	2.0 (1)	NIL	4.0 (1)	52.8 (4)	48.6 (4)
KLN	335.1	235.3	1.4	10.5	NIL	52.6	2.7	-
Max. R.H. (%)								
VAR	-	87.4	90.8	84.5	79.6	76.5	63.0	-
SHL	90.5	93.0	87.3	90.7	88.7	86.0	83.4	-
SBR	84.7	85.4	86.6	87.3	87.1	85.1	82.4	80.1
DOL	92.5	94.5	95.3	97.2	97.0	95.5	91.8	-
KNK	87.0	87.0	86.0	86.0	86.0	86.0	86.0	87.0
KLN	97.5	97.5	97.8	98.6	98.4	96.7	94.3	-
Min. R.H. (%)								
VAR	-	60.0	49.5	51.8	53.2	48.8	37.3	-
SHL	70.4	82.7	71.7	63.0	63.5	54.9	53.5	-
SBR	77.5	78.1	80.2	80.9	78.1	74.9	68.4	62.3
DOL	73.5	66.5	58.5	50.8	71.0	61.5	61.3	
KNK	70.0	70.0	70.0	70.0	70.0	69.0	70.0	70.0
KLN	88.8	87.3	68.3	67.1	60.7	52.4	38.8	-
Sunshine (hours/day)								
VAR	-	6.1	3.3	3.6	3.9	8.1	9.0	-
SHL	-	-	-	-	-	-	-	-
SBR	4.7	2. 9	2.7	1.7	2.0	5.0	4.6	5.2
DOL	5.4	4.6	3.0	4.9	1.9	6.8	7.2	-

Zone VI

Good rain was received during the September month. The maximum temperature ranged from 20.2 ^{0}C to 34.1^{0}C while the minimum temperature ranged from 5.4 to 22.7 ^{0}C during the crop season. Maximum relative humidity ranged from 53.8 to 98.0 during the crop season.

Table: 1.6 Weather conditions during crop season in Zone VI

Location	Sep. 24	Oct. 24	Nov. 24	Dec. 24	Jan. 25	Feb. 25	Mar. 25	Apr. 25
Max. Temp. (^{0}C)								
PGT	-	27.3	30.0	25.2	24.7	20.1	24.0	25.0
TPR	34.1	33.1	29.6	26.6	25.1	27.0	33.8	-
IMP	-	30.5	29.4	26.5	24.6	27.5	31.0	32.4
Min. Temp. (^{0}C)								
PGT	-	20.4	17.1	14.0	13.0	13.0	14.0	15.0
TPR	22.7	21.4	14.6	11.3	9.8	10.0	15.6	-
IMP	-	16.5	10.5	5.5	6.0	5.4	9.4	14.5
Rainfall (mm) (rainy days)								
PGT	-	165.7 (7)	0.5 (1)	4.3 (2)	49.1 (3)	33.4 (8)	76.4(11)	55.9 (5)
TPR	113.8 (7)	56.7 (3)	84.0 (2)	63.0(2)	NIL	NIL	34.9 (3)	-
IMP	-	134.1(11)	51.9(5)	NIL	3.0 (1)	18.2(3)	58.4 (5)	55.8(5)
Max. R.H. (%)								
PGT		68.8	53.8	55.5	59.0	76.2	75.1	68.0
TPR	95.0	96.0	96.0	96.0	98.0	94.0	93.0	-
IMP		95.1	94.8	92.5	91.4	88.9	84.9	81.6
Min. R.H. (%)								
PGT	-	62.9	49.7	49.9	50.9	66.4	64.3	50.0
TPR	73.0	71.0	58.0	60.0	57.0	45.0	46.0	-
IMP	-	68.9	56.5	51.6	43.4	34.9	38.2	50.0

Sunshine (hours/day)								
PGT	-	-	-	-	-	-	-	-
TPR	4.7	5.6	7.0	5.9	5.5	6.9	7.0	-
	-	4.2	7.9	6.6	7.6	7.9	7.1	5.5

Zone VII

Maximum temperature varied from 28.3 ^{0}C to 36.0 ^{0}C during the crop season. The minimum temperature ranged from 9.2 ^{0}C to 22.4 ^{0}C during the crop season. Bright sunshine hours 3.8 to 9.1 were observed during the crop season.

Table: 1.7 Weather conditions during crop season in Zone VII

Location	Sep. 24	Oct. 24	Nov. 24	Dec. 24	Jan. 25	Feb. 25	Mar. 25	Apr. 25
Max. Temp. (^{0}C)								
BLR	-	33.6	30.1	28.8	29.0	33.3	36.0	
JAG	30.2	32.0	29.7	28.3	29.1	32.9	35.6	-
Min. Temp. (^{0}C)								
BLR		18.9	11.6	10.9	9.2	13.3	18.0	
JAG	22.4	21.0	13.9	15.0	10.2	13.9	16.7	-
Rainfall (mm) (rainy days)								
BLR	-	2.7 (1)	NIL	0.6	NIL	NIL	NIL	-
JAG	284.1(15)	32.2(5)	0.2	50.6 (5)	NIL	NIL	NIL	-
Max. R.H. (%)								
BLR	-	-	-	-	-	-	-	-
JAG	91.9	90.2	89.8	89.6	83.5	80.7	80.5	-
Min. R.H. (%)								
BLR	-	-	-	-	-	-	-	-
JAG	74.5	57.7	42.0	49.2	34.1	32.5	30.5	-
Sunshine (hours/day)								
BLR	-	5.4	5.7	5.4	8.1	9.1	9.0	
JAG	3.8	6.6	6.8	4.9	7.8	8.3	8.0	-

Genetics & Plant Breeding

2. Genetics & Plant Breeding

2.1 Varietal Improvement

Sixteen centres, spread over 14 states, carried out the varietal development activities as per the approved technical programme. The salient achievements during the year 2024-25 in toria (*Brassica rapa* var toria), yellow sarson (*B. rapa* var yellow sarson), gobhi sarson (*B. napus*), Indian mustard (*B. juncea*), karan rai (*B. carinata*) and taramira (*Eruca sativa*) are discussed below:

2.1.1 Genetic Resource Management

A total of 7520 accessions comprising toria (1010), Indian mustard (5047), yellow sarson (442), gobhi sarson (619), brown sarson (64), karan rai (268), taramira (*Eruca sativa*) (04), *B. rugosa* (23), *B. nigra* (01), *B. tournifortii* (04), *Crambe abyssinica* (07) , *S. alba* (05), *Sinapis alba + B. juncea* (Hexaploid) (02), *Crambe sp* (01), *B chinenesis (01)*, *B. fruiticulosa* (04), *Camelina sativa* (02), *Capsella bursapastoris* (02), *Diplotaxis assurgens* (02), *Diplotaxis tenuisilique (01), Erucastrum spp* (02), *Biscutella sp* (01), *Diplotaxis viminea (01), Lepidium sp* (03), *Diplotaxis muralis (01), R caudatus* (01) *B. chinensis* (01) and *Dilotaxis erucoides* (01) were maintained through appropriate mating system at Bhubaneshwar, Dholi, Hisar, Pantnagar, Ludhiana, Kanpur, Hisar, IARI, New Delhi, Jhansi, Kangra, Pantnagar, Chatha-Jammu, Nagpur and SK Nagar (Table 2.1.1). In addition, 340 new accessions comprising toria (72), Indian mustard (203), yellow Sarson (55), gobhi sarson (05), and karan rai (05) were collected. Further, 2271 accessions consisting of 2059 Indian mustard, 89 toria, 61 yellow sarson, 7 karan rai, 37 gobhi sarson, and 18 brown sarson, accessions were evaluated. On the basis of germplasm evaluation, promising accessions were identified for seed yield, earliness, yield components, thermo-tolerant (early and terminal stages), resistance/tolerance to diseases/pests and quality traits in toria at Bhubaneshwar, Dholi, Chatha-Jammu, Pantnagar, Imphal, New Delhi, Ludhiana, SK Nagar, Varanasi and Kanpur. Four traits specific genetic stocks of Indian mustard viz. DRMRCI 132 (INGR24029), DRMRCI (Q) 57 (INGR24028), DRMR 1188 (INGR24084; IC), DRMR IJ 12-21(INGR25018) were registered by PGRC, New Delhi.

2.1.2 Creation of genetic variability through hybridization/ mutagenesis and selection

Creation of variability is the essence and backbone of the breeding programme. To cater the need of diverse agro-climatic conditions of the country, 51 crosses were attempted in toria, 107 in yellow sarson at Pantnagar, Bhubneshwar, Chattha-Jammu, Imphal, and Kanpur and 1284 in Indian mustard at Bhubaneshwar, Chatha-Jammu, Imphal, Hisar, IARI New Delhi, Ludhiana, Kanpur, Pantnagar, SK Nagar, Dholi, Jhansi, Nagpur, Imphal and Varanasi to improve seed yield, earliness, seed size, component traits, disease/pest resistance, heat tolerance suitable for late sown condition, normal sown, drought tolerance, "0" and "00" quality characters, gene Pyramiding of AB/WR, introgression of *AB* resistance and high oil content (Table 2.1.2). Selection of superior plants/bulks at different centres was practised in toria, yellow sarson, Gobhi sarson, Brown sarson, *B. carinata* and Indian mustard. In toria, development of composite populations after the selection was the main objective. In yellow sarson, hybridization and selection from segregating generations were attempted at Kanpur, Bhubaneshwar and Pantnagar. In Indian mustard, 12382 single plants were selected at New Delhi, Hisar, Jhansi, Bhubaneshwar, Chatha-Jammu, Pantnagar, Ludhiana, SK Nagar, Jagdalpur, Varanasi, Dholi, Imphal, Nagpur, Kangra and Kanpur. In Indian mustard, about 1478 bulks were selected from segregating and advanced generations.

2.1.3 Evaluation of advanced breeding lines

The advanced breeding lines were evaluated under different station/state /preliminary yield trials at various centres have been presented in Table 2.1.3. 112 strains of toria were tested at Kanpur, Bhubaneshwar, Chatha-Jammu, Dholi and Pantnagar. The yield superiority in toria station trial was up to 22.07 over the check (Tapeshwari) at Pantnagar. In yellow sarson, 90 strains were tested at Kanpur, Pantnagar and Bhubaneshwar. The yield superiority in station trial I up to 23.16 % over the check Pitambari was recorded at Pantnagar. In Indian mustard, 611 strains were evaluated at 09 centres; Chatha, Imphal, Hisar, Kanpur, Ludhiana, Pantnagar, Dholi, Bhubaneshwar and SK Nagar in 43 trials. Seed yield superiority up to 25.78 % over the check PAB-9511 (1890) was recorded at Pantnagar. Ten strains at Hisar, 66 strains at Ludhiana and 18 strains at Chatha of gobhi sarson were evaluated for seed yield and its component characters. Seed yield superiority up to 16.60 % over the check GSC 7 was recorded at Ludhiana.

2.1.4 Hybrid Development

Efforts for hybrid development continued during 2024-25 under "Consortia Research Platform on Hybrids", at four centres including ICAR-DRMR Bharatpur, ICAR-IARI New Delhi, PAU Ludhiana and CCS HAU Hisar. One Hybrid RHH 2101 (2700 kg/ha), out yielded the best varietal check; RH 749 (2336 kg/ha) by the margin of more than 15% and hybrid check; DMH-1 hybrid check (2572 kg/h) by margin of more than 5% of seed yield over five locations in AHT-II Zone II and hence, identified during AICRP-RM 2023-24 at Assam Agricultural University. Khanapara Campus, Guwahati (AAU, Assam).

Twenty experimental hybrids of Indian mustard, comprising five from each of four centers were evaluated in replicated block design at all four centers. On the basis of mean seed yield over four locations (Bharatpur, New Delhi, Ludhiana and Hisar) in CRPMLT 1, four hybrids; RHH 2404 (3125 kg/ha), DRMRHJ 2517 (3094 kg/ha), DRMRHJ 3818 (3075 kg/ha) and RHH 2407 (3060 kg/ha) out-yielded the best check Pioneer 45S46 (2926 kg/ha) by a margin of 6.8, 5.7, 5.1 and 4.6%, respectively. On the basis of oil yield performance mean of three locations (New Delhi, Hisar and Bharatpur); three hybrids out yielded the best check Pioneer 45S46 (1256 kg/h), namely; RHH 2404 (1402 kg/h), DRMRHJ 3818 (1310 kg/ha) and DRMRHJ 2517 (1310 kg/h) with a margin of 11.6, 4.3 and 4.3 percent, respectively. Forty experimental hybrids were evaluated in RCBD design (CRPMLT 2) keeping two replications. On the basis of mean seed yield over four locations (Bharatpur, New Delhi, Ludhiana and Hisar), three hybrids; DRMRHJ 2718 (3144 kg/ha), RHH 2409 (3060 kg/ha) and RHH 2417 (3040 kg/ha), out-yielded the best check Pioneer 45S46 (2945 kg/ha) by a margin of 6.7, 3.9 and 3.3% respectively. Forty F1 crosses were evaluated in CRPMLT 3 conducted at four locations (Bharatpur, Hisar, New Delhi and Ludhiana) in RBD keeping plot size of 3m long paired rows. On the basis of seed yield five crosses out yielded the best check DMH 1 (3143 kg/ha) namely; RH 2299-30/ DRMRIJ 21-31 (3541kg/ha), MJB 37/ TN 3 (3509kg/ha), MJB 36/ M 37 (3495 kg/ha), RH 2265/ PR-2019-9 (3456 kg/ha), and MJB 27/ RC 273 (3301 kg/ha) with margin of 13.8,12.7, 12.2, 10.8 and 9.7 percent respectively. Two hundred fifty-three (253) experimental hybrids including 68, 46, 57 and 82 at IIRMR, CCSHAU, IARI, and PAU, respectively were evaluated at respective centers. Each center identified promising hybrids at their location. Eight hundred twenty (820) F1 crosses including 54 at ICAR-IIRMR, 197 at CCSHAU, 376 at ICAR-IARI and 193 at PAU were evaluated. Superior crosses were identified at each center. CMS and restorers are being converted in total 421 and 178 nuclear backgrounds, respectively, through back-crossing. In addition to this a total of 213 CMS and 103 restorer lines were maintained. Seed of 253 experimental hybrids and 691 F1 crosses was produced for evaluation in the next year. A set of 60 lines shared during last year & comprising CMS, maintainer and restorer, 15 from each collaborative center were utilized and maintained. A white rust resistant genotype of Indian mustard (DRMRIJ 12-21) was registered by Plant Germplasm Registration Committee (PGRC) of Indian Council of Agricultural Research, New Delhi in its meeting held on March 24, 2025. Efforts are underway to improve parental lines for white rust resistance, quality and other agronomic traits. A set of 40 inbred lines derived from diverse inter- and intra-specific hybridization, 10 from each centre, was constituted and evaluated for agronomic performance.

Table 2.1.1 Genetic Resource Management activities

Crop	Centre	No. of accessions procured/ collected	No. of lines maintained	No. of lines Evaluated	Promising accessions identified	Traits for which identified
1	**2**	**3**	**4**	**5**	**6**	**7**
Toria	Bhubaneswar Ranital(OUAT)	2	109	23	ORT 2017-9, PT 2015-10-1	Earliness, High Yield under late sown conditions
					ORT 15-9-4	Moderate tolerance to aphids
					RAUDT 14-9-sel3,	More number of basal branching
	Chatha Jammu	2	53	16	-	Earliness
	Dholi	16	16	-	IGT-2, IGT-64, IGT-91, RAUDT-62, RAUDT-15, RAUDT-7, RAUDT-67, RAUDT-36, RAUDT-16, RAUDT-74, RAUDT-79, RAUDT-7, DC9401, TH-9802, Dwarf Toria, Satha local	Earliness and yield components
	Imphal (CAU)	-	10	-	-	-
	Kanpur	-	255			
	Ludhiana		Diversity set: 192			
			RILs : 375			
			567			
	Pantnagar	50	50	50	DRMR-295,308,314,298,256, DRMR-267, 276, 278,323, 255, DRMR-312, 310,317	Dwarf and early Plant type Basal branching
		-	16	-	-	-
		-	6	-	-	-
		-	14	-	-	-
	SK Nagar	-	19	-	-	-
Total		**70**	**1010**	**89**	-	-
Indian mustard	Bhubaneswar Ranital (OUAT)	1	124	16	TPM1, ORM 2019-25	Earliness
				11	TM 258	High yield under late sown conditions
				14	ORM 18-29-5	Bold seed and moderate aphid tolerance
	Chatha-Jammu	4	116	24	-	White rust resistance& High seed yield
	Dholi	42	42	-	MDOC-8, MDOC-53, MDOC-27, TPM-1, RK-8401, NDRE -4, IC -401574, IC-399788, TM-12, BIO94, Domo, Jatai Local, EC	High genetic diversity, Earliness, Thermo-

					339000, EC 338997, EC-399301, PAB 9511, PAB 9534, IC401574, IC-399788, RAURDA09-32, RAURDA 09-34, RAURDA 09-78, RAURDA 09-153,RAURDA 09-170, RAURDA 09-172, RAURDA 09-212, RAURDA 09-214, RE11, NC 37362, RE44, CN 105364, IC 597880, RLC 3, RE8, DRMR MJA 35, DRMR IJ 12-48, DRMR IJ 12-40, DRMR IJ 31, LES 39, TN3, NPJ 112, M34	tolerant(Early and Terminal stages) ; Resistance/Tolerance to white rust, and Quality traits like bold seeded, high Oil Content and low erucic acid
	Kangra	-	20	20	-	-
	Jhansi	17	344	280	06	Productivity traits, Earliness and Disease resistance
	Imphal (CAU)	20 (local yella collection)	50	25	CAU LYC-15, CAU RM-1	Higher yield
	Hisar	-	302	-	-	-
	IARI, New Delhi		373	40		Productivity traits
		-	259 RILs	259	10	Evaluated for powdery mildew resistance
		-	26	-	-	Yield and disease resistance
			40	40	-	Low erucic/ Low Glucosinolates content
		-	176	176	JC-33, RC-571, NPJ-181, DJ-26, NPJ-245, PM-27, NPJ-203, Varuna, PM-25, and RC-891-1	Reproductive phase drought stress tolerance
	Kanpur	-	1465	-	-	-
	Ludhiana		Germplasm lines :500	-	-	-
			Radiation panel : 350	-	-	Herbicide Resistance, Earliness, Plant height , seed size
			Mustard Introgression lines	220	SRIL2-2, SRIL6-1, SRIL8-1, SRIL12-2, SRIL14-8, NASRM13-4, NASRM16-3, NASRM19-1,ARILM15-1,ARILM13-2, AR4-2, AR14-2 DTM 500, DTM 508, DTM 509, DTM 514, DTM515	Resistance/tolerance to Sclerotinia stem rot and Mustard aphid and Determinate growth
			ICAR-NASF panel	270		
			Newton Pori panel	260		
	Nagpur	15	223	238	-	Thermo tolerance (terminal stage) and earliness
	Pantnagar	-	08		-	
		-	25	-	DRMR-1483, DRMR-1485, DRMR-1491, DRMR-1495, DRMR-	Bold seeded, High

					1496, DRMR-1517, DRMR-1518	yield
		15	15	15	Ped-2013, Ped-2019	Multiple disease resistance
			25	-	-	Quality traits and disease resistance
		71	71	71	ERJ-35, ERJ-112, ERJ-164, ERJ-159, ERJ191	Alternaria blight resistance
	SK Nagar	-	407	-	-	-
	Varanasi	16 From GBPUA&T, ICAR-NRCPB	80	80	PAB-2017-15,PAB-2017-1,PAB-2017-25,PAB-2014-26,PAB-2014-4,PAB-2017-22,PAB-2017-18,PAB-9511,PAB-2014-7,PAB-2014-8,PAB-2017-4,PAB-2017-18,ERJ-175,ERJ-1,RLM-198,ERJ-191	Alternaria blight
		2	6	-	F1 (NRCHB101 x *B. napus* 114), *B. napus* 114	Sclerotinia rot
Total		**203**	**5047**	**2059**		
Yellow Sarson	Bhubaneshwar	-	13	-		
	Dholi	05	05	-	RAUDYS-89-111, RAUDYS-9701, RAUDYS-9702, RS-1, Pendent Local	Yield , Earliness , Yield components Resistance/Tolerance to AB Disease and Oil Content.
	Imphal (CAU)	-	19	-	-	-
	Hisar	-	12	-	-	-
	Delhi	-	4	-	-	Shorter maturity duration
	Pantnagar	50	50			
			37	37	EC-414301, EC-414284, IC 267704	
		-	24	24	DRMR-2383, DRMR-2384DRMR-2508, DRMR-2385	Basal Branching and long main raceme
		-	28	-	-	-
		-	16	-	PYSC-12-48, PYSC-12-53, PYSC-12-54, PYSC-55	Basal branching, long main raceme and long pod length, Laxed bearing
		-	35	-	DRMR-2386, DRMR-2380, DRMR-646, DRMR-646, DRMR-2376 DRMR-633	Basal Branching Long main raceme long pod
	Kanpur	-	155	-	-	-
	S K Nagar	-	44	-	-	-
Total		**55**	**442**	**61**		
Gobhi sarson	Dholi	03	03	-	Tower, HNS 0004 and HYOLA 401	Resistance/Tolerance to AB Disease and quality

						traits like Oil Content.
	Hisar	-	39	-	-	-
	IARI, New Delhi	-	2	-	-	-
	Ludhiana	Germplasm lines	150	-	-	
		Radiation Panel	350	-	-	
	Chatha-Jammu	2	43	18	-	High seed yield
	Kangra	-	19	19	-	-
	SK Nagar	-	13	-	-	-
Total		**05**	**619**	**37**		
Brown Sarson	Pantnagar	-	26	-	-	-
	Kangra	-	18	18	-	-
	S K Nagar	-	20	-		
Total		-	**64**	**18**		
Karan rai	Dholi	05	05	-	Kiran, PBN-2001, PBN-2002, PBN9501, PBC9221	Resistance/Tolerance to AB Disease
	Hisar	-	10	-	-	-
	Kangra	-	7	7	-	-
	IARI, New Delhi	-	174	-	-	-
	Ludhiana		67			
	S K Nagar		05			
Total		**05**	**268**	**7**	-	
Taramira (*Eruca sativa*)	SK Nagar	-	02	-	-	
	IARI, New Delhi	-	02	-	-	-
Total		-	**04**	-		
B. nigra	Hisar		01			
Total		-	**01**	-		
B. rugosa	Pantnagar		23	-	EEC-5, EEC-3, EEC-1	Alternaria blight resistance, Good for vegetable purpose
Total		-	**23**	--		
S. Alba	IARI, New Delhi	-	1	-	-	-
	Hisar		4			
Total			**05**			
Sinapis alba + B. juncea (Hexaploid)	IARI, New Delhi	-	02			
Total			**02**			
Crambe sp	Hisar		1			

Total			**01**			
Crambe abyssinica	IARI, New Delhi	-	07	-	-	-
Total			**07**			
R. caudatus	IARI, New Delhi	-	1	-	-	-
Total	-	-	**01**	-	-	-
Lepidium sp	IARI, New Delhi	-	1	-	-	-
Total			**01**			
Lepidium sativum	IARI, New Delhi	-	2+1	-	-	-
Total			**03**	-	-	-
B. tournifortii	IARI, New Delhi	-	1+2	-	-	-
	Hisar		1			
Total			**04**			
B. chinenesis	IARI, New Delhi	-	1	-	-	-
Total			**01**			
B. fruticulosa	Hisar		1			
Total			**01**			
Sisimbrium (BWMR)	IARI, New Delhi	-	1	-	-	-
Total			**01**			
Camelina sativa	IARI, New Delhi	-	1	-	-	-
	Hisar		1			
Total			**02**			
Capsella-bursapastoris	ICAR-IARI, New Delhi	-	2	-	-	-
Total			**02**			
Diplotaxis assurgens	IARI, New Delhi	-	1	-	-	-
	Hisar		1			
Total			**02**			
Diplotaxis muralis	IARI, New Delhi	-	1	-	-	
Total			01			
Diplotaxis tenuisilique	Hisar		01			
Total			**01**			
Enarthrocarpus lyratus	IARI, New Delhi	-	1	-	-	-
Total			**01**			
Erucastrum canariense spp	IARI, New Delhi	-	1	-	-	
	Hisar		01			
Total			**02**			

Erucastrum cardaminoides	IARI, New Delhi	-	1	-	-	-
Total			**01**			
Biscutella sp	IARI, New Delhi	-	1	-	-	-
Total	-	-	**01**	-	-	-
Diplotaxis viminea	IARI, New Delhi	-	1	-	-	
Total			**01**			
Diplotaxis erucoides	IARI, New Delhi	-	1	-	-	-
Total			**01**			
Grand Total		**338**	**7520**	**2271**		

Table 2.1.2: Number of crosses, their generation and number of selections practiced.

Centre	Objective (s)	Generation	Pedigree	No. of crosses/ lines	Selection	
					No. of single plants	No. of bulks
1	2	3	4	5	6	7
Crop: Toria						
Bhubaneshwar (OUAT RRTTS, Ranital)	Development of high seed yielding strains of Toria suitable for rice-fallows	Fresh Crosses	PHT1 x Sushree, PT141 x Anuradha, Bhawani x ORT 2019-5, RMT 10-15 x ORT 2018-31, Tapeswari x ORT 2018-6, PT 2015-10 x CAU Toria 1, PT 508 x Sushree, ORT 18-6-16 x PT 508, PT 508 x CAU Toria 1	9		
		F1	Uttara x ORT 18-6-16, Parbati x TS-38, ORT 2018-05 x PT303	6		5
		F2	Anuradha x Tapeswari, Anuradha x ORT 18-6-16, CAU-Toria 1 x RAUDT 14-9-Sel1,Sushree x Tapeswari, Sushree X Uttara, Tapeswari x ORT18-6-16, Sushree X RAUDT 14-9-Sel1, TKM 18-1 x Parbati	8	57	7
		F3	Uttara x RAUDT 14-9, PT303 x TS-38 , Tapeswari x Anuradha, Parbati x PT 303, TKM 18-1 x Sushree, PT 303 x TKM 18-2	6	15	2
		F4	Sushree x PT303, Anuradha x TS-38, PT303 x Panchali, TS-29 x Panchali,	11	36	4
		F5	TS-29 x Panchali, Parbati x PT 303, PT 303 x TS-38 ,	13	2	3
		F6	PT 303 x TKM 18-2, TS-29 x JT 90-1, Uttara x TKM 18-2,	6		4
		F7	Composite population	8	-	6
		Population improvement for seed yield	Population1: Sushree, PT508, Bhawani, Tapeswari, T9; Population2: Anuradha, PT 2015-10, Uttara, TS38, Panchali, RAUDT 14-9; Population3:Parbati, ORT 18-6-16, PT 508, TS38, TKM 18-2 JT 90-1	21		
	Development of composites for seed yield	Fresh Crosses	ORTC-2024-01, ORTC-2024-02, ORTC-2024-03, ORTC-2024-04, ORTC-2024-05, ORTC-2024-06	06		
Chatha-Jammu	Early, high yielding	Fresh cross	Composite populations	06		
		F_1	Composite populations	08		

		F2	RSPT-2, RSPT-9 with Pant hill toria-1, PT-508 & Uttara	05		
		F3	Composite populations	07		
		F4	RSPT-1,RSPT-6,TL-15,PT-303 & Uttara , Satha local	06		
		F5	Six single crosses using parents RSPT-6, Bhawani, Uttara, PT-303,TL-15&RSPT-9.	06		
		F6	PT-2013-5,PT-2013-8,TS-38,TRS-79,TKM-16-1 with Bhawani, PT-303 & Tapeswari	8		
		F7	RSPT-3, RSPT-11,TL15 & RSPT-8 with Bhawani & satha local	07		
Imphal	High yield and earliness	F7	M 27, TS 36	1		
		F1	TS 38, TS 67	1 (composite)		
Kanpur	Development of early maturing high yielding varieties	F_4	PT-303 x T9, PT-303 x Bhawani, PT-303 x Tapeswari, PT-303 x ORT-11, PT-303 x PT507, PT-303 x Anuradha, T9 x Bhawani, T9 x Tapeswari, T9 x ORT-11, T9 x PT507, T9 x Anuradha, Bhawani x Tapeswari, Bhawani x ORT-11,Bhawani x PT507,Bhawani x Anuradha, Tapeswari x ORT-11, Tapeswari x PT507, Tapeswari x Anuradha, ORT-11 x PT507, ORT-11 x Anuradha, PT-507 x Anuradha	17	212	
Pantnagar	Earliness	Fresh crosses	PT-2022-1 × PT-141, PT-2022-2 × PT-141, PT-2017-3 × PT-141, PT-2018-3 × PT-141, PT-2021-1 × RSPT-1, PT-2018-1 × RSPT-1, PT-2022-1 × RSPT-1, Uttara × RSPT-1	08		
		F1	TS-36 × PT-141, Tapeswari × PT-141, PT-508 × PT-141, PT-2017-2 × PT-141, PT-2022-1 × PT-141, PT-2016-11×Bhawani, JT-1 × Bhawani, PT-2019-5 × Bhawani	11		08
		F2	RAUDT-10-33 × Bhawani, PHT-1 × PT-141, Tapeswari × Bhawani,	06		03
		F3	PT-507 × Bhawani, PT-2015-6 × Bhawani, PT-2017-2 × Bhawani	04	-	03
		F4	T-9 × PT-2020-9	03	-	01
			Population improvement in PT-141 (recurrent selection)			
	Seed yield	Fresh crosses	PT-2022-2 × PT-508, PT-2022-2 × Tapeswari, PT-2021-1 × PT-508, PT-2021-1 × Uttara, PT-2017-3 × PT-508, PT-2017-3 × Tapeswari, PT-2018-1 × PT-508, PT-2018-1 × Uttara, PT-2018-3 × PT-508, PT-2018-3 × Tapeswari, PT-2022-1 × Tapeswari, PT-2022-1 × Uttara, Uttara × Tapeswari, Uttara × PTC-2021-1	14		
		F1	PT-508 × JT-28, JT-1 × Tapeswari, PT-2016-9×JT-28, PT-2019-5×JT-28, PT-2022-1×PT-2017-1, PT-2022-5×PT 30, PT-2020-1×JT-28, PT-2020-1×PT-2019-4, PT-2016-11×PT-2017-1	12		09
		F2	Tapeswari × Uttara, PT-2015-7 × TS-46, PT-2018-9 × RAUDT-10-33, RAUDT-10-33 × PT-2018-9 , PT-2018-7 × PT-508	07		05
		F3	PT-2018-6 × PT-2017-3, PT-2018-3 × PT-2017-3, PT-30 × Tapeswari, PT-507 × T-9	05	-	04
		F4	PT-2020-5 × PT-2018-8, PT-2020-5 × PT-15-4	03	-	02
	Composite for Seed yield		Composite			
		C0	PTC-2025-1, PTC-2025-2, PTC-2025-3, PTC-2025-4	04		
		C1	PTC-2024-1, PTC-2024-2, PTC-2024-3, PTC-2024-4, PTC-2024-5, PTC-2024-6, PTC-2024-7	07		06
		C2	PTC-2023-2, PTC-2023-4	02		02
		C3	PTC-2022-6, PTC-2022-8	06	-	02
		C4	PTC-2021-3, PTC-2021-4, PT-2021-12	06		06
			Recurrent selection			
			PT 2020-3, PT 2020-6, PT 2008-7×RAUDT-10-22, Uttara, DRMR-2396			

	Specific adaptation to hill		Development of inbred in toria (S0, S2, S3)			
		Fresh crosses	PT-2018-3 × PRT-1, PT-2022-2 × PRT-1, , PT-2017-3 × PRT-1, PT-2018-1 × PHT-1, PT-2022-1 × PHT-1, PHT-1 × PT-2018-3, PHT-1 × PT-2016-8, PHT-1 × PT-2018-7			
		F1	TS-36 × PHT-1, Tapeswari × PHT-1, PT-508 × PHT-1, PT-2022-5 × PHT-1,	07		04
		F2	PRT-1 × Uttara, JT-28 × PT-508, JT-11 × Tapeswari, JT-11 × TS-46, JT-11 × PT-508	10		05
		F3	Uttara × T-9, PT-2015-6 × Tapeshwari, PT-2015-7 × T-9,	07	-	03
		F4	PT-2019-4 × PHT-1, PT-2018-9× PHT-1	02	-	02
Crop: Yellow Sarson						
Bhubaneswar (OUAT RRTTS, Ranital)	Development of high - yielding strains of Yellow Sarson suitable for rice-fallows of Odisha	Fresh Single crosses	RMSY2 x YSH 401(m)-11, NRCYS 95-02(m)-13 x RMYS2, DRMRYS 202 x YSH 401(m)-17, Benoy x Pant Sweta, YSH401(m)-14 x Benoy, NRCYS(m)-16 x DRMR202, NRCYS(m)-11 x PYS 2018-1, PYS 2018-1 x B9, Pitambari x PYS 2018-1	10		-
		F1	NRCYS 05-02(m)-54 x RMYS2, DRMYS 202 x B9, DRMRYS 202 x Pitambari, YSH0401 x RMYS2	4	-	
		F2	DRMYS 202 x YSH 401, RMYS2 x NRCYS 05-02	2	114 IPS	
		F3	Pitambari x YSH 0401, NRCYS 05-02 x B9	27	24 (57IPS)	
		M4	Parents: NRCYS 05-02, YSH 401, Mutagen: 0.5%EMS	23	12(37 IPS)	4 (31 IPS)
		M5	Parents: NRCYS 05-02, YSH 401, Mutagen: 0.5%EMS	18	12	3 (23 IPS)
		M6	Parents: NRCYS 05-02, YSH 401, Mutagen: 0.5%EMS	11	5	

Pantnagar	High seed yield	Fresh crosses	PYS-2022-3 × NRCYS-05-02, PYS-2022-3 × PPS-2, PYS-2022-3 × DRMR-2386, PYS-2022-3 × Pitambari, PYS-2021-4 × NRCYS-05-02, PYS-2021-4 × PPS-2, PYS-2021-4 × DRMR-2386, PYS-2021-4 × Pitambari, PYS-2021-12 × NRCYS-05-02, PYS-2021-12 × PPS-2, PYS-2021-12 × DRMR-2386, PYS-2021-12 × Pitambari, PYS-2022-4 × NRCYS-05-02, PYS-2022-4 × PPS-2, PYS-2022-4 × DRMR-2386, PYS-2022-4 × Pitambari, PYS-2022-15 × NRCYS-05-02, PYS-2022-15 × PPS-2, PYS-2022-15 × DRMR-2386, PYS-2022-15 × Pitambari, PYS-2023-2 × NRCYS-05-02, PYS-2023-2 × PPS-2, PYS-2023-2 × DRMR-2386, PYS-2023-2 × Pitambari, PYS-2024-5 × NRCYS-05-02, PYS-2024-5 × PPS-2, PYS-2024-5 × DRMR-2386, PYS-2024-5 × Pitambari, PYS-2024-9 × NRCYS-05-02, PYS-2024-9 × PPS-2, PYS-2024-9 × DRMR-2386, PYS-2024-9 × Pitambari, PYS-2024-6 × NRCYS-05-02, PYS-2024-6 × PPS-2, PYS-2024-6 × DRMR-2386, PYS-2024-6 × Pitambari, PYS-2024-7 × NRCYS-05-02, PYS-2024-7 × PPS-2, PYS-2024-7 × DRMR-2386, PYS-2024-7 × Pitambari, PYS-2024-12 × NRCYS-05-02, PYS-2024-12 × PPS-2, PYS-2024-12 × DRMR-2386, PYS-2024-12 × Pitambari, PYS-2022-4 × PYS-2024-12, PYS-2022-4 × PYS-2024-3, PYS-2022-4 × PYS-2024-5, PYS-2022-4 × PYS-2024-6, PYS-2022-4 × PYS-2024-7, PYS-2022-4 × PYS-2024-9, PYS-2022-4 × PYS-2024-10, PYS-2022-8 × PPS-2, PYS-2022-8 × NRCYS-05-02, PYS-2022-8 × DRMR-2386, PYS-2024-2 × DRMR-2386, PYS-6 × PYS-2021-12, PYS-6 × NRCYS-05-02, PYS-6 × PYS-2017-6, PYS-6 × DRMR-2386, PYS-842 × PYS-2024-6, PYS-842 × PYS-2021-21, PYS-2018-1 × PYS-2021-21, PYS-2018-1 × PYS-2024-6, PYS-2018-1 × PYS-2021-4, PYS-2018-1 × DRMR-2386, PYS-2018-1 × PYS-2020-3, PYS-842 × NRCYS-05-02, PYS-2017-8 × DRMR-2386, PYS-2017-8 × NRCYS-05-02, PYS-2017-8 × PYS-2024-6, PYS-2017-8 × DRMR-2386, PYS-2017-8 × PYS-2021-21, PYS-2017-11 × PYS-2020-3, PYS-2017-11 × PYS-2021-21, PYS-2017-13 × DRMR-2386, PYS-2017-13 × NRCYS-05-02, PYS-2021-5 × DRMR-2386, PYS-2021-5 × NRCYS-05-02, PYS-, 021-5 × PYS-2021-21, PYS-2021-6 × DRMR-2386, PYS-2021-6 × NRCYS-05-02, PYS-2021-4 × DRMR-2386, PYS-2021-4 × NRCYS-05-02, PYS-2021-4 × PYS-2017-6, PYS-2017-7 × DRMR-2386, PYS-2017-7× NRCYS-05-02, PYS-2017-7× PYS-2017-6, DRMR-2386 ×PYS-2021-10, DRMR-2386 ×PYS-2020-12, DRMR-2386× PYS-2020-7,DRMR-2386 × PYS-2020-13,DRMR-2386 ×PYSC-70-7-11,DRMR-2386× PYSC-17-6-5,DRMR-2509 × PYS-2021-4, DRMR-2509 × PYS-2021-2, DRMR-2509× PYS-2020-12, DRMR-2509 × PYSC-17-6-5	97		
		F1	DRMR 2386 × PYS-2022-15, DRMR-2379 × Pitambari, PYS-2022-5 × PYS-2023-12, DRMR-2386 × YSH 0401, DRMR-2386 × PYS-2022-15, DRMR-2509 × PYS-2022-15, DRMR-2509 × NDYS-2018, PYS-2022-2 × PYS 842, PYS-2022-2 × DRMR 2386, PYS-2022-2 × YSH 0401, PYS-2022-4 × PYS-2018-1, PYS-2022-4 × NRCYS 0502, PYS-2022-4 × PYS-2023-4, PYS-2022-4 × PYS-2022-15, PYS-2022-14 × PYS 842, PYS-2022-14 × PYS-2018-1, Pitambari × PYS-2023-2, Pitambari × PYS-2022-2, PPS-2 × DRMR 2386, PPS-2 × PYS-2023-2, PPS-2 × PYS-2022-2, NRCYS 0502 × PYS-2022-4, YSH 0401 × PYS-2023-1, YSH 0401 × PYS-2022-5, PYS-2023-1 × PYS-2022-15, PYS-2023-1 × PYS-2022-9	85		23

		F2	YSGP-61 × NRCYS-05-02, YSGP-66 × NYM-6001, YSGP-68 × NRCYS-05-02, YSGP-68 × PYS-2017-8, PYS-2021-8 ×Pitambari, PYS-2022-2 × NRCYS-05-02, PYS-2022-4 × NRCYS-05-02, PYS-2022-7 × PYS-2021-2, PYS-2022-7 × PYS-2021-4, PYS-2022-8 × NRCYS-05-02, PYS-2022-9 × NRCYS-05-02, PYS-2022-9 × PYS-2021-2, PYS-2021-6 × PYS-2017-8, PYS-2017-13 × PYS-2021-4, PYS-2017-13 × PYS-2018-3,NRCYS-05-02× PYS-2022-2, PYS-2018-1 × Pitambari	42		16 (277 IPS)
		F3	PYS 842 × YSH 0401, PYS-17-13 × NRCYS-05-02, PYS-18-7 × PYS-21-21, PYS-18-7 × PYS-21-12, PYS-21-7 × NDYS 2018, PYS-21-14 × PYS-21-18, PYS-21-20 × YSH 0401, YSCN-20-2 × NRCYS-05-02	15 (403 IPS)	8 (164 IPS)	
		F4	PYS-2018-1 × PYS-842, PYS-2018-1 × PYS-20-7, PYS-17-8 × PYS-842, YSGP6 × Pant Sweta, GP-49 × GP-52, PYS-18-1 × GP-49, YSGP 49 × PYS-17-6, EC-7×EC-13, EC-11×EC-8, EC-12×EC-4, YSGP-69× NRCYS-05-02	17(473IPS)	11 (169 IPS)	-
		F5	PPS-1×PYS-2017-6, Pant Sweta × PYS-2018-4, Pant Sweta × PYS-2017-6, Pant Girija × PYS-2017-6, NRCYS-05-02×PYS-2017-6, NRCYS-05-02×PYS-2017-8, Pitambari × PYS-2017-8, YSH-401×PYS-2017-8, NDYS 2018×PYS-6	8 (126 IPS)	8 (131 IPS)	-
		F6	YS-89-7×NDYS-107, PYS-17-6× PYS-16-7, PYS-17-6× NDYS-2018, PYS-17-6× PYS-2016-15, PYS-17-11× NDYS-2018, PYS-17-11× NDYS-123	6 (150 IPS)		6 (36 lines)
		F7	PYSC-21-6 × YS-89-7, PYSC-40-4 × RAUDYS-14-9, PYS-841 × RAUDYS-14-9, PYSC-53-5 × RAUDYS-14-9, (PYS-2016-6 × PYS-6) × RAUDTYS-14-9	5 (44 lines)		5 (15 lines)
Kanpur	Breeding early maturing and high yielding varieties of Yellow Sarson	F_4	YSKM 15-2 x YSH – 401, YSKM 16-2 x Benoy, YSKM 17-2 x Pitambari, YSKM 18-1 x Benoy, YSKM 18-2 x Pitambari, YSKM 19-1 x YSH-401	6	75	
		F_5	YSC-63 x NRCYS-05-02,YSC-63 x YSH-401, YSC-63 x Benoy, YSC-63 x Pitambari, YSC-41 x NRCYS-05-02, YSC-41 x YSH-401, YSC-41 x Benoy, YSC-41 x Pitambari, YSC-09 x NRCYS-05-02, YSC-09 x YSH-401, YSC-09 x Benoy, YSC-09 x Pitambari, YSC-71 x NRCYS-05-02, YSC-71 x YSH-401, YSC-71 x Benoy, YSC-71 x Pitambari, YSKM11-02 x NRCYS-05-02, YSKM11-02 x YSH-401, YSKM11-02 x Benoy, YSKM11-02 x Pitambari, YSC-76 x NRCYS-05-02, YSC-76 x YSH-401, YSC-76 x Benoy, YSC-76 x Pitambari, YSKM-10-1 x NRCYS-05-02, YSC -10-1 x YSH-401, YSKM-10-1 x Benoy, YSKM-10-1 x Pitambari, YSKM-11-1 x NRCYS-05-02, YSKM-11-1 x YSH-401, YSKM-11-1 x Benoy, YSKM-11-1 x Pitambari, YSC-75 x NRCYS-05-02, YSC-75 x YSH-401, YSK-03 x Pitambari	32	435	
		F_6	YST-151 x T-44, YST-151 x K88, YST-151 x T-3, YST-151 x T-4, YST-151 x B-9, YST-151 x YSK-1, T-44 x K88, T-44 x T-3, T-44 x T-4, T-44 x B-9, T-44 x YSK-1, K-88 x T-3, K-88 x T-4, K-88 x B-9, K-88 x YSK-1, T-3 x T-4, T-3 x B-9, T-3 x YSK-1, T-4 x B-9, T-4 x YSK-1, B-9 x YSK-1	21	323	
		F_7	YST-151 x YSK-3, YST-151 x YSK-24, YST-151 x YSK-28, YST-151 x YSK-42, YST-151 x K88, YST-151 x YSK-2, YST-151 x YSK-4, YSK-3 x YSK-2, YSK-3 x YSK-28, YSK-3 x YSK-42, YSK-3 x K88, YSK-3 x YSK-2, YSK-3 x YSK-4, YSK-24 x YSK-28, YSK-24 x SK-42, YSK-24 x K88, YSK-24 x YSK-2, YSK-24 x YSK-4, YSK-28 xYSK-42, YSK-28 x K88, YSK-28 x YSK-2, YSK-28 x YSK-4, YSK-42 x K88	23	343	
Crop: Indian mustard						

Bhubaneswar (OUAT RRTTS, Ranital)	Earliness and high yield under late sown conditions	Fresh single crosses	DRMRIJ 31 x ORM 2019-30, NPJ 112 x ORM 2019-31, JD6 x DRMRIJ31, Kranti x ORM 18-29-5, PM-25 x ORM 18-29-5, ORM 2019-02 x Kranti, ORM 2019-02 x JD6, ORM 2019-25 x PM 25 , DRMRIJ 31 x JD6, ORM 2019-25 x NPJ 112, ORM 2019-25 x TM 108-1, PM-25 x TM 108-1	12		
		F1	Parents: TPM 1, TM 143, NRCHB101, DRMRIJ 31, JD6, PM25	4	-	5
		F2	ORM 18-29-5 x NPJ 112, NRCHB101 x NPJ112, ORM 2019-25 x NPJ 112, DRMRIJ 31 x ORM 18-29-5, DRMRIJ 31 x ORM 2019-25, DRMRIJ 31 x NPJ 112	6	59	7
		F3	Pusa Bold x TM 106, Pusa Bold x TM 208, Pusa Bold x KMR E 19-1, ORM 41-4-5 x TM 208, PRE 17-2 x TM 117, TM 108-1 x PRE 17-2, PM 25 x TM 108-1, Pusa Bold x BAUM-09-12, TM 106 x NRCHB101	9 lines	71 IPS	10
		F4	RMM-10-1-1 x NRCHB 101, TM 258 x RMM 10-1-1, TM 106 x 2019-02	9	24	3
		F5	RMM 10-1-1 x JD6, RMM 10-1-1 x NPJ 226, TM 108-1 x RMM 10-2-3	8	19	
		F6	RMM 10-1-1 x PM 25, RMM 10-1-1 x NPJ 226	4	13	
		M6	Parents: Kranti, NRCHB101, Dosage: 0.4% EMS, 8 hr and 0.7% for 6 hr	27	39	8
Chatha-Jammu	High Seed yield & White rust resistance. breeding for Stress (Moisture Stress)	Fresh crosses	JM-135, JM-122,RSPR-25, RSPR-69,JM 18-7 With DRMR 2018-19,RH 1975 & RH-1424	15		
		F1	JM-126, ORM 2019-25,JM-142, JM-135, RH 1999-42, RSPR-69 With PM-25, Pant Rai-19 & PM-28	18		
		F2	SKJM-5,RH-1676,NPJ-223,PR-2016-4,PBR-385,PR-17-7,DRMR-2018-25,RGN-462, AKMS19-2 & DRMRCI-96 with DRMRIJ-31, RH-749, NRCHB-101,PM-27& RGN-73	42		
		F3	RSPR-69, RSPR-01, RSPR-03 With RE-11, NC 37362, RE-44, CN105364, IC-597880, RLC-3, RE-8, DRMRMJB-35, DRMRIJ 12-48, DRMRIJ 12-40, NPJ-112,TN-3 , M-34 ,DRMR-2035, DRMR-2019 & BioYSR.	41		
		F4	RH-1658, SKJM-16, PBR-378, RH-1584, RH-1424,PMM 12-2-18, RSPR-01, DRMR 15-35 & OMR 4-3-5 With RH-406, RGN-48, RB-50 & RH-725	18		
		F5	Attempted using agronomically superior 15 genotypes with RH-761,RB-24& RH725.	22		
		F6	RSPR-69,RSPR-5,RSPR-1,RSPR-3,RH-1209,RH-0923,SKJM-5,SKJM-3 With NRCHB-101, RH-406 & RH-749	16		
		F7	RGN-400, DRMRIJ-16-1, PRE-2013-10, DRMRCI-55, NRCHB-101, RH-1207 with RH-406, PM-25 & RH-1573	14		
Dholi	To develop high temperature tolerant mustard strains for early sown condition	M_9	Source material: Rajendra Suflam (i) Dosages of Gamma Rays: 80Kr, 90Kr, 100Kr, 110Kr, 120 Kr (ii) Dosages of Gamma Rays + EMS: 0490Kr +0.2%EMS, 90 Kr+0.3% EMS, 100Kr +0.2%EMS, 100 Kr+0.3% EMS	09	351	199
	Early Maturity, Yield & component traits	F_1	RS*DRRIJ-31, RS*CN-105364, VARUNA*DRMRIJ-31, VARUNA*CN105364, RS*RE44, RS*DRMRJA-35, RS*TN-3, RS*NPJ112, RS*DRMRJA-35, RS*DMRIJ-12-48, RS*DRMRIJ-12-40, RS*NC-37362, RS*RE11, RS*IC597880, RS*M-34 (15 Crosses)	15	--	--
	Low Erucic acid content, Bold seed, WRR resistance	F_3	RS*RE11,RS*NC-37362,RS*RE44,RS*CN105364,RS*IC59M880,RS*RE-8 RE-11*NC37362, RE11*RE44,RE11*CN-105364,RE11*IC-597880,RE11*RE8,NC37362*RE44,NC*37362*CN-105364,NC37362*IC597880, NC37362*RE8, RE44*CN105364, RE44*IC594880, RE44*RE8, CN105364*IC-597880, CN-105364*RE-8 and IC597880*RE-8 (21 Crosses)	21	208	21
	Earliness, Bold seed and high oil content, Low	F_4	NC-37362/MJR20,CN-105257/MJR20,Pusa-Bahar/MJR20,IM-170/MJR20,CN-101813/MJR20, CN-105233/MJR20,RE 13/MJR20, MJB3/Heera, MJB3/RE35-4, MJB3/Donskaja, NPJ 225/EC	15	68	

	Erucic acid		27-1, NPJ 203/RH 1599-41, MST 18-16/PDZ 6MST 18-26/PDZ 6, RMWR-09-05/IC 277699			
	High yield	F_3	PAB-14-17/NRCHB-101, PAB-14-4/EC-399302, PAB-14-1/DRMR-2017-5, EC-399299/PAB-9511	5	32	
Kangra	High yielding, early, bold seed, plant architecture	F_2	DRMRIJ 31 X CS 54, CS 54 X NRCKR 314, NRCKR 314 X CT 517, LC 3 X Karan rai, AKMS 22 6 X Karan rai brown AKMS 22-1 X DRMR 6,AKMS 22-2 X NRCHB 101, AKMS 22-3 X NRCHB 101, AKMS 22-4 X DRMR 6, AKMS 22-5 X NRCHB 101, AKMS 22-7 X CS 54, AKMS 22-8 X DRMRIJ 31, AKMS 22-9 X DRMRIJ 31, AKMS 22-10 X DRMR 6, AKMS 22-14 XDRMR 6, AKMS 22-15 X DRMR 6,AKMS 22-18 X CS 54, AKMS 22-22 X DRMRIJ 31,AKMS 22-22 X CS 54,AKMS 22-28 X NRCHB 101, AKMS 22-24 XDRMR 6,AKMS 22-25 X DRMR 6,AKMS 22-26 X CS 54, AKMS 22-29 X CS 54,AKMS 22-30 X CS 54	25		
		F_3	RE 11 X RE 44,RE 11X CN 105364,RE 11 X IC 597880, NC 37362 X R E 11, NC 37362 X DRMRJA 35,NC 37362 X DRMRIJ 12-48, NC 37362 X DRMRIJ 12-40, NC 37362 X DRMRIJ 31,RE 44 X NC 37362, RE 44 X CN 105364, RE 44 X DRMRIJ 12-48, RE 44 X LES 39,RE 44 X TN 3,RE 44 X M 34,CN 105364 X RE 11, CN 105364 X NC 37362, CN 105364 X RLC 3,CN 105364 X DRMRIJ 12-40, CN 105364 X DRMRIJ 31,CN 105364 X LES 39,CN 105364 X NPJ 112,IC 597880 X NC 37362,IC 597880 X RE 44,IC 597880 X DRMRJA 35, , IC 597880 X M34, RLC 3 X DRMRIJ 12-48, RLC 3 X DRMRIJ 12-40, RLC 3 X LES 39, RLC 3 X NPJ 112, RLC 3 X M 34, RE 8 X RE 11, RE 8 X RE 44, RE 8 X CN 105364, RE 8 X RLC 3, RE 8 X DRMRIJ 12-40, RE 8 X DRMRIJ 31, DRMRMJA 35 X DRMRIJ 31, MJA 35 X CN 105364, DRMRMJA 35 X RLC 3, DRMRIJ 12-48 X RE 11DRMRIJ 12-48 X LES 39, DRMRIJ 12-48 X M 34, DRMRIJ 12-40 X RE 8, DRMRIJ 12-40 X DRMRJA 35, DRMRIJ 12-40 X DRMRIJ 12-48, DRMRIJ 12-40 X NPJ 112DRMRIJ 31 X NC 37362, DRMRIJ 31 X RE 44, DRMRIJ 31 X CN 105364, DRMRIJ 31 XRE 8, DRMRIJ 31 X DRMRIJ 12-48, DRMRIJ 31 X DRMRIJ 12-40, , DRMRIJ 31 X LES 39, DRMRIJ 31 X TN 3, DRMRIJ 31 X NPJ 112, DRMRIJ 31 X M34, LES 39 X RE 11, LES39 X NC 37362, LES 39 X CN 105364, LES 39 X RLC 3, LES 39 X DRMRIJ 12-48, Les 39 X DRMRIJ 12-40, LES 39 X TN 3, LES 39 X NPJ 112, LES 39 X M 34, TN 3 X RE 44, TN 3 X RLC 3, TN 3 X DRMRIJ 12-40, TN 3 X DRMRIJ 31, TN 3 X M 34, NPJ 112 X RE 11, NPJ 112 XRE 8, NPJ 112 XDRMRMJA 35, NPJ 112 X LES 39, NPJ 112 X M 34,M 34 X RE 11, M 34 X RE 44,M 34 XDRMRIJ 12-48, M 34 X DRMRIJ 12-40,M 34 X DRMRIJ 31, M 34 X NPJ 112	80		
		F_6	AKMS 3745 XAKMS 1002, AKMS 3745 x AKMS 9329, RCC 4 x CT 463, RCC 4 X CT 465	4		
		Advanced	RCC 4, Kranti, Varuna, Pusa Bold, Geeta, RH 749, DRMRIJ 20, Divya 33, Bausum 2002, NDRE 4, NDRE 7, RH 735, RMM 09-2, SKM 815, NDRE7, NDRE 4, JMM 11, DRMRIJ 31, EC 399299, EC 399301, EC399313, LES 43, PHR2, PBR 378,PAB 2005-19, RH 903, RH 906,NDN11-23, CJ 3761,JMR 08-3, Heera, KBJ80,EJ17,OMK4,RGN 236,NPJ151, ELM 123	35		
Jagdalpur	Earliness, high seed yield, bold seed and quality	F3	RE 11 x NC 37362, RE 11 x RE 44, RE 11 x CN 105364, RE 11 x IC 597880, RE 11 x RIC 3, RE 11 x RE 8, NC 37362 x RE 44, NC 37362 x CN 105364, NC 37362 x IC 597880, NC 37362 x RIC 3, NC 37362 x RE 8, RE 44 x CN 105364, RE 44 x IC 597880, RE 44 x RIC 3, RE 44 x RE 8, CN 105364 x IC 597880, CN 105364 x RIC 3, CN 105364 x RE 8, IC 597880 x RIC 3, IC 597880 x RE 8, RIC 3 x RE 8, DRMRMJB 35 x DRMRIJ 12-48, DRMRMJB 35 x DRMRIJ 12-40, DRMRMJB 35 x DRMRIJ 31, DRMRMJB 35 x LES 39, DRMRMJB 35 x TN 3, DRMRMJB 35 x NPJ 112, DRMRIJ 12-48 x DRMRIJ 12-40, DRMRIJ 12-48 x DRMRIJ 31, DRMRIJ 12-48 x LES 39, DRMRIJ 12-48 x TN 3, DRMRIJ 12-48 x NPJ 112, DRMRIJ 12-40 x	42	150	

			DRMRIJ 31, DRMRIJ 12-40 x LES 39, DRMRIJ 12-40 x TN 3, DRMRIJ 12-40 x NPJ 112, DRMRIJ 31 x LES 39, DRMRIJ 31 x TN 3, DRMRIJ 31 x NPJ 112, LES 39 x TN 3, LES 39 x NPJ 112, TN 3 x NPJ 112			
		F6	Laxmi x Pusa Bold, Pusa Agrani x Pusa Bold, DRMR IJ-31 x Pusa Bold, CG Sarson x Pusa Bold, RH-406 x Pusa Bold, Laxmi x Kranti, Pusa Agrani x Kranti, DRMR IJ-31 x Kranti, CG Sarson x Kranti, RH-406 x Kranti, Laxmi x Varuna, Pusa Agrani x Varuna, DRMR IJ-31 x Varuna, CG Sarson x Varuna, RH-406 x Varuna, Laxmi x PM-27, Pusa Agrani x PM-27, DRMR IJ-31 x PM-27, CG Sarson x PM-27, RH-406 x PM-27	20	100	
		F7	Laxmi x Pusa Bold, Pusa Agrani x Pusa Bold, DRMR IJ-31 x Kranti, DRMR IJ-31 x Varuna, Kranti x Varuna, Pusa Agrani x Kranti, DRMR IJ-31 x Pusa Bold, Pusa Agrani x Varuna, Laxmi x Varuna	9	45	
Jhansi	Breeding for high yielding varieties of Indian Mustard	Fresh Crosses	LES-69 × NPJ-253, RGN -559 ×GIRIRAJ, MCN-23-26 (RGN -559) ×NPJ 112, RGN -559 ×NPJ 271, RH(OE-1710) × RE -44, LES-69 × RE -44, RH(OE-1710) × GIRIRAJ, LES-69 × NPJ 112, RH(OE-1710) × NPJ 271, IC-231117 × DRMRMJA-35, IC-231117 × RE -44, LES-39 × NPJ 112, LES-39 × DRMRMJA-35, IC-231117× NPJ 271, LES-39 × RE -44, RH(OE-1710) × NPJ 112, LES-69 × NPJ 271, RGN -559 ×NPJ-253	18		
		F1	RH 2187 X EC766322, RH 2187 X NRCHB-101, RH 2187 X GIRIRAJ, DRMRIJ 21-37 X RH-725, NPJ-253 X GIRIRAJ, IJ19 R5004 X NPJ-253, IJ19 R5004 X GIRIRAJ, IJ19 R5004 X RH-725, DRMR 2018-25 X EC766322)	9		-
		F2	Conventional crosses among improved genotypes of *B. juncea/ B. juncea*	30 Procured + 36 RLBCAU	142	-
		F3	Conventional crosses among improved genotypes of *B. juncea/ B. juncea*	35	67	9
		F4	Conventional crosses among improved genotypes of *B. juncea/ B. juncea*	25	60	8
		F5	Conventional crosses among improved genotypes of *B. juncea/ B. juncea*	20	32	5
		F6	Juncea YS x RE 14, Juncea x RE 551, HB 9918 x RE 18, HB 9918 x RE 14, EH 2 x RE 44, EH 2 x RE 551, MJB 3 x Donskaja, MJB 3 x RE 8, MJB 3 x RE 13 and IJ 31 x RE 44	10	24	6
		F7	HB 9925 x RGN 73, HB 9925 x RH 749, DRMR-IJ-31 x RGN- 73, DRMR-IJ-31 x EH2 , DRMR-IJ-31 x DRMR-IJ-17-40, DRMR-IJ-31 x RH- 749, MJB-10 x EH2 , MJB-10 x DRMR-IJ-17-40, MJB-11 x RGN-73, MJB-5 x RH-749	10	-	8
Imphal (CAU)	High yield and non-shattering habit suitable for rainfed condition	F8	Local Yella x Kranti	1		
	High yield and oil content	F4	Local Yella x PM 25, Local Yella x JD 6, Local Yella x Pusa bold, Local Yella x DRMR 150-35	4		
		F2	JD 6 X DRMR 150-35, LYC 1 X NRCHB 101	2		
Hisar	Breeding for early raya	F1(New crosses)	JD 6, PM 25 and PM 28 as agronomically superior backgrounds and RH 2299-96, RH 2299-97 and RH 2299-92 as donor sources	9	-	-
		F2	-	3	64/14	-
		F3	-	4	38/9	-
		F4	-	2	26/7	-

		F5	-	5	24/10	-
		F6	-	3	89	19
	Breeding for component traits	F1(New crosses)	RH 1974-1, RH 2217, RH 2203, RH 2329, RH 2358, RH 2438, RH 0749, RH 8812 and RH 725 as base population and MCN 24-8, RH-1301, Bio-902, IC-589656 and RH 50 B as donor sources	45	-	-
		F2	-	16	302/74	-
		F3	-	6	112/28	-
		F4	-	5	102/45	-
		F5	-	4	68/25	-
		F6	-	8	327	34
	Breeding for Disease resistance	F1(New crosses)	RH 1974-1, RH 2217, RH 2203, RH 2329, RH 2358, RH 2438, RH 0749, RH 8812 and RH 725 as base population and Varuna (A4-A5)-842 as donor source for white rust resistance	9	-	-
		F2	-	3	37/19	-
		F3	-	3	26/14	-
		F4	-	2	28/11	-
		F5	-	2	11/7	-
		F6	-	2	67	9
	Breeding for aphid tolerance	F1(New crosses)	RH 1974-1, RH 2217, RH 2203, RH 2329, RH 2358, RH 2438, RH 0749, RH 8812 and RH 725 as base population and RH-7846 as donor source	9	-	-
		F2	-	3	39/14	-
		F3	-	2	25/10	-
		F4	-	1	22/12	-
		F5	-	1	18/10	-
		F6	-	1	48	5
	Breeding for quality traits	F1(New crosses)	RH 1974-1, RH 2217, RH 2203, RH 2329, RH 2358, RH 2438, RH 0749, RH 8812 and RH 725 as base population and RH-7846 as donor source	9	-	-
		F2	-	3	39/14	-
		F3	-	2	25/10	-
		F4	-	1	22/12	-
		F5	-	1	18/10	-
	Development of hybrids in Indian mustard	Hybrids (F1) generated	(i) Three Small Scale Trials comprising 16 experimental hybrids in each trial and two checks, RH 725 and 45S46 were conducted and results compiled. (ii) 171 new test hybrids based upon Ogura CMS system were evaluated against three checks. (iii) 13 A lines of Mori and 38 A lines of Ogura CMS system were maintained. (iv) 39 R lines of Mori CMS and 99 R lines for Ogura CMS system were maintained. (v) Generations were advanced for incorporation/diversification of Ogura CMS system into 56 different genetic backgrounds 197 new test F1 hybrids based upon Ogura CMS systems were developed for evaluation			
IARI, New Delhi	Development of short duration *B. juncea* varieties for early sown	F1s crosses attempted	MSTL24-13 (RH-1573 X PM 28) X TC24-14 [(PM26 X Heera) x PM26]; AVTL24-25 X TWR24-1(PM25 X Donskaja) ;(PM25 X PM30D) X RH-1975; (PM25 X Heera) X RH-1975; (PM26 X Pusa Bold-WR) X BHM-11; (PM26 X Pusa Bold-WR) X PM 37; NRCHB 101 X	42	42	0

	conditions		Rohini 491; PM32 X Heera; AVTL24-25 X TWR24-10 (PM 25 X P BOLD-WR); TC24-14-10(PM26 X Heera/ PM26) X IVTL24-3; TC24-14-7 (PM26 X Heera/ PM26) X IVTL24-9; TC24-14-6 (PM26 X Heera/ PM26) X IVTL24-18; TC24-14-4(PM26 X Heera/ PM26) X IVTL24-22; TC24-14-4(PM26 X Heera/ PM26) X IVTL24-15; TC24-14-4 (PM26 X Heera/ PM26) X IVTQM 24-15,; ; AVTL24-25 X PM37; AVTL24-25 X MSTL24-17; AVTL24-25 X IVTL24-13; AVTL24-25 X IVTQM24-9; AVTL24-25 X MSTQ24-4; MSTL24-14 X TC24-14; MSTL24-15 X LWR24-6; LWR24-6 X IVTL24-19; PM27 X PHR 8024; PM26 X PUSA BARANI; PM27 X PUSA BARANI; PM27 X PJK 114; PM 27 X Rohini 491; LWR24-1 -8X Pusa 425-2-1-1; LWR24-1 -7 X Pusa 427-1-1-1; LWR24-3-3 X Pusa 428-2-1-1; LWR24-6 X 428-2-1-1; TC24-14 X Pusa 425-2-1-1; TC24-14 X Pusa 427-1-1-1			
		F1	PM25 X RGN 34; PM 25 X RF2; PM 25 X NPJ 253; PM26 X RGN 34; PM26 X CN-101845; PM 26 X RE-8; PM 26 X NPJ 253; PM30 X DJ-26; PM30 X RGN 73; PM30 X PM25; PM30 X DJ-57; PM30 X RH-1999-18; PM30 X RH-6-114; PM30 X MSTE23-13 ; PM30 X MSTE23-20; PM30 X MSTE23-21; PM30 X Assam Local (Rapa); NPJ 267 X CS56; NPJ 268 X CS56; PM 32 X ELM 123; PM 32 X CN 101813; PM 32 X RE 8; PM32 X MSTE23-20; PM32 X MSTE23-21; PM27 X TM-311(LP23-17); NRCHB101 X TM-311(LP23-17); TM-311(LP23-17)XNRCHB101 ; WRL23-1-5 X Giriraj; WRL23-1-12 X RH 749; EWR23-8 X CS 56; PM 28 X LP23-11; IVTL23-20 X WRL23-1; IVTL23-20 X PM30PB; PM32 X MSTE23-13	35	35	-
		F2	PM25 X CN-101845; NPJ 259 X DRMRHT 13-13-5-4 (AVTE 22-29); NPJ 259 X RH 1999-42 (AVTE 22-26); NPJ 250 X PDZ11 ; NPJ 260 X DRMRHT 13-13-5-4 (AVTE22-29); NPJ 260 X RH 1999-42 (AVTE 22-26); NPJ 259 X NPJ 265 (IVTL 22-10); NPJ 260 X NPJ 265 (IVTL 22-10); [Radhika X DRMR 2017-15 (LR)] x PM25; [NPJ 248 X NPJ 251] X PM27; [BEC 144 X PM25] X PM 27; [BEC 144 X PM25] X PM 28; PM30 X PBWR	17	123	0
		F3	MP27 X TM- 311; 27 X PRE- 2018-9; NPJ 230 X RH (OE)- 1808; NPJ 230 X DRMR 2017-15 (LR); NPJ 230 X NPJ 251; NPJ 250 X DRMR 2017-15 (LR); NPJ 250 X NPJ 251; NPJ 250 X DRMRSJ 272; NPJ 248 X NPJ 251; PM 25 X NPJ 251; BEC144 X NPJ 176; DRMR-2017-21 X NPJ 240; Vasundhra X NPJ 240	60	53	
		F4	DRMRIJ17-46 X Early Heera; IC597894 X (NRCHB-101/ NPJ 173); (NRCHB-101/ NPJ 173) X Early Heera; LP8 (NRCHB101 X NPJ 173) XF1 Glossy Mutant X IC597894; IC597894 X Early Heera; (NRCHB-101/ NPJ 173) X RH 1599-41; (NRCHB-101/ NPJ 173) X (NPJ 112/ BCEF 17-20-1) ; (NRCHB-101/ NPJ 173) X (NPJ 112/ BCEF 17-20-1)]; (PJ X CB-76) X PM 25M; (PJ X CB-76) X PM 26; PM25 X RH 1999-42; OOWR -21-1005(PM26 X HEERA); PM25 X RLC 3; PM 25 X Donskaja; (KMR18-5 X Heera) X PM25M; (KMR18-5 X Heera) X PM25M	90	76	
		F5	(SEJ 8 X NPJ 176) X KMR (L) 18-5; LP3 (NRCHB101 X NPJ 173) X PM26; LP8 (NRCHB101 X NPJ 173) X (NPJ 112/ BCEF 17-20-1); (NRCHB101 X NPJ 173) X RH 1599-41(MCNL19-21); LP8 (NRCHB101 X NPJ 173) X PDZ-6; LP3 (NRCHB101 X NPJ 173) X Glossy Mutant ; LP3 (NRCHB101 X NPJ 173) X Glossy Mutant ; NRCHB 101 X DMR J 31	42	46	
		F6	DRMR4005 X NPJ 209; MST TS-17-19 X PM25 MUTANT; RH1209 X NPJ222; JS 29 X NPJ 198; PM25 MUTANT X DRMR4005; PM25 MUTANT X DRMR 2017-15; JS 29 X NPJ 221; LP8 (NRCHB101 X NPJ 173) X Glossy Mutant ; PJ X 45S42; PJ X 45S42; (NPJ 210 X GP 455) X IC597894; RH 1301/ PM 27	33	2	22
	Development of short	F2	PM 25 X DRMR 2017-15 (LR); PM25 X DRMRSJ 272; PM25 X DRMRHJ 430; PM25 X ACN	9	54	

	duration B. juncea varieties for late sown conditions		237; NPJ248 X DRMR 2017-15 (LR); NPJ248 X DRMRSJ 272; NPJ248 X DRMRHJ 430; NPJ248 X ACN 237			
		F3	NPJ 210 X RH (OE)- 1808); NPJ 230 X DRMRSJ 272; NPJ 230 X DRMRHJ 430; NPJ 230 X ACN 237 ; NPJ 250 X DRMRHJ 430; NPJ 250 X ACN 237; Radhika X DRMR 2017-15 (LR); Radhika X NPJ 251	65	117	
		F4	LP8 (NRCHB101 X NPJ 173) X RH 1599-41; [P8 (NRCHB101 X NPJ 173) X RH 1599-41(MCNL19-21)] x IC597894; LP8 (NRCHB101 X NPJ 173) X (NPJ 112/ BCEF 17-20-1)]; IC597894) X Heera; (NRCHB-101/ NPJ 173) X Heera; NASF 186 (DRMRIJ17-46) X Heera; (PJ X CB-76) X PM 25M; NASF 186 (DRMRIJ17-46) X Heera;	65	112	
		F5	JS 29 X NPJ 221; Pre-13-10 X PM28; Pusa Agrani X GP 161 (EC 766602); RH 1590 X PM25; E 16-7072 X NPJ- 209; L-16-6030 X Pre 2013-10; NPJ 209 X GP 455; LP8 (NRCHB101 X NPJ 173) X (NPJ 112/ BCEF 17-20-1); LP8 (NRCHB101 X NPJ 173) X PDZ-6; LP3 (NRCHB101 X NPJ 173) X Glossy Mutant ; LP3 (NRCHB101 X NPJ 173) X PM26; LP8 (NRCHB101 X NPJ 173) X (NPJ 112/ BCEF 17-20-1)	60	57	
		F6	DRMR 2017-15 X NPJ222; IC 766428 X NRCHB 101; NPJ 216 X RH1209; PJ X 45S46; PJ X 45S46; PM25 MUTANT X BM 118; JS 29 X NPJ 198; RH-1573 X PM25; RH 1590 X PM25; E 16-7072 X EC61-1-1-2-1; E 16-7072 X EC61-1-1-2-1; E 16-7072 X EC61-18-1-4-3-3; Pre-2013-10 X NPJ- 209; PM 27/ 6010(Laxmi/BCEF-1-0018-1-1); PM25 MUTANT X DRMR4005; PM27 X CB-76 (Rapa); (PJ X CB-76) X PM 25M; (PJ X CB-76) X PM 25M;	46	11	34
		F7	DRMR-4005 X NRCHB-101; Pre-13-10 X PM25; Pre-13-10 X PM25; Pre-13-10 X PM25; DRMR-4005 X PM26; SVJ-8 X PM28; PM 25/ 6014 (NPJ 112/ BCEF 17-20-1); PM 28/ 6017(NPJ 112/ BCEF 17-20-1); RH-1573 X PM28; JS 29 X NPJ 221; PM26 X Pusa bold	15	0	11
	Development of high yielding varieties for timely sown conditions	Single crosses attempted for improving oil and seed productivity	NPJ 253 / Pusa Jagannath, NPJ 253 / PUSA 34-1-1-1-1-1, NPJ 253 / Pusa 1-1-1-1, NPJ 253 / Pusa 268-1-1-2, NPJ 253 / Pusa 197-2-1-1-1-2, NPJ 253 / Pusa 213-1-1-1-2-1, NPJ 253 / Pusa 217-1-1-2-2-1, NPJ 253 / MCN 24-20, NPJ 253 / PUSA 243-1-1-1-1, NPJ 253 / PUSA 250-2-1-1-1, NPJ 253 / Pusa 256-4-2-1-2, NPJ 253 / Pusa 257-1-1-1-2, NPJ 253 /Pusa 262-1-1-1-1, NPJ 253 / Pusa 265-2-1-1-2, NPJ 253 / Pusa Bold, NPJ 253 / NPJ 271, NPJ 253 / NPJ 278, NPJ 253 / NPJ 279, NPJ 253 / NPJ 280, NPJ 261 / Pusa 34-1-1-1-1-1, NPJ 261 / Pusa 124-1-2-1-1, NPJ 261 / Pusa 194-4-1-2-1, NPJ 261 / Pusa 215-2-1-1-2, NPJ 261 / Pusa 217-1-1-1-1, NPJ 261 / Pusa 268-1-1-2, NPJ 261 / Pusa 197-2-1-1-1-2, NPJ 261 / Pusa213-1-1-1-2-1, NPJ 261 / Pusa 217-1-1-2-2-1, NPJ 261 / Pusa 243-1-1-1-1, NPJ 261 / Pusa 250-2-1-1-1, NPJ 261 / Pusa 256-4-2-1-2, NPJ 261 / Pusa 257-1-1-1-2, NPJ 261 / Pusa 262-1-1-1-1, NPJ 261 / Pusa 265-2-1-1-2, NPJ 261 / Pusa Bold, NPJ 261 / NPJ 271, NPJ 261 / NPJ 278, NPJ 261 / NPJ 279, NPJ 261 / NPJ 280, NPJ 261 / RH 725, NPJ 261 / Pusa Jagannath, NPJ 271 / Pusa 34-1-1-1-1-1, NPJ 271 / Pusa 124-1-2-1-1, NPJ 271 /Pusa 194-4-1-2-1, NPJ 271 /Pusa 215-2-1-1-2, NPJ 271 / Pusa 217-1-1-1-1, NPJ 271 / Pusa 268-1-1-2, NPJ 271 / Pusa 197-2-1-1-1-2, NPJ 271 / Pusa 213-1-1-1-2-1, NPJ 271 / Pusa 217-1-1-2-2-1, NPJ 271 / Pusa 243-1-1-1-1, NPJ 271 / Pusa 250-2-1-1-1, NPJ 271 / Pusa 256-4-2-1-2, NPJ 271 / Pusa 257-1-1-1-2, NPJ 271 / Pusa 262-1-1-1-1, NPJ 271 / Pusa 265-2-1-1-2, NPJ 271 / Pusa Bold, NPJ 271 / RH 1975, NPJ 271 / RH 1424, NPJ 271 / Pusa Jagannath, NPJ 278 / Pusa 34-1-1-1-1-1, NPJ 278 / Pusa 124-1-2-1-1, NPJ 278 / Pusa 194-4-1-2-1, NPJ 278 / Pusa 215-2-1-1-2, NPJ 278 / Pusa 217-1-1-1-1, NPJ 278 / Pusa 268-1-1-2, NPJ 278 / Pusa 197-2-1-1-1-2, NPJ 278 / Pusa 213-1-1-1-2-1, NPJ 278 / Pusa 217-1-1-2-2-1, NPJ 278 / Pusa 243-1-1-1-1, NPJ 278 / Pusa 250-2-1-1-1, NPJ 278 / Pusa 256-4-2-1-2, NPJ 278	150	150	

			/ Pusa 257-1-1-1-2, NPJ 278 / Pusa 262-1-1-1-1, NPJ 278 / Pusa 265-2-1-1-2, NPJ 278 / Pusa Bold, NPJ 278 / RH 725, NPJ 278 / RH 1975, NPJ 278 / RH 1424, NPJ 279 / Pusa 34-1-1-1-1-1, NPJ 279 / Pusa 124-1-2-1-1, NPJ 279 / Pusa 194-4-1-2-1, NPJ 279 / Pusa 215-2-1-1-2, NPJ 279 / Pusa 217-1-1-1-1, NPJ 279 / Pusa 268-1-1-2, NPJ 279 / Pusa 197-2-1-1-1-2, NPJ 279 / Pusa 213-1-1-1-2-1, NPJ 279 / Pusa 217-1-1-2-2-1, NPJ 279 / Pusa 243-1-1-1-1, NPJ 279 / Pusa 250-2-1-1-1, NPJ 279 / PUSA 256-4-2-1-2, NPJ 279 / PUSA 257-1-1-1-2, NPJ 279 / PUSA 262-1-1-1-1, NPJ 279 / Pusa 265-2-1-1-2, NPJ 279 / RH 725, NPJ 279 / RH 1975, NPJ 279 / RH 1424, NPJ 279 / Pusa Bold, NPJ 279 / Pusa Jagannath, NPJ 280 / Pusa 34-1-1-1-1-1, NPJ 280 / Pusa 124-1-2-1-1, NPJ 280 / Pusa 194-4-1-2-1, NPJ 280 / Pusa 215-2-1-1-2, NPJ 280 / Pusa 217-1-1-1-1, NPJ 280 / Pusa 268-1-1-2, NPJ 280 / Pusa 197-2-1-1-1-2, NPJ 280 / Pusa 213-1-1-1-2-1, NPJ 280 / Pusa 217-1-1-2-2-1, NPJ 280 / Pusa 243-1-1-1-1, NPJ 280 / Pusa 250-2-1-1-1, NPJ 280 / Pusa 256-4-2-1-2, NPJ 280 / Pusa 257-1-1-1-2, NPJ 280 / Pusa 262-1-1-1-1, NPJ 280 / Pusa 265-2-1-1-2, NPJ 280 / Pusa Bold, NPJ 280 / RH 725, NPJ 280 / Giriraj, NPJ 280 / MCN 24-20, NPJ 253 / DRMR-DL 4, NPJ 253 / DRMR-DL 8, NPJ 253 / M-76, NPJ 253 / M-193, NPJ 261 / DRMR-DL 4, NPJ 261 / DRMR-DL 8, NPJ 261 / M-76, NPJ 261 / M-193, NPJ 271 / DRMR-DL 4, NPJ 271 / DRMR-DL 8, NPJ 271 / M-76, NPJ 271 / M-193, NPJ 253 / Pusa 367-1-1-1-1, NPJ 253 / Pusa 365-1-2-1-1, NPJ 253 / Pusa 369-2-3-2-2, NPJ 253 / Pusa 369-2-2-3-2, NPJ 253 / Pusa 369-2-2-2-1, NPJ 261 / Pusa 367-1-1-1-1, NPJ 261 / Pusa 365-1-2-1-1, NPJ 261 / Pusa 369-2-2-3-2, NPJ 261 / Pusa 369-2-2-2-1, NPJ 261 / Pusa 369-2-3-2-2, NPJ 271 / Pusa 367-1-1-1-1, NPJ 271 / Pusa 365-1-2-1-1, NPJ 271 / Pusa 369-2-3-2-2, NPJ 271 / Pusa 369-2-2-3-2, NPJ 271 / Pusa 369-2-2-2-1, NPJ 271 / MCN 24-20, NPJ 253/ MCN 24-28			
		Single Crosses attempted	*B. juncea* genotypes possessing Powdery Mildew resistance	14	14	
		F_1 (Single Crosses, $BC_1$and double crosses attempted	Herbicide tolerance in improved genetic backgrounds	80	80	
		Double-cross hybrids (F_1/F_1) generated	NPJ 253/NPJ 262//NPJ 253/NPJ 271 NPJ 253/NPJ 271//NPJ 253/PUSA 147-1-1-1-1 NPJ 253/NPJ 271//NPJ 253/PUSA 193-3-1-1-1 NPJ 253/PUSA 210-3-1-1-1-1//NPJ 253/PUSA 368-1-3-2 NPJ 253/PUSA 210-3-1-1-1-1//NPJ 273/RGN 528 NPJ 273/HOC 20//NPJ 273/DRMR 2018-25 NPJ 271/PUSA 36-1-1-4-2-1//NPJ 271/NPJ 252 NPJ 253/NPJ 262//NPJ 271/RH 761 NPJ 271/HOC 4//NPJ 253/NPJ 262 NPJ 271/NPJ 270//NPJ 243	10	10	-
		F_1	NPJ 253/NPJ 252, NPJ 253/NPJ 262, NPJ 253/NPJ 270, NPJ 253/NPJ 271, NPJ 253/ Pusa 36-1-1-4-2-1, NPJ 253/ Pusa 124-1-2-1-1, NPJ 253/ Pusa 154-2-2-3-1, NPJ 253/ Pusa 171-2-1-1-1, NPJ 253/ Pusa 194-4-1-2-1, NPJ 253/ Pusa 197-2-1-1-2, NPJ 253/ Pusa 217-1-1-1-1, NPJ 253/ Pusa 147-1-1-1-1, NPJ 253/ Pusa 154-2-2-2-1, NPJ 253/ Pusa 154-2-3-1-2, NPJ 253/ Pusa 164-4-2-1-1, NPJ 253/ Pusa 171-2-1-1-1, NPJ 253/ Pusa 193-3-1-1-1, NPJ 253/ Pusa 210-3-1-1-1-1, NPJ 253/ Pusa 213-1-1-1-2-1, NPJ 253/RH 761, NPJ 253/ Pusa 257-1-1-1-1, NPJ 253/ Pusa 67-2-2-1, NPJ 253/ Pusa 367-2-3-1, NPJ 253/ Pusa 368-1-3-2, NPJ 253/IL 6180-1-3, NPJ 273/NPJ	82	82	0

			252, NPJ 273/NPJ 261, NPJ 273/RGN 528, NPJ 273/NPJ 262, NPJ 273/RH 725, NPJ 273/RH 761, NPJ 273/HOC 20, NPJ 273/CN 105364, NPJ 273/DRMR 2018-25, NPJ 273/RH 8812, NPJ 271/NPJ 252, NPJ 271/NPJ 262, NPJ 271/NPJ 270, NPJ 271/NPJ 272, NPJ 271/ Pusa 36-1-1-4-2-1, NPJ 271/ Pusa 124-1-2-1-1, NPJ 271/ Pusa 154-2-2-3-1, NPJ 271/ Pusa 171-2-1-1-1, NPJ 271/ Pusa 194-4-1-2-1, NPJ 271/ Pusa 197-2-1-1-2, NPJ 271/ Pusa 217-1-1-1-1, NPJ 271/ Pusa 147-1-1-1-1, NPJ 271/ Pusa 154-2-2-2-1, NPJ 271/ Pusa 154-2-3-1-2, NPJ 271/ Pusa 164-4-2-1-1, NPJ 271/ Pusa 171-2-1-1-1, NPJ 271/ Pusa 193-3-1-1-1, NPJ 271/ Pusa 210-3-1-1-1-2, NPJ 271/ Pusa 213-1-1-1-2-1, NPJ 271/ RGN 528, NPJ 271/RH 761, NPJ 271/HOC 4, NPJ 271/HOC 20, NPJ 271/PUSA 257-1-1-1-1, NPJ 271/ Pusa 367-2-2-1, NPJ 271/ Pusa 367-2-3-1, NPJ 271/ Pusa 368-1-3-2, PM 25/L-11 (*Trachystoma ballii*-RLM 198)/RLM 198*), PM 25/L-18 (*Trachystoma ballii*-RLM 198)/RLM 198*), PM 25/L-59 (*Trachystoma ballii*-RLM 198)/RLM 198*), PM 25/L-11 (*Trachystoma ballii*-RLM 198)/RLM 198*), PM 25/L-18 (*Trachystoma ballii*-RLM 198)/RLM 198*), PM 25/L-59 (*Trachystoma ballii*-RLM 198)/RLM 198*), NPJ 252/ Tetralocolar, NPJ 253/Tetralocolar, NPJ 262/Tetralocolar, NPJ 271/Tetralocolar, NPJ 273/Tetralocolar, NPJ 253/Trachy Bold (*Trachystoma ballii*-RLM 198), NPJ 261/Trachy Bold (*Trachystoma ballii*-RLM 198), NPJ 273/Trachy Bold (*Trachystoma ballii*-RLM 198), PUSA 367-1-3-1/Trachy Bold (*Trachystoma ballii*-RLM 198), NPJ 253/Glossy Mutant, NPJ 253/IC 597949 , RH 761/Glossy Mutant ,RH 761/IC 597949, and NPJ 253/Pusa 94-2-1-1-1-2			
		F_2	MST TS 22-4 [Pusa Tarak//Varuna/EC399301 (non waxy)] / MST TS 22-5(PM 25//DRMRIJ 31/BCI-4), Pusa 12-3-2-2-1-1 / RH 555, PUSA 36-1-1-1-1-1/ NPJ 253, PUSA 36-1-1-1-1-1/ NPJ 262, NPJ 253 /MST TS 20-18-4 (Pusa Agrani/Laxmi//Pusa Agrani///NPJ 112/NPJ 176), NPJ 253 / NPJ 214, NPJ 253 / RH 1934, NPJ 253 / KMR 21-3, NPJ 262 / RH 1934, NPJ 262 / KMR 21-3, NPJ 253 / CS 60, RH 1222-28 /(PM 25//DRMRIJ 31/BCI-4), NPJ 253 / HOC -4, NPJ 253 / HOC -20, NPJ 253 / HOC -22, NPJ 253 / RVM -1, NPJ 252 / HOC-22, NPJ 156 / AKMS 19-2, NPJ 265 / AKMS 19-2, NPJ 262 / Pusa 12-3-2-2-1-1, NPJ 252 / Pusa 12-3-2-2-1-1, NPJ 252 / RE 8, NPJ 253 / RE 8, NPJ 263 / NPJ 253, NPJ 252 / DRMR 2018-25, NPJ 253 / Pusa 66-5-1-1-1-1, NPJ 253 / RLC -3, NPJ 253 / RB 110, NPJ 252 / SKM 1924, NPJ 253 / KMR 22-3, NPJ 253 / PR 2020-14, NPJ 253 / SKM 1924, NPJ 262 / EC 29 -2, NPJ 252 /L-5 (*Trachystoma ballii*- RLM 198)/RLM 198*), NPJ 253 / L- 8 (*Trachystoma ballii*- RLM 198)/RLM 198*), NPJ 253 / L- 18 (*Trachystoma ballii*- RLM 198)/RLM 198*), NPJ 253/ L- 24 (*Trachystoma ballii*- RLM 198)/RLM 198*), NPJ 265/L- 11 (*Trachystoma ballii*- RLM 198)/RLM 198*), NPJ 265 / L- 24 (*Trachystoma ballii*- RLM 198)/RLM 198*), NPJ 156 / L- 8 (*Trachystoma ballii*- RLM 198)/RLM 198*), NPJ 156 / L- 14 (*Trachystoma ballii*- RLM 198)/RLM 198*), NPJ 156 / L- 18 (*Trachystoma ballii*- RLM 198)/RLM 198*), and Pusa 12-3-2-2-1-1 / DRMR2018-25	43	179	0
		MCF_2	NPJ 253 / Q90007, NPJ 253 / 45S46, NPJ 262 / 45 S 46, NPJ 261 / 45S46, HOC 14 / 45 S 46, HOC 4 / 45 S 46, NPJ 252 / 45S46, NPJ 252 / Q90007, NPJ 261 / Q90007	46	31	0
		F_3	NPJ 252/Varuna (A4A5)-936-279, Rohini (A4A5)-491/NPJ 252, NPJ 254/Pusa Bold (A4A5)-842, NPJ 254/Rohini (A4A5)-491, Varuna (A4A5)-936-279/NPJ 253, Rohini (A4A5)-491/NPJ 253, Radhika/MST TS 21-2(Pusa Agrani/Laxmi// PA ///NPJ 112/NPJ 176), MST TS 21-3 (Pusa Agrani/Laxmi// PA ///NPJ 112/NPJ 176)) /Radhika, MST TS 21-2 (Pusa Agrani/Laxmi// PA ///NPJ 112/NPJ 176) /DRMR-2019-19, Pusa 25-1-1-1-1 / NPJ 253, Pusa 36-1-1-3-21 / NPJ 253, NPJ 253/PUSA 66-5-2-1-1, Pusa 94-2-1-1-1 / NPJ 253, Radhika/MST TS 21-6 (Kranti//JM 2/	274	171	0

			BioYSR///RH 749), MST TS 21-6 (Kranti//JM 2/ BioYSR///RH 749) /Rohini (A4A5)-491, RH 406/MST TS 21-6 (Kranti//JM 2/ BioYSR///RH 749), Radhika/RH 406, RH 406/NPJ 253, RH 555/NPJ 253, RH 555/NPJ 252, MST TS 21-2 (Pusa Agrani/Laxmi// PA ///NPJ 112/NPJ 176) /RH 555, NPJ 252/NPJ 253, NPJ 253/DRMR AB-72, NPJ 252/DRMR AB-72, MST TS 21-2 (Pusa Agrani/Laxmi// PA ///NPJ 112/NPJ 176) /DRMRAB 158, DRMR AB-158/NPJ 252, MST TS 21-1 (NPJ 102/Laxmi//P Jagannath) /NPJ 253, MST TS 21-1 (NPJ 102/Laxmi//P Jagannath) /NPJ 252, RH 9811/NPJ 252, DRMRIJ 20-109/NPJ 253, DRMRIJ 20-109/NPJ 252, DRMR 1165-40/NPJ 252, RE-44/NPJ 156, CN 105364/NPJ 252, NPJ 253/CN 105364, RE-8/NPJ 252, SEJ 8/NPJ 252, SEJ 8/NPJ 254, NPJ 253/SEJ 8, SEJ 8/MST TS 21-2 (Pusa Agrani/Laxmi// PA ///NPJ 112/NPJ 176), MST TS 21-3 (Pusa Agrani/Laxmi// PA ///NPJ 112/NPJ 176) /SEJ 8, SEJ 8/MST TS 21-6 (Kranti//JM 2/ BioYSR///RH 749), MST TS 21-7 (NRCDR 02//RC 781/ SEJ 8///NPJ 102/RGN 48//NPJ 112/NPJ 176) /SEJ 8, PUSA 34-1-1-1-2 / SEJ 8, PUSA 94-2-1-1-1 / SEJ 8, NPJ 253/MST 21-9 (RH 1031/PM 27), NPJ 253/DRMR-2019-19, NPJ 253/RH 2049, NPJ 253/RH 761, NPJ 253/Pusa Tarak, NPJ 253/EC 223389, NPJ 253/Pusa Mustard 21, RH 761/EC 223389, NPJ 161/RH 761, and NPJ 161/EC 223389			
		MCF_3	NPJ 243/NPJ 253//DRMR 2019-19, NPJ 243/PM 27//NPJ 231/NPJ253, NPJ 243/NPJ 253//NPJ 231/Pusa 36-1-1-3-2,Pusa 119-1-1-2/DRMRAB-158//Pusa 32-1-1-4-2//Pusa 36-1-1-3-2, Pusa 119-1-1-2/DRMRAB-158//Pusa 36-1-1-3-2/NPJ 253, Pusa 36-1-1-3-2/DRMRAB 158///Pusa 36-1-1-3-2//NPJ 253, PM 27/Pusa 119-1-1-2//PM 27/NPJ 253, PM 27/NPJ 262//PM 27/MST TS 20-11, PM 27/NPJ 262//PM 27/NPJ 253, RH 725/NPJ 243//RH 725/NPJ 253, RH 725/NPJ 243//RH 725/ Pusa 36-1-1-3-2, RH 725/Pusa 36-1-1-3-2//DRMR 2019-19, DRMRAB 158/NPJ 253//RH 725/MST TS 20-10 (NPJ 102/RGN 48//NPJ 161), PM 27/NPJ 253//AKMS 19-2/NPJ 253, PMW 18/NPJ 176//MST TS 20-16/PMW 18, PMW 18/Pusa 119-1-1-2//PMW 18/NPJ 176, PMW 18/NPJ 176//NPJ 253/PMW 18, PMW 18/RH 725//PMW 18/NPJ 176, NPJ 243/DRMRAB158//AKMS 19-2/NPJ 176, Pusa 119-1-1-2/NPJ 253//AKMS 19-2/NPJ 176, and MST TS 19-3/NPJ 253//AKMS 19-2/NPJ 176	45	36	0
		F_4	NPJ 241/Pusa 36-1-1-3-2, NPJ 243/NPJ 253, NPJ 243/Pusa 119-1-1-2, NPJ 243/Pusa 36-1-1-3-2, NPJ 231/NPJ 253, NPJ 231/NPJ 243, NPJ 231/Pusa 36-1-1-3-2, Pusa 32-1-1-4-2/Pusa 36-1-1-3-2, Pusa 36-1-1-3-2/NPJ 253, Pusa 36-1-1-32/DRMRAB-158, PM 27/NPJ 253, PM 27/Pusa 36-1-1-3-2 PM 27/MST TS20-11 [(P. Jagannath/DRMRIJ 31)/PBR 357// (NPJ 102/RGN 48)], PM 27/MST TS20-12 (PBR 357//NPJ 102/RGN 48///NPJ 174/PBR 2008-5), PM 27/NPJ 262, RH 749/Pusa 119-1-1-2, RH 725/NPJ 253, RH 725/NPJ 241, RH 725/Pusa 36-1-1-3-2, RH 725/PM 27, RH 725/NRCHB 101 RH 725/DRMRAB-158, RH 725/MSTTS20-12 (PBR 357//NPJ 102/RGN 48///NPJ 174/PBR 2008-5), RH 725/MSTTS20-16 (EC 399299/NPJ 156), DRMRAB-158/NPJ 253, AKMS 19-2/NPJ 253, Pusa 36-1-1-3-2/Pusa 119-1-1-2, DRMR 73/RH 555, MST 19-3 (Pusa Vijay / NPJ 116)/NPJ 253, NPJ 253/PMW 18, and PMW 18/RH 725	69	57	0
		MCF_4	MST TS 18-20(NPJ 124/ BM 97)/RH 1550//MST TS 18-22(Pusa Vijay/ NPJ 116)/PR 2016-4, MST TS 18-28(NPJ 156/EJ 17)/SKM 1626//MST TS 18-20(NPJ 124/ BM 97)/RH 1550, MST TS 18-17 (NPJ 124/ RB 50)/PBR 385//MST TS 18-20(NPJ 124/ BM 97)/RGN 443, MST TS 18-28(NPJ 156/EJ 17)/RH 1676//MST TS 18-27(NPJ 138/ BM 97)/PR 2016-4, MST TS 18-17(NPJ 124/ RB 50)/RH 1550//MST TS 18-22(Pusa Vijay/ NPJ 116)/PR 2016-4, and MST TS 18-28(NPJ 156/EJ 17)/SKM 1626//MST TS 18-27(NPJ 138/ BM 97)/PR 2016-4	11	3	0
		F_5	MST TS 18-17 (NPJ 124/ RB 50)/PBR 385, MST TS 18-17(NPJ 124/ RB 50)/RGN 443, MST	58	55	1

			TS 18-17(NPJ 124/ RB 50)/DRMR 2017-16, MST TS 18-17(NPJ 124/ RB 50)/SKM 1626, MST TS 18-17(NPJ 124/ RB 50)/RH 1550, MST TS 18-17(NPJ 124/ RB 50)/RH 555, MST TS 18-20(NPJ 124/ BM 97)/PR 2016-8, MST TS 18-20(NPJ 124/ BM 97)/RH 1584, MST TS 18-20(NPJ 124/ BM 97)/PR 2016-4, MST TS 18-20(NPJ 124/ BM 97)/SKM 1626, MST TS 18-20(NPJ 124/ BM 97)/RH 1550, MST TS 18-20(NPJ 124/ BM 97)/RH 555, MST TS 18-22(Pusa Vijay/ NPJ 116)/PBR 385, MST TS 18-22(Pusa Vijay/ NPJ 116)/PR 2016-8, MST TS 18-22(Pusa Vijay/ NPJ 116)/RGN 443, MST TS 18-22(Pusa Vijay/ NPJ 116)/DRMR 2017-16, MST TS 18-22(Pusa Vijay/ NPJ 116)/PR 2016-4, MST TS 18-22(Pusa Vijay/ NPJ 116)/SKM 1626, MST TS 18-22(Pusa Vijay/ NPJ 116)/RH 1550, MST TS 18-22(Pusa Vijay/ NPJ 116)/RH 555, MST TS 18-27(NPJ 138/ BM 97)/PBR 385, MST TS 18-27(NPJ 138/ BM 97)/RGN 443, MST TS 18-27(NPJ 138/ BM 97)/RH 1550, MST TS 18-27(NPJ 138/ BM 97)/RH 555, MST TS 18-28(NPJ 156/EJ 17)/DRMR 2017-16, MST TS 18-28(NPJ 156/EJ 17)/SKM 1626, MST TS 18-28(NPJ 156/EJ 17)/RH 1550, and MST TS 18-28(NPJ 156/EJ 17)/RH 555			
		MCF_5	DRMRAB-72/ IL18- 5171 (DRMRIJ 31/BCI 4) //DRMRAB-72/ IL18- 5258 (PM 30/BCI 4), DRMRAB-72/ IL18- 5171(DRMRIJ 31/BCI 4) //DRMR-40/ IL18- 5146, DRMRAB-72/ IL18-5258(PM 30/BCI 4) //DRMRAB-158/ IL18- 5245(PM 30/BCI 4) DRMRAB-72/ IL18-5258(PM 30/BCI 4)//IL18-5253(PM 30/BCI 4)/DRMRAB-158, DRMRAB-158/ IL18-5245(PM 30/BCI 4) //DRMR-40/ IL18- 5146 (P Agrani/BCI 12), DRMRAB-72//DRMRAB-72/ IL18- 5171 (DRMRIJ 31/BCI 4) DRMRAB-72//DRMRAB-72/ IL18- 5258(PM 30/BCI 4), MST19-5 (NPJ 138/BM 97)/Pro 45S46, MST19-10 (NPJ 112/BCEF 17-20-1)/Pro 45S46, MST19-12 (NPJ 124/BM 97)/Pro 45S46, and MST19-21 (PBR 357//NPJ 102/RGN 48///NPJ 174/PBR 2008-5)/Pro 45S46	40	5	17
		F_6	NPJ 225/BM 97, NPJ 225/RH 555, NPJ 203/RH 555, MST 18-16 (NPJ 112/BCEF17-20-1)/RH 555, MST 18-16 (NPJ112/BCEF17-20-1)/RH 1599-41, BM 97/RH 1326, RH 725/MST 18-16 (NPJ 112/BCEF17-20-1), RH 725/MST 18-26 (Pusa Vijay/YSG), 18-7015(NPJ 124/BM 97)/18-7001(NPJ 156/EJ 17), NRCHB 101/18-7015(NPJ 124/BM 97), 18-7015(NPJ 124/BM 97)/NRCHB 101, RH 1222-28/ 18- 5174 (DRMRIJ 31/BCI 4), DRMRIJ 31/BCI-12 // DRMRIJ 31/BCI-4 DRMRIJ 31/BCI-4 // PM 30/BCI-4, PM 30/BCI-4 // DRMRIJ 31/BCI-4, PM 30/BCI-4 // Pusa Agrani/BCI-5, DRMRIJ 31/BCI-4 // DRMRIJ 31/BCI-4, PM 30/BCI-4 // DRMRIJ31/BCI-4, and DRMRIJ 31/BCI-4 // DRMRIJ31/BCI-4	38	1	15
		F_7	RH 1566/NPJ 212, and RH 1566/ PDR 2013-6	2	0	1
	Development of High yielding hybrids: To identify high yielding combinations	Hybrids (F_1) generated	A / R crosses generated through hand pollination for small quantity of seed	226	-	-
		Seeds of new hybrids multiplied for evaluation in trials (A/R crosses)	SEJ 8 (*mori*) / EC 62-67-1R, La/mi (*mori*) / EC 62-67-1R, MJA 5 / EC 62-67-1R, MJA 9 / EC 62-67-1R, MJA 11 / EC 62-67-1R, Pusa Tarak (*eru*) / EC 62-67-1R, Pusa Kisan (*mori*) / EC 62-67-1R, Pusa Barani (*mori*) / EC 62-67-1R, Pusa Bahar (*ber*) / EC 62-67-1R, Pusa Kisan (*eru*) / EC 62-67-1R, NPJ 161 (*ber*) / EC 62-67-1R, NPJ 139 (*eru*) / EC 62-67-1R, DRMRIJ 31 (*mori*) / EC 62-67-1R, MA 30 / EC 62-67-1R, P. Tarak (*mori*) / NPJ 93R, MJA 38 (*mori*) / NPJ 93R, La/mi (*eru*) / NPJ 93R, SEJ 8 (*mori*) / NPJ 93R, Pusa Kisan (*mori*) / NPJ 93R, Pusa Barani (*mori*) / NPJ 93R, Pusa bahar (*ber*) / NPJ 93R, Pusa Kisan (*eru*) / NPJ 93R, NPJ 161 (*ber*) / NPJ 93R, DRMRIJ 31 (*mori*) / NPJ 93R, MJA 5 / NPJ 93R, MJA 9 / NPJ 93R, MJA 11 / NPJ 93R,	57	-	-

			MA 30 / NPJ 93R, M 37A / *Ogu* R F5-6, M 37NA / *Ogu* R F5-6, M 78A Early / *Ogu* R F5-6, M 78A Late / *Ogu* R F5-6, LES 57A / *Ogu* R F5-6, Pusa Mahak A Early / *Ogu* R F5-6, Pusa Mahak A / *Ogu* R F5-6, Pusa 94-1-1-2 A / *Ogu* R F5-6, NPJ 196A / *Ogu* R F5-6, Pusa 77-1-1-1A / *Ogu* R F5-6, NPJ 253A / *Ogu* R F5-6, M 37A / *Ogu* R F5-79 , M 78A Late / *Ogu* R F5-79 , LES 57A / *Ogu* R F5-79 , NPJ 196A / *Ogu* R F5-79 , Pusa 77-1-1-1A / *Ogu* R F5-79 , 1202A / *Ogu* R F5-79 , M 37A / *Ogu* R F5-169, M 78A Late / *Ogu* R F5-169, LES 57A / *Ogu* R F5-169, Pusa 94-1-1-2 A / *Ogu* R F5-169, RH761A / *Ogu* R F5-169, RH 725A / *Ogu* R F5-169, MA 37 / *Ogu* R F5-46, M78A / *Ogu* R F5-46, NPJ 253A / *Ogu* R F5-46, MJA 5/TN3R, LES 43 A (*mori*)/LET 17 R, La/mi *mori*/EC62-1R			
	Development of new CMS lines for hybrid breeding	Backcrosses for development of new CMS lines	BC1/BC2/BC3/BC4/BC5/BC7 generation	22	22	-
	Multiplication of CMS lines for further use	Hand pollination of A with respective B line	Pusa MS 5-1A, Pusa MS 7-2A, Pusa MS 3-2A, Pusa MS 15-2A, Pusa MS 4-2A, Pusa MS 21-2A, Pusa MS 9-2A, Pusa MS 7-3A, Pusa MS 4-3A, Pusa MS 6-3A, Pusa MS 24-3A, Pusa MS 21-3A, Pusa MS 8-3A, MJA 5, MJA 9, M78 , Pusa Mahak (*ogu*), Pusa 94-1-1-2 (*ogu*), NPJ 196 (*ogu*), Pusa 77-1-1-1 (*ogu*), M 40B (*ogu*), NPJ 253 (*ogu*), Pusa MS-1-1A	23	23	-
	Development of new fertility restorers for hybrid breeding	Backcross/ Hybridization followed by pedigree selection	BC1F5/BC1/F1	11	11	-
	Generating mapping populations (RIL) for mapping of powdery mildew resistance	F9:F10	PMW25/RDV 29	259	259	-
	Wide hybridization for creating novel genetic variability					
	To create genetic variability through development of synthetic *B. juncea*	F_1	NRCPB *rapa* 8 &*B. nigra* accsessions	1	1	-
		S_6		120	163	-
	Create variability through development of *B. carinata* derived *B. juncea* Introgression lines (ILs)	Lines (fixed)	ILs maintained through selfing	191	-	191
	Improve variability using Turnip (*Brassica rapa* var. *rapa* L.)	BC_2F_7	*B. juncea* // Turnip/*B. juncea*///*B. juncea*	1	Re-tested in station trial (2nd year)	1
	Create genetic variability involving *eru-rapa*	Fixed lines in F_8 /MCF_7	*D. erucoides/ B. rapa* (D^eD^eAA) //*B. juncea*///*B. juncea*	7	Station Trial	7

	(D^eD^eAA,; derived lines of *B. juncea*				(1st year)	
		F_4s	*D. erucoides/ B. rapa* (D^eD^eAA) //*B. juncea* (PM 25 & NRCHB 101)	77 progenies from 2 crosses	105	-
		F_2s	*D. erucoides/ B. rapa* (D^eD^eAA) //*B. juncea* (NPJ 176, SEJ 8, P Tarak, NPJ 252, NPJ253, NPJ 261 and NPJ 262)	progenies from 7 crosses	130	-
	Create genetic variability involving *oxy-rapa* (OxOxAA) derived lines of *B. juncea*	F_3	*B. oxyrrhina/ B. rapa*//*B. juncea* (NPJ 176, NPJ 253 & SEJ 8)	62 progenies from 3 crosses	93	-
		F_2	*B. oxyrrhina/ B. rapa*//*B. juncea* (Pusa Tarak)	1	16	-
	Create genetic variability involving *alba-juncea* (SalSalAABB)	F_2 x F_2 derived F_2 progenies	From cross between *S. alba-B. juncea* and NPJ 176	264	358	-
		F_3	From cross between *S. alba-B. juncea* and NPJ 253, P Tarak & SEJ 8	200	319	-
		F_4	From cross between *S. alba-B. juncea* and NPJ 176	671	904	-
	Improve genetic base of *B. juncea* by involving *Trachystoma ballii* derived ILs	F_2	RLM 198 carrying introgression from *Trachystoma ballii* was crossed to Heera for deriving ILs. The superior ILs were again crossed with *B. juncea* genotypes (NPJ 252, NPJ 253, NPJ 156 and NPJ 265)	9	48	-
		F_1s	RLM 198 carrying introgression from *Trachystoma ballii* was crossed to Heera for deriving ILs. The superior ILs were again crossed with *B. juncea* (PM 25, NPJ 253, NPJ 261, NPJ 262, NPJ 271, NPJ 273)	10	10	-
	Incorporation of drought tolerance in *B. juncea* using *B. tournefortii* (TT)	F_3	SEJ 8 & NPJ 176 was crossed with *B. tournifortii* (TT) bulk pollen	23	36	-
	Development of *nigra-tournifortii* amphidiploid	F_1s	Reciprocal crosses were made between *B. nigra* and *B. tournifortii*	2	-	2
	Enhancement of oil and meal quality coupled with improved yield in Indian mustard	Fresh crosses attempted	Fresh crosses were attempted using following improved genotypes-PDZ21, PDZM31, PDZM-33, MSTQ23-13 (PM30/RLC3), MSTQ23-14 (PM30/RLC3), MSTQ23-16 (PDZ6/RLC3), MSTQ23-19 (PM30/RLC3), BS(00)L 8 (PDZ 11/ RH 749), BS(00)Fixed line12 (PM 30/RLC 3), BS(00)Fixed line14 (PM 30/RLC 3), BS(00)Fixed line15 (PM 30/RLC 3), BS(00)Fixed line18 (PM 30/RLC 3), BS(00)Fixed line21 (PM 30/RLC 3//PDZ 21), Q(00)7036, CRPMB24-4 (PM 25/PM 30D//PM 25*2), CRPMB24-8 (PM 25/RLC 3//PM 25), CRPMB24-11 (PM 32/Heera//PM 32), CRPMB24-14 (PM 32/Heera//PM 32), CRPMB24-17 (PM 32/Heera//PM 32), PM-27, NPJ-203, NPJ-281, Varuna, PM-25, R-C891-1, Radhika, PM-37, GSL-7, PM-30, PM-32, PDZ-22, PDZ-23, PDZM-35, *B. oleracea* (Homo O5)	117	-	-
		F_1	RH1706/PM32; RH1706/PM34; RH1706/PDZM33; RH(0E)1612/PM32; RH(0E)1612/PM34; RH(0E)1612/PDZM33; RH(0E)1808/PM32; RH(0E)1808/PM34; RH(0E)1808/PDZM33; PM-27/Pusa Karishma	10	-	-
		MCF_1	PM21/EC597325//PDZ11/RH749;PM30/RLC3//PDZ11/RH749;PM30/RLC3//PDZ11/RH749;PDZ6/PDZ4//PDZ11/RH749; PDZ6/RLC3//PDZ11/RH749; PDZ6/RLC3//PDZ11/RH749; PM30/RLC3//PDZ11/RH749; PM30/RLC3//PDZ11/RH749; PDZM33// PDZ11/RH749	27	-	-
		F_2	PDZM33/PM32; PDZM33/RCH1; PM32/RCH1; PM34/RCH1; LES1-27/PDZ2// PDZM33; LES1-27/PDZ2 // RLC3; LES1-27/PDZ2//RCH1; LES1-27/PDZ2 // PDZM31; RH1706/PM32; DRMRCI(Q)47/PM32; RH(0E)-1612/PM32; RH(0E)-1808/PM32; PDZM33/PM32//PDZM33; PDZM33/PM32// RCH1; DRMRQ 143-9/PDZM31//RCH1; DRMRQ 143-	63	210	-

			9/PDZM33//PDZM33; DRMRQ 143-9/PDZM33//RLC3; RH (0E) 1808/PDZM31//PDZM33; RH (0E) 1808/PDZM31//RLC3; RH (0E) 1808/PDZM31//PDZM31; RH (0E) 1808/PDZM33//PDZM33;RH(0E)1808/PDZM33//RLC3;RH(0E)1808/PDZM33//RCH1;RH(OE)1806/PM32;PDZM33/PM32; PDZM31/RCH1; PDZM31/RCH1; PDZM35/RCH1; PDZM36/RCH1; PDZM33//WR22-24-8(PM32/Heera//PM32);PDZM33/WR22-28-2(PM32/RLC3//PM32); PDZM33/WR22-8-6 (PM25/PM30D// PM25); PDZM33/WR22-8-7(PM25/PM30D// PM25); PM27/Pusa Karishma			
		F_3	Single zero- PM32/RCH1//PDZM33; RLC3/PDZM33// 00WR21-62; PDZ11/RH801//PDZ12; PDZ12/RLC3//LES1-27/PDZM31; PDZ12/RLC3//PDZ11/RH749; PM34/RH1706// PM32/Heera; PDZM33×RH1706//Kranti///PM32/Heera; PM32×RH801//Heera///PM32/Heera; PM30/BRS10//PM30; PM30/BRS10//PDZM33; PDZM33/DRMRQ143-9; PM32/ DRMRQ 143-9; RH (0E) 1808/PM32; RH (0E)1808/PDZM33 DoubleZero-PM32/RCH1//PDZM33; PM32/RCH1//PM32/Heera; RLC3/PDZM33//00WR21-62; PDZ12/RLC3//LES1-27/PDZM31; PDZ12/RLC3// PDZ11/RH749; PDZM33×RH1706//Kranti///PM32/Heera; PM30/BRS10// PDZM33; RH (0E) 1808/PDZM33	73	225	-
		F_4	Single zero- PM32//RCH1; PM30//RH1706; PM30//RH1706; PM30//RH801; PM32//RH1706; LES60//RH801; PDZ6//DMH1; PDZ6//45S46; PDZ11//45S46× PM32; PM32// RH1706//Heera; RLC3/RH725//RH725///PM30; RLC3/RH725//RH725/// PM30; RLC3/RH725//RH725///PM32; PDZ11//BRS10 Double Zero- RLC3//PDZ11; PDZ12//RLC3;PDZ11/45S46// PDZ11	77	122	-
		F_5	Single zero- PDZ11 / RH1706; PDZ11 / 45S46; RH1705 / LES54; RH1706 / PDZ11; RH1706 / RLC2; RH1705 / RLC2; PDZ11 / RH749 // 45S46; PDZ11 / RLC3 // RH725; PDZ11 / RLC3 // RH749; PDZ11 // RLC3 / 45S46; LES54 / RH749 // RH749; LES54 // RH749 / 45S46 Double Zero- PDZ11 / 45S46; RH1706 / PDZ11; RLC3 // RH725 / RLC3; PDZ11 // RH749 / PDZ11; PDZ11 // RLC3 / PDZ11; LES54 // RLC3 / PDZ11; LES54 // RLC3 / RLC3	89	120	-
		F_6	Single zero- LES-54/RH-749; LES-54/NPJ-203; LES-54/RLC-3; PDZ-11/NPJ-203; Double Zero- PDZ-11/RLC-3; PDZ-6/RLC3; RLC-3/RH725; PDZ-11/NPJ-203; RLC-3/ECB-23	57	11	32
		F_7	Single zero- PM30/RLC3; RLC3/LES57; PM30/PDZ6; PM 30/LES56; PM 30/RLC-3//PM30 Double Zero- PM30/RLC3;PM 30/RLC-3//PM30;PM30/ RLC3//PM21/RLC3; PDZ11/RH749	92	13	85
Brassica juncea (0/00) (Canola quality with high oil content)		Fresh crosses	PMAS-7A x PMAS-1602, PMAS-1602 x PMAS1607, PMAS-1602 x PMAS1604, PMAS-1602 x 93-1, PMAS-1602 x 93-19, PMAS-1602x 93-6, PMAS-1607 x PMAS-1604, OCRE-4NR x 93-19, OCRE-4NR x 93-1, OCRE-4NR x 93-6	10		-
		F1	-	11	-	-
		F_2		27		
		F_3		11		
		F_4		19		
		F_5		21		
		F_5	-	7	-	7
		F_6	-	-	-	27
	Oil content and seed weight	F_1		90		
	Rainfed	F_1		11		

	Alternaria blight	Fresh crosses	RH-725 × CN-33056, RH-749 × CN-45727, RH-749 × CN-43560, RH-749 × CN-43750, RH-749 × CN-45814, RL-2024-307 × CN-33056, NPJ-263 × BT-37, NPJ-263 × ATC-94485, NPJ-264 × ATC-94730, RH-725 × DRMR-2218	10		
	Stem rot	Fresh crosses	EC-766478 × CN-33056, EC-766478 × WS-9-98, PBR-357 × CN-30473, PBR-813 × CN-33054	04		
	Heat tolerance	Fresh crosses	EC-766748 × ATC-94963, EC-766748 × WS-9-100, PBR-357 × ATC-94963, PBR-357 × ATC-94961, PDZ-1 × ATC-94963, Pusa Karishma × WS-9-99, Pusa Karishma × ATC-94961, RH-725 × WS-9-100	08		
	Heat and Drought	F_4	DRMR 150-35 X DRMR 541-44	3	3	
	Heat tolerance at early stage	F_4	JN 032 X DRMR CI 116	4	1	
	Drought	F_5	NRCHB 101 X RH-725, DRMR 1165-40 X DRMR CI 70, DRMR 1165-40 X RH 406	5	-	2
	Heat tolerance at seedling and terminal stage	F_5	DRMR 150-35 X DRMR 2059, NRCDR-02 X DRMR 2059	6	-	3
	Aphid resistance	F_1	PBR 357 XP64, PBR 91X P64, RLC 3XP64	3		
	White rust resistance	F_2	RVM-1 x WRR-21-19, RVM-1 x WRR-21-12, RVM 1 x WRR-21-19	3		
	Hybrid development *(B. juncea*-conventional mustard*)*- Hybrids with improved productivity	Advanced generation CMS lines developed/ maintained	Natural mustard :75 (85) Introgressed mustard: 90 (155) Resynthesized mustard: 36 (35) Exotic mustard: 25	236	-	-
	Early and dwarf Fertility Restorers	Fixed	In the background of Indian, European backgrounds and introgression lines	9	-	-
Kanpur	Breeding mustard varieties for normal sown situation	Fresh crosses Set – I	Twenty-one crosses (7 Parental diallel excluding reciprocals) using Varuna, Surekha, Maya, Rohini, Ashirwad, KMR (L)17-5 and Urvashi were attempted F_0 seeds of 21 crosses were procured which will be grown in coming next season to raise F_{1s} population	21		
		Fresh crosses - Set– II	Twenty one crosses (7 Parental diallel excluding reciprocals) using KMR (L) 17-5, Azad Mahak, Rohini, KMR(E) 22-2, Vaibhav and Kanti were attempted F_0 seeds of 21 crosses were procured which will be grown in coming next season to raise F_{1s} population	21		
		Fresh crosses - Set– III	Twenty one crosses (7 Parental diallel excluding reciprocals) using Basanti, Maya, Mathura rai, Azad Gaurav, KMR (E) 23-1, Kanti and Azad Mahak were attempted F_0 seeds of 21 crosses were procured which will be grown in coming next season to raise F_{1s} population	21		
		F_2	**Set – I:** Twenty one crosses (7 Parental diallel excluding reciprocals) using PR-21, Azad Mahak, KMR 16-2, KMR 18-1, TPM-1, PR-20 and Kanti were attempted F_1 seeds of 21 crosses were procured which will be grown in coming next season to raise F_{2s} population	21		
		F_2	**Set – II:** Twenty one crosses (7 Parental diallel excluding reciprocals) using KMR 23-3, KMR 23-4, DRMRCI-173, DRMRHJ-25018, DRMRHJ-1170, Maya and Surekha were attempted F_1 seeds of 21 crosses were procured which will be grown in coming next season to raise F_{2s} population	21		
		F_2	**Set – III:** Forty five crosses (10 Parental diallel excluding reciprocals) using KMR(L)17-5, Mathura rai, NRCDR-2, Narendra Rai-4, Azad Mahak, PR-21, NDR-8501, Maya, Varuna and Rohini were attempted F_1 seeds of 45 crosses were procured which will be grown in coming next season to raise F_{2s} populations.	21		

		F_2	Basanti X Varuna, Basanti X Urvashi, Basanti X NRCDR-2, Basanti X KMR 19-1, Basanti X KMR 19-2, Basanti X RH-749, Basanti X IJ -31, Basanti X RH-406, Basanti X Azad Mahak , Varuna X Urvashi, Varuna X NRCDR-2, Varuna X KMR 19-1, Varuna X KMR 19-2,Varuna X RH-749, Varuna X IJ -31, Varuna X RH-406, Varuna X Azad Mahak, Urvashi X NRCDR-2, Urvashi X KMR 19-1, Urvashi X KMR 19-2, Urvashi X RH-749, Urvashi X IJ -31, Urvashi X RH-406, Urvashi X Azad Mahak, NRCDR-2 X KMR 19-1, NRCDR-2 X KMR 19-2, NRCDR-2 X RH-749, NRCDR-2 X IJ -31, NRCDR-2 X RH-406, NRCDR-2 X Azad Mahak, KMR 19-1 X . KMR 19-2, KMR 19-1 X RH 749, KMR 19-1 X IJ-31, KMR 19-1 X RH 406, KMR 19-1 X Azad Mahak, KMR 19-2 X RH 749, KMR 19-2 X IJ -31, KMR 19-2 X RH-406, KMR 19-2 X Azad Mahak	39	551	
		F_3	Varuna X KMR 17-3, Varuna X KMR 16-1, NRCDR-2 x RLM-198, NRCDR-2 x KMR-13-4, NRCDR-2 x KMR-14-4, NRCDR-2 x Pusa bold, NRCHB-101 x Pusa mustard-21,NRCHB-101 x RLM-198, NRCHB-101 x KMR-13-4, NRCHB-101 x KMR-14-4, NRCHB-101 x Pusa bold, Pusa mustard-21 x RLM-19, Pusa mustard-21 x KMR-13-4, Pusa mustard-21 x KMR-14-4, RLM-198 x Pusa bold, RLM-198 x KMR-13-4, RLM-198 x KMR-14-4, KMR-13-4 x KMR-14-4, KMR-13-4 x Pusa bold, KMR 16-1 X Sej-2	24	318	
		F_4	Urvashi X PM-27,Uravashi X Pusa Agarni, Uravashi X RH-749, Uravashi X KMR 15-2, Uravashi X Pusa Bahar , Uravashi X Durgamani, PM-27 X Pusa Agarni, PM-27 X RH-749 , PM-27 X KMR 15-2, PM-27 X Pusa Bahar, PM-27 X Durgamani, Pusa Agarni X RH-749 , Pusa Agarni X KMR 15-2, Pusa Agarni X Pusa Bahar, Pusa Agarni X Durgamani, RH-749 X KMR 15-2, RH-749 X Pusa Bahar	17	315	
		F_5	NRCDR-2 x NRCHB-101, NRCDR-2 x Pusa mustard-2, NRCDR-2 x RLM-198, NRCDR-2 x KMR-13-4, NRCDR-2 x KMR-14-4, NRCDR-2 x Pusa bold, NRCHB-101 x PM 21,NRCHB-101 x RLM-198, NRCHB-101 x KMR-13-4, NRCHB-101 x KMR-14-4, NRCHB-101 x Pusa bold, PM-21 x RLM-19, PM-21 x KMR-13-4	13	163	
		F_6	NRCDR-2 x Pusa jai kisan , Varuna x RLM 198, Varuna x Rajat, Kranti x Rajat, Pusa bold x RLM 198, Vardan x Pusa bold, Vardan x NDR-8501, Vardan x Laha-101, Vaibhav x Pusa bahar, Vaibhav x Pusa bold, Vaibhav x NDR-8501, Vaibhav x Laha-101, Pusa bahar x Pusa bold, Pusa bahar x NDR-8501, Pusa bahar x Laha-101, Pusa bold x NDR-8501, Pusa bold x Laha-101, JM-2 x Urvashi	15	224	
		F_7	Varuna x Urvashi , Varuna x Maya, Varuna x RH-198, Varuna x Pusa Jagannath, Varuna x Jawahar mustard-1, NUDH x Pusa bold, NUDH x RC-781, NUDH x RH-198, NUDH x Pusa Jagannath, NUDH x Jawahar mustard-1, Maya x RH-30, Kranti x NDR-8501	16	202	
		F_8	Kranti x Pusa bold, Seeta x Varuna, Seeta x Pusa bold, Seeta x Aravali, Seeta x Sej-2, Pusa bold x Durgamani, Pusa bold x Aravali, Ashirwad x Varuna, Ashirwad x Maya, Ashirwad x Kanti, Ashirwad x Jawahar-1, Ashirwad x Vaibhav, Rohini x Vardan, Rohini x Basanti, Rohini x Maya, Rohini x Pusa bold, Rohini x Kranti, Rohini x Pusa basant	19	242	
Nagpur	Development of high yielding varieties with high oil content and boldness	F_0 generation	Agronomical superior genotypes *viz*.,ACN – 264, ACN –308, ACN –315, NPJ –252, NPJ – 253, GDM -4, TAM 108-1, PDKV Kartik and ACN 250 were crossed in full diallel fashion (9 x 9)	72 crosses		
		F_2 generation	Brijraj, Krishana and Narendra rai high yielding varieties crossed with TAM -108 (High yielding, bold seed, Kranti (High yielding, more siliquae) and ACN 237 (High yielding, more siliquae and suitable for late sown condition)	9 crosses (90 progenies)	45	

		F_3 generation	Agronomical superior genotypes ACN 141, ACN 184, TAM 108-1 and NRCHB 101 as base population and RE 11, NC 37362,RE 44, CN 105364, IC 597880, RLC 3, RE 8, DRMRIJ 12-48, DRMRIJ 12-40, DRMRIJ 31, LES 39, TN 3, NPJ 112 and M34 as donor source	40 crosses (203 progenies)	185	
		F_5 generation	RH 406, Kranti, NRCHB 101, PM 31, RH 749 and Giriraj as high yielding and Geeta as donor for tetra locular and high siliquae density	16 Crosses (100 progenies)	98	
		F_6 generation	NRCHB 101, RH-749, Giriraj, RH 406, P M-31 and Kranti	26 Crosses (140 progenies)	118	28
	Development of short duration varieties	F_1	Agronomical superior genotypes viz. TAM 108-1, Kranti, ACN 237, ACN 9, Bio -902 and NRCHB 101 as base population and Early lines (NRCS 05-02, EC-634282, EC 266127, , IC-337386 and IC 375924 as donor source	11 crosses	-	
		F2	Agronomical superior genotypes viz. TAM 108-1, Kranti , ACN 9, JD -6, Bio 902, NRCHB 101 and ACN 237 as base population and 10 Early lines of B. juncea and 10 Toria as donor source (IC -122567, IC-355350, IC- 766290, IC- 424412, IC-296746, IC- 597874, IC-292994, IC - 267699, IC-337386, IC-20167, EC-414294, IC-411750, EC-766071, IC-426322, IC-491600, IC-363694, IC-426392, IC-399791, EC-399294, IC-312575, IC-332734, IC-597874, IC-375924, IC-363300, IC-23121 and IC-76640	47 crosses (235) progenies	245	
	Development of varieties resistant to powdery mildew	F_1 generation	Agronomical superior genotypes viz. TAM 108-1, Kranti, ACN 9 as base population and Powdery mildew resistance PC -6 and crossed seed treated with 1000 Gy	2 lines of each cross	-	
		Bi parental population	TAM 108-1 x PC-6	132 line 10 bulk lines	P. M. Res-10, P. M Susce-5 Bold seed, long sil.-6, Long sil. & early-7	
		Bi parental population	ACN -9 x PC-6	132 line 10 bulk lines	P. M. Res-7, P. M Susce-6 Bold seed, long sil.-6, Long sil. & early-7, Small siliquae, high density, early -3	
		Bi parental population	Kranti x PC-6	132 line 10 bulk lines	P. M. Res-8, P. M Susce-6 Bold seed,	

					long sil.-5, Long sil. & early-7, high density & early -4	
		F_3	TAM 108-1 x PC-6	10 lines	P. M. Res-10 P. M Susce-2	
		F_3	ACN -9 x PC-6	10 lines	P. M. Res-5 P. M Susce-3	
		F_3	Kranti x PC-6	10 lines	P. M Susce-10 P. M. Res-7	
		F_2	Kranti x PC-6	05 lines	P. M. Res-2	
	Development of varieties for terminal heat tolerance	F_2 generation	Terminal heat tolerance line – Radhika crossed with Agronomical superior Tester-TAM 108-1, Kranti and ACN 237	3 crosses (30 progenies	27	
		F_3 generation	Agronomical superior genotypes viz., RE 11, NC 37362,RE 44, CN 105364, IC 597880, RLC 3, RE 8, DRMRMJB – 35, DRMRIJ 12-48, DRMRIJ 12-40, DRMRIJ 31, LES 39, TN 3, NPJ 112 and M34 as base population and ACN 9, Bhawani and CG Sarson as donor source	38 crosses (216 progenies)	172	
		F_4 generation	TAM 108-1, ACN 9, Kranti, Bio -902, PM - 26 and PM - 28 (*B. juncea*) as base population and Bhawani, CG Sarson and *Sinapsis alba* as donor source	17 crosses (100 progenies)	95	
Pantnagar	Early sown	Fresh crosses	PRE-2024-4 × PRE-2018-8, PRE-2024-4 × PRE-2018-7, PRE-2024-4 × PRE-2020-5, PRE-2024-4 × PRE-2021-1, PRE-2024-4 × PRE-2022-2, PRE-2024-4 × TM-312, PRE-2023-14 × PRE-2018-8, PRE-2023-14 × PRE-2018-7, PRE-2023-14 × PRE-2020-5, PRE-2023-14 × PRE-2021-1, PRE-2023-14 × PRE-2022-2, PRE-2023-14 × TM-312, PRE-2023-1 × PRE-2018-8, PRE-2023-1 × PRE-2018-7, PRE-2023-1 × PRE-2020-5, PRE-2023-6 × PRE-2021-1, PRE-2023-6 × PRE-2022-2, PRE-2023-6 × TM-312, TM-314-1 × PRE-2018-8, TM-314-1 × PRE-2022-2, PRE-2022-4 × PRE-2018-8, PRE-2022-4 × PRE-2020-5, PRE-2022-4 × TM-312, PRE-2020-14 × PRE-2018-8, PRE-2020-14 × PRE-2021-1, PRE-2020-14 × PRE-2022-2, PRE-2022-5 × PRE-2020-5, PRE-2022-5 × PRE-2022-2, PRE-2022-5 × TM-312, PRE-2022-10 × PRE-2018-8, PRE-2022-10 × PRE-2018-7, PRE-2022-10 × PRE-2021-1, PRE-2024-7 × PRE-2021-1, PRE-2024-7 × PRE-2022-2, PRE-2024-7 × TM-312	30		
		F1	PM-25 × NPJ-209, PM-25 × PR-19, PRE-2018-10 × NPJ-209, PRE-2018-10 × PR-19, PRE-2018-10 × TM-309-2, PRE-2021-2 × NPJ-209, PRE-2021-2 × PRE-2021-7, PRE-2021-13 × TM-306-1, PRE-2021-13 × PRE-2021-7, PRE-2021-17 × NPJ-209, PRE-2021-17 × PR-19, DRMRCI-106 × PR-19, DRMRCI-106 × TM-313, DRMRCI-98 × PR-19, RH-1656 × PR-19,	52		27

			RH-1656 × PRE-2021-7, PRE-2022-9 × NPJ-209, PRE-2022-9 × PR-19, PRE-2022-9 × PRE-2021-7, PRE-2015-1 × NPJ-209, PRE-2015-1 × PRE-2017-1, PRE-2022-18 × PRE-2013-3, PRE-2022-18 × PM-25, PRE-2018-1 × NPJ-209, PRE-2018-1 × PR-19, PRE-2018-1 × PRE-2017-1, CRP-3 × NPJ-209			
		F2	NPJ-209 × PRE-18-10, PM-25 × PRE-18-10, PRB-16-1 × NPJ-209, PRB-16-1 × PM-25, PRB-21-2 × PR-19, NDRE-4 × TM-304, NDRE-4 × TM-313, NDRE-4 × TM-310-1, PR-19 × TM-304, PR-19 × TM-310-1, Kranti × TM-310-1	40		13
		F3	PRE-15-1 × NPJ 112, PRE-15-1 × PRE-18-10, PRE-21-17 × NPJ-112, PRE-16-5 × PR-19, PRE-21-2 × PRE-21-17, PRE-21-2 × PR-19, NPJ-209 x PR-19, NPJ-209 x PRE-18-10, DRMR-IJ-16-51 x PR-19, PRE-21-2 × CRP-5, RE-11 × CRP-530	22	-	10
		F4	PRE-13-3 × PRE-20-12, PRE-16-2 × CRP-8, PRE-19-7 × PRE-20-12, CRP-11 × CRP-8, CRP-17 × PRE-2012, CRP-11 × PRHC-2014-15, CRP-12 × PRHC-2020-12	11		07
		F5	PM-25×PRHC-14-5, PRE-18-14×PRHC-14-1-1, PRE-18-8×CRP-15, PR-20×PRHC-6-3, PR-16-4×CRP-3, PM-27×CRP-8, PM-28×PRHC-14-5, DRMRIJ-16-15×CRP-5, PRE-18-1×PM-25	09		09 (151 IPS)
		F6	NDRE-4×DRMR-IJ-16-56, DRMR-IJ-16-51×PM-25, RH-1656×PM-25, (RH-1209×GP1-8)×NPJ-112, (RH-1209×GP-1-7)×NPJ-112, (PR-2015-1×CRP-3)×PR-19, (PRE-13-13×PR-20)×NPJ-112	06 (126 IPS)		6 (30 lines)
		F7	RH 1209 × GP-I-7, PR-2015-1× GP-1-5-3, Giriraj × GP-I-22, PR-21 × GP-I-7, PR-19 × EJ-17, Giriraj × GP-I-3, PR-2012-4 × CRP-3, Rohini × PRHC-17-7-10, , NPJ-203 × GP-I-7,	9 (62 lines)	-	9(22 lines)
	Timely sown	Fresh crosses	PR-2024-4 × NPJ-253, PR-2024-4 × PR-20, PR-2024-4 × Giriraj, PR-2024-5 × NPJ-253, PR-2024-5 × PR-20, PR-2024-5 × Giriraj, PR-2021-4 × DRMR-19-19, PR-2021-4 × NPJ-253, PR-2021-4 × Giriraj, PR-2020-16 × PR-2024-19, PR-2020-16 × MCN-23-57, PR-2020-16 × DRMR-19-19, PR-2017-7 × NPJ-253, PR-2017-7 × Giriraj, PR-2017-7 × MCN-23-57, DRMR-19-19 × PR-2024-19, DRMR-19-19 × NPJ-253, DRMR-19-19 × MCN-23-57, NPJ-253 × DRMR-19-19, NPJ-253 × PR-2024-19, NPJ-253 × MCN-23-57, PR-2024-6 × NPJ-253, PR-2024-6 × Giriraj, PR-2024-6 × PR-2024-19, PR-2024-9 × MCN-23-57, PR-2024-9 × NPJ-253, PR-2024-9 × DRMR-19-19, PR-2024-14 × Giriraj, PR-2024-14 × PR-2024-19, PR-2024-14 × MCN-23-57, PR-2024-16 × NPJ-253, PR-2024-16 × DRMR-19-19, PR-2024-16 × Giriraj, PR-2024-19 × DRMR-19-19, PR-2024-19 × NPJ-253, PR-2024-19 × MCN-23-57, PR-2024-20 × DRMR-19-19, PR-2024-20 × MCN-23-57, PR-2024-20 × Giriraj, PRB-2015-2 × NPJ-253, PRB-2015-2 × DRMR-19-19, PRB-2015-2 × MCN-23-57, PRB-2016-1 × Giriraj, PRB-2016-1 × NPJ-253, PRB-2016-1 × PR-2024-19, PR-2019-9 × DRMR-19-19, PR-2019-9 × NPJ-253, PR-2019-9 × Giriraj, PR-2024-10 × DRMR-19-19, PR-2024-10 × NPJ-253, PR-2024-10 × Giriraj, RB-109 × DRMR-19-19, RB-109 × NPJ-253, RB-109 × Giriraj, PR-2013-7 × DRMR-19-19, PR-2013-7 × Giriraj, PR-2013-7 × NPJ-253, PR-2016-4 × DRMR-19-19, PR-2016-4 × NPJ-253, PR-2016-4 × Giriraj	60		-
		F1	PR-2023-11 × NPJ 253, PR-2023-8 × NPJ-253, PR-2023-8 × RB-109, PR-2017-8 × RB-109, PR-2017-8 × Giriraj, PR-2022-6 × NPJ-253, PR-2022-6 × RB-109, PR-2022-6 × Giriraj, PR-2022-12 × NPJ-253, PR-2018-6 × NPJ-253, PR-2018-6 × RB-109, PR-2018-6 × Giriraj, PR-2021-7 × NPJ-253, PR-2021-7 × Giriraj, PR-2022-5 × RB-109, PR-20× NPJ 253, RB-57× Giriraj, DRMR-19-19× RB 109, PRB-15-2× RB109, PRB-16-1× RB-109, PR-19-1× NPJ 253, DL 256 ×DL-244	32		22
		F2	PR-20 × Giriraj, PR-20 × NPJ 253, PR-20 × Rajvijay, Krishna × Rajvijay, RGN 73 × Albeli,	20		13

			RH 1585 × PR-20, RH 1585 × Giriraj, RB 57 × NPJ 253, RB 57 × PR-20, RB 57 × Giriraj, DRMR-IJ-31× NPJ 253, DRMR-IJ-31× PR-20, PRB-15-2 × NPJ 253			
		F3	CRP-2 × PR-21, PR-19-1 x PR-21, PR-19-5 x RH 1585, DRMRIJ-31 x PR-21, PR-20-1 x RH-1585, PR-20-1 x Giriraj, RB-57 x RH-1585,	14	-	07
		F4	PR-17-2 × PRHC-13-7-10, PR-17-2 × PRB-16-1, PR-17-5 × PR-13-7, DRMRAR-158× IC-18-5123-73, (PR-2019-8 × PYR-2009-8) × Pro-306, (PR-2017-2 × PYR-2019-3) × Pro-306, (PR-2017-5 × PYR-2019-13) × Pro-306	09	-	07
		F5	PM-26 × PR-18-6, RH-749 × Rajvijay, PR-19-11 × RH-749, PR-18-5 × PR-2012-4, PR-18-6 × RH 749, RGN-73 × PYR-2009-5, PR-20 × NDYR-8	09	07 (93 IPS)	-
		F6	(Rohini × PRHC-13-7-10) ×Albeli, (PR-2013-2 × PRHC-13-7-10) × RH-749, (RGN-394 × PRHC-13-7-1) × Giriraj, PR-15-7 × Kranti, RH-749 × PR-12-4, PR-17-5 × RH-749, PR-2009-6 × NDYR-8	07 (188 IPS)		07 (32 lines)
		F7	RGN-394 × PRHC-14-7-1, RGN-394 × PRHC-13-7-1, PR-2013-7 × PRHC-14-10, (PR-15-5 × Divya) × PRHC-14-9, PRE-10-15× NDRE-4, EJ-17 × PRE-2007-6,	10 (31 lines)		10 (12 lines
	Late sown	Fresh crosses	PRL-2022-4 × NRCHB-101, PRL-2022-4 × NPJ-251, PRL-2022-4 × NPJ-196, PRL-2022-4 × RH-1599-41, PRL-2022-2 × NPJ-251, PRL-2022-2 × NPJ-196, PRL-2022-2 × RH-1599-41, PRL-2022-10 × NPJ-251, PRL-2022-10 × NPJ-196, PRL-2022-10 × RH-1599-41, NRCHB-101 × NPJ-251, NRCHB-101 × NPJ-196, NRCHB-101 × RH-1599-41, PRL-2022-9 × NPJ-251, PRL-2022-9 × NPJ-196, PRL-2022-9 × RH-1599-41, PRL-2024-1 × NPJ-251, PRL-2024-1 × NPJ-196, PRL-2024-1 × RH-1599-41, PRL-2024-5 × RH-1599-41, PRL-2024-5 × NPJ-251, PRL-2024-8 × RH-1599-41, PRL-2024-8 × NPJ-251, PRL-2024-9 × RH-1599-41, PRL-2024-9 × NPJ-251, PRL-2024-12 × RH-1599-41, PRL-2024-12 × NPJ-251, PRL-2024-13 × RH-1599-41, PRL-2024-13 × NPJ-251	32		
		F1	NPJ-196 × RB-109, NPJ-196 × NPJ-253, NPJ-196 × Giriraj, CS-56 × NRCHB 101, PRL-2020-2 × ERJ-164, PRL-2020-2 × Vardan, PRL-2022-3 × Vardan, PRL-2022-4 × PYR-2023-3, PRL-2022-5 × PYR-2023-3, PRL-2022-10 × PYR-2023-3, PRL-2022-11 × Vardan, PRL-2022-11 × PYR-2023-3, PRL-2023-1 × ERJ-164, PRL-2023-1 × Vardan, NPJ-113 × RB-109	38		15
		F2	Vardan × NRCHB-101, Vardan × NPJ-251, RMWR 0901× Kranti, Raj Vijay × NPJ 251, DRMR-IC-16-38 × NRCHB 101, DRMR-IC-16-38 × NPJ 251, PRL-2020-2 × NRCHB 101, PRL-2020-2 × NPJ 251, DRMRHI-430 × NRCHB 101, Kranti × NPJ-251, Kranti × Rajvijay	18		09
		F3	PRL-20-2 x NRCHB 101, PRL-20-5 x PRL-20-20, PRL-20-5 x PRL-20-9, PRL-20-16 x PRL-20-9, PRL-20-19 x PRL-20-20, PRL-20-19 x PRL-20-9, PRL-20-22 x PRL-20-9, PRL-20-27 x PRL-20-9 , PRL-20-27 x PRL-20-20, PRL-20-2 x PRL-20-9	13	-	10
		F4	PAB-17-11 × NPJ-113, PAB-17-11 × PRL-17-3, PRL-2017-3 ×CRP-14,	3	-	3
		F5	PRL-17-1×NPJ-126, PRL-17-2×NRCHB-101, PRL-17-2×NPJ-126, PRL-17-3×NRCHB-101, NPJ-216×Albeli	5	5 (96 IPS)	
		F6	PRL-2018-5×PRL-2018-19, PRL-2017-1×NRCHB-101, PRL-2017-2×NRCHB-101	4 (101 IPS)		4 (20 lines)
		F7	PRL-2013-17 × Ashirwad, DRMR-2035 × NRCHB-101, NRCHB-101× PRHC-14-8, PR-2015-1 × GP-1-22, PR-2015-1 × GP-1-23, RH-1599 × Ashirwad	6 (44 lines)		6 (15 lines)
	Breeding for yellow	Fresh crosses	PYR-2021-4×PYR-2018-1, PYR-2021-4×PYR-2020-11, PYR-2021-4×PYR-2019-5, PYR-2021-5×PYR-2018-1, PYR-2021-5×PYR-2020-11, PYR-2021-5×PYR-2019-5, PYR-2023-	16		

	mustard		2×PYR-2018-1, PYR-2023-2×PYR-2020-11, PYR-2023-2×PYR-2019-5, PYR-2012-5×PYR-2018-1, PYR-2012-5×PYR-2020-11, PYR-2012-5×PYR-2019-5, PYR-2023-1×PYR-2018-1, PYR-2023-1×PYR-2020-11, PYR-2023-3×PYR-2020-11, PYR-2023-3×PYR-2019-5			
		F1	PYR-2023-2 × PAB-2014-7, PYR-2023-2 × PAB-2014-18, PYR-2019-3 × PAB-2014-8, PYR-2021-7 × PAB-2014-7, PYR-2021-7 × PAB-2014-8, PYR-2021-7 × PAB-2014-18, PYR-2023-4 × PAB-2014-7, PYR-2023-4 × PAB-2014-8, PYR-2021-2 × PAB-2014-7, PYR-2021-2 × PAB-2014-1, PYR-2023-2 × Giriraj, PYR-2020-11 × Giriraj, PYR-2020-11 × RB 109, PYR-2020-11 × NPJ 253	23		13
		F2	PYR-2021-6 × PYR-2012-5, PYR-2021-6 × PYR-2020-11, PYR-2019-3 × PYR-2012-5, PYR-2019-3 × PYR-2020-11, PYR-2018-1 × PYR-2020-11, PYR-2021-5 × PYR-2012-5	09		06
		F3	NDYR 10 × PYR-2009-5, NDYR 10 × PYR-2017-3, Basanti × PYR-2017-1	07	-	03
		F5	(PR-2017-5×PYR-2009-13) ×Pro 0306, (PR-2019-8×PYR 2009-13) ×Pro 0306, (Giriraj× PYR 2009-13) ×Pro 0306, PR-2017-5 × PYR-2019-13, PR-2020-11× RB-109	06	05 (150 IPS)	
		F6	DRMR-61-106×NDYR-8, DRMR-61-106×PYR-12-5, (NDYR-10 × PR-20) ×NDYR-10	3 (91 IPS)		3 (20 lines)
		F7	NDYR-10 × Maya, NDYR-10 × RH-749, PYR-2012-5 × NDYR-8	3 (7 lines)		3 (5 lines)
	Alternaria blight resistance	Fresh crosses	NRCHB 101 × ERJ-164, Kranti × PAB-14-8, Kranti × ERJ-3, PAB -14-18 × PAB -14-15, PAB -14-18 × PAB -17-22, PAB -14-18 × PAB -17-25, PAB -14-15 × PAB -17-22, PAB -14-15 × PAB -17-25, PAB -14-15 × PAB -17-1, PAB -17-22 × PAB -17-25, PAB -17-22 × PAB -17-1, PAB -17-22 × PAB -14-8, PAB -17-25 × PAB -17-1, PAB -17-25 × PAB -14-8, PAB -17-25 × PAB -14-18, PAB -14-8 × PAB -24-1, PAB -14-8 × PAB -14-15	17		-
		F1	ERJ 3 × PAB -14-8, ERJ 3 × PAB -14-18, ERJ 3 × ERJ 164, ERJ 164 × PAB -14-8, ERJ 164 × PAB -14-18, NRCHB-101 × PAB -14-8, NRCHB-101 × ERJ 3, Kranti × PAB -14-8, Kranti × ERJ 164, NRCHB-101 × ERJ 164, NRCHB-101 × PAB-2014-7, Vardan × PAB-2014-7, Vardan × ERJ-159, Kranti × PAB-2014-1, Kranti × PAB-2014-4, Kranti × ERJ-159, PRL-2022-6 × PAB-2014-7, PRL-2022-6 × PAB-2014-4, PRL-2022-6 × PAB-2014-8, PRL-2022-6 × ERJ-159, PRL-2022-6 × ERJ-39, PRL-2022-6 × ERJ-172	31		22
		F2	PHR-2 × PAB9511, PAB-9511 × PAB-2017-1, RGN-73 × PAB-17-3) ×RGN-73	06		03
		F3	PAB-9511 × PAB-17-1, PAB-17-3 × PHR-1, PAB-17-2 × PHR-1, PAB-17-3 × PHR-2, PHR-2 × PAB-9541, PAB-17-1 × PHR-1, PAB-9511 × PAB-17-3, PAB-9511 × PHR-2, PAB-17-1 × PAB-2017-3	12	-	09
		F4	RGN73 × PHR-2, RGN 73 × PAB-17-3, Krishna × PAB 9511, PAB-2017-1×PHR-1, PAB-17-2 × PHR-2, PAB-17-4 × PHR-1	06	-	06
		F5	PAB-14-15 × MCNL-19-6, PAB-2014-25 × MCNL-19-6, PAB-14-1 × DRMR-2017-5, (PAB-2017-1 × PHR-2) × PAB-2017-1, (PAB-2017-1 × PHR-2) × PHR-1, (PAB-2017-2 × PHR-2) × PHR-1, (PAB-2017-4 × PHR-2) × PAB-2017-4	07	07 (136 IPS)	
		F6	PAB-14-7 × MCN-18-5, PAB-14-4 × MCN-18-5, MCN-14-5 × MCN-18-19, PAB-17-5 × PHR-2, PAB-17-5 × PHR-1, PAB-17-20 × PAB 9511, PAB-17-20 × PHR-2	07 (183 IPS)		07 (75 lines)
		F7	PRB06-5 × PRB-04-3-4, PRB-04-304 × NRCHB-101, PRB-06-5 × NRCHB-101, Varuna × NRCHB-101, Varuna × PRB-04-3-04, PWR-13-8 × NRCHB-101,	7 (38 lines)		6 (18 lines)
		Advanced lines			-	51 lines
	White rust resistance	Fresh crosses	Maya ×Varuna WRR, Maya ×P Bold WRR, Maya ×Rohini WRR, PR-20 ×Varuna WRR, PR-20	20		

			×P Bold WRR, PR-20 ×Rohini WRR, PR-21 ×Varuna WRR, PR-21 ×P Bold WRR, PR-21 ×Rohini WRR, Giriraj ×Varuna WRR, Giriraj ×P Bold WRR, Giriraj ×Rohini WRR, NRCHB-101 ×Varuna WRR, NRCHB-101 ×P Bold WRR, NRCHB-101 ×Rohini WRR, NRCHB 101 × PWR 13 -8, NRCHB 101 × Heera, NRCHB 101 × Donskaja, Kranti × PWR 13 -8, NRCHB 101 × PWR 13 -8			
		F1	NRCHB-101 × Bio YSR-2, NRCHB-101 × Donskaja, Kranti × Bio YSR-2, ERJ 3 x Heera, ERJ 3 × Bio YSR-2, ERJ 3 × Donskaja, ERJ 164 × Heera, ERJ 164 x Bio YSR-2, Kranti× PWR-13-8-7, Heera× Donskaja	12		09
		F2	Giriraj× Donskaja, Giriraj× BIOYSR-2, Kranti× Donskaja, NRCHB-101× PWR-13-8, Kranti× Heera, (Kranti× Donskaja) × Kranti, (Kranti× Donskaja) × Donskaja, (Giriraj× BIOYSR-2) × BIOYSR-2, (Giriraj× BIOYSR-2) × Giriraj, (Kranti× Heera)× Heera	15	-	11
		F3	Giriraj× BIOYSR, Giriraj× Donskaja, NRCHB101× PWR-13-8-7, Kranti× Donskaja, Kranti× Heera	16	-	05
		F4	RGN 73 × WRII, RGN 73 × PWR-9541, NRCHB101 × Donskaja, Krishna × WR-II, RGN 73 × PWR-13-8-7, Rohini × PWR-9541	08	-	06
		F5	PWR-13-8 × PHR-1, PWR-13-8 × PAB-9534, EEC-3 × Donskaja, PRD-2014-21 × NPJ 126	04	04 (100 IPS)	
		F6	PAB 9511 × Donskaja, PWR-2012 × Donskaja, PWR-2012 × PAB 9511, PWR 9538 × Donskaja, PWR 9538 × PAB 9511, PHR-1 × Donskaja, PAB-14-4 × PWR-13-8	08 (188 IPS)	08 (29 IPS)	
		F7	Donskaja × Kranti, PWR-13-8-2 × Donskaja, PR-16-5 × Donskaja, PWR-13-8-8-6 × Donskaja, PWR-13-8-14-1 × Donskaja, PR-16-3 × Donskaja, PWR-3-8-6 × Donskaja, (EEC-2 × PWR-13-8) × PWR-13-8, (EEC-4 × PWR-13-8) × PWR-13-8, (EEC-10 × PWR-13-8) × PWR-13-8, (FS-13-8 × PWR-13-8) × PWR-13-8, PR-21 × PWR-13-8, PR-2016-5 × PWR-13-8, (IC-320932 × Kiran) × PWR-13-8, (Kranti × PWR-13-8) × PWR-13-8, (Kranti × PWR-13-8) × Kranti, PWR-13-8-6 × EC-399299, (NRCHB-101 × PWR-13-8) × NRCHB-101, (NRCHB-101 × PWR-13-8) × PWR-13-8	20 (90 lines)		20 (47 lines)
		Advanced lines				40

	Pyramiding of AB and WR	Fresh crosses	PWR 13 -8 × PAB-14-8, Donskaja ×PAB-14-8, Heera × ERJ-3, ERJ-164 × Heera,PAB-14-18 × Heera, ERJ-3 × BIOYSR-2, ERJ164 × PAB-14-8, ERJ 3 × PAB-14-18, PWR 13 -8× Heera, Heera × BIOYSR-2, PAB-14-18 × Donskaja, PAB-14-18 × BIOYSR-2, PAB-14-15 × Heera, PAB-14-18 × Donskaja, PAB-17-1 × Heera, PAB-17-1 × BIOYSR-2, PAB-17-22 × Donskaja, PAB-17-1 × BIOYSR-2,PAB-17-25× Donskaja, PAB-17-25 × Heera, PAB-17-25 × BIOYSR-2, PAB-24-1 × Donskaja, PAB-24-1× Heera, PAB-14-8× Heera, PAB-14-8 × BIOYSR-2,	25		
		F1	Heera × Donskaja, Heera × PWR 13 -8, Heera × PAB -14-8, Heera × PAB -14-18, Bio YSR-2 × PWR 13 -8,Bio YSR-2 × PAB-14-8, BioYSR-2 × PAB 14-18, Donskaja × PAB -14-8, Donskaja × PAB -14-18, PWR 13-8 × PAB -14-8, PAB-14-8 × PAB -14-18	14		11
		F2	PAB-17-3 × Donskaja, PAB-17-3 × WR-II, PAB-17-3 × PWR-13-8-7, PAB-17-3 × PWR-9541, PHR-2 × PWR-13-8-7, PAB-17-1 × PWR-13-8-7, PAB-17-1 × Donskaja, PAB-9511 × WR-II, PAB-9511 x PWR- 9541, PAB-9511 × Donskaja	12		10
	Introgression of *AB* resistance	Fresh crosses	PAB-2014-15× ERJ 7, PAB-2014-15× ERJ 35, PAB-2017-1× ERJ 7, PAB-2017-22× ERJ 7, PAB-2017-22× ERJ 35, PAB-2024-1× ERJ 7, PAB-2024-1× ERJ 35, PAB-2014-8× ERJ 7, PAB-2014-8× ERJ 35, PAB-2014-18× ERJ 7, PAB-2014-15× ERJ 35, PAB-2017-25× ERJ 35	12		
		F1	Heera × ERJ 3, Heera × ERJ 164, Bio YSR-2 × ERJ 3, Bio YSR-2 × ERJ 164, Donskaja × ERJ 3, PWR 13-8 × ERJ 3, PWR 13-8 × ERJ 164, PAB -14-8 × ERJ 3, PAB -14-8 × ERJ 164, PAB -14-18 × ERJ 3, PAB -14-18 × ERJ 164, NRCHB 101 × ERJ 164, Kranti × ERJ 164	15		13
SK Nagar	Early maturing, bold seed and high seed yield	Fresh crosses	Fresh crosses were attempted using GM 6, GM 7, GM 8, NPJ 266, TM 309-2, DRMRCI 175, RKM 544 and RH 2049	28	-	-
	Heat tolerant	Interspecific crosses	Fresh crosses were attempted with *B. juncea* and *B. tournifortii*	04	-	-
	Early maturing & high seed yield	F_1	GDM 4 × PDZM 31, GDM 4 × PM 32, GDM 4 × PDZM 33, GM 6 × GM 7, GM 6 × PM 30, GM 6 × PDZM 31, GM 6 × PM 32, GM 6 × PDZM 33, GM 7 × PM 30, GM 7 × PDZM 31, GM 7 × PM 32, GM 7 × PDZM 33, PM 30 × PDZM 31, PM 30 × PM 32, PM 30 × PDZM 33,	42	-	42

			PDZM 31 × PM 32, PDZM 31 × PDZM 33, PM 32 × PDZM 33, PDZM 33 × PM 32, PDZM 33 × PDZM 31, PDZM 33 × PM 30, PDZM 33 × GM 7, PDZM 33 × GM 6, PDZM 33 × GDM 4, PM 32 × PDZM 31, PM 32 × PM 30, PM 32 × GM 7, PM 32 × GM 6, PM 32 × GDM 4, PDZM 31 × PM 30, PDZM 31 × GM 7, PDZM 31 × GM 6, PDZM 31 × GDM 4, PM 30 × GM 7, PM 30 × GM 6, PM 30 × GDM 4, GM 7 × GM 6, GM 7 × GDM 4, GM 6 × GDM 4			
	High seed yield, bold seed & early maturing	F_2	GM 1, GM 6, GM 7, NPJ 253, SKM 1801, KMR 21-3, NPJ 248, PRE 2018-9, HUJM 20-4 and Mali MS 90 were used as parents	45	114	-
	Early maturing, high seed yield, bold seed & low erucic acid	F_3	GM 1, GDM 4, GM 6, RE 8, TN 3, RLC 3, LES 39, M 34, DRMRJA 35, PM 25, CN 103364, SKM 1746, SKM 1620, ANDM 14-9, GM 3, PM 30, PDZM 31, DRMR 150-35, LES 44, RB 50 and NUDHYJ 4 were used as parents	68	215	-
	Early maturing, high seed yield & heat tolerant	F_4	RMM 10-1-1, SKM 1746-W, CS 56, GM 1, PM 26, NRCHB 101, IC 491448, IL 18-5255, IC 766512, IL 18-5121, IL 18-5123, IL 18-5245, IL 18-5255, DRMRIJ 31, BCI 4, PM 30 were used as parents	41	102	-
	Early maturing, high seed yield, bold seed & quality	F_5	SKM 1328, SKM 1746-W, NPJ 112, NPJ 203, KP 9905, ANDM 14-9, GM 1, GM 3, GDM 4, SKM 1621, SKM 1324, SKM 1319, Ranasan 2, RS 1, DRMR 659-49, RH 8812, LES 44, DRMR 150-35, DRMR 2059 were used as parents	90	230	-
	Early maturing, dwarf & high seed yield	F_6 - I	ANDM 14-9, NPJ 203, DRMR-IJ 16-66, KM 126, 8IJ0116, SKM 1746, GM 1, GDM 4 were used as parents	52	211	-
	Powdery mildew resistant/tolerant	F_6 - II	GM 1, GDM 4, BCRS 3 (*B. Carinata*) were used	04	20	-
	Early maturing, Heat tolerance & High seed yield	F_7 - I	Urvashi, NPJ 112, ANDM 14-9, PDZM 31, P. Vijay, SKM 219, DRMR IJ-31, GM 3, DRMR 150-35, GM 1, PM 26, BPR 349-9, NRCDR 2, PM 21, NRCHB 101, GDM 4, PM 27, GM 2, NRCDR 601, PM 28, Kranti, PM 30 were taken as parents	44	-	49
	Powdery mildew resistant/tolerant	F_7 - II	GDM 4, BCRS 3 were used	02	-	09
	Hybrid development	CMS lines maintained	Involving CMS lines with *Mori, Ogura, Oxyrrhina* and *Siffolia* system	36	-	-
		Restorer lines developed/maintained		36	-	-
		F_1	New test hybrids based upon *Mori* CMS system were evaluated	20	-	-
Varanasi	High yield earliness	F3	NDRE-4 x HUJM-18-7,NDRE-4 x HUJM-19-18,(NRC HB-101 X HUJM-08-12) -1,NDRE-4 x HUJM-21-4,NDRE-4 x HUJM-21-1,NDRE-4 x HUJM-21-1(E),NDRE-4 x HUJM-18-9,NDRE-4 x HUJM-20-9,JD-6 x HUJM-18-7,JD-6 x HUJM-19-18,JD-6 x HUJM- 17-7,JD-6 x HUJM-21-4,JD-6 x HUJM-21-1,JD-6 x HUJM-21-1(E),JD-6 x HUJM-18-9,JD-6 x HUJM-20-9,Sej-2 x HUJM-18-7,Sej-2 x HUJM-19-18,Sej-2 x HUJM- 17-7,Sej-2 x HUJM-21-4,Sej-2 x HUJM-21-1,Sej-2 x HUJM-21-1(E),Sej-2 x HUJM-18-9,Sej-2 x HUJM-20-9 ,NPJ-112 x HUJM-18-7,NPJ-112 x HUJM-19-18,NPJ-112 x HUJM- 17-7,NPJ-112 x HUJM-21-4,NPJ-112 x HUJM-21-1,NPJ-112 x HUJM-21-1(E),NPJ-112x HUJM-18-9,NPJ-112 x HUJM-20-9	32	96	
		F4	NDRE-4 x HUJM-17-7, (NRC HB-101 X HUJM-08-12)-2, (NRC HB-101 X HUJM-08-12) -3, (NRC HB-101 X HUJM-99-08)-3, (RH-406 X HUJM-18-7)-3, (JD-6 X HUJM-05-03)-3, (NRC HB-101 X HUJM-99-01)-1, (NRC HB-101 X HUJM-99-01)-2(NRC HB-101 X HUJM-18-07)-1, (PM-25 X HUJM-08-12)-1,(JD-6 X HUJM-18-02)-1,(JD-6 X HUJM-18-02)-2,(Vardan X HUJM-08-12)-1,(Vardan X HUJM-08-12)-3,(RH-406 X HUJM-08-12)-1,(Giriraj X HUJM-18-	24	72	

			7)-1,(Giriraj X HUJM-18-7)-2,(JD-6 X HUJM-08-01)-1,(RH-406 X HUJM-07-06)-3,(Vardan X HUJM-08-01)-2,(Vardan X HUJM-08-01)-3,(JD-6 X HUJM-99-03)-3,(Giriraj X HUJM-99-03)-3,(RH-406 X HUJM-9903)-3			
		F5	(RH-749 X TM-143)-2,(HUJM-10-6 X TM-143)-1,(HUJM-10-6 X TM-143)-3 (RH-749 X TM-108-1)-1,(RH-749 X TM-263-3)-2,(Giriraj X TM-108-1)-1	6	18	
		F6	RGN-73 x DRMR-150-35,EC-597309 x RE-8,RGN-73 x Vardan	3	9	
		F7	Kranti x Sej -2,NRCHB-101 x Sej-2,Kranti x RH-406,Kranti x Giriraj,RGN-73 x NPJ-112	5	15	
		F8	NPJ-112 x Ashirwad, Ashirwad x RH-8814,Maya x Rh-781,Sej -2 x HUJM-9901,Kranti x HUJM-9903	5	15	
		F9	Varuna x LP, Ashirwad x Swarn Jyoti,NPJ-112 x Kranti, Ashirwad x HUJM-9903,NPJ-112 x HUJM-9901,Kranti x Jatai rai, Divya x HUJM-9964	7	21	
		F10	Maya x NPJ-112,NDRE-4 x ABR-4,PR-19 x HUJM-9901	3	9	
		F11	MCN-6-28 x ABR-4,HUJM-10-28,HUJM-09-18-2	3	9	-
	High yielding for Timely sown condition	F3	(NRC HB-101 × HUJM-08-12)-1,(NRC HB-101 × HUJM-08-12)-2,(NRC HB-101 × HUJM-99-08)-2,(NRC HB-101 × HUJM-99-08)-3,(NRC HB-101 × HUJM-18-02)-1,(NRC HB-101 × HUJM-18-02)-2 ,(NRC HB-101 × HUJM-18-02)-3,(RH-406 × HUJM-18-7)-1,(RH-406 × HUJM-18-7)-3,(RH-406 × HUJM-08-01)-1,(RH-406 × HUJM-08-01)-2,(RH-406 × HUJM-08-01)-3,(JD-6 × HUJM-05-03)-2,(JD-6 × HUJM-05-03)-3,(NRC HB-101 × HUJM-99-01)-2,(NRC HB-101 × HUJM-99-01)-3,(JD-6 × HUJM-18-7)-1,(Giriraj × HUJM-95-04)-1,(Giriraj × HUJM-95-04)-2,(Giriraj × HUJM-95-04)-3,(PM-25 × HUJM-18-02)-1,(PM-25 × HUJM-18-02)-2,(NRC HB-101 × HUJM-18-07)-1,(NRC HB-101 × HUJM-18-07)-2,(NRC HB-101 × HUJM-18-07)-3,(PM-25 × HUJM-08-12)-2,(PM-25 × HUJM-08-12)-3,(Giriraj × HUJM-08-01)-1,(Giriraj × HUJM-08-01)-2,(PM-25 × HUJM-99-03)-1,(PM-25 × HUJM-99-03)-3,(Giriraj × HUJM-08-12)-1,(Giriraj × HUJM-08-12)-2,(Giriraj × HUJM-08-12)-3,(RH-406 × HUJM-95-04)-1,(RH-406 × HUJM-95-04)-3,(JD-6 × HUJM-18-02)-2,(JD-6 × HUJM-18-02)-3,(Vardan × HUJM-08-12)-1,(Vardan × HUJM-08-12)-2,(NRC HB-101 × HUJM-07-06)-2,(NRC HB-101 × HUJM-07-06)-3,(Vardan × HUJM-99-01)-1,(RH-406 × HUJM-08-12)-1,(RH-406 × HUJM-08-12)-2,(RH-406 × HUJM-08-12)-3,(Giriraj × HUJM-18-7)-3,(JD-6 × HUJM-08-01)-2,(JD-6 × HUJM-08-01)-3,(RH-406 × HUJM-07-06)-1,(RH-406 × HUJM-07-06)-2,(JD-6 × HUJM-07-06)-2,(JD-6 × HUJM-99-01)-1,(JD-6 × HUJM-99-01)-2,(Vardan × HUJM-08-01)-1,(Vardan × HUJM-08-01)-2,(Vardan × HUJM-08-01)-3,(JD-6 × HUJM-99-03)-3,(Giriraj× HUJM-99-03)-1,(RH-406 × HUJM-99-03)-1,(NRC HB-101 × HUJM-18-07)-1,(NRC HB-101 × HUJM-18-07)-2,Varuna × (Varuna × Heera),Basanti × (Kranti × Basanti),RH-749 × (BIOYSR × RH-749),Kranti × Heera(RH-1222-28 × IL-18-5245)-2	67	201	
		F4	(RH-749 × TM-143)-1,(HUJM-10-6 × TM-143)-3,(Giriraj × TM-117)-2,(Giriraj × TM-117)-3,(RH-749 × TM-217)-2,(RH-749 × TM-217)-3,(RH-749 × TM-108-1)-1,(RH-749 × TM-108-1)-2,(RH-749 × TM-108-1)-3,(Giriraj × TPM-1)-1,(Giriraj × TPM-1)-3,(HUJM-10-6 × TM-117)-1,(HUJM-10-6 × TM-117)-2,(HUJM-10-6 × TM-117)-3,(RH-749 × TM-258)-1,(RH-749 × TM-258)-2,(RH-749 × TM-263-3)-1,(RH-749 × TM-263-3)-2,(RH-749 × TM-263-3)-3,(Giriraj × TM-108-1)-1	20	60	

		F5	RH-749 × PM-28, RGN-73 × PM-27, RGN-73 × DRMR-150-35, EC-597309 × RE-8, EC-597309 × RE-44, Juncea YS × RE-44, EC-597309 × RE-13, MJB-3 × RE-35-4 , Juncea YS × Donskaja , Juncea YS × RE-8 , MJB-10 × RE-8, RGN-73 × Vardan , MJB-13 × RE-14, EC-597309 × Donskaja	14	42	
		F6	Kranti x Sej-2, NRCHB-101 x Sej-2, Vardan x RH-406, Kranti x Pusa Bold, Vardan x Giriraj, NRCHB-101 x RH-406, NRCHB-101 x Pusa Bold, Vardan x PM-26, Vardan x Urvashi, NRCHB-101 x BPR-541-4, NRCHB-101 x PM-25, Kranti x RH-406, Vardan x PM-30, Kranti x Giriraj, Kranti x BPR-541-4, Varuna x HUJM-0706, RGN-73 x NPJ-112	33	99	
		F7	Varuna × HUJM-9903, PR-19 × Pusa Bold , Vardan × PM-25 , Maya × RH-781,Vardan × RH-781, Sej-2 × HUJM-9901 , Maya × HUJM-9903 , Vardan × BPR-541-4, Varuna × NPJ-112	9	27	-
		F8	Maya × RLM-1359, Kranti × Jatai Rai , Ashirwad × Swarn Jyoti, Kranti × NPJ-112 , NPJ-112 × Kranti , Ashirwad × HUJM-9903 , Ashirwad × HUJM-9901 ,NDRE-4 × Pusa Bold, Varuna × Pusa Bold, Sej-2 × RH-8813, Divya × HUJM-9964 ,Sej-2 × Ashirwad , Sej-2 × HUJM-9903 , Sej-2 × ISH-7-3-2, NPJ-112 × HUJM-9903, NDRE-4 × LP , Divya × ABR-4, NDRE-4 × HUJM-9901	18	54	
		F9	Maya × NPJ-112 NDRE-4 × ABR-4 PR-19 × HUJM-9964 PR-19 × HUJM-9901 Kranti × LP Sej-2 × HUJM-9964	6	18	-
		F10	MCN-6-28 × ABR-4 , HUJM-10-28, HUJM-09-18-2, HUJM-09-025-2 , HUJM-10-24 , HUJM-08-18-1-1-1-1,Ashirwad × RLM-1359, HUJM-09-13-2 , HUJM-10-24 × (MCN-05-28 × RH-8812), HUJM-05-28 × RH-8812-1-1-1-1, LP × Vardan-1-2-2-2-2-1	11		
	High yielding for Drought conditions	F4	(RH-406 X HUJM- 18-7)-1,(RH-406 X HUJM- 18-7)-3,(RH-406 X HUJM-08-01)-1,(RH-406 X HUJM-08-01)-2,(RH-406 X HUJM-08-01)-3,(RH-406 X HUJM-99-04)-1,(RH-406 X HUJM-99-04)-3,(RH-406 X HUJM-08-12)-1,(RH-406 X HUJM-08-12)-2,(RH-406 X HUJM-08-12)-3,(RH-406 X HUJM-07-06)-1,(RH-406 X HUJM-07-06)-2,(RH-406 X HUJM-9903)-2,(RH-406 X HUJM-9903)-3,DRMR-150-35 X DRMR-541-44,NRCHB-101 X RH-725 ,DRMR 1165-40 X DRMRCI 70,DRMR 1165-40 X RH-406	18	54	
		F-6	RGN-73 x DRMR -150-35, RGN-73 x Vardan, RGN-73 x RH-119, RGN-73 x PM-28, Giriraj x RGN-298, RH-749 x RGN-229, RH-749 x PM-28, RH-749 x PM-27, RH-749 x DRMR -150-35, RH-749 x RH-406, RGN-73 x RGN-298,Vardan x RH-406, NRCHB-101 x RH-406, Kranti x RH-406	14	42	
		F8	RGN-73 x NPJ-112,Vardan x RH-781, Maya x RH-781, RGN-73 x Jatai Rai, RGN-73 x Pusa Bold	5	15	
		F9	RGN -73 x Varuna, RGN -73 x HUJM-9901,RGN -73 x RLM-1359,RGN-229-2-1	4	12	
	High yielding for late Condition	F4	(NRC HB-101 X HUJM-08-12) -1,(NRC HB-101 X HUJM-08-12) -2,(NRC HB-101 X HUJM-99-08)-2,(NRC HB-101 X HUJM-99-08)-3,(NRC HB-101 X HUJM-18-02)-1,(NRC HB-101 X HUJM-18-02)-2,(NRC HB-101 X HUJM-18-02)-3,(NRC HB-101 X HUJM-99-01)-2,(NRC HB-101 X HUJM-99-01)-3,(NRC HB-101 X HUJM-18-07)-1,(NRC HB-101 X HUJM-18-07)-2,(NRC HB-101 X HUJM-18-07)-3,(Vardan X HUJM-08-12)-1,(Vardan X HUJM-08-12)-2,(NRC HB-101 X HUJM-07-06)-2,(NRC HB-101 X HUJM-07-06)-3,(Vardan X HUJM-99-01)-1,(Vardan X HUJM-08-01)-1,(Vardan X HUJM-08-01)-2,(Vardan X HUJM-08-01)-3,(NRC HB-101 X HUJM-18-07)-1,(NRC HB-101 X HUJM-18-07)-2,NRCDR-02 x DRMR-2059,DRMR-150-35 x DRMR- 541-44	24	72	

		F6	RGN-73 x Vardhan,RH-749 x PM-28	2	6	
		F7	Vardan x Giriraj,NRCHB-101 x Sej-2,Vardan x RH-406,NRCHB-101 x RH-406,NRCHB-101 x Pusa Bold, Vardan x PM-26,Vardan x Urvashi,NRCHB-101 x BPR-541-4,NRCHB-101 x PM-25,Vardan x PM-30,Kranti x BPR-541-4	11	33	
		F8	Vardan x PM-25,Vardan x RH-781,Vardan x BPR-541-4	3	9	
		Fresh crosses For yield, Alternaria , Sclerotinia tolerance, earliness	PAB-2017-15 x HUJM-20-6, PAB-2017-15 x HUJM-17-8, PAB-2017-15 x HUJM-10-6, PAB-2017-15 x HUJM-21-1(E), PAB-2017-15 x HUJM-20-9, PAB-2017-15 x HUJM-20-4, PAB-2017-15 x HUJM-17-6, PAB-2017-1 x HUJM-20-6, PAB-2017-1 x HUJM-17-8, PAB-2017-1 x HUJM-10-6, PAB-2017-1 x HUJM-21-1(E), PAB-2017-1 x HUJM-20-9, PAB-2017-1 x HUJM-20-4, PAB-2017-1 x HUJM-17-6, PAB-2017-25 x HUJM-20-6, PAB-2017-25 x HUJM-17-8, PAB-2017-25 x HUJM-10-6, PAB-2017-25 x HUJM-21-1(E), PAB-2017-25 x HUJM-20-9, PAB-2017-25 x HUJM-20-4, PAB-2017-25 x HUJM-17-6, PAB-2014-26 x HUJM-20-6, PAB-2014-26 x HUJM-17-8, PAB-2014-26 x HUJM-10-6, PAB-2014-26 x HUJM-21-1(E), PAB-2014-26 x HUJM-20-9, PAB-2014-26 x HUJM-20-4, PAB-2014-26 x HUJM-17-6, PAB-2014-4 x HUJM-20-6, PAB-2014-4 x HUJM-17-8, PAB-2014-4 x HUJM-10-6, PAB-2014-4 x HUJM-21-1(E), PAB-2014-4 x HUJM-20-9, PAB-2014-4 x HUJM-20-4, PAB-2014-4 x HUJM-17-6, PAB-2017-22 x HUJM-20-6, PAB-2017-22 x HUJM-17-8, PAB-2017-22 x HUJM-10-6, PAB-2017-22 x HUJM-21-1(E), PAB-2017-22 x HUJM-20-9, PAB-2017-22 x HUJM-20-4, PAB-2017-22 x HUJM-17-6, PAB-2017-18 x HUJM-20-6, PAB-2017-18 x HUJM-17-8, PAB-2017-18 x HUJM-10-6, PAB-2017-18 x HUJM-21-1(E), PAB-2017-18 x HUJM-20-9, PAB-2017-18 x HUJM-20-4, PAB-2017-18 x HUJM-17-6, PAB-9511 x HUJM-20-6, PAB-9511 x HUJM-17-8, PAB-9511 x HUJM-10-6, PAB9511 x HUJM-21-1(E), PAB-9511 x HUJM209, PAB9511 x HUJM204, PAB9511 x HUJM-17-6, PAB-2014-7 x HUJM-20-6, PAB-2014-7 x HUJM-17-8, PAB-2014-7 x HUJM-10-6, PAB-2014-7 x HUJM-21-1(E), PAB-2014-7 x HUJM-20-9, PAB-2014-7 x HUJM-20-4, PAB-2014-7 x HUJM-17-6, PAB-2014-8 x HUJM-20-6, PAB-2014-8 x HUJM-17-8,PAB-2014-8 x HUJM-10-6, PAB-2014-8 x HUJM-21-1(E), PAB-2014-8 x HUJM-20-9, PAB-2014-8 x HUJM-20-4, PAB-2014-8 x HUJM-17-6, PAB-2017-4 x HUJM-20-6, PAB-2017-4 x HUJM-17-8, PAB-2017-4 x HUJM-10-6, PAB-2017-4 x HUJM-21-1(E), PAB-2017-4 x HUJM-20-9, PAB-2017-4 x HUJM-20-4, PAB-2017-4 x HUJM-17-6, PAB-2017-18 x HUJM-20-6, PAB-2017-18 x HUJM-17-8, PAB-2017-18 x HUJM-10-6, PAB-2017-18 x HUJM-21-1(E), PAB-2017-18 x HUJM-20-9, PAB-2017-18 x HUJM-20-4, PAB-2017-18 x HUJM-17-6, ERJ-175 x HUJM-20-6, ERJ-175 x HUJM-17-8, ERJ-175 x HUJM-10-6, ERJ-175 x HUJM-21-1(E), ERJ-175 x HUJM-20-9, ERJ-175 x HUJM-20-4, ERJ-175 x HUJM-17-6, ERJ-1 x HUJM-20-6, ERJ-1 x HUJM-17-8, ERJ-1 x HUJM-10-6, ERJ-1 x HUJM-21-1(E), ERJ-1 x HUJM-20-9, ERJ-1 x HUJM-20-4, ERJ-1 x HUJM-17-6, RLM-198 x HUJM-20-6, RLM-198 x HUJM-17-8, RLM-198 x HUJM-10-6, RLM-198 x HUJM-21-1(E), RLM-198 x HUJM-20-9, RLM-198 x HUJM-20-9, RLM-198 x HUJM-17-6, ERJ-191 x HUJM-20-6, ERJ-191 x HUJM-17-8, ERJ-191 x HUJM-10-6, ERJ-191 x HUJM-21-1(E), ERJ-191 x HUJM-20-9, ERJ-191 x HUJM-20-4, ERJ-191 x HUJM-17-6	112		
Crop: Gobhi Sarson						
Chatha-Jammu.	High seed yield & oil content	Fresh crosses	JGS 17-5,JGS 123, RSPN-25,JGS-23 With GSH- 1699,GSH 2155&GSL-1	12		
		F1	JGS-123, JGS 17-8, RSPN-32, JGS 18-2, RSPN-32, GSC-64 With GSC-6,GSL-1 & AKMS-8141	18		

		F2	RSPN-28, DGS-6, RSPN-25,RSPN- 29 With AKMS 8141,GSC-6 & GSL-1	12		
		F3	DGS-1, RSPN-25, GSL-1 With HNS 1102, DRMRIN 20-23, AKGS 8060 & GSH-1723	12		
		F4	GSH-1699, RSPN-28, RSPN-25, DGS-1, GSH-1707, AKGS-8146, HNS-1102, GSH-1717& AKGS-8217 With GSC-6, GSL-1& AKMS-8141	24		
		F5	Improved breeding lines/varieties	10		
		F6	Advanced fixed genotypes with GSC-6,GSL-1&RSPN-25	14		
		F7	CNH-11-1,RSPN-28,CNH-11-13,HNS0901,RSPN-25 With GSC-6,GSL-1&DGS-1	13		
Kangra	High yielding, Early, dwarf, good branching, bold seeded and quality, shatter resistance	F2	GSC 7X Karan rai, Neelam X Karan Rai	2		
		F3	HPGS 1 X RCC 4, HPGS 1 X ONK 1, HPGS 1 X GSC 7 HPGS 1 X Mustard 9, AKGS 8060 X HPGS 1	5		
		F4	AKGS 1242 X Brown Sarson, AKGS 1242 X GSH 2196,AKGS 1242 X PHR 2, AKGS 1242 X Chinese Sarson, AKGS 1242 X GSC 6, AKGS 3745 X Neelam, Mustard 9X AKGS 8141, GSC 7 X toria, AKGS 1235 X AKGS 1242,Brown sarson X GSC 6, GSC 7 X AKGS 8060, AKGS 1135 X GSH 1699,AKGS 1135 X Chinese Sarson, AKGS 1242 X GSH 2196,GSC 7 X KBS 3, AKGS 8217 X GSC 6, AKGS 8217 X GSH 2196,	17		
		F6& Advanced	Neelam, Sheetal, Him Sarson 1, GSC 7, GSL 1, CNH11-1, CNH-11-2, Hyola 401, HNS 0801, HNS 0901, NUDB 26-11, AG-13, NUDB 38, NUDH-86, AS-13, IC 552608, Y3000, MHO 173 , HNS 003, HNS 005, Y3000,MHO 173 NUDH 9, NUDB 26- 11, NUDH 86, NUDH 7, AS 12,AG 12,CA 12, QA 12,EC 552608, AKGS 8060, HPGS 1, Gobhi Sarson X RCC 4, AKGS 1242 X AKBS 3, AKGS 1135 X AKGS 8146	30		
Ludhiana	*Brassica napus*- Induced mutagenesis- Herbicide resistance Shattering tolerance, Early maturity and productivity	M4 generation	Induced mutagenesis of GSC-7	141	105	
	Brassica napus (Shattering tolerance)- High productivity and shattering tolerance (Interspecific crosses)	Fresh crosses	GSC-6 × BJC-9-30-10-228, GSC-6 × PC-6, GSC-6 × PDC-4-2, GSC-7 × BJC-9-30-10-211, GSC-7 × PC-6, GSC-7 × PDC-4-2, GSC-7 × PDC-83-2	7		
	Brassica napus (Shattering tolerance)- High productivity and shattering tolerance (Interspecific crosses)	Fresh crosses	GSC-6 × BJC-9-30-10-228, GSC-6 × PC-6, GSC-6 × PDC-4-2, GSC-7 × BJC-9-30-10-211, GSC-7 × PC-6, GSC-7 × PDC-4-2, GSC-7 × PDC-83-2	7		
	Brassica napus (Shattering tolerance)- Early	F1	-	15		
		F2	-	3		
		F3	-	70		

	maturity and shatter tolerance	F4	-	8		
		F5	-	7		
	Hybrid development (*B. napus*)- Development of canola hybrids	Advanced generation CMS lines developed/ maintained	Indian group :78 Introgressed *B. napus* :86 Exotic *B. napus* -12 Derived napus: 14	190		
	Hybrid development (*B. napus*)- Early maturing Fertility Restorers	Fixed		6		
Brown Sarson:						
Kangra		Advanced populations	KBS 3, CLM 02, HPBS 1 , IC182671, KLM 4	4		
Karan rai:						
Kangra	High yield, earliness, dwarf stature	F_2	NRCKR 314 X Karan rai yellow, Karan rai D Y X Kiran, Karan rai yellow X NRCKR 314	3		

Table 2.1.3 Evaluation of advanced breeding lines at different centres.

Centre	Name of trials	No. of trials	No. of strains tested	Name of best strain excelling the check	Yield (kg/ha)	Check	Superiority over the check (%)	Specific objective
1	2	3	4	5	6	7	8	9
Crop: Toria								
Kanpur	PYT	01	12	TKM 24-108	1624	Tapeshwari (1422)	11.4	High seed yield
				TKM 24-110	1620		11.3	
				TKM 24-106	1593		11.2	
	SVT	01	08	TKM 24-1	1598	Azad Chetna (1505)	10.6	High seed yield
				TKM 23-2	1592		10.5	
				TKM 21-2	1563 kg/ha			
Bhubaneswar	ST-I	01	16	ORT 2022-09	1289	Sushree	15.1	Earliness and High yield under late sown conditions
		-	-	ORT 2021-7	1367	Sushree	22.1	
	State MLT(Four Locations)	01	10	ORT 2018-6	1266	Sushree	14.5	Earliness and High yield under late sown conditions
Dholi	CSVT(Toria)	01(Three locations)	12	Multi location data under Analysis	-	Bhawani	-	To develop high yielding varieties for Bihar
Pantnagar	ST-I	1	12	PT-2020-4	1368	Tapeswari (1209)	13.2	Earliness and high yield
				PT-2017-2	1322		9.2	
				PT-2021-6	1322		9.2	
	ST-II	1	18	PTC-2021-3	1620	Tapeswari (1327)	22.1	Earliness and high yield

				PTC-2023-2	1591		19.9	
				PT-2022-4	1488		12.1	
	SVT	1	08	TP-208	1774			
				TP-206	1707			
				TP-201	1661			
Chatha-KS	Station trial	01	16	JT-18-2	1398	PT-303	11.9	Earliness and high yield
Crop: Yellow Sarson								
Pantnagar	ST-I	1	14	PYS-2023-2	1776	Pitambari (1442)	23.2	High yield
				PYS-2023-1	1675		16.2	
				PYS-2021-12	1586		10.0	
	ST-II	1	19	PYS-2024-10	2166	YSH-0401 (1856)	16.0	High yield
				PYS-2024-2	2136		15.1	
				PYS-2024-5	2057		10.8	
	SVT	1	19	PYS-2024-10	2166	YSH-0401 (1856)	16.0	High yield
				PYS-2024-2	2136		15.1	
				PYS-2024-5	2057		10.8	
	SVT	1	07	YSP-401	2014		10.9	High yield
				YSP-406	1983		10.7	
				YSP-408	1801		9.7	
Kanpur	PYT	01	12	YSKM 24-208	1767	Pitambari (1775)		High yield
				YSKM 24-201	1747			
				YSKM 24-203	1704			
	SVT	01	07	YSKM 23-2	1890	Pitambari (1775)		High yield
				YSKM 22-1	1775			
				YSKM 23-1	1736			
Bhubaneswar	PYT	01	12	ORYS 2019-46	1235	Pitambari	13.5	Earliness, High yield
				ORYS 2018-09	1260	Pitambari	15.8	
Crop: Indian Mustard								
Bhubaneswar	PYT	01	18	ORM 2021-11	1595	NRCHB 101	14.8	
		-	-	ORM 2022-15	1618	NRCHB101	16.4	
	State MLT (four locations)	01	11	ORM 2021-36	1492	NRCHB 101	12.8	
				ORM 2021-18	1512	NRCHB101	14.3	
Chatha	Station trial	01	24	JM-19-5	2005	Kranti	12.7	High Yield
Dholi	CSVT	01 (Eleven locations)	18	Multi location data under Analysis	--	PM 25, RGN 73, & Kranti		To develop high yielding varieties for Bihar
	TM Mustard	01	12	TM 23-308, TM 23-301	2100 kg/ha	PM 25 & JD6	11.0	Earliness & high yield
Hisar	FYT (TS)	1	10	Compilation in progress	-			
	FYT (LS)	1	10	Compilation in progress	-			
	FYT (Early)	1	10	Compilation in progress				

	LST	3	30	Compilation in progress	-			
	SST	3	66	Compilation in progress	-			
	SST (ER)	1	19	Compilation in progress	-			
	SST (hybrid)	3	48	Compilation in progress	-			
Imphal (CAU)	STIM 1	1	21	CAU LYC 15	1683	NRCHB 101 (1435)	17.3	High yield
	MLTIM 1	1	7	CAU RM-1	1480 (mean of 3 locations)	NRCHB 101 (1242) (mean of 3 locations)	19.1	High yield
				CAU RM 4-1	1395 (mean of 3 locations)	NRCHB 101 (1242) (mean of 3 locations)	12.3	High yield
Kanpur	PYT (Early sown Mustard)	1	12	KMR (E) 24-303	1815	Kanti (1406)	12.9	High yield
				KMR(E) 24-3066	1815		12.9	
				KMR(E) 24-308	1716		12.2	
	SVT: (Early sown Mustard)	1	08	KMR (E) 22-1	1803	Azad Mahak (1659)	10.8	High yield
				KMR (E) 23-1	1757		10.5	
				KMR (E) 22-2	1689		10.1	
Ludhiana *Brassica juncea (conventional)*	Multilocation-Timely Sown	1	15	RL-19-237 RL-19-162	3072 2868	PBR-357 (2578)	14.5 11.2	Productivity assessment
	Large Scale Trial		20	RL-19-30 RL-19-85 RL-19-162 RL-19-25	3228 3191 3162 3071	PBR- 357 (2721)	18.6 17.3 16.2 12.9	Productivity assessment
	Station Trial-1	2	16	RLHR1 RLHR3	2355 2376	PBR 357 (2203)	6.9 7.9	Herbicide Resistance
	Station Trial- 2	1	12	RLHR1	2469	PBR 357 (2345)	5.3	Herbicide Resistance
Ludhiana- *Brassica juncea(0/00)*	Multilocation-Timely Sown	1	15	PMAS-07-A PMAS-1604 PMAS-1602 PMAS-A-29	2444 2413 2393 2372	RLC-3 (2070)	18.0 16.6 15.6 14.6	Productivity assessment
	Large Scale Trial-1	1	14	PMAS-1603 PMAS-1612 PMAS-1625 PMAS-1607	2512 2481 2399 2350	RLC-3 (2060)	21.9 20.4 16.5 14.1	Productivity assessment
Ludhiana-Conventional mustard hybrids	MLT	1	12	PHR 2402 PHR 2407 PHR 2403 PHR 2401	3148 3148 3100 2948	PHR 126 (2670)	17.9 17.9 16.1 10.4	High yield, earliness and oil content
	Station trials	2	40	PHR 2418 PHR 2413 PHR 2410 PHR 2420	2568 2501 2475 2460	PHR 127 (2324)	10.5 7.6 6.5 5.9	High yield, earliness and oil content
Pantnagar	ST-I	1	18	PRE-2023-13	2335	PR-19(1942)	20.2	Earliness and high yield

				PRE-2023-1	2291		18.0	
				PRE-2020-12	2211		13.9	
	ST-II	1	12	PRE-2024-8	2337	PM-25 (2042)	14.4	Earliness and high yield
				PRE-2024-3	2228		9.1	
				PRE-2024-9	2175		6.5	
	ST-III	1	10	PR-2023-8	2739	RGN-73 (2301)	19.0	Timely sown and High yield
				PR-2023-6	2709		17.7	
				PR-2023-2	2676		16.3	
	ST-IV	1	24	PR-2024-13	2920	Maya (2541)	14.9	Timely sown and High yield
				PR-2024-3	2883		13.5	
				PR-2024-12	2831		11.4	
	ST-V	1	12	PYR-2023-1	2059	NDYR-8 (1744)	18.1	Yellow seed color
				PYR-2021-4	1944		11.5	
				PYR-2020-11	1911		9.6	
	ST-VI	1	12	PRL-2020-2	1600	NRCHB-101 (1411)	13.4	Late sown and high yield
				PRL-2022-3	1581		12.0	
				PRL-2020-19	1537		8.9	
	ST-VII	1	16	PRL-2024-12	1851	NRCHB-101 (1500)	23.4	Late sown and high yield
				PRL-2024-13	1744		16.3	
				PRL-2024-7	1707		13.8	
	ST-VIII	1	10	PAB-2024-2	2377	PAB-9511 (1890)	25.8	*Alternaria* blight resistance and high yield
				PAB-2024-2	2186		15.7	
				PAB-2024-2	2084		10.3	
	SVT	1	08	RP-305	2465			High yield
				RP-303	2106			
				RP-304	2066			
S K Nagar	LSVT	01	12	SKM 2104	-	GDM 4	-	High seed yield & Medium maturing
	SSVT			SKM 2206			-	
Crop: Gobhi Sarson								
Hisar	LST	1	10	Compilation in progress				
Chatha	Station trial	01	18	JGS 18-1	2023	GSL-1	13.1	High Yield
Ludhiana - Evaluation of G*obhi sarson* hybrids	MLT-Ludhiana	1	16	GSH 2517 GSH 2631 GSH-2654 GSC 8	3268 3076 3087 2776	PGSH 2155(2803) GSC 7 (2563)	16.6 9.7 10.1 8.3	Productivity, height, maturity and herbicide resistance
	PRHT	1	40	GSH 2621 (588g/plot) GSH 2560 (560g/plot) GSH 2549 (557g/plot) GSH 2618 (551g/plot)	3919 3733 3713 3670	PGSH2155 (3366)	16.4 10.9 10.3 9.1	Productivity, height and maturity

Breeder seed production:

Indents of 95.32 q breeder seed of 86 Rapeseed-Mustard varieties were received from Department of Agriculture and Cooperation (DAC), Ministry of Agriculture and Farmers Welfare, Govt. of India for production during 2024-25. The allocation was made to 22 centers for the production of 95.32 q of 86 Rapeseed-Mustard varieties during 31st Annual Group Meeting was held at AAU Guwahati, Assam. Against the indent of 95.32q, 252.42q Breeder Seed was produced, indicating a surplus availability of 157.10q. Breeder seed of 01 variety RVT-2 of toria; 02 varieties Vasundhra, and Urvashi of Indian mustard; 01 variety Subinoy of yellow sarson could not be produced. Further, less quantity of PDZM 35 and PDZM 36 of Indian mustard and T-9 of toria were produced. In addition, 39.45q breeder seed of 09 varieties was also produced by different centers. The center and variety wise details of breeder seed production are presented in Table 2.2.

Breeder Seed production of indented Rapeseed Mustard varieties during 2024-25

S. No.	State	Producing centre	Crop	Name of variety	Year of notification	DAC indent (q)	Allocation	Actual production (q)	Production surplus/deficit as per BSP-1 target(q)
1	Assam	AAU, Shillongani	Toria	AAU TS 38	2021	1.00	1.00	4.50	3.50
2	Assam	AAU, Shillongani,	Toria	Jeuti (JT 90-1)	2020	4.00	4.00	0.30	3.70
3	Chhattisgarh	IGKVV, Jagdalpur	Indian mustard	Chhattisgarh Sarson	2010	2.00	2.00	2.50	0.50
4	Gujarat	AAU, Anand	Indian mustard	Gujarat Mustard -8	2023	0.10	0.10	7.00	6.90
5	Gujarat	SDAU, SKNagar	Indian mustard	Gujarat Mustard -5	2016	0.10	0.10	0.90	0.80
6	Gujarat	SDAU, SKNagar	Indian mustard	Gujarat Mustard -4	2015	0.20	0.20	2.00	1.80
7	Gujarat	SDAU, SKNagar	Indian mustard	Gujarat Mustard -2	2015	2.00	2.00	2.20	0.20
8	H.P.	SAREC, Kangra	Indian mustard	HPGS-1	2021	0.10	0.10	0.62	0.52
9	H.P.	Kangra	Gobhi Sarson	Him Sarson -1	2009	0.52	0.52	0.70	0.18
10	Haryana	CCS HAU, Hisar	Indian mustard	RH 1975	2024	1.28	1.28	16.10	14.82
11	Haryana	CCS HAU, Hisar	Indian mustard	RH 1706	2023	0.83	0.83	9.27	8.44
12	Haryana	CCS HAU, Hisar	Indian mustard	RH-1424	2023	1.27	1.27	11.93	10.66
13	Haryana	CCS HAU, Hisar	Indian mustard	RH 30	1985	0.64	0.64	0.65*	0.001
14	Haryana	CCS HAU, Hisar	Indian mustard	RH-725	2018	4.12	4.12	12.25	8.13
15	Haryana	CCS HAU, Hisar	Indian mustard	RH 749	2013	0.05	0.05	0.10	0.05
16	Haryana	CCS HAU, Hisar	Indian mustard	RH-761	2019	2.35	2.35	4.53*	2.18
17	Haryana	CCS HAU, Hisar	Indian mustard	Laxmi	1991	0.30	0.30	0.60	0.30
18	Haryana	CCS HAU, Hisar	Indian mustard	Vasundhra	2003	0.10	0.10	00	-0.10
19	Haryana	CCS HAU, Hisar	Yellow Sarson	YSH 0401	2009	0.35	0.35	0.50	0.15
20	Haryana	CCS HAU, Hisar	Toria	TH-68	1991	0.10	0.10	0.22	0.12
21	Haryana	CSSRI, Karnal	Indian mustard	CS-64	2023	0.50	0.50	6.00	5.50
22	Haryana	CSSRI, Karnal	Indian mustard	CS-61	2023	0.20	0.20	5.00	4.80
23	Haryana	CSSRI, Karnal	Indian mustard	CS-60	2018	0.95	0.95	12.0	11.05
24	Haryana	CSSRI, Karnal	Indian mustard	CS-58	2017	0.51	0.51	7.00	6.49
25	J.& K.	SKUAT, Jammu	Indian mustard	JM 135	2022	0.25	0.25	0.50	0.25
26	J.& K.	SKUAT, Jammu	Toria	RSPT-6	2019	0.75	0.75	0.80	0.05
27	J.& K.	SKUAT, Jammu	Gobhi sarson	JGS 12-3	2022	0.50	0.50	0.70	0.20
28	J.& K.	SKUAT, Srinagar	Brown Sarson	Shalimar Sarson-2	2019	1.44	1.44	2.5	1.06
29	Jharkhand	BAU, Ranchi	Indian mustard	BBM 1	2021	4.30	4.30	4.30	0.00

30	Madhya Pradesh	ZARS, Morena	Indian mustard	Raj Vijay Mustard-1	2016	9.00	9.00	5.77	3.23
31	Madhya Pradesh	ZARS, Morena	Indian mustard	Raj Vijay Mustard-2	2013	6.55	6.55	6.98	0.43
32	Madhya Pradesh	ZARS, Morena	Toria	Raj Vijay Toria-2	2021	0.10	0.10	0.00	-0.10
33	Madhya Pradesh	ZARS, Morena	Toria	Raj Vijay Toria-3	2020	0.50	0.50	1.91	1.41
34	Maharashtra	COA, Nagpur	Indian mustard	TAM 108-1	2021	0.10	0.10	1.00	0.90
35	New Delhi	IARI, New Delhi	Indian mustard	PDZM-35	2024	0.45	0.45	0.23	-0.22
36	New Delhi	IARI, New Delhi	Indian mustard	PDZM-36	2024	0.35	0.35	0.13	-0.22
37	New Delhi	IARI, New Delhi	Indian mustard	Pusa Mustard-34	2023	2.47	2.47	2.53	0.06
38	New Delhi	IARI, New Delhi	Indian mustard	PDZM-33	2021	1.30	1.30	1.50	0.20
39	New Delhi	IARI, New Delhi	Indian mustard	PDZM-31	2018	2.53	2.53	3.00	0.47
40	New Delhi	IARI, New Delhi	Indian mustard	Pusa Mustard-32	2020	4.80	4.80	10.02	5.40
41	New Delhi	IARI, New Delhi	Indian mustard	Pusa Mustard-30	2013	0.90	0.90	1.20	0.30
42	New Delhi	IARI, New Delhi	Indian mustard	Pusa Mustard-28	2012	0.86	0.86	1.20	0.34
43	New Delhi	IARI, New Delhi	Indian mustard	Pusa Mustard-27	2011	0.51	0.51	1.00	0.49
44	New Delhi	IARI, New Delhi	Indian mustard	Pusa Mustard-26	2011	0.01	0.01	0.04*	0.03
45	New Delhi	IARI, New Delhi	Indian mustard	Pusa Mustard-25	2010	0.30	0.30	1.00	0.70
46	New Delhi	IARI, New Delhi	Indian mustard	Pusa Agrani	1998	0.23	0.23	0.60	0.37
47	New Delhi	IARI, New Delhi	Indian mustard	Pusa Jai Kisan	1998	0.10	0.10	0.30	0.07
48	New Delhi	DU, South Campus	Indian mustard	Rohini –WRR 2	2023	0.10	0.10	0.10	0
49	New Delhi	DU, South Campus	Indian mustard	Varuna -WRR2	2023	0.50	0.50	0.50	0
50	New Delhi	DU, South Campus	Indian mustard	Pusa Bold -WRR2	2023	1.30	1.30	1.30	0
51	Orissa	OUAT, Bhubaneswar	Indian mustard	Sampoorna	2023	1.00	1.00	1.20	0.20
52	Orissa	OUAT, Bhubaneswar	Toria	Sushree	2015	2.50	2.50	2.5	0.00
53	Punjab	PAU, Ludhiana	Indian mustard	PHR 126	2021	0.05	0.05	0.10	0.05
54	Punjab	PAU, Ludhiana	Indian mustard	RCH 1	2021	0.07	0.07	0.20	0.13
55	Punjab	PAU, Ludhiana	Toria	TL-17	2016	0.03	0.03	1.00	0.97
56	Punjab	PAU, Ludhiana	Gobhi sarson	GSC-7	2015	0. 05	0. 05	1.50	1.45
57	Punjab	PAU, Ludhiana	Gobhi sarson	GSL-1	1987	0.10	0.10	1.00	0.90
58	Rajasthan	DRMR, Bharatpur	Indian mustard	BPM-11	2024	2.39	2.39	7.00	4.61
59	Rajasthan	DRMR, Bharatpur	Indian mustard	Giriraj	2013	4.32	4.32	13.00	8.68
60	Rajasthan	DRMR, Bharatpur	Indian mustard	DRMR 1165-40	2020	1.45	1.45	4.00	2.55
61	Rajasthan	DRMR, Bharatpur	Indian mustard	NRCHB 101	2009	0.27	0.27	10.00*	9.73
62	Rajasthan	DRMR, Bharatpur	Indian mustard	Radhika	2021	1.62	1.62	4.10	2.48
63	Rajasthan	DRMR, Bharatpur	Indian mustard	DRMR 150-35	2020	5.61	5.61	9.30	3.69
64	Rajasthan	DRMR, Bharatpur	Indian mustard	Brijraj	2021	0.10	0.10	0.90*	0.80
65	Rajasthan	DRMR, Bharatpur	Indian mustard	NRCDR 601	2010	0.10	0.10	0.20*	0.10
66	Rajasthan	DRMR, Bharatpur	Yellow Sarson	NRCYS 05-02	2009	0.12	0.12	0.40	0.28
67	Rajasthan	ARS, Sriganganagar	Indian mustard	RGN-298	2015	0.50	0.50	1.50	1.00
68	Rajasthan	SKNAU, Jobner	Taramira	RTM-1351	2017	0.10	0.10	0.50	0.40
69	Rajasthan	SKNAU, Jobner	Taramira	RTM-1355	2017	0.20	0.20	1.25	1.05

70	Rajasthan	SKNAU, Jobner	Taramira	RTM-1624	2022	0.10	0.10	0.40	0.30
71	Uttar Pradesh	CSAUA&T, Kanpur	Indian mustard	Urvashi	2001	0.10	0.10	0.00	-0.10
72	Uttar Pradesh	CSAUA&T, Kanpur	Toria	Azad Chetna	2021	1.08	1.08	1.30	0.22
73	Uttar Pradesh	CSAUA&T, Kanpur	Toria	Bhawani	1986	0.40	0.40	0.50	0.10
74	Uttar Pradesh	CSAUA&T, Kanpur	Toria	Tapeshwari	2018	1.80	1.80	3.49	1.69
75	Uttar Pradesh	CSAUA&T, Kanpur	Toria	T-9	1975	0.10	0.10	0.01	-0.09
76	Uttar Pradesh	CSAUA&T, Kanpur	Yellow Sarson	Pitambari	2018	0.12	0.12	0.70	0.58
77	Uttarakhand	GBPUAT, Pantnagar	Toria	Pant Hill Toria-1	2017	0.30	0.30	5.00	4.70
78	Uttarakhand	GBPUAT, Pantnagar	Toria	Pant Toria-508	2017	3.20	3.20	7.20	4.00
79	Uttarakhand	GBPUAT, Pantnagar	Toria	Pant Toria-303	1985	0.10	0.10	4.50	4.40
80	Uttarakhand	GBPUAT, Pantnagar	Yellow sarson	Pant Pili Sarson -2	2010	0.20	0.20	5.58	5.38
81	Uttarakhand	GBPUAT, Pantnagar	Yellow sarson	Pant Sweta	2017	1.09	1.09	2.00	0.91
82	West Bengal	PORS, Berhampore	Yellow sarson	Benoy (B-9)	1982	1.46	1.46	2.30	0.84
83	West Bengal	PORS, Berhampore	Toria	Agrani (B-54)	1982	0.41	0.41	1.30	0.89
84	West Bengal	PORS, Berhampore	Yellow Sarson	Anushka	2020	0.44	0.44	1.75	1.31
85	West Bengal	PORS, Berhampore	Yellow Sarson	Sanchita	2020	0.05	0.05	0.80	0.75
86	West Bengal	PORS, Berhampore	Yellow Sarson	Subinoy	1991	0.02	0.02	0.00	-0.02
	Total					**95.32**	**95.32**	**252.42**	**157.10**

Additional breeder seed produced

S.No.	State	Crop	Name of the Variety	Actual production
1	West Bengal	Indian mustard	TBM 143	0.40
2	Punjab	Indian mustard	RLC 3	1.00
3	Punjab	Indian mustard	PBR 357	1.00
4	Uttarakhand	Indian mustard	Kranti	1.00
5	Uttarakhand	Indian mustard	PR-21	2.95
6	Delhi	Indian mustard	PM-37	6.55
7	Rajasthan	Indian mustard	BPM 1825	2.00
8	Chhattisgarh	Indian mustard	CG Sarson	0.55
9	Maharashtra	Indian mustard	TAM 108-1	24
		Total		**39.45**

2.3 Coordinated Trials

Performance of 149 strains including 07 of toria, 10 of yellow sarson and 132 of Indian mustard was tested in twenty-two performance evaluation trials consisting of toria (01), yellow sarson (02) and Indian mustard (19) at 52 locations across the 7 agro-climatic zones of the country. On the basis of superiority for seed / oil yield / earliness / quality / resistance over the best check 27 strains of Indian mustard were promoted for advanced stage evaluation. The performance of the strains was tested against following national check (NC), zonal check (ZC) and the latest release (LR) varieties/hybrids.

Trial	NC	ZC	LR
Toria	PT 303	Uttara, Bhawani	RSPT-6, TS 38
Yellow sarson	YSH 401	Benoy	Pitambari
Indian mustard			
Early mustard	PM 25	JD 6, PRO 5111 (Hybrid Check)	GDM 4, NRCHB 101
Timely sown irrigated	Kranti	RCC 4, RH 749, Maya, Bio 902	RH 1975, Giriraj, RGN 73, GDM 4
Rainfed	Kranti	RH 725, NRCHB 101	RH 1424, DRMR150-35,
Late sown	Kranti	PM 26, NRCHB 101	Radhika, CS 56, BPM 11
Hybrid	Kranti	RGN 73, RH 749, GDM 4	DMH 1, 45S46, NRCHB 506
Quality	PM 30	RGN 73, RH 749, PDZ 11 (Double low check)	PM 30, PM 32, PM 34
Salinity	Kranti	CS 54	CS 60
White Rust Resistance	Basanti (WRRC)	RH 749	Giriraj
For genome edited strains (GED 1 and GED 2) Varuna was also used as parental check.			

Table 1.1a Performance of toria strains in IVT Zone-I

S.No.	Code	Strain	Seed Yield (Kg/ha)						Plant Stand					Days to Maturity					
			PTN	CHT	UDH	KAS	DHN	Mean	PTN	CHT	UDH	KAS	DHN	PTN	CHT	UDH	KAS	DHN	Mean
			1	2	3	4	5	(1-5)	1	2	3	4	5	1	2	3	4	5	(1-5)
1	TCN-24-1	PTC 2021-1	1792	1416	1041	1856	1608	**1543**	166	130	119	166	151	96	90	87	97	101	**94**
2	TCN-24-2	JT-17-1	1095	1381	1141	1169	1209	**1199**	145	140	129	142	147	87	79	75	85	**97**	**85**
3	TCN-24-3	BAUT-08-12	1293	1288	1047	1504	1290	**1284**	139	129	119	144	137	96	87	83	102	102	**94**
4	**TCN-24-4**	**RSPT-6 (LR)**	**1172**	**1581**	**1340**	**1531**	**1370**	**1399**	**138**	**108**	**97**	**156**	**154**	**90**	**80**	**76**	**96**	**100**	**88**
5	TCN-24-5	PTC 2021-2	1322	1440	1201	1236	1249	**1289**	163	133	122	143	133	96	87	83	97	99	**92**
6	TCN-24-6	TKM 24-1	1448	1244	1004	1350	1492	**1308**	152	143	133	149	161	100	94	91	100	100	**97**
7	TCN-24-7	Uttara (ZC)	1495	1281	1176	1659	1411	**1404**	163	133	122	129	158	98	89	86	98	101	**94**
8	TCN-24-8	TKM 24-2	1590	1152	912	1759	1376	**1358**	168	133	123	158	155	101	91	87	100	100	**96**
9	TCN-24-9	CG Toria-02	2155	1725	1484	2207	1915	**1897**	160	132	121	146	141	134	132	128	133	136	**133**
10	TCN-24-10	PT 303 (NC)	1540	1347	1107	1579	1336	**1382**	147	128	117	161	162	97	88	84	98	100	**93**
		GM	**1490**	**1385**	**1145**	**1585**	**1425**	**1406**											
		CD (5 %)	238	238	238	225	**252**												
		CV (%)	9.3	10.0	12.1	8.3	**10.3**												
		DOS	4-10-24	27-09-24	8-10-24	8-10-24	10-10-24												

Table 1.1b Performance of toria strains in IVT Zone-I

S.No.	Code	Strain	1000-Seed Wt. (g)						Oil Content (%)					Oil Yield (kg/ ha)
			PTN	CHT	UDH	KAS	DHN	Mean	PTN	CHT	UDH	KAS	Mean	
			1	2	3	4	5	(1-5)	1	2	3	4	(1-4)	
1	TCN-24-1	PTC 2021-1	3.3	4.3	4.5	3.1	3.2	3.7	42.1	42.4	40.8	39.9	**41.3**	**637**
2	TCN-24-2	JT-17-1	2.9	3.7	3.9	3.2	3.0	3.4	42.2	42.0	39.8	39.6	**40.9**	**490**
3	TCN-24-3	BAUT-08-12	3.1	4.2	4.3	3.0	3.1	3.5	41.1	42.5	40.4	40.1	**41.0**	**527**
4	**TCN-24-4**	**RSPT-6 (LR)**	**2.9**	**4.6**	**4.8**	**3.2**	**3.2**	**3.7**	**41.0**	**42.9**	**41.9**	**39.6**	**41.3**	**578**
5	TCN-24-5	PTC 2021-2	3.2	4.9	5.1	3.1	3.1	3.9	40.3	42.6	41.7	39.5	**41.0**	**529**
6	TCN-24-6	TKM 24-1	3.1	5.4	5.6	3.0	3.0	4.0	41.3	42.4	41.5	40.3	**41.4**	**541**
7	TCN-24-7	Uttara (ZC)	3.3	4.8	4.9	3.0	3.1	3.8	41.2	42.1	42.6	40.0	**41.5**	**583**
8	TCN-24-8	TKM 24-2	2.9	5.0	5.2	3.1	3.0	3.8	42.7	42.3	40.4	40.1	**41.4**	**562**
9	TCN-24-9	CG Toria-02	3.7	5.3	5.4	3.3	3.4	4.2	40.7	37.4	37.9	41.2	**39.3**	**746**
10	TCN-24-10	PT 303 (NC)	3.2	5.4	5.6	3.1	3.0	4.1	41.5	42.0	40.3	40.2	**41.0**	**567**

Table 1.2a Performance of toria strains in IVT Zone-V (rainfed)

S.No.	Code	Strain	Seed Yield (Kg/ha)						Plant Stand					Days to Maturity					
			KNK	SHL$	DOL	KLN	VAR	Mean	KNK	SHL	DOL	KLN	VAR	KNK	SHL	DOL	KLN	VAR	Mean
			1	2	3	4	5	(1,3-5)	1	2	3	4	5	1	2	3	4	5	(1,3-5)
1	TCN-24-1	PTC 2021-1	744	1858	1052	1576	1460	**1208**	195	168	118	187	174	88	92	100	88	93	**92**
2	TCN-24-2	JT-17-1	899	1401	1314	1167	1690	**1267**	194	149	115	190	177	83	85	93	83	91	**87**
3	TCN-24-3	BAUT-08-12	1050	1426	1060	1294	1826	**1308**	193	151	117	181	186	93	92	98	86	96	**93**
4	**TCN-24-4**	**TS 38 (LR)**	**1065**	**1765**	**1180**	**1573**	**1860**	**1420**	**194**	**150**	**118**	**180**	**178**	**92**	**92**	**97**	**90**	**94**	**93**
5	TCN-24-5	PTC 2021-2	772	1593	956	1598	1783	**1277**	192	146	117	182	189	88	87	96	87	92	**91**
6	TCN-24-6	TKM 24-1	1165	1515	1398	1631	1919	**1528**	191	153	121	195	183	90	92	103	90	97	**95**
7	TCN-24-7	Bhawani (ZC)	1087	1469	1017	1635	1852	**1398**	193	158	117	178	190	86	92	100	88	95	**92**
8	TCN-24-8	TKM 24-2	962	1531	1077	1509	1809	**1339**	194	174	118	178	183	87	92	102	91	97	**94**
9	TCN-24-9	CG Toria-02	1412	2179	1419	1428	2104	**1591**	198	158	119	167	162	110	108	117	111	121	**115**
10	TCN-24-10	PT 303 (NC)	1106	1636	958	1588	1996	**1412**	195	159	117	188	192	89	86	101	87	95	**93**
		GM	**1026**	**1637**	**1143**	**1500**	**1830**	**1375**											
		CD (5 %)	138	252	137	285	279												
		CV (%)	7.9	9.0	7.0	11.1	8.9												
		DOS	23-10-24	15-11-24	7-10-24	30-10-24	25-9-24												

$ data of SHL excluded from computation of mean due to sowing after cut off date

Table 1.2b Performance of toria strains in IVT Zone -V

S.No.	Code	Strain	1000-Seed Wt. (g)					Oil Content (%)					Oil Yield (kg/ ha)
			KNK	SHL	DOL	KLN	VAR	KNK	DOL	KLN	VAR	Mean	
			1	2	3	4	5	1	3	4	5	(1,3-5)	
1	TCN-24-1	PTC 2021-1	2.3	4.9	3.4	3.2	5.6	38.2	42.3	38.3	42.6	**40.4**	**488**
2	TCN-24-2	JT-17-1	2.1	4.5	2.8	3.4	6.0	37.2	42.2	38.6	40.3	**39.6**	**501**
3	TCN-24-3	BAUT-08-12	3.1	4.5	2.7	3.3	6.0	42.7	40.7	42.1	42.1	**41.9**	**548**
4	TCN-24-4	TS 38 (LR)	3.2	4.8	3.4	3.8	5.7	41.2	41.9	37.3	41.5	**40.5**	**575**
5	TCN-24-5	PTC 2021-2	2.7	4.7	2.8	3.9	5.6	38.8	41.5	40.7	41.8	**40.7**	**520**
6	TCN-24-6	TKM 24-1	2.3	4.6	3.0	3.5	5.7	40.5	42.3	39.5	42.6	**41.2**	**630**
7	TCN-24-7	Bhawani (ZC)	2.3	4.7	3.1	3.2	5.8	41.4	42.8	39.1	42.2	**41.3**	**578**
8	TCN-24-8	TKM 24-2	2.3	4.4	3.0	3.4	5.8	39.1	41.6	38.4	41.1	**40.0**	**536**
9	TCN-24-9	CG Toria-02	4.2	5.8	4.0	4.1	4.8	37.2	42.5	37.1	41.5	**39.6**	**629**
10	**TCN-24-10**	**PT 303 (NC)**	**3.0**	**4.6**	**3.1**	**3.9**	**5.2**	**42.8**	**42.4**	**41.4**	**42.4**	**42.2**	**597**

Table 1.3 Performance of toria strains in IVT Zone-VI (rainfed)

S.No.	Code	Strain	Seed Yield (Kg/ha)					Plant Stand				Days to Maturity					1000-Seed Wt. (g)				Oil Content (%)			Oil Yield (kg/ ha)
			IMP	PGT$	TPR	BMK	Mean	IMP	PGT	TPR	BMK	IMP	PGT	TPR	BMK	Mean	IMP	PGT	TPR	BMK	IMP	BMK	Mean	
			1	2	3	4	(1,3-4)	1	2	3	4	1	2	3	4	(1,3-4)	1	2	3	4	1	4	(1,4)	
1	TCN-24-1	PTC 2021-1	928	940	1264	1518	**1237**	152	148	109	189	102	103	90	107	**100**	3.4	3.3	4.3	3.7	37.2	40.6	**38.9**	**481**
2	TCN-24-2	JT-17-1	713	746	1416	1220	**1116**	163	170	109	186	101	103	92	106	**99**	3.2	3.6	4.3	3.6	40.4	37.3	**38.8**	**433**
3	TCN-24-3	BAUT-08-12	930	781	1502	927	**1120**	171	164	109	192	103	102	91	107	**100**	3.8	3.6	3.6	3.9	37.0	38.5	**37.7**	**423**
4	TCN-24-4	TS 38 (LR)	1153	1054	1333	795	**1094**	169	173	108	181	101	101	88	108	**99**	3.8	3.5	3.9	4.3	37.8	36.8	**37.3**	**408**
5	TCN-24-5	PTC 2021-2	793	757	1159	809	**920**	169	164	111	184	102	103	88	106	**99**	3.7	3.7	4.6	4.0	38.1	38.3	**38.2**	**352**
6	TCN-24-6	TKM 24-1	767	928	1316	763	**949**	173	169	109	185	105	107	90	107	**101**	3.8	4.1	4.1	3.9	37.6	37.5	**37.5**	**356**
7	TCN-24-7	Bhawani (ZC)	750	746	1378	707	**945**	164	160	108	194	103	102	90	111	**101**	3.4	3.5	4.1	4.0	37.1	37.4	**37.2**	**352**
8	TCN-24-8	TKM 24-2	895	669	1273	917	**1028**	165	163	107	203	103	104	89	112	**101**	3.2	3.3	3.9	3.7	38.2	38.4	**38.3**	**394**
9	TCN-24-9	CG Toria-02	1201	964	1844	839	**1295**	171	163	108	181	119	110	114	106	**113**	4.1	3.8	4.5	4.2	38.6	37.7	**38.2**	**494**
10	**TCN-24-10**	**PT 303 (NC)**	**835**	**903**	**1291**	**1323**	**1149**	**170**	**168**	**108**	**184**	**103**	**100**	**88**	**106**	**99**	**3.5**	**3.4**	**4.1**	**4.1**	**39.4**	**38.4**	**38.9**	**447**
		GM	**896**	**849**	**1377**	**982**	**1085**																	
		CD (5 %)	113	146	265	158																		
		CV (%)	7.4	10.1	10.4	9.4																		
		DOS	14-11-24	18-11-24	14-11-24	8-11-24																		

$ data of PGT excluded from computation of mean due to rejection by monitoring team and also sowing after cut off date.

Table 1.4 Performance of toria strains in IVT Zone-VII (rainfed)

S.No.	Code	Strain	Seed Yield (Kg/ha)					Plant Stand				Days to Maturity					1000-Seed Wt. (g)				Oil Content (%)					Oil Yield (kg/ ha)
			JAG	BHU	KNR	AKR	Mean	JAG	BHU	KNR	AKR	JAG	BHU	KNR	AKR	Mean	JAG	BHU	KNR	AKR	JAG	BHU	KNR	AKR	Mean	
			1	2	3	4	(1-4)	1	2	3	4	1	2	3	4	(1-4)	1	2	3	4	1	2	3	4	(1-4)	
1	TCN-24-1	PTC 2021-1	1109	1124	646	1296	**1044**	136	137	153	193	84	94	90	59	**82**	2.6	3.9	3.5	3.3	39.3	38.5	39.1	41.2	**39.5**	**413**
2	TCN-24-2	JT-17-1	906	814	601	2037	**1090**	117	127	111	172	78	89	87	67	**80**	2.5	3.6	3.3	3.1	39.3	37.4	40.9	40.2	**39.4**	**430**
3	TCN-24-3	BAUT-08-12	901	965	832	1790	**1122**	133	130	133	176	80	92	89	71	**83**	2.6	3.5	3.2	3.4	40.4	37.5	42.2	40.4	**40.1**	**450**
4	**TCN-24-4**	**TS 38 (LR)**	**912**	**1096**	**943**	**1975**	**1232**	**125**	**135**	**201**	**158**	**85**	**90**	**85**	**67**	**82**	**2.8**	**3.8**	**3.9**	**3.3**	**40.3**	**39.0**	**42.6**	**42.0**	**41.0**	**505**
5	TCN-24-5	PTC 2021-2	1221	1183	483	1235	**1030**	133	138	116	175	83	93	90	66	**83**	2.8	3.8	2.8	3.1	39.8	38.3	41.2	41.0	**40.1**	**413**
6	TCN-24-6	TKM 24-1	910	978	684	1049	**905**	142	129	147	201	84	85	84	60	**78**	2.8	3.5	3.4	3.2	37.7	38.4	42.7	42.4	**40.3**	**365**
7	TCN-24-7	Bhawani (ZC)	920	999	591	1111	**905**	134	128	131	167	87	94	83	58	**81**	3.0	3.7	3.2	2.9	38.3	37.6	42.0	41.2	**39.8**	**360**
8	TCN-24-8	TKM 24-2	783	1034	552	988	**839**	135	135	123	193	89	91	84	59	**81**	2.7	4.0	3.6	3.0	40.1	38.7	39.6	41.5	**40.0**	**335**
9	TCN-24-9	CG Toria-02	1245	1017	1146	1296	**1176**	140	131	190	195	113	86	114	59	**93**	3.8	3.8	4.2	4.0	37.5	40.4	39.5	41.3	**39.7**	**466**
10	TCN-24-10	PT 303 (NC)	837	1040	1001	1111	**997**	127	133	212	186	79	88	84	59	**78**	2.3	3.7	3.5	3.0	38.4	37.6	39.5	41.5	**39.2**	**391**
		GM	**974**	**1025**	**748**	**1389**	**1034**																			
		CD (5 %)	190	129	108	324																				
		CV (%)	11.4	7.3	8.4	13.6																				
		DOS	17-10-24	31-10-24	17-10-24	23-10-24																				

Table 2.1a Performance of Yellow Sarson strains in IVT Zone-V

S.No.	Code	Strain	Seed Yield (kg/ha)							Plant Stand						Days to Maturity					
			KNK	SHL$	DOL#	KLN	VAR	PNT	Mean	KNK	SHL	DOL	KLN	VAR	PNT	KNK	SHL	DOL	KLN	VAR	PNT
			1	2	3	4	5	6	(1,4-6)	1	2	3	4	5	6	1	2	3	4	5	6
1	YSCN-24-1	BRYS-2	**787**	2222	1101	1330	1627	1124	**1217**	197	170	117	190	185	167	102	99	106	102	112	122
2	YSCN-24-2	YSKM 24-2	825	1525	1063	1586	1631	1282	**1331**	187	149	117	187	181	130	100	99	110	108	112	127
3	YSCN-24-3	YSH 401 (NC)	850	1821	1241	1558	1409	1959	**1444**	192	153	117	174	186	175	103	99	116	100	112	128
4	YSCN-24-4	DRMRYS 202	952	2037	1185	1307	1473	1149	**1220**	193	158	116	176	179	141	104	92	115	99	107	116
5	YSCN-24-5	PYS-2021-21	744	2469	1344	1311	1757	2097	**1477**	195	167	117	185	185	157	97	97	114	101	110	126
6	YSCN-24-6	BYS-24	1079	1877	1409	1368	1606	1401	**1364**	199	141	118	185	176	156	104	101	113	104	111	128
7	**YSCN-24-7**	**Pitambari (LR)**	**1175**	**2130**	**1221**	**1587**	**1531**	**1486**	**1445**	**194**	**164**	**116**	**188**	**191**	**162**	**101**	**97**	**114**	**103**	**112**	**126**
8	YSCN-24-8	YSKM 24-1	914	2173	1370	1698	1812	1841	**1566**	190	158	116	185	187	163	99	99	111	100	112	129
9	YSCN-24-9	RMYS-6	985	2068	1117	1629	1328	1184	**1282**	195	177	119	190	187	146	105	99	112	106	113	125
10	YSCN-24-10	Benoy (ZC)	1071	2562	1210	1341	1594	1231	**1309**	190	149	119	188	181	166	90	95	97	92	108	113
11	YSCN-24-11	DRMRYS 24-3	874	1407	1273	1733	1573	1505	**1421**	184	158	116	175	178	159	106	99	112	108	114	131
12	YSCN-24-12	PYS-2020-3	1004	2593	1205	1654	1783	1687	**1532**	193	163	120	197	179	163	102	99	106	105	110	124
		GM	**938**	**2074**	**1228**	**1509**	**1594**	**1496**	**1384**												
		CD (5%)	106	280	73	291	236	279													
		CV (%)	6.7	8.0	3.5	11.4	8.8	11.0													
		DOS	24-10-24	15-11-24	7-10-24	30-10-24	26-10-24	4-10-24													

$ Data of SHL excluded from computation of mean due to sowing after cut off date.

Data of DOL excluded from computation of mean due to low CV.

Table 2.1.b Performance of Yellow Sarson strains in IVT Zone-V

S.No.	Code	Strain	1000 Seed Weight (g)						Oil Content (%)						Oil Yield (kg/ha)
			KNK	SHL	DOL	KLN	VAR	PNT	KNK	DOL	KLN	VAR	PNT	Mean	
			1	2	3	4	5	6	1	3	4	5	6	(1,4-6)	
1	YSCN-24-1	BRYS-2	3.5	5.5	3.3	4.1	5.0	3.7	43.0	45.8	43.2	44.4	43.8	**43.6**	**530**
2	YSCN-24-2	YSKM 24-2	3.9	5.1	3.5	3.4	5.0	3.9	42.9	46.4	40.9	44.3	45.0	**43.3**	**576**
3	**YSCN-24-3**	**YSH 401 (NC)**	**3.8**	**5.3**	**4.1**	**4.1**	**5.3**	**4.1**	**43.9**	**47.5**	**43.7**	**45.5**	**45.0**	**44.5**	**642**
4	YSCN-24-4	DRMRYS 202	3.8	5.7	3.7	3.4	4.7	3.8	43.7	43.7	41.9	45.7	45.6	**44.2**	**539**
5	YSCN-24-5	PYS-2021-21	3.8	5.1	4.0	3.8	5.2	3.7	43.2	43.7	44.7	42.0	44.4	**43.6**	**644**
6	YSCN-24-6	BYS-24	4.1	5.3	4.1	3.4	5.5	3.9	43.9	45.1	43.9	43.0	47.0	**44.5**	**606**
7	YSCN-24-7	Pitambari (LR)	3.6	5.5	3.9	3.6	5.0	3.6	43.9	44.8	42.7	43.2	46.1	**43.9**	**635**
8	YSCN-24-8	YSKM 24-1	3.8	5.4	3.4	3.3	5.0	3.6	42.1	43.9	43.4	44.1	46.5	**44.0**	**689**
9	YSCN-24-9	RMYS-6	3.9	5.3	3.2	3.9	5.3	4.2	43.0	44.2	40.7	45.6	45.9	**43.8**	**561**
10	YSCN-24-10	Benoy (ZC)	3.7	5.0	2.9	3.0	5.6	3.0	42.4	41.9	39.8	44.4	42.8	**42.4**	**555**
11	YSCN-24-11	DRMRYS 24-3	4.2	5.6	3.3	3.9	5.3	4.1	42.5	45.4	44.0	44.0	47.1	**44.4**	**631**
12	YSCN-24-12	PYS-2020-3	4.2	5.5	3.4	3.9	5.4	3.9	43.9	45.9	43.0	42.2	46.8	**44.0**	**674**

Table 2.2a Performance of Yellow Sarson strains in IVT Zone-VI

S.No.	Code	Strain	Seed Yield (kg/ha)					Plant Stand				Days to Maturity			
			IMP	PGT$	TPR#	BMK	Mean	IMP	PGT	TPR	BMK	IMP	PGT	TPR	BMK
			1	2	3	4	(1,4)	1	2	3	4	1	2	3	4
1	YSCN-24-1	BRYS-2	1872	1855	956	1475	**1674**	172	149	111	192	106	103	88	110
2	YSCN-24-2	YSKM 24-2	1020	1191	1086	919	**969**	97	115	112	130	113	107	88	115
3	**YSCN-24-3**	**YSH 401 (NC)**	**2188**	**1765**	**1218**	**1340**	**1764**	**164**	**163**	**115**	**202**	**110**	**108**	**89**	**114**
4	YSCN-24-4	DRMRYS 202	1916	1853	988	1465	**1691**	147	165	113	208	109	109	86	108
5	YSCN-24-5	PYS-2021-21	2107	2062	1216	1081	**1594**	143	164	110	181	109	109	89	109
6	YSCN-24-6	BYS-24	1982	1932	1142	959	**1470**	136	108	109	211	113	110	89	110
7	YSCN-24-7	Pitambari (LR)	2280	2377	1102	977	**1629**	160	154	106	208	114	106	90	113
8	YSCN-24-8	YSKM 24-1	2015	1944	1192	680	**1347**	150	152	106	198	114	105	88	112
9	YSCN-24-9	RMYS-6	1731	2123	1110	1465	**1598**	159	163	110	152	114	109	89	113
10	YSCN-24-10	Benoy (ZC)	1626	1580	203	604	**1115**	154	148	20	194	110	106	90	109
11	YSCN-24-11	DRMRYS 24-3	1891	1726	1219	1141	**1516**	179	163	115	208	113	108	89	114
12	YSCN-24-12	PYS-2020-3	2160	1920	970	1303	**1732**	145	151	106	200	114	108	87	119
		GM	**1899**	**1861**	**1034**	**1117**	**1508**								
		CD (5%)	428	527	221	212									
		CV (%)	13.3	16.7	12.6	11.2									
		DOS	14-11-24	20/11/24	15-11-24	25-10-24									

$ Data of PGT excluded from computation of mean due to sowing after cut off date and also rejection by monitoring team.

Data of TPR excluded from computation of mean due to four times variation in strains of particular trial at one center

Table 2.2.b Performance of Yellow Sarson strains in IVT Zone-VI

S.No.	Code	Strain	1000 Seed Weight (g)				Oil Content (%)				Oil Yield (kg/ha)
			IMP	PGT	TPR	BMK	IMP	TPR	BMK	Mean	
			1	2	3	4	1	3	4	(1,4)	
1	YSCN-24-1	BRYS-2	4.4	3.8	3.9	4.5	43.0	41.7	43.7	**43.4**	**726**
2	YSCN-24-2	YSKM 24-2	3.3	4.2	4.9	4.6	43.1	41.7	42.5	**42.8**	**415**
3	**YSCN-24-3**	**YSH 401 (NC)**	**4.5**	**4.1**	**4.0**	**4.9**	**42.6**	**43.5**	**42.9**	**42.7**	**754**
4	YSCN-24-4	DRMRYS 202	4.7	4.3	4.3	5.3	43.6	42.7	42.7	**43.2**	**730**
5	YSCN-24-5	PYS-2021-21	4.4	4.2	3.4	4.4	42.9	42.6	43.5	**43.2**	**689**
6	YSCN-24-6	BYS-24	4.0	4.0	4.3	4.5	43.0	43.8	43.6	**43.3**	**637**
7	YSCN-24-7	Pitambari (LR)	4.0	4.1	4.0	4.7	43.1	42.0	42.3	**42.7**	**695**
8	YSCN-24-8	YSKM 24-1	4.3	4.2	3.4	4.6	43.7	42.8	43.1	**43.4**	**584**
9	YSCN-24-9	RMYS-6	5.2	5.0	3.4	5.4	44.0	43.1	43.3	**43.7**	**698**
10	YSCN-24-10	Benoy (ZC)	3.8	4.4	4.0	3.9	43.4	39.2	42.7	**43.0**	**480**
11	YSCN-24-11	DRMRYS 24-3	5.1	5.0	3.9	5.5	42.7	43.7	41.8	**42.2**	**640**
12	YSCN-24-12	PYS-2020-3	4.0	4.0	4.2	4.5	42.4	42.7	43.0	**42.7**	**739**

Table 2.3a Performance of Yellow Sarson strains in IVT Zone-VII

S.No.	Code	Strain	Seed Yield (kg/ha)					Plant Stand				Days to Maturity			
			JAG	BHU	KNR	AKR	Mean	JAG	BHU	KNR	AKR	JAG	BHU	KNR	AKR
			1	2	3	4	(1-4)	1	2	3	4	1	2	3	4
1	YSCN-24-1	BRYS-2	1007	1023	568	1167	**941**	130	137	188	188	99	103	106	85
2	YSCN-24-2	YSKM 24-2	841	1053	589	1111	**898**	123	136	114	187	101	101	108	87
3	YSCN-24-3	YSH 401 (NC)	1204	1095	853	1006	**1039**	125	140	197	176	99	100	107	85
4	YSCN-24-4	DRMRYS 202	809	915	852	1627	**1051**	122	132	190	206	93	101	106	85
5	YSCN-24-5	PYS-2021-21	1452	973	709	1173	**1077**	125	128	183	203	91	99	104	87
6	YSCN-24-6	BYS-24	1012	934	875	1614	**1109**	125	130	205	182	97	101	105	81
7	**YSCN-24-7**	**Pitambari (LR)**	**1146**	**795**	**1270**	**1667**	**1219**	**122**	**132**	**215**	**172**	**99**	**99**	**99**	**87**
8	YSCN-24-8	YSKM 24-1	1370	1082	1133	1170	**1189**	123	146	186	161	94	101	95	85
9	YSCN-24-9	RMYS-6	1278	922	569	1296	**1016**	128	140	155	198	99	97	98	87
10	YSCN-24-10	Benoy (ZC)	1475	1030	559	1500	**1141**	113	135	148	213	89	100	97	93
11	YSCN-24-11	DRMRYS 24-3	986	947	669	1481	**1021**	126	134	145	180	97	98	104	81
12	YSCN-24-12	PYS-2020-3	1072	1129	715	1352	**1067**	123	143	151	179	99	102	106	87
		GM	**1138**	**992**	780	**1347**	**1064**								
		CD (5%)	265	120	159	358									
		CV (%)	12.8	7.1	12.1	15.7									
		DOS	18-10-24	31-10-24	29-10-24	23-10-24									

Table 2.3b Performance of Yellow Sarson strains in IVT Zone-VII

S.No.	Code	Strain	1000 Seed Weight (g)				Oil Content (%)				Oil Yield (kg/ha)
			JAG	BHU	KNR	AKR	JAG	KNR	AKR	Mean	
			1	2	3	4	1	3	4	(1,3-4)	
1	YSCN-24-1	BRYS-2	3.6	4.2	3.6	3.5	42.9	43.9	43.4	**43.4**	**408**
2	YSCN-24-2	YSKM 24-2	4.0	4.5	3.9	3.8	43.7	42.1	43.5	**43.1**	**387**
3	YSCN-24-3	YSH 401 (NC)	3.8	4.4	4.3	4.2	44.0	44.3	44.3	**44.2**	**460**
4	YSCN-24-4	DRMRYS 202	3.4	4.1	4.2	3.9	43.3	45.8	43.6	**44.2**	**465**
5	YSCN-24-5	PYS-2021-21	3.6	4.1	3.9	3.7	43.0	42.8	43.4	**43.1**	**464**
6	YSCN-24-6	BYS-24	3.6	4.2	4.5	3.8	43.7	42.7	44.7	**43.7**	**484**
7	**YSCN-24-7**	**Pitambari (LR)**	**3.9**	**4.1**	**4.6**	**4.4**	**44.5**	**44.5**	**43.7**	**44.2**	**539**
8	YSCN-24-8	YSKM 24-1	3.7	4.4	3.9	3.8	43.8	45.0	43.0	**43.9**	**522**
9	YSCN-24-9	RMYS-6	4.1	4.2	4.6	4.3	43.6	43.0	43.1	**43.2**	**439**
10	YSCN-24-10	Benoy (ZC)	3.0	4.5	3.2	3.2	43.4	43.2	43.9	**43.5**	**496**
11	YSCN-24-11	DRMRYS 24-3	3.5	4.1	4.6	4.4	43.3	44.2	43.0	**43.5**	**444**
12	YSCN-24-12	PYS-2020-3	3.9	4.1	4.1	3.7	43.4	45.0	43.2	**43.9**	**468**

Table 2.4a Performance of Yellow Sarson strains in AVT-I Zone-V (Repeat)

S.No.	Code	Strain	Seed Yield (kg/ha)						Plant Stand					Days to Maturity				
			SHL$	IMP	KNK#	KLN#	BHU#	Mean	SHL	IMP	KNK	KLN	BHU	SHL	IMP	KNK	KLN	BHU
			1	2	3	4	5	(2)	1	2	3	4	5	1	2	3	4	5
1	**YSCN-24-13**	**Pitambari (LR)**	1940	1772	870	1713	1048	**1772**	328	337	388	344	273	100	110	102	104	100
2	YSCN-24-14	PYS 2018-1	2014	1723	1025	1793	1285	**1723**	344	343	392	353	281	100	110	101	105	99
3	YSCN-24-15	Benoy (ZC)	1722	1042	794	1440	1116	**1042**	334	339	364	362	271	95	101	92	88	101
4	YSCN-24-16	Pitambari (filler)	1611	1653	994	1350	1172	**1653**	348	336	392	376	274	100	112	104	102	99
5	YSCN-24-17	YSH 401(NC)	1569	1714	831	1431	942	**1714**	350	335	384	377	268	100	108	99	103	102
		GM	**1771**	**1581**	**903**	**1545**	**1113**	**1581**										
		CD (5%)	248	250	76	277	123											
		CV (%)	9.1	10.2	5.5	11.7	7.2											
		DOS	16-11-24	30-10-24	25-10-24	30-10-24	31-10-24											

$ Data of SHL excluded from computation of mean due to significant difference in seed yield of same genotype being used as filler/check and also sowing after cut off date.
# Data of KNK, KLN and BHU excluded from computation of mean due to significant difference in seed yield of same genotype being used as filler/check

Table 2.4b Performance of Yellow Sarson strains in AVT-I Zone-V (Repeat)

S.No.	Code	Strain	1000 Seed Weight (g)					Oil Content (%)					Oil Yield (kg/ha)
			SHL	IMP	KNK	KLN	BHU	IMP	KNK	KLN	BHU	Mean	
			1	2	3	4	5	2	3	4	5	(2)	
1	**YSCN-24-13**	**Pitambari (LR)**	5.6	4.6	3.7	3.7	4.2	42.3	41.8	43.9	43.4	**42.3**	**749**
2	YSCN-24-14	PYS 2018-1	5.5	5.5	3.3	3.8	4.5	40.8	41.9	43.4	44.0	**40.8**	**704**
3	YSCN-24-15	Benoy (ZC)	5.0	4.4	2.9	2.8	4.3	41.7	42.0	41.2	44.0	**41.7**	**434**
4	YSCN-24-16	Pitambari (filler)	5.3	6.1	3.5	3.7	4.4	41.4	43.3	43.6	44.3	**41.4**	**685**
5	YSCN-24-17	YSH 401(NC)	5.5	5.9	3.5	4.2	4.2	42.2	42.7	42.6	44.3	**42.2**	**724**

Table 3.1a Performance of Early Indian mustard strains in IVT Zone-IV

S.No.	Code	Strain	Seed Yield (kg/ha)						Plant Stand				Days to maturity				
			SKN	NGP	MDR	JUG	Mean		SKN	NGP	MDR	JUG	SKN	NGP	MDR	JUG	Mean
			1	2	3	4	(1-4)		1	2	3	4	1	2	3	4	(1-4)
1	MCN (E)-24-01	NPJ 274	3040	1659	3080	2534	**2578**		165	113	168	179	118	103	115	91	**107**
2	**MCN (E)-24-02**	**DRMRHT-13-2**	**3412**	**1996**	**2656**	**2778**	**2710**	*	**169**	**115**	**166**	**176**	**116**	**104**	**118**	**98**	**109**
3	**MCN (E)-24-03**	**RH -2399-2**	**3435**	**1953**	**3015**	**2577**	**2745**	*	**173**	**119**	**168**	**176**	**116**	**104**	**118**	**98**	**109**
4	MCN (E)-24-04	Kesari 5113	3469	1846	2654	2840	**2702**		169	118	167	179	111	105	112	88	**104**
5	MCN (E)-24-05	GDM 4 (LR)	3567	1657	3451	2407	**2771**		175	116	164	177	116	105	118	102	**110**
6	MCN (E)-24-06	HUJM (E) 23-7	3554	1921	2802	2253	**2633**		164	122	166	178	120	106	120	104	**112**
7	**MCN (E)-24-07**	**RH 1999-18**	**3384**	**1587**	**2912**	**2704**	**2647**	**	**167**	**115**	**164**	**176**	**116**	**102**	**112**	**100**	**108**
8	**MCN (E)-24-08**	**DRMRCI-206**	**3381**	**1727**	**3235**	**2398**	**2685**	*	**171**	**119**	**167**	**178**	**117**	**104**	**114**	**101**	**109**
9	MCN (E)-24-09	**KMR(E) 24-1**	**3588**	**2019**	**3463**	**2543**	**2903**	*	**171**	**123**	**163**	**179**	**115**	**104**	**117**	**100**	**109**
10	MCN (E)-24-10	JD 6 (ZC)	3297	1782	2315	2562	**2489**		176	117	164	174	120	102	117	102	**110**
11	MCN (E)-24-11	PRE-2022-12	2678	1420	2537	2222	**2214**		170	121	166	178	116	98	112	87	**103**
12	MCN (E)-24-12	NJI 24-401	3558	1705	2609	2765	**2659**		180	120	163	173	115	101	112	104	**108**
13	**MCN (E)-24-13**	**PM 25 (NC)**	**2996**	**1440**	**2720**	**2512**	**2417**		**174**	**119**	**162**	**178**	**115**	**100**	**110**	**91**	**104**
14	MCN (E)-24-14	PRE-2022-6	2540	1695	2419	2531	**2296**		169	120	167	176	115	104	111	89	**105**
15	**MCN (E)-24-15**	**KMR(E) 24-2**	**3549**	**1515**	**3241**	**2485**	**2697**	*	**168**	**115**	**166**	**178**	**117**	**99**	**117**	**104**	**109**
16	MCN (E)-24-16	NPJ 275	2538	1586	2300	2454	**2219**		172	116	166	175	117	98	115	103	**108**
17	MCN (E)-24-17	DRMRHT-22-125	2533	1849	2498	2552	**2358**		169	121	166	178	117	103	117	102	**110**
18	**MCN (E)-24-18**	**Pro 5111 (hy. check)**	**3467**	**1656**	**2333**	**2972**	**2607**		**166**	**120**	**165**	**177**	**109**	**99**	**111**	**90**	**102**
		GM	**3221**	**1723**	**2791**	**2561**	**2574**										
		CD (5 %)	547	288	401	396											
		CV (%)	10.2	10.1	8.7	9.3											
		DOS	10/10/24	9/10/24	9/10/24	10/10/24											

* strains out yielding the best check with a margin of equal to or more than 10 percent over the best check on basis of seed yield
** strain out yielding the best check with a margin of equal to or more than 10% over the best check on the basis of oil yield.

Table 3.1b Performance of Early Indian mustard strains in IVT Zone-IV

S.No.	Code	Strain	1000 Seed Weight				Oil Content (%)					Oil Yield (kg/ha)
			SKN	NGP	MDR	JUG	SKN	NGP	MDR	JUG	Mean	
			1	2	3	4	1	2	3	4	(1-4)	
1	MCN (E)-24-01	NPJ 274	5.1	5.2	5.9	4.8	40.7	37.7	42.8	38.6	**39.9**	**1030**
2	**MCN (E)-24-02**	**DRMRHT-13-2**	**4.3**	**5.2**	**5.0**	**4.0**	**41.3**	**39.5**	**42.3**	**39.5**	**40.7**	**1102**
3	**MCN (E)-24-03**	**RH -2399-2**	**4.6**	**4.8**	**5.3**	**4.0**	**37.9**	**37.9**	**42.6**	**38.3**	**39.2**	**1076**
4	MCN (E)-24-04	Kesari 5113	4.0	5.0	4.2	3.4	41.5	38.7	42.9	38.8	**40.5**	**1093**
5	MCN (E)-24-05	GDM 4 (LR)	5.1	5.0	5.3	4.7	41.0	40.1	40.5	39.2	**40.2**	**1114**
6	MCN (E)-24-06	HUJM (E) 23-7	5.4	5.1	5.7	4.5	39.6	39.1	44.0	37.9	**40.2**	**1057**
7	**MCN (E)-24-07**	**RH 1999-18**	**4.7**	**4.7**	**4.8**	**4.2**	**41.7**	**39.4**	**42.6**	**40.2**	**41.0**	**1085**
8	**MCN (E)-24-08**	**DRMRCI-206**	**4.5**	**5.8**	**5.3**	**4.6**	**42.2**	**40.3**	**42.1**	**40.3**	**41.2**	**1107**
9	**MCN (E)-24-09**	**KMR(E) 24-1**	**4.3**	**4.9**	**4.9**	**4.1**	**40.4**	**40.6**	**41.6**	**39.2**	**40.4**	**1174**
10	MCN (E)-24-10	JD 6 (ZC)	4.3	5.8	5.3	4.2	40.9	40.4	41.7	39.9	**40.7**	**1014**
11	MCN (E)-24-11	PRE-2022-12	4.0	5.3	4.9	4.0	40.3	39.7	41.6	40.8	**40.6**	**899**
12	MCN (E)-24-12	NJI 24-401	4.6	5.6	5.2	4.3	41.6	37.4	42.1	38.7	**39.9**	**1062**
13	**MCN (E)-24-13**	**PM 25**	**4.4**	**4.4**	**5.4**	**4.6**	**41.1**	**37.1**	**40.5**	**40.2**	**39.7**	**960**
14	MCN (E)-24-14	PRE-2022-6	3.8	4.5	5.2	3.4	41.2	38.6	42.4	40.8	**40.8**	**936**
15	**MCN (E)-24-15**	**KMR(E) 24-2**	**4.4**	**4.5**	**5.5**	**4.5**	**40.0**	**39.4**	**41.4**	**40.9**	**40.4**	**1091**
16	MCN (E)-24-16	NPJ 275	4.2	4.5	5.3	4.3	40.6	38.8	40.4	39.2	**39.7**	**882**
17	MCN (E)-24-17	DRMRHT-22-125	4.5	5.0	6.0	4.6	39.4	38.5	41.1	38.6	**39.4**	**930**
18	MCN (E)-24-18	Pro 5111 (hy. check)	3.5	4.8	4.2	3.2	40.5	39.0	42.3	40.3	**40.5**	**1057**

Table 3.2a. Performance of Early Indian mustard strains in IVT Zone-V

S.No	Code	Strain	Seed Yield (Kg/ha)							Plant Stand				
			KNK	SHL$	KLN	DOL	VAR	Mean		KNK	SHL	KLN	DOL	VAR
			1	2	3	4	5	(1,3-5)		1	2	3	4	5
1	MCN (E)-24-01	NPJ 274	1398	2148	1501	1857	1475	**1558**		190	150	183	166	181
2	MCN (E)-24-02	DRMRHT-13-2	1580	2284	1411	1808	1767	**1641**		193	164	190	166	191
3	MCN (E)-24-03	RH -2399-2	1255	2451	1139	1870	2171	**1609**		188	153	187	164	187
4	**MCN (E)-24-04**	**Kesari 5113**	**1309**	**2148**	**2129**	**2841**	**1804**	**2021**	*	**193**	**158**	**192**	**166**	**177**
5	MCN (E)-24-05	NRCHB 101 (LR)	1178	2648	1635	1595	2240	**1662**		192	163	185	163	187
6	MCN (E)-24-06	HUJM (E) 23-7	1484	2185	1154	1946	2214	**1699**		195	150	169	160	181
7	MCN (E)-24-07	RH 1999-18	1349	2543	1091	1740	1822	**1501**		188	158	183	164	181
8	MCN (E)-24-08	DRMRCI-206	1219	2333	1379	1802	2067	**1617**		188	149	176	165	179
9	MCN (E)-24-09	KMR (E) 24-1	1402	2099	1754	1669	2151	**1744**		191	153	186	165	174
10	MCN (E)-24-10	JD 6 (ZC)	1172	1852	1349	1492	2023	**1509**		194	138	182	163	177
11	**MCN (E)-24-11**	**PRE-2022-12**	**1684**	**2568**	**1918**	**1791**	**1731**	**1781**	*	**198**	**170**	**185**	**169**	**181**
12	MCN (E)-24-12	NJI 24-401	1458	2407	1430	2034	2290	**1803**		185	167	192	161	171
13	**MCN (E)-24-13**	**PM 25 (NC)**	**1267**	**2068**	**2071**	**1480**	**1625**	**1611**		**182**	**141**	**192**	**167**	**159**
14	MCN (E)-24-14	PRE-2022-6	1343	2667	1220	1636	1399	**1399**		181	164	188	168	167
15	MCN (E)-24-15	KMR (E) 24-2	1505	2593	1260	1779	1943	**1622**		183	158	193	162	183
16	MCN (E)-24-16	NPJ 275	971	2272	1609	1923	1873	**1594**		183	158	198	165	159
17	MCN (E)-24-17	DRMRHT-22-125	1155	2222	1983	1773	1610	**1630**		188	167	182	167	162
18	**MCN (E)-24-18**	**Pro 5111 (hy. check)**	**1101**	**2648**	**1859**	**1916**	**1926**	**1701**		**174**	**177**	**183**	**164**	**173**
		GM	**1324**	**2341**	**1550**	**1831**	**1896**	**1650**						
		CD (5 %)	188	371	269	276	295							
		CV (%)	8.6	9.6	10.5	9.1	9.4							
		DOS	10-11-24	26-11-24	14-11-24	16-10-24	25-09-24							

$ Data of SHL excluded from computation of mean due to sowing after cut off date.

* Strain outyielding the best check by a margin of more than or equal to 10 percent on the basis of seed yield

Table 3.2b. Performance of Early Indian mustard strains in IVT Zone-V

S.No	Code	Strain	Days to Maturity						1000-Seed Wt.(g)					Oil Content (%)					Oil Yield (kg/ha)
			KNK	SHL	KLN	DOL	VAR	Mean	KNK	SHL	KLN	DOL	VAR	KNK	KLN	DOL	VAR	Mean	
			1	2	3	4	5	(1,3-5)	1	2	3	4	5	1	3	4	5	(1,3-5)	
1	MCN (E)-24-01	NPJ 274	105	98	90	119	106	**105**	4.3	6.0	4.8	4.2	5.6	40.7	35.8	40.9	40.6	**39.5**	**615**
2	MCN (E)-24-02	DRMRHT-13-2	107	102	102	121	115	**111**	3.8	4.8	3.6	3.9	5.0	41.4	37.3	40.8	39.4	**39.7**	**652**
3	MCN (E)-24-03	RH -2399-2	106	105	103	121	113	**111**	4.2	5.5	3.9	3.5	4.8	39.6	36.1	42.6	39.4	**39.4**	**634**
4	**MCN (E)-24-04**	**Kesari 5113**	**103**	**98**	**99**	**117**	**107**	**107**	**3.4**	**5.2**	**3.4**	**3.5**	**5.2**	**40.9**	**37.2**	**41.7**	**37.7**	**39.4**	**796**
5	MCN (E)-24-05	NRCHB 101 (LR)	108	105	106	127	120	**115**	5.1	6.5	4.6	4.8	5.2	41.8	36.7	42.9	42.5	**41.0**	**681**
6	MCN (E)-24-06	HUJM (E) 23-7	111	110	112	129	119	**118**	4.3	5.5	4.6	4.4	5.4	41.3	37.1	39.8	36.3	**38.6**	**656**
7	MCN (E)-24-07	RH 1999-18	107	100	112	121	113	**113**	3.8	5.8	3.7	3.4	5.3	39.6	37.6	41.9	37.7	**39.2**	**588**
8	MCN (E)-24-08	DRMRCI-206	109	107	105	126	119	**115**	4.4	6.4	4.4	4.1	4.9	40.4	37.0	41.4	39.0	**39.5**	**638**
9	MCN (E)-24-09	KMR (E) 24-1	108	108	109	124	111	**113**	4.6	4.9	4.1	3.5	4.7	40.6	37.7	39.4	41.9	**39.9**	**696**
10	MCN (E)-24-10	JD 6 (ZC)	109	108	109	126	118	**115**	3.9	5.1	3.6	3.8	5.2	40.7	38.1	42.3	40.8	**40.5**	**611**
11	**MCN (E)-24-11**	**PRE-2022-12**	**104**	**100**	**100**	**112**	**112**	**107**	**3.9**	**5.5**	**3.5**	**3.8**	**5.2**	**39.0**	**37.8**	**40.3**	**40.6**	**39.4**	**702**
12	MCN (E)-24-12	NJI 24-401	107	98	100	123	117	**112**	3.7	5.5	4.2	3.9	5.2	41.8	37.2	39.8	40.6	**39.8**	**718**
13	**MCN (E)-24-13**	**PM 25**	**106**	**98**	**97**	**118**	**105**	**106**	**3.8**	**5.7**	**4.1**	**3.9**	**5.0**	**40.6**	**38.8**	**40.2**	**41.3**	**40.2**	**648**
14	MCN (E)-24-14	PRE-2022-6	102	98	98	116	104	**105**	3.3	5.2	3.7	3.5	4.8	41.8	37.2	41.8	41.1	**40.5**	**566**
15	MCN (E)-24-15	KMR (E) 24-2	111	108	107	123	115	**114**	3.8	5.4	4.1	4.2	5.1	40.5	37.4	41.0	42.3	**40.3**	**654**
16	MCN (E)-24-16	NPJ 275	108	100	104	123	113	**112**	3.7	5.5	3.3	3.9	5.3	41.1	40.4	40.1	39.1	**40.2**	**640**
17	MCN (E)-24-17	DRMRHT-22-125	105	100	105	122	113	**111**	4.5	5.8	4.2	4.4	5.2	41.8	38.7	40.0	41.2	**40.4**	**659**
18	**MCN (E)-24-18**	**Pro 5111 (hy. check)**	**104**	**98**	**99**	**118**	**108**	**107**	**3.3**	**4.9**	**2.9**	**3.3**	**5.7**	**40.7**	**37.6**	**40.1**	**41.5**	**40.0**	**680**

Table 3.3a Performance of Early Indian mustard strains in IVT Zone-VI

S.No.	Code	Strain	Seed Yield (Kg/ha)					Plant Stand			
			IMP	PGT$	TPR	BMK	Mean	IMP	PGT	TPR	BMK
			1	2	3	4	(1,3-4)	1	2	3	4
1	MCN (E)-24-01	NPJ 274	1469	1335	1703	1252	**1475**	175	166	118	179
2	MCN (E)-24-02	DRMRHT-13-2	1023	1086	1490	1251	**1255**	175	173	116	201
3	MCN (E)-24-03	RH -2399-2	869	1193	1360	904	**1044**	178	179	114	198
4	MCN (E)-24-04	Kesari 5113	1633	1420	1803	1266	**1567**	179	176	115	198
5	MCN (E)-24-05	NRCHB 101 (LR)	1424	1253	1218	1121	**1254**	173	178	115	167
6	MCN (E)-24-06	HUJM (E) 23-7	1269	1074	1242	659	**1057**	175	179	116	190
7	MCN (E)-24-07	RH 1999-18	1005	1105	1526	1096	**1209**	178	169	114	197
8	MCN (E)-24-08	DRMRCI-206	991	1096	1596	1045	**1210**	179	173	107	193
9	MCN (E)-24-09	KMR (E) 24-1	957	1099	1223	1056	**1079**	174	172	107	190
10	MCN (E)-24-10	JD 6 (ZC)	1193	1290	1396	1263	**1284**	179	172	110	186
11	MCN (E)-24-11	PRE-2022-12	918	1136	1137	1193	**1083**	179	176	112	194
12	MCN (E)-24-12	NJI 24-401	1133	1173	1683	1243	**1353**	176	175	108	205
13	**MCN (E)-24-13**	**PM 25 (NC)**	**1533**	**1364**	**1399**	**1370**	**1434**	**180**	**171**	**107**	**177**
14	MCN (E)-24-14	PRE-2022-6	1456	1395	1537	1487	**1493**	174	171	108	187
15	MCN (E)-24-15	KMR (E) 24-2	1364	1407	1478	1245	**1362**	171	170	110	174
16	MCN (E)-24-16	NPJ 275	828	1012	1837	923	**1196**	179	173	109	202
17	MCN (E)-24-17	DRMRHT-22-125	1101	1130	1668	991	**1253**	178	179	110	162
18	**MCN (E)-24-18**	**Pro 5111 (hy. check)**	**1917**	**1543**	**1553**	**1361**	**1611**	**178**	**176**	**112**	**192**
		GM	**1227**	**1228**	**1492**	**1151**	**1290**				
		CD (5 %)	266	237	199	223					
		CV (%)	13.7	11.6	8.0	11.6					
		DOS	26-11-24	28-11-24	27-11-24	18-11-24					

$ data of PGT excluded from computation of mean due to rejection of trial by monitoring team.

Table 3.3b Performance of Early Indian mustard strains in IVT Zone-VI

S.No.	Code	Strain	Days to Maturity					1000 Seed Weight (g)				Oil Content (%)				Oil Yield (kg/ha)
			IMP	PGT	TPR	BMK	Mean	IMP	PGT	TPR	BMK	IMP	TPR	BMK	Mean	
			1	2	3	4	(1,3-4)	1	2	3	4	1	3	4	(1,3-4)	
1	MCN (E)-24-01	NPJ 274	119	120	110	112	**114**	5.9	5.6	4.5	5.2	38.4	38.5	37.6	**38.2**	**563**
2	MCN (E)-24-02	DRMRHT-13-2	119	118	111	114	**115**	5.2	5.8	4.5	4.4	39.0	40.6	40.0	**39.9**	**501**
3	MCN (E)-24-03	RH -2399-2	119	120	109	113	**114**	4.9	5.3	4.1	4.5	38.5	38.0	38.6	**38.4**	**401**
4	MCN (E)-24-04	Kesari 5113	118	118	111	114	**114**	4.5	5.2	4.3	4.7	37.2	37.7	37.3	**37.4**	**586**
5	MCN (E)-24-05	NRCHB 101 (LR)	120	119	112	116	**116**	6.0	5.9	3.4	5.8	38.2	39.4	38.4	**38.7**	**485**
6	MCN (E)-24-06	HUJM (E) 23-7	120	120	113	119	**118**	5.4	5.9	4.3	4.9	38.1	40.5	39.6	**39.4**	**416**
7	MCN (E)-24-07	RH 1999-18	120	118	111	115	**115**	5.5	5.2	3.8	4.5	37.6	38.8	40.1	**38.8**	**470**
8	MCN (E)-24-08	DRMRCI-206	118	119	111	116	**115**	6.1	5.7	4.4	5.1	38.1	38.4	38.1	**38.2**	**462**
9	MCN (E)-24-09	KMR (E) 24-1	120	120	112	118	**117**	5.4	5.5	3.9	4.4	37.3	41.1	39.4	**39.3**	**423**
10	MCN (E)-24-10	JD 6 (ZC)	120	119	111	116	**115**	5.3	4.9	4.1	4.4	38.7	38.3	40.1	**39.0**	**501**
11	MCN (E)-24-11	PRE-2022-12	118	118	105	114	**112**	5.5	5.4	4.0	4.0	38.0	37.9	38.2	**38.0**	**412**
12	MCN (E)-24-12	NJI 24-401	118	119	110	113	**114**	5.9	5.5	4.2	4.3	39.4	40.0	37.6	**39.0**	**528**
13	**MCN (E)-24-13**	**PM 25 (NC)**	**118**	**118**	**107**	**116**	**114**	**5.5**	**5.3**	**4.3**	**4.5**	**38.7**	**38.5**	**38.1**	**38.4**	**551**
14	MCN (E)-24-14	PRE-2022-6	117	119	104	116	**112**	4.4	5.3	4.4	3.9	40.3	40.9	38.4	**39.9**	**596**
15	MCN (E)-24-15	KMR (E) 24-2	120	119	109	121	**116**	5.4	5.2	4.2	4.2	37.1	42.8	38.5	**39.4**	**537**
16	MCN (E)-24-16	NPJ 275	119	120	108	122	**116**	5.3	5.3	4.1	4.0	38.4	39.6	39.4	**39.2**	**468**
17	MCN (E)-24-17	DRMRHT-22-125	119	120	110	122	**117**	5.9	5.6	4.3	4.6	40.4	41.1	40.0	**40.5**	**507**
18	**MCN (E)-24-18**	**Pro 5111 (hy. check)**	**116**	**117**	**110**	**114**	**114**	**4.4**	**4.7**	**4.2**	**3.5**	**40.3**	**38.1**	**39.6**	**39.3**	**634**

Table 3.4a Performance of Early Indian mustard strains in IVT Zone-VII

S.No.	Code	Strain	Seed Yield (Kg/ha)						Plant Stand			
			JAG	BHU	KNR	AKR$	Mean		JAG	BHU	KNR	AKR
			1	2	3	4	(1-3)		1	2	3	4
1	MCN (E)-24-01	NPJ 274	967	1372	785	1142	**1041**		166	142	232	170
2	MCN (E)-24-02	DRMRHT-13-2	916	1129	1161	1358	**1069**		161	146	226	192
3	MCN (E)-24-03	RH -2399-2	1072	995	796	1506	**954**		157	141	186	171
4	MCN (E)-24-04	Kesari 5113	641	1119	1360	1166	**1040**		140	145	256	195
5	**MCN (E)-24-05**	**NRCHB 101 (LR)**	**1483**	**932**	**860**	**1419**	**1092**		**164**	**143**	**186**	**179**
6	MCN (E)-24-06	HUJM (E) 23-7	1485	974	825	1543	**1095**		167	139	159	197
7	MCN (E)-24-07	RH 1999-18	782	1399	762	1265	**981**		157	147	167	194
8	MCN (E)-24-08	DRMRCI-206	663	1218	775	1438	**885**		178	148	150	169
9	**MCN (E)-24-09**	**KMR (E) 24-1**	**1479**	**1358**	**843**	**1728**	**1227**	*	**167**	**151**	**200**	**193**
10	MCN (E)-24-10	JD 6 (ZC)	1040	1036	770	1049	**949**		162	142	156	195
11	MCN (E)-24-11	PRE-2022-12	588	1140	810	1173	**846**		154	149	123	176
12	MCN (E)-24-12	NJI 24-401	1356	1219	952	1666	**1175**		165	140	144	179
13	MCN (E)-24-13	PM 25	691	1267	1276	1851	**1078**		160	142	203	169
14	MCN (E)-24-14	PRE-2022-6	848	1059	840	1481	**916**		157	151	169	182
15	**MCN (E)-24-15**	**KMR (E) 24-2**	**1486**	**1275**	**994**	**1450**	**1252**	*	**166**	**150**	**253**	**204**
16	MCN (E)-24-16	NPJ 275	701	1458	841	1142	**1000**		164	149	200	180
17	**MCN (E)-24-17**	**DRMRHT-22-125**	**1398**	**1165**	**1019**	**1413**	**1194**	*	**151**	**145**	**214**	**195**
18	MCN (E)-24-18	Pro 5111 (hy. check)	1489	1325	1473	1753	**1429**		151	152	231	197
		GM	**1060**	**1191**	**952**	**1419**	**1068**					
		CD (5 %)	212	123	166	366						
		CV (%)	12.0	6.2	10.5	15.6						
		DOS	19-10-24	14-11-24	15-11-24	15-11-24						

$ Data of AKR excluded from computation of mean due to high CV

* Strain outyielding the best check with a margin of more than or equal to 10% on the basis of seed yield

Table 3.4b Performance of Early Indian mustard strains in IVT Zone-VII

S.No.	Code	Strain	Days to Maturity					1000 Seed Weight (g)				Oil Content (%)					Oil Yield (kg/ha)
			JAG	BHU	KNR	AKR	Mean	JAG	BHU	KNR	AKR	JAG	BHU	KNR	AKR	Mean	
			1	2	3	4	(1-3)	1	2	3	4	1	2	3	4	(1-3)	
1	MCN (E)-24-01	NPJ 274	103	117	107	111	**109**	4.7	4.3	5.3	5.4	36.8	39.5	37.9	40.1	**38.1**	**396**
2	MCN (E)-24-02	DRMRHT-13-2	109	112	106	110	**109**	4.0	4.1	4.5	4.4	38.3	40.0	38.6	40.9	**39.0**	**416**
3	MCN (E)-24-03	RH -2399-2	97	113	115	108	**108**	4.0	4.2	5.2	4.8	37.6	38.6	38.1	40.5	**38.1**	**364**
4	MCN (E)-24-04	Kesari 5113	97	111	101	107	**103**	3.6	4.2	3.4	3.3	37.5	37.4	38.6	40.7	**37.9**	**394**
5	**MCN (E)-24-05**	**NRCHB 101 (LR)**	**105**	**114**	**112**	**108**	**110**	**5.0**	**4.3**	**5.0**	**5.9**	**38.5**	**38.4**	**38.1**	**41.0**	**38.3**	**418**
6	MCN (E)-24-06	HUJM (E) 23-7	110	110	117	109	**113**	4.9	4.4	4.5	5.5	37.4	38.4	37.5	40.6	**37.8**	**413**
7	MCN (E)-24-07	RH 1999-18	112	119	110	111	**114**	4.3	4.3	4.1	5.2	37.4	39.4	38.7	40.6	**38.5**	**378**
8	MCN (E)-24-08	DRMRCI-206	116	114	109	108	**113**	4.6	4.3	5.8	5.6	37.2	40.3	39.4	40.8	**39.0**	**345**
9	**MCN (E)-24-09**	**KMR (E) 24-1**	**106**	**117**	**114**	**107**	**112**	**4.1**	**4.4**	**5.1**	**3.9**	**38.5**	**40.4**	**38.8**	**40.4**	**39.2**	**481**
10	MCN (E)-24-10	JD 6 (ZC)	118	108	113	107	**113**	3.8	4.1	4.5	4.1	38.9	40.4	37.6	40.2	**38.9**	**369**
11	MCN (E)-24-11	PRE-2022-12	98	110	108	103	**105**	4.3	4.2	4.4	3.6	37.8	39.6	39.1	41.4	**38.8**	**329**
12	MCN (E)-24-12	NJI 24-401	107	115	110	104	**111**	4.2	4.1	5.4	5.0	37.1	39.0	36.7	40.4	**37.6**	**442**
13	MCN (E)-24-13	PM 25	106	119	107	107	**111**	4.2	4.2	5.3	5.0	38.8	37.6	39.5	40.7	**38.6**	**416**
14	MCN (E)-24-14	PRE-2022-6	97	115	106	104	**106**	4.0	4.1	4.1	4.0	37.4	37.4	38.6	41.3	**37.8**	**346**
15	**MCN (E)-24-15**	**KMR (E) 24-2**	**110**	**119**	**116**	**108**	**115**	**4.7**	**4.3**	**4.5**	**4.6**	**37.4**	**37.0**	**38.8**	**40.0**	**37.7**	**472**
16	MCN (E)-24-16	NPJ 275	107	124	112	109	**114**	4.3	4.2	4.2	4.2	38.1	37.4	38.4	41.0	**38.0**	**380**
17	**MCN (E)-24-17**	**DRMRHT-22-125**	**115**	**117**	**109**	**107**	**114**	**4.5**	**4.3**	**5.0**	**5.3**	**39.7**	**37.9**	**38.5**	**41.1**	**38.7**	**462**
18	MCN (E)-24-18	Pro 5111 (hy. check)	98	116	105	104	**106**	3.5	4.0	4.2	3.5	37.9	40.1	40.3	41.7	**39.4**	**564**

Table 3.5a. Performance of Early Indian mustard strains in AVT-I Zone-V

S.No.	Code	Strain	Seed Yield (Kg/ha)						Plant Stand					Days to Maturity					
			KNK$	SHL#	KLN	DOL$	VAR@	Mean	KNK	SHL	KLN	DOL	VAR	KNK	SHL	KLN	DOL	VAR	Mean
			1	2	3	4	5	(3)	1	2	3	4	5	1	2	3	4	5	(3)
1	MCN (E)-24-19	JD 6 (ZC)	1020	1447	1318	1528	1825	**1318**	373	327	354	332	378	109	114	110	123	115	**110**
2	MCN (E)-24-20	PM 25	1204	2002	1877	1568	1884	**1877**	374	343	366	338	387	106	108	99	117	110	**99**
3	MCN (E)-24-21	PM 25 (filler)	1009	2037	1857	1402	1851	**1857**	389	353	370	326	379	104	105	105	118	107	**105**
4	MCN (E)-24-22	420B296-01	1511	2616	1627	1722	2137	**1627**	382	346	365	334	392	107	102	105	117	106	**105**
5	MCN (E)-24-23	Pro 5111 (hy. Check)	1188	2280	1469	1758	1778	**1469**	399	340	383	337	387	104	102	99	116	109	**99**
6	MCN (E)-24-24	KMR (E) 22-2 &	1317	1736	1497	1533	2027	**1497**	368	334	334	326	394	111	112	115	126	117	**115**
7	MCN (E)-24-25	KMR (E) 23-1	1450	2292	1957	1566	1976	**1957**	397	350	352	323	387	108	114	107	122	114	**107**
8	MCN (E)-24-26	NRCHB 101 (LR)	1421	2477	1592	1576	2015	**1592**	394	354	352	330	379	110	117	110	126	120	**110**
		GM	**1265**	**2111**	**1649**	**1582**	**1937**	**1649**											
		CD (5 %)	105	267	285	115	NS												
		CV (%)	7.6	8.6	11.7	4.9	7.9												
		DOS	11-11-24	16-11-24	8-11-24	23-10-24	25-9-24												

& - repeat entry

$ Data of KNK and DOL excluded from computation of mean due to significant difference in seed yield of same genotype being used as filler/check and DOL also due to low CV.

Data of SHL excluded from computation of mean due to sowing after cut off date.

@ Data of VAR excluded from computation of mean due to non-significant data.

Table 3.5b. Performance of early Indian mustard strains in AVT-I Zone-V

S.No.	Code	Strain	1000-Seed Wt. (g)					Oil Content (%)					Oil Yield (kg/ha)
			KNK	SHL	KLN	DOL	VAR	KNK	KLN	DOL	VAR	Mean	
			1	2	3	4	5	1	3	4	5	(3)	
1	MCN (E)-24-19	JD 6 (ZC)	4.3	5.8	4.2	3.9	4.7	39.8	37.7	41.1	42.7	**37.7**	**496**
2	MCN (E)-24-20	PM 25	4.4	5.9	4.3	4.7	5.1	41.7	38.1	41.2	39.8	**38.1**	**715**
3	MCN (E)-24-21	PM 25 (filler)	3.8	5.7	4.5	4.3	5.3	42.2	37.1	41.5	40.5	**37.1**	**689**
4	MCN (E)-24-22	420B296-01	4.2	6.3	4.8	3.8	5.3	34.4	36.2	40.2	41.2	**36.2**	**588**
5	MCN (E)-24-23	Pro 5111 (hy. Check)	3.7	4.9	3.3	3.0	4.3	40.6	37.4	39.3	40.5	**37.4**	**549**
6	MCN (E)-24-24	KMR (E) 22-2	4.3	5.5	3.9	3.8	4.8	41.0	38.9	40.0	41.4	**38.9**	**583**
7	MCN (E)-24-25	KMR (E) 23-1	4.5	5.4	4.3	5.0	5.7	40.8	37.8	40.2	40.1	**37.8**	**741**
8	MCN (E)-24-26	NRCHB 101 (LR)	4.4	6.3	5.1	4.0	5.9	41.7	37.0	40.2	40.5	**37.0**	**589**

Table 3.6a. Performance of Early Indian mustard strains in AVT-I Zone-VI

S.No.	Code	Strain	Seed Yield (Kg/ha)					Plant Stand				Days to Maturity				
			IMP	PGT$	TPR	BMK#	Mean	IMP	PGT	TPR	BMK	IMP	PGT	TPR	BMK	Mean
			1	2	3	4	(1, 3)	1	2	3	4	1	2	3	4	(1,3)
1	MCN (E)-24-27	JD 6 (ZC)	1036	968	1548	1525	**1292**	339	337	445	322	116	112	113	116	**114**
2	MCN (E)-24-28	DRMRHT 18-65	1218	1296	1405	1047	**1311**	353	339	443	323	116	113	110	116	**113**
3	**MCN (E)-24-29**	**PM 25 (NC)**	**1349**	**1127**	**1481**	**645**	**1415**	**349**	**347**	**458**	**321**	**116**	**115**	**112**	**113**	**114**
4	MCN (E)-24-30	NRCHB 101 (filler)	1142	1118	1397	525	**1269**	342	329	450	312	116	116	110	109	**113**
5	**MCN (E)-24-31**	**Pro 5111 (hy. Check)**	**1573**	**1205**	**1425**	**846**	**1499**	**358**	**348**	**435**	**322**	**112**	**116**	**109**	**105**	**111**
6	MCN (E)-24-32	420B296-01	1632	1421	1677	1498	**1654**	359	349	456	321	113	116	116	109	**114**
7	MCN (E)-24-33	NRCHB 101 (LR)	1113	1035	1530	1240	**1321**	347	331	449	327	115	116	111	112	**113**
		GM	**1295**	**1167**	**1495**	**1046**	**1395**									
		CD (5 %)	221	228	142	170										
		CV (%)	11.5	13.2	6.4	10.9										
		DOS	27-11-24	29-11-24	28-11-24	15-11-24										

$ Data of PGT excluded from computation of mean due to rejection of trial by monitoring team.

Data of BMK excluded from computation of mean due to significant difference in seed yield of same genotype being used as filler/check.

Table 3.6b. Performance of Early Indian mustard strains in AVT-I Zone-VI

S.No.	Code	Strain	1000-Seed Wt. (g)				Oil Content (%)				Oil Yield (kg/ha)
			IMP	PGT	TPR	BMK	IMP	TPR	BMK	Mean	
			1	2	3	4	1	3	4	(1,3)	
1	MCN (E)-24-27	JD 6 (ZC)	5.1	4.8	4.3	4.6	38.5	39.0	37.3	**38.8**	**501**
2	MCN (E)-24-28	DRMRHT 18-65	5.1	5.2	4.0	4.8	37.0	39.1	38.6	**38.1**	**499**
3	**MCN (E)-24-29**	**PM 25 (NC)**	**5.0**	**5.0**	**4.2**	**4.9**	**37.6**	**40.0**	**36.9**	**38.8**	**549**
4	MCN (E)-24-30	NRCHB 101 (filler)	6.3	6.1	4.0	5.2	38.5	38.5	37.6	**38.5**	**489**
5	**MCN (E)-24-31**	**Pro 5111 (hy. Check)**	**4.2**	**4.6**	**4.0**	**3.9**	**37.1**	**38.0**	**38.0**	**37.6**	**563**
6	MCN (E)-24-32	420B296-01	5.2	5.2	4.4	5.1	37.9	39.4	40.1	**38.6**	**639**
7	MCN (E)-24-33	NRCHB 101 (LR)	6.1	6.1	4.2	5.3	38.6	40.9	37.3	**39.8**	**526**

Table 3.7a. Performance of Early Indian mustard strains in AVT-I Zone-VII

S.No.	Code	Strain	Seed Yield (Kg/ha)						Plant Stand					Days to Maturity					
			JAG	BHU	KNR#	BLR$	AKR$	Mean	JAG	BHU	KNR	BLR	AKR	JAG	BHU	KNR	BLR	AKR	Mean
			1	2	3	4	5	(1-2)	1	2	3	4	5	1	2	3	4	5	(1-2)
1	MCN (E)-24-34	JD 6 (ZC)	1328	1565	1350	878	1289	**1446**	160	279	275	164	293	110	111	118	86	81	**111**
2	MCN (E)-24-35	PM 25 (NC)	1234	1391	1529	611	1133	**1313**	155	271	317	163	281	110	108	106	79	99	**109**
3	MCN (E)-24-36	JD 6 (filler)	1330	1423	1058	783	1440	**1377**	153	273	315	161	308	116	110	118	86	104	**113**
4	MCN (E)-24-37	KMR (E) 23-1	1585	1559	1170	698	1168	**1572**	172	268	299	176	310	112	111	105	81	103	**111**
5	MCN (E)-24-38	NRCHB 101 (LR)	1713	1254	1172	858	1540	**1484**	166	265	261	179	322	118	117	113	84	105	**118**
		GM	**1438**	**1438**	**1256**	**765**	**1314**	**1438**											
		CD (5 %)	265	144	197	146	183												
		CV (%)	12.0	6.5	10.2	10.1	9.1												
		DOS	21/10/24	14-11.24	14-11-24	21-11-24	20-11-24												

Data of KNR excluded from computation of mean due to significant difference in seed yield of same genotype being used as filler/check.

$ Data of BLR and AKR excluded from computation of mean due to sowing after cut off date.

Table 3.7b. Performance of early Indian mustard strains in AVT-I Zone-VII

S.No.	Code	Strain	1000-Seed Wt. (g)					Oil Content (%)					Oil Yield (kg/ha)
			JAG	BHU	KNR	BLR	AKR	JAG	BHU	KNR	AKR	Mean	
			1	2	3	4	5	1	2	3	5	(1-2)	
1	MCN (E)-24-34	JD 6 (ZC)	4.2	4.2	4.2	4.2	4.6	37.4	40.3	40.9	39.6	**38.9**	**562**
2	MCN (E)-24-35	PM 25 (NC)	4.1	4.5	4.3	4.7	4.4	38.6	38.5	42.1	40.6	**38.5**	**506**
3	MCN (E)-24-36	JD 6 (filler)	4.1	4.2	3.8	3.7	3.7	39.8	38.0	40.4	39.2	**38.9**	**536**
4	MCN (E)-24-37	KMR (E) 23-1	4.3	4.3	4.2	3.9	3.9	40.3	37.5	40.8	41.0	**38.9**	**611**
5	MCN (E)-24-38	NRCHB 101 (LR)	5.0	4.4	5.1	5.3	5.3	39.8	37.3	39.7	39.5	**38.5**	**572**

Table 3.8a. Performance of Indian mustard strains in IVT Timely Sown (Irrigated), Zone - I

S.No.	Code	Strain	Seed Yield (kg/ha)							Plant Stand					Days to Maturity				
			KNG#	CHT	PNT	DLK	UNA#	Mean		KNG	CHT	PNT	DLK	UNA	KNG	CHT	PNT	DLK	UNA
			1	2	3	4	5	(2-4)		1	2	3	4	5	1	2	3	4	5
1	MCN-24-1	TM 416	929	1846	1781	1271	1198	**1633**		85	149	138	136	344	154	143	131	138	137
2	MCN-24-2	PYR-2018-1	833	2355	1742	917	1047	**1672**		83	140	153	135	341	161	149	136	148	146
3	MCN-24-3	ORM 2019-31	1148	2505	1615	954	958	**1692**		86	130	175	136	345	160	142	133	142	142
4	MCN-24-4	DRMRCI 195	1280	2043	1948	784	1075	**1591**		84	136	135	135	344	158	143	137	143	141
5	MCN-24-5	KMR 24-4	1094	2208	1893	1166	1202	**1756**		86	135	145	138	345	156	141	138	139	138
6	**MCN-24-6**	**SKM 2209**	**1481**	**2152**	**2431**	**1307**	**1167**	**1963**	*	**86**	**127**	**143**	**137**	**344**	**155**	**148**	**133**	**142**	**139**
7	MCN-24-7	RL-19-162	1307	2301	1524	1031	1079	**1619**		85	127	159	135	347	157	148	140	148	145
8	MCN-24-8	RKM 460	1074	1973	1808	691	972	**1491**		85	141	147	137	343	158	147	131	143	139
9	MCN-24-9	RGN 593	1477	2471	1861	1039	1295	**1791**		85	141	146	133	342	157	146	131	144	141
10	MCN-24-10	RH 2399-6	1258	2247	1638	988	1003	**1624**		84	138	155	135	343	152	145	133	139	138
11	MCN-24-11	SKM 2206	1158	2331	2028	955	998	**1771**		86	133	141	137	339	155	147	132	140	138
12	MCN-24-12	NPJ 279	1410	2296	2112	1036	1295	**1815**		83	138	148	137	344	154	144	136	144	143
13	MCN-24-13	DRMRIJ 21-57	1219	2326	2017	1039	1297	**1794**		87	128	122	135	341	152	147	132	140	138
14	**MCN-24-14**	**RL-19-237**	**1360**	**2650**	**2233**	**1011**	**1127**	**1965**	*	**86**	**131**	**157**	**135**	**343**	**156**	**145**	**133**	**142**	**139**
15	MCN-24-15	Kranti (NC)	875	1827	1815	888	1118	**1510**		86	135	141	136	340	154	145	131	140	138
16	MCN-24-16	HUJM-23-12	1426	2012	1757	867	990	**1545**		88	128	163	135	343	159	148	134	143	140
17	MCN-24-17	ACN-231	1071	2043	2215	1221	1321	**1826**		88	134	152	135	346	159	149	139	144	141
18	MCN-24-18	PR-2020-16	1466	2501	2067	980	1064	**1849**		85	126	150	135	345	159	146	140	145	142
19	**MCN-24-19**	**CS 2009-219**	**1321**	**2595**	**2439**	**1096**	**1086**	**2043**	*	**83**	**140**	**148**	**134**	**343**	**157**	**148**	**138**	**144**	**143**
20	MCN-24-20	18-52	1484	1894	1849	775	1208	**1506**		85	135	125	134	344	155	142	135	141	139
21	MCN-24-21	NPJ 278	1383	2096	1708	1038	1173	**1614**		86	136	163	133	341	159	148	133	143	140
22	MCN-24-22	RH 2263	1352	2191	2014	1141	1299	**1782**		86	101	139	135	344	154	144	136	138	138
23	MCN-24-23	KMR 24-3	1356	2464	1407	1300	1323	**1724**		85	131	166	136	346	159	146	134	149	143
24	**MCN-24-24**	**AKMS-1003-50**	**1354**	**2351**	**2385**	**1188**	**1333**	**1975**	*	**86**	**133**	**151**	**136**	**343**	**159**	**149**	**138**	**148**	**145**
25	MCN-24-25	RH 1975 (LR)	1460	2397	1726	966	917	1696		84	144	139	137	343	161	142	133	147	144
26	MCN-24-26	**RB-118**	**1504**	**2351**	**2855**	**1269**	**1347**	**2158**	*	**86**	**135**	**135**	**136**	**342**	**156**	**146**	**141**	**144**	**143**
27	**MCN-24-27**	**RCC 4 (ZC)**	**1048**	**2381**	**1508**	**1298**	**1151**	**1729**		**85**	**126**	**172**	**137**	**343**	**162**	**148**	**138**	**149**	**146**
28	MCN-24-28	DRMR 2022-4	1357	2245	2112	1194	1121	**1850**		86	140	146	135	346	158	142	132	144	139
		GM	**1267**	**2252**	**1946**	**1050**	**1149**	**1749**											
		CD (5%)	143	423	395	254	117												
		CV(%)	6.9	11.4	12.3	14.7	6.2												
		DOS	19-10-24	09/10/24	20-10-24	28-10-24	25-10-24												

#Data of KNG & UNA excluded from computation of mean due to unappropriate plant population.

* strain out yielding the best check with a margin of equal to or more than 10% over the best check on the basis of seed yield.

Table 3.8b. Performance of Indian mustard strains in IVT Timely Sown (Irrigated), Zone - I

S.No.	Code	Strain	1000 Seed Wt. (g)					Oil Content (%)						Oil Yield (kg/ha)
			KNG	CHT	PNT	DLK	UNA	KNG	CHT	PNT	DLK	UNA	Mean	
			1	2	3	4	5	1	2	3	4	5	(2-4)	
1	MCN-24-1	TM 416	5.4	3.8	4.4	2.8	4.5	39.7	37.4	42.2	38.6	42.0	**39.4**	**643**
2	MCN-24-2	PYR-2018-1	5.0	3.8	3.8	2.9	4.3	40.4	41.8	42.5	43.4	42.8	**42.6**	**711**
3	MCN-24-3	ORM 2019-31	4.2	3.6	3.4	2.5	3.7	42.5	37.1	40.8	39.8	40.5	**39.2**	**664**
4	MCN-24-4	DRMRCI 195	6.2	4.5	4.7	3.3	5.6	41.3	38.5	42.5	38.7	43.0	**39.9**	**635**
5	MCN-24-5	KMR 24-4	4.4	3.8	3.6	3.0	4.0	42.5	40.7	43.8	40.5	41.4	**41.7**	**732**
6	**MCN-24-6**	**SKM 2209**	**4.9**	**4.0**	**4.3**	**3.1**	**4.6**	**42.3**	**39.5**	**43.1**	**41.2**	**43.1**	**41.3**	**810**
7	MCN-24-7	RL-19-162	5.6	4.5	4.4	2.8	5.8	42.8	38.9	40.9	42.6	41.6	**40.8**	**660**
8	MCN-24-8	RKM 460	4.7	3.6	3.7	2.6	4.0	43.0	40.6	42.5	39.8	42.1	**40.9**	**610**
9	MCN-24-9	RGN 593	5.0	3.7	4.0	3.3	5.1	43.1	40.4	41.8	39.4	42.2	**40.5**	**726**
10	MCN-24-10	RH 2399-6	5.0	4.3	4.2	3.7	5.1	42.1	38.8	41.0	38.4	39.9	**39.4**	**640**
11	MCN-24-11	SKM 2206	5.2	3.7	4.0	2.9	5.0	42.6	38.3	41.5	39.7	42.1	**39.8**	**705**
12	MCN-24-12	NPJ 279	6.0	4.6	4.7	3.1	5.5	42.3	41.3	42.7	39.4	40.9	**41.1**	**746**
13	MCN-24-13	DRMRIJ 21-57	5.9	5.3	5.2	3.3	6.1	41.5	40.6	43.7	39.4	43.1	**41.2**	**740**
14	**MCN-24-14**	**RL-19-237**	**5.5**	**4.0**	**4.2**	**2.9**	**4.9**	**42.3**	**40.9**	**42.3**	**42.0**	**42.1**	**41.7**	**819**
15	MCN-24-15	Kranti (NC)	4.3	3.7	4.0	2.8	4.2	42.2	37.2	41.5	40.7	42.2	**39.8**	**601**
16	MCN-24-16	HUJM-23-12	5.7	4.2	4.4	3.1	5.6	40.5	39.0	42.5	37.3	38.2	**39.6**	**612**
17	MCN-24-17	ACN-231	4.7	4.1	3.3	2.7	3.7	40.6	37.0	41.3	39.6	41.4	**39.3**	**718**
18	MCN-24-18	PR-2020-16	5.5	4.6	5.0	4.1	6.3	40.6	39.9	41.7	40.4	41.3	**40.7**	**752**
19	**MCN-24-19**	**CS 2009-219**	**5.7**	**4.4**	**4.4**	**3.2**	**5.7**	**42.8**	**42.1**	**40.7**	**42.7**	**40.0**	**41.9**	**855**
20	MCN-24-20	18-52	4.9	4.1	4.4	2.9	5.2	41.8	39.2	40.1	38.4	40.9	**39.2**	**591**
21	MCN-24-21	NPJ 278	5.0	4.2	4.0	3.2	5.1	41.8	41.6	39.9	41.1	42.8	**40.8**	**659**
22	MCN-24-22	RH 2263	6.6	4.7	5.2	3.5	6.2	41.7	40.8	43.1	42.5	41.3	**42.1**	**751**
23	MCN-24-23	KMR 24-3	4.4	4.3	3.9	2.9	4.5	41.9	40.6	39.5	39.0	42.0	**39.7**	**684**
24	**MCN-24-24**	**AKMS-1003-50**	**6.4**	**5.7**	**5.7**	**4.5**	**6.1**	**42.9**	**40.1**	**40.6**	**40.8**	**42.1**	**40.5**	**800**
25	MCN-24-25	RH 1975 (LR)	5.7	4.5	4.6	4.4	6.1	41.1	38.6	43.3	42.3	40.1	41.4	703
26	**MCN-24-26**	**RB-118**	**5.5**	**4.6**	**4.6**	**4.4**	**5.3**	**40.4**	**37.1**	**43.0**	**37.7**	**42.6**	**39.2**	**847**
27	**MCN-24-27**	**RCC 4 (ZC)**	**3.9**	**4.0**	**2.5**	**2.7**	**3.6**	**40.4**	**41.1**	**42.8**	**39.3**	**42.2**	**41.1**	**710**
28	MCN-24-28	DRMR 2022-4	5.1	4.8	5.2	3.7	6.4	39.4	40.1	40.7	40.1	42.5	**40.3**	**746**

Table 3.9a. Performance of Indian mustard strains in IVT Timely Sown (Irrigated), Zone - II

S.No.	Code	Strain	Seed Yield (Kg/ha)								Plant Stand						
			ABR	BWL	LDH	HSR	NDH	MOD$	ALW	Mean	ABR	BWL	LDH	HSR	NDH	MOD	ALW
			1	2	3	4	5	6	7	(1-5,7)	1	2	3	4	5	6	7
1	MCN-24-1	TM 416	1927	2722	1710	2447	2335	1748	1723	**2144**	128	123	126	113	148	122	117
2	MCN-24-2	PYR-2018-1	2326	2411	2579	2858	2751	2793	1852	**2463**	135	122	140	113	148	101	115
3	MCN-24-3	ORM 2019-31	2319	2194	2098	2477	2472	1731	1578	**2190**	133	116	132	115	155	95	116
4	MCN-24-4	DRMRCI 195	2240	2391	2309	2562	2405	2555	2173	**2347**	127	125	122	114	146	90	116
5	MCN-24-5	KMR 24-4	2073	2548	2307	2946	2737	2270	1711	**2387**	133	121	132	116	142	124	113
6	MCN-24-6	SKM 2209	2909	2259	2254	3398	3110	2433	1976	**2651**	132	115	132	117	148	125	114
7	MCN-24-7	RL-19-162	2721	2083	2545	2986	3100	2046	1260	**2449**	131	113	135	116	149	61	115
8	MCN-24-8	RKM 460	2441	2348	2373	3122	2817	2144	2296	**2566**	128	121	130	114	146	78	117
9	MCN-24-9	RGN 593	2423	2587	2599	3085	2823	2547	1903	**2570**	125	115	125	113	151	126	114
10	MCN-24-10	RH 2399-6	2932	2879	2283	3296	3040	2178	2582	**2835**	136	117	130	115	144	124	113
11	MCN-24-11	SKM 2206	2515	1957	2608	2733	2823	2117	1896	**2422**	126	115	128	114	144	99	115
12	MCN-24-12	NPJ 279	3130	2234	2613	3436	3089	2759	1606	**2685**	133	129	131	115	146	95	114
13	MCN-24-13	DRMRIJ 21-57	2727	2216	2477	2901	2833	2761	2283	**2573**	137	115	136	114	147	110	114
14	MCN-24-14	RL-19-237	2602	2390	2109	2911	3042	2726	2106	**2527**	126	116	128	112	153	126	113
15	MCN-24-15	Kranti (NC)	2547	2515	1716	2940	2819	1881	1668	**2367**	134	124	137	114	156	95	112
16	MCN-24-16	HUJM-23-12	2288	2343	2459	2981	2909	1941	2696	**2613**	134	122	134	115	155	98	114
17	MCN-24-17	ACN-231	2291	2164	1962	2914	2636	1800	1972	**2323**	131	113	133	115	156	81	117
18	MCN-24-18	PR-2020-16	2970	2408	2561	3222	2847	2017	1840	**2641**	137	117	136	115	153	105	116
19	MCN-24-19	CS 2009-219	2472	1820	2542	3286	2776	2514	1292	**2365**	127	113	129	114	163	120	115
20	MCN-24-20	18-52	2459	2474	2619	2978	2588	1953	1871	**2498**	133	123	132	115	155	78	115
21	MCN-24-21	NPJ 278	3009	2222	2537	3491	3268	2642	2236	**2794**	135	114	135	115	150	125	115
22	MCN-24-22	RH 2263	3022	2723	2672	3651	3361	2701	1928	**2893**	136	120	132	113	147	128	115
23	MCN-24-23	KMR 24-3	2532	2621	2429	3060	2560	2350	2241	**2574**	138	121	134	113	153	109	112
24	MCN-24-24	AKMS-1003-50	2171	2323	2519	2666	2663	2328	1603	**2324**	127	115	119	113	161	108	117
25	**MCN-24-25**	**RH 1975 (LR)**	**2821**	**2591**	**2616**	**3262**	**2848**	**2431**	**1878**	**2670**	**129**	**116**	**130**	**114**	**150**	**116**	**115**
26	MCN-24-26	RB-118	2884	2097	2374	3160	3205	2279	1965	**2614**	127	116	142	117	155	93	115
27	MCN-24-27	RH 749 (ZC)	2621	2355	2245	3068	2593	2132	2286	**2528**	136	118	135	116	159	103	116
28	MCN-24-28	DRMR 2022-4	2341	2004	2421	2732	2585	2252	1949	**2339**	130	118	132	115	158	108	115
		GM	**2561**	**2353**	**2376**	**3020**	**2823**	**2287**	**1942**	**2512**							
		CD (5%)	392	369	353	611	388	691	339								
		CV(%)	9.3	9.5	9.0	12.3	8.4	18.4	10.6								
		DOS	26-10-24	22-10-24	16-10-24	12/10/24	15-10-24	30-10-24	21-10-24								

$Data of MOD excluded from computation of mean due to high C.V and also rejected by monitoring team.

Table 3.9b. Performance of Indian mustard strains in IVT Timely Sown (Irrigated), Zone - II

S.No.	Code	Strain	Days to Maturity							1000 Seed Weight (g)						
			ABR	BWL	LDH	HSR	NDH	MOD	ALW	ABR	BWL	LDH	HSR	NDH	MOD	ALW
			1	2	3	4	5	6	7	1	2	3	4	5	6	7
1	MCN-24-1	TM 416	140	131	142	140	140	140	144	5.3	5.8	4.9	5.3	4.5	5.1	4.5
2	MCN-24-2	PYR-2018-1	143	135	146	145	143	137	140	5.9	4.3	4.5	4.7	4.0	4.7	4.1
3	MCN-24-3	ORM 2019-31	144	136	144	146	145	144	145	5.0	4.2	5.7	3.8	3.6	4.1	3.2
4	MCN-24-4	DRMRCI 195	143	136	143	143	144	138	145	6.1	5.4	6.4	5.9	5.5	5.3	4.6
5	MCN-24-5	KMR 24-4	144	135	141	141	145	142	144	4.2	4.3	4.4	4.5	4.1	4.1	4.2
6	MCN-24-6	SKM 2209	141	134	143	140	143	137	144	5.4	4.3	5.2	5.2	5.0	4.9	4.5
7	MCN-24-7	RL-19-162	145	135	146	142	142	139	139	6.0	4.6	5.2	5.4	5.2	4.6	4.8
8	MCN-24-8	RKM 460	145	137	145	142	144	140	144	5.9	5.4	4.3	5.1	4.4	4.6	3.8
9	MCN-24-9	RGN 593	146	137	147	151	148	142	146	4.6	4.2	6.3	5.4	4.8	4.9	4.4
10	MCN-24-10	RH 2399-6	142	134	145	140	143	142	143	5.3	5.6	5.2	5.4	4.9	4.6	4.5
11	MCN-24-11	SKM 2206	144	137	144	142	145	143	142	5.6	4.2	5.2	5.8	5.0	4.4	4.6
12	MCN-24-12	NPJ 279	144	140	144	140	144	139	145	6.1	5.3	6.0	5.6	5.6	5.0	5.1
13	MCN-24-13	DRMRIJ 21-57	144	134	145	143	144	138	143	4.8	5.5	6.2	6.1	5.5	6.4	5.2
14	MCN-24-14	RL-19-237	146	135	145	149	145	142	144	6.1	4.3	4.9	5.3	4.9	5.2	4.5
15	MCN-24-15	Kranti (NC)	144	132	145	138	136	141	139	5.6	4.5	5.3	4.6	4.5	3.9	3.9
16	MCN-24-16	HUJM-23-12	144	132	143	142	143	140	141	5.1	5.4	6.4	5.0	4.7	4.2	4.6
17	MCN-24-17	ACN-231	147	139	146	152	152	145	145	5.9	4.2	5.3	4.4	3.5	4.6	3.7
18	MCN-24-18	PR-2020-16	146	136	142	141	146	142	143	6.3	4.1	6.1	6.6	6.0	6.6	5.1
19	MCN-24-19	CS 2009-219	146	134	142	142	145	142	144	4.6	4.4	5.8	6.1	5.1	5.7	4.8
20	MCN-24-20	18-52	140	131	140	142	142	143	139	5.0	5.3	5.9	5.9	5.2	5.0	4.5
21	MCN-24-21	NPJ 278	143	137	144	144	144	140	143	5.6	4.3	5.5	5.5	5.2	5.4	4.4
22	MCN-24-22	RH 2263	144	134	143	146	145	139	142	7.0	5.2	6.6	6.2	6.2	6.7	5.0
23	MCN-24-23	KMR 24-3	145	132	144	146	147	140	146	6.0	5.4	4.9	5.2	4.4	4.8	4.1
24	MCN-24-24	AKMS-1003-50	145	135	146	144	149	141	144	6.1	4.4	6.5	6.9	5.8	5.6	5.2
25	**MCN-24-25**	**RH 1975 (LR)**	**143**	**136**	**141**	**140**	**148**	**141**	**144**	**5.4**	**5.4**	**6.2**	**6.2**	**5.7**	**5.5**	**4.3**
26	MCN-24-26	RB-118	145	137	144	144	147	141	144	4.7	4.7	6.6	6.0	5.6	6.2	5.0
27	MCN-24-27	RH 749 (ZC)	146	137	147	147	151	142	145	6.1	5.9	6.9	6.7	6.1	5.5	4.3
28	MCN-24-28	DRMR 2022-4	140	135	140	140	139	135	144	5.9	4.6	6.8	5.8	5.5	5.4	5.2

Table 3.9c. Performance of Indian mustard strains in IVT Timely Sown (Irrigated), Zone - II

S.No.	Code	Strain	Oil Content (%)								Oil Yield (kg/ha)
			ABR	BWL	LDH	HSR	NDH	MOD	ALW	Mean	
			1	2	3	4	5	6	7	(1-5,7)	
1	MCN-24-1	TM 416	38.66	40.6	39.1	39.8	41.7	37.9	41.9	**40.3**	**864**
2	MCN-24-2	PYR-2018-1	43.3	38.8	40.9	41.2	43.0	40.7	42.9	**41.7**	**1026**
3	MCN-24-3	ORM 2019-31	40.41	42.7	37.2	39.7	40.4	37.5	43.6	**40.7**	**891**
4	MCN-24-4	DRMRCI 195	41.71	41.2	42.4	38.7	42.0	38.1	42.1	**41.4**	**971**
5	MCN-24-5	KMR 24-4	41.83	41.7	38.0	39.0	41.5	37.7	40.6	**40.4**	**965**
6	MCN-24-6	SKM 2209	42.42	42.6	43.9	39.8	42.3	37.7	42.6	**42.3**	**1120**
7	MCN-24-7	RL-19-162	42.16	41.3	39.7	39.5	40.3	37.0	40.4	**40.6**	**993**
8	MCN-24-8	RKM 460	42.2	40.6	41.5	40.7	42.3	37.7	39.3	**41.1**	**1054**
9	MCN-24-9	RGN 593	44.3	40.6	39.5	38.8	41.5	38.4	41.1	**41.0**	**1052**
10	MCN-24-10	RH 2399-6	41.8	42.4	41.6	41.5	42.3	40.6	42.4	**42.0**	**1190**
11	MCN-24-11	SKM 2206	42.9	42.3	41.7	41.2	41.4	39.5	40.4	**41.6**	**1008**
12	MCN-24-12	NPJ 279	42.4	43.1	42.7	42.8	40.3	38.3	38.7	**41.7**	**1118**
13	MCN-24-13	DRMRIJ 21-57	42.7	40.8	42.7	43.9	42.8	41.3	42.3	**42.5**	**1094**
14	MCN-24-14	RL-19-237	42.4	42.0	42.9	42.9	43.1	40.2	40.4	**42.3**	**1068**
15	MCN-24-15	Kranti (NC)	43.7	40.1	40.1	40.4	41.3	37.3	39.9	**40.9**	**969**
16	MCN-24-16	HUJM-23-12	39.1	41.6	39.1	38.9	41.0	36.5	42.7	**40.4**	**1055**
17	MCN-24-17	ACN-231	40.6	39.6	38.6	40.7	39.5	38.4	42.7	**40.3**	**935**
18	MCN-24-18	PR-2020-16	40.6	41.6	41.5	42.0	39.2	37.9	40.6	**40.9**	**1081**
19	MCN-24-19	CS 2009-219	38.9	43.0	40.3	41.0	43.1	37.6	42.3	**41.4**	**980**
20	MCN-24-20	18-52	43.3	39.2	43.0	41.6	40.4	41.2	40.4	**41.3**	**1032**
21	MCN-24-21	NPJ 278	42.7	42.7	42.7	41.5	42.2	39.9	42.4	**42.4**	**1183**
22	MCN-24-22	RH 2263	40.0	42.2	42.0	41.5	42.5	39.5	42.1	**41.7**	**1207**
23	MCN-24-23	KMR 24-3	42.0	40.1	37.9	42.1	42.8	37.1	40.4	**40.9**	**1052**
24	MCN-24-24	AKMS-1003-50	41.5	41.9	39.4	40.8	42.7	39.6	39.7	**41.0**	**953**
25	**MCN-24-25**	**RH 1975 (LR)**	**43.2**	**42.5**	**41.8**	**42.1**	**40.0**	**37.6**	**40.3**	**41.7**	**1112**
26	MCN-24-26	RB-118	40.9	39.2	42.6	42.5	42.5	38.4	43.0	**41.8**	**1092**
27	MCN-24-27	RH 749 (ZC)	42.6	42.4	43.3	40.9	42.4	37.0	42.7	**42.4**	**1071**
28	MCN-24-28	DRMR 2022-4	42.8	40.4	43.8	41.7	42.5	39.2	40.3	**41.9**	**980**

Table 3.10a. Performance of Indian mustard strains in IVT Timely Sown (irrigated), Zone - III

S.No	Code	Strain	Seed Yield (Kg/ha)								Plant Stand						
			KPR$	MOR	KOT	JHS	BND	JAI	TKM#	Mean	KPR	MOR	KOT	JHS	BND	JAI	TKM
			1	2	3	4	5	6	7	(2-6)	1	2	3	4	5	6	7
1	MCN-24-1	TM 416	2087	1844	2496	2138	2152	2416	1820	**2209**	115	152	163	127	161	115	283
2	MCN-24-2	PYR-2018-1	1963	2151	2646	2353	1945	2253	1738	**2270**	120	161	155	123	168	127	257
3	MCN-24-3	ORM 2019-31	1867	2043	2666	2001	2101	2370	1649	**2236**	120	164	172	119	160	129	263
4	MCN-24-4	DRMRCI 195	1938	2321	2763	2212	2107	2376	1650	**2356**	116	160	161	133	164	125	255
5	MCN-24-5	KMR 24-4	2080	2329	2841	2319	2679	2003	1937	**2434**	119	151	163	136	163	130	307
6	MCN-24-6	SKM 2209	2150	3231	2806	2291	2746	2989	1808	**2813**	114	161	167	126	166	129	272
7	MCN-24-7	RL-19-162	1813	2619	2558	2192	2423	2234	1801	**2405**	116	164	159	128	164	112	327
8	MCN-24-8	RKM 460	1907	2223	3002	2104	2038	2786	1778	**2431**	114	153	162	128	162	122	313
9	MCN-24-9	RGN 593	1889	2391	2711	2520	2253	2223	1783	**2420**	121	151	167	135	167	124	245
10	MCN-24-10	RH 2399-6	2142	2195	2810	2205	2148	2057	1785	**2283**	116	157	169	132	163	120	273
11	MCN-24-11	SKM 2206	1746	2653	3057	2504	2286	2816	1719	**2664**	117	153	160	152	162	123	309
12	MCN-24-12	NPJ 279	2046	2741	2708	2326	2189	2931	1783	**2579**	120	145	175	142	171	119	240
13	MCN-24-13	DRMRIJ 21-57	1974	2916	2672	2219	2813	2482	1759	**2620**	117	149	174	139	162	121	281
14	MCN-24-14	RL-19-237	1959	1730	2825	2194	2254	2690	1795	**2338**	116	154	163	130	165	133	241
15	MCN-24-15	Kranti (NC)	2240	2898	2366	2231	1761	2477	1846	**2347**	120	159	165	122	165	125	297
16	MCN-24-16	HUJM-23-12	2012	2571	2572	2276	2478	2598	1791	**2499**	115	162	166	116	164	129	206
17	MCN-24-17	ACN-231	1909	2244	2728	2391	2392	2262	1674	**2403**	116	160	168	152	164	144	289
18	MCN-24-18	PR-2020-16	1977	2732	3048	2287	2390	2089	1781	**2509**	120	166	164	133	164	121	241
19	MCN-24-19	CS 2009-219	2043	2865	2610	2219	2250	2938	1572	**2576**	114	157	165	137	179	123	268
20	MCN-24-20	18-52	1910	2187	2573	2192	2055	2524	1586	**2306**	117	159	171	121	164	122	216
21	MCN-24-21	NPJ 278	1885	2320	2885	2088	2310	2847	1789	**2490**	119	161	164	132	172	136	262
22	MCN-24-22	RH 2263	2385	2678	3065	2418	3042	3002	1875	**2841**	121	159	160	143	197	130	251
23	MCN-24-23	KMR 24-3	2183	2962	2818	2505	2470	2337	1609	**2619**	117	150	160	141	169	119	255
24	MCN-24-24	AKMS-1003-50	2349	2155	2695	2487	2676	2333	1918	**2469**	122	155	169	131	164	125	297
25	**MCN-24-25**	**RGN 73 (LR)**	**2163**	**2904**	**2735**	**2533**	**3028**	**1963**	**1851**	**2633**	**118**	**157**	**160**	**144**	**161**	**119**	**258**
26	MCN-24-26	RB-118	2363	3007	2788	2654	2889	2176	1626	**2703**	121	152	170	155	177	122	248
27	MCN-24-27	Maya (ZC)	2177	3005	2991	2152	2060	2792	1448	**2600**	116	145	167	130	161	123	222
28	MCN-24-28	DRMR 2022-4	2342	2173	2497	2204	3079	2988	1563	**2588**	122	168	159	129	162	133	272
		GM	**2054**	**2503**	**2748**	**2293**	**2393**	**2498**	**1740**	**2487**							
		C.D. (5%)	163	405	350	451	487	356	307								
		CV (%)	4.8	9.9	7.7	12.0	12.4	8.7	10.7								
		DOS	21-10-24	18-10-24	27-10-24	24-10-24	27-10-24	26-10-24	6-11-24								

$ Data of KPR excluded from computation of mean due to low C.V.
# Data of TKM excluded from computation of mean due to sowing after cut off date.

Table 3.10b. Performance of Indian mustard strains in IVT Timely Sown (Irrigated), Zone-III

S.No.	Code	Strain	Days to Maturity							1000-Seed Wt. (g)						
			KPR	MOR	KOT	JHS	BND	JAI	TKM	KPR	MOR	KOT	JHS	BND	JAI	TKM
			1	2	3	4	5	6	7	1	2	3	4	5	6	7
1	MCN-24-1	TM 416	129	134	130	136	136	131	123	5.4	4.6	4.9	5.2	5.9	4.9	4.5
2	MCN-24-2	PYR-2018-1	132	135	128	136	138	128	124	5.1	4.7	4.7	5.1	5.3	4.3	4.8
3	MCN-24-3	ORM 2019-31	129	134	131	130	137	128	122	4.7	3.9	3.9	5.1	4.0	3.7	4.4
4	MCN-24-4	DRMRCI 195	131	132	131	130	138	129	124	5.2	5.7	5.2	5.0	6.2	5.0	4.3
5	MCN-24-5	KMR 24-4	133	136	130	135	137	131	124	4.8	3.9	4.6	4.6	4.3	4.0	5.1
6	MCN-24-6	SKM 2209	130	132	127	133	137	130	121	4.8	4.4	5.0	5.2	5.6	4.6	3.9
7	MCN-24-7	RL-19-162	131	134	128	136	138	131	124	4.7	5.3	5.4	5.4	6.0	4.5	4.5
8	MCN-24-8	RKM 460	128	130	128	133	137	128	118	4.5	4.6	4.5	4.5	4.7	3.8	3.9
9	MCN-24-9	RGN 593	130	134	131	139	138	135	124	5.2	5.5	4.9	5.1	5.4	4.2	4.7
10	MCN-24-10	RH 2399-6	134	132	131	134	138	132	123	5.6	5.7	4.9	5.1	6.1	4.3	4.6
11	MCN-24-11	SKM 2206	129	133	131	132	137	127	123	5.2	4.9	5.1	5.4	5.1	4.5	4.6
12	MCN-24-12	NPJ 279	132	134	129	131	137	131	124	5.4	5.3	5.5	5.5	5.6	4.7	4.9
13	MCN-24-13	DRMRIJ 21-57	131	135	132	133	138	130	125	5.9	6.4	5.9	5.7	6.7	5.3	4.8
14	MCN-24-14	RL-19-237	135	130	132	137	139	132	121	5.2	4.4	5.2	5.3	5.3	4.6	4.3
15	MCN-24-15	Kranti (NC)	130	136	126	136	136	127	121	4.9	5.6	4.4	4.4	5.5	4.4	5.3
16	MCN-24-16	HUJM-23-12	128	132	129	137	138	130	120	5.2	4.4	5.0	4.4	6.0	4.6	5.1
17	MCN-24-17	ACN-231	131	134	135	139	141	128	125	5.0	4.6	4.1	4.6	4.9	4.1	4.3
18	MCN-24-18	PR-2020-16	133	135	134	133	139	131	123	5.9	5.3	5.6	5.3	6.6	5.1	3.9
19	MCN-24-19	CS 2009-219	129	133	130	132	138	131	122	5.3	5.5	5.3	4.8	6.6	4.8	4.7
20	MCN-24-20	18-52	127	135	130	131	137	132	122	5.3	5.7	5.2	5.0	6.2	4.9	4.9
21	MCN-24-21	NPJ 278	134	133	130	138	137	130	125	5.4	5.4	4.9	5.5	5.3	4.1	5.1
22	MCN-24-22	RH 2263	127	129	131	136	137	127	123	5.2	5.7	6.1	6.0	6.8	5.6	4.5
23	MCN-24-23	KMR 24-3	130	137	133	132	139	130	123	4.9	5.3	4.5	4.9	5.3	4.1	4.8
24	MCN-24-24	AKMS-1003-50	131	134	132	134	138	128	124	5.7	7.2	5.9	6.3	6.5	5.3	4.0
25	**MCN-24-25**	**RGN 73 (LR)**	**133**	**137**	**132**	**138**	**139**	**133**	**123**	**5.0**	**4.7**	**4.8**	**4.3**	**4.7**	**4.3**	**5.3**
26	MCN-24-26	RB-118	127	137	131	138	138	127	123	5.3	5.8	5.5	5.4	6.5	4.9	4.8
27	MCN-24-27	Maya (ZC)	131	135	130	137	139	132	120	4.9	5.3	4.7	5.2	6.0	4.7	4.3
28	MCN-24-28	DRMR 2022-4	131	133	130	132	137	130	122.3	5.3	5.3	5.7	5.4	6.8	5.6	4.1

Table 3.10c. Performance of Indian mustard strains in IVT Timely Sown (Irrigated), Zone-III

S.No.	Code	Strain	Oil Content (%)								Oil Yield (kg/ha)
			KPR	MOR	KOT	JHS	BND	JAI	TKM	Mean	
			1	2	3	4	5	6	7	(2-6)	
1	MCN-24-1	TM 416	42.3	41.7	40.2	40.3	42.5	41.5	42.1	**41.2**	**911**
2	MCN-24-2	PYR-2018-1	41.7	43.5	43.5	44.8	42.3	42.3	43.1	**43.3**	**983**
3	MCN-24-3	ORM 2019-31	39.8	43.6	42.8	41.5	42.9	41.4	40.7	**42.4**	**949**
4	MCN-24-4	DRMRCI 195	43.9	42.1	42.0	39.9	41.3	41.4	42.6	**41.3**	**974**
5	MCN-24-5	KMR 24-4	42.4	42.8	41.1	40.3	40.9	40.3	40.3	**41.1**	**1000**
6	MCN-24-6	SKM 2209	42.6	41.5	42.1	41.5	41.6	42.8	41.7	**41.9**	**1178**
7	MCN-24-7	RL-19-162	41.5	41.5	42.1	41.5	40.2	40.9	40.7	**41.3**	**992**
8	MCN-24-8	RKM 460	42.7	41.6	41.1	41.0	42.0	41.6	40.3	**41.4**	**1007**
9	MCN-24-9	RGN 593	42.5	42.8	42.3	40.9	42.1	40.8	41.8	**41.8**	**1011**
10	MCN-24-10	RH 2399-6	38.7	40.6	42.0	41.1	42.3	41.4	40.4	**41.5**	**947**
11	MCN-24-11	SKM 2206	42.2	41.6	40.7	40.6	41.3	39.9	39.7	**40.8**	**1087**
12	MCN-24-12	NPJ 279	42.0	42.4	39.3	41.2	42.2	42.6	40.1	**41.5**	**1071**
13	MCN-24-13	DRMRIJ 21-57	41.1	40.3	41.8	43.5	40.9	41.3	41.4	**41.6**	**1089**
14	MCN-24-14	RL-19-237	42.6	42.6	42.9	41.0	41.6	42.2	41.3	**42.0**	**983**
15	MCN-24-15	Kranti (NC)	41.1	43.1	41.7	40.2	40.8	41.2	41.7	**41.4**	**971**
16	MCN-24-16	HUJM-23-12	41.1	41.3	40.5	38.9	40.7	41.2	42.4	**40.5**	**1012**
17	MCN-24-17	ACN-231	42.1	40.4	40.9	40.9	39.5	39.6	42.7	**40.3**	**967**
18	MCN-24-18	PR-2020-16	42.2	39.4	40.8	41.0	41.0	41.0	40.1	**40.6**	**1019**
19	MCN-24-19	CS 2009-219	41.4	40.4	40.5	40.1	41.6	40.2	40.3	**40.5**	**1044**
20	MCN-24-20	18-52	42.5	42.6	43.0	42.9	43.1	42.6	42.8	**42.8**	**988**
21	MCN-24-21	NPJ 278	40.5	40.1	40.2	41.3	41.1	39.8	42.1	**40.5**	**1008**
22	MCN-24-22	RH 2263	39.9	41.0	42.0	40.7	42.5	41.1	41.6	**41.5**	**1178**
23	MCN-24-23	KMR 24-3	42.0	40.6	40.7	41.5	41.0	41.2	42.7	**41.0**	**1073**
24	MCN-24-24	AKMS-1003-50	42.3	41.4	42.6	40.2	40.9	41.4	40.1	**41.3**	**1020**
25	**MCN-24-25**	**RGN 73 (LR)**	**39.9**	**39.6**	**41.8**	**42.0**	**41.5**	**40.1**	**41.0**	**41.0**	**1080**
26	MCN-24-26	RB-118	42.6	39.5	43.0	43.0	40.4	41.8	40.1	**41.5**	**1122**
27	MCN-24-27	Maya (ZC)	40.0	40.4	41.6	39.5	40.1	41.1	39.8	**40.5**	**1054**
28	MCN-24-28	DRMR 2022-4	41.3	40.3	40.3	42.0	42.9	41.9	40.7	**41.5**	**1074**

Table 3.11a. Performance of Indian mustard strains in IVT Timely Sown (Irrigated), Zone - IV

S.No.	Code	Strain	Seed Yield (Kg/ha)							Plant Stand				
			SKN	NGP	JAL	MDR$	PLI	Mean		SKN	NGP	JAL	MDR	PLI
			1	2	3	4	5	(1-3,5)		1	2	3	4	5
1	MCN-24-1	TM 416	2601	1738	1289	2096	2969	**2149**		161	135	107	123	177
2	**MCN-24-2**	**PYR-2018-1**	**3593**	**2190**	**1263**	**1930**	**3476**	**2630**	**	**170**	**132**	**104**	**133**	**175**
3	MCN-24-3	ORM 2019-31	3181	1684	1249	1591	3001	**2279**		176	119	112	125	174
4	MCN-24-4	DRMRCI 195	3367	1532	1928	2050	2641	**2367**		169	126	125	124	172
5	MCN-24-5	KMR 24-4	3357	1719	1295	2016	1547	**1980**		164	138	150	153	172
6	MCN-24-6	SKM 2209	3261	1676	1289	2560	2722	**2237**		170	132	112	145	179
7	MCN-24-7	RL-19-162	3505	1873	1836	1898	1793	**2252**		163	127	134	125	171
8	MCN-24-8	RKM 460	3473	2227	1306	2125	3186	**2548**		176	127	150	133	173
9	MCN-24-9	RGN 593	3218	2034	1800	2129	2775	**2457**		169	133	140	144	175
10	MCN-24-10	RH 2399-6	3554	1540	1104	2145	3292	**2372**		170	135	129	134	172
11	MCN-24-11	SKM 2206	3532	1871	1456	1725	2352	**2303**		172	128	125	143	174
12	MCN-24-12	NPJ 279	3627	1644	955	2138	3001	**2307**		178	128	149	119	176
13	MCN-24-13	DRMRIJ 21-57	3291	2118	983	1851	2352	**2186**		167	127	149	132	177
14	MCN-24-14	RL-19-237	3493	2170	1215	2001	3517	**2599**		169	118	122	138	175
15	MCN-24-15	Kranti (NC)	2793	1701	1664	1902	2296	**2113**		163	137	140	140	170
16	MCN-24-16	HUJM-23-12	3206	2104	1376	1937	1952	**2160**		167	130	134	142	173
17	MCN-24-17	ACN-231	3422	2279	1377	1752	2858	**2484**		173	125	130	134	178
18	MCN-24-18	PR-2020-16	3608	1851	1287	1672	2024	**2193**		162	134	123	125	172
19	MCN-24-19	CS 2009-219	2936	1551	1556	2454	3016	**2265**		172	127	115	144	177
20	MCN-24-20	18-52	3355	1617	1321	2295	2603	**2224**		165	131	149	136	179
21	MCN-24-21	NPJ 278	3269	1901	1050	2307	1813	**2008**		167	129	129	145	173
22	MCN-24-22	RH 2263	3296	2118	1376	1664	2421	**2303**		164	127	128	133	176
23	MCN-24-23	KMR 24-3	3698	1748	1091	1162	1980	**2129**		179	131	125	73	170
24	MCN-24-24	AKMS-1003-50	3130	1637	1216	1509	1891	**1969**		164	129	114	124	175
25	**MCN-24-25**	**GDM 4 (LR)**	**3366**	**2123**	**1372**	**2754**	**2937**	**2449**		**166**	**128**	**129**	**149**	**173**
26	MCN-24-26	RB-118	3523	1673	1227	2244	2055	**2120**		166	137	124	128	169
27	MCN-24-27	Bio 902 (ZC)	3277	1995	1304	1548	2233	**2202**		170	130	131	122	177
28	MCN-24-28	DRMR 2022-4	3114	1652	1280	2120	2327	**2093**		179	131	139	150	179
		GM	3323	1856	1338	1985	2537	**2263**						
		CD (5%)	534	292	314	789	350							
		CV (%)	9.8	9.6	14.3	24.2	8.4							
		DOS	11/10/24	26-10-24	30-10-24	28-10-24	31-10-24							

$Data of MDR excluded from computation of mean due to high C.V and also rejected by monitoring team.

** strain out yielding the best check with a margin of equal to or more than 10% over the best check on the basis of oil yield.

Table 3.11b. Performance of Indian mustard strains in IVT Timely Sown (Irrigated), Zone - IV

S.No.	Code	Strain	Days to Maturity					1000- Seed wt (g)					Oil Content (%)						Oil Yield (kg/ha)
			SKN	NGP	JAL	MDR	PLI	SKN	NGP	JAL	MDR	PLI	SKN	NGP	JAL	MDR	PLI	Mean	
			1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	(1-3,5)	
1	MCN-24-1	TM 416	120	111	95	117	117	4.7	4.3	3.9	5.0	5.2	37.4	37.3	39.0	38.3	42.9	**39.1**	**841**
2	**MCN-24-2**	**PYR-2018-1**	**117**	**113**	**94**	**121**	**116**	**4.0**	**4.4**	**4.4**	**4.8**	**5.0**	**43.0**	**41.6**	**41.6**	**42.3**	**43.0**	**42.3**	**1113**
3	MCN-24-3	ORM 2019-31	119	112	94	122	117	3.4	4.2	3.9	5.6	5.1	41.4	40.1	38.7	39.0	40.6	**40.2**	**916**
4	MCN-24-4	DRMRCI 195	118	108	95	124	118	5.2	5.5	4.1	5.3	5.3	39.4	40.4	38.4	43.5	41.6	**39.9**	**945**
5	MCN-24-5	KMR 24-4	119	111	99	127	119	4.0	5.1	4.0	4.8	5.1	39.7	38.9	37.9	42.3	41.3	**39.5**	**781**
6	MCN-24-6	SKM 2209	117	111	95	122	119	5.1	5.0	3.8	5.1	5.5	41.8	37.1	39.2	41.7	42.1	**40.1**	**896**
7	MCN-24-7	RL-19-162	118	112	93	124	119	4.7	5.0	4.2	4.9	6.0	39.5	38.5	40.8	42.6	42.2	**40.2**	**906**
8	MCN-24-8	RKM 460	118	112	99	124	119	4.1	5.7	4.2	4.6	5.6	40.1	40.4	39.2	42.3	42.0	**40.4**	**1030**
9	MCN-24-9	RGN 593	121	114	97	129	120	4.7	4.9	4.1	5.2	5.4	39.1	37.8	40.0	42.9	42.2	**39.7**	**976**
10	MCN-24-10	RH 2399-6	118	108	98	125	120	4.9	5.4	4.1	5.3	6.1	40.3	39.4	39.3	42.3	41.1	**40.0**	**949**
11	MCN-24-11	SKM 2206	116	111	95	124	120	4.9	4.9	4.0	5.5	6.4	40.9	40.4	39.3	39.4	42.4	**40.7**	**938**
12	MCN-24-12	NPJ 279	118	109	99	126	119	5.1	5.2	3.9	5.7	6.1	40.8	42.3	39.4	42.8	41.8	**41.1**	**948**
13	MCN-24-13	DRMRIJ 21-57	120	115	93	122	120	5.5	5.2	4.1	5.6	6.0	42.7	40.1	40.4	41.1	42.6	**41.5**	**906**
14	MCN-24-14	RL-19-237	121	112	93	126	120	4.8	4.5	4.1	4.7	6.4	42.2	39.6	39.4	42.1	41.5	**40.7**	**1057**
15	MCN-24-15	Kranti (NC)	115	112	93	119	118	4.5	4.8	3.7	4.7	5.5	40.6	40.0	39.4	42.4	40.6	**40.1**	**848**
16	MCN-24-16	HUJM-23-12	117	114	98	121	118	4.6	4.9	4.1	5.2	6.1	38.0	37.6	38.7	43.1	41.6	**39.0**	**842**
17	MCN-24-17	ACN-231	122	114	98	126	119	4.0	4.8	3.7	4.5	6.2	39.0	37.1	37.8	41.5	42.4	**39.1**	**971**
18	MCN-24-18	PR-2020-16	119	113	99	127	120	5.3	5.2	4.1	5.7	6.6	42.2	38.7	38.4	40.1	42.9	**40.5**	**889**
19	MCN-24-19	CS 2009-219	119	109	94	128	119	5.0	5.3	4.0	5.7	5.9	40.9	39.0	39.0	42.6	42.2	**40.3**	**912**
20	MCN-24-20	18-52	119	110	93	126	120	4.9	4.9	4.7	5.2	6.1	40.8	39.7	40.9	41.3	41.3	**40.7**	**904**
21	MCN-24-21	NPJ 278	120	111	96	125	120	4.6	5.5	4.1	5.5	6.1	41.9	39.1	37.4	42.1	42.0	**40.1**	**806**
22	MCN-24-22	RH 2263	119	112	93	124	118	5.7	5.4	4.1	6.1	6.0	41.7	39.4	39.6	42.4	41.8	**40.6**	**935**
23	MCN-24-23	KMR 24-3	121	114	93	83	118	4.4	5.3	3.8	3.2	5.7	40.8	38.2	39.8	43.4	41.9	**40.2**	**855**
24	MCN-24-24	AKMS-1003-50	120	110	99	121	119	5.9	5.4	3.9	6.3	6.5	41.1	40.1	38.4	41.5	41.8	**40.3**	**794**
25	**MCN-24-25**	**GDM 4 (LR)**	**116**	**115**	**94**	**117**	**118**	**5.2**	**4.8**	**3.8**	**5.2**	**5.9**	**40.7**	**40.4**	**39.7**	**42.1**	**42.8**	**40.9**	**1001**
26	MCN-24-26	RB-118	119	115	99	125	117	4.9	4.4	3.9	5.7	5.9	37.9	38.6	39.9	42.7	40.5	**39.2**	**831**
27	MCN-24-27	Bio 902 (ZC)	120	113	99	126	118	5.6	5.1	4.3	5.8	6.0	40.6	38.1	38.8	42.8	41.2	**39.7**	**874**
28	MCN-24-28	DRMR 2022-4	120	110	99	124	118	5.1	5.2	4.3	5.9	5.7	40.8	39.4	38.6	41.81	40.9	**39.9**	**835**

Table 3.12a. Performance of Indian mustard strains in AVT-I Timely Sown (Irrigated), Zone - I

S.No	Code	Strain	Seed Yield (Kg/ha)								Plant Stand						Days to Maturity					
			KNG	CHT	PNT	BJR	DLK	UNA	Mean		KNG	CHT	PNT	BJR	DLK	UNA	KNG	CHT	PNT	BJR	DLK	UNA
			1	2	3	4	5	6	(1-6)		1	2	3	4	5	6	1	2	3	4	5	6
1	MCN-24-29	Giriraj (LR)	1005	2111	2304	984	1050	952	**1401**		294	329	302	265	327	289	151	141	136	169	138	137
2	MCN-24-30	RCC 4 (fillar)	1052	1872	1974	1293	1063	1093	**1391**		297	319	284	264	324	288	163	146	139	173	154	152
3	MCN-24-31	Kranti (NC)	1080	2065	1906	1297	1071	959	**1396**		296	296	277	266	325	286	152	139	132	171	136	134
4	**MCN-24-32**	**RH 2299-63**	**1406**	**2344**	**2506**	**1409**	**1300**	**1308**	**1712**	*	**296**	**301**	**287**	**264**	**324**	**287**	**159**	**142**	**138**	**173**	**145**	**143**
5	**MCN-24-33**	**SKM 2104**	**1304**	**2328**	**2002**	**1512**	**1292**	**1270**	**1618**	*	**297**	**283**	**272**	**263**	**326**	**288**	**156**	**146**	**132**	**172**	**142**	**140**
6	**MCN-24-34**	**RCC 4 (ZC)**	**1021**	**2088**	**1996**	**1292**	**1029**	**1031**	**1410**		**295**	**327**	**305**	**265**	**324**	**286**	**165**	**144**	**138**	**175**	**155**	**153**
		GM	**1145**	**2135**	**2115**	**1298**	**1134**	**1102**	**1488**													
		CD (5%)	202	306	312	109	206	133														
		CV (%)	11.7	9.5	9.8	5.6	12.1	8.0														
		DOS	12-10-24	11-10-24	20-10-24	12-10-24	28-10-24	25-10-24														

* Strain out yielding the best check by a margin of more than or equal to 10 percent on the basis of seed yield

Table 3.12b. Performance of Indian mustard strains in AVT-I Timely Sown (Irrigated), Zone - I

S.No	Code	Strain	1000 Seed wt. (g)						Oil Content (%)							Oil Yield (kg/ha)
			KNG	CHT	PNT	BJR	DLK	UNA	KNG	CHT	PNT	BJR	DLK	UNA	Mean	
			1	2	3	4	5	6	1	2	3	4	5	6	(1-6)	
1	MCN-24-29	Giriraj (LR)	6.1	4.3	5.1	5.1	5.3	5.5	40.9	40.9	38.8	41.8	40.2	41.4	**40.6**	**569**
2	MCN-24-30	RCC 4 (fillar)	3.5	3.2	2.8	4.5	2.2	3.2	41.9	40.0	40.0	41.8	40.3	38.8	**40.5**	**563**
3	MCN-24-31	Kranti (NC)	4.6	3.5	4.2	4.4	3.2	4.5	42.3	36.8	40.7	38.9	41.1	40.8	**40.1**	**560**
4	**MCN-24-32**	**RH 2299-63**	**6.1**	**3.8**	**4.9**	**6.0**	**4.5**	**5.7**	**41.7**	**38.9**	**39.0**	**42.7**	**41.4**	**42.4**	**41.0**	**702**
5	**MCN-24-33**	**SKM 2104**	**5.5**	**4.6**	**4.8**	**5.5**	**3.3**	**5.5**	**42.3**	**40.3**	**40.2**	**42.4**	**41.8**	**42.2**	**41.5**	**672**
6	**MCN-24-34**	**RCC 4 (ZC)**	**3.4**	**3.4**	**2.5**	**4.1**	**2.3**	**3.2**	**40.5**	**38.7**	**38.0**	**42.6**	**40.9**	**40.8**	**40.2**	**567**

Table 3.13a. Performance of Indian mustard strains in AVT-I+II Timely Sown (Irrigated/ Quality/ WRR), Zone-II

S.No	Code	Strain	Seed Yield (Kg/ha)								Plant Stand						
			ABR	BAW	LDH	HSR	NDH	MOD&	ALW#	Mean	ABR	BAW	LDH	HSR	NDH	MOD	ALW
			1	2	3	4	5	6	7	(1-5)	1	2	3	4	5	6	7
1	**MCN-24-35**	**Basanti (WRR C)**	**2230**	**1871**	**1724**	**2661**	**2362**	**2232**	**2043**	**2169**	**265**	**196**	**264**	**265**	**267**	**205**	**227**
2	**MCN-24-36**	**RH 749 (ZC)**	**2605**	**2438**	**2557**	**3112**	**2747**	**2148**	**2472**	**2692**	**264**	**258**	**270**	**266**	**310**	**194**	**234**
3	**MCN-24-37**	NPJ 261 #	3033	2320	2461	3443	3296	1960	1944	**2911**	262	258	266	261	311	206	237
4	**MCN-24-38**	PBR 813-2@	3022	2654	2707	2889	3124	2838	2136	**2879**	260	247	264	268	301	210	229
5	**MCN-24-39**	GED 1$	2608	2026	2403	2741	2765	2767	2276	**2509**	261	200	269	260	286	210	238
6	**MCN-24-40**	PM 30 (NC)	2480	2321	2350	2567	2684	2897	2330	**2480**	254	256	266	260	307	206	228
7	**MCN-24-41**	Giriraj (filler)	2556	2379	2469	2754	2845	2806	2395	**2601**	271	260	264	265	274	210	233
8	**MCN-24-42**	RH (OE) 1710**	2819	2481	2676	3267	3091	1923	2128	**2867**	261	255	261	258	300	173	228
9	**MCN-24-43**	DRMRCI (Q) 179 **	2371	2542	2434	2668	2669	2698	2228	**2537**	267	233	263	262	290	221	227
10	**MCN-24-44**	Giriraj (LR)	2650	2135	2556	2838	2830	2715	2897	**2602**	259	242	267	267	285	216	233
11	**MCN-24-45**	GED 2$	2534	2385	1954	2304	2686	1779	2645	**2372**	258	247	262	262	266	140	228
12	**MCN-24-46**	Kranti (NC)	2462	2749	2378	2903	2786	2426	2513	**2656**	259	259	268	263	290	201	227
13	**MCN-24-47**	**PM 32 (QLR)**	**2642**	**2592**	**2529**	**2852**	**2724**	**2627**	**2495**	**2668**	**268**	**268**	**273**	**261**	**300**	**195**	**231**
14	**MCN-24-48**	DRMR 2018-25 ***#	2565	2499	2486	2369	2716	2509	2340	**2527**	265	258	270	260	326	216	232
15	**MCN-24-49**	**Varuna**	**2619**	**2615**	**2293**	**2781**	**2749**	**2686**	**1948**	**2612**	**269**	**255**	**267**	**261**	**304**	**204**	**231**
16	**MCN-24-50**	DRMR CI (Q) 181**	2548	2432	2304	2977	2849	2212	2176	**2622**	256	249	265	263	294	200	233
17	**MCN-24-51**	NPJ 271***	2832	2379	2336	3155	3171	2121	2136	**2775**	271	252	265	265	316	203	228
18	**MCN-24-52**	**PDZ 11 (DLC)**	**2438**	**1848**	**2310**	**2463**	**2564**	**2063**	**2522**	**2325**	**249**	**190**	**264**	**263**	**242**	**182**	**233**
		GM	**2612**	**2370**	**2385**	2819	**2814**	**2411**	**2312**	**2600**							
		CD (5%)	359	302	289	361	386	381	274								
		CV (%)	9.7	9.0	8.5	9.0	9.7	11.1	8.3								
		DOS	26-10-24	23-10-24	29-10-24	12/10/24	15-10-24	29.10-24	22-10-24								

Quality strain **; white rust resistant strain ***; AVT- II strain #, @repeat entry, Genome edited lines $.

Data of ALW excluded from computation of mean due to significant difference in seed yield of same genotype being used as filler/check.

& Data of MOD excluded from computation of mean due to rejection of trial by monitoring team.

Table 3.13b. Performance of Indian mustard strains in AVT-I+II Timely Sown (Irrigated/ Quality/ WRR), Zone-II

S.No	Code	Strain	Days to Maturity							1000 Seed wt. (g)							Oil Content (%)								Oil Yield (kg/ha)
			ABR 1	BAW 2	LDH 3	HSR 4	NDH 5	MOD 6	ALW 7	ABR 1	BAW 2	LDH 3	HSR 4	NDH 5	MOD 6	ALW 7	ABR 1	BAW 2	LDH 3	HSR 4	NDH 5	MOD 6	ALW 7	Mean (1-5)	
1	**MCN-24-35**	**Basanti (WRR C)**	148	145	147	148	153	143	144	4.4	4.2	3.6	4.3	3.8	3.7	3.9	40.1	41.8	42.0	43.6	42.7	42.4	40.9	**42.0**	**912**
2	MCN-24-36	RH 749 (ZC)	147	146	147	147	150	142	142	6.1	6.1	6.0	6.5	5.9	6.6	5.3	41.2	41.1	42.6	42.6	39.9	40.7	43.6	**41.5**	**1116**
3	MCN-24-37	NPJ 261 #	142	146	146	143	147	141	143	6.0	5.0	5.9	5.7	6.2	5.6	6.1	42.8	42.1	42.4	43.4	42.3	42.7	42.5	**42.6**	**1240**
4	MCN-24-38	PBR 813-2@	144	143	146	148	146	139	142	4.2	4.8	4.3	4.1	3.5	4.3	3.7	41.3	41.1	40.6	40.8	41.0	42.3	39.4	**41.0**	**1180**
5	MCN-24-39	GED 1$	141	144	145	143	142	139	143	4.6	4.5	3.8	4.8	5.0	4.7	4.6	40.6	39.6	40.2	38.2	38.2	39.8	40.3	**39.3**	**987**
6	MCN-24-40	PM 30 (NC)	143	145	146	142	148	142	145	6.3	5.9	5.5	6.4	7.0	6.2	5.4	41.5	41.4	42.8	41.7	40.3	42.6	40.3	**41.5**	**1031**
7	**MCN-24-41**	**Giriraj (filler)**	144	138	145	142	143	141	142	6.0	5.8	5.8	6.2	5.6	6.2	5.5	41.6	42.0	41.3	41.7	43.2	41.6	39.7	**42.0**	**1091**
8	MCN-24-42	RH (OE) 1710**	141	143	142	142	142	142	141	4.8	4.7	4.2	4.3	3.8	4.3	3.9	41.5	42.1	41.3	41.6	42.7	40.1	41.1	**41.8**	**1200**
9	MCN-24-43	DRMRCI (Q) 179 **	144	144	144	146	146	142	143	4.5	4.8	4.6	4.3	4.3	4.2	3.7	43.0	43.8	43.6	39.1	40.1	40.4	42.7	**41.9**	**1063**
10	MCN-24-44	Giriraj (LR)	143	140	145	142	144	139	141	6.1	5.7	4.9	6.3	5.5	5.9	5.2	41.2	42.2	41.0	39.0	41.7	42.4	43.1	**41.0**	**1067**
11	MCN-24-45	GED 2$	140	145	144	140	143	144	142	4.9	5.1	4.5	5.0	5.3	5.0	3.7	39.6	38.8	42.6	38.6	39.3	40.1	39.7	**39.8**	**944**
12	**MCN-24-46**	**Kranti (NC)**	140	137	146	140	135	139	140	5.0	4.6	4.5	4.8	5.1	4.3	3.8	40.1	42.2	42.0	40.0	39.4	41.7	40.4	**40.7**	**1082**
13	MCN-24-47	PM 32 (QLR)	142	142	145	143	144	138	141	4.7	4.7	4.5	4.6	4.2	4.4	4.3	42.4	40.1	42.9	42.1	41.7	42.0	40.4	**41.9**	**1117**
14	MCN-24-48	DRMR 2018-25 ***#	143	141	144	142	148	140	143	5.2	4.8	4.4	5.5	5.2	5.0	3.9	41.7	41.7	40.6	43.0	42.5	41.6	40.4	**41.9**	**1059**
15	MCN-24-49	Varuna	141	143	145	141	143	142	143	4.9	5.3	4.7	5.3	5.1	5.3	4.9	42.2	41.1	42.4	40.3	42.4	40.1	41.6	**41.7**	**1088**
16	MCN-24-50	DRMR CI (Q) 181**	142	143	145	141	147	139	142	5.2	5.1	5.5	4.7	4.8	4.4	5.1	39.9	41.0	40.6	43.2	40.3	37.0	40.3	**41.0**	**1075**
17	MCN-24-51	NPJ 271***	143	144	144	143	145	139	143	5.6	5.5	5.5	6.0	5.6	5.9	4.7	41.3	41.7	41.4	42.2	41.1	40.0	40.3	**41.5**	**1152**
18	MCN-24-52	PDZ 11 (DLC)	139	146	144	146	138	137	136	3.7	4.7	4.3	3.7	3.9	3.4	3.1	40.4	43.0	42.9	41.6	42.5	42.2	42.4	**42.1**	**978**

Quality strain **; white rust resistant strain ***; AVT- II strain #, repeat entry @

Table 3.14a. Performance of Indian mustard strains in AVT-I+II Timely Sown (Irrigated/ Quality), Zone - III

S.No.	Code	Strain	Seed Yield (Kg/ha)									Plant Stand							
			PNT	KPR$	MOR&	BPR	VAR	DOL	JHS#	KOT	Mean	PNT	KPR	MOR	BPR	VAR	DOL	JHS	KOT
			1	2	3	4	5	6	7	8	(1,4-6,8)	1	2	3	4	5	6	7	8
1	MCN-24-53	GED 1$	1934	2029	2275	2454	2622	1507	2088	2539	**2211**	293	213	334	259	332	332	193	301
2	**MCN-24-54**	**Varuna**	**1859**	**2323**	**2475**	**2632**	**2591**	**1644**	**2397**	**2452**	**2236**	**302**	**221**	**341**	**291**	**343**	**338**	**254**	**310**
3	**MCN-24-55**	**PDZ 11 (DLC)**	**1665**	**1972**	**1689**	**2852**	**2450**	**1364**	**955**	**2561**	**2178**	**270**	**214**	**343**	**194**	**320**	**326**	**72**	**268**
4	**MCN-24-56**	**PM 30 (NC)**	**2263**	**2026**	**2550**	**2507**	**2481**	**1452**	**2617**	**2478**	**2236**	**273**	**214**	**338**	**268**	**335**	**334**	**236**	**304**
5	MCN-24-57	DRMRCI (Q) 172***#	1590	1929	2281	2644	2148	1577	1750	2728	**2137**	300	221	334	247	314	337	243	294
6	MCN-24-58	GED 2$	2035	2073	2445	2565	1973	1406	1791	2385	**2073**	292	216	341	245	326	326	227	303
7	**MCN-24-59**	**RGN 73 (ZC)**	**2030**	**2096**	**2675**	**2303**	**2588**	**1454**	**2224**	**3091**	**2293**	**297**	**211**	**326**	**271**	**331**	**323**	**253**	**297**
8	MCN-24-60	RGN 73 (filler)	2122	2057	2247	2275	2565	1304	2613	3040	**2261**	289	207	337	271	348	330	254	305
9	MCN-24-61	PM 30 (QLR)	2109	2301	2471	2338	2365	1484	2511	2624	**2184**	284	225	337	254	327	330	257	303
10	MCN-24-62	LES 68**	1878	1958	2001	2727	2478	1344	1826	2777	**2241**	300	217	337	237	315	336	235	294
		GM	**1948**	**2076**	**2311**	**2530**	**2426**	**1454**	**2077**	**2668**	**2205**								
		CD (5%)	301	88	256	359	246	166	392	354									
		CV (%)	10.6	2.9	7.6	9.8	7.02	7.9	13.0	9.2									
		DOS	20-10-24	21-10-24	19-10-24	29-10-24	30-10-24	22-10-24	24-10-24	27-10-24									

Timely sown irrigated *; quality strain **; white rust resistant strain ***; AVT- II strain #, Genome edited strain$.
$ Data of KPR excluded from computation of mean due to low CV.
# Data of JHS excluded from computation of mean due to rejection of trial by monitoring team.
& Data of MOR excluded from computation of mean due to significant difference in seed yield of same genotype being used as filler/check.

Table 3.14b. Performance of Indian mustard strains in AVT-I+II Timely Sown (Irrigated/ Quality/ WRR), Zone - III

S.No	Code	Strain	Days to Maturity								1000 Seed Weight (gm)								Oil Content (%)									Oil Yield (kg/ha)
			PNT	KPR	MOR	BPR	VAR	DOL	JHS	KOT	PNT	KPR	MOR	BPR	VAR	DOL	JHS	KOT	PNT	KPR	MOR	BPR	VAR	DOL	JHS	KOT	Mean	
			1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	(1,4-6,8)	
1	MCN-24-53	GED 1$	132	135	134	136	119	115	140	130	3.8	5.1	5.1	4.3	4.6	3.0	4.5	5.0	37.2	38.6	40.8	38.1	41.1	37.9	38.2	40.1	**38.9**	**860**
2	**MCN-24-54**	**Varuna**	**132**	**132**	**132**	**136**	**120**	**115**	**135**	**129**	**4.1**	**5.2**	**5.4**	**4.8**	**4.7**	**3.1**	**4.6**	**5.2**	**38.2**	**42.5**	**42.5**	**39.9**	**41.3**	**40.0**	**39.5**	**39.3**	**39.8**	**889**
3	**MCN-24-55**	**PDZ 11 (DLC)**	**130**	**131**	**124**	**135**	**115**	**114**	**128**	**129**	**3.2**	**4.0**	**4.9**	**3.5**	**4.2**	**3.4**	**3.9**	**3.7**	**44.7**	**41.8**	**42.9**	**41.0**	**41.5**	**40.0**	**41.2**	**38.2**	**41.1**	**895**
4	**MCN-24-56**	**PM 30 (NC)**	**137**	**131**	**136**	**137**	**124**	**116**	**140**	**134**	**4.5**	**5.8**	**4.0**	**5.5**	**5.5**	**4.2**	**5.3**	**6.3**	**41.5**	**41.8**	**43.1**	**40.6**	**41.7**	**40.9**	**42.5**	**39.9**	**40.9**	**915**
5	MCN-24-57	DRMRCI (Q) 172***#	132	135	132	135	120	115	128	131	2.6	4.2	5.2	3.4	5.1	3.2	3.7	3.9	41.9	42.1	41.4	42.5	41.9	40.6	42.2	42.2	**41.8**	**893**
6	MCN-24-58	GED 2$	132	134	133	135	118	115	135	131	3.9	4.0	4.9	4.6	4.7	3.3	4.6	4.9	37.1	37.7	41.4	38.2	38.3	37.1	38.2	42.9	**38.7**	**802**
7	**MCN-24-59**	**RGN 73 (ZC)**	**137**	**131**	**140**	**137**	**126**	**117**	**139**	**135**	**3.5**	**4.8**	**4.8**	**4.6**	**5.0**	**3.2**	**4.5**	**4.9**	**39.2**	**42.8**	**40.1**	**39.1**	**40.9**	**38.9**	**40.1**	**41.8**	**40.0**	**916**
8	MCN-24-60	RGN 73 (filler)	138	131	139	136	125	117	140	136	3.6	4.4	4.6	4.0	5.2	3.7	4.6	4.7	38.1	40.1	42.6	39.2	41.5	38.3	40.0	37.8	**39.0**	**881**
9	MCN-24-61	PM 30 (QLR)	137	129	139	137	122	116	140	136	4.3	4.8	6.3	6.2	5.9	3.6	6.0	6.5	41.1	40.1	41.1	40.8	41.3	37.1	42.9	39.8	**40.0**	**874**
10	MCN-24-62	LES 68**	135	128	137	135	120	116	135	129	3.5	4.2	4.2	4.4	4.6	3.0	4.3	4.4	41.5	41.5	39.6	40.4	40.2	39.9	40.2	40.0	**40.4**	**905**

Table 3.15.a. Performance of Indian mustard strains in IVT Timely Sown (Rainfed), Zone - II

S.No.	Code	Strain	Seed Yield (Kg/ha)						Plant Stand				
			SGN	HSR	BAW	LDH	ABR	Mean	SGN	HSR	BAW	LDH	ABR
			1	2	3	4	5	(1-5)	1	2	3	4	5
1	MCNR-24-1	RH 2299-64	2740	3219	2506	2004	2519	**2598**	118	119	122	133	138
2	MCNR-24-2	HUJM-23-12	2827	2667	2230	2288	2459	**2494**	115	116	127	132	141
3	**MCNR-24-3**	**RH 1424 (LR)**	**2665**	**2794**	**2285**	**2407**	**2754**	**2581**	**115**	**117**	**124**	**135**	**137**
4	MCNR-24-4	DRMR 2019-16	2721	2506	2132	1893	2778	**2406**	115	113	122	132	133
5	MCNR-24-5	RKM 588	2743	2782	1998	1979	2265	**2353**	117	116	124	131	132
6	MCNR-24-6	BAUM 13-6	2056	2786	2384	1695	2333	**2251**	114	115	126	128	136
7	MCNR-24-7	NPJ 281	2503	2569	2273	2226	2528	**2420**	118	115	137	134	133
8	MCNR-24-8	DRMRHT 2090	2655	3006	2167	2070	2305	**2441**	116	114	126	131	138
9	MCNR-24-9	CAURM 4-1S	1896	2482	2333	1905	2010	**2125**	113	118	125	129	129
10	MCNR-24-10	NPJ 280	2684	2411	2289	2218	2244	**2369**	116	115	128	133	127
11	MCNR-24-11	DRMRIJ 138	2228	2124	2313	1708	1988	**2072**	116	113	129	131	139
12	MCNR-24-12	RAURD 14-18	2858	2683	1789	1967	2155	**2290**	112	115	125	130	141
13	MCNR-24-13	RH 725 (ZC)	2040	2486	2238	1675	2537	**2195**	113	116	120	128	140
14	MCNR-24-14	RMM 19-06	2360	2340	2112	1605	2210	**2125**	115	115	117	131	135
15	MCNR-24-15	Kranti (NC)	2342	2573	2301	1683	2414	**2263**	114	112	127	133	133
16	MCNR-24-16	RGN 599	2718	2506	2139	1774	2295	**2286**	117	114	126	134	135
17	MCNR-24-17	RH 2265	2001	2439	2155	2025	2546	**2233**	114	114	127	137	133
18	MCNR-24-18	DRMRCI 196	2330	2009	1915	1955	2112	**2064**	115	115	124	133	135
		GM	**2465**	**2577**	**2198**	**1949**	**2358**	**2309**					
		CD (5%)	384	577	351	383	395						
		CV (%)	9.4	13.5	9.6	11.1	10.1						
		DOS	22-10-24	15-10-24	22-10-24	16-10-24	26-10-24						

Table 3.15b. Performance of Indian mustard strains in IVT Timely Sown (Rainfed), Zone - II

S.No.	Code	Strain	Days to Maturity					1000 - Seed Weight (g)					Oil Content (%)						Oil Yield (kg/ha)
			SGN 1	HSR 2	BAW 3	LDH 4	ABR 5	SGN 1	HSR 2	BAW 3	LDH 4	ABR 5	SGN 1	HSR 2	BAW 3	LDH 4	ABR 5	Mean (1-5)	
1	MCNR-24-1	RH 2299-64	152	143	145	141	143	4.3	6.4	5.7	5.8	6.1	40.3	39.8	41.4	39.5	38.3	**39.9**	**1035**
2	MCNR-24-2	HUJM-23-12	151	142	143	142	144	6.7	5.4	5.2	5.9	5.8	41.2	40.6	40.8	42.2	41.0	**41.2**	**1027**
3	**MCNR-24-3**	**RH 1424 (LR)**	**153**	**141**	**144**	**141**	**140**	**4.2**	**6.7**	**6.1**	**6.1**	**6.2**	**41.2**	**41.7**	**39.4**	**38.7**	**40.0**	**40.2**	**1038**
4	MCNR-24-4	DRMR 2019-16	152	142	140	142	140	5.4	6.5	5.9	6.4	6.5	42.4	42.1	39.7	40.5	42.3	**41.4**	**996**
5	MCNR-24-5	RKM 588	154	140	142	143	142	5.7	5.3	5.4	4.6	5.3	41.4	41.3	42.1	42.5	42.4	**41.9**	**987**
6	MCNR-24-6	BAUM 13-6	149	136	141	139	139	5.1	5.5	5.3	5.1	5.1	40.6	40.2	39.6	39.6	39.5	**39.9**	**898**
7	MCNR-24-7	NPJ 281	152	145	147	144	144	5.7	5.5	5.7	5.5	6.1	40.2	41.9	42.9	42.4	39.5	**41.4**	**1001**
8	MCNR-24-8	DRMRHT 2090	153	146	145	143	142	6.3	4.7	5.1	4.7	5.4	42.5	42.6	40.7	40.8	43.9	**42.1**	**1028**
9	MCNR-24-9	CAURM 4-1S	154	143	143	141	143	5.4	4.3	5.5	4.2	4.5	43.0	39.9	37.4	37.1	39.8	**39.4**	**838**
10	MCNR-24-10	NPJ 280	154	143	145	144	144	4.0	5.9	5.1	5.7	5.7	40.4	40.9	39.3	40.5	39.3	**40.1**	**950**
11	MCNR-24-11	DRMRIJ 138	155	142	142	147	144	6.0	6.3	6.0	6.0	5.6	39.5	41.5	39.1	41.8	38.8	**40.1**	**832**
12	MCNR-24-12	RAURD 14-18	154	143	146	144	143	6.9	6.4	5.7	6.0	6.2	38.6	41.3	41.4	40.7	42.0	**40.8**	**934**
13	MCNR-24-13	RH 725 (ZC)	153	145	144	143	143	6.0	5.9	6.1	5.7	5.8	42.5	42.2	37.7	39.0	41.2	**40.5**	**889**
14	MCNR-24-14	RMM 19-06	152	144	146	143	144	4.4	4.9	5.0	5.8	5.2	41.4	40.0	40.1	41.3	39.6	**40.5**	**860**
15	MCNR-24-15	Kranti (NC)	148	138	141	138	139	5.7	5.3	5.5	5.1	5.1	42.2	41.6	38.2	39.5	36.6	**39.6**	**897**
16	MCNR-24-16	RGN 599	154	146	147	147	151	4.9	4.7	5.3	4.9	4.7	38.6	41.3	38.0	38.8	38.3	**39.0**	**891**
17	MCNR-24-17	RH 2265	153	140	143	145	143	5.8	6.3	5.4	5.7	5.6	40.3	40.6	38.1	39.9	38.9	**39.6**	**883**
18	MCNR-24-18	DRMRCI 196	154	144	142	147	151	6.4	6.0	5.6	5.4	4.2	41.5	43.5	37.6	39.5	43.1	**41.0**	**847**

Table 3.16a. Performance of Indian mustard strains in IVT Timely Sown (Rainfed), Zone - V

S.No.	Code	Strain	Seed Yield (Kg/ha)					Plant Stand				Days to Maturity			
			KNK	SHL	DOL	VAR	Mean	KNK	SHL	DOL	VAR	KNK	SHL	DOL	VAR
			1	2	3	4	(1-4)	1	2	3	4	1	2	3	4
1	MCNR-24-1	RH 2299-64	1088	2074	1387	2157	**1676**	199	175	166	171	110	109	116	124
2	MCNR-24-2	HUJM-23-12	1152	2111	1112	2117	**1623**	193	177	166	183	111	109	113	125
3	MCNR-24-3	DRMR 150-35 (LR)	1273	1827	1191	2232	**1631**	195	149	164	183	112	109	115	122
4	MCNR-24-4	DRMR 2019-16	1305	2525	1173	1995	**1750**	198	161	166	182	112	112	114	122
5	MCNR-24-5	RKM 588	1044	2068	1176	1936	**1556**	193	158	163	184	110	109	110	120
6	MCNR-24-6	BAUM 13-6	1001	1809	1130	1712	**1413**	191	150	160	185	107	104	108	114
7	MCNR-24-7	NPJ 281	1128	2333	1158	2009	**1657**	201	153	164	186	113	112	117	125
8	MCNR-24-8	DRMRHT 2090	1302	2093	1124	2258	**1694**	199	166	165	181	109	112	116	122
9	MCNR-24-9	CAURM 4-1S	1360	2099	976	2247	**1670**	196	163	165	181	113	114	116	121
10	MCNR-24-10	NPJ 280	1105	2204	1112	1865	**1572**	194	167	163	185	114	116	115	122
11	MCNR-24-11	DRMRIJ 138	1274	2278	952	2079	**1646**	186	178	169	180	111	112	114	122
12	MCNR-24-12	RAURD 14-18	1429	2370	1058	2089	**1737**	199	159	161	181	109	114	113	120
13	**MCNR-24-13**	**NRCHB 101 (ZC)**	**1198**	**2228**	**1171**	**2612**	**1802**	**188**	**161**	**167**	**189**	**109**	**112**	**112**	**122**
14	MCNR-24-14	RMM 19-06	1354	2586	1291	2123	**1839**	183	171	168	177	112	106	117	121
15	MCNR-24-15	Kranti (NC)	1476	2321	1274	1936	**1752**	190	152	162	184	106	104	109	116
16	MCNR-24-16	RGN 599	1337	2506	1236	1890	**1742**	202	160	165	188	116	116	118	127
17	MCNR-24-17	RH 2265	1551	1944	1481	2052	**1757**	195	152	167	173	114	109	116	122
18	MCNR-24-18	DRMRCI 196	1181	2414	1193	1965	**1688**	198	164	164	176	115	109	117	125
		GM	**1253**	**2211**	**1178**	**2071**	**1678**								
		CD (5%)	173	408	121	292									
		CV (%)	8.3	11.1	6.2	8.5									
		DOS	14-11-24	27-11-24	21-10-24	29-10-24									

Table 3.16b. Performance of Indian mustard strains in IVT Timely Sown (Rainfed), Zone- V

S.No.	Code	Strain	1000 Seed Weight (g)				Oil Content (%)				Oil Yield (Kg/ha)
			KNK	SHL	DOL	VAR	KNK	DOL	VAR	Mean	
			1	2	3	4	1	3	4	(1,3-4)	
1	MCNR-24-1	RH 2299-64	4.2	6.4	4.7	5.5	37.2	38.2	41.3	**38.9**	**652**
2	MCNR-24-2	HUJM-23-12	4.6	5.4	4.1	5.1	40.7	39.9	40.4	**40.3**	**654**
3	MCNR-24-3	DRMR 150-35 (LR)	3.8	5.7	4.1	5.2	40.4	39.0	42.2	**40.5**	**661**
4	MCNR-24-4	DRMR 2019-16	4.1	6.5	4.7	5.7	39.0	39.7	41.2	**40.0**	**700**
5	MCNR-24-5	RKM 588	4.2	5.4	4.0	4.7	39.1	40.6	41.1	**40.2**	**626**
6	MCNR-24-6	BAUM 13-6	4.2	5.4	3.8	5.2	38.9	38.2	39.8	**39.0**	**550**
7	MCNR-24-7	NPJ 281	5.1	6.1	4.1	5.5	39.8	38.5	41.6	**40.0**	**662**
8	MCNR-24-8	DRMRHT 2090	4.4	5.4	4.0	5.0	38.6	38.5	42.5	**39.9**	**675**
9	MCNR-24-9	CAURM 4-1S	4.1	4.4	3.2	4.5	40.0	37.2	39.6	**39.0**	**651**
10	MCNR-24-10	NPJ 280	4.6	5.9	4.2	5.3	40.1	37.2	41.5	**39.6**	**622**
11	MCNR-24-11	DRMRIJ 138	5.1	5.9	5.1	5.6	36.7	39.4	41.6	**39.2**	**646**
12	MCNR-24-12	RAURD 14-18	5.3	7.0	5.0	5.9	41.5	40.3	40.7	**40.8**	**709**
13	**MCNR-24-13**	**NRCHB 101 (ZC)**	**5.3**	**6.5**	**4.8**	**5.6**	**41.1**	**36.7**	**40.8**	**39.5**	**712**
14	MCNR-24-14	RMM 19-06	4.3	5.5	3.9	5.2	39.0	38.2	40.6	**39.2**	**722**
15	MCNR-24-15	Kranti (NC)	5.5	5.5	3.7	5.3	37.7	37.6	42.6	**39.3**	**688**
16	MCNR-24-16	RGN 599	4.1	5.6	3.4	4.9	37.5	37.0	42.3	**39.0**	**679**
17	MCNR-24-17	RH 2265	5.2	5.9	5.0	5.9	37.4	38.8	41.8	**39.3**	**691**
18	MCNR-24-18	DRMRCI 196	5.3	6.2	4.5	5.5	40.2	40.0	41.8	**40.7**	**687**

Table 3.17a. Performance of Indian mustard strains in IVT Late Sown (Irrigated) Zone - II

S.No.	Code	Strain	Seed Yield (Kg/ha)							Plant Stand					Days to Maturity				
			SGN	HSR	NDH	LDH	ABR	Mean		SGN	HSR	NDH	LDH	ABR	SGN	HSR	NDH	LDH	ABR
			1	2	3	4	5	(1-5)		1	2	3	4	5	1	2	3	4	5
1	MCNL-24-1	NPJ 277	2305	2252	2017	2019	2146	**2148**		174	121	137	117	135	136	128	123	128	128
2	MCNL-24-2	KMR (L) 24-5	2432	2051	1569	2086	2123	**2052**		170	123	147	166	132	134	131	130	137	132
3	MCNL-24-3	DRMR 2022-16	2418	1992	1954	1994	2178	**2107**		171	120	139	158	126	133	130	124	135	130
4	MCNL-24-4	PRL-2022-1	1964	1785	1427	2111	1906	**1838**		170	116	150	172	127	135	132	132	138	133
5	MCNL-24-5	ORM 2019-30	2431	2364	2043	2364	2275	**2296**		174	118	151	190	118	134	131	121	135	130
6	MCNL-24-6	Radhika (LR)	2422	1862	1870	2006	2160	**2064**		173	122	145	140	134	129	130	124	136	131
7	MCNL-24-7	RMWR 19-01	2261	2080	1621	1549	2185	**1939**		168	118	133	160	128	132	131	128	139	133
8	MCNL-24-8	PM 26 (ZC)	1871	1850	1641	1444	1790	**1719**		167	111	127	177	130	138	128	121	138	130
9	MCNL-24-9	RGN 592	2198	2045	1803	1790	2248	**2017**		173	123	155	186	121	137	132	132	131	133
10	MCNL-24-10	NPJ 276	2578	2187	1855	1685	2285	**2118**		174	117	154	178	131	134	129	123	128	129
11	MCNL-24-11	RH 2374	2528	2677	1938	1790	2030	**2193**		177	122	147	174	121	136	126	120	128	128
12	MCNL-24-12	DRMRIJ 22-2	2423	1726	1612	1537	2075	**1875**		177	121	157	177	126	138	131	123	136	131
13	**MCNL-24-13**	**SVJH 78**	**2754**	**2423**	**2210**	**2735**	**2173**	**2459**	*	**174**	**117**	**138**	**181**	**125**	**134**	**130**	**122**	**130**	**131**
14	MCNL-24-14	Pusa MH 218	2689	2086	2047	2605	2120	**2309**		172	123	140	188	120	134	127	123	135	131
15	MCNL-24-15	PRL 2022-5	2129	1968	1534	1735	1856	**1844**		175	120	144	172	120	139	131	124	135	133
16	MCNL-24-16	RKM 599	2462	1820	1739	2142	1877	**2008**		173	118	148	178	116	138	130	132	137	134
17	MCNL-24-17	KMR (L) 24-6	2323	2069	1827	1654	2091	**1993**		173	115	148	149	121	137	132	132	137	131
18	MCNL-24-18	RH 2370	2238	2465	1692	1599	1779	**1954**		171	117	143	180	119	138	130	124	137	131
19	MCNL-24-19	TM 132-1	1804	1619	1117	1574	1543	**1531**		171	121	145	183	114	137	131	132	135	134
20	**MCNL-24-20**	**DRMRDR 2141**	**2416**	**2092**	**2023**	**2204**	**2105**	**2168**	***	**173**	**117**	**142**	**176**	**117**	**136**	**130**	**125**	**135**	**131**
21	MCNL-24-21	HUJM-23-4	2025	1785	1252	1494	1573	**1626**		171	114	147	185	126	137	132	132	137	132
22	**MCNL-24-22**	**Kranti (NC)**	**2365**	**2382**	**2168**	**1809**	**2069**	**2159**		**174**	**119**	**143**	**129**	**130**	**134**	**129**	**122**	**128**	**129**
		GM	**2320**	**2072**	**1771**	**1906**	**2027**	**2019**											
		CD (5%)	**364**	**397**	**255**	**344**	**339**												
		CV (%)	**9.5**	**11.6**	**8.8**	**11.0**	**10.2**												
		DOS	22-11-24	15-11-24	22-11-24	15-11-25	19-11-24												

* Strain outyielding the best check with a margin of more than 10% on the basis of seed and oil yield.

***Strain at par in seed/oil yield with the best check and possessing white rust resistance

Table 3.17b. Performance of Indian mustard strains in IVT Late Sown (Irrigated) Zone - II

S.No.	Code	Strain	1000-Seed Wt. (g)					Oil Content (%)						Oil Yield (kg/ha)
			SGN	HSR	NDH	LDH	ABR	SGN	HSR	NDH	LDH	ABR	Mean	
			1	2	3	4	5	1	2	3	4	5	(1-5)	
1	MCNL-24-1	NPJ 277	6.0	4.8	4.9	4.6	4.9	40.6	42.0	42.0	40.4	39.6	**40.9**	**879**
2	MCNL-24-2	KMR (L) 24-5	5.0	4.6	3.6	4.6	4.2	42.0	42.2	37.9	39.5	42.4	**40.8**	**837**
3	MCNL-24-3	DRMR 2022-16	5.3	5.7	4.7	5.3	5.2	40.7	40.8	39.5	40.2	40.1	**40.3**	**848**
4	MCNL-24-4	PRL-2022-1	4.2	4.5	3.7	5.2	5.0	40.9	42.6	37.4	42.4	38.8	**40.4**	**743**
5	MCNL-24-5	ORM 2019-30	4.7	5.0	4.6	5.1	5.4	42.1	43.5	39.2	41.6	40.3	**41.3**	**949**
6	MCNL-24-6	Radhika (LR)	4.4	4.7	4.2	5.0	4.9	41.0	41.8	39.8	40.4	41.9	**41.0**	**846**
7	MCNL-24-7	RMWR 19-01	4.1	4.3	3.6	4.9	4.5	41.1	40.8	39.4	38.8	39.7	**40.0**	**775**
8	MCNL-24-8	PM 25 (ZC)	3.7	4.0	3.3	3.3	4.1	42.0	41.5	38.7	39.6	42.1	**40.8**	**701**
9	MCNL-24-9	RGN 592	4.4	3.9	3.3	5.4	4.4	41.4	39.2	41.4	40.7	40.9	**40.7**	**821**
10	MCNL-24-10	NPJ 276	5.2	4.9	4.5	4.7	5.0	41.3	41.5	39.8	42.1	40.2	**41.0**	**868**
11	MCNL-24-11	RH 2374	5.1	4.3	4.0	4.9	4.4	42.8	40.8	42.7	41.4	39.7	**41.5**	**909**
12	MCNL-24-12	DRMRIJ 22-2	4.7	4.8	4.4	5.1	4.7	41.2	43.7	41.5	41.7	41.3	**41.9**	**785**
13	**MCNL-24-13**	**SVJH 78**	**4.8**	**4.0**	**3.7**	**4.7**	**4.3**	**40.3**	**42.8**	**39.6**	**40.6**	**41.3**	**40.9**	**1007**
14	MCNL-24-14	Pusa MH 218	3.5	4.2	4.0	4.6	4.6	41.2	41.9	40.2	40.5	41.8	**41.1**	**950**
15	MCNL-24-15	PRL 2022-5	4.9	4.5	4.1	5.1	4.8	38.7	42.4	39.0	42.1	41.0	**40.6**	**749**
16	MCNL-24-16	RKM 599	5.4	5.6	4.7	5.3	5.2	40.6	43.0	39.2	40.4	38.3	**40.3**	**809**
17	MCNL-24-17	KMR (L) 24-6	5.4	4.6	3.8	5.2	4.3	42.8	41.9	38.3	39.6	41.3	**40.8**	**813**
18	MCNL-24-18	RH 2370	4.9	4.4	3.8	4.2	4.2	42.2	40.1	38.6	40.1	38.1	**39.8**	**778**
19	MCNL-24-19	TM 132-1	4.7	5.5	5.1	6.0	5.2	41.6	40.5	39.3	39.4	39.2	**40.0**	**612**
20	**MCNL-24-20**	**DRMRDR 2141**	**5.0**	**5.4**	**5.2**	**5.6**	**5.1**	**42.0**	**41.5**	**37.9**	**40.4**	**41.8**	**40.7**	**883**
21	MCNL-24-21	HUJM-23-4	5.0	4.7	3.7	4.8	4.6	40.1	40.0	39.7	42.4	39.5	**40.3**	**656**
22	**MCNL-24-22**	**Kranti (NC)**	**3.9**	**4.6**	**4.0**	**4.5**	**4.8**	**41.3**	**39.9**	**39.3**	**41.8**	**39.5**	**40.4**	**871**

Table 3.18a. Performance of Indian mustard strains in IVT Late Sown (Irrigated) Zone - III

S.No.	Code	Strain	Seed Yield (Kg/ha)							Plant Stand					Days to Maturity				
			KPR	**MOR**	**KOT**	**JHS**	**BND**	**Mean**		**KPR**	**MOR**	**KOT**	**JHS**	**BND**	**KPR**	**MOR**	**KOT**	**JHS**	**BND**
			1	**2**	**3**	**4**	**5**	**(1-5)**		**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
1	MCNL-24-1	NPJ 277	1424	2858	2439	1554	2182	**2091**		117	159	160	121	151	124	125	121	124	121
2	MCNL-24-2	KMR (L) 24-5	1412	2523	2098	2250	1942	**2045**		116	157	166	128	171	120	128	123	130	123
3	MCNL-24-3	DRMR 2022-16	1922	2781	2367	2218	2499	**2357**		122	160	170	132	154	119	127	125	125	122
4	MCNL-24-4	PRL-2022-1	1716	2520	1996	2354	2240	**2165**		117	154	166	148	173	123	131	124	131	123
5	MCNL-24-5	ORM 2019-30	1823	3023	2372	2209	2307	**2347**		119	163	164	127	158	117	127	121	123	121
6	MCNL-24-6	BPM 11 (LR)	1329	2363	2169	2374	2054	2058		119	151	163	133	154	120	127	126	125	122
7	**MCNL-24-7**	**RMWR 19-01**	**1872**	**3058**	**2351**	**2222**	**2525**	**2406**	*	**114**	**168**	**160**	**136**	**181**	**125**	**132**	**126**	**130**	**122**
8	**MCNL-24-8**	**NRCHB 101 (ZC)**	**1481**	**2883**	**2236**	**2258**	**1983**	**2168**		**119**	**167**	**175**	**141**	**157**	**122**	**129**	**122**	**126**	**122**
9	MCNL-24-9	RGN 592	1473	2165	1712	2314	2517	**2036**		117	152	157	149	175	124	131	124	131	125
10	MCNL-24-10	NPJ 276	1988	2599	1612	2275	1738	**2042**		124	149	160	132	155	121	127	121	123	120
11	MCNL-24-11	RH 2374	1391	2268	1964	2538	1810	**1994**		114	169	162	140	165	121	126	121	124	122
12	MCNL-24-12	DRMRIJ 22-2	1626	2441	2238	2515	2035	**2171**		115	168	165	133	153	118	132	124	129	122
13	MCNL-24-13	SVJH 78	1494	2819	2502	2613	1617	**2209**		119	160	165	136	159	120	130	123	125	121
14	MCNL-24-14	Pusa MH 218	1527	2075	2001	2515	1873	**1998**		122	152	171	127	154	122	129	121	124	121
15	MCNL-24-15	PRL 2022-5	1584	2252	2297	2174	2122	**2086**		114	162	164	136	161	123	131	123	128	123
16	MCNL-24-16	RKM 599	1609	2446	2493	2411	1846	**2161**		116	161	169	148	156	120	128	124	127	124
17	MCNL-24-17	KMR (L) 24-6	1547	2573	2067	2315	2031	**2107**		116	157	165	149	168	122	130	123	123	122
18	MCNL-24-18	RH 2370	1658	3014	1991	2150	1809	**2124**		114	153	162	122	153	120	128	122	124	121
19	MCNL-24-19	TM 132-1	1469	2501	1735	2048	1338	**1818**		120	159	163	132	150	123	132	127	130	126
20	MCNL-24-20	DRMRDR 2141	1486	2653	2119	2167	2384	**2162**		121	154	165	132	156	118	129	122	126	124
21	MCNL-24-21	HUJM-23-4	1379	1981	1783	1889	1560	**1718**		119	153	155	141	157	122	133	123	127	123
22	MCNL-24-22	Kranti (NC)	1745	2554	2194	2075	1450	**2004**		123	148	163	134	161	119	126	121	126	121
		GM	**1589**	**2561**	**2124**	**2247**	**1994**	**2103**											
		CD (5%)	**163**	**370**	**285**	**444**	**309**												
		CV (%)	**6.2**	**8.8**	**8.1**	**12.0**	**9.4**												
		DOS	27-11-24	16-11-24	20-11-24	19-11-24	15-11-24												

* Strain outyielding the best check with a margin of more than 10% on the basis of seed yield.

Table 3.18b. Performance of Indian mustard strains in IVT Late Sown (Irrigated) Zone - III

S.No.	Code	Strain	1000-Seed Wt.(g)					Oil Content (%)						Oil Yield (kg/ha)
			KPR	MOR	KOT	JHS	BND	KPR	MOR	KOT	JHS	BND	Mean	
			1	2	3	4	5	1	2	3	4	5	(1-5)	
1	MCNL-24-1	NPJ 277	3.6	5.1	4.1	5.4	4.7	39.9	40.3	40.9	39.9	41.3	**40.5**	**846**
2	MCNL-24-2	KMR (L) 24-5	4.3	4.6	4.0	4.6	4.6	39.2	41.7	37.5	38.4	40.6	**39.5**	**807**
3	MCNL-24-3	DRMR 2022-16	4.8	5.8	5.1	5.4	5.8	41.0	42.5	38.1	40.7	41.8	**40.8**	**962**
4	MCNL-24-4	PRL-2022-1	3.7	4.6	4.0	5.6	5.0	40.3	42.6	38.0	36.9	40.7	**39.7**	**860**
5	MCNL-24-5	ORM 2019-30	3.9	5.3	4.4	4.8	5.4	39.3	42.1	37.2	39.8	40.2	**39.7**	**933**
6	MCNL-24-6	BPM 11 (LR)	4.5	5.5	4.8	5.9	5.3	41.5	42.3	41.7	41.2	41.5	**41.6**	**857**
7	**MCNL-24-7**	**RMWR 19-01**	**3.1**	**4.4**	**3.8**	**4.5**	**5.3**	**37.6**	**41.6**	**40.5**	**37.2**	**39.0**	**39.2**	**942**
8	**MCNL-24-8**	**NRCHB 101 (ZC)**	**4.5**	**5.5**	**4.5**	**5.6**	**5.1**	**41.8**	**41.4**	**39.8**	**40.7**	**40.8**	**40.9**	**886**
9	MCNL-24-9	RGN 592	3.2	4.3	3.5	3.2	3.7	37.2	40.5	41.3	37.2	40.0	**39.3**	**799**
10	MCNL-24-10	NPJ 276	4.3	5.1	3.6	5.2	4.8	38.6	39.4	40.9	39.3	40.4	**39.7**	**811**
11	MCNL-24-11	RH 2374	3.9	4.7	3.7	4.7	4.6	37.5	42.4	39.7	39.3	41.2	**40.0**	**798**
12	MCNL-24-12	DRMRIJ 22-2	4.5	5.0	4.1	4.6	4.4	39.7	42.9	41.8	39.9	41.3	**41.1**	**892**
13	MCNL-24-13	SVJH 78	4.3	5.3	3.8	5.1	4.6	42.3	42.4	37.9	39.4	40.2	**40.4**	**893**
14	MCNL-24-14	Pusa MH 218	3.2	4.4	3.4	4.4	4.4	39.8	41.5	42.3	39.8	40.7	**40.8**	**816**
15	MCNL-24-15	PRL 2022-5	3.6	4.9	3.6	4.5	4.4	39.2	42.5	41.8	39.2	40.8	**40.7**	**849**
16	MCNL-24-16	RKM 599	4.3	5.5	5.1	5.6	5.1	39.8	41.9	42.2	39.4	40.3	**40.7**	**880**
17	MCNL-24-17	KMR (L) 24-6	3.6	4.4	3.9	4.9	5.5	39.1	40.9	40.8	39.9	38.6	**39.9**	**840**
18	MCNL-24-18	RH 2370	3.7	4.7	3.6	4.4	4.0	39.0	43.0	39.6	39.6	39.4	**40.1**	**852**
19	MCNL-24-19	TM 132-1	3.8	6.4	4.9	4.9	4.9	38.2	41.4	40.6	39.2	40.6	**40.0**	**727**
20	MCNL-24-20	DRMRDR 2141	4.0	5.2	4.2	4.6	4.7	40.4	40.3	38.8	39.5	41.2	**40.0**	**866**
21	MCNL-24-21	HUJM-23-4	3.3	4.4	3.8	4.3	4.2	40.8	42.6	40.4	36.8	41.8	**40.5**	**696**
22	MCNL-24-22	Kranti (NC)	3.5	4.4	3.6	3.7	4.6	37.8	40.3	41.4	39.2	40.7	**39.9**	**799**

Table 3.19a. Performance of Indian mustard strains in IVT Late Sown (Irrigated) Zone - V

S.No.	Code	Strain	Seed Yield (Kg/ha)							Plant Stand					Days to Maturity				
			KNK	SHL	DOL	VAR	SBR$	Mean		KNK	SHL	DOL	VAR	SBR	KNK	SHL	DOL	VAR	SBR
			1	2	3	4	5	(1-4)		1	2	3	4	5	1	2	3	4	5
1	MCNL-24-1	NPJ 277	926	1019	1045	2508	1699	**1374**		187	158	163	172	294	106	107	109	114	100
2	MCNL-24-2	KMR (L) 24-5	1056	1296	983	2412	1969	**1437**		189	163	161	187	296	110	110	115	118	106
3	MCNL-24-3	DRMR 2022-16	856	1698	784	2777	1787	**1529**		187	165	171	201	296	107	104	111	118	102
4	MCNL-24-4	PRL-2022-1	1111	1698	867	2491	2007	**1542**		198	164	164	188	298	117	110	115	121	107
5	MCNL-24-5	ORM 2019-30	1021	1512	811	2335	2133	**1420**		199	162	164	195	298	106	107	110	117	101
6	MCNL-24-6	CS 56 (LR)	859	1586	1045	2606	2000	**1524**		198	156	164	198	298	111	110	115	120	105
7	**MCNL-24-7**	**RMWR 19-01**	**1197**	**2160**	**853**	**2598**	**2020**	**1702**	***	**195**	**163**	**168**	**196**	**298**	**115**	**110**	**115**	**121**	**106**
8	**MCNL-24-8**	**NRCHB 101 (ZC)**	**1250**	**1698**	**998**	**2668**	**2320**	**1653**		**193**	**159**	**166**	**206**	**296**	**109**	**110**	**111**	**117**	**102**
9	MCNL-24-9	RGN 592	1227	1463	703	2662	1787	**1514**		196	155	166	195	297	116	107	116	124	104
10	MCNL-24-10	NPJ 276	1111	1543	808	2591	1813	**1513**		210	167	163	201	299	107	110	1109	115	101
11	MCNL-24-11	RH 2374	1360	1636	800	3165	2215	**1740**		197	163	159	204	298	107	110	110	113	101
12	MCNL-24-12	DRMRIJ 22-2	1392	1562	911	2459	2047	**1581**		192	167	164	191	297	112	110	111	118	105
13	MCNL-24-13	SVJH 78	897	1741	988	2851	2009	**1619**		204	156	165	195	297	110	107	111	116	103
14	MCNL-24-14	Pusa MH 218	788	1907	982	2644	1856	**1580**		187	153	163	188	296	108	104	112	115	102
15	MCNL-24-15	PRL 2022-5	891	1438	901	2680	1953	**1478**		191	159	163	192	299	109	110	114	118	106
16	MCNL-24-16	RKM 599	1105	1414	949	2351	1597	**1455**		198	157	163	190	296	111	116	115	120	104
17	MCNL-24-17	KMR (L) 24-6	1296	1679	876	2310	1785	**1540**		200	169	162	183	298	111	110	114	118	107
18	MCNL-24-18	RH 2370	966	1883	1261	2498	2189	**1652**		195	156	165	195	297	109	110	112	116	106
19	MCNL-24-19	TM 132-1	1094	1994	946	2448	1463	**1620**		192	156	167	188	299	114	110	115	121	105
20	**MCNL-24-20**	**DRMRDR 2141**	**1308**	**1877**	**1034**	**2623**	**2061**	**1710**	***	**192**	**159**	**164**	**188**	**297**	**109**	**112**	**112**	**117**	**105**
21	MCNL-24-21	HUJM-23-4	810	1623	851	2356	2017	**1410**		201	163	165	195	297	109	110	114	121	107
22	MCNL-24-22	Kranti (NC)	1157	1531	996	2667	2283	**1588**		193	164	163	199	299	107	107	109	114	102
		GM	**1076**	**1634**	**927**	**2577**	**1955**	**1554**											
		CD (5%)	195	275	124	395	NS												
		CV (%)	11.0	10.2	8.1	9.3	14.8												
		DOS	30-11-24	29-11-24	28-11-24	17-11-24	25-11-24												

$Data of SBR excluded from computation of mean due to non significant data
***Strain at par in seed/oil yield with the best check and possessing white rust resistance

Table 3.19b. Performance of Indian mustard strains in IVT Late Sown (Irrigated) Zone - V

S.No.	Code	Strain	1000-Seed Wt.(g)					Oil Content (%)					Oil Yield (kg/ha)
			KNK	SHL	DOL	VAR	SBR	KNK	DOL	VAR	SBR	Mean	
			1	2	3	4	5	1	3	4	5	(1,3-4)	
1	MCNL-24-1	NPJ 277	5.3	5.5	3.4	5.4	4.7	41.6	37.7	39.7	38.9	**39.7**	**545**
2	MCNL-24-2	KMR (L) 24-5	4.3	5.5	4.0	5.5	4.5	38.9	38.7	37.1	37.9	**38.3**	**550**
3	MCNL-24-3	DRMR 2022-16	5.3	6.5	4.1	5.6	5.4	43.3	38.5	38.7	40.3	**40.1**	**613**
4	MCNL-24-4	PRL-2022-1	4.7	5.5	3.9	5.3	4.1	39.7	38.3	39.0	38.6	**39.0**	**602**
5	MCNL-24-5	ORM 2019-30	4.1	5.4	3.6	5.3	5.1	40.1	36.3	41.3	40.1	**39.2**	**557**
6	MCNL-24-6	CS 56 (LR)	4.3	6.2	3.6	5.0	5.2	37.8	37.3	38.9	37.1	**38.0**	**579**
7	**MCNL-24-7**	**RMWR 19-01**	**4.6**	**5.2**	**3.8**	**5.3**	**4.4**	**41.7**	**36.9**	**41.1**	**38.9**	**39.9**	**679**
8	**MCNL-24-8**	**NRCHB 101 (ZC)**	**5.2**	**6.5**	**4.2**	**5.5**	**5.3**	**40.7**	**37.4**	**41.0**	**39.3**	**39.7**	**657**
9	MCNL-24-9	RGN 592	3.9	4.9	4.4	5.5	3.9	38.6	36.4	37.3	37.4	**37.4**	**566**
10	MCNL-24-10	NPJ 276	4.7	5.5	4.4	5.1	4.8	38.2	37.2	37.9	38.4	**37.8**	**571**
11	MCNL-24-11	RH 2374	4.4	5.4	3.7	5.4	4.4	40.2	37.3	38.0	38.8	**38.5**	**670**
12	MCNL-24-12	DRMRIJ 22-2	4.2	6.4	4.2	5.7	5.2	40.2	38.3	39.8	37.1	**39.4**	**623**
13	MCNL-24-13	SVJH 78	4.3	7.3	3.4	5.6	4.5	42.2	37.8	42.3	39.2	**40.8**	**660**
14	MCNL-24-14	Pusa MH 218	4.3	6.2	3.3	5.4	4.4	41.3	39.3	41.6	38.6	**40.7**	**644**
15	MCNL-24-15	PRL 2022-5	4.3	5.5	3.6	5.8	4.5	40.9	37.9	43.9	39.3	**40.9**	**605**
16	MCNL-24-16	RKM 599	5.4	5.8	4.4	5.7	5.5	37.4	37.1	39.3	37.6	**37.9**	**552**
17	MCNL-24-17	KMR (L) 24-6	4.5	5.2	3.9	5.4	4.4	42.7	39.9	40.2	39.3	**40.9**	**630**
18	MCNL-24-18	RH 2370	4.6	6.4	3.6	5.1	4.1	40.2	38.1	39.5	38.9	**39.3**	**649**
19	MCNL-24-19	TM 132-1	5.5	5.1	4.8	5.7	6.2	39.6	37.6	40.5	38.3	**39.3**	**636**
20	**MCNL-24-20**	**DRMRDR 2141**	**5.2**	**5.1**	**4.4**	**5.7**	**4.8**	**41.6**	**39.3**	**41.1**	**38.0**	**40.6**	**695**
21	MCNL-24-21	HUJM-23-4	4.3	5.4	3.7	5.7	4.4	41.7	38.3	39.6	39.6	**39.9**	**562**
22	MCNL-24-22	Kranti (NC)	5.8	5.2	3.8	5.6	4.3	40.0	38.6	38.6	39.1	**39.1**	**621**

Table 3.20a. Performance of Indian mustard strains in AVT-I Late Sown (Irrigated) Zone - II

S.No	Code	Strain	Seed Yield (Kg/ha)						Plant Stand				Days to Maturity			
			HSR	NDH	LDH	ABR	Mean		HSR	NDH	LDH	ABR	HSR	NDH	LDH	ABR
			1	2	3	4	(1-4)		1	2	3	4	1	2	3	4
1	MCNL-24-23	PM 26 (ZC)	1862	1593	1398	1689	**1635**		250	247	262	235	131	122	132	131
2	**MCNL-24-24**	**Kranti (NC)**	**2187**	**1991**	**2356**	**2075**	**2153**		**262**	**268**	**289**	**225**	**128**	**122**	**131**	**129**
3	**MCNL-24-25**	**NPJ 267**	**2247**	**2208**	**2563**	**2175**	**2298**	**	**263**	**274**	**290**	**214**	**130**	**123**	**132**	**129**
4	MCNL-24-26	Kranti (fillar)	2021	1955	2324	2031	**2083**		262	264	265	232	131	122	131	130
5	MCNL-24-27	Radhika (LR)	1684	1901	2576	1989	**2038**		261	270	281	229	128	125	133	130
6	MCNL-24-28	NPJ 268	1809	2300	1993	2034	**2034**		263	263	264	240	128	121	131	128
		GM	**1968**	**1991**	**2202**	**1999**	**2040**									
		CD (5%)	349	183	357	240										
		CV (%)	11.8	6.1	10.8	8.0										
		DOS	15-11-24	21-11-24	15-11-24	19-11-24										

** Strain outyielding the best check with a margin of more than 10% on the basis of oil yield.

Table 3.20b. Performance of Indian mustard strains in AVT-I Late Sown (Irrigated) Zone - II

S.No	Code	Strain	1000-Seed Wt.(g)				Oil Content (%)					Oil Yield (kg/ha)
			HSR	NDH	LDH	ABR	HSR	NDH	LDH	ABR	Mean	
			1	2	3	4	1	2	3	4	(1-4)	
1	MCNL-24-23	PM 26 (ZC)	3.9	3.2	4.2	4.1	40.5	37.7	41.2	38.4	**39.4**	**645**
2	**MCNL-24-24**	**Kranti (NC)**	**4.3**	**3.7**	**4.7**	**4.4**	**40.1**	**36.8**	**40.9**	**40.8**	**39.7**	**854**
3	**MCNL-24-25**	**NPJ 267**	**5.2**	**4.6**	**5.1**	**5.3**	**43.9**	**38.9**	**42.5**	**41.4**	**41.7**	**958**
4	MCNL-24-26	Kranti (fillar)	4.6	3.8	5.2	4.6	40.1	37.2	42.4	41.0	**40.2**	**837**
5	MCNL-24-27	Radhika (LR)	4.7	4.1	5.2	4.8	41.9	38.2	42.1	39.4	**40.4**	**823**
6	MCNL-24-28	NPJ 268	4.8	4.8	5.8	4.9	41.1	40.4	40.6	40.1	**40.5**	**824**

Table 3.21a. Performance of Indian mustard strains in AVT-I Late Sown (Irrigated) Zone - III

S.No	Code	Strain	Seed Yield (Kg/ha)							Plant Stand					Days to Maturity				
			KPR$	MOR#	KOT	BPR	BND	Mean		KPR	MOR	KOT	BPR	BND	KPR	MOR	KOT	BPR	BND
			1	2	3	4	5	(3-5)		1	2	3	4	5	1	2	3	4	5
1	**MCNL-24-29**	**CS 56 (LR)**	**2060**	**2402**	**2341**	**2089**	**2211**	**2214**		**212**	**333**	**319**	**284**	**307**	**125**	**132**	**124**	**131**	**123**
2	MCNL-24-30	NRCHB 101 (fillar)	2199	2369	2190	2226	1940	**2119**		227	314	316	292	309	123	127	123	129	119
3	**MCNL-24-31**	**DRMR 2018-1*** **	**2219**	**2225**	**2534**	**2720**	**2497**	**2584**	*	**221**	**320**	**351**	**288**	**282**	**122**	**129**	**124**	**127**	**120**
4	MCNL-24-32	Kranti (NC)	2085	2538	2064	1969	2023	**2019**		214	331	313	285	301	120	127	121	124	119
5	MCNL-24-33	NPJ 268 ***	2088	2331	2414	2106	1809	**2109**		210	324	326	278	279	124	128	122	126	119
6	MCNL-24-34	NRCHB 101 (ZC)	2238	2119	2219	2312	1956	**2163**		223	327	327	273	302	118	124	124	130	120
		GM	**2148**	**2331**	**2294**	**2237**	**2073**	**2201**											
		CD (5%)	NS	213	277	354	285												
		CV (%)	4.9	6.1	8.0	10.5	9.1												
		DOS	27-11-24	16-11-24	20-11-24	15-11-24	16-11-24												

$ Data of KPR excluded from computation of mean due to low CV and non significant data.
# Data of MOR excluded from computation of mean due to significant difference between same strain being used as check/filler
* Strain outyielding the best check with a margin of more than 10% on the basis of seed yield.

Table 3.21b. Performance of Indian mustard strains in AVT-I Late Sown (Irrigated) Zone - III

S.No	Code	Strain	1000-Seed Wt.(g)					Oil Content (%)						Oil Yield (kg/ha)
			KPR	MOR	KOT	BPR	BND	KPR	MOR	KOT	BPR	BND	Mean	
			1	2	3	4	5	1	2	3	4	5	(3-5)	
1	**MCNL-24-29**	**CS 56 (LR)**	**3.6**	**5.2**	**4.5**	**4.2**	**4.4**	**37.4**	**38.2**	**39.4**	**39.8**	**38.4**	**39.2**	**867**
2	MCNL-24-30	NRCHB 101	3.4	5.4	4.8	4.7	5.1	37.2	39.8	40.5	38.8	39.8	**39.7**	**840**
3	**MCNL-24-31**	**DRMR 2018-1*** **	**3.5**	**4.9**	**4.7**	**5.5**	**5.0**	**36.7**	**40.8**	**40.8**	**39.7**	**40.5**	**40.3**	**1042**
4	MCNL-24-32	Kranti (NC)	3.8	4.0	3.6	3.8	4.1	37.2	40.3	39.7	37.9	39.5	**39.0**	**787**
5	MCNL-24-33	NPJ 268 ***	4.3	5.2	4.5	4.5	4.2	37.3	40.4	38.9	39.6	37.4	**38.6**	**814**
6	MCNL-24-34	NRCHB 101 (ZC)	3.8	4.9	4.8	4.6	4.5	38.5	42.1	38.1	40.2	39.5	**39.3**	**849**

Table 3.22a. Performance of Indian mustard strains in AVT-I Late Sown (Irrigated) Zone - V

S.No	Code	Strain	Seed Yield (Kg/ha)							Plant Stand						Days to Maturity					
			KNK@	SHL	DOL$	VAR#	KLN	SBR	Mean	KNK	SHL	DOL	VAR	KLN	SBR	KNK	SHL	DOL	VAR	KLN	SBR
			1	2	3	4	5	6	(2,5-6)	1	2	3	4	5	6	1	2	3	4	5	6
1	**MCNL-24-35**	**NRCHB 101 (ZC)**	**1204**	**1586**	**1333**	**2408**	**1550**	**2036**	**1724**	**393**	**387**	**335**	**346**	**376**	**496**	**106**	**107**	**115**	**116**	**108**	**102**
2	MCNL-24-36	DRMR 2018-1***	1270	1250	1240	2117	1531	1918	**1566**	392	350	333	386	373	497	107	107	114	112	105	101
3	MCNL-24-37	CS 56 (filler)	1096	1470	1199	2425	1556	1784	**1604**	386	318	337	377	371	495	109	116	118	119	107	105
4	MCNL-24-38	Kranti (NC)	1335	1319	1216	2195	1285	1825	**1477**	385	364	328	386	385	496	104	107	114	112	103	100
5	MCNL-24-39	CS 56 (LR)	1315	1435	1325	2250	1657	1588	**1560**	387	354	325	365	358	494	108	112	117	118	108	106
		GM	**1244**	**1412**	**1263**	**2279**	**1516**	**1830**	**1586**												
		CD (5%)	157	217	76	NS	165	257													
		CV (%)	8.2	10.0	3.9	8.2	7.0	9.1													
		DOS	30-11-24	29-11-24	21-11-24	17-11-24	25-11-24	26-11-24													

$ Data of DOL excluded from computation of mean due to low CV.
@ Data of KNK and DOL excluded from computation of mean due to significant difference between same strain being used as check/filler
# Data of VAR excluded from computation of mean due to non-significant data

Table 3.22b. Performance of Indian mustard strains in AVT-I Late Sown (Irrigated) Zone-V

S.No	Code	Strain	1000-Seed Wt.(g)						Oil Content (%)						Oil Yield (kg/ha)
			KNK	SHL	DOL	VAR	KLN	SBR	KNK	DOL	VAR	KLN	SBR	Mean	
			1	2	3	4	5	6	1	3	4	5	6	(5-6)	
1	**MCNL-24-35**	**NRCHB 101 (ZC)**	**5.3**	**6.0**	**4.0**	**5.5**	**4.4**	**5.6**	**40.1**	**40.7**	**40.2**	**37.7**	**39.4**	**38.6**	**665**
2	MCNL-24-36	DRMR 2018-1***	4.5	5.9	3.6	5.1	4.0	6.0	41.3	40.0	39.9	36.8	39.4	**38.1**	**597**
3	MCNL-24-37	CS 56 (filler)	4.6	6.5	4.3	5.1	3.6	4.6	38.6	39.7	39.2	38.4	38.1	**38.2**	**613**
4	MCNL-24-38	Kranti (NC)	4.2	5.4	3.9	5.0	3.8	4.4	36.5	38.8	41.8	40.1	38.3	**39.2**	**579**
5	MCNL-24-39	CS 56 (LR)	5.2	6.1	3.5	5.1	4.5	4.9	39.5	38.8	40.2	38.4	37.6	**38.0**	**593**

Table 3.23a. Performance of Indian mustard hybrids in IHT, Zone-II

S.No.	Code	Strain	Seed Yield (kg/ha)							Plant Stand					Days to Maturity				
			HSR	LDH	NDH	ALW	BAW	Mean		HSR	LDH	NDH	ALW	BAW	HSR	LDH	NDH	ALW	BAW
			1	2	3	4	5	(1-5)		1	2	3	4	5	1	2	3	4	5
1	MH 24-01	Pusa MH 194	3589	2310	3204	2119	2463	**2737**		120	113	157	115	127	144	142	143	141	135
2	MH 24-02	US 8787	2979	2389	3146	3111	2370	**2799**		121	121	144	117	120	142	141	138	143	134
3	MH 24-03	HT 7262	2561	2396	2992	2642	2179	**2554**		119	120	165	115	119	142	140	141	138	137
4	**MH 24-04**	**Kranti (NC)**	**3282**	**2268**	**2799**	**3152**	**2172**	**2735**		**115**	**127**	**170**	**115**	**119**	**140**	**141**	**138**	**139**	**135**
5	MH 24-05	NJH 24-101	2927	2440	2875	2914	2191	**2669**		119	117	123	115	122	144	136	142	142	137
6	MH 24-06	PHR 10265	3258	2556	2839	2490	2530	**2735**		115	119	165	116	113	143	139	144	139	137
7	MH 24-07	KBH 5256	3069	2611	2759	2778	2407	**2725**		116	119	150	114	115	139	136	140	136	136
8	MH 24-08	NRCHB 506	2667	2530	2254	2449	2420	**2464**		118	125	162	115	113	140	140	142	140	135
9	MH 24-09	SVJH-77	3073	2789	2652	2144	2312	**2594**		112	122	147	115	119	137	140	143	137	136
10	MH 24-10	DRMRHJ 520	3195	1865	2521	2584	2384	**2510**		117	121	159	116	116	142	140	143	140	135
11	MH 24-11	RHH 2401	3101	2633	2901	2403	2435	**2695**		119	125	152	115	120	142	139	140	138	135
12	MH 24-12	DRMRHJ 2420	3018	2380	2958	2864	2478	**2740**		118	117	160	117	120	145	142	143	138	136
13	MH 24-13	NIMOH -02	3231	2383	2971	2226	2415	**2645**		112	128	141	115	118	137	136	131	138	130
14	MH 24-14	SBH 618	3069	2818	2665	2263	2068	**2577**		117	116	159	116	120	136	137	141	139	137
15	MH 24-15	NMH90M03	3180	2741	3131	2173	2398	**2724**		118	121	166	114	125	136	143	141	137	135
16	MH 24-16	DRMRHJ 410	3081	2310	2860	2016	2459	**2545**		120	120	155	118	125	139	139	144	140	138
17	MH 24-17	PHR 10143	2959	2566	2768	2979	2180	**2690**		119	130	158	117	121	137	142	147	139	136
18	MH 24-18	PA 5235	3073	2488	2967	2424	2546	**2700**		116	114	147	116	124	140	141	142	140	134
19	**MH 24-19**	**DMH 1 (hy. Check)**	**3207**	**2493**	**2677**	**2432**	**1939**	**2550**		**115**	**127**	**142**	**115**	**123**	**141**	**140**	**142**	**135**	**136**
20	MH 24-20	4205D300-01	3121	2774	3018	2181	2325	**2684**		119	117	122	117	122	139	141	142	138	136
21	MH 24-21	Pusa MH 226	3499	2036	3137	2222	2498	**2678**		115	121	162	115	128	141	139	142	138	138
22	**MH 24-22**	**RHH 2402**	**3617**	**2663**	**3227**	**2576**	**2604**	**2937**	**	**111**	**117**	**152**	**116**	**127**	**141**	**140**	**142**	**136**	**133**
23	MH 24-23	AMH-511	2679	2597	2820	2251	1824	**2434**		115	119	152	114	119	143	138	142	137	130
24	MH 24-24	RH 749 (ZC)	3180	2029	2823	2626	2431	**2618**		114	122	132	115	122	147	140	150	140	135
		GM	**3109**	**2461**	**2874**	**2501**	**2334**	**2656**											
		CD (5%)	502	368	422	293	395												
		CV (%)	9.8	9.1	8.9	7.1	10.3												
		DOS	10-10-24	18-10-24	16-10-24	22-10-24	22-10-24												

** Strain out yielding the best hybrid check by a margin of more than or equal to 5 percent and best varietal check by a margin of more than or equal to 10 percent on the basis of oil yield.

Table 3.23b. Performance of Indian mustard hybrids in IHT, Zone-II

S.No.	Code	Strain	1000-Seed Wt.(g)						Oil Content (%)						Oil Yield (kg/ha)
			HSR	LDH	NDH	ALW	BAW	Mean	HSR	LDH	NDH	ALW	BAW	Mean	
			1	2	3	4	5	(1-5)	1	2	3	4	5	(1-5)	
1	MH 24-01	Pusa MH 194	5.5	5.2	5.4	4.6	5.3	**5.2**	39.6	38.1	40.6	39.6	40.2	**39.6**	**1085**
2	MH 24-02	US 8787	5.7	6.0	5.7	4.4	5.7	**5.5**	39.7	41.4	42.1	40.3	42.0	**41.1**	**1150**
3	MH 24-03	HT 7262	5.0	5.5	5.1	4.3	5.7	**5.1**	39.2	42.1	41.9	42.6	41.8	**41.5**	**1060**
4	**MH 24-04**	**Kranti (NC)**	**5.0**	**4.5**	**4.7**	**3.7**	**4.7**	**4.5**	**37.2**	**41.1**	**41.7**	**37.8**	**39.3**	**39.4**	**1079**
5	MH 24-05	NJH 24-101	4.8	4.8	4.6	3.3	4.6	**4.4**	36.0	37.9	39.9	38.6	38.1	**38.1**	**1017**
6	MH 24-06	PHR 10265	4.8	4.7	4.2	3.9	4.6	**4.4**	38.2	40.0	40.0	39.4	38.9	**39.3**	**1074**
7	MH 24-07	KBH 5256	5.8	5.3	5.2	4.1	5.5	**5.2**	37.8	40.0	42.5	40.3	40.7	**40.3**	**1097**
8	MH 24-08	NRCHB 506	5.6	5.1	5.0	4.4	4.8	**5.0**	37.4	38.5	42.2	40.4	38.3	**39.4**	**970**
9	MH 24-09	SVJH-77	5.0	5.2	5.2	3.9	4.9	**4.8**	40.2	39.7	40.7	42.1	41.3	**40.8**	**1059**
10	MH 24-10	DRMRHJ 520	5.4	5.0	4.2	3.7	4.6	**4.5**	39.3	39.3	42.2	41.4	40.4	**40.5**	**1017**
11	MH 24-11	RHH 2401	5.5	5.2	5.2	4.0	5.5	**5.1**	37.9	39.8	43.3	40.4	40.9	**40.5**	**1090**
12	MH 24-12	DRMRHJ 2420	5.0	4.4	4.2	3.5	4.7	**4.4**	36.7	38.3	40.4	42.2	40.0	**39.5**	**1083**
13	MH 24-13	NIMOH -02	5.4	4.9	4.9	4.2	4.7	**4.8**	40.0	40.9	41.3	39.4	42.7	**40.9**	**1081**
14	MH 24-14	SBH 618	5.8	5.1	5.1	4.1	5.2	**5.1**	41.3	40.2	43.3	38.6	42.2	**41.1**	**1060**
15	MH 24-15	NMH90M03	5.5	5.4	5.3	4.4	5.4	**5.2**	40.1	43.2	42.6	42.4	42.2	**42.1**	**1146**
16	MH 24-16	DRMRHJ 410	4.9	5.3	4.5	3.9	4.4	**4.6**	39.2	40.8	40.1	40.1	42.2	**40.5**	**1030**
17	MH 24-17	PHR 10143	4.5	4.4	3.8	3.4	4.1	**4.0**	39.3	37.3	39.4	37.7	40.4	**38.8**	**1044**
18	MH 24-18	PA 5235	5.1	5.0	5.2	3.9	4.9	**4.8**	39.0	40.5	38.2	40.3	39.7	**39.6**	**1068**
19	**MH 24-19**	**DMH 1 (hy. Check)**	**3.7**	**4.2**	**3.4**	**2.8**	**3.7**	**3.6**	**39.5**	**42.4**	**37.5**	**42.1**	**40.0**	**40.3**	**1027**
20	MH 24-20	4205D300-01	5.5	5.7	5.6	4.1	4.1	**5.0**	40.1	43.0	42.4	40.4	42.5	**41.7**	**1119**
21	MH 24-21	Pusa MH 226	4.7	6.0	4.9	4.0	5.1	**4.9**	38.0	38.7	39.8	41.4	42.2	**40.0**	**1071**
22	**MH 24-22**	**RHH 2402**	**5.2**	**5.2**	**4.9**	**3.8**	**5.1**	**4.8**	**37.8**	**41.6**		**41.1**	**41.7**	**40.6**	**1191**
23	MH 24-23	AMH-511	5.8	6.0	5.8	4.2	5.3	**5.4**	41.1	40.0	39.5	42.4	40.5	**40.7**	**990**
24	MH 24-24	RH 749 (ZC)	6.6	6.3	6.4	3.7	5.9	**5.8**	40.7	39.9	39.4	40.4	39.3	**39.9**	**1045**

Table 3.24a. Performance of Indian mustard hybrids in IHT, Zone-III

S.No.	Code	Strain	Seed Yield (kg/ha)						Plant Stand					Days to Maturity				
			KAN	MOR	KOT	JHS$	BPR	Mean	KAN	MOR	KOT	JHS	BPR	KAN	MOR	KOT	JHS	BPR
			1	2	3	4	5	(1-3,5)	1	2	3	4	5	1	2	3	4	5
1	MH 24-01	Pusa MH 194	1955	2058	3006	1676	2041	**2265**	119	109	103	125	116	132	133	130	136	128
2	MH 24-02	US 8787	1893	2325	2901	2330	2448	**2392**	120	115	101	101	127	129	137	127	135	128
3	MH 24-03	HT 7262	2169	2677	2552	2117	2741	**2535**	116	115	106	113	124	135	135	127	134	129
4	MH 24-04	Kranti (NC)	1885	1672	2200	1915	2330	**2022**	121	116	100	115	120	130	134	124	128	128
5	MH 24-05	NJH 24-101	2325	2741	3419	2091	2500	**2746**	123	113	100	115	113	132	135	127	134	130
6	MH 24-06	PHR 10265	1889	2770	2639	2316	2467	**2441**	118	110	105	112	115	129	133	131	133	131
7	MH 24-07	KBH 5256	2214	2114	2563	2147	2667	**2389**	118	112	102	110	113	129	136	125	137	129
8	MH 24-08	NRCHB 506	1909	1890	2613	1758	1637	**2012**	121	114	105	111	125	131	138	131	127	131
9	MH 24-09	SVJH-77	2004	2621	2215	2263	2463	**2326**	117	108	103	116	116	135	136	125	132	130
10	MH 24-10	DRMRHJ 520	2070	2433	2887	1872	1930	**2330**	117	114	106	116	111	131	138	131	130	130
11	MH 24-11	RHH 2401	2049	2501	2547	2087	2111	**2302**	115	115	106	113	117	134	134	125	127	127
12	MH 24-12	DRMRHJ 2420	1770	2477	2812	2109	2104	**2291**	114	116	105	115	105	127	134	130	128	128
13	MH 24-13	NIMOH -02	1996	2086	2186	1934	2304	**2143**	120	112	108	103	122	131	132	123	125	122
14	MH 24-14	SBH 618	1975	2423	2481	1889	2533	**2353**	120	114	105	104	125	128	136	127	134	128
15	MH 24-15	NMH90M03	1996	2869	3038	2312	2622	**2631**	116	114	104	110	118	134	134	127	135	125
16	MH 24-16	DRMRHJ 410	1852	2604	2570	1938	1989	**2254**	120	109	104	112	112	129	137	128	130	129
17	MH 24-17	PHR 10143	1872	2147	2165	1666	2322	**2127**	120	105	108	112	118	135	134	130	136	130
18	MH 24-18	PA 5235	1737	2673	2717	1860	2474	**2400**	116	113	107	110	123	128	136	132	135	131
19	**MH 24-19**	**DMH 1 (hy. Check)**	**2173**	**2490**	**2382**	**1896**	**2530**	**2394**	**122**	**117**	**109**	**114**	**128**	**132**	**137**	**131**	**138**	**131**
20	MH 24-20	4205D300-01	1774	2674	3069	2511	2770	**2572**	121	105	108	123	103	129	133	131	137	126
21	MH 24-21	Pusa MH 226	1914	2572	2052	1850	2085	**2156**	116	112	103	109	129	135	135	127	135	129
22	MH 24-22	RHH 2402	2070	2676	2124	2182	2496	**2342**	118	107	105	111	131	132	132	125	127	127
23	MH 24-23	AMH-511	1831	2374	3166	1793	2359	**2433**	115	112	116	115	127	133	134	131	131	126
24	**MH 24-24**	**RGN 73 (ZC)**	**1802**	**2709**	**3317**	**1846**	**2519**	**2587**	**119**	**114**	**110**	**110**	**143**	**130**	**139**	**134**	**134**	**129**
		GM	**1963**	**2441**	**2651**	**2015**	**2352**	**2352**										
		CD (5%)	176	387	378	394	403											
		CV (%)	5.5	9.6	8.7	11.9	10.4											
		DOS	21-10-24	20-10-24	28-10-24	26-10-24	28-10-24											

$ data of JHS centre excluded from computation of mean due to rejection of trial by monitoring team.

Table 3.24b. Performance of Indian mustard hybrids in IHT, Zone-III

S.No.	Code	Strain	1000-Seed Wt.(g)						Oil Content (%)						Oil Yield (kg/ha)
			KAN	MOR	KOT	JHS	BPR	Mean	KAN	MOR	KOT	JHS	BPR	Mean	
			1	2	3	4	5	(1-3,5)	1	2	3	4	5	(1-3,5)	
1	MH 24-01	Pusa MH 194	4.9	5.1	5.6	4.2	5.1	**5.2**	42.2	42.4	42.9	40.4	42.5	**42.5**	**962**
2	MH 24-02	US 8787	5.2	5.2	5.3	4.0	5.6	**5.3**	41.8	42.3	40.2	41.9	41.8	**41.5**	**993**
3	MH 24-03	HT 7262	4.7	4.8	5.2	3.1	5.3	**5.0**	42.3	41.4	38.4	39.8	42.9	**41.2**	**1045**
4	MH 24-04	Kranti (NC)	4.4	4.8	4.5	3.7	4.6	**4.6**	42.0	43.0	42.6	40.9	39.7	**41.8**	**845**
5	MH 24-05	NJH 24-101	4.2	4.5	4.2	3.4	5.2	**4.5**	40.3	41.6	38.7	40.0	40.5	**40.3**	**1106**
6	MH 24-06	PHR 10265	4.4	4.3	4.8	4.1	3.7	**4.3**	41.4	42.2	38.7	42.3	41.9	**41.1**	**1002**
7	MH 24-07	KBH 5256	4.2	5.5	4.9	3.9	5.7	**5.1**	42.9	39.5	39.7	41.6	40.5	**40.6**	**971**
8	MH 24-08	NRCHB 506	4.5	5.0	5.3	4.0	5.1	**5.0**	42.8	42.9	41.3	40.9	38.5	**41.4**	**833**
9	MH 24-09	SVJH-77	3.9	4.8	4.7	4.0	5.0	**4.6**	42.7	40.8	39.5	42.1	41.8	**41.2**	**958**
10	MH 24-10	DRMRHJ 520	4.4	4.5	4.4	3.1	4.7	**4.5**	40.6	42.5	42.6	41.0	42.6	**42.1**	**981**
11	MH 24-11	RHH 2401	4.3	4.8	4.8	3.4	5.3	**4.8**	42.3	41.4	41.4	41.8	40.1	**41.3**	**951**
12	MH 24-12	DRMRHJ 2420	3.4	4.1	4.3	3.9	4.3	**4.0**	39.8	40.4	40.6	42.5	41.4	**40.5**	**929**
13	MH 24-13	NIMOH -02	4.1	4.5	5.1	4.2	5.4	**4.8**	40.6	41.1	39.7	41.8	42.4	**41.0**	**878**
14	MH 24-14	SBH 618	4.3	5.1	5.0	4.2	4.6	**4.7**	41.4	38.4	39.7	41.3	42.5	**40.5**	**953**
15	MH 24-15	NMH90M03	4.3	5.2	5.3	3.4	5.5	**5.1**	41.7	39.4	38.2	42.1	41.3	**40.1**	**1056**
16	MH 24-16	DRMRHJ 410	4.3	4.9	4.7	3.1	4.5	**4.6**	41.4	40.1	42.5	41.6	41.3	**41.3**	**931**
17	MH 24-17	PHR 10143	4.5	3.9	4.1	3.1	4.4	**4.2**	42.6	40.6	42.5	41.4	42.3	**42.0**	**894**
18	MH 24-18	PA 5235	4.2	4.5	4.7	3.2	5.5	**4.7**	42.4	41.1	40.4	41.0	40.3	**41.1**	**985**
19	**MH 24-19**	**DMH 1 (hy. Check)**	**4.1**	**4.1**	**3.5**	**3.6**	**3.1**	**3.7**	**42.3**	**43.0**	**40.0**	**41.1**	**41.9**	**41.8**	**1000**
20	MH 24-20	4205D300-01	4.2	4.7	5.0	4.1	5.4	**4.8**	43.0	40.4	41.0	39.8	40.4	**41.2**	**1059**
21	MH 24-21	Pusa MH 226	4.4	4.7	4.9	3.3	4.8	**4.7**	42.0	43.1	38.3	41.8	39.7	**40.8**	**879**
22	MH 24-22	RHH 2402	3.9	4.5	4.6	4.6	4.9	**4.5**	44.7	41.3	38.4	41.9	42.9	**41.8**	**979**
23	MH 24-23	AMH-511	4.7	4.7	5.1	3.8	5.3	**4.9**	42.7	40.0	39.6	38.8	40.0	**40.6**	**987**
24	**MH 24-24**	**RGN 73 (ZC)**	**3.9**	**4.7**	**4.6**	**4.1**	**4.6**	**4.4**	**42.4**	**42.7**	**42.4**	**39.9**	**41.4**	**42.2**	**1092**

Table 3.25a. Performance of Indian mustard hybrids in IHT, Zone-IV

S. No.	Code	Strain	Seed Yield (kg/ha)							Plant Stand					Days to maturity				
			SKN	MDR	PLI	JAL	NGP	Mean		SKN	MDR	PLI	JAL	NGP	SKN	MDR	PLI	JAL	NGP
			1	2	3	4	5	(1-5)		1	2	3	4	5	1	2	3	4	5
1	MH 24-01	Pusa MH 194	2605	2321	2880	1614	1611	**2206**		130	121	121	129	137	115	123	114	93	113
2	**MH 24-02**	**US 8787**	**3594**	**2807**	**3431**	**1632**	**1879**	**2669**	**	**124**	**123**	**120**	**125**	**125**	**114**	**118**	**115**	**93**	**116**
3	MH 24-03	HT 7262	3684	3313	3084	1462	1776	**2664**		125	124	120	121	125	113	119	112	92	114
4	MH 24-04	Kranti (NC)	3426	1955	2714	1527	1491	**2222**		130	125	122	120	126	113	117	109	91	113
5	MH 24-05	NJH 24-101	3677	2626	3046	1401	1602	**2470**		115	125	121	121	128	118	118	117	97	118
6	MH 24-06	PHR 10265	3310	2095	2907	1820	1854	**2397**		131	123	122	113	134	116	122	117	97	119
7	MH 24-07	KBH 5256	2998	2922	3061	1669	1605	**2451**		124	125	121	121	137	115	121	114	100	114
8	MH 24-08	NRCHB 506	3059	3132	3081	1599	1423	**2459**		135	122	118	136	134	117	120	117	97	113
9	MH 24-09	SVJH-77	3540	2897	3031	2084	1927	**2696**		132	125	117	118	136	116	118	116	92	118
10	MH 24-10	DRMRHJ 520	3226	2289	2930	1783	1792	**2404**		129	124	122	123	134	117	119	117	93	114
11	MH 24-11	RHH 2401	3344	2621	2856	1505	1612	**2388**		129	122	121	113	133	115	118	109	97	114
12	MH 24-12	DRMRHJ 2420	3427	2776	3144	1664	1675	**2537**		126	124	122	116	130	117	120	116	98	115
13	MH 24-13	NIMOH -02	3146	2086	3058	1884	1472	**2329**		121	123	117	117	133	116	115	107	93	115
14	MH 24-14	SBH 618	3470	2788	3348	1655	1756	**2603**		129	123	119	111	131	116	119	114	92	115
15	MH 24-15	NMH90M03	3639	2712	3301	1411	1406	**2494**		136	126	119	122	128	114	120	116	92	112
16	MH 24-16	DRMRHJ 410	3288	2968	3144	1643	1640	**2536**		138	124	121	131	133	117	119	116	92	117
17	MH 24-17	PHR 10143	3081	2400	3096	1656	1562	**2359**		128	124	121	124	130	115	117	117	93	116
18	MH 24-18	PA 5235	3511	2533	2916	1835	1579	**2474**		130	124	121	120	130	115	120	116	97	113
19	**MH 24-19**	**DMH 1 (hy. Check)**	**3492**	**2750**	**2779**	**2124**	**1689**	**2567**		**121**	**123**	**123**	**126**	**129**	**114**	**118**	**111**	**91**	**114**
20	**MH 24-20**	**4205D300-01**	**3663**	**3020**	**3230**	**2151**	**1526**	**2718**	*	**133**	**125**	**122**	**130**	**129**	**116**	**123**	**114**	**92**	**115**
21	MH 24-21	Pusa MH 226	2712	1771	2219	1716	1447	**1973**		130	126	122	120	132	117	119	117	93	112
22	MH 24-22	RHH 2402	3479	2248	2705	1856	1568	**2371**		125	124	120	115	133	114	117	109	96	115
23	MH 24-23	AMH-511	3414	2575	3167	1777	1664	**2519**		119	124	119	121	131	115	115	112	96	115
24	**MH 24-24**	**GDM 4 (ZC)**	**3153**	**2580**	**2584**	**1603**	**1632**	**2310**		**125**	**122**	**122**	**138**	**135**	**116**	**119**	**116**	**95**	**118**
		GM	**3331**	**2591**	**2988**	**1711**	**1633**												
		CD (5%)	**586**	**316**	**286**	**243**	**262**												
		CV (%)	**10.7**	**7.4**	**5.8**	**8.6**	**9.7**												
		DOS	16.10-24	29-10-24	29-10-24	30-10-24	30-10-24												

* Strain out yielding the best hybrid check by a margin of more than or equal to 5 percent and best varietal check by a margin of more than or equal to 10 percent on the basis of seed yield.

** Strain out yielding the best hybrid check by a margin of more than or equal to 5 percent and best varietal check by a margin of more than or equal to 10 percent on the basis of oil yield.

Table 3.25b. Performance of Indian mustard hybrids in IHT, Zone-IV

S. No.	Code	Strain	1000-Seed Wt.(g)						Oil Content (%)						Oil Yield (kg/ha)
			SKN	MDR	PLI	JAL	NGP	Mean	SKN	MDR	PLI	JAL	NGP	Mean	
			1	2	3	4	5	(1-5)	1	2	3	4	5	(1-5)	
1	MH 24-01	Pusa MH 194	4.7	5.8	5.4	4.8	5.2	**5.2**	41.5	42.4	42.0	38.9	37.7	**40.5**	**893**
2	**MH 24-02**	**US 8787**	**5.3**	**6.3**	**6.6**	**4.4**	**5.3**	**5.6**	**42.3**	**40.3**	**42.1**	**40.1**	**39.4**	**40.9**	**1090**
3	MH 24-03	HT 7262	5.2	5.5	6.3	4.1	5.6	**5.3**	42.6	39.5	42.5	39.3	37.3	**40.2**	**1072**
4	MH 24-04	Kranti (NC)	4.8	5.0	5.5	4.0	4.6	**4.8**	40.4	41.6	41.7	39.6	38.1	**40.3**	**896**
5	MH 24-05	NJH 24-101	4.5	5.3	6.1	4.6	4.2	**4.9**	40.6	42.4	41.7	39.0	37.1	**40.2**	**992**
6	MH 24-06	PHR 10265	4.4	4.9	5.3	4.4	4.2	**4.7**	41.8	40.1	42.3	39.0	38.6	**40.4**	**967**
7	MH 24-07	KBH 5256	5.2	6.6	6.3	4.6	5.4	**5.6**	39.7	43.0	42.8	40.5	37.3	**40.7**	**997**
8	MH 24-08	NRCHB 506	5.2	5.7	6.2	4.8	5.0	**5.4**	40.3	40.4	41.1	38.8	38.3	**39.8**	**978**
9	MH 24-09	SVJH-77	4.9	5.7	5.6	4.2	5.2	**5.1**	42.1	42.4	43.2	38.5	38.4	**40.9**	**1102**
10	MH 24-10	DRMRHJ 520	4.7	5.4	6.3	4.5	4.6	**5.1**	40.6	41.6	42.7	37.2	37.5	**39.9**	**960**
11	MH 24-11	RHH 2401	4.8	5.2	5.5	5.2	4.9	**5.1**	41.6	39.4	41.8	37.3	39.5	**39.9**	**953**
12	MH 24-12	DRMRHJ 2420	4.3	5.7	6.2	4.5	4.4	**5.0**	38.7	40.3	42.1	36.9	37.5	**39.1**	**992**
13	MH 24-13	NIMOH -02	4.7	6.0	5.6	4.5	5.3	**5.2**	42.5	42.4	42.6	38.6	37.2	**40.6**	**946**
14	MH 24-14	SBH 618	5.1	6.1	5.7	4.1	5.2	**5.2**	43.5	40.1	42.6	39.8	40.1	**41.2**	**1073**
15	MH 24-15	NMH90M03	5.0	6.0	5.1	4.9	5.4	**5.3**	42.0	40.4	41.2	38.9	38.8	**40.3**	**1004**
16	MH 24-16	DRMRHJ 410	4.2	5.3	5.4	4.8	4.6	**4.9**	38.5	40.7	42.2	39.4	38.1	**39.8**	**1008**
17	MH 24-17	PHR 10143	4.1	5.5	6.0	4.3	4.6	**4.9**	39.4	41.4	42.9	38.3	37.8	**39.9**	**942**
18	MH 24-18	PA 5235	4.8	5.6	5.5	4.6	4.9	**5.1**	39.2	41.4	41.8	38.3	37.5	**39.6**	**981**
19	**MH 24-19**	**DMH 1 (hy. Check)**	**3.5**	**5.3**	**5.4**	**4.7**	**4.8**	4.7	**39.7**	**42.4**	**40.2**	**41.6**	**37.4**	**40.2**	**1033**
20	**MH 24-20**	**4205D300-01**	**4.8**	**6.4**	**6.4**	**4.5**	**5.2**	**5.5**	**40.9**	**40.4**	**41.4**	**39.8**	**38.8**	**40.2**	**1094**
21	MH 24-21	Pusa MH 226	4.6	4.7	5.0	4.6	5.1	**4.8**	41.4	40.0	42.0	40.0	39.4	**40.5**	**800**
22	MH 24-22	RHH 2402	4.7	5.5	5.5	5.0	4.7	**5.1**	40.4	39.4	40.6	40.5	40.0	**40.2**	**953**
23	MH 24-23	AMH-511	5.3	5.4	5.4	5.0	5.4	**5.3**	40.2	40.4	42.3	39.4	38.5	**40.1**	**1011**
24	**MH 24-24**	**GDM 4 (ZC)**	**5.2**	**5.4**	**5.3**	**4.6**	**4.6**	**5.0**	**39.1**	**41.3**	**40.7**	**38.1**	**37.5**	**39.3**	**909**

Table 3.26 Percent sterile plants in different hybrid entries in variaous trials

S.No	Code	Strain	Sterility (%)				Mean
			HSR	LDH$	NDH	BPR	
			1	2	3	4	(1, 3-4)
1	MH 24-01	SBH 618	31	0	34	37	**34**
2	MH 24-02	DRMRHJ 520	6	0	21	13	**14**
3	MH 24-03	DRMRHJ 2420	2	40	15	17	**11**
4	MH 24-04	NMH90M03	13	0	15	0	**9**
5	MH 24-05	US 8787	2	0	6	7	**5**
6	MH 24-06	RH 749	2	0	8	0	**3**
7	MH 24-07	Q90033	8	40	12	17	**12**
8	MH 24-08	18J408C	19	40	25	20	**21**
9	MH 24-09	Kesari 5113	8	0	0	3	**4**
10	MH 24-10	Kesari Pro5111	4	0	10	13	**9**
11	MH 24-11	JKJH 11	13	3	14	43	**23**
12	MH 24-12	4205D300-01	0	0	0	0	**0**
13	MH 24-13	KBH 5256	13	10	48	20	**27**
14	MH 24-14	NJH 24-101	9	7	4	7	**7**
15	MH 24-15	RHH 2401	8	27	14	10	**11**
16	MH 24-16	Pusa MH 226	4	43	25	13	**14**
17	MH 24-17	SVJH 73	16	0	20	17	**18**
18	MH 24-18	4205B296-01	0	0	0	0	**0**
19	MH 24-19	AMH 511	10	27	12	10	**11**
20	MH 24-20	HT 7262	0	23	0	13	**4**
21	MH 24-21	NIMOH 02	7	40	6	7	**7**
22	MH 24-22	NRCHB 506	37	60	58	53	**49**
23	MH 24-23	PA 5235	4	30	14	3	**7**
24	MH 24-24	RHH 2402	17	50	19	3	**13**
25	MH 24-25	DRMRHJ 410	49	53	29	27	**35**
26	MH 24-26	PHR 10143	12	17	8	10	**10**
27	MH 24-27	NJ124-401	3	7	11	0	**5**
28	MH 24-28	DMH 1 (hy. Check)	6	3	13	3	**7**
29	MH 24-29	4205B284-01	3	0	0	0	**1**
30	MH 24-30	Kranti (NC)	0	0	0	0	**0**
31	MH 24-31	Pusa MH 218	3	23	26	17	**15**
32	MH 24-32	SKMH 1901	3	47	2	3	**2**
33	MH 24-33	SVJH 78	23	0	12	13	**16**
34	MH 24-34	45S46 (Pioneer)	8	43	4	7	**6**
35	MH 24-35	HRH 191290	8	27	6	7	**7**
36	MH 24-36	SVJH 77	36	30	28	13	**26**
37	MH 24-37	PHR 10265	3	0	11	27	**14**
38	MH 24-38	Pusa MH 194	0	23	2	0	**1**
39	MH 24-39	RGN 73	2	0	0	0	**1**
40	MH 24-40	GDM 4	0	0	0	0	**0**

$ data of LDH centre not included in the computation of mean due to large variation in most of the entries.

Table 3.27a. Performance of Indian mustard hybrids in AHT-I, Zone-II

S.No.	Code	Strain	Seed Yield (kg/ha)						Plant Stand				Days to Maturity			
			LDH	HSR	NDH	ALW	Mean		LDH	HSR	NDH	ALW	LDH	HSR	NDH	ALW
			1	2	3	4	(1-4)		1	2	3	4	1	2	3	4
1	**MH 24-25**	**DMH 1 (hy. Check)**	**2625**	**3370**	**2717**	**2319**	**2758**		**269**	**262**	**277**	**233**	**142**	**141**	**141**	**136**
2	MH 24-26	RH 749 (fillar)	2324	3212	2865	1962	**2591**		261	264	263	231	140	146	148	137
3	**MH 24-27**	**RH 749 (ZC)**	**2284**	**3091**	**2927**	**2189**	**2623**		**268**	**265**	**254**	**237**	**141**	**146**	**148**	**136**
4	MH 24-28	4205B284-01	2655	3254	3155	2377	**2860**		269	261	259	232	138	138	141	132
5	MH 24-29	Kranti (NC)	2373	2865	2857	2335	**2608**		264	264	275	230	135	137	138	134
6	**MH 24-30**	**HRH 191290**	**2689**	**3329**	**3139**	**2568**	**2931**	*	**265**	**261**	**273**	**236**	**138**	**139**	**141**	**134**
7	MH 24-31	Q90033	2364	3394	2904	2187	**2712**		266	262	264	230	139	145	141	133
		GM	**2474**	**3216**	**2938**	**2277**	**2726**									
		CD (5%)	315	323	267	274										
		CV (%)	8.6	6.8	6.1	8.1										
		DOS	18-10-24	13-10-24	16-10-24	22-10-24										

* Strain out yielding the best hybrid check by a margin of more than or equal to 5 percent and best varietal check by a margin of more than or equal to 10 percent on the basis of seed yield.

Table 3.27b. Performance of Indian mustard hybrids in AHT-I, Zone-II

S.No.	Code	Strain	1000-Seed Wt.(g)						Oil Content (%) Zone II					Oil Yield (kg/ha)
			LDH	HSR	NDH	ALW	Mean		LDH	HSR	NDH	ALW	Mean	
			1	2	3	4	(1-5)		1	2	3	4	(1-4)	
1	**MH 24-25**	**DMH 1 (hy. Check)**	**3.7**	**3.4**	**3.3**	**3.7**	**3.5**		**37.0**	**37.6**	**39.5**	**39.2**	**38.3**	**1056**
2	MH 24-26	RH 749 (fillar)	6.6	6.6	6.2	6.1	**6.4**		38.7	37.3	38.8	40.3	**38.8**	**1004**
3	**MH 24-27**	**RH 749 (ZC)**	**6.6**	**6.5**	**6.3**	**5.9**	**6.3**		**39.5**	**39.6**	**39.9**	**38.5**	**39.4**	**1032**
4	MH 24-28	4205B284-01	5.6	5.8	5.5	4.5	**5.4**		38.8	37.9	39.3	40.6	**39.2**	**1120**
5	MH 24-29	Kranti (NC)	4.6	4.4	4.4	4.5	**4.5**		39.8	37.4	39.0	40.4	**39.1**	**1020**
6	**MH 24-30**	**HRH 191290**	**5.2**	**4.5**	**4.7**	**4.2**	**4.6**		**39.4**	**41.5**	**42.6**	**39.4**	**40.7**	**1194**
7	MH 24-31	Q90033	5.9	5.4	5.5	4.9	**5.4**		40.0	37.6	38.4	39.7	**38.9**	**1055**

Table 3.28a. Performance of Indian mustard hybrids in AHT-I, Zone-III

S.No.	Code	Strain	Seed Yield (kg/ha)						Plant Stand					Days to Maturity				
			KPR#	MOR	KOT	BPR	JHS$	Mean	KPR	MOR	KOT	BPR	JHS	KPR	MOR	KOT	BPR	JHS
			1	2	3	4	5	(2-4)	1	2	3	4	5	1	2	3	4	5
1	**MH 24-32**	**RGN 73 (ZC)**	**2307**	**2409**	**3682**	**2112**	**2159**	**2735**	**223**	**225**	**227**	**237**	**252**	**128**	**137**	**134**	**131**	**137**
2	MH 24-33	DMH 1 (hy. Check)	2269	2060	3237	2358	2007	**2552**	211	232	226	263	242	134	136	125	129	134
3	MH 24-34	4205B284-01	2296	2161	3507	2576	2117	**2748**	225	224	221	246	235	130	134	123	126	135
4	MH 24-35	Kranti (filler)	2238	1984	2718	2203	1943	**2302**	213	225	219	258	234	131	132	123	125	133
5	MH 24-36	Kranti (NC)	2201	1858	2596	2122	2003	**2192**	210	228	214	289	241	135	135	125	127	132
		GM	**2262**	**2094**	**3148**	**2274**	**2046**	**2506**										
		CD (5%)	73	217	406	214	NS											
		CV (%)	2.1	6.7	8.4	6.1	5.8											
		DOS	21-10-24	22-10-24	28/10/24	28-10-24	26-10-24											

$ data of JHS centre excluded from computation of mean due to non significant data and also rejected by monitoring team.
# data of KPR centre excluded from computation of mean due to low CV.

Table 3.28b. Performance of Indian mustard hybrids in AHT-I, Zone-III

S.No.	Code	Strain	1000-Seed Wt.(g)						Oil Content (%) Zone II						Oil Yield (kg/ha)
			KPR	MOR	KOT	BPR	JHS	Mean	KPR	MOR	KOT	BPR	JHS	Mean	
			1	2	3	4	5	(2-4)	1	2	3	4	5	(2-4)	
1	**MH 24-32**	**RGN 73 (ZC)**	**4.0**	**4.4**	**4.9**	**4.0**	**4.2**	**4.4**	**43.0**	**41.9**	**40.5**	**40.8**	**40.9**	**41.1**	**1123**
2	MH 24-33	DMH 1 (hy. Check)	4.3	3.1	3.9	3.4	4.1	**3.5**	41.6	40.6	39.5	42.6	39.4	**40.9**	**1043**
3	MH 24-34	4205B284-01	4.5	4.9	5.4	5.3	3.9	**5.2**	42.1	40.2	40.2	40.7	40.1	**40.4**	**1110**
4	MH 24-35	Kranti (filler)	4.2	4.3	5.1	4.5	4.0	**4.6**	43.0	39.6	39.4	42.2	38.6	**40.4**	**930**
5	MH 24-36	Kranti (NC)	4.0	4.3	5.0	4.7	4.5	**4.6**	42.7	40.8	38.4	41.6	38.0	**40.3**	**883**

Table 3.29a. Performance of Indian mustard hybrids in AHT-I+II, Zone-IV (Repeat)

S. No.	Code	Strain	Seed Yield (kg/ha)						Plant Stand					Days to maturity				
			SKN	MDR	PLI	JAL	NGP$	Mean	SKN	MDR	PLI	JAL	NGP	SKN	MDR	PLI	JAL	NGP
			1	2	3	4	5	(1-4)	1	2	3	4	5	1	2	3	4	5
1	MH 24-37	DMH 1 (hy. Check)	3377	2794	3382	1286	2030	**2710**	258	226	262	196	273	117	119	116	93	106
2	**MH 24-38**	**45S46 (hy. Check)**	**3640**	**2596**	**3625**	**1713**	**1686**	**2894**	**263**	**227**	**254**	**220**	**280**	**114**	**121**	**115**	**92**	**104**
3	MH 24-39	18J408C#	3573	2783	3898	1819	1934	**3018**	260	220	253	225	279	116	121	114	94	101
4	MH 24-40	JKJH 11	3473	2887	3917	1555	2079	**2958**	262	234	249	211	267	118	120	114	92	105
5	MH 24-41	SVJH 73	3401	2667	3559	1492	1850	**2780**	265	225	244	208	271	116	120	116	92	104
6	**MH 24-42**	**GDM 4 (ZC)**	**2938**	**2841**	**3400**	**1545**	**2049**	**2681**	**249**	**224**	**261**	**209**	**292**	**115**	**120**	**115**	**94**	**106**
7	MH 24-43	Kranti (NC)	3162	2578	3188	1671	1753	**2650**	258	227	254	214	285	115	119	114	96	105
8	MH 24-44	SKMH 1901	3259	2466	3449	1162	2002	**2584**	261	228	244	180	296	118	126	122	97	108
9	MH 24-45	GDM 4 (filler)	3103	2858	3498	1370	1716	**2707**	265	232	248	200	273	117	121	117	98	105
		GM	**3325**	**2719**	**3546**	**1513**	**1900**	**2776**										
		CD (5%)	420	271	283	252	243											
		CV (%)	8.6	6.8	5.5	11.4	8.8											
		DOS	16-10-24	29-10-24	29-10-24	31-10-24	27-10-24											

$Data of NGP excluded in computation of mean due to significant difference between same strain being used as check/ filler.
#AHT-II strain

Table 3.29b. Performance of Indian mustard hybrids in AHT-I+II, Zone-IV (Repeat)

S. No.	Code	Strain	1000-Seed Wt.(g)						Oil Content (%)						Oil Yield (kg/ha)
			SKN	MDR	PLI	JAL	NGP	Mean	SKN	MDR	PLI	JAL	NGP	Mean	
			1	2	3	4	5	(1-4)	1	2	3	4	5	(1-4)	
1	MH 24-37	DMH 1 (hy. Check)	3.2	4.3	4.8	3.9	5.0	**4.1**	41.1	40.2	42.8	38.8	37.0	**40.7**	**1103**
2	**MH 24-38**	**45S46 (hy. Check)**	**4.9**	**5.6**	**5.4**	**3.3**	**5.1**	**4.8**	**42.4**	**40.5**	**42.0**	**39.1**	**40.8**	**41.0**	**1186**
3	MH 24-39	18J408C	4.4	5.6	5.5	4.1	5.3	**4.9**	39.3	40.5	40.7	38.2	38.9	**39.7**	**1198**
4	MH 24-40	JKJH 11	4.8	5.5	6.1	3.9	4.9	**5.1**	41.3	40.7	42.4	38.3	36.5	**40.7**	**1203**
5	MH 24-41	SVJH 73	4.2	4.9	5.2	3.8	4.9	**4.5**	41.4	41.4	41.1	38.7	38.1	**40.6**	**1129**
6	**MH 24-42**	**GDM 4 (ZC)**	**4.7**	**5.2**	**5.6**	**4.2**	**4.6**	**4.9**	**41.2**	**42.4**	**41.4**	**38.2**	**37.2**	**40.8**	**1093**
7	MH 24-43	Kranti (NC)	4.1	5.4	5.5	3.9	4.8	**4.7**	43.5	41.3	40.6	36.9	37.2	**40.6**	**1075**
8	MH 24-44	SKMH 1901	4.6	5.3	5.8	4.0	4.9	**4.9**	43.1	39.3	42.8	39.7	38.1	**41.2**	**1065**
9	MH 24-45	GDM 4 (filler)	4.5	5.4	5.8	4.9	5.2	**5.2**	38.0	42.1	42.9	39.5	38.0	**40.6**	**1100**

Table 3.30a. Performance of Quality Indian mustard strains in IVT, Zone-II

S.No.	Code	Strain	Seed Yield (kg/ha)							Plant Stand					Days to Maturity				
			BAW	NDH	HSR	LDH	SGN	Mean		BAW	NDH	HSR	LDH	SGN	BAW	NDH	HSR	LDH	SGN
			1	2	3	4	5	(1-5)		1	2	3	4	5	1	2	3	4	5
1	**QM-24-1**	**RH 749 (ZC)**	**2049**	**3046**	**3290**	**2560**	**2549**	**2699**		**119**	**116**	**115**	**124**	**111**	**144**	**143**	**146**	**137**	**156**
2	QM-24-2	PM 34 (LR)	2116	3026	3286	1959	2503	**2578**		118	122	114	127	110	148	141	138	145	152
3	QM-24-3	DRMRCI (Q) 198	2199	3376	3061	2189	3266	2818		126	122	117	122	112	141	138	136	147	148
4	**QM-24-4**	**RH (OE) 1702**	**2400**	**3234**	**3471**	**2560**	**2900**	**2913**	*	**120**	**137**	**118**	**125**	**113**	**146**	**139**	**139**	**138**	**149**
5	QM-24-5	PDZ-22 #	2364	2895	2415	2321	2559	**2511**		121	131	119	121	111	144	141	142	146	153
6	QM-24-6	BPMQ 47 (filler)	2376	2908	2573	2432	2437	**2545**		129	114	113	121	116	148	142	137	141	155
7	**QM-24-7**	**PM 30 (NC)**	**2258**	**3031**	**3109**	**2379**	**2287**	**2613**		**119**	**112**	**116**	**125**	**113**	**145**	**143**	**141**	**141**	**154**
8	QM-24-8	PDZ-23#	2415	2480	2159	1465	2149	**2134**		123	129	110	135	109	139	137	136	143	154
9	QM-24-9	LES-71	1887	2516	2482	1909	2015	**2162**		122	118	118	121	114	147	141	140	142	155
10	QM-24-10	PMAS 1604	2021	2533	2514	2613	2410	**2418**		121	127	117	124	111	145	141	140	140	156
11	QM-24-11	LES-70	2242	3129	3089	1802	2805	**2613**		119	113	116	120	112	142	141	139	137	158
12	QM-24-12	DRMRCI (Q) 197	1734	3047	2340	2226	2863	**2442**		132	114	111	125	110	145	142	147	144	156
13	QM-24-13	DH-2'00'7G	1809	2642	2518	2119	2458	**2309**		129	144	116	119	113	148	140	142	142	158
14	**QM-24-14**	**PDZ 11 (DLC)**	**1545**	**2477**	**2321**	**1860**	**2074**	**2055**		**118**	**114**	**114**	**129**	**115**	**145**	**139**	**138**	**141**	**157**
15	QM-24-15	RH (OE) 1704	2069	2871	2620	1988	2327	**2375**		123	129	114	121	115	146	138	136	141	153
16	QM-24-16	PMAS 1602	2230	2816	2742	2572	2490	**2570**		123	127	115	127	114	143	141	141	141	154
		GM	**2107**	**2877**	**2749**	**2185**	**2506**	**2485**											
		CD (5%)	302	268	406	385	295												
		CV (%)	8.6	5.6	10.2	10.6	8.0												
		DOS	22-10-24	19-10-24	12/10/24	17-10-24	22-10-24												

* single low strain outyielding the best single low quality check by a margin of equal to or more than 10 % for seed yield & oil yield and at par with best non quality check

Table 3.30b. Performance of Quality Indian mustard strains in IVT, Zone-II

S.No.	Code	Strain	1000-Seed Wt. (g)					Oil Content (%)						Oil Yield (kg/ha)
			BAW	NDH	HSR	LDH	SGN	BAW	NDH	HSR	LDH	SGN	Mean	
			1	2	3	4	5	1	2	3	4	5	(1-5)	
1	**QM-24-1**	**RH 749 (ZC)**	**6.0**	**6.1**	**6.4**	**6.1**	**5.6**	**39.3**	**38.2**	**38.3**	**42.3**	**41.2**	**39.8**	**1075**
2	**QM-24-2**	**PM 34 (LR)**	**4.5**	**3.8**	**4.4**	**4.7**	**3.1**	**40.3**	**43.4**	**42.3**	**43.4**	**43.5**	**42.6**	**1097**
3	QM-24-3	DRMRCI (Q) 198	5.4	4.8	5.2	5.3	3.9	44.0	43.6	39.6	43.5	42.8	**42.7**	**1203**
4	**QM-24-4**	**RH (OE) 1702**	**5.3**	**4.9**	**5.6**	**5.1**	**4.7**	**42.9**	**41.5**	**39.1**	**40.5**	**42.1**	**41.2**	**1201**
5	QM-24-5	PDZ-22 #	4.4	4.1	4.2	5.2	3.1	42.7	42.2	36.9	45.6	43.1	**42.1**	**1057**
6	QM-24-6	BPMQ 47 (filler)	5.1	4.2	4.1	5.8	5.6	43.7	43.3	42.0	41.4	42.8	**42.6**	**1085**
7	QM-24-7	PM 30 (NC)	5.7	5.9	6.4	5.6	5.1	41.0	40.6	39.1	41.4	42.1	40.8	1067
8	QM-24-8	PDZ-23#	4.0	3.8	3.3	4.5	2.9	41.1	41.2	39.3	41.6	41.6	**40.9**	**874**
9	QM-24-9	LES-71	5.6	5.2	5.0	5.9	4.9	41.9	40.9	41.3	40.4	40.8	**41.0**	**887**
10	QM-24-10	PMAS 1604	3.7	3.1	3.3	4.0	5.5	40.6	39.7	40.7	43.1	42.3	**41.3**	**998**
11	QM-24-11	LES-70	5.8	5.8	5.8	5.6	5.6	41.3	39.5	38.7	42.6	41.5	**40.7**	**1064**
12	QM-24-12	DRMRCI (Q) 197	5.0	4.0	4.1	5.3	3.5	42.6	42.8	41.5	40.4	42.7	**42.0**	**1026**
13	QM-24-13	DH-2'00'7G	4.9	5.0	5.1	5.6	5.3	39.3	39.3	38.0	38.9	41.5	**39.4**	**909**
14	**QM-24-14**	**PDZ 11 (DLC)**	**4.2**	**3.7**	**3.7**	**4.0**	**3.2**	**43.3**	**43.4**	**43.1**	**40.4**	**42.9**	**42.6**	**876**
15	QM-24-15	RH (OE) 1704	4.5	3.9	4.2	4.8	4.7	42.4	40.3	39.4	43.5	42.5	**41.6**	**988**
16	QM-24-16	PMAS 1602	4.1	3.1	3.6	3.9	5.0	40.6	40.6	40.4	42.4	41.5	**41.1**	**1056**

Table 3.31a. Performance of Quality Indian mustard strains in IVT, Zone-III

S.No	Code	Strain	Seed Yield (kg/ha)					Plant Stand				Days to Maturity			
			KPR	MOR	KOT#	JHS	Mean	KPR	MOR	KOT	JHS	KPR	MOR	KOT	JHS
			1	2	3	4	(1-2,4)	1	2	3	4	1	2	3	4
1	**QM-24-1**	**RGN 73 (ZC)**	**1975**	**2979**	**2655**	**1943**	**2299**	**116**	**158**	**169**	**132**	**128**	**137**	**132**	**138**
2	**QM-24-2**	**PM 30 (LR)**	**1934**	**2238**	**2696**	**2225**	**2132**	**122**	**155**	**161**	**121**	**132**	**139**	**134**	**142**
3	QM-24-3	DRMRCI (Q) 198	1605	2051	2293	1860	**1838**	114	146	169	112	130	132	126	126
4	QM-24-4	RH (OE) 1702	1593	2094	2450	1843	**1843**	123	157	164	117	133	134	124	127
5	QM-24-5	PDZ-22 #	2029	2409	2889	1870	**2102**	121	158	162	117	129	130	129	136
6	QM-24-6	BPMQ 47 (filler)	2008	2268	2121	2080	**2119**	119	164	157	126	127	136	130	139
7	QM-24-7	PM 30 (NC)	1988	2304	1702	2038	**2110**	121	159	161	137	130	137	135	140
8	QM-24-8	PDZ-23#	1593	1369	2138	1736	**1566**	117	161	162	124	128	122	125	129
9	QM-24-9	LES-71	1708	1498	2250	1686	**1631**	122	163	165	121	130	123	130	136
10	QM-24-10	PMAS 1604	1926	2365	2177	1954	**2082**	120	156	153	122	127	135	129	133
11	QM-24-11	LES-70	1490	2225	2980	2046	**1920**	117	157	163	132	134	138	135	141
12	QM-24-12	DRMRCI (Q) 197	1646	2607	2801	1617	**1957**	114	152	162	123	129	140	132	140
13	QM-24-13	DH-2'00'7G	1626	1420	2066	1530	**1525**	118	162	161	118	132	120	128	129
14	**QM-24-14**	**PDZ 11 (DLC)**	**1708**	**1619**	**2465**	**1565**	**1630**	**115**	**167**	**147**	**114**	**135**	**121**	**133**	**135**
15	QM-24-15	RH (OE) 1704	1630	2125	2744	2006	**1920**	120	160	165	128	132	128	127	130
16	QM-24-16	PMAS 1602	1642	2284	2591	1962	**1963**	120	158	161	126	128	131	130	135
		GM	**1756**	**2116**	**2439**	**1872**	**1915**								
		CD (5%)	271	313	357	323									
		CV (%)	9.3	9.5	8.8	10.4									
		DOS	21-10-24	22-10-24	27-10-24	24-10-24									

Data of KOT excluded from computation of mean due to significant difference betwwen the same check.

Table 3.31b. Performance of Quality Indian mustard strains in IVT, Zone-III

S.No.	Code	Strain	1000-Seed Wt. (g)				Oil Content (%)					Oil Yield (kg/ha)
			KPR	MOR	KOT	JHS	KPR	MOR	KOT	JHS	Mean	
			1	2	3	4	1	2	3	4	(1-2,4)	
1	**QM-24-1**	**RGN 73 (ZC)**	**3.8**	**4.3**	**4.7**	**4.2**	**42.9**	**43.0**	**42.9**	**39.9**	**41.9**	**963**
2	**QM-24-2**	**PM 30 (LR)**	**3.7**	**5.9**	**6.3**	**5.6**	**40.6**	**41.2**	**42.4**	**42.5**	**41.5**	**884**
3	QM-24-3	DRMRCI (Q) 198	3.4	4.3	4.6	4.6	41.7	43.0	41.7	41.0	**41.9**	**770**
4	QM-24-4	RH (OE) 1702	3.6	4.3	4.6	4.1	40.4	42.4	40.4	41.6	**41.4**	**764**
5	QM-24-5	PDZ-22 #	3.2	3.8	3.9	3.3	40.5	41.4	42.8	42.2	**41.3**	**869**
6	QM-24-6	BPMQ 47 (filler)	3.5	4.1	4.2	3.1	41.4	39.7	43.6	44.0	**41.7**	**883**
7	QM-24-7	PM 30 (NC)	5.0	5.8	6.3	5.6	42.4	41.9	42.7	43.4	**42.5**	**898**
8	QM-24-8	PDZ-23#	2.9	3.0	3.6	4.1	40.4	42.4	41.8	40.9	**41.2**	**645**
9	QM-24-9	LES-71	3.4	5.0	5.3	4.0	38.7	40.4	42.2	42.8	**40.6**	**662**
10	QM-24-10	PMAS 1604	3.0	3.5	3.4	3.5	39.5	41.4	42.7	42.1	**41.0**	**853**
11	QM-24-11	LES-70	3.9	5.7	6.2	4.7	42.4	42.4	40.5	40.6	**41.8**	**802**
12	QM-24-12	DRMRCI (Q) 197	3.4	3.8	4.3	4.1	40.3	41.1	42.0	43.6	**41.7**	**816**
13	QM-24-13	DH-2'00'7G	3.8	4.6	5.1	4.6	42.7	40.6	42.0	39.9	**41.1**	**626**
14	**QM-24-14**	**PDZ 11 (DLC)**	**3.5**	**3.3**	**3.5**	**3.7**	**40.4**	**40.1**	**41.7**	**42.1**	**40.9**	**666**
15	QM-24-15	RH (OE) 1704	3.3	3.6	3.5	4.0	40.4	41.4	42.7	41.5	**41.1**	**788**
16	QM-24-16	PMAS 1602	3.3	3.3	3.7	3.7	39.7	42.4	42.7	42.0	**41.3**	**811**

Table 3.32 Erucic acid Content (%) of entries being evaluated in IVT/AVT Quality trials

S. No.	Code	Genotypes	Erucic Acid Content (%)					Glucosinolate Content (µmol/ g)				
			BPR	PNT	HSR	PAU	Mean	BPR	PNT	HSR	PAU	Mean
			1	2	3	4	(1-4)	1	2	3	4	(1-4)
1	QM-24-1	DRMRCI (Q) 198	0.1	0.7	0.3	0.3	**0.3**	44.3	85.7	50.0	40.0	**55.0**
2	QM-24-2	PM 30 (NC)	0.5	0.6	1.6	0.2	**0.7**	66.6	68.5	76.7	70.3	**70.5**
3	QM-24-3	BPMQ 47 (Fillar)	0.4	0.8	0.4	0.4	**0.5**	22.9	41.6	27.8	28.8	**30.3**
4	QM-24-4	RH (OE) 1702	0.0	0.3	1.0	0.2	**0.4**	58.8	57.8	45.6	63.5	**56.4**
5	QM-24-5	LES 70	0.3	0.7	0.4	0.0	**0.3**	64.4	68.2	72.2	69.2	**68.5**
6	QM-24-6	PM 34 (LR)	0.6	0.9	0.6	0.1	**0.5**	50.4	54.8	62.8	65.4	**58.3**
7	QM-24-7	PMAS 1604	0.3	0.9	1.9	0.9	**1.0**	30.6	18.2	32.8	29.7	**27.8**
8	QM-24-8	PDZ 22#	0.0	0.1	0.6	1.0	**0.4**	36.9	34.2	31.2	33.1	**33.9**
9	QM-24-9	PDZ 11 (DLC)	0.3	0.3	0.0	0.0	**0.2**	20.1	16.2	20.6	27.7	**21.2**
10	QM-24-10	PMAS 1602	0.4	0.5	1.8	0.6	**0.8**	29.6	35.2	30.1	29.3	**31.1**
11	QM-24-11	DRMRCI (Q) 197	0.5	0.8	0.4	0.0	**0.4**	41.9	46.5	38.7	42.6	**42.4**
12	QM-24-12	RH (OE) 1704	0.4	0.5	1.2	0.0	**0.5**	63.4	66.8	47.9	62.8	**60.2**
13	QM-24-13	DH-2'00'7G	0.2	1.1	0.0	0.0	**0.3**	17.2	20.6	14.7	18.5	**17.7**
14	QM-24-14	LES 71	0.1	0.6	0.5	0.3	**0.4**	77.1	90.2	82.0	77.9	**81.8**
15	QM-24-15	PDZ 23#	0.0	0.1	0.3	0.0	**0.1**	30.2	27.2	31.3	33.3	**30.5**
16	QM-24-16	RH 749 (ZC)	49.7	44.2	48.5	50.3	**48.2**	50.0	50.8	69.8	69.6	**60.1**
17	QM-24-17	LES 68	0.1	0.5	1.1	0.0	**0.4**	64.2	75.1	52.2	67.4	**64.8**
18	QM-24-18	RGN 73	45.8	45.3	49.5	50.6	**47.8**	53.5	74.3	63.3	60.8	**63.0**
19	QM-24-19	Varuna	39.8	41.0	47.3	43.6	**42.9**	70.2	89.4	80.1	78.3	**79.5**
20	QM-24-20	DRMRCI (Q) 172	0.5	0.7	1.7	1.1	**1.0**	29.1	35.9	34.8	30.1	**32.5**
21	QM-24-21	RH (OE) 1710	1.5	8.1	2.0	1.0	**3.1**	57.1	71.1	68.1	53.1	**62.4**
22	QM-24-22	PM 32 (LR)	0.4	6.6	0.0	0.0	**1.7**	64.7	73.8	81.6	61.1	**70.3**
23	QM-24-23	GED 2$	46.9	41.5	48.5	47.6	**46.1**	15.5	14.6	16.2	17.7	**16.0**
24	QM-24-24	DRMRCI (Q) 181	0.4	0.7	0.7	0.0	**0.4**	52.6	85.7	61.5	58.8	**64.6**
25	QM-24-25	DRMRCI (Q) 179	0.3	0.6	0.3	0.1	**0.3**	35.9	45.9	37.3	43.7	**40.7**
26	QM-24-26	GED-1$	38.8	41.4	51.6	45.4	**44.3**	11.7	12.1	19.4	11.6	**13.7**
27	QM-24-27	PMAS 7	0.5	0.4	1.8	1.1	**1.0**	22.8	26.2	24.1	18.7	**23.0**
28	QM-24-28	PMAS 8	0.8	1.1	0.3	0.0	**0.5**	30.8	33.0	31.5	27.0	**30.6**

Table: 3.33 Performance of Indian mustard strains in AVT-II under saline/alkaline conditions

S.No.	Code	Strain	Seed Yield (kg/ha)					Plant Stand				Days to Maturity				1000- Seed Wt. (g)				Oil Content (%)				Oil yield (kg/ha)
			KAR	LKW#	HSR	FTP	Mean	KAR	LKW	HSR	FTP	KAR	LKW	HSR	FTP	KAR	LKW	HSR	FTP	KAR	LKW	FTP	Mean	
			1	2	3	4	(1,3-4)	1	2	3	4	1	2	3	4	1	2	3	4	1	2	4	(1,4)	
1	CSCN-24-1	Kranti (NC)	1477	1721	1571	1511	**1520**	264	260	237	249	139	125	138	124	4.6	4.7	4.5	4.5	37.8	40.5	38.1	**37.9**	**576**
2	CSCN-24-2	CS 2020-10@	2447	2090	2196	1983	**2209**	268	262	248	255	145	129	139	124	5.5	5.3	5.5	5.2	39.0	40.2	37.8	**38.4**	**848**
3	CSCN-24-3	CS 60 (filler)	2002	1814	1899	1687	**1862**	270	271	245	252	147	130	147	126	5.3	5.3	5.2	5.1	38.3	39.7	40.5	**39.4**	**733**
4	CSCN-24-4	CS 54 (check)	1808	1717	1796	1592	**1732**	269	257	244	251	144	128	144	125	5.2	5.2	5.0	5.1	37.0	38.9	38.6	**37.8**	**655**
5	**CSCN-24-5**	**CS 60 (LR)**	**1997**	**1796**	**1927**	**1636**	**1853**	**264**	**268**	**243**	**253**	**147**	**130**	**146**	**126**	**5.3**	**5.3**	**5.2**	**5.1**	**37.5**	**39.8**	**39.5**	**38.5**	**714**
		GM	**1946**	**1828**	**1878**	**1682**	**1835**																	
		CD (5%)	**274**	**NS**	**268**	**271**																		
		C.V. (%)	**9.2**	**10.5**	**9.3**	**10.5**																		
		Ece*/ pH**	9.3**	9.2**	10.26*	9.4**																		
		DOS	22-10-24	26-10-24	25-10-24	30-10-24																		

Data of LKW excluded from computation of mean due to non-significant data.

Agronomy

3. Agronomy

3.1 Long-term fertility experiment on cropping systems involving rapeseed-mustard

The experiment was initiated in the year 2011-12 and conducted at six locations during 2024-25 (Table 3.1.1-6). The location-wise results are presented below.

Kangra: Application of 150% NPK recorded markedly higher seed yield of mustard which was 26% higher over the application 100% NPK. The net returns (NR) and B:C ratio (BCR) of mustard were recorded highest with the use of 150% NPK.

Ludhiana: Application of 150% NPK recorded 12% higher seed yield of mustard over 100% NPK. Net returns and BCR were also recorded higher with 150% NPK compared to 100% NPK.

Pantnagar: Application of 100% NPK+2.5 t FYM/ha recorded seed yield of mustard at par with the application of 100% and 150% NPK. The system productivity and net returns were also recorded highest with the application of 100% NPK+2.5 t FYM/ha under maize-mustard cropping system. Soil organic carbon and available N content were found maximum with the use of 100% NPK along with FYM (2.5 t/ha) at Pantnagar.

Kota: Application of 100% NPK+2.5 t FYM/ha recorded significantly higher seed yield, NR and BCR of mustard by 15, 17 and 10% over the application of 100% NPK. Soil OC, N, P, K, S and Zn content were also increased and recorded maximum with the use of 100% NPK+2.5 t FYM/ha.

Bharatpur: Application of 150% NPK recorded significantly higher seed yield (12%) of mustard compared to 100% NPK.

Hisar: Application of 150% NPK recorded markedly higher seed yield (22%) of mustard over the application 100% NPK. The system productivity, sustainability index, system net returns and BCR were also recorded highest with the use of 150% NPK.

Table 3.1.1. Seed yield (kg/ha) of rapeseed-mustard under different fertility levels (2024-25).

Treatments	Zone I	Zone II		Zone III		
	KNG	LDH	HSR	PNT	KOT	BPR
Control	667	572	1159 (38.9)	864 (47.4)	997	707
100% PK	893	822	1641 (39.2)	1415 (44.2)	1583	839
100% NPK	1656	1703	1912 (40.5)	2305 (42.8)	1973	2068
150% NPK	2089	1900	2333 (40.0)	2343 (42.1)	2192	2319
100% NPK + 40 kg S/ha	1908	1712	1970 (40.9)	2390 (46.3)	2145	2211
100% NPK + 25 kgZnSO4/ha	1874	1741	2299 (40.5)	2370 (43.7)	2006	2099
100% NPK + 1 kg B/ha	1773	1706	1975 (40.1)	2360 (42.2)	1996	1970
100% NPK + 2.5 t FYM/ha	1937	1714	2031 (40.2)	2471 (44.9)	2263	2111
100% NP	1568	1647	1883 (39.9)	2118 (43.7)	1576	1678
100% NK	1514	1352	1666 (39.7)	1937 (42.4)	1595	1586
CD (p = 0.05)	263	186	418 (0.8)	235	235	193
Date of sowing	Oct. 08	Nov. 13	Nov. 11	Oct. 28	Oct. 21	Oct. 27
Variety	GSC 7	PBR 357	RH 749	NDRE 4	Giriraj	Radhika
RDF (NPK kg/ha)	120:60:60	100:30:15	80:30:20	120:40:20	80:40:30	80:40:40
Year of start	2019-20	2011-12	2011-12	2011-12	2017-18	2022-23
Preceding crop	Maize	Maize	P. millet	Maize	Urdbean	P. millet

*Oil content (%) in parenthesis

Table 3.1.2. Productivity and profitability of pearl millet-mustard cropping system at Hisar during 2024-25.

Treatments	System productivity (kg/ha)	SYI	System net return (Rs/ha)	B:C ratio
Control	2613	0.42	53982	1.46
100% PK	3212	0.54	83447	1.68
100% NPK	3621	0.62	106244	1.85
150% NPK	4073	0.71	129181	2.00
100% NPK + 40 kg S/ha	3635	0.63	106641	1.85
100% NPK + 25 kg ZnSO4/ha	3909	0.68	121181	1.95
100% NPK + 1 kg B/ha	3635	0.63	107058	1.86
100% NPK + 2.5 t FYM/ha	3732	0.64	112768	1.90
100% NP	3496	0.60	99926	1.81
100% NK	3265	0.55	89853	1.75
CD (p = 0.05)	435	-	-	-

Table 3.1.3. Economics of mustard under different fertility levels at Ludhiana and Kangra during 2024-25.

Treatments	Ludhiana			Kangra		
	Net returns (Rs/ha)	B:C ratio	ICBR	Net returns (Rs/ha)	B:C ratio	ICBR
Control	2663	1.07	-	11684	0.45	-
100% PK	18155	1.46	26.6	19216	0.57	0.95
100% NPK	75619	2.85	19.5	61485	1.66	4.50
150% NPK	87892	3.05	15.4	83699	2.06	4.94
100% NPK + 40 kg S/ha	73192	2.65	10.5	74374	1.90	4.76
100% NPK + 25 kg ZnSO4/ha	76663	2.81	14.6	71930	1.82	4.44
100% NPK + 1 kg B/ha	74862	2.75	13.7	66767	1.72	4.33
100% NPK + 2.5 t FYM/ha	76610	2.84	16.8	73371	1.67	3.46
100% NP	72691	2.81	23.7	59231	1.74	5.90
100% NK	53271	2.36	24.7	57459	1.76	6.94
CD (p = 0.05)	12681	0.30		15673	0.37	-

Table 3.1.4. Soil fertility status under pearl millet-mustard cropping system at Hisar (at harvest of mustard 2024-25).

Treatments	N (kg/ha)	P_2O_5 (kg/ha)	K_2O (kg/ha)	S (ppm)	Zn (ppm)	B (ppm)
Control	85	8	212	3.00	1.24	0.75
100% PK	82	16	298	3.70	1.38	0.75
100% NPK	98	20	268	4.20	1.16	0.45
150% NPK	112	10	276	6.00	1.42	0.65
100% NPK + 40 kg S/ha	91	16	240	4.20	1.37	0.75
100% NPK + 25 kg ZnSO4/ha	100	25	318	5.00	1.50	0.95
100% NPK + 1 kg B/ha	105	14	286	4.20	1.42	0.95
100% NPK + 2.5 t FYM/ha	102	12	322	3.70	1.29	0.65
100% NP	98	14	242	3.30	1.40	0.65
100% NK	106	6	246	4.20	1.34	0.95
Initial values	115	12.4	396	-	-	-

Table 3.1.5. Economics of mustard and soil fertility status in soil under urdbean-mustard cropping system at Kota (at harvest of mustard 2024-25).

Treatments	Net returns (Rs/ha)	B:C ratio	N (kg/ha)	P_2O_5 (kg/ha)	K_2O (kg/ha)	S (kg/ha)	Zn (ppm)
Control	33822	1.21	203	24	315	13.6	0.51
100% PK	66008	2.15	219	57	426	15.4	0.62
100% NPK	88106	2.77	288	64	446	17.5	0.68
150% NPK	99496	2.98	326	71	466	17.8	0.77
100% NPK + 40 kg S/ha	96741	2.90	304	63	460	30.1	0.84
100% NPK + 25 kg ZnSO4/ha	89077	2.72	296	59	454	18.3	1.19
100% NPK + 1 kg B/ha	87746	2.62	298	62	448	18.0	0.82
100% NPK + 2.5 t FYM/ha	103368	3.06	329	73	472	30.3	1.20
100% NP	65071	2.09	285	57	345	17.0	0.62
100% NK	67703	2.28	284	26	423	17.4	0.69
CD (p = 0.05)	13996	0.43	27.3	5.7	27.2	1.87	0.11
Initial values	-	-	280	40.3	400	18.9	0.92

Table 3.1.6. Productivity, profitability and soil fertility status (0-15 cm) under maize-mustard cropping system at Pantnagar (at harvest of mustard 2024-25).

Treatments	System productivity (kg/ha)	Incremental income over control (Rs/ha)	ICBR	OC (%)	N (kg/ha)	P (kg/ha	K (kg/ha	S (kg/ha)	Zn (ppm)	B (ppm)
Control	1223	-	-	0.49	176	8.1	155	23.7	0.77	0.54
100% PK	2042	48703	1.63	0.56	210	19.4	163	25.7	0.78	0.54
100% NPK	3515	136338	4.11	0.73	265	19.6	164	26.2	0.76	0.53
150% NPK	3581	140276	4.10	0.65	271	20.4	180	27.6	0.77	0.53
100% NPK + 40 kg S/ha	3596	141187	4.19	0.75	275	18.8	170	31.2	0.78	0.54
100% NPK + 25 kg ZnSO4/ha	3547	138295	3.96	0.68	269	18.3	169	28.7	0.83	0.55
100% NPK + 1 kg B/ha	3533	137451	4.14	0.67	267	18.1	173	28.2	0.79	0.57
100% NPK + 2.5 t FYM/ha	3718	148411	3.65	0.92	286	19.1	172	27.5	0.82	0.56
100% NP	3050	108707	3.60	0.70	242	18.5	158	26.8	0.77	0.54
100% NK	2820	94976	3.45	0.69	240	13.3	163	26.3	0.03	0.56
CD (p=0.05)	242	15367	0.46	0.07	26	1.7	14	7.1	NS	NS
Initial value	-	-	-	-	242	19.5	220	-	-	-

3.2 Evaluation of herbicides for weed management in rapeseed-mustard

The experiment was conducted at six locations during 2024-25 (Table 3.2.1-5) results are presented below.

Ludhiana: Pre-emergence (PE) application of pendimethalin 0.75 kg a.i./ha followed by (*fb*) post-emergence (PoE) application of fluazifop-p-butyl 0.125 kg a.i./ha at 25-30 DAS recorded significantly higher seed yield and NR, and lowest weed index compared to weedy check plots. However, pre-emergence application of pendimethalin 1.0 kg a.i./ha alone recorded highest weed control efficiency.

Hisar: Pendimethalin 1.0 kg a.i./ha (PE) *fb* fluazifop-p-butyl 0.125 kg a.i./ha at 25-30 DAS (PoE) recorded significantly higher seed yield, however, highest WCE and lowest weed index was recorded with the application of pendimethalin 1.0 kg a.i./ha (PE) *fb* quizalofop 0.050 kg a.i./ha at 15-20 DAS (PoE). The maximum net returns and IBCR were recorded with the pre-emergence application of pendimethalin 1.0 kg a.i./ha alone.

Pantnagar: Pendimethalin 1.0 kg a.i./ha (PE) *fb* quizalofop 0.050 kg a.i./ha at 15-20 DAS (PoE) recorded significantly higher seed yield, NR, BCR and WCE, and lowest weed index compared to rest of the treatments.

SK Nagar: Pendimethalin 1.0 kg a.i./ha (PE) *fb* quizalofop 0.050 kg a.i./ha at 15-20 DAS (PoE) recorded significantly higher seed yield and WCE, and lowest weed index. Seed yield increased by 48% with the application of pendimethalin 1.0 kg a.i./ha (PE) *fb* quizalofop 0.050 kg a.i./ha at 15-20 DAS (PoE) over the weedy check.

Ranital: Pendimethalin 0.75 kg a.i./ha (PE) *fb* fluazifop-p-butyl 0.125 kg a.i./ha at 25-30 DAS (PoE) recorded highest seed yield and WCE compared to weedy check plots.

Imphal: Pendimethalin 1.0 kg a.i./ha (PE) *fb* fluazifop-p-butyl 0.125 kg a.i./ha at 25-30 DAS (PoE) recorded highest seed yield, NR, BCR and WCE, and lowest weed index compared to rest of the treatments.

Oil content was also increased markedly with herbicide treatments from 2.3% at Hisar to 14.5% at Imphal compared to weedy check plots.

Table 3.2.1. Seed yield (kg/ha) of mustard as influenced by different herbicides.

Treatments	LDH	HSR	PNT	SKN	RNT	IMP
Pendimethalin 1.0 kg ai/ha(PE)	2357	2155	1818	1937	903	1119
Pendimethalin 0.75 kg ai/ha(PE)	2338	2047	1790	1616	955	1064
Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	2278	1894	1664	1188	932	1036
Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	2384	1899	1753	1283	998	1092
Pendimethalin 0.75 kg ai/ha(PE) *fb* Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	2403	2099	1808	1995	1156	1619
Pendimethalin 1.0 kg ai/ha(PE) *fb* Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	2361	2194	1912	1765	1039	1689
Pendimethalin 0.75 kg ai/ha(PE) *fb* Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	2347	2133	1814	2033	1041	1300
Pendimethalin 1.0 kg ai/ha(PE) *fb* Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	2227	2179	2171	1911	1015	1439
Weedy check	1963	1814	1037	926	768	822
Weed free	2523	2489	2275	2039	1162	1925
CD (p=0.05)	233	180	330	337	109	330
DOS	Oct. 28	Oct. 17	Oct. 28	Oct. 22	Nov. 08	Nov. 29
Variety	PBR 357	RH725	PR 20	GDM-4	NRCHB 101	NRCHB 101

PE: Pre-emergence; PoE: Post-emergence

Table 3.2.2. Weed control efficiency (%) of different herbicides in mustard.

Treatments	LDH	HSR*		PNT	SKN	RNT	IMP
	Maturity	45 DAS	80 DAS	45 DAS	45 DAS	45 DAS	45 DAS
Pendimethalin 1.0 kg ai/ha(PE)	61.2	7.5 (55.5)	6.4 (39.8)	80.7	69.4	59.5	47.9
Pendimethalin 0.75 kg ai/ha(PE)	51.7	7.2 (50.8)	5.9 (33.7)	75.2	52.9	66.9	33.5
Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	23.2	6.2 (39.6)	5.7 (31.8)	71.6	47.6	62.8	13.7
Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	28.5	6.7 (43.7)	6.3 (39.1)	73.8	56.7	69.4	7.9
Pendimethalin 0.75 kg ai/ha(PE) *fb* Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	59.2	7.0 (49.9)	6.1 (36.1)	76.8	48.1	83.5	63.5
Pendimethalin 1.0 kg ai/ha(PE) *fb* Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	57.0	7.0 (51.2)	6.5 (41.1)	82.4	69.7	68.1	63.7
Pendimethalin 0.75 kg ai/ha(PE) *fb* Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	31.4	7.2 (52.4)	6.7 (43.4)	79.5	65.6	74.7	42.7
Pendimethalin 1.0 kg ai/ha(PE) *fb* Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	41.4	7.9 (61.6)	6.9 (46.1)	83.7	65.3	64.6	60.2
Weedy check	-	1.0 (0.0)	1.0 (0.0)	-	0.0	0.0	-
Weed free	81.1	10.0 (100)	10.0 (100)	-	100	100	90.2
CD (p=0.05)	25.3	0.99	-	-	11.3	**7.0**	13.0

PE: Pre-emergence; PoE: Post-emergence; *Original values in parentheses

Table 3.2.3. Weed index (%) of different herbicides in mustard.

Treatments	LDH	HSR	PNT	SKN	IMP
Pendimethalin 1.0 kg ai/ha(PE)	6.5	3.8 (13.4)	20.1	6.4	42.0
Pendimethalin 0.75 kg ai/ha(PE)	7.2	4.3 (17.8)	21.3	27.2	44.7
Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	9.6	5.0 (23.9)	26.9	77.0	46.2
Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	5.4	4.9 (23.7)	23.0	60.2	43.1
Pendimethalin 0.75 kg ai/ha(PE) *fb* Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	4.7	4.1 (15.7)	20.6	2.7	15.6
Pendimethalin 1.0 kg ai/ha(PE) *fb* Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	6.3	3.6 (11.9)	16.0	16.3	12.7
Pendimethalin 0.75 kg ai/ha(PE) *fb* Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	7.0	3.9 (14.3)	20.3	1.5	32.5
Pendimethalin 1.0 kg ai/ha(PE) *fb* Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	11.7	3.7 (12.4)	4.6	6.9	25.0
Weedy check	22.1	5.3 (27.1)	54.4	137.6	56.9
Weed free	-	1.0 (0.0)	-	0.0	0.0

CD (p=0.05)	9.5	0.8	-	46.4	16.5

PE: Pre-emergence; PoE: Post-emergence

Table: 3.2.4. Economics of mustard as influenced by different herbicides.

Treatments	Net returns (Rs/ha)				ICBR			
	PNT#	IMP	HSR	LDH	PNT	IMP	HSR*	LDH
Pendimethalin 1.0 kg ai/ha(PE)	46849	19686	55589	117750	1.36	0.38	1.84	15.3 (3.76)
Pendimethalin 0.75 kg ai/ha(PE)	44803	16972	49625	117114	1.33	0.31	1.75	19.6 (3.78)
Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	37306	14295	39709	112568	1.11	0.27	1.59	18.1 (3.68)
Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	42602	19950	39478	119926	1.28	0.36	1.58	22.8 (3.85)
Pendimethalin 0.75 kg ai/ha(PE) *fb* Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	45855	46255	50838	122013	1.71	0.95	1.75	12.9 (3.82)
Pendimethalin 1.0 kg ai/ha(PE) *fb* Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	52062	49795	56321	118882	1.91	1.02	1.83	10.0 (3.72)
Pendimethalin 0.75 kg ai/ha(PE) *fb* Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	46231	29598	52275	115400	1.73	0.60	1.77	9.8 (3.66)
Pendimethalin 1.0 kg ai/ha(PE) *fb* Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	67513	37270	54990	108698	2.49	0.76	1.81	6.2 (3.48)
Weedy check	-	5341	37495	93756	-	-	1.58	- (3.29
Weed free	73701	56391	68362	125779	2.32	1.13	1.95	7.4 (3.74)
CD (p=0.05)	19618	-	-	15891	0.66	-	-	- NS

PE: Pre-emergence; PoE: Post-emergence; #Incremental income over control; *B:C ratio; $B:C ratio in parenthesis

Table: 3.2.5. Oil content (%) in mustard seed as influenced by different herbicides.

Treatments	PNT	IMP	SKN	HSR
Pendimethalin 1.0 kg ai/ha(PE)	44.4	36.4	37.9	40.4
Pendimethalin 0.75 kg ai/ha(PE)	42.5	36.3	37.1	39.8
Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	42.9	34.0	36.8	40.1
Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	40.7	37.8	37.0	39.6
Pendimethalin 0.75 kg ai/ha(PE) *fb* Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	43.0	38.7	37.5	39.4
Pendimethalin 1.0 kg ai/ha(PE) *fb* Fluazifop-p-butyl 0.125 kg ai/ha at 25-30 DAS (PoE)	44.1	38.6	37.4	40.1

Pendimethalin 0.75 kg ai/ha(PE) *fb* Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	42.3	37.5	37.4	40.2
Pendimethalin 1.0 kg ai/ha(PE) *fb* Quizalofop 0.05 kg ai /ha at 15-20 DAS (PoE)	41.5	37.0	38.0	39.9
Weedy check	42.1	33.8	36.5	39.5
Weed free	42.4	41.1	38.2	39.3
CD (p=0.05)	NS	NS	NS	0.6

PE: Pre-emergence; PoE: Post-emergence

3.3 Agronomic evaluation of promising rapeseed-mustard entries

Timely sown, irrigated/quality/WRR entries (Zone-II):
The trial was conducted at Abohar, Chatha, Hisar, Ludhiana and New Delhi centres and evaluated the test entries (DRMR 2018-25 and NPJ 261) with the checks (Table 3.3.1).
DRMR 2018-25: At Abohar, entry DRMR 2018-25 recorded higher seed yield over Kranti (11.6%) and Basanti (15.7%), and recorded lower seed yield compared to Giriraj and RH 749. At Chatha, DRMR 2018-25 recorded lower seed yield compared to checks except Basanti. At Hisar, DRMR 2018-25 recorded higher seed yield over Basanti (28.4%) and Giriraj (6.6%) but, lower than Kranti and RH 749. At Ludhiana, DRMR 2018-25 recorded higher seed yield over Kranti (6.4%) and Basanti (3.8%) but, lower than Giriraj and RH 749. At New Delhi, DRMR 2018-25 recorded higher seed yield over Basanti and RH 749 but, lower than Kranti and Giriraj.
NPJ 261: At Abohar, entry NPJ 261 recorded higher seed yield over Kranti (17.3%) and Basanti (21.7%), and recorded lower seed yield compared to Giriraj and RH 749. At Chatha, NPJ 261 recorded lower seed yield compared to checks except Basanti. At Hisar, NPJ 261 recorded higher seed yield over Basanti (37.0%) Giriraj (13.8%) and RH 749 (1.0%) but, lower than Kranti. At Ludhiana, NPJ 261 recorded higher seed yield over Kranti (16.6%), Basanti (14.1%), Giriraj (9.8%) and RH 749(6.5%). At New Delhi, NPJ 261 recorded higher seed yield over Kranti (7.1%), Basanti (71.6%), Giriraj (5.6%) and RH 749(8.6%)

Table 3.3.1. Agronomic evaluation (seed yield, kg/ha) of timely sown, irrigated/ quality/ WRR entries in Zone-II.

Entries/ Varieties (E)	Fertility levels (F)			
	100% RDF	125% RDF	150% RDF	Mean
Abohar				
DRMR 2018-25	**2294**	**2258**	**2414**	**2322**
NPJ 261	**2313**	**2377**	**2636**	**2442**
Kranti	1905	2098	2241	2081
Basanti	1940	1965	2114	2007
Giriraj	2160	2721	2737	2539
RH 749	2256	2707	2764	2576
Mean	2145	2354	2484	
CD (p=0.05)	Entries (E) = 343; Fertility (F) = 131; ExF = NS			
DOS: Oct. 26; Recommended fertility levels NPK (kg/ha)-100:40:20				
Chatha				
DRMR 2018-25	**1307**	**1460**	**1477**	**1414**
NPJ 261	**1253**	**1403**	**1428**	**1362**
Kranti	1350	1503	1525	1459
Basanti	1153	1303	1323	1260

Giriraj	1480	1623	1648	1584
RH 749	1520	1667	1692	1626
Mean	1344	1493	1516	
CD (p=0.05)	Entries (E) = 195; Fertility (F) = 23; ExF = NS			
DOS: Oct. 22; Recommended fertility levels NPK (kg/ha)-80:40:20				
Hisar				
DRMR 2018-25	**2201**	**2217**	**2125**	**2181**
NPJ 261	**2218**	**2456**	**2310**	**2328**
Kranti	2228	2788	2150	2389
Basanti	1762	1879	1455	1699
Giriraj	2148	1969	2022	2046
RH 749	2022	2430	2462	2305
Mean	2097	2290	2087	
CD (p=0.05)	Entries (E) = 117; Fertility (F) = 66; Interaction: F at same level of E = 167, E at same level of F = 176			
DOS: Oct. 18; Recommended fertility levels NPK (kg/ha)-80:30:20				
Ludhiana				
DRMR 2018-25	**2451**	**2503**	**2651**	**2535**
NPJ 261	**2682**	**2824**	**2855**	**2787**
Kranti	2131	2444	2573	2383
Basanti	2415	2448	2463	2442
Giriraj	2460	2531	2623	2538
RH 749	2500	2602	2750	2617
Mean	2440	2559	2653	
CD (p=0.05)	Entries (E) = 160; Fertility (F) = 113 ExF = NS			
DOS: Oct. 12; Recommended fertility levels NPK (kg/ha)- 120:30:15				
New Delhi				
DRMR 2018-25	**2970**	**2690**	**2770**	**2810**
NPJ 261	**3450**	**2800**	**2830**	**3020**
Kranti	2850	2950	2650	2820
Basanti	2630	1290	1370	1760
Giriraj	3020	2880	2690	2860
RH 749	2710	2900	2730	2780
Mean	2940	2580	2550	0
CD (p=0.05)	Entries (E) = 310; Fertility (F) = 270; ExF = F at same level of E = 530, E at same level of F = 470			
DOS: Oct. 25; Recommended fertility levels NPKS (kg/ha)-80:40:40:30				

Timely sown (irrigated/quality) mustard entries in Zone-III

The trial was conducted at Jhansi, Morena, Kota, Pantnagar and Varanasi centres and evaluated the test entry (DRMRCIQ 172) with the checks (Table 3.3.2).

At Jhansi, entry DRMRCIQ 172 recorded higher seed yield over the checks RGN 73 (5.8%), PDZ 11 (41.2%) and PM 30 (12.6%). At Morena, DRMRCIQ 172 recorded higher seed yield over the checks PDZ 11 (32.9%) and PM 30 (1.9%) but, lower than RGN 73. At Kota, DRMRCIQ 172 recorded lower seed yield compared to checks. At Pantnagar, DRMRCIQ 172 recorded higher seed yield over the checks RGN 73 (6.8%), PDZ 11 (56.4%) and PM 30 (26.7%). At Varanasi, DRMRCIQ 172 recorded higher seed yield over the checks PDZ 11 (19.8%) and PM 30 (10.7%) but, lower than RGN 73.

Table 3.3.2. Agronomic evaluation (seed yield, kg/ha) of timely sown (irrigated/quality) mustard entries in Zone-III.

Entries/ Varieties (E)	Fertility levels (F)			
	100% RDF	125% RDF	150% RDF	Mean
Jhansi				
DRMRCI(Q) 172	**2711**	**2527**	**2809**	**2682**
RGN 73	2642	2288	2672	2534
PDZ 11	1806	1913	1981	1900
PM 30	2480	2206	2435	2372
Filler	2245	2577	3095	2639
Mean	2377	2302	2599	
CD (p=0.05)	Entries (E) = 272; Fertility (F) = 160; ExF = 359			
DOS: Oct. 28; Recommended fertility levels NPKS (kg/ha)- 120:60:60:40				
Morena				
DRMRCI(Q) 172	**1888**	**2053**	**2546**	**2162**
RGN 73	1950	2331	2692	2324
PDZ 11	1372	1577	1932	1627
PM 30	1961	2078	2327	2122
Filler	1836	2027	2295	2052
Mean	1801	2013	2358	
CD (p=0.05)	Entries (E) = 275; Fertility (F) = 143; ExF = NS			
DOS: Oct. 10; Recommended fertility levels NPK (kg/ha)-80:40:20				
Kota				
DRMRCI(Q) 172	**2027**	**2080**	**2130**	**2079**
RGN 73	2238	2297	2330	2288
PDZ 11	2123	2197	2253	2191
PM 30	2100	2160	2200	2153
Filler	2155	2160	2207	2174
Mean	2128	2179	2224	
CD (p=0.05)	Entries (E) = 156; Fertility (F) = 88; ExF = NS			
DOS: Oct. 25; Recommended fertility levels NPK (kg/ha)-100:50:30				
Pantnagar				
DRMRCI(Q) 172	**2568**	**2813**	**2766**	**2715**
RGN 73	2472	2861	2461	2538
PDZ 11	1484	1871	1855	1736
PM 30	2111	2172	2149	2144
Filler	2264	2354	2321	2313
Mean	2179	2378	2310	
CD (p=0.05)	Entries (E) = 389; Fertility (F) = 160; ExF = NS			
DOS: Oct. 23; Recommended fertility levels NPK (kg/ha)- 120:40:20				
Varanasi				
DRMRCI(Q) 172	**1864**	**1946**	**2029**	**1947**
RGN 73	1900	1983	2066	1983
PDZ 11	1542	1625	1708	1625
PM 30	1676	1759	1842	1759
Filler	1738	1820	1903	1820
Mean	1744	1827	1910	
CD (p=0.05)	Entries (E) = 120; Fertility (F) = 105; ExF = NS			
DOS: Oct. 30; Recommended fertility levels NPKS (kg/ha)-120:60:60				

AHT-II mustard entries in Zone IV

The trial was conducted at Jalgaon, Mandore, Nagpur, Pali and SK Nagar centres and evaluated the test entry (18J408C) with the checks (Table 3.3.3).

At Jalgaon, entry 18J408C recorded lower seed yield compared to hybrid checks. At Mandore, 18J408C recorded higher seed yield compared to 45S46 (15.7%) and DMH 1 (32.8%) but, lower than GDM 4. At Nagpur, 18J408C recorded lower seed yield compared to DMH 1 but, higher over 45S46 (4.8%). At Pali, 18J408C recorded higher seed yield compared to hybrid checks 45S46 (20.5%) and DMH 1 (15.5%). At SK Nagar, 18J408C recorded higher seed yield compared to 45S46 (2.6%), DMH 1 (9.9%) and Kranti (4.6%) but, lower than GDM 4.

Table 3.3.3. Agronomic evaluation (seed yield, kg/ha) of AHT-II mustard entries in Zone IV.

Entries/ Varieties (E)	Fertility levels (F)			
	100% RDF	125% RDF	150% RDF	Mean
Jalgaon				
18J408C	**1326**	**1477**	**1491**	**1431**
45S46	1681	1801	1827	1770
DMH 1	1810	2030	1932	1924
Kranti	1132	1365	1361	1286
GDM 4	1131	1286	1248	1222
Mean	1416	1592	1572	
CD (p=0.05)	Entries (E) = 158; Fertility (F) =150; ExF = NS			
DOS: Nov. 13; Recommended fertility level- 80 kg N, 40 kg P_2O_5, 40 kg K_2O/ha				
Mandore (Jodhpur)				
18J408C	**1991**	**2243**	**2317**	**2184**
45S46	1752	1926	1986	1888
DMH 1	1507	1674	1749	1644
Kranti	1937	2173	2245	2118
GDM 4	2207	2423	2521	2383
Mean	1879	2088	2164	
CD (p=0.05)	Entries (E) = 250; Fertility (F) = 155; ExF = NS			
DOS: Oct. 28; Recommended fertility level- 60 kg N, 40 kg P_2O_5, 40 kg K_2O/ha				
Nagpur				
18J408C	**1253**	**1430**	**1443**	**1375**
45S46	1247	1325	1368	1313
DMH 1	1805	1862	1894	1854
Kranti	1763	1728	1777	1756
GDM 4	1423	1503	1548	1491
Mean	1498	1570	1606	
CD (p=0.05)	Entries (E) = 122; Fertility (F) = NS; ExF = NS			
DOS: Nov. 13; Recommended fertility level- 80 kg N, 40 kg P_2O_5, 20 kg K_2O/ha				
Pali (CAZRI)				
18J408C	**2520**	**2565**	**2586**	**2557**
45S46	2084	2100	2183	2122
DMH 1	2104	2200	2333	2213
Kranti	1900	1917	1983	1933
GDM 4	2438	2450	2485	2458
Mean	2209	2246	2314	
CD (p=0.05)	Entries (E) = 178; Fertility (F) = 144; ExF = 287			
DOS: Nov. 06; Recommended fertility level- 60 kg N, 40 kg P_2O_5/ha				

SK Nagar				
18J408C	**2683**	**2633**	**2787**	**2701**
45S46	2610	2802	2480	2630
DMH 1	2585	2588	2202	2458
Kranti	2439	2718	2594	2583
GDM 4	2725	2835	3219	2926
Mean	2608	2715	2656	
CD (p=0.05)	Entries (E) = 272; Fertility (F) = NS; ExF = NS			
DOS: Oct 22; Recommended fertility levels NPKS (kg/ha)- 75:50:00:40				

Saline/alkaline entries at across the zones

The trial was conducted at Hisar, Karnal and Lucknow centres and evaluated the test entry (CS 2020-10) with the checks (Table 3.3.4).

At Hisar, entry CS 2020-10 recorded higher seed yield compared to Kranti (31.2%), CS 54 (19.6%), CS 60 (12.4%) and Filler. At Karnal, CS 2020-10 recorded higher seed yield compared to Kranti (49.9%), CS 54 (36.3%), CS 60 (29.2%) and Filler. At Lucknow, CS 2020-10 recorded higher seed yield compared to Kranti (30.1%), CS 54 (21.7%), CS 60 (19.5%) and Filler.

Table 3.3.4. Agronomic evaluation (seed yield, kg/ha) of mustard (saline/alkaline) entries at across the zones.

Entries/ Varieties (E)	Fertility levels (F)			
	100% RDF	125% RDF	150% RDF	Mean
Hisar				
CS 2020-10	**1915**	**2052**	**2304**	**2090**
Kranti	1436	1618	1725	1593
CS 54	1556	1772	1913	1747
CS 60	1715	1919	1944	1860
Filler	1783	1977	1998	1919
Mean	1681	1868	1977	
CD (p=0.05)	Entries (E) = 162; Fertility (F) = 101; ExF = NS			
DOS: Oct. 20; Recommended fertility level- 80 kg N, 30 kg P_2O_5, 20 kg K_2O/ha				
Karnal				
CS 2020-10	**2308**	**2655**	**2623**	**2529**
Kranti	1483	1612	1966	1687
CS 54	1779	1821	1967	1856
CS 60	1872	1909	2093	1958
Filler	1865	1944	2046	1952
Mean	1861	1988	2139	
CD (p=0.05)	Entries (E) = 194; Fertility (F) = 104; ExF = NS			
DOS: Oct. 17; Recommended fertility level- 80 kg N, 40 kg P_2O_5/ha				
Lucknow				
CS 2020-10	**2033**	**2125**	**2400**	**2186**
Kranti	1573	1668	1800	1680
CS 54	1704	1798	1885	1796
CS 60	1750	1830	1908	1829
Filler	1723	1808	1927	1820
Mean	1757	1846	1984	
CD (p=0.05)	Entries (E) = 221; Fertility (F) = 79; ExF = NS			
DOS: Oct 28; Recommended fertility levels NPK (kg/ha)- 80:40:40				

3.4 Response of macro and micro nutrient bio-fertilizers in enhancing rapeseed-mustard productivity and soil health

The experiment was conducted at 16 locations during 2024-25 (Table 3.4.1-7).
Application of 100% RDF increased seed yield significantly over 75% RDF across the biofertilizers at Kangra, Chatha, Pantnagar, Morena, Dholi, Kota,Varanasi, Ranital, Bawal, Bharatpur, Ludhiana and Sriganganagar. Whereas, application of 75% being on par with 100% RDF recorded markedly higher seed yield at SK Nagar, Kanke, Imphal and Shillongani across the biofertilizers. Though, the response of biofertilizers was varied according to location. The seed inoculation with NPK consortia+ZSB markedly increased seed yield at Kangra (21.6%), Chatha (15.0%), Pantnagar (17.1%), Morena (17.5%), Dholi (24.2%), Kota (17.7%), Varanasi (32.2%), SK Nagar (2.5%), Kanke (17.1%), Ranital (32.7%), Imphal (45.6%), Bawal (25.4%), Bharatpur (25.3%), Shillongani (11.5%), Ludhiana (11.4%) and Sriganganagar (22.1%) compared to no inoculation.
Seed inoculation with NPK consortia+ZSB significantly increased net economic returns (23-47%) over no inoculation at all the locations except at Pantanagar, SK Nagar and Imphal (Table 3.4.2). *Azotobacter* at Pantnagar, KMB at SK Nagar and Imphal recorded highest net return over no inoculation.
Soil fertility parameters (SOC, N, P, K, S and Zn) were also influenced with the seed inoculation of biofertilizers across the fertility levels (RDF), and recorded highest with 100% RDF and NPK consortia+ZSB at most of the locations.

Table 3.4.1. Seed yield (kg/ha) of mustard as influenced by different fertility levels and liquid biofertilizers.

Fertility level (F)	Biofertilizers (BF)						Mean
	Azotobacter	PSMO	KMB	ZSB	NPK Consortia + ZSB	No culture	
Kangra							
100% RDF	1756	1818	1841	1770	1860	1478	1754
75% RDF	1450	1397	1365	1398	1459	1151	1370
Control	668	722	679	737	645	628	680
Mean	1291	1312	1295	1302	1321	1086	
CD (p=0.05)	Fertility Levels (F) = 83; Biofertilizers (BF) = 103; FxBF = NS						
DOS: Oct 14; Recommended fertility levels NPK (kg/ha) - 60:40:40							
Chatha							
100% RDF	1837	1808	1763	1710	1863	1633	1769
75% RDF	1527	1498	1460	1350	1553	1297	1447
Control	1187	1140	1120	1083	1183	1070	1131
Mean	1517	1482	1448	1381	1533	1333	
CD (p=0.05)	Fertility Levels (F) = 210; Biofertilizers (BF) = 57; FxBF = NS						
DOS: Oct 25; Recommended fertility levels NPK (kg/ha) - 80:40:20							
Pantnagar							
100% RDF	2162	2093	2038	2017	2260	1964	2089
75% RDF	1855	1816	1805	1792	1944	1730	1823
Control	1196	1180	1024	842	1004	755	1000
Mean	1738	1696	1622	1550	1736	1483	
CD (p=0.05)	Fertility Levels (F) = 181; Biofertilizers (BF) = 167; FxBF = NS						
DOS: Oct. 23; Recommended fertility levels NPKS (kg/ha) - 120:40:20:20							

Morena							
100% RDF	2557	2246	2339	2392	2363	2032	2321
75% RDF	1886	1916	1966	1863	2077	1706	1902
Control	1340	1261	1403	1410	1360	1196	1328
Mean	1928	1808	1903	1888	1933	1645	
CD (p=0.05)	Fertility Levels (F) = 294; Biofertilizers (BF) = 148; FxBF = NS						
DOS: Oct. 11; Recommended fertility levels NPK (kg/ha) - 80:40:20							
Dholi							
100% RDF	1684	1690	1713	1826	1985	1640	1756
75% RDF	1428	1600	1594	1757	1724	1448	1592
Control	1285	1367	1268	1482	1611	1197	1368
Mean	1466	1552	1525	1689	1773	1428	
CD (p=0.05)	Fertility Levels (F) = 73; Biofertilizers (BF) = 111; FxBF = NS						
DOS: Nov. 28; Recommended fertility levels NPK (kg/ha) - 80:40:40							
Kota							
100% RDF	2157	2043	2142	1969	2263	1866	2073
75% RDF	1653	1731	1545	1854	1793	1513	1682
Control	1131	1101	1298	1303	1235	1115	1197
Mean	1647	1625	1662	1709	1764	1498	
CD (p=0.05)	Fertility Levels (F) = 146; Biofertilizers (BF) = 220; FxBF = NS						
DOS: Oct 21; Recommended fertility levels NPK (kg/ha) - 100:50:30							
Varanasi							
100% RDF	2332	2423	2102	1989	2467	1925	2206
75% RDF	2124	2216	1894	1782	2259	1718	1999
Control	1799	1891	1569	1457	1934	1393	1674
Mean	2085	2177	1855	1743	2220	1679	
CD (p=0.05)	Fertility Levels (F) = 149; Biofertilizers (BF) = 132; FxBF = NS						
DOS: Oct 30; Recommended fertility levels NPK (kg/ha) - 120:60:60							
SK Nagar							
100% RDF	1957	1879	2168	2394	2370	2063	2139
75% RDF	1743	2088	2056	1847	2009	2070	1969
Control	1698	1563	1827	1742	1359	1468	1610
Mean	1799	1843	2017	1995	1913	1867	
CD (p=0.05)	Fertility Levels (F) = 216; Biofertilizers (BF) = NS; FxBF = 369						
DOS: Oct 22; Recommended fertility levels NPKS (kg/ha) - 50:50:00:40							
Kanke							
100% RDF	1366	1296	1309	1392	1470	1315	1358
75% RDF	1298	1275	1228	1382	1489	1188	1310
Control	865	866	858	883	895	786	859
Mean	1176	1146	1132	1219	1285	1097	
CD (p=0.05)	Fertility Levels (F) = 123; Biofertilizers (BF) = 117; FxBF = NS						
DOS: Nov. 27; Recommended fertility levels NPKS (kg/ha) - 80:60:40:20							
Ranital (Previously Bhubaneswar)							
100% RDF	1059	1021	1113	1013	1168	865	1040
75% RDF	1031	1022	1033	1007	1047	767	985
Control	379	356	364	362	387	330	363
Mean	823	800	837	794	868	654	
CD (p=0.05)	Fertility Levels (F) = 52; Biofertilizers (BF) = 45; FxBF = 87						
DOS: Nov. 14; Recommended fertility levels NPK (kg/ha) - 80:40:40							

Imphal							
100% RDF	1828	1731	1967	1633	1925	1369	1742
75% RDF	1625	1569	1778	1500	1694	1278	1574
Control	1389	1361	1639	1306	1556	908	1360
Mean	1614	1554	1794	1480	1725	1185	
CD (p=0.05)	Fertility Levels (F) = 278; Biofertilizers (BF) = 254; FxBF= NS						
DOS: Nov. 30; Recommended fertility levels NPK (kg/ha) - 60:30:30							
Bawal							
100% RDF	2044	2031	2008	1970	2382	1751	2031
75% RDF	1655	1586	1529	1543	1815	1589	1620
Control	1329	1339	1272	1235	1607	1289	1345
Mean	1676	1652	1603	1583	1935	1543	
CD (p=0.05)	Fertility Levels (F) = 190; Biofertilizers (BF) = 148; FxBF = NS						
DOS: Oct. 16; Recommended fertility levels NPKS (kg/ha) - 80:30:20:40							
Bharatpur							
100% RDF	1878	1902	1870	1858	1930	1731	1862
75% RDF	1424	1392	1390	1380	1592	1278	1409
Control	602	519	665	714	808	446	626
Mean	1301	1271	1308	1317	1443	1152	
CD (p=0.05)	Fertility Levels (F) = 132; Biofertilizers (BF) = 98; FxBF = NS						
DOS: Oct. 30; Recommended fertility levels NPK (kg/ha) - 80:40:40							
Shillongani							
100% RDF	1090	1026	1041	897	1346	1218	1103
75% RDF	1185	849	1210	772	937	1097	1009
Control	642	681	721	593	1010	641	714
Mean	972	852	991	754	1098	985	
CD (p=0.05)	Fertility Levels (F) = 124; Biofertilizers (BF) = NS; FxBF = NS						
DOS: Nov. 25; Recommended fertility levels NPK (kg/ha) - 60:30:30							
Ludhiana							
100% RDF	2321	2340	2290	2380	2426	2225	2330
75% RDF	2179	2216	2083	2231	2346	2062	2186
Control	1920	1818	1794	1814	1991	1784	1853
Mean	2140	2124	2056	2142	2254	2024	
CD (p=0.05)	Fertility Levels (F) = 111; Biofertilizers (BF) = 135; FxBF = NS						
DOS: Nov. 05; Recommended fertility levels NPK (kg/ha) - 100:30:15							
Sriganganagar							
100% RDF	2616	2893	2661	2916	3204	2622	2819
75% RDF	2326	2617	2249	2537	2846	2118	2449
Control	2078	2128	2129	2409	2524	2006	2212
Mean	2340	2546	2346	2621	2858	2340	
CD (p=0.05)	Fertility Levels (F) = 153; Biofertilizers (BF) = 125; FxBF = NS						
DOS: Oct. 23; Recommended fertility levels NPKS (kg/ha) - 75:40:30:20							

Table 3.4.2. Productivity, profitability and sustainability of mustard as influenced by different fertility levels and liquid biofertilizers at Bharatpur (5-years mean data 2020-21 to 2024-25) and SK Nagar (4-years mean data 2021-22 to 2024-25).

Treatment	Bharatpur					SK Nagar			
	Seed yield (kg/ha)	Net returns (Rs/ha)	B:C ratio	Sustainable yield index	Oil content (%)*	Seed yield (kg/ha)	Net returns (Rs/ha)	B:C ratio	Oil content (%)
Fertility levels									
100% RDF	2274	80489	2.77	0.69	42.5	2006	62852	2.61	37.7
75% RDF	1958	65104	2.52	0.56	42.0	1742	48947	2.31	37.5
Control	1199	27911	1.81	0.27	41.8	1402	36565	2.15	37.5
CD (p=0.05)	102	4266	0.09	0.03	0.6	88.8	-	-	NS
Biofertilizers									
Azotobacter	1845	60471	2.43	0.52	42.1	1719	55593	2.50	37.4
PSMO	1807	56957	2.34	0.50	42.5	1700	54858	2.48	37.0
KMB	1779	56284	2.33	0.51	42.0	1740	57282	2.55	37.4
ZSB	1814	57569	2.36	0.51	42.1	1774	59106	2.59	36.7
NPK consortia+ZSB	1993	67892	2.61	0.56	42.4	1726	56240	2.50	37.6
No culture	1622	47836	2.13	0.46	41.4	1643	52021	2.41	37.3
CD (p=0.05)	40	3130	0.07	0.03	0.4	NS	-	-	NS

*Oil content data reported for the year 2024-25.

Table 3.4.3. Net returns of mustard as influenced by different fertility levels and liquid biofertilizers.

Treatment	Net returns (Rs/ha)														
	CHT	KOT	VAR	KNK	LDH	BAW	KNG	MOR	BPR	DOL	SHL	PNT	SKN	IMP	SGN
Fertility levels															
100% RDF	85807	92270	105039	46464	120581	74475	66174	116582	68068	66281	39582	89439	85860	57282	127105
75% RDF	67723	70298	93753	45544	112085	51052	45238	89564	43596	59617	32644	74955	77424	48639	110320
Control	52042	45490	78275	23131	93226	37881	8354	59896	2243	50363	22898	30993	61824	40028	98603
CD (p=0.05)	12464	10058	2248	7400	8699	11313	5890	-	8048	4823	9626	10790	12883	-	-
Biofertilizers															
Azotobacter	72505	69133	99794	38427	109311	55119	41242	94295	38479	51985	35300	72469	68700	51937	103725
PSMO	70449	67810	105428	36628	108952	53693	42608	87188	36549	57333	26591	69992	71326	48356	114827
KMB	68406	70011	85974	35790	103557	50777	41037	91425	38485	56320	34818	66040	81668	62680	104060
ZSB	64439	72805	79179	41019	110060	49559	41647	91365	38762	65714	19560	611847	80319	43949	118869
NPK consortia+ZSB	73497	75829	108382	43287	118135	70432	43468	95063	46921	69523	44267	71902	75345	58448	131679
No culture	61847	60529	75373	35128	101767	47236	29530	74424	28618	51645	29715	49188	72858	26529	98898
CD (p=0.05)	3409	12523	2204	7021	9300	8798	5005	-	5522	5911	15174	9927	NS	-	-

Table 3.4.4. B:C ratio of mustard as influenced by different fertility levels and liquid biofertilizers after harvest of mustard.

Treatment	DOL	SKN	KNK	CHT	VAR	BPR	KOT	LDH	DOL	IMP*	PNT
Fertility levels											
100% RDF	1.46	3.07	1.62	4.41	2.82	2.37	2.75	3.95	1.46	1.07	2.5
75% RDF	1.39	2.95	1.58	3.68	2.62	1.93	2.18	3.80	1.39	0.88	2.2
Control	1.32	2.82	1.50	3.42	2.50	1.06	1.61	3.51	1.32	0.66	1.1
CD (p=0.05)	0.11	NS	0.21	0.72	0.16	0.17	0.32	0.22	0.11	-	0.34
Biofertilizers											
Azotobacter	1.23	2.80	1.62	4.05	2.87	1.79	2.16	3.77	1.23	0.94	2.2
PSMO	1.35	2.86	1.51	3.93	3.03	1.75	2.12	3.76	1.35	0.86	2.2
KMB	1.33	3.13	1.53	3.82	2.47	1.80	2.21	3.62	1.33	1.19	2.1
ZSB	1.55	3.09	1.66	3.60	2.27	1.81	2.30	3.78	1.55	0.76	1.9
NPK consortia+ZSB	1.62	2.92	1.68	4.10	3.11	1.99	2.36	3.99	1.62	1.09	2.2
No culture	1.28	2.89	1.63	3.51	2.19	1.57	1.92	3.58	1.28	0.36	1.2
CD (p=0.05)	0.14	NS	0.21	0.20	0.14	0.12	0.40	0.24	NS	-	0.30

*ICBR

Table 3.4.5. Soil Organic carbon and available N as influenced by different fertility levels and liquid biofertilizers after harvest of mustard.

Treatment	OC (%)			N (kg/ha)				
	DOL	BAW	CHT	CHT	KOT	BAW	DOL	PNT
Fertility levels								
100% RDF	0.56	0.21	0.51	157	303	131	167	210
75% RDF	0.52	0.19	0.51	150	247	122	162	188
Control	0.49	0.19	0.50	140	212	81	146	155
CD (p=0.05)	0.06	NS	NS	6	9	2	13	17
Biofertilizers								
Azotobacter	0.49	0.20	0.52	151	255	115	142	193
PSMO	0.50	0.20	0.51	147	255	107	164	184
KMB	0.53	0.20	0.51	147	252	108	149	179
ZSB	0.57	0.19	0.51	147	251	109	168	172
NPK consortia+ZSB	0.54	0.21	0.52	151	263	125	169	203
No culture	0.54	0.19	0.51	150	250	103	157	176
CD (p=0.05)	0.07	NS	NS	NS	8.3	3	13	10
Initial value	0.50	0.21	-	172	305	132	150	235

Table 3.4.6. Soil available P and K as influenced by different fertility levels and liquid biofertilizers after harvest of mustard.

Treatment	P (kg/ha)					K (kg/ha)				
Fertility levels	CHT	KOT	BAW	DOL	PNT	CHT	KOT	BAW	DOL	PNT
100% RDF	16.3	64.7	13.9	14.1	12.6	132	457	217	134	224
75% RDF	15.0	40.6	12.8	13.9	11.3	126	422	209	132	200
Control	14.9	23.8	11.5	13.4	8.8	120	363	177	130	181
CD (p=0.05)	0.9	2.7	0.6	0.9	0.8	5	23	6	15	15
Biofertilizers										
Azotobacter	15.4	42.9	12.8	12.3	10.3	127	408	197	114	207
PSMO	15.4	44.4	13.3	13.6	11.3	126	416	196	127	202
KMB	15.2	43.9	12.6	13.9	11.4	126	419	209	126	210
ZSB	15.3	42.4	12.5	14.8	10.9	126	411	200	144	187
NPK consortia+ZSB	15.4	46.3	13.4	14.2	11.4	125	426	212	142	215
No culture	15.6	38.4	11.7	13.9	10.1	127	405	194	135	188
CD (p=0.05)	NS	2.4	0.5	1.2	0.7	NS	10.9	6	12	12
Initial value	15.6	55.5	29	13.3	20.1	120	455	226	131	223

Table 3.4.7. Soil available sulphur and zinc as influenced by different fertility levels and liquid biofertilizers after harvest of mustard.

Treatment	S (mg/kg)				Zn (mg/kg)				
Fertility levels	CHT*	KOT	DOL	PNT*	CHT	KOT	DOL	BAW	PNT
100% RDF	28.3	10.5	11.7	25.9	0.57	0.90	0.50	0.54	0.70
75% RDF	25.6	9.1	11.5	21.5	0.53	0.80	0.57	0.54	0.70
Control	22.9	8.1	11.8	13.3	0.51	0.69	0.49	0.53	0.72
CD (p=0.05)	0.7	0.6	1.6	1.97	0.02	0.03	NS	NS	NS
Biofertilizers									
Azotobacter	25.3	9.0	11.6	19.8	0.53	0.79	0.44	0.52	0.68
PSMO	25.7	9.5	11.9	20.9	0.54	0.79	0.50	0.52	0.66
KMB	25.6	9.4	11.5	20.8	0.53	0.80	0.48	0.54	0.67
ZSB	25.7	9.0	11.7	20.4	0.53	0.80	0.58	0.56	0.79
NPK consortia+ZSB	25.3	9.6	11.7	19.8	0.54	0.81	0.54	0.56	0.78
No culture	25.8	8.9	11.7	19.8	0.54	0.78	0.45	0.53	0.68
CD (p=0.05)	NS	0.4	1.2	NS	NS	0.03	0.06	NS	0.47
Initial value	28.0	12.5	11.8	-	0.56	1.04	0.52	0.60	-

*(kg/ha)

3.5 Optimization of mineral nutrient management for higher productivity

The experiment was conducted at 17 locations during 2024-25 (Table 3.5.1-6).

Application of secondary (S) and micronutrients (Zn & B) with and without FYM enrichment significantly increased the seed yield of mustard at all the locations. Application of 125% RDF recorded significantly higher seed yield at Chatha, Ranital, Imphal, Kanke, Kota, Ludhiana, Pantnagar and Dholi when applied with FYM enriched secondary and micronutrients, whereas, 150% RDF found better at Jhansi, Kangra, Morena, Nagpur and Hisar. Application of FYM enriched '40 kg S+5.0 kg Zn+1.0 kg B/ha' recorded highest seed yield at all the locations.

Oil content improved with the application of higher fertility levels and FYM enriched secondary and micro nutrients.

Economic returns in terms of net returns were recorded maximum with the application of 150% NPK and FYM enriched '40 kg S+5.0 kg Zn+1.0 kg B/ha' at Hisar, Kota, Chatha, Jhansi, Morena, Nagpur, Ludhiana, Dholi and Kanke. Whereas, at Pantanagar and Imphal, 100% NPK and FYM enriched '20 kg S+2.5 kg Zn+0.5 kg B/ha' were recorded maximum net returns.

Soil fertility parameters were also improved with the application of FYM enriched secondary and micro nutrients.

Note: Data of Jobner, SK Nagar and Shillongani centres were excluded from the report due to unanticipated trend.

Kanpur centre not conducted the experiment

Table 3.5.1. Seed yield (kg/ha) of mustard as influenced by different nutrient management options.

Major nutrients (M)	Secondary & micro nutrients (SM)				Mean
	20 kg S+2.5 kg Zn+ 0.5 kg B/ha	40 kg S+5 kg Zn+1 kg B/ha	20 kg S+2.5 kg Zn+0.5 kg B/ha enriched with 500 kg FYM/ha	40 kg S+5 kg Zn+1 kg B/ha enriched with 500 kg FYM/ha	
Chatha					
Control	930	1000	1060	1127	1029
100% NPK	1453	1573	1599	1710	1584
125% NPK	1663	1807	1787	1917	1793
150% NPK	1707	1830	1840	1967	1836
Mean	1438	1553	1571	1580	
CD (p=0.05)	Major nutrients (M) = 194; Secondary & micro nutrients (SM) = 46; MxSM = NS				
DOS: Oct 26; Recommended fertility levels NPK (kg/ha) - 80:40:20					
Ranital (Previously Bhubaneswar)					
Control	456	505	537	682	545
100% NPK	911	1008	1011	1102	1008
125% NPK	1049	1063	1119	1078	1077
150% NPK	1090	1098	1100	1187	1119
Mean	877	919	942	1012	
CD (p=0.05)	Major nutrients (M) = 57; Secondary & micro nutrients (SM) = 44; MxSM = NS				
DOS: Nov. 14; Recommended fertility levels NPK (kg/ha) – 80:40:40					
Imphal					
Control	842	1058	1244	1167	1078
100% NPK	1419	1475	1704	1584	1546
125% NPK	1586	1667	1839	1769	1715
150% NPK	1456	1525	1767	1639	1597
Mean	1326	1431	1639	1540	

CD (p=0.05)	Major nutrients (M) = 440; Secondary & micro nutrients (SM) =; 153; MxSM = NS				
DOS: Nov. 30; Recommended fertility levels NPK (kg/ha) – 60:30:30					
Jhansi					
Control	1225	1401	1311	1471	1352
100% NPK	1583	1798	1685	1939	1751
125% NPK	2537	2575	2615	2653	2595
150% NPK	2729	2885	2924	3005	2886
Mean	2019	2165	2134	2267	
CD (p=0.05)	Major nutrients (M) = 228; Secondary & micro nutrients (SM) = 142; MxSM = 284				
DOS: Nov. 04; Recommended fertility levels NPK (kg/ha) - 120:60:60					
Jobner					
Control	949	1327	1460	1550	1321
100% NPK	1057	1444	1566	1665	1433
125% NPK	984	1349	1501	1569	1351
150% NPK	1079	1456	1586	1688	1452
Mean	1018	1394	1528	1618	
CD (p=0.05)	Major nutrients (M) = 105; Secondary & micro nutrients (SM) = 87; MxSM = NS				
DOS: Oct 30; Recommended fertility levels NPK (kg/ha) – 60:40:00					
Kangra					
Control	797	799	800	930	831
100% NPK	1694	1736	1854	1900	1796
125% NPK	1835	1937	2031	2138	1985
150% NPK	1971	2083	2186	2214	2114
Mean	1574	1639	1718	1796	
CD (p=0.05)	Major nutrients (M) = 99; Secondary & micro nutrients (SM) = 99; MxSM = NS				
DOS: Oct 15; Recommended fertility levels NPK (kg/ha) – 120:60:40					
Kanke					
Control	743	757	771	804	769
100% NPK	1285	1312	1394	1435	1357
125% NPK	1306	1349	1408	1432	1374
150% NPK	1380	1423	1473	1584	1465
Mean	1179	1210	1261	1314	1241
CD (p=0.05)	Major nutrients (M) = 169; Secondary & micro nutrients (SM) = 106; MxSM = 211				
DOS: Nov. 26; Recommended fertility levels NPK (kg/ha) – 80:60:40:20					
Kota					
Control	1078	1328	1281	1405	1273
100% NPK	1795	2060	2093	2329	2069
125% NPK	2089	2101	2114	2343	2162
150% NPK	2207	2327	2234	2329	2274
Mean	1792	1954	1930	2101	
CD (p=0.05)	Major nutrients (M) = 169; Secondary & micro nutrients (SM) = 198; MxSM = NS				
DOS: Oct 21; Recommended fertility levels NPK (kg/ha) - 100:50:30					
Khudwani					
Control	947	983	1014	1042	996
100% NPK	1076	1159	1167	1179	1145

125% NPK	1144	1201	1185	1222	1188
150% NPK	1176	1234	1220	1246	1219
Mean	1086	1144	1146	1172	
CD (p=0.05)	Major nutrients (M) = 80; Secondary & micro nutrients (SM) = NS; MxSM = NS				
DOS: Oct 15; Recommended fertility levels NPK (kg/ha) - 80:50:40					
Ludhiana					
Control	1711	1822	2044	2071	1912
100% NPK	2365	2554	2392	2586	2474
125% NPK	2603	2621	2669	2661	2639
150% NPK	2639	2769	2767	2839	2754
Mean	2330	2442	2468	2539	
CD (p=0.05)	Major nutrients (M) = 134; Secondary & micro nutrients (SM) = 145; MxSM = NS				
DOS: Nov 06; Recommended fertility levels NPK (kg/ha) – 100:30:15					
Morena					
Control	1082	1164	1293	1622	1290
100% NPK	1676	1751	1780	1838	1761
125% NPK	1949	1989	2045	2126	2027
150% NPK	2156	2496	2570	2562	2446
Mean	1716	1850	1922	2037	
CD (p=0.05)	Major nutrients (M) = 164; Secondary & micro nutrients (SM) = 66; MxSM = SM at same level of M = 147; M at same or different level of SM = 199				
DOS: Oct. 12; Recommended fertility levels NPKS (kg/ha) - 80:40:20					
Nagpur					
Control	903	947	973	1000	956
100% NPK	920	970	1055	1283	1057
125% NPK	1168	1188	1254	1326	1234
150% NPK	1368	1388	1454	1526	1434
Mean	1090	1123	1184	1284	
CD (p=0.05)	Major nutrients (M) = 20; Secondary & micro nutrients (SM) = 49; MxSM = NS				
DOS: Oct 28; Recommended fertility levels NPKS (kg/ha) - 80:40:20:20					
Pantnagar					
Control	967	970	1005	991	983
100% NPK	2122	2137	2143	2195	2149
125% NPK	2024	2280	2060	2469	2209
150% NPK	1953	2106	2017	2257	2083
Mean	1767	1873	1807	1978	
CD (p=0.05)	Major nutrients (M) = 248; Secondary & micro nutrients (SM) = 126; MxSM = NS				
DOS: Oct. 25; Recommended fertility levels NPK (kg/ha) – 120:40:20					
SK Nagar					
Control	1832	1595	1812	1782	1755
100% NPK	2272	2298	2151	2604	2331
125% NPK	2310	2049	2376	2227	2241
150% NPK	2320	2285	2313	2460	2345
Mean	2183	2057	2163	2268	
CD (p=0.05)	Major nutrients (M) = 184; Secondary & micro nutrients (SM) = NS; MxSM = NS				
DOS: Oct 22; Recommended fertility levels NPK (kg/ha) – 50:50:00					

Shillongani					
Control	768	674	781	1033	814
100% NPK	944	1088	974	1104	1028
125% NPK	1128	825	1223	652	957
150% NPK	667	922	1083	1068	935
Mean	877	877	1015	964	
CD (p=0.05)	Major nutrients (M) = NS; Secondary & micro nutrients (SM) =NS; MxSM = 386				
DOS: Dec. 03; Recommended fertility levels NPK (kg/ha) - 60-30-30					
Dholi					
Control	1156	1116	1204	1202	1170
100% NPK	1709	1752	1814	1920	1799
125% NPK	1752	2096	2314	2386	2137
150% NPK	2240	2347	2346	2358	2323
Mean	1714	1828	1920	1967	
CD (p=0.05)	Major nutrients (M) = 211; Secondary & micro nutrients (SM) = 115; MxSM = 264				
DOS: Oct 22; Recommended fertility levels NPK (kg/ha) – 80:40:40					
Hisar					
Control	1757	1900	1984	2225	1966
100% NPK	2057	2122	2230	2277	2172
125% NPK	2172	2290	2556	2700	2430
150% NPK	2463	2463	2555	2638	2530
Mean	2112	2194	2331	2460	
CD (p=0.05)	Major nutrients (M) = 90; Secondary & micro nutrients (SM) = 79; MxSM = NS				
DOS: Oct. 17; Recommended fertility levels NPK (kg/ha) – 80:30:20					

Table 3.5.2. Oil content (%) in mustard seed as influenced by different nutrient management options.

Treatments	Oil content (%)							
	CHT	IMP	SHL	SKN	JHS	PNT	HSR	KNG
Major nutrients								
Control	34.1	33.4	33.0	38.0	34.6	44.9	39.3	38.4
100% NPK	40.5	38.1	38.0	37.7	35.1	42.9	39.7	40.7
125% NPK	41.0	39.3	39.0	37.8	35.2	42.4	39.9	41.7
150% NPK	41.3	38.7	42.3	38.4	35.8	42.1	39.6	43.0
CD (p=0.05)	0.9	1.2	0.8	NS	NS	NS	NS	1.1
Secondary & micro nutrients								
20 kg S +2.5 kg Zn+ 0.5 kg B/ha	38.6	35.7	35.0	37.2	35.3	42.8	39.2	40.4
40 kg S +5.0 kg Zn+ 1 kg B/ha	39.2	37.1	38.3	39.1	34.7	43.2	39.3	40.6
20 kg S +2.5 kg Zn+ 0.5 kg B/ha enriched with 500 kg FYM/ha	39.4	39.0	39.0	37.7	35.2	43.9	39.9	41.2
40 kg S +5.0 kg Zn+ 1 kg B/ha enriched with 500 kg FYM/ha	39.7	37.6	39.3	37.9	35.5	42.5	40.0	41.6
CD (p=0.05)	0.2	NS	0.9	NS	NS	NS	39.3	0.9

Table 3.5.3. Net returns of mustard as influenced by different nutrient management options.

Treatments	Net return (Rs./ha)														
	JOB	HSR	KOT	CHT	JHS	MOR	NGP	LDH	PNT	IMP	KNG	SHL	SKN	DOL	KNK
Major nutrients															
Control	38969	60682	49424	42345	45346	64915	33615	93581	26821	19903	12931	32126	63513	36322	17318
100% NPK	60312	67265	93716	71726	62500	94030	37937	127980	85754	42239	56194	41238	93697	75018	45317
125% NPK	68195	83503	98256	83293	111025	111830	47033	136522	88089	50958	66774	35515	87467	96378	45313
150% NPK	73256	86860	103924	84894	126637	138942	55366	143695	78422	42518	73695	32917	92813	84534	48824
CD (p=0.05)	6726	5340	10070	11534	13622	-	1092	9357	13999	-	5911	NS	10966	11264	9617
Secondary & micro nutrients															
20 kg S +2.5 kg Zn+ 0.5 kg B/ha	56588	65927	76967	64948	80376	89126	36860	118807	65912	31997	49184	31807	87450	72494	36255
40 kg S +5.0 kg Zn+ 1 kg B/ha	62488	68895	84613	69426	86571	96062	38740	123835	70236	37278	47185	31819	76356	69314	37450
20 kg S +2.5 kg Zn+ 0.5 kg B/ha enriched with 500 kg FYM/ha	58202	78770	84870	71871	86574	103078	40954	128062	67011	46611	57206	42244	85490	75349	40237
40 kg S +5.0 kg Zn+ 1 kg B/ha enriched with 500 kg FYM/ha	63454	84718	93124	76012	91987	108953	45127	131075	75925	39732	56019	35925	88195	79111	42829
CD (p=0.05)	5587	4714	11767	2716	NS	-	2655	-	7111	-	5866	NS	NS	6904	6279

Table 3.5.4. Soil organic carbon and available nitrogen as influenced by different nutrient management options in mustard at harvest.

Treatment	Soil organic carbon (%)				N (kg/ha)							
Major nutrients	CHT	NGP	PNT	DOL	CHT	KOT	JHS	PNT	DOL	JOB	NGP	KNG
Control	0.55	0.27	0.69	0.42	143	238	103	175	160	116	212	220
100% NPK	0.55	0.31	0.69	0.43	149	303	104	199	165	134	222	253
125% NPK	0.55	0.33	0.70	0.43	149	313	105	218	167	140	233	263
150% NPK	0.56	0.34	0.70	0.43	154	321	106	209	171	141	245	269
CD (p=0.05)	NS	NS	NS	0.04	NS	8.9	NS	8.9	12	NS	NS	6
Secondary & micro nutrients												
20 kg S +2.5 kg Zn+ 0.5 kg B/ha	0.55	0.30	0.68	0.42	148	285	104	195	161	128	221	246
40 kg S +5.0 kg Zn+ 1 kg B/ha	0.55	0.31	0.70	0.43	150	295	106	199	164	135	225	251
20 kg S +2.5 kg Zn+ 0.5 kg B/ha enriched with 500 kg FYM/ha	0.56	0.32	0.70	0.44	152	290	104	203	167	132	231	254
40 kg S +5.0 kg Zn+ 1 kg B/ha enriched with 500 kg FYM/ha	0.56	0.33	0.70	0.44	145	298	105	204	171	136	235	255
CD (p=0.05)	NS	NS	NS	0.03	NS	7.9	NS	6.1	18	NS	NS	4
Initial	-	-	0.66	-	168	305	102	232	-	132	-	226

Table 3.5.5. Soil available phosphorus and potassium as influenced by different nutrient management options in mustard at harvest.

Treatment	P (kg/ha)								K (kg/ha)						
Major nutrients	CHT	KOT	JHS	DOL	JOB	NGP	PNT	KNG	CHT	KOT	JHS	DOL	NGP	PNT	KNG
Control	15.2	27.5	7.1	13.9	12.1	19.2	11.0	15.7	122	382	218	127	348	179	269
100% NPK	15.5	65.5	7.6	15.6	14.0	19.8	11.9	19.6	125	442	219	128	352	198	278
125% NPK	15.5	69.0	8.2	15.9	16.8	20.6	11.9	20.0	125	454	219	130	360	212	282
150% NPK	15.6	75.1	8.4	16.4	14.3	20.9	14.6	20.4	125	455	224	134	362	230	284
CD (p=0.05)	0.3	3.0	0.7	2.1	2.8	NS	1.2	1.8	2.0	12.9	NS	17	NS	9.1	6
Secondary & micro nutrients															
20 kg S +2.5 kg Zn+ 0.5 kg B/ha	15.4	53.1	7.4	15.1	13.2	19.5	11.9	18.9	124	422	221	129	350	197	275
40 kg S +5.0 kg Zn+ 1 kg B/ha	15.4	60.6	8.0	15.1	14.0	19.9	11.8	19.1	124	436	220	127	352	197	277
20 kg S +2.5 kg Zn+ 0.5 kg B/ha enriched with 500 kg FYM/ha	15.4	57.6	7.9	15.7	15.8	20.4	12.9	19.6	124	429	220	130	357	213	280
40 kg S +5.0 kg Zn+ 1 kg B/ha enriched with 500 kg FYM/ha	15.6	62.5	8.0	15.9	14.2	20.6	13.1	17.9	125	440	218	133	363	213	282
CD (p=0.05)	NS	2.6	NS	1.5	NS	NS	1.1	1.2	1.1	6.0	NS	6.4	NS	11.7	5
Initial	15.1	55.5	7.4	-	18.8	-	21.2	16.8	118	455	211	-	-	230	272

Table 3.5.6. Soil available sulphur, zinc and boron as influenced by different nutrient management options in mustard at harvest.

Treatment	S (mg/kg)					Zn (mg/kg)					B (mg/kg)				
Major nutrients	PNT*	DOL	CHT*	KOT	KNG*	PNT	DOL	CHT	KOT	KNG	PNT	DOL	CHT	KOT	KNG
Control	21.1	10.9	27.8	9.2	13.7	0.85	0.52	0.57	0.84	2.15	0.58	0.39	0.55	0.49	0.32
100% NPK	26.5	10.9	28.6	11.0	14.1	0.83	0.51	0.58	1.03	2.18	0.56	0.40	0.60	0.67	0.33
125% NPK	26.8	10.6	28.1	11.3	14.5	0.82	0.52	0.57	1.08	2.23	0.53	0.39	0.56	0.70	0.34
150% NPK	30.8	10.8	28.8	11.3	15.2	0.83	0.51	0.58	1.02	2.27	0.52	0.40	0.59	0.70	0.35
CD (p=0.05)	1.4	0.7	0.7	0.7	0.8	0.22	0.7	NS	0.04	NS	0.36	0.10	0.02	0.04	0.02
Secondary & micro nutrients															
20 kg S +2.5 kg Zn+ 0.5 kg B/ha	24.4	11.1	27.5	9.5	13.3	0.81	0.51	0.56	0.94	1.90	0.52	0.40	0.56	0.55	0.29
40 kg S +5.0 kg Zn+ 1 kg B/ha	25.8	10.8	27.9	10.8	14.9	0.83	0.51	0.57	1.00	2.29	0.55	0.39	0.57	0.64	0.35
20 kg S +2.5 kg Zn+ 0.5 kg B/ha enriched with 500 kg FYM/ha	26.8	10.3	28.8	10.8	13.7	0.84	052	0.58	0.99	2.26	0.55	0.39	0.58	0.65	0.32
40 kg S +5.0 kg Zn+ 1 kg B/ha enriched with 500 kg FYM/ha	28.4	10.9	29.2	11.4	15.6	0.86	0.52	0.59	1.03	2.38	0.58	0.39	0.59	0.69	0.37
CD (p=0.05)	2.2	0.54	0.5	1.0	0.6	0.16	0.3	0.01	0.03	0.16	0.27	0.05	0.02	0.04	0.02
Initial	23.8	-	28.0	12.5	12.6	0.66	-	0.56	1.04	1.62	1.65	-	0.52	-	0.27

*kg/ha

3.6. Technological advancement for mustard production in rice-fallow areas

The trial was initiated from 2023-24 and allotted to Imphal, Shillongani and Dholi centres to evaluate the system based interventions in rice-mustard cropping system (Table 3.6.1-3). Rice was sown with DSR method and used short duration varieties at all the centers. In mustard different tillage and nutrient management practices were evaluated.

Dholi: Zero tilled sowing of mustard under anchored rice straw recorded significantly higher seed yield (13.9%) and net return (33.7%) compared to conventional tillage. Among nutrient management practices, application of NPKZnB (50% N basal+50% N top dressing) recorded non-significantly higher seed yield (7.6%) but, significantly higher net return (11.8%) of mustard compared to 100% NPK as basal application. Soil NPK content were increased non-significantly with ZT+residue retention over conventional tillage while, significantly with the application of NPKZnB (50% N basal+50% N top dressing) over 100% NPK as basal application.

Shillongani: Seed yield not influenced significantly with tillage practices, however, net returns were increased by 5.8% with zero tilled sowing of mustard under anchored rice straw over the conventional tillage. Application of NPKZnB (100% basal or 50% N basal+50% N top dressing) in mustard recorded significantly higher seed yield of mustard which was 51% higher over the NPK (100% basal), whereas, net returns were increased by 288.6% over the 100% NPK as basal application.

Imphal: Zero tilled sowing of mustard under anchored rice straw recorded significantly higher seed yield (22.7%) compared to conventional tillage. Among nutrient management practices, application of NPKZnB (50% N basal+50% N top dressing) recorded non-significantly higher seed yield (5.8%) compared to 100% NPK as basal application. The net returns were recorded negative in all the treatments except in ZT+residue retention.

Note: Yield levels at Imphal and Shillongani were less than State average yield.
Dholi and Imphal centres also not conducted the trial as per technical programme.

Table 3.6.1. Seed yield (kg/ha) of mustard as influenced by different tillage and nutrient management practices

Tillage practices (T)	Nutrient management (N)				Mean
	NPK (100 % basal)	NPKZn (100 % basal)	NPKZnB (100 % basal)	NPKZnB (50 % N basal & 50 % N top dressing)	
Dholi					
CT	1549	1576	1656	1610	1598
ZT+ 30% kharif rice residue + Pusa decomposer (500 ml/ha)	1730	1849	1780	1920	1820
Mean	1640	1713	1718	1765	
CD (p=0.05)	Tillage (T) = 162; Nutrient management (N) = NS; TxN = 207				
DOS: Nov 26; Recommended fertility levels NPK (kg/ha) – 80:40:40					
Imphal					
CT	542	500	556	583	545
ZT+ 30% kharif rice residue + Pusa decomposer (500 ml/ha)	653	647	694	681	669
Mean	597	574	625	632	
CD (p=0.05)	Tillage (T) = 96; Nutrient management (N) = NS; TxN = NS				
DOS: Nov. Dec. 15; Recommended fertility levels NPKZnB (kg/ha): 60:30:30:2.5:0.5					
Shillongani					
CT	457	574	651	686	592

ZT+30% kharif rice residue + Pusa decomposer (500 ml/ha)	451	630	721	686	622
Mean	454	602	686	686	
CD (p=0.05)	Major nutrients (M) = NS; Secondary & micro nutrients (SM) =; 177; MxSM = NS				
DOS: Dec. 04; Recommended fertility levels NPK (kg/ha) – 60:30:30					

Table 3.6.2. Productivity and profitability of rice-mustard cropping system as influenced by different tillage and nutrient management practices.

Treatment	Shillongani		Dholi		Imphal	
	Sustainability yield index	Net returns of mustard (Rs/ha)	Net returns of mustard (Rs/ha)	B:C ratio	Net returns of mustard (Rs/ha)	IBCR
Tillage practices						
CT	0.38	21163	59446	1.32	-11805	0.06
ZT+30% kharif rice residue + Pusa decomposer (500 ml/ha)	0.38	22383	79470	1.99	1567	0.26
CD (p=0.05)	NS	NS	7263	0.14		-
Nutrient management practices						
NPK (100 % basal)	0.38	8824	65571	1.69	-3688	0.15
NPKZn (100 % basal)	0.50	18943	69880	1.69	-6733	0.12
NPKZnB (100 % basal)	0.57	25039	69091	1.6	-4785	0.19
NPKZnB (50 % N basal & 50 % N top dressing)	0.57	34286	73288	1.66	-5270	0.19
CD (p=0.05)	0.15	11464	7263	NS	-	-

Table 3.6.3. Soil organic carbon and available NPK as influenced by different tillage and nutrient management practices in mustard at Dholi (at harvest of mustard).

Treatment	OC (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)	S (mg/kg)	Zn (mg/kg)	B (mg/kg)
Tillage practices							
CT	0.56	158	14.3	133	11.5	0.58	0.51
ZT+30% kharif rice residue + Pusa decomposer (500 ml/ha)	0.53	161	14.1	137	11.4	0.64	0.53
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS
Nutrient management practices							
NPK (100 % basal)	0.52	156	13.4	130	11.3	0.55	0.50
NPKZn (100 % basal)	0.52	158	14.2	135	11.4	0.59	0.53
NPKZnB (100 % basal)	0.55	160	14.7	133	11.3	0.62	0.52
NPKZnB (50 % N basal & 50 % N top dressing)	0.58	163	14.7	141	11.7	0.69	0.55
CD (p=0.05)	NS	6.4	1.04	8.2	NS	NS	NS
Initial	-	-	-	-	-	-	-

3.7. Effect of nano-fertilizers on yield and quality of rapeseed-mustard

The trial was initiated from 2024-25 and allotted to 18 centres to evaluate the effect of nano fertilizers on yield, economics and quality of mustard (Table 3.7.1-6).

Application of 75% RDF (NP) being on par with 100% RDF (NP) recorded significantly higher seed yield at Dholi, Hisar, Jobner, Kota, Ranital and SK Nagar. Whereas, application of 100% RDF (NP) recorded highest seed yield at Bawal, Chatha, Imphal, Jhansi, Kangra, Kanke, Khudwani, Morena, Nagpur, Pantnagar and Shillongani across the nano-fertilizers. Two foliar sprays of nano urea+nano DAP (25-30 and 45-50 DAS) recorded highest seed yield at Chatha, Dholi, Hisar, Imphal, Jhansi, Jobner, Kangra, Kanke, Kota, Morena, Nagpur, Pantnagar and Ranital compared to rest of the nano-fertilizers. However, application of nano-fertilizers not influenced seed yield significantly at Khudwani, Bawal, SK Nagar and Shillongani.

Application of two foliar spray of nano urea+nano DAP (25-30 and 45-50 DAS) recorded highest oil content and net returns at all the locations.

Plant N and P content and soil OC, N, P and K content also recorded highest with the application of two foliar spray of nano urea+nano DAP (25-30 and 45-50 DAS).

Note: The trial was not conducted by Kanpur and Mandore centres.

Trial was rejected at Ludhiana center by the monitoring team due to poor plant population and expression of the crop.

Table 3.7.1. Seed yield (kg/ha) of mustard as influenced by different major and nano-fertilizers.

Major nutrients (M)	Nano-fertilizers (N)			Mean
	2 sprays of nano-urea	2 sprays of nano-DAP	2 sprays of each nano-urea & nano-DAP	
Bawal				
100% RD-NP	2246	2194	2229	2223
75% RD-NP	1974	1884	1930	1929
50% RD-NP	1626	1616	1694	1645
Mean	1949	1898	1951	
Control vs Rest	Absolute control (AC) = 1511; Rest of the treatments = 1933			
CD (p=0.05)	Major nutrient (M) = 153; Nano-fertilizers (N) = NS; MxN = NS; AC vs Rest = 90			
DOS: Oct 16; Recommended fertility levels NPK (kg/ha) – 80:30:20:40				
Chatha				
100% RD-NP	1520	1556	1733	1603
75% RD-NP	1262	1300	14431	1335
50% RD-NP	1013	1120	1203	1112
Mean	1265	1325	1460	
Control vs Rest	Absolute control (AC) = 733; Rest of the treatments = 1350			
CD (p=0.05)	Major nutrient (M) = 94; Nano-fertilizers (N) = 94; MxN = NS; AC vs Rest = 54			
DOS: Oct 23; Recommended fertility levels NPK (kg/ha) – 80:40:40				
Dholi				
100% RD-NP	1898	1664	2085	1882
75% RD-NP	1995	1682	1805	1827
50% RD-NP	1492	1545	1534	1523
Mean	1795	1630	1808	
Control vs Rest	Absolute control (AC) =1240; Rest of the treatments = 1744			
CD (p=0.05)	Major nutrient (M) = 139; Nano-fertilizers (N) = 139; MxN = NS; AC vs Rest = 487			
DOS: Oct 21; Recommended fertility levels NPK (kg/ha) – 80:40:40				

Hisar				
100% RD-NP	1965	2268	2284	2172
75% RD-NP	1953	2183	2195	2110
50% RD-NP	1784	1668	1784	1746
Mean	1901	2040	2088	
Control vs Rest	Absolute control (AC) = 1568; Rest of the treatments = 2009			
CD (p=0.05)	Major nutrient (M) = 114; Nano-fertilizers (N) = 114; MxN = 197; AC vs Rest = 66			
DOS: Oct 18; Recommended fertility levels NPK (kg/ha) – 80:30:20				
Imphal				
100% RD-NP	1458	1500	1894	1618
75% RD-NP	1306	1472	1758	1512
50% RD-NP	1250	1292	1486	1343
Mean	1338	1421	1713	
Control vs Rest	Absolute control (AC) = 986; Rest of the treatment = 1491			
CD (p=0.05)	Major nutrient (M) = 203; Nano-fertilizers (N) = 203; MxN = 352; AC vs Rest = --			
DOS: Nov 29; Recommended fertility levels NPK (kg/ha) – 60:30:30				
Jhansi				
100% RD-NP	2083	2086	1972	2047
75% RD-NP	1649	1743	1705	1699
50% RD-NP	1137	1060	2089	1429
Mean	1623	1630	1922	
Control vs Rest	Absolute control (AC) = 817; Rest of the treatments = 1725			
CD (p=0.05)	Major nutrient (M) = 177; Nano-fertilizers (N) = 177; MxN = 307; AC vs Rest = 102			
DOS: Nov. 04; Recommended fertility levels NPK (kg/ha) – 120:60:60				
Jobner				
100% RD-NP	1393	1423	1548	1454
75% RD-NP	1302	1323	1459	1361
50% RD-NP	1150	1176	1298	1208
Mean	1282	1307	1435	
Control vs Rest	Absolute control (AC) = 958; Rest of the treatments = 1341			
CD (p=0.05)	Major nutrient (M) = 110; Nano-fertilizers (N) = 110; MxN = NS; AC vs Rest = 142			
DOS: Nov 05; Recommended fertility levels NPK (kg/ha) – 60:40:00				
Kangra				
100% RD-NP	1449	1565	1723	1579
75% RD-NP	1357	1391	1603	1450
50% RD-NP	1221	1358	1579	1386
Mean	1342	1438	1635	
Control vs Rest	Absolute control (AC) = 1004; Rest of the treatments = 1472			
CD (p=0.05)	325; Major nutrient (M) = 127; Nano-fertilizers (N) = 127; MxN = NS; AC vs Rest = 164			
DOS: Oct 10; Recommended fertility levels NPK (kg/ha) – 120:60:60				
Kanke				
100% RD-NP	1406	1269	1467	1381
75% RD-NP	1254	1094	1372	1240
50% RD-NP	1068	1051	1080	1066
Mean	1243	1138	1306	
Control vs Rest	Absolute control (AC) = 794; Rest of the treatments = 1229			

CD (p=0.05)	Major nutrient (M) = 163; Nano-fertilizers (N) = 163; MxN = NS; AC vs Rest = 210			
DOS: Nov 25; Recommended fertility levels NPKS (kg/ha) – 80:60:40:20				
Khudwani				
100% RD-NP	1018	997	1065	1027
75% RD-NP	861	825	991	892
50% RD-NP	743	645	740	709
Mean	874	822	932	
Control vs Rest	Absolute control (AC) = 661; Rest of the treatments = 876			
CD (p=0.05)	Major nutrient (M) = 94; Nano-fertilizers (N) = NS; MxN = NS; AC vs Rest = 157			
DOS: Oct 16; Recommended fertility levels NPK (kg/ha) – 80:50:40				
Kota				
100% RD-NP	2239	2108	**2251**	2200
75% RD-NP	2158	1993	2183	2112
50% RD-NP	1833	1760	1850	1815
Mean	2077	1954	2095	
Control vs Rest	Absolute control (AC) = 1012; Rest of the treatments = 2042			
CD (p=0.05)	Major nutrient (M) = 142; Nano-fertilizers (N) = 142; MxN = NS; AC vs Rest = 82			
DOS: Oct 21; Recommended fertility levels NPK (kg/ha) – 100:50:30				
DOS: Nov. 13; Recommended fertility levels NPK (kg/ha) – 100:30:15				
Morena				
100% RD-NP	2000	2118	2311	2143
75% RD-NP	1785	1830	1920	1845
50% RD-NP	1555	1581	1668	1601
Mean	1780	1843	1966	
Control vs Rest	Absolute control (AC) = 1376; Rest of the treatments = 1863			
CD (p=0.05)	Major nutrient (M) = 130; Nano-fertilizers (N) = 130; MxN = NS; AC vs Rest = --			
DOS: Oct 13; Recommended fertility levels NPK (kg/ha) – 80:40:20				
Nagpur				
100% RD-NP	1433	1467	1525	1475
75% RD-NP	1130	1210	1267	1202
50% RD-NP	817	913	982	904
Mean	1127	1197	1258	
Control vs Rest	Absolute control (AC) = 783; Rest of the treatments = 1194			
CD (p=0.05)	Major nutrient (M) = 108; Nano-fertilizers (N) = 108; MxN = NS; AC vs Rest = NS			
DOS: Nov 12; Recommended fertility levels NPKS (kg/ha) – 80:40:20:20				
Pantnagar				
100% RD-NP	2125	2115	2442	2228
75% RD-NP	1961	1910	2027	1983
50% RD-NP	1904	1870	2035	1938
Mean	1997	1966	2185	
Control vs Rest	Absolute control (AC) = 997; Rest of the treatments = 2049			
CD (p=0.05)	Major nutrient (M) = 185; Nano-fertilizers (N) = 185; MxN = NS; AC vs Rest = 107			
DOS: Nov 28; Recommended fertility levels NPKS (kg/ha) – 120:40:20:20				
Ranital				
100% RD-NP	1001	1020	1092	1038
75% RD-NP	995	997	1011	1001
50% RD-NP	922	865	967	918

Mean	973	961	1023	
Control vs Rest	Absolute control (AC) = 321; Rest of the treatments = 986			
CD (p=0.05)	Major nutrient (M) = 55; Nano-fertilizers (N) = 55; MxN = NS; AC vs Rest = 96			
DOS: Nov 14; Recommended fertility levels NPK (kg/ha) – 80:40:40				
Shillonagani				
100% RD-NP	1106	1469	1486	1354
75% RD-NP	1252	1056	1445	1251
50% RD-NP	1440	1160	988	1196
Mean	1266	1229	1306	
Control vs Rest	Absolute control (AC) = 880; Rest of the treatments = 1267			
CD (p=0.05)	Major nutrient (M) = NS; Nano-fertilizers (N) = NS; MxN = 231; AC vs Rest = --			
DOS: Dec. 05; Recommended fertility levels NPK (kg/ha) – 60:30:30				
SK Nagar				
100% RD-NP	2061	2142	1991	2065
75% RD-NP	1975	2024	1985	1995
50% RD-NP	1922	1657	1692	1757
Mean	1986	1941	1889	
Control vs Rest	Absolute control (AC) = 1488; Rest of the treatments = 1939			
CD (p=0.05)	Major nutrient (M) = 228; Nano-fertilizers (N) = NS; MxN = NS; AC vs Rest = 294			
DOS: Oct 22; Recommended fertility levels NPK (kg/ha) – 75:50:00				

Table 3.7.2. Oil content (%) in mustard as influenced by different major and nano-fertilizers.

Treatment	Oil content (%)							Chlorophyll content (SPAD value)			
	CHT	IMP	JHS	SKN	PNT	HSR	KNG	BAW	NGP	PNT	DOL*
Major nutrients											
100% RD-NP	42.4	40.0	36.5	37.4	42.1	40.1	41.2	48.6	50.2	38.0	48.8
75% RD-NP	40.4	39.2	35.7	36.7	43.0	39.9	40.3	48.6	39.9	39.1	47.9
50% RD-NP	39.4	35.9	35.8	37.8	44.8	39.8	39.8	46.9	32.7	43.7	42.1
CD (p=0.05)	0.97	2.35	3.6	NS	1.7	0.3	0.8	NS	NS	2.7	3.9
Nano-fertilizers					42.3						
2 sprays of nano-urea	40.3	37.6	35.3	37.3	44.6	39.6	40.4	48.3	40.8	42.5	48.1
2 sprays of nano-DAP	40.7	38.3	35.8	36.9	43.0	39.9	39.9	46.2	39.8	40.0	43.3
2 sprays each of nano-urea & nano-DAP	41.3	39.3	36.9	37.8	42.1	40.3	41.0	49.6	42.1	38.5	48.3
CD (p=0.05)	0.97	NS	3.6	NS	1.7	0.3	0.8	2.6	NS	2.7	3.9
Control vs Rest											
Absolute control	35.7	34.9	30.7	36.9	40.9	39.7	37.2	43.6	28.0	35.2	42.2
Rest of the treatments	40.7	38.4	36.0	37.3	43.3	39.9	40.4	48.0	40.9		46.3
CD (p=0.05)	0.56	-	2.1	NS	0.97	0.2	1.1	1.24	NS	1.5	-

*90 DAS

Table 3.7.3. Net returns (Rs/ha) of mustard as influenced by different major and nano-fertilizers.

Treatment	Net returns (Rs/ha)														
	BAW	CHT	DOL	HSR	JHS	JOB	KNG	KNK	KOT	MOR	NGP	SHL	IMP	LDH	PNT
Major nutrients															
100% RD-NP	85203	72844	78860	66894	80893	56524	54907	51941	97457	117892	67593	69650	44443	112143	108265
75% RD-NP	68798	57968	76119	63841	62331	52091	50038	43566	93180	98917	60184	57473	39537	97312	93680
50% RD-NP	52954	45756	57672	42821	48546	43985	47094	32882	76459	82969	48630	61862	30831	81700	91012
CD (p=0.05)	9603	5567	8510	6792	10553	6691	NS	10251	8439	-	6263	NS	-	-	11034
Nano-fertilizers															
2 sprays of nano-urea	70908	55094	74451	51805	58502	47936	45359	44803	92501	92110	59707	60072	30645	96416	94530
2 sprays of nano-DAP	67887	57177	63569	59700	58174	49185	49396	36671	84455	94556	56345	63148	35463	95975	92713
2 sprays each of nano-urea & nano-DAP	68160	64297	74631	62051	75095	55479	57284	46914	90139	101414	60355	65766	48703	98765	105714
CD (p=0.05)	NS	5567	8510	6792	10553	NS	8051	10251	8439	-	6263	NS	-	-	11034
Control vs Rest															
Absolute control	50285	27519	44795	34544	17804	33451	33564	24054	34714	69317	44202	48000	17949	57688	35027
Rest of the treatments	68985	58856	70884	57852	63924	50867	50680	42796	89032	96026	58803	62995	38270	97052	97652
CD (p=0.05)	5352	3214	-	3921	6093	8638	10393	13234	4872	-	8085	-	-	12976	6370

Table 3.7.4. Plant nutrient uptake (kg/ha) as influenced by different major and nano-fertilizers.

Treatment	N						P						K					
	BAW	DOL		SHL		PNT	BAW	DOL		SHL		PNT	BAW	DOL		SHL		PNT
	Total	Seed	Stover	Seed	Stover	Total	Total	Seed	Stover	Seed	Stover	Total	Total	Seed	Stover	Seed	Stover	Total
Major nutrients																		
100% RD-NP	115	34.4	35.1	34.7	7.2	99	28.4	11.4	18.2	6.6	17.8	44.2	124	12.9	66.4	12.8	35.9	212
75% RD-NP	96	32.2	32.1	32.2	6.7	88	23.6	10.8	15.8	6.2	13.2	40.0	105	12.6	57.8	11.3	31.7	203
50% RD-NP	82	25.6	28.6	31.0	6.4	78	19.1	7.8	12.9	5.9	15.3	36.3	86	10.6	52.6	9.6	26.8	196
CD (p=0.05)	5.4	2.3	2.1	NS	NS	9.1	1.9	0.9	1.7	NS	NS	3.8	8.6	0.9	4.6	NS	NS	NS
Nano-fertilizers																		
2 sprays of nano-urea	100	30.8	31.1	31.6	7.0	85	22.2	9.4	15.8	6.4	16.0	37.7	106	10.8	58.6	11.7	32.8	201
2 sprays of nano-DAP	94	26.9	30.5	32.6	6.7	83	24.0	7.9	14.6	6.2	15.3	40.2	104	11.1	51.4	11.0	31.0	206
2 sprays each of nano-urea & nano-DAP	99	31.5	34.2	33.7	-	98	24.9	10.2	16.2	6.0	15.0	42.6	106	11.4	59.2	11.0	30.6	205
CD (p=0.05)	NS	2.3	2.1	NS	NS	9.1	1.9	0.9	1.7	NS	NS	3.8	NS	0.9	4.6	NS	NS	NS
Control vs Rest																		
Absolute control	70	11.9	20.5	19.7	4.1	41	16.4	5.8	6.8	3.8	9.8	19.7	84	6.3	48.9	8.0	18.1	127
Rest of the treatments	98	30.7	31.9	32.6	6.8	88	23.7	10.0	15.6	6.2	15.4	40.2	105	12.0	58.9	11.2	31.5	204
CD (p=0.05)	1.7	-	-	-	-	5.2	1.1	-	-	-	-	2.2	4.8	-	-	-	-	11.7

Table 3.7.5. Soil organic carbon and available N content as influenced by different major and nano-fertilizers after harvest of mustard.

Treatment	Organic carbon (%))			N (kg/ha)							
Major nutrients	DOL	NGP	PNT	BAW	NGP	JHS	DOL	JOB	KNG	KOT	PNT
100% RD-NP	0.58	0.35	0.86	131	252	105	183	137	272	300	340
75% RD-NP	0.52	0.34	0.85	123	244	104	180	134	265	258	225
50% RD-NP	0.50	0.30	0.83	115	223	104	164	124	256	249	193
CD (p=0.05)	NS	NS	0.02	8	NS	9	10	NS	NS	7.7	9.0
Nano-fertilizers											
2 sprays of nano-urea	0.61	0.33	0.84	118	240	103	173	129	257	267	255
2 sprays of nano-DAP	0.54	0.32	0.83	123	235	103	163	130	259	269	245
2 sprays each of nano-urea & nano-DAP	0.53	0.34	0.87	129	243	106	178	136	277	271	257
CD (p=0.05)	NS	NS	0.02	NS	NS	9	10	NS	NS	NS	9.0
Control vs Rest											
Absolute control	0.51	0.27	0.78	110	213	104	166	119	226	228	165
Rest of the treatments	0.53	0.33	0.85	123	240	104	176	132	264	269	252
CD (p=0.05)	-	NS	-	5.4	NS	5	-	NS	25	4.4	5.2
Initial value	0.44	-	0.60	122	-	101	-	128	282	-	235

Table 3.7.6. Soil available nutrients as influenced by different major and nano-fertilizers after harvest of mustard.

Treatment	P (kg/ha)								K (kg/ha)						
Major nutrients	BAW	NGP	JHS	DOL	KNG	JOB	PNT	KOT	BAW	NGP	JHS	DOL	KNG	PNT	KOT
100% RD-NP	13.3	23.6	7.5	16.7	21.2	13.7	27.9	58.2	219	368	215	150	215	152	429
75% RD-NP	13.2	22.4	7.5	15.8	20.6	13.3	25.6	48.7	207	360	212	147	213	160	428
50% RD-NP	12.4	21.4	7.8	15.5	18.7	12.2	24.3	40.9	196	353	212	138	211	166	425
CD (p=0.05)	NS	NS	0.7	0.6	1.2	1.1	2.0	2.6	6.6	NS	17	6	NS	NS	10.2
Nano-fertilizers															
2 sprays of nano-urea	12.2	22.3	7.4	15.9	19.6	12.8	24.4	48.6	207	360	213	145	208	160	427
2 sprays of nano-DAP	13.2	22.1	7.4	15.4	18.9	12.9	25.8	49.8	208	359	210	139	213	163	427
2 sprays each of nano-urea & nano-DAP	13.6	23.0	7.9	16.3	22.0	13.5	27.6	49.3	207	364	215	147	217	155	428
CD (p=0.05)	0.9	NS	0.7	0.6	1.2	NS	2.0	NS	NS	NS	17	6	NS	NS	NS
Control vs Rest															
Absolute control	10.5	20.7	6.2	15.1	15.8	11.6	21.5	32.0	188	339	207	135	204	145	385
Rest of the treatments	13.0	22.5	7.6	16.0	20.2	13.1	25.9	49.3	207	361	213	145	213	159	427
CD (p=0.05)	0.5	NS	0.4	-	1.6	1.4	1.1	1.5	1.7	NS	10	-	NS	3.8	5.9
Initial value	22	-	6.2	-	18.1	18.7	21.3	-	14	-	210	131	220	232	-

3.8 Scaling of natural farming practices in rapeseed-mustard

The trial was initiated from 2024-25 and allotted to Bawal, Kota and Pantnagar centres to evaluate the different farming practices in mustard-based cropping systems (Table 3.8.1-2).

Farming practices significantly influenced mustard seed yield and net returns. The natural farming practices recorded lowest seed yield of mustard at all three locations while, net returns accrued lower at Bawal but, higher at Kota center compared to other practices. Soil OC, N, P, K, S, Zn and Fe were also influenced significantly with the farming practices.

Table 3.8.1. Seed yield, protein content and economics of mustard as influenced by different crop management practices.

Treatment	Seed yield (kg/ha)			Protein content (%)		Net returns (Rs/ha)		B:C ratio	
	BAW	KOT	PNT	BAW	PNT	BAW	KOT	BAW	KOT
Natural farming	1690	1344	1180	15.5	24.2	56655	92416	1.29	3.08
Organic farming	2024	1474	1382	15.9	22.9	75398	88563	1.63	1.95
INM	2163	1693	1955	17.0	22.3	78588	88153	1.57	2.19
Farmers practice	2314	1575	1554	18.7	24.5	88864	61336	1.82	1.76
CD (p=0.05)	243	186	335	0.6	2.3	-	16477	-	0.50

Table 3.8.2. Soil available nutrients as influenced by different crop management practices after harvest of mustard.

Treatment	Organic carbon (%)		N (kg/ha)			P (kg/ha)			K (kg/ha)			Kota		
	KOT	PNT	BAW	KOT	PNT	BAW	KOT	PNT	BAW	KOT	PNT	S (kg/ha)	Zn (m/kg)	Fe (mg/kg)
Natural farming	0.60	0.69	105	370	146	10.4	54.6	15.7	208	417	167	18.4	0.85	4.54
Organic farming	0.62	0.69	108	376	154	10.6	57.8	16.1	211	421	171	21.2	0.90	4.57
INM	0.61	0.69	126	375	220	13.6	58.2	16.5	226	422	200	20.2	0.88	4.56
Farmers practice	0.59	0.68	136	376	213	14.4	58.1	16.3	135	422	196	18.0	0.83	4.53
CD (p=0.05)	0.02	0.39	5.9	4.2	19	1.6	2.3	1.3	6.7	4.0	18	1.2	0.05	0.03
Initial	0.60	0.68	135	375	240	12.3	56.5	19.8	226	420	225	20.5	0.94	4.57

3.9 Management of *Orobanche* through novel herbicide formulations

The trial was initiated from 2024-25 and allotted to Bawal, Chandgothi and Dausa centres to evaluate the novel herbicide formulation against Orobanche in mustard (Table 3.9.1-3).

Herbicide dose significantly influenced seed yield both at Bawal and Dausa centers. Novel herbicide formulations (NHF) applied at 3 ml a.i./ha being on par with 4 and 5 ml a.i./ha recorded significantly higher seed yield over weedy check at Bawal. Whereas, time of application (DAS) showed non-significant response to the seed yield at Bawal. At Dausa, time of application and herbicide formulation significantly influenced seed yield and recorded highest with 4 ml a.i./ha applied at one day after sowing.

Though, the overall Orobanche infestation was less at both the locations, however, treatments showed significant variation in controlling Orobanche. Among the treatments the lowest number of Orobanche plants were recorded with 3 ml a.i./ha at Dausa and 4 ml a.i./ha at Bawal. At both the locations, herbicide applied after one day of sowing recorded lowest plants/plot. The highest number of Orobanche plants/plot was recorded under weedy check plots.
Weed control efficiency recorded highest with 3 ml a.i./ha when applied at one day after sowing both at Bawal and Dausa centres.

Note: Chandgothi trial was rejected due to low plant population

Table 3.9.1. Seed yield (kg/ha) of mustard as influenced by application schedule of novel herbicide formulations.

Time of application	Dose of herbicide (NHF)					Mean
	3 ml a.i./ha	4 ml a.i./ha	5 ml a.i./ha	Weedy check	Weed free	
Bawal						
1 DAS	2573	2429	2384	2220	2654	2452
2 DAS	2495	2404	2432	2301	2556	2437
3 DAS	2510	2551	2510	2260	2566	2479
Mean	2526	2461	2442	2260	2592	
CD (p=0.05): Time of application (T) : NS; Dose of Herbicide (D): 188; Interaction (T x D): NS						
Dausa						
1 DAS	923	1328	830	787	1135	1001
2 DAS	1017	754	1051	652	1045	904
3 DAS	998	556	580	628	696	691
Mean	979	879	820	689	959	
CD (p=0.05): Time of application (T) : 105; Dose of Herbicide (D): 111; Interaction (T x D): 192						

Table 3.9.2. Number of Orobanche plants/ plot as influenced by application schedule of novel herbicide formulations.

Time of application	Dose of herbicide (NHF)					**Mean**
	3 ml a.i./ha	4 ml a.i./ha	5 ml a.i./ha	Weedy check	Weed free	
Bawal						
1 DAS	7	8	9	12	0	7
2 DAS	10	9	8	10	0	7
3 DAS	13	11	16	14	0	11
Mean	10	9	11	12	0	
CD (p=0.05): Time of application (T): 3; Dose of Herbicide (D): NS; Interaction (T x D): NS						

Dausa						
1 DAS	0	2	2	4	1	2
2 DAS	1	2	4	19	1	5
3 DAS	3	2	5	55	0	13
Mean	1	2	3	26	1	
CD (p=0.05): Time of application (T) : 3; Dose of Herbicide (D): 3; Interaction (T x D): 4						

Table 3.9.3. Weed control efficiency (%) as influenced by application schedule of novel herbicide formulations.

Time of application	Dose of herbicide (NHF)					**Mean**
	3 ml a.i./ha	4 ml a.i./ha	5 ml a.i./ha	Weedy check	Weed free	
Bawal						
1 DAS	43	37	24	0	37	28
2 DAS	0	13	20	0	7	7
3 DAS	7	20	0	0	36	9
Mean	16	23	8	0	27	
Dausa						
1 DAS	100	54	51	0	71	55
2 DAS	94	91	80	0	95	72
3 DAS	95	96	91	0	100	76
Mean	97	80	74	0	89	

Plant Pathology

4. Plant Pathology

Disease Scenario

During 2024-25, moderate to severe occurrence of Alternaria blight and white rust diseases was recorded at different locations. Low to moderate incidence of downy mildew was observed at the cotyledonary stage at MOR, JAG and PNT. Powdery mildew severity was high at SKN and JAG. Moderate to severe incidence of Sclerotinia rot was observed at HSR, MOR and BPR. Different trials were sown as per technical program on dates as given below:

Date of sowing of different trials						
Centre	**4.1**	**4.2**	**4.3**	**4.4**	**4.5**	**4.6**
PNT	25.10.2024 (A and B)	25.10.2024	25.10.2024	25.10.2024	25.10.2024	26.10.2024
HSR	13.11.2024 (B)	13.11.2024	13.11.2024	13.11.2024	13.11.2024	14.11.2024
LDH	05.11.2024 (A and B)	05.11.2024	05.11.2024	06.11.2024	06.11.2024	06.11.2024
NDH	-	19.11.2024	-	-	-	-
MOR	19.11.2024 (A and B)	19.11.2024	20.11.2024	20.11.2024	20.11.2024	20.11.2024
SKN	21.11.2024 (B)	21.11.2024	-	-	-	21.11.2024
JAG	-	06.11.2024	07.11.2024	-	-	-
DOL	27.11.2024 (A and B)	26.11.2024	26.11.2024	28.11.2024	18-112024	15.11.2024
SHL	19.11.2024 (A and B)	20.11.2024	22.11.2024	-	20.11.2024	22.11.2024
BPR	29.10.2024 (B)	-	-	06.11.2024	29.10.2024	-
JPR	-	26.10.2024	-	-	-	-
NGP	-	26.11.2024	-	-	-	24.11.2024
VAR	-	14.11.2024	-	-	14.11.2024	-
JHS	A- 28.10.2024 B-05 11.2024	28.10.2024	05.11.2024	5.11.2024	05.11.2024	28.10.2024

4.1. Screening of AVT-1 and AVT-2 *Brassica* breeding material

Natural conditions: PNT, HSR, MOR, LDH, SKN, DOL, SHL, JHS
Artificial conditions: **AB:** DOL, MOR, SHL, PNT, HSR, LDH, JHS
WR/DM: PNT, MOR, HSR, LDH and JHS
SR: LDH, HSR, PNT, DOL, MOR, JHS and BPR

Total 61 lines including checks (susceptible, resistant, LR, ZC, NC, hybrid, quality) were sown in single 3-m row in randomized completely block design (RCBD) with 2 replications. Under artificial conditions, repeated inoculation was done after collecting inoculum from naturally infected plants with AB and WR diseases to facilitate the secondary spread of the pathogen. For SR disease screening, 5 mm disc of 7-days fresh fungal mycelium was placed on third internode of plant at flowering stage.

Observations of DM (20 DAS), WR, AB on leaves (ABL), PM and SR (% incidence) were recorded at 90-100 days after sowing (DAS) depending upon location under natural and artificial conditions. Staghead incidence and Alternaria pod blight (ABP) severity were recorded 15-days before harvest (table 4.1.1-2). All disease data recorded in per cent were converted as arc sin transformation value and analysed using ANOVA.

WR: Entries, 4205B296-01, RSPT-6, DRMRCI (Q) 172***#, JKJH 11, Uttara, NPJ 268, DRMR 2018-25***# were found resistant to WR under both natural and artificial conditions (Table 4.1.1-4.1.3). DRMR 2018-1 was found resistant to WR at PNT and SKN under natural conditions and at HSR under artificial conditions. DRMR 2018-1 was also found resistant under NDN at PNT, LDH and HSR (Table 4.1.1; 4.1.3 & 4.4.1). NPJ 271 and DRMRCI (Q) 181**, were found resistant to WR at PNT and HSR under artificial conditions (Table 4.1.3).
None of the entries showed resistance to AB and SR at the tested locations.

4.2. Uniform Disease Nursery for major diseases

Locations: DOL, PNT, MOR, HSR, SKN, LDH, SHL, NDH, VAR, JHS, JAG, NGP, JPR.

Total 84 entries including 10 checks, were sown in a single 3-m row with two replications in RCBD. Susceptible checks were sown after every two test rows. Observations on AB, WR, DM, PM severity and SR incidence were recorded in UDN under natural conditions (Tables 4.2.1-2).

WR: DRMRDR 2141, DRMRDR 2155, DRMRDR 2152, DRMRDR 2203, DRMRCI 203, DRMRSJ 9, DRMR 2018-26, DRMRDR 2304, DRMRDR 2335, DRMRDR 2206, DRMRDR 2241, DRMRCI 202, DRMRDR 2227, DRMRIJWR 20-30, DRMR 2020-14, DRMRIJWR 20-12, DRMRCI 204, DRMRIJWR 20-29, DRMRCI 205, DRMR 2020-15, DRMRDR 2320, DRMR 2019-20, PRD-2014-15, DRMRSJ 12, DRMR 2019-16, DRMRDR 2301, DRMRSJ 14, RH-1700-3, DRMR 2019-15, DRMRDR 2315, DRMRDR 2352, DRMRDR 2317, DRMRDR 2319, DRMRDR 2322 of Indian mustard showed resistance reaction to WR under natural conditions with mean disease severity <10%, and the highest WR severity was on check Rohini (44.3%) at HSR, JPR, PNT, SKN locations (Table 4.2.2).

None of the entries showed resistance to AB on leaves and Pods and powdery mildew

4.3 National Disease Nursery (NDN) for Alternaria blight

Locations: PNT, DOL, HSR, MOR, LDH, JHS, SHL, JAG

Total 37 entries including 9 checks were sown in paired row of 3 m length. Observation on AB was recorded on leaves 90/100 DAS and on silique 15-days before harvesting under artificial inoculation conditions at the tested locations. Reaction to AB, WR, DM, PM and SR was recorded from the trial (Table 4.3.1).

AB: None of the entries showed resistance to AB on leaves and Pods.

WR: Entries PAB-2014-8, DRMRIJWR 20-15, DRMRSJ-349, DRMRIJWR 20-16, PAB-2014-4, DRMRIJWR 20-19, RH-1700-3, DRMRIJWR 20-11, PAB-2017-22, PAB-2014-18, PAB-2017-15, PAB-2014-7 of *B. juncea* were found resistant to WR (Table 4.3.1).

4.4 National Disease Nursery (NDN) for white rust

Locations: PNT, MOR, HSR, LDH, JHS, DOL, BPR (artificial condition)

Total 71 genotypes including 9 checks, were sown in paired-row of 3 m length between susceptible checks. Observation for WR on leaves and stag head formation was recorded at 100 DAS under artificial inoculation conditions. Reaction to AB, PM, SR and DM was also recorded (Table 4.4.1).

WR: Entries DRMRIJWR-20-11, PAB 14-7, DRMRIJWR-20-26, DRMRCI (Q) 57, DRMRSJ-271, DRMRIJWR-20-13, DRMRIJWR-20-24, RH-1700-4, DRMRCI 153, DRMRIJ-12-44, DRMRIJWR-20-14, DRMRSJ-206, RH-1700-3, DRMRCI 168, DRMRIJ 12-37, DRMR 2018-41, DRMRCI 169, DRMR 2018-26, DRMRIJWR-20-15, DRMRCI 171, DRMRDR 2135, DRMR 2019-15, DRMRCI 182, DRMRDR 2141, PAB 14-18, DRMRIJWR-20-17, DRMR 2020-15, DRMRCI 190, DRMRDR 2152, RH-1700-1, DRMR 2018-1, DRMRIJWR-20-19, DRMRCI 191, DRMRDR 2155, DRMRCI-139, RH-1700, DRMRCI 192, DRMRM 18-35-11, DRMRIJWR-20-20, DRMRCI-131, DRMRCI-132, DRMRIJWR-20-21, DRMRM 18-36-12, DRMRIJWR-20-23, DRMRM 18-37-13, DRMRM-163 of *B. juncea* showed resistant reaction to WR at PNT, HSR and LDH locations under artificial conditions (Table 4.4.1).

AB: None of the entries showed resistance to AB on leaves and Pods (Table 4.4.1).

4.5 National Disease Nursery (NDN) for Sclerotinia rot

Locations: PNT, HSR, DOL, LDH, BPR, MOR, VAR, SHL and JHS

Total 37 entries including 7 checks were sown in paired rows of 3 m length between susceptible check (Rohini, NRCHB 101 and NRCYS-5-2) and tolerant check NPC 16. Stem inoculation was done to ensure uniform SR infection. Per cent SR incidence was recorded prior to harvest and mean lesion size (cm) was also measured 3-weeks after artificial inoculation. In addition, reaction to AB, WR and PM was also recorded (Table 4.5.1-2).

SR: None of the entries showed resistance to SR at the tested locations.

WR: Entries DRMRIS 20-11, DRMRDR 2322, DRMRDR 2237, DRMRDR 2317, DRMRSJ-25, DRMRDR 2343, DRMRDR 2239, DRMRDR 2352, DRMRSJ 361, DRMRDR 2315, DRMRDR 2220, PAB 2017-25 of Indian mustard showed resistance to WR at HSR and PNT.

AB: None of the entries showed resistance to ABL and ABP at the tested locations.

4.6 Screening of IVT entries of Brassica against different diseases

Locations: DOL, PNT, HSR, JHS, LDH, SKN, SHL, MOR and NGP

Total 159 strains including checks (susceptible, resistant, LR, ZC, NC, hybrid, quality) were sown in single 3m row in RCBD with 2 replications. Observation on AB, WR, DM, SR and PM was recorded. Staghead incidence and AB severity on pod was recorded 15-days before harvesting. Entries showing resistant/tolerant/susceptible reaction to AB, WR, DM and PM under natural conditions are listed in Table 4.6.1-2.

WR: Entries, TKM 24-1, PTC-2021-1, BAUT-08-12, JT-17-1, PTC 2021-2, TKM 24-2 of *B. rapa var Toria*; YSKM 24-1, PYS 2021-21, BRYS 2, BYS-24, RMYS 6, YSKM 24-2, DRMRYS 24-3, PYS 2020-3, DRMRYS 202 of *B. rapa var* Yellow sarson; Kesari 5113, , TM 416, DRMR 2019-16, NPJ 276, PRL 2022-1, DRMRDR 2141, RMWR 19-01, DRMRIJ 22-2, DRMRCI (Q) 197, PMAS 1604, PMAS 1602, PRE 2022-12, PDZ-22#, LES-70, PDZ-23#, LES-71 of Indian mustard were found resistant to WR with <10% severity at HSR, LDH, PNT and SKN (Table 4.6.2). None of the entries showed resistant reaction against ABL, ABP and PM at the tested locations (Table 4.6.1-2).

4.7 Management of rapeseed-mustard diseases using novel bio-formulations

Location: PNT, HSR, LDH, JHS, SHL and SKN

Formulations of different treatments as per proceedings were not received from ICAR-NBAIM, Mau even after repeated request by the Director, DRMR. Hence, the trial was not conducted.

4.8 Epidemiology of major rapeseed-mustard diseases

Experiment on epidemiological studies of rapeseed-mustard diseases was conducted at HSR, PNT, SHL, SKN, JAG, DOL, MOR and JHS using cv. Varuna and local variety sown on 8 different dates starting from October 01 to November 19 at weekly interval without adopting any protection measures against pest and diseases (Table 4.8.1-8). Data for initial appearance of diseases followed by per cent disease severity/incidence was recorded in each plot twice a week on Tuesday and Friday till harvest.

HSR

Experiment was conducted with 8 dates of sowing using Varuna and RH 30 cultivars of mustard. WR appeared first at 46 DAS on Nov 19 sown Varuna. WR appeared first at 48 DAS on Nov 19 sown RH 30 (Table 4.8.1A). Highest WR severity of 45.6% was observed in Nov 19 sown Varuna. Staghead formation was observed first at 76 DAS on both Varuna and RH 30 on Nov 19 sown crop (Table 4.8.1B). AB appeared first 77 DAS on Nov 19 sown Varuna and RH 30 (Table 4.8.1C). SR disease initiation was observed 77 DAS in Oct 15 and Nov 19 sown Varuna and 77 DAS in Nov 19 sown RH 30. Maximum incidence was 24.1 % in Oct 15 sown RH 30 while in Varuna it was 26.1% in Oct 15 sown crop (Table 4.8.1C). Maximum yield was 3066 kg/ha in Varuna and 3078 kg/ha in RH 30 in Oct 1 sown crop (Table 4.8.1D).

JAG

Experiment on epidemiological studies was laid out with cv Varuna and CG Sarson. PM appeared first at 78 DAS on Nov 19 sown Varuna and CG Sarson. Highest PM severity was 85% at 110 DAS in Nov 19 sown crop of Varuna (Table 4.8.2A). AB appeared at 50 DAS on Nov 19 sown Varuna and 49 DAS on CG Sarson (Table 4.8.2A). Maximum yield was recorded in Oct 1 sown Varuna (1640 kg/ha) and CG Sarson (1464 kg/ha).

MOR

Experiment was conducted with 8 sowing dates starting from Oct 01 to Nov 19 at weekly interval using Rohini and Varuna varieties. AB appeared first on leaves at 70 DAS on Nov 19 sown Varuna and Rohini, whereas AB on pods was seen at 80 DAS on Nov 19 sown Varuna and Rohini (Table 4.8.3A). WR appeared first at 48 DAS on Nov 19 sown Varuna and Rohini (Table 4.8.3C). PM initiated at 80 DAS in Nov 19 sown crop (Table 4.8.3D). Maximum yield was recorded in Oct 29 sown Varuna (2631.3 kg/ha) and Oct 1 sown Rohini (2645 kg/ha).

PNT

Cultivar Varuna was sown with weekly interval starting from Oct 01 to Nov 19 at eight different dates. Downy mildew disease first appeared 10 DAS on Nov 5 sown Varuna (Table 4.8.4A). WR disease first appeared 49 DAS on Nov 19 sown crop (Table 4.8.4B). Highest WR severity observed was 75% in Nov 5 and Nov 12 sown crop. AB disease was first noticed at 53 DAS on Nov 19 sown crop (Table 4.8.4C). Maximum AB severity observed was 85% on Oct 22 sown crop. Maximum yield was recorded in Oct 8 sown crop (3330 kg/ha).

SHL

Experiment was laid out with cv. Varuna and TM 2 sown on 8 dates starting from Oct 01 to Nov 19 at weekly intervals. Due to heavy rains during first week of October, crop was not sown on Oct 01, 08, 15 and 29 dates. White rust severity was negligible during the season. ABL observed first on leaves at 34 DAS and on silique at 84 DAS on Nov 19 sown Varuna and TM 2. Maximum disease severity was 38.5% (100 DAS) on Nov 19 sown TM 2 (Table 4.8.5A). Maximum yield was recorded in Nov 05 sown Varuna (1853 kg/ha) and TM 2 (1760 kg/ha) (Table 4.8.5A).

JHS

Experiment was conducted with 8 sowing dates starting from Oct 01 to Nov 19 at weekly interval using Giriraj and Varuna varieties. AB appeared first on leaves at 50 DAS on Nov 5 sown Varuna and Giriraj, whereas AB on pods was seen at 83 DAS on Nov 19 sown Varuna (Table 4.8.6A). WR appeared first at 70 DAS on Nov 19 sown Varuna and highest severity observed was 30% in Giriraj and Varuna (Table 4.8.6B). PM initiated at 78 DAS in Nov 19 sown Varuna (Table 4.8.6C). Maximum yield was recorded in Oct 22 sown Giriraj (2550 kg/ha) and Varuna (1740 kg/ha).

DOL

Experiment was laid out at weekly intervals with 8 dates of sowing starting from Oct 01 to Nov 19 using cv. Varuna and Rajendra Suflam. AB was first observed at 17 DAS and 23 DAS on Varuna and Rajendra Suflam, respectively. The disease continued to progress on leaves up to 120 DAS on both the cultivars (Table 4.8.7A). Maximum AB severity observed was 46.1%. Maximum yield was recorded in Oct 22 sown Varuna (1450 kg/ha) and Oct 22 sown Rajendra Suflam (1630 kg/ha) (Table 4.8.7A).

SKN

Experiment was laid out with cv. Varuna and GM 2 sown at 8 sowing dates starting from Oct 01 to Nov. 19 at weekly intervals. WR was observed first at 57 DAS on Varuna and 58 DAS on GM 2 on Nov 19 sown crop. Maximum white rust severity was 43.2% on Oct 29 sown Varuna (Table 4.8.8A). Powdery mildew disease first appeared at 84 DAS on Nov 19 sown Varuna and at 85 DAS on Nov 19 sown GM 2. The maximum disease severity was observed in Nov 19 sown cv. Varuna (100%) and GM 2 (100%), which clearly indicates that late sown crop encountered with higher PM incidence (Table 4.8.8B). Highest yield was observed in Oct 01 sown GM 2 (1910 kg/ha) and Varuna (1850 kg/ha).

Table 4.9 National Genetic Stock Nursery

Location: BPR

The trial was conducted as per technical programme to maintain pure seed of different check germplasm/genotypes viz, NRCHB 101 & Rohini (SC), Varuna, DRMRIJ 31 (Mgt trials), DRMRMJA 35, BIOYSR (RC-WR), PHR 2 (TC-AB), RH 1222-28 (TC-SR), DMH 1 (HB), PDZ 1 (Q), NRCYS-05-2 (YS), NPC 16, DLSC 1 (Bc), GSL 1 (Bn), PT 303 (Br), RTM 314 (Es) was maintained for their utilization in different Plant Pathological trials.

Table 4.10 Survey of farmer's field for disease outbreak

HSR

A survey was carried out to assess the prevalence and severity of diseases affecting Indian mustard across approximately 102 locations/villages in major mustard growing areas of Haryana state. The onset of white rust disease was observed to occur slightly later than in previous crop season, with its emergence recorded in the first week of January at majority of surveyed sites. The severity of white rust ranged from 5 to 15 per cent in farmer's field, although, from some locations (Hisar, Agroha, Mirpur, Sirsa, Fatehabad, Bhiwani, Siwani, Satnali and Mahendergarh) severity levels were 20 to 25%. Additionally, the incidence of Sclerotinia rot varied between 5 to 10 per cent at some of the locations with a prior history of this disease. Alternaria blight disease severity was found to be between 10-15 per cent across the surveyed location. Bacterial stalk rot was detected in a few areas following the first irrigation in low lying regions of mustard growing areas. Furthermore, powdery mildew disease was observed at low intensity, even under late sown conditions in Haryana.

SKN

Survey of five farmer's fields for disease outbreak was conducted. White rust and powdery mildew were observed in severe form on late sown crops. On timely sown crops, white rust disease appeared during second fortnight of December month (18th Dec.) and 23-36% severity was observed. Powdery mildew disease appeared during second fortnight of January month (20th Jan.) and 47-68% severity was observed.

SHL

Survey was conducted in Nagaon, Jorhat, North Lakhimpur and Gossaigaon districts of Assam. The Alternaria leaf blight started appearing from second fortnight of December and reached its peak in February-March and disease severity ranged from 25 to 44%. The Sclerotinia rot (0.08 to 3.0% disease incidence) appeared from second week of January.

DOL

Survey was conducted in Samastipur, Muzaffarpur and Darbhanga districts of Bihar. Major diseases observed were Alternaria blight with disease severity varying between 14 to 66% and Sclerotinia rot with disease incidence varying between 2 to 39% in different famer's fields.

JAG

Survey of ten farmer's fields for disease outbreak was conducted. Major diseases observed was powdery mildew. Severity of powdery mildew varied between 14.3 to 70.6% in different fields.

PNT

Downy mildew, white rust, Alternaria blight, Scleotinia rot and powdery mildew were observed. Downy mildew severity ranged between 10 to 75%. Sclerotinia rot incidence varied between 10 to 30%. White rust severity varied between 25 to 65%. Alternaria blight severity varied between 25 to 70%. Powdery mildew severity varied between 30 to 65%. In *Brassica rapa*, symptoms of viral infections such as Turnip mosaic virus (TuMV) and Turnip yellows virus (TuYV) were observed. The affected plants exhibited symptoms like leaf curling, puckering, mosaic patterns on the foliage and stunting of overall growth.

BPR

In *Brassica* species, symptoms of viral infection primarily caused by TuMV between 40 to 70% was observed at 20 DAS particularly in late sown crop in the experimental field.

Table 4.1.1: Reaction of AVT-I and AVT-II *Brassica* germplasm to AB and WR under natural condition

Plant Pathology	PC Unit	Entry Name	% ABL						% ABP				% WR				
			SHL	JHS	DOL	LDH	PNT	Mean	JHS	LDH	PNT	Mean	PNT	SKN	Mean	MOR	LDH
SBG-24-01	MCN(OD)24-17	**RSPT-6**	34.5	20.0	45.3	36.8	52.5	**37.8**	10.0	19.7	47.5	**25.7**	0.0	2.2	**1.1**	0.0	0.0
SBG-24-02	MCN(OD)24-31	**PBR 813-2**	37.7	32.6	34.0	32.7	50.0	**37.4**	20.0	15.4	20.0	**18.5**	25.0	13.9	**19.4**	0.0	0.0
SBG-24-03	MCN(OD)24-7	**Varuna**	36.1	22.5	42.4	39.0	42.5	**36.5**	10.0	15.9	22.5	**16.1**	32.5	28.9	**30.7**	34.0	0.0
SBG-24-04	**PP-49**	**DMH 1 (HC)**	31.2	50.0	43.1	43.9	32.5	**40.1**	20.0	10.3	10.0	**13.4**	30.0	5.6	**17.8**	0.0	0.0
SBG-24-05	**PP-56**	**Rohini (SC)**	34.5	30.0	34.7	37.7	40.0	**35.4**	10.0	19.5	20.0	**16.5**	35.0	52.2	**43.6**	16.7	0.0
SBG-24-06	MCN(OD)24-18	**SVJH 73**	38.0	37.5	36.8	42.3	42.5	**39.4**	20.0	20.0	12.5	**17.5**	28.5	37.2	**32.9**	9.6	0.0
SBG-24-07	MCN(OD)24-30	**RH (OE) 1710**	35.7	20.0	43.8	53.6	37.5	**38.1**	5.0	26.0	27.5	**19.5**	20.0	14.4	**17.2**	7.4	0.0
SBG-24-08	MCN(OD)24-6	**4205B296-01**	33.1	30.0	33.3	43.2	40.0	**35.9**	10.0	20.5	30.0	**20.2**	0.0	5.0	**2.5**	0.2	0.0
SBG-24-09	**PP-48**	**PHR 2 (TC-AB)**	32.0	20.0	35.2	42.7	47.5	**35.5**	10.0	21.1	32.5	**21.2**	25.0	30.0	**27.5**	2.5	0.0
SBG-24-10	**PP-57**	**NRCHB 101 (SC)**	42.4	27.5	41.3	48.3	52.5	**42.4**	20.0	21.6	22.5	**21.4**	32.5	76.7	**54.6**	11.1	0.0
SBG-24-11	MCN(OD)24-32	**DRMRHT 18-65**	36.5	20.0	33.5	42.8	47.5	**36.0**	10.0	27.1	27.5	**21.5**	12.5	41.7	**27.1**	9.4	0.0
SBG-24-12	MCN(OD)24-19	**BPM 11 (LR)**	36.8	30.0	46.9	40.2	37.5	**38.3**	20.0	27.0	37.5	**28.2**	5.0	6.1	**5.6**	2.5	0.0
SBG-24-13	MCN(OD)24-8	**Maya (ZC)**	35.5	30.0	39.3	40.8	57.5	**40.6**	15.0	23.9	35.0	**24.6**	12.5	55.6	**34.0**	18.0	0.0
SBG-24-14	**PP-50**	**PDZ 1(QC)**	33.3	27.5	32.8	53.4	45.0	**38.4**	15.0	25.7	22.5	**21.1**	0.0	2.2	**1.1**	0.2	0.0
SBG-24-15	MCN(OD)24-5	**45S46 (H. Check)**	34.7	20.0	30.1	42.4	40.0	**33.4**	10.0	25.5	27.5	**21.0**	15.0	47.8	**31.4**	10.7	0.0
SBG-24-16	**PP-58**	**BioYSR (RC-WR)**	33.4	25.0	37.7	38.5	57.5	**38.4**	10.0	17.0	40.0	**22.3**	7.5	2.2	**4.9**	0.4	0.0
SBG-24-17	MCN(OD)24-20	**DRMR 2018-1**	33.0	30.0	40.2	45.5	45.0	**38.7**	20.0	21.0	62.5	**34.5**	0.0	14.4	**7.2**	1.3	0.0
SBG-24-18	MCN(OD)24-33	**Q90033**	32.8	30.0	37.7	57.4	52.5	**42.1**	15.0	28.5	32.5	**25.3**	15.0	47.2	**31.1**	15.1	0.0
SBG-24-19	MCN(OD)24-9	**SKMH 1901**	31.5	20.0	27.9	54.3	67.5	**40.2**	10.0	28.1	27.5	**21.9**	17.5	36.1	**26.8**	2.9	0.0
SBG-24-20	MCN(OD)24-21	**GED $ 2**	30.1	20.0	33.1	46.6	50.0	**35.9**	10.0	22.2	22.5	**18.2**	28.5	41.1	**34.8**	10.9	0.0
SBG-24-21	**PP-47**	**DRMRMJA-35 (RC-WR)**	31.1	30.0	30.9	38.8	52.5	**36.6**	26.5	18.7	47.5	**30.9**	0.0	0.0	**0.0**	0.5	0.0
SBG-24-22	**PP-59**	**DRMRMJA-35 (RC-WR)**	34.8	30.0	33.5	38.4	55.0	**38.3**	15.0	20.9	42.5	**26.1**	0.0	0.0	**0.0**	0.5	0.0
SBG-24-23	MCN(OD)24-1	**LES 68****	35.4	30.0	37.2	56.5	47.5	**41.3**	20.0	28.6	27.5	**25.4**	32.5	38.9	**35.7**	8.9	0.0
SBG-24-24	MCN(OD)24-11	**PYS 2018-1**	38.0	22.5	33.8	34.2	50.0	**35.7**	10.0	25.5	67.5	**34.3**	42.5	1.1	**21.8**	1.6	0.0
SBG-24-25	MCN(OD)24-22	**DRMRCI (Q) 172***#**	40.3	29.0	32.9	40.5	45.0	**37.5**	10.0	21.5	27.5	**19.7**	10.0	9.4	**9.7**	6.7	0.0
SBG-24-26	MCN(OD)24-34	**DRMR 150-35(LR)**	33.5	30.0	41.4	44.5	47.5	**39.4**	20.0	22.5	32.5	**25.0**	35.0	47.8	**41.4**	6.5	0.0
SBG-24-27	**PP-51**	**GSL 1 (GSC)**	16.7	30.0	39.5	48.5	42.5	**35.4**	15.0	23.5	17.5	**18.7**	0.0	0.0	**0.0**	0.0	0.0
SBG-24-28	MCN(OD)24-12	**SKM 2104**	37.5	30.0	28.1	42.3	60.0	**39.6**	15.0	25.0	42.5	**27.5**	37.5	57.8	**47.6**	14.0	0.0
SBG-24-29	MCN(OD)24-23	**DRMRCI (Q) 179****	32.5	30.0	48.4	52.3	57.5	**44.1**	20.0	30.5	17.5	**22.7**	15.0	7.8	**11.4**	1.6	0.0
SBG-24-30	MCN(OD)24-35	**18J408C**	37.7	27.5	36.9	57.5	50.0	**41.9**	20.0	29.0	27.5	**25.5**	20.0	34.4	**27.2**	4.2	0.0
SBG-24-31	MCN(OD)24-10	**KMR (E) 23-2**	30.7	30.0	32.8	48.1	42.5	**36.8**	20.0	22.5	42.5	**28.3**	35.0	37.8	**36.4**	2.9	0.0
SBG-24-32	**PP-52**	**DLSC 1 (Bc-C)**	13.3	20.0	33.9	33.2	32.5	**26.6**	10.0	18.0	22.5	**16.8**	0.0	0.0	**0.0**	0.0	0.0
SBG-24-33	MCN(OD)24-3	**Basanti (WRR Check)**	33.3	20.0	39.6	57.5	57.5	**41.6**	5.0	33.1	10.0	**16.0**	0.0	3.9	**1.9**	12.0	0.0
SBG-24-34	MCN(OD)24-24	**NRCHB 101**	33.6	27.5	31.2	53.5	37.5	**36.6**	20.0	34.9	17.5	**24.1**	30.0	64.4	**47.2**	13.1	0.0
SBG-24-35	MCN(OD)24-29	**Bio 902 (ZC)**	37.8	30.0	42.5	40.5	42.5	**38.6**	20.0	21.0	12.5	**17.8**	17.5	61.1	**39.3**	9.1	0.0
SBG-24-36	MCN(OD)24-36	**CS 54 (SC)**	38.7	24.5	32.5	48.6	57.5	**40.4**	12.5	21.0	17.5	**17.0**	12.5	53.3	**32.9**	5.1	0.0
SBG-24-37	**PP-53**	**NRCYS-05-02 (YS-C)**	39.7	20.0	43.2	54.6	52.5	**42.0**	10.0	34.3	52.5	**32.3**	50.0	2.8	**26.4**	1.8	0.0
SBG-24-38	MCN(OD)24-2	**NPJ 267**	34.0	30.0	34.1	38.4	42.5	**35.8**	20.0	21.4	32.5	**24.6**	3.5	29.4	**16.5**	7.4	0.0
SBG-24-39	MCN(OD)24-25	**JKJH 11**	33.5	30.0	34.5	40.4	60.0	**39.7**	20.0	17.8	22.5	**20.1**	15.0	2.8	**8.9**	1.1	0.0
SBG-24-40	MCN(OD)24-37	**PM 32 (QLR)**	34.9	28.0	49.0	52.1	47.5	**42.3**	10.0	30.5	7.5	**16.0**	17.5	36.7	**27.1**	4.9	0.0
SBG-24-41	MCN(OD)24-28	**NPJ 268**	37.4	30.0	52.9	43.5	32.5	**39.2**	20.0	26.7	30.0	**25.6**	7.5	2.8	**5.1**	1.6	0.0
SBG-24-42	MCN(OD)24-16	**CS 60 (LR)**	33.8	27.5	45.4	48.2	37.5	**38.5**	20.0	25.7	25.0	**23.6**	17.5	27.2	**22.4**	10.7	11.6
SBG-24-43	MCN(OD)24-4	**HRH 191290**	33.2	20.0	46.9	39.4	42.5	**36.4**	10.0	21.1	32.5	**21.2**	10.0	21.1	**15.6**	13.6	0.0
SBG-24-44	MCN(OD)24-26	**Uttara**	36.9	30.0	42.4	48.3	57.5	**43.0**	20.0	22.0	62.5	**34.8**	0.0	2.2	**1.1**	1.1	0.0
SBG-24-45	MCN(OD)24-38	**GED $ 1**	36.2	30.0	35.3	53.7	55.0	**42.0**	10.0	34.0	32.5	**25.5**	37.5	45.6	**41.5**	11.4	8.0
SBG-24-46	**PP-54**	**PT 303 (Br-TC)**	36.9	15.0	29.0	47.4	57.5	**37.1**	5.0	28.5	67.5	**33.7**	0.0	2.2	**1.1**	0.2	0.0
SBG-24-47	MCN(OD)24-27	**CS 56 (LR)**	33.0	20.0	32.9	56.7	62.5	**41.0**	7.5	38.0	22.5	**22.7**	30.0	50.0	**40.0**	7.4	18.5
SBG-24-48	MCN(OD)24-13	**NPJ 271**	38.2	17.5	29.0	53.3	52.5	**38.1**	10.0	34.6	20.0	**21.5**	15.0	12.2	**13.6**	4.0	8.0
SBG-24-49	**PP-44**	**Rohini (SC)**	37.1	30.0	32.8	60.1	47.5	**41.5**	20.0	39.0	12.5	**23.8**	20.0	42.2	**31.1**	14.0	14.1
SBG-24-50	MCN(OD)24-39	**DRMRCI (Q) 181****	37.2	30.0	37.0	52.2	57.5	**42.8**	20.0	36.2	15.0	**23.7**	15.0	21.1	**18.1**	1.4	0.0
SBG-24-51	**PP-60**	**PHR 2 (TC-AB)**	32.5	22.5	33.1	57.2	62.5	**41.6**	10.0	39.8	17.5	**22.4**	17.5	12.8	**15.1**	4.2	0.0
SBG-24-52	MCN(OD)24-40	**NPJ 261**	41.4	28.0	32.9	59.9	45.0	**41.4**	10.0	40.8	17.5	**22.8**	20.0	38.9	**29.4**	10.2	8.5
SBG-24-53	MCN(OD)24-15	**CS 2020-10**	42.2	30.0	37.5	49.7	52.5	**42.4**	20.0	24.0	22.5	**22.2**	35.0	31.1	**33.1**	6.9	24.6
SBG-24-54	**PP-55**	**RTM 314 (Es-C)**	35.0	30.0	28.9	43.9	50.0	**37.5**	5.0	34.4	20.0	**19.8**	0.0	0.0	**0.0**	0.0	0.0
SBG-24-55	MCN(OD)24-14	**4205B284-01**	35.5	30.0	32.5	52.5	32.5	**36.6**	20.0	34.3	15.0	**23.1**	10.0	13.9	**11.9**	4.0	13.6
SBG-24-56	**PP-45**	**NRCHB 101 (SC)**	35.0	30.0	36.5	54.0	52.5	**41.6**	20.0	37.3	15.0	**24.1**	17.5	53.3	**35.4**	12.0	28.6
SBG-24-57	**PP-61**	**DMH 1 (HC)**	29.0	30.0	37.3	61.7	32.5	**38.1**	20.0	39.4	12.5	**24.0**	0.0	3.3	**1.7**	4.3	0.0
SBG-24-58	MCN(OD)24-43	**KMR (E) 23-1**	34.1	30.0	41.3	58.0	37.5	**40.2**	20.0	34.7	25.0	**26.6**	20.0	30.0	**25.0**	8.7	8.5
SBG-24-59	**PP-46**	**BioYSR (RC-WR)**	33.5	27.5	33.3	60.7	52.5	**41.5**	20.0	39.9	25.0	**28.3**	0.0	1.7	**0.8**	0.0	0.0
SBG-24-60	MCN(OD)24-42	**RH 2299-63**	37.5	30.0	37.5	59.0	42.5	**41.3**	20.0	35.5	20.0	**25.2**	25.0	35.6	**30.3**	5.1	10.2
SBG-24-61	MCN(OD)24-41	**DRMR 2018-25***#**	35.7	25.5	39.5	54.0	45.0	**39.9**	20.0	30.9	17.5	**22.8**	10.0	6.1	**8.1**	0.0	0.0
CD(*P*=0.05)			**2.1**	**3.2**	**3.6**	**3.5**	**11.4**		**4.3**	**3.9**	**6.6**		**10.2**	**13.6**		**3.5**	**2.0**
CV (%)			**3.0**	**4.6**	**4.8**	**4.0**	**-**		**8.5**	**6.4**	**-**		**3.6**	**27.4**		**14.4**	**26.3**

ABL: MOR excluded due to <20% severity in SC
ABP: MOR, SHL and **DOL** excluded due to <20% severity in SC
WR: MOR and **LDH** data excluded from mean due to <20% severity in SC

Table 4.1.2 Reaction of AVT-I and AVT-II *Brassica* germplasm to PM and DM under natural condition

Plant Pathology	PC Unit	Entry Name	% PM				% DM
			MOR	JHS	SKN	Mean	PNT
SBG-24-01	MCN(OD)24-17	**RSPT-6**	10.3	10.0	64.3	**28.2**	12.5
SBG-24-02	MCN(OD)24-31	**PBR 813-2**	40.5	30.0	86.0	**52.2**	27.5
SBG-24-03	MCN(OD)24-7	**Varuna**	34.5	30.0	94.5	**53.0**	32.5
SBG-24-04	**PP-49**	**DMH 1 (HC)**	31.3	20.0	94.3	**48.5**	17.5
SBG-24-05	**PP-56**	**Rohini (SC)**	20.9	10.0	100.0	**43.6**	12.5
SBG-24-06	MCN(OD)24-18	**SVJH 73**	16.0	40.0	91.8	**49.3**	32.5
SBG-24-07	MCN(OD)24-30	**RH (OE) 1710**	10.5	10.0	95.0	**38.5**	25.0
SBG-24-08	MCN(OD)24-6	**4205B296-01**	13.4	30.0	81.8	**41.7**	12.5
SBG-24-09	**PP-48**	**PHR 2 (TC-AB)**	20.2	10.0	74.3	**34.8**	0.0
SBG-24-10	**PP-57**	**NRCHB 101 (SC)**	20.7	30.0	74.8	**41.8**	20.0
SBG-24-11	MCN(OD)24-32	**DRMRHT 18-65**	10.0	10.0	70.0	**30.0**	20.0
SBG-24-12	MCN(OD)24-19	**BPM 11 (LR)**	6.0	30.0	93.5	**43.2**	15.0
SBG-24-13	MCN(OD)24-8	**Maya (ZC)**	6.9	30.0	94.8	**43.9**	22.5
SBG-24-14	**PP-50**	**PDZ 1(QC)**	10.7	30.0	95.0	**45.2**	17.5
SBG-24-15	MCN(OD)24-5	**45S46 (H. Check)**	13.8	10.0	84.3	**36.0**	35.0
SBG-24-16	**PP-58**	**BioYSR (RC-WR)**	6.4	10.0	90.3	**35.6**	60.0
SBG-24-17	MCN(OD)24-20	**DRMR 2018-1**	16.3	25.0	97.0	**46.1**	30.0
SBG-24-18	MCN(OD)24-33	**Q90033**	20.2	30.0	97.5	**49.2**	37.5
SBG-24-19	MCN(OD)24-9	**SKMH 1901**	12.3	5.0	100.0	**39.1**	37.5
SBG-24-20	MCN(OD)24-21	**GED $ 2**	23.1	5.0	86.5	**38.2**	39.3
SBG-24-21	**PP-47**	**DRMRMJA-35 (RC-WR)**	30.7	30.0	100.0	**53.6**	39.2
SBG-24-22	**PP-59**	**DRMRMJA-35 (RC-WR)**	14.5	30.0	94.3	**46.2**	27.5
SBG-24-23	MCN(OD)24-1	**LES 68****	7.2	30.0	86.0	**41.1**	10.0
SBG-24-24	MCN(OD)24-11	**PYS 2018-1**	4.9	10.0	66.5	**27.1**	25.0
SBG-24-25	MCN(OD)24-22	**DRMRCI (Q) 172***#**	21.8	10.0	85.5	**39.1**	10.0
SBG-24-26	MCN(OD)24-34	**DRMR 150-35(LR)**	14.9	30.0	90.0	**45.0**	0.0
SBG-24-27	**PP-51**	**GSL 1 (GSC)**	0.0	30.0	54.0	**28.0**	37.5
SBG-24-28	MCN(OD)24-12	**SKM 2104**	18.0	30.0	81.5	**43.2**	12.5
SBG-24-29	MCN(OD)24-23	**DRMRCI (Q) 179****	38.5	30.0	95.0	**54.5**	20.0
SBG-24-30	MCN(OD)24-35	**18J408C**	26.2	30.0	100.0	**52.1**	15.0
SBG-24-31	MCN(OD)24-10	**KMR (E) 23-2**	20.9	30.0	92.3	**47.7**	10.0
SBG-24-32	**PP-52**	**DLSC 1 (Bc-C)**	0.0	10.0	0.0	**3.3**	0.0
SBG-24-33	MCN(OD)24-3	**Basanti (WRR Check)**	25.1	5.0	83.3	**37.8**	32.5
SBG-24-34	MCN(OD)24-24	**NRCHB 101**	26.7	30.0	85.3	**47.3**	35.0
SBG-24-35	MCN(OD)24-29	**Bio 902 (ZC)**	10.7	30.0	90.0	**43.6**	20.0
SBG-24-36	MCN(OD)24-36	**CS 54 (SC)**	14.0	10.0	95.5	**39.8**	25.0
SBG-24-37	**PP-53**	**NRCYS-05-02 (YS-C)**	8.9	10.0	63.8	**27.5**	35.0
SBG-24-38	MCN(OD)24-2	**NPJ 267**	22.0	30.0	80.0	**44.0**	17.5
SBG-24-39	MCN(OD)24-25	**JKJH 11**	24.0	30.0	84.3	**46.1**	40.0
SBG-24-40	MCN(OD)24-37	**PM 32 (QLR)**	20.2	10.0	60.0	**30.1**	32.5
SBG-24-41	MCN(OD)24-28	**NPJ 268**	16.0	30.0	70.0	**38.7**	37.5
SBG-24-42	MCN(OD)24-16	**CS 60 (LR)**	26.0	30.0	79.0	**45.0**	30.0
SBG-24-43	MCN(OD)24-4	**HRH 191290**	17.1	10.0	88.5	**38.5**	25.0
SBG-24-44	MCN(OD)24-26	**Uttara**	2.0	10.0	85.3	**32.4**	15.0
SBG-24-45	MCN(OD)24-38	**GED $ 1**	16.7	10.0	81.8	**36.2**	7.5
SBG-24-46	**PP-54**	**PT 303 (Br-TC)**	1.8	25.0	80.0	**35.6**	20.0
SBG-24-47	MCN(OD)24-27	**CS 56 (LR)**	32.9	10.0	94.0	**45.6**	27.5
SBG-24-48	MCN(OD)24-13	**NPJ 271**	15.8	10.0	96.8	**40.9**	7.5
SBG-24-49	**PP-44**	**Rohini (SC)**	17.8	40.0	99.3	**52.3**	17.5
SBG-24-50	MCN(OD)24-39	**DRMRCI (Q) 181****	24.9	35.0	90.0	**50.0**	40.0
SBG-24-51	**PP-60**	**PHR 2 (TC-AB)**	15.6	10.0	70.0	**31.9**	10.0
SBG-24-52	MCN(OD)24-40	**NPJ 261**	13.8	10.0	96.5	**40.1**	25.0
SBG-24-53	MCN(OD)24-15	**CS 2020-10**	24.0	30.0	92.0	**48.7**	12.5
SBG-24-54	**PP-55**	**RTM 314 (Es-C)**	0.0	30.0	0.0	**10.0**	0.0
SBG-24-55	MCN(OD)24-14	**4205B284-01**	15.3	30.0	82.0	**42.4**	17.5
SBG-24-56	**PP-45**	**NRCHB 101 (SC)**	18.5	30.0	80.0	**42.8**	25.0
SBG-24-57	**PP-61**	**DMH 1 (HC)**	28.9	30.0	99.3	**52.7**	12.5
SBG-24-58	MCN(OD)24-43	**KMR (E) 23-1**	20.9	30.0	95.3	**48.7**	40.0
SBG-24-59	**PP-46**	**BioYSR (RC-WR)**	11.6	30.0	84.8	**42.1**	20.0
SBG-24-60	MCN(OD)24-42	**RH 2299-63**	23.4	30.0	83.0	**45.5**	30.0
SBG-24-61	MCN(OD)24-41	**DRMR 2018-25***#**	29.8	30.0	99.8	**53.2**	20.0
CD(*P*=0.05)			**2.7**	**3.6**	**8.5**		**9.1**
CV (%)			**5.7**	**5.9**	**5.1**		**-**

PM: PNT excluded due to <20% severity in SC
DM: MOR excluded due to <20% severity in SC
SR: MOR, PNT and **LDH** excluded due to <20% severity in SC

Table 4.1.3: Reaction of AVT-I and AVT-II *Brassica* germplasm to AB, WR under artificial condition

Plant Pathology	Entry Name	% ABL						% ABP						% WR				
		HSR	SHL	DOL	LDH	PNT	Mean	HSR	SHL	DOL	LDH	PNT	Mean	HSR	PNT	Mean	MOR	LDH
SBG-24-01	RSPT-6	40.0	37.5	52.4	64.7	67.5	52.4	32.2	20.2	29.4	23.2	57.5	32.5	0.0	0.0	0.0	0.0	0.0
SBG-24-02	PBR 813-2	35.6	41.2	40.8	63.5	52.5	46.7	28.9	21.0	24.8	20.7	27.5	24.6	4.5	30.0	17.3	0.0	8.8
SBG-24-03	Varuna	26.7	39.1	48.7	63.7	45.0	44.6	15.6	17.0	24.4	19.0	30.0	21.2	38.9	35.0	37.0	35.1	9.3
SBG-24-04	DMH 1 (HC)	31.2	35.7	50.0	55.5	47.5	44.0	24.5	18.7	27.0	13.9	17.5	20.3	0.0	30.0	15.0	1.8	8.7
SBG-24-05	Rohini (SC)	24.5	38.5	41.6	63.0	50.0	43.5	18.9	20.5	20.2	22.7	27.5	22.0	42.2	40.0	41.1	23.6	12.7
SBG-24-06	SVJH 73	27.2	42.0	44.0	58.4	47.5	43.8	20.5	20.7	20.7	24.5	20.0	21.3	40.0	30.5	35.3	14.0	13.3
SBG-24-07	RH (OE) 1710	30.0	39.8	50.7	59.3	42.5	44.5	17.8	21.4	28.0	30.0	35.0	26.4	10.0	30.0	20.0	8.0	11.5
SBG-24-08	4205B296-01	20.5	37.9	40.3	58.1	45.0	40.3	14.5	19.2	18.4	27.7	37.5	23.5	0.0	0.0	0.0	2.0	4.6
SBG-24-09	PHR 2 (TC-AB)	28.4	36.6	42.2	54.4	60.0	44.3	21.1	19.0	19.1	23.9	42.5	25.1	31.1	31.0	31.1	3.4	3.7
SBG-24-10	NRCHB 101 (SC)	23.4	46.2	48.4	70.8	57.5	49.3	17.8	24.7	24.9	23.1	32.5	24.6	41.1	35.0	38.1	17.8	18.4
SBG-24-11	DRMRHT 18-65	27.2	40.1	40.5	67.1	57.5	46.5	20.5	18.8	21.8	29.1	35.0	25.0	30.0	20.0	25.0	10.9	13.0
SBG-24-12	BPM 11 (LR)	22.2	41.7	54.3	66.2	50.0	46.9	15.6	20.8	29.7	29.5	47.5	28.6	5.0	12.5	8.8	6.0	7.5
SBG-24-13	Maya (ZC)	26.7	40.5	46.6	72.3	67.5	50.7	20.0	20.7	22.9	27.6	42.5	26.7	35.6	30.0	32.8	20.0	27.8
SBG-24-14	PDZ 1(QC)	28.9	38.4	39.9	63.9	52.5	44.7	21.1	17.2	18.2	27.7	32.5	23.3	0.0	0.0	0.0	0.9	0.0
SBG-24-15	45S46 (H. Check)	24.5	39.2	38.0	68.4	55.0	45.0	18.9	20.6	16.6	30.4	35.0	24.3	31.7	20.0	25.9	12.0	13.0
SBG-24-16	BioYSR (RC-WR)	35.6	39.3	45.1	75.0	65.0	52.0	23.4	19.7	21.6	19.5	47.5	26.3	0.0	10.0	5.0	0.5	4.7
SBG-24-17	DRMR 2018-1	36.7	38.9	47.3	73.6	50.0	49.3	31.2	20.7	24.4	21.8	67.5	33.1	4.5	20.0	12.3	3.6	0.0
SBG-24-18	Q90033	26.7	37.7	45.1	70.4	65.0	49.0	17.8	20.7	22.2	35.0	40.0	27.1	36.7	20.0	28.4	17.1	5.2
SBG-24-19	SKMH 1901	24.5	36.7	34.9	70.4	70.0	47.3	18.9	19.2	15.0	29.6	37.5	24.0	38.9	25.0	32.0	14.0	4.5
SBG-24-20	GED $ 2	20.5	36.7	40.1	74.5	57.5	45.8	14.5	19.5	17.8	27.1	27.5	21.3	40.0	30.0	35.0	11.4	14.3
SBG-24-21	DRMRMJA-35 (RC-WR)	28.4	38.0	37.8	70.1	60.0	46.9	21.1	19.9	15.3	20.8	50.0	25.4	0.0	0.0	0.0	3.4	0.0
SBG-24-22	DRMRMJA-35 (RC-WR)	30.0	41.4	39.1	69.7	57.5	47.5	20.0	22.0	17.8	27.4	47.5	26.9	0.0	0.0	0.0	2.5	0.0
SBG-24-23	LES 68**	24.5	41.9	44.4	65.5	62.5	47.8	18.9	21.1	20.4	27.4	35.0	24.6	35.6	30.0	32.8	10.0	0.0
SBG-24-24	PYS 2018-1	40.0	42.9	40.8	72.2	60.0	51.2	32.2	23.0	18.4	28.2	75.0	35.3	0.0	47.5	23.8	2.0	0.0
SBG-24-25	DRMRCI (Q) 172***#	35.6	46.7	40.1	65.0	52.5	48.0	28.9	22.7	18.2	24.7	36.5	26.2	0.0	12.5	6.3	7.8	5.0
SBG-24-26	DRMR 150-35(LR)	33.4	38.9	47.8	67.0	62.5	49.9	26.7	19.7	25.1	28.3	40.0	28.0	32.2	37.5	34.9	12.7	19.0
SBG-24-27	GSL 1 (GSC)	7.8	21.5	46.6	60.4	57.5	38.7	6.7	14.0	22.8	29.0	21.5	18.8	0.0	0.0	0.0	0.0	0.0
SBG-24-28	SKM 2104	23.4	42.6	35.2	69.8	67.5	47.7	17.8	21.4	15.9	29.4	48.5	26.6	33.4	40.0	36.7	14.2	21.5
SBG-24-29	DRMRCI (Q) 179**	31.1	36.8	55.2	69.3	75.0	53.5	21.1	17.8	31.1	33.0	25.0	25.6	0.0	30.0	15.0	4.9	5.6
SBG-24-30	18J408C	31.2	42.4	44.0	61.0	57.5	47.2	24.5	22.4	21.1	30.7	32.5	26.2	20.0	25.0	22.5	8.0	4.6
SBG-24-31	KMR (E) 23-2	38.9	36.1	40.1	66.3	50.0	46.3	27.2	20.4	18.8	27.1	47.5	28.2	18.9	37.5	28.2	14.0	18.8
SBG-24-32	DLSC 1 (Bc-C)	8.4	17.9	40.8	58.5	45.0	34.1	6.7	11.8	18.1	20.9	30.0	17.5	0.0	0.0	0.0	0.0	0.0
SBG-24-33	Basanti (WRR Check)	29.5	39.3	46.6	67.2	72.5	51.0	22.2	21.2	21.6	33.4	17.5	23.2	0.0	0.0	0.0	14.9	5.3
SBG-24-34	NRCHB 101	24.5	38.9	37.9	70.4	45.0	43.3	18.9	22.0	17.2	37.3	25.0	24.1	46.7	30.0	38.4	17.6	20.0
SBG-24-35	Bio 902 (ZC)	25.1	43.3	49.9	68.9	55.0	48.4	17.8	24.4	25.5	26.2	22.5	23.3	30.0	30.0	30.0	15.8	9.9
SBG-24-36	CS 54 (SC)	31.1	43.0	39.4	62.7	62.5	47.7	21.1	23.4	16.6	24.0	30.0	23.0	33.4	32.5	33.0	10.0	24.0
SBG-24-37	NRCYS-05-02 (YS-C)	36.7	45.4	49.8	68.6	60.0	52.1	25.1	23.8	26.5	36.5	60.0	34.4	0.0	50.0	25.0	1.1	0.0
SBG-24-38	NPJ 267	24.5	40.2	41.0	62.8	47.5	43.2	15.6	22.3	18.1	24.5	45.0	25.1	28.9	20.0	24.5	12.0	11.8
SBG-24-39	JKJH 11	32.2	38.8	40.9	63.5	NG	43.8	22.2	19.8	17.2	21.0	NG	20.0	0.0	NG	0.0	8.2	5.5
SBG-24-40	PM 32 (QLR)	26.7	41.8	54.2	65.9	62.5	50.2	20.5	20.0	32.8	34.5	17.5	25.1	28.4	30.0	29.2	14.7	26.0
SBG-24-41	NPJ 268	23.4	43.8	59.2	70.9	52.5	50.0	18.9	22.3	36.9	28.7	42.0	29.7	0.0	12.5	6.3	1.6	6.6
SBG-24-42	CS 60 (LR)	34.5	39.6	51.8	68.9	52.5	49.4	25.1	19.8	30.0	32.5	32.5	28.0	35.6	25.0	30.3	14.0	27.7
SBG-24-43	HRH 191290	28.4	38.6	53.3	66.4	50.0	47.3	16.8	20.9	31.8	28.0	45.0	28.5	33.4	12.5	23.0	16.2	7.5
SBG-24-44	Uttara	41.1	44.0	49.4	69.8	62.5	53.4	30.0	24.1	26.6	27.4	65.0	34.6	0.0	5.0	2.5	4.2	0.0
SBG-24-45	GED $ 1	29.5	42.9	41.3	66.0	67.5	49.4	26.7	22.3	19.4	37.0	40.0	29.1	51.1	37.5	44.3	21.8	11.8
SBG-24-46	PT 303 (Br-TC)	38.9	44.0	35.0	68.8	62.5	49.8	28.4	21.0	15.0	34.0	72.5	34.2	0.0	0.0	0.0	0.5	0.0
SBG-24-47	CS 56 (LR)	30.0	41.5	38.8	64.2	70.0	48.9	23.4	21.0	17.0	40.4	30.0	26.3	36.7	30.0	33.4	14.0	10.3
SBG-24-48	NPJ 271	28.9	44.9	40.1	69.9	67.5	50.2	21.1	21.7	15.3	37.4	27.5	24.6	0.0	17.5	8.8	10.9	6.7
SBG-24-49	Rohini (SC)	26.7	42.0	39.5	65.6	57.5	46.3	20.5	23.9	16.8	41.9	30.0	26.6	43.4	32.5	38.0	18.9	13.7
SBG-24-50	DRMRCI (Q) 181**	23.4	42.7	44.0	67.8	72.5	50.1	17.8	23.0	21.1	43.8	22.5	25.6	0.0	12.5	6.3	2.7	0.0
SBG-24-51	PHR 2 (TC-AB)	29.5	36.4	38.8	64.3	70.0	47.8	21.1	18.1	17.2	43.1	27.5	25.4	31.1	32.5	31.8	6.0	5.0
SBG-24-52	NPJ 261	25.1	45.7	40.5	67.3	55.0	46.7	18.9	24.1	15.8	45.1	25.0	25.8	38.9	25.0	32.0	11.1	24.2
SBG-24-53	CS 2020-10	23.4	46.5	45.1	68.1	67.5	50.1	16.8	24.6	21.9	26.2	30.0	23.9	40.0	32.5	36.3	19.6	25.4
SBG-24-54	RTM 314 (Es-C)	33.4	38.7	36.2	69.4	62.5	48.0	25.1	20.5	15.2	37.4	27.5	25.1	0.0	0.0	0.0	0.0	0.0
SBG-24-55	4205B284-01	30.0	40.1	40.1	66.2	42.5	43.8	22.2	24.5	17.8	38.8	22.5	25.2	14.5	12.5	13.5	5.8	4.9
SBG-24-56	NRCHB 101 (SC)	31.2	42.5	43.4	68.0	60.0	49.0	24.5	21.6	21.1	41.2	24.0	26.5	36.7	28.5	32.6	19.1	6.2
SBG-24-57	DMH 1 (HC)	34.5	36.5	44.4	68.4	50.0	46.8	26.7	20.0	21.8	41.7	30.0	28.0	0.0	0.0	0.0	2.9	0.0
SBG-24-58	KMR (E) 23-1	26.7	40.3	48.6	65.0	52.5	46.6	18.9	20.9	30.5	37.7	32.5	28.1	34.5	29.5	32.0	16.0	12.3
SBG-24-59	BioYSR (RC-WR)	35.6	38.5	40.3	62.5	NG	44.2	26.7	21.4	16.9	41.5	NG	26.6	0.0	NG	0.0	0.0	0.0
SBG-24-60	RH 2299-63	30.0	43.1	44.4	68.1	57.5	48.6	24.5	23.5	21.1	40.8	27.5	27.5	33.4	30.0	31.7	18.2	13.8
SBG-24-61	DRMR 2018-25***#	27.8	41.4	46.1	64.3	60.0	47.9	22.2	21.5	24.4	34.7	25.0	25.5	0.0	10.0	5.0	1.1	0.0
CD(*P*=0.05)		4.5	2.2	3.2	2.6	12.2		4.4	2.1	3.4	4.2	10.3		3.2	7.9		3.3	0.4
CV (%)		6.9	2.8	3.8	2.4	-		8.1	2.9	6.2	6.2	-		7.9	-		10.6	6.2

ABL: MOR excluded due to <20% severity in SC
ABP: MOR excluded due to <20% severity in SC
WR: MOR and **LDH data** excluded from mean due to <20% severity in SC

Table 4.1.4: Reaction of AVT-I and AVT-II *Brassica* germplasm to PM, DM and SR under artificial condition

Coding		Entries	% PM	% DM	% SR						Stem Diameter	Lesion Size (cm)			
Plant Pathology	PC Unit		MOR	PNT	HSR	PNT	BPR	JHS	MOR	Mean	BPR	BPR	LDH	JHS	Mean
SBG-24-01	MCN(OD)24-17	RSPT-6	13.1	15.0	100.0	77.5	56.8	43.5	57.5	67.1	1.6	27.1	4.9	13.9	15.3
SBG-24-02	MCN(OD)24-31	PBR 813-2	41.8	27.5	41.7	77.5	45.8	53.7	32.5	50.2	1.6	18.8	7.2	27.1	17.7
SBG-24-03	MCN(OD)24-7	Varuna	35.1	17.5	72.0	97.5	34.3	61.5	12.5	55.6	1.4	14.7	6.8	30.0	17.2
SBG-24-04	PP-49	DMH 1 (HC)	32.2	12.5	74.9	17.5	52.7	29.2	5.0	35.9	1.2	13.6	8.8	7.8	10.1
SBG-24-05	PP-56	Rohini (SC)	25.1	35.0	83.7	97.5	40.6	30.0	32.5	56.9	1.7	18.8	12.3	7.4	12.8
SBG-24-06	MCN(OD)24-18	SVJH 73	16.3	17.5	54.8	57.5	42.9	39.1	7.5	40.4	1.6	26.2	17.1	16.8	20.0
SBG-24-07	MCN(OD)24-30	RH (OE) 1710	10.2	22.5	70.8	64.2	36.7	19.8	7.5	39.8	1.5	38.3	19.6	5.0	21.0
SBG-24-08	MCN(OD)24-6	4205B296-01	14.2	7.5	63.9	57.5	59.1	50.9	5.0	47.3	1.5	47.1	20.5	29.2	32.3
SBG-24-09	PP-48	PHR 2 (TC-AB)	18.9	0.0	78.9	47.5	53.6	16.8	5.0	40.4	1.8	35.5	19.3	3.7	19.5
SBG-24-10	PP-57	NRCHB 101 (SC)	21.3	19.2	52.3	57.5	81.7	52.9	27.5	54.4	1.9	52.1	22.4	21.4	32.0
SBG-24-11	MCN(OD)24-32	DRMRHT 18-65	10.9	13.6	78.9	77.5	67.8	42.8	5.0	54.4	1.5	42.3	24.3	34.3	33.6
SBG-24-12	MCN(OD)24-19	BPM 11 (LR)	7.3	17.5	73.9	77.5	42.7	54.4	17.5	53.2	1.5	68.0	20.6	29.5	39.4
SBG-24-13	MCN(OD)24-8	Maya (ZC)	7.8	17.5	65.0	97.5	51.6	46.3	7.5	53.6	1.6	39.3	20.6	12.7	24.2
SBG-24-14	PP-50	PDZ 1(QC)	11.3	20.5	52.3	97.5	56.3	15.7	7.5	45.9	1.2	42.0	20.4	3.5	22.0
SBG-24-15	MCN(OD)24-5	45S46 (H. Check)	12.7	12.5	75.0	97.5	42.2	19.1	22.5	51.3	1.4	17.1	20.8	3.9	13.9
SBG-24-16	PP-58	BioYSR (RC-WR)	7.6	30.0	63.9	64.2	49.5	47.4	7.5	46.5	1.6	57.1	20.5	19.4	32.3
SBG-24-17	MCN(OD)24-20	DRMR 2018-1	19.1	25.0	72.0	97.5	55.1	24.1	27.5	55.2	1.5	68.2	23.5	6.2	32.6
SBG-24-18	MCN(OD)24-33	Q90033	21.3	10.0	75.0	57.5	47.3	24.7	12.5	43.4	1.6	31.3	17.3	9.5	19.4
SBG-24-19	MCN(OD)24-9	SKMH 1901	13.3	30.0	55.0	77.5	56.8	42.5	7.5	47.9	1.6	38.7	23.1	17.7	26.5
SBG-24-20	MCN(OD)24-21	GED $ 2	22.7	42.5	92.0	97.5	41.5	15.0	22.5	53.7	1.4	47.3	22.4	3.9	24.5
SBG-24-21	PP-47	DRMRMJA-35 (RC-WR)	32.9	5.0	61.1	37.5	45.0	17.4	30.0	38.2	1.3	40.7	22.4	6.9	23.3
SBG-24-22	PP-59	DRMRMJA-35 (RC-WR)	15.8	2.5	65.8	47.5	63.5	22.3	5.0	40.8	1.7	36.7	19.3	6.4	20.8
SBG-24-23	MCN(OD)24-1	LES 68**	7.6	0.0	74.9	57.5	53.6	23.5	57.5	53.4	1.3	52.0	22.2	6.6	26.9
SBG-24-24	MCN(OD)24-11	PYS 2018-1	6.0	25.0	100.0	57.5	58.3	55.9	32.5	60.8	1.3	67.3	25.5	17.4	36.7
SBG-24-25	MCN(OD)24-22	DRMRCI (Q) 172***#	22.2	20.0	59.4	57.5	43.9	29.6	7.5	39.6	1.4	44.1	22.7	8.1	25.0
SBG-24-26	MCN(OD)24-34	DRMR 150-35(LR)	15.3	15.0	54.8	97.5	56.4	31.4	7.5	49.5	1.4	65.2	15.2	8.3	29.6
SBG-24-27	PP-51	GSL 1 (GSC)	5.8	0.0	12.9	37.5	54.3	28.4	5.0	27.6	1.8	37.7	16.9	8.6	21.1
SBG-24-28	MCN(OD)24-12	SKM 2104	18.2	25.0	74.9	57.5	50.8	44.9	52.5	56.1	1.5	55.6	19.5	13.2	29.4
SBG-24-29	MCN(OD)24-23	DRMRCI (Q) 179**	44.2	15.0	59.4	97.5	41.7	55.4	5.0	51.8	1.9	57.5	17.2	16.5	30.4
SBG-24-30	MCN(OD)24-35	18J408C	27.1	35.0	63.9	57.5	38.1	29.7	42.5	46.3	1.3	36.9	18.3	8.6	21.3
SBG-24-31	MCN(OD)24-10	KMR (E) 23-2	19.8	33.6	74.9	57.5	60.4	32.9	10.0	47.1	1.5	50.7	19.4	7.5	25.9
SBG-24-32	PP-52	DLSC 1 (Bc-C)	0.0	0.0	19.0	97.5	58.3	31.3	5.0	42.2	2.3	33.4	15.8	8.0	19.1
SBG-24-33	MCN(OD)24-3	Basanti (WRR Check)	26.9	37.5	65.0	77.5	55.6	27.2	12.5	47.6	1.5	52.4	19.2	6.9	26.2
SBG-24-34	MCN(OD)24-24	NRCHB 101	27.1	12.5	60.0	97.5	69.2	26.0	47.5	60.0	1.6	58.8	22.5	7.4	29.6
SBG-24-35	MCN(OD)24-29	Bio 902 (ZC)	13.8	32.5	50.0	97.5	40.2	29.2	27.5	48.9	1.7	55.4	16.4	9.1	27.0
SBG-24-36	MCN(OD)24-36	CS 54 (SC)	16.0	27.5	75.0	77.5	52.7	18.5	32.5	51.2	2.0	61.5	21.7	4.5	29.2
SBG-24-37	PP-53	NRCYS-05-02 (YS-C)	10.9	12.5	95.0	97.5	55.0	54.8	7.5	62.0	1.3	62.1	20.2	13.9	32.1
SBG-24-38	MCN(OD)24-2	NPJ 267	22.9	7.5	60.0	97.5	53.3	42.3	17.5	54.1	1.6	58.8	16.5	10.1	28.5
SBG-24-39	MCN(OD)24-25	JKJH 11	26.2	NG	65.0	NG	40.1	54.2	7.5	41.7	1.6	61.5	21.3	18.6	33.8
SBG-24-40	MCN(OD)24-37	PM 32 (QLR)	21.3	17.5	45.0	55.0	29.2	62.0	17.5	41.7	1.3	60.0	20.0	16.8	32.3
SBG-24-41	MCN(OD)24-28	NPJ 268	17.3	31.8	55.0	70.0	49.7	61.3	12.5	49.7	1.5	53.9	25.5	23.9	34.4
SBG-24-42	MCN(OD)24-16	CS 60 (LR)	26.2	17.5	65.0	75.0	69.3	24.5	27.5	52.3	2.3	78.7	20.2	11.9	36.9
SBG-24-43	MCN(OD)24-4	HRH 191290	18.2	20.0	85.0	95.0	64.0	31.7	7.5	56.6	1.5	80.0	20.2	19.3	39.8
SBG-24-44	MCN(OD)24-26	Uttara	3.4	0.0	100.0	95.0	63.1	33.9	27.5	63.9	1.0	79.4	16.5	15.0	37.0
SBG-24-45	MCN(OD)24-38	GED $ 1	15.8	12.5	72.0	90.0	45.8	29.6	32.5	54.0	1.7	53.2	17.3	9.2	26.6
SBG-24-46	PP-54	PT 303 (Br-TC)	2.5	7.5	95.0	95.0	88.8	41.2	12.5	66.5	1.0	70.6	20.7	20.2	37.2
SBG-24-47	MCN(OD)24-27	CS 56 (LR)	34.2	27.5	52.3	92.5	95.8	33.1	7.5	56.2	1.8	62.5	14.0	21.5	32.7
SBG-24-48	MCN(OD)24-13	NPJ 271	16.0	15.0	63.9	95.0	80.1	50.8	12.5	60.5	1.5	61.6	17.2	29.0	35.9
SBG-24-49	PP-44	Rohini (SC)	19.1	39.0	78.9	97.5	45.3	53.4	57.5	66.5	1.6	52.4	21.6	23.4	32.5
SBG-24-50	MCN(OD)24-39	DRMRCI (Q) 181**	25.3	22.5	52.3	95.0	55.0	35.9	7.5	49.1	1.3	56.9	19.7	9.0	28.5
SBG-24-51	PP-60	PHR 2 (TC-AB)	15.0	17.5	80.9	90.0	33.3	65.8	0.0	54.0	2.0	13.3	21.5	31.0	21.9
SBG-24-52	MCN(OD)24-40	NPJ 261	17.8	0.0	65.0	55.0	80.4	51.3	5.0	51.3	1.4	36.9	18.9	11.5	22.4
SBG-24-53	MCN(OD)24-15	CS 2020-10	27.8	22.5	76.0	75.0	93.8	43.4	32.5	64.1	1.2	49.9	20.1	21.2	30.4
SBG-24-54	PP-55	RTM 314 (Es-C)	0.0	17.5	100.0	92.5	73.9	34.5	0.0	60.2	1.3	60.3	17.2	10.0	29.2
SBG-24-55	MCN(OD)24-14	4205B284-01	16.3	25.0	70.8	90.0	45.6	39.3	7.5	50.6	1.6	33.1	19.6	18.0	23.6
SBG-24-56	PP-45	NRCHB 101 (SC)	21.8	12.5	74.9	95.0	70.8	22.6	12.5	55.2	1.5	35.4	15.4	8.0	19.6
SBG-24-57	PP-61	DMH 1 (HC)	29.3	7.5	61.1	95.0	67.5	23.1	12.5	51.8	2.0	50.2	30.6	6.5	29.1
SBG-24-58	MCN(OD)24-43	KMR (E) 23-1	22.0	17.5	65.8	97.5	47.2	31.9	47.5	58.0	1.4	47.3	18.4	9.5	25.1
SBG-24-59	PP-46	BioYSR (RC-WR)	13.3	NG	74.9	NG	52.1	31.5	57.5	54.0	2.1	52.7	19.4	8.0	26.7
SBG-24-60	MCN(OD)24-42	RH 2299-63	25.8	15.0	54.9	42.5	43.1	40.2	5.0	37.1	1.7	35.1	18.4	23.5	25.7
SBG-24-61	MCN(OD)24-41	DRMR 2018-25***#	33.3	15.0	63.9	62.5	42.6	36.6	7.5	42.6	1.7	24.1	24.2	13.5	20.6
CD(*P*=0.05)			2.6	7.0	11.3	6.8	7.9	6.1	4.9		-	-	2.3	4.7	
CV (%)			5.2	-	9.9	-	9.0	8.2	10.2		-	-	4.5	17.1	

PM: PNT excluded due to <20% severity in SC
DM: MOR excluded due to <20% severity in SC
SR: LDH excluded due to <20% severity in SC

Table.4.2.1: Reaction of oilseed *Brassica* germplasm against Alternaria blight in Uniform Disease Nursery

Code No.	Entries	% ABL									% ABP				
		HSR	PNT	SHL	VAR	JHS	DOL	NDH	LDH	Mean	PNT	VAR	DOL	HSR	Mean
UDN-24-01	DRMRDR 2141	33.4	47.5	37.5	50.0	27.9	36.7	28.9	24.6	**35.8**	27.5	22.5	18.9	29.5	**24.6**
UDN-24-02	DRMRDR 2135	24.5	32.5	36.7	52.5	30.0	34.3	15.6	25.9	**31.5**	12.5	37.5	16.8	18.9	**21.4**
UDN-24-03	DRMRDR 2155	28.4	35.0	38.5	60.0	10.0	35.6	20.0	30.4	**32.2**	22.5	37.5	22.2	20.0	**25.6**
UDN-24-04	DRMRDR 2140	31.2	45.0	35.5	50.0	26.2	34.3	20.0	26.0	**33.5**	22.5	27.5	16.8	24.5	**22.8**
UDN-24-05	DRMRDR 2152	22.2	50.0	34.3	60.0	10.0	32.7	18.9	30.4	**32.3**	25.0	37.5	16.6	17.8	**24.2**
UDN-24-06	DRMRDR 2156	26.7	42.5	35.2	52.5	25.7	35.1	32.2	32.9	**35.3**	35.0	20.0	18.6	20.0	**23.4**
UDN-24-07	**Rohini (SC)**	28.4	37.5	35.4	50.0	31.2	35.2	35.6	31.7	**35.6**	22.5	40.0	20.0	21.1	**25.9**
UDN-24-08	DRMRDR 2133	33.4	35.0	37.7	50.0	30.0	35.8	17.8	26.5	**33.3**	30.0	30.0	18.6	29.5	**27.0**
UDN-24-09	DRMRDR 2119	26.7	50.0	36.4	60.0	10.0	34.0	46.7	29.7	**36.7**	40.0	47.5	18.0	17.8	**30.8**
UDN-24-10	DRMRDR 2116	28.9	40.0	37.4	52.5	32.6	36.6	26.7	27.5	**35.3**	15.0	47.5	23.0	22.2	**26.9**
UDN-24-11	**NRCHB 101 (SC)**	21.1	37.5	38.5	50.0	30.0	33.0	21.1	42.1	**34.2**	32.5	60.0	20.0	15.6	**32.0**
UDN-24-12	DRMRCI 201	24.5	47.5	35.8	57.5	28.6	36.2	21.1	31.0	**35.3**	42.5	62.5	22.7	18.9	**36.7**
UDN-24-13	DRMRDR 2235	32.2	47.5	36.2	50.0	29.6	39.1	52.2	43.4	**41.3**	17.5	20.0	24.3	21.1	**20.7**
UDN-24-14	DRMRDR 2203	30.0	57.5	37.8	57.5	29.2	34.0	21.1	29.3	**37.1**	22.5	17.5	19.1	20.0	**19.8**
UDN-24-15	DRMRCI 203	36.7	50.0	34.6	62.5	31.0	37.1	22.2	39.6	**39.2**	12.5	15.0	23.5	25.1	**19.0**
UDN-24-16	DRMRSJ 9	34.5	52.5	35.7	60.0	25.3	35.5	27.8	29.6	**37.6**	47.5	37.5	21.3	29.5	**33.9**
UDN-24-17	DRMRDR 2195	26.7	42.5	34.2	57.5	9.5	37.8	40.0	31.4	**34.9**	37.5	37.5	24.3	20.0	**29.8**
UDN-24-18	DRMRDR 2201	32.2	42.5	34.7	57.5	29.6	33.6	27.8	25.7	**35.4**	32.5	30.0	21.1	23.4	**26.7**
UDN-24-19	DRMR 2018-26	30.0	57.5	36.1	55.0	19.4	32.8	24.4	37.6	**36.6**	37.5	40.0	18.1	22.2	**29.4**
UDN-24-20	**BIOYSR (RC-WR)**	36.7	45.0	38.9	57.5	30.6	34.4	30.0	41.9	**39.4**	35.0	47.5	20.2	25.1	**31.9**
UDN-24-21	DRMRDR 2304	33.4	52.5	36.5	47.5	30.2	35.8	22.2	42.5	**37.6**	20.0	30.0	22.0	23.4	**23.9**
UDN-24-22	DRMRDR 2335	28.4	50.0	32.4	52.5	37.1	31.6	22.2	42.4	**37.1**	27.5	37.5	18.5	20.5	**26.0**
UDN-24-23	DRMRDR 2196	28.4	60.0	39.7	52.5	10.0	39.3	20.0	31.5	**35.2**	25.0	37.5	25.5	16.8	**26.2**
UDN-24-24	DRMRDR 2202	33.4	50.0	34.4	50.0	27.1	30.2	22.2	36.9	**35.5**	20.0	30.0	19.3	26.7	**24.0**
UDN-24-25	DRMRDR 2206	36.7	57.5	35.6	47.5	27.1	33.0	26.7	38.5	**37.8**	17.5	45.0	19.1	31.2	**28.2**
UDN-24-26	DRMRDR 2241	30.0	52.5	32.4	52.5	28.7	36.5	42.2	38.3	**39.1**	15.0	30.0	22.7	23.4	**22.8**
UDN-24-27	DRMRDR 2351	23.4	62.5	31.7	40.0	30.2	33.9	28.9	39.5	**36.3**	32.5	25.0	20.6	17.8	**24.0**
UDN-24-28	DRMRCI 202	31.2	60.0	35.9	52.5	30.0	30.2	33.3	43.2	**39.5**	27.5	50.0	21.8	24.5	**31.0**
UDN-24-29	**RH 1222-28(TC-SR)**	34.5	57.5	40.9	57.5	31.1	31.5	32.2	44.9	**41.2**	37.5	35.0	18.3	25.1	**29.0**
UDN-24-30	DRMRDR 2227	31.1	50.0	37.4	52.5	26.1	33.2	33.3	40.5	**38.0**	22.5	50.0	19.8	21.1	**28.3**
UDN-24-31	PRD-2014-6	33.4	42.5	35.4	62.5	29.1	31.3	25.6	35.5	**36.9**	12.5	20.0	18.3	26.7	**19.4**
UDN-24-32	DRMRIJWR 20-30	30.0	45.0	36.6	57.5	26.8	34.7	33.3	44.0	**38.5**	22.5	30.0	20.6	17.8	**22.7**
UDN-24-33	DRMRDR 2236	27.2	62.5	33.3	50.0	27.7	32.8	21.1	52.6	**38.4**	52.5	37.5	20.1	16.8	**31.7**
UDN-24-34	PRD-2014-27	34.5	37.5	37.9	60.0	27.6	36.4	37.8	42.1	**39.2**	27.5	30.0	22.0	25.1	**26.1**
UDN-24-35	DRMR 2021-28	20.5	52.5	40.0	50.0	28.2	31.5	42.2	41.6	**38.3**	27.5	30.0	20.1	14.5	**23.0**
UDN-24-36	**NRCYS-5-2 (YS-C)**	40.0	65.0	39.0	70.0	27.2	34.1	22.2	51.4	**43.6**	72.5	72.5	20.5	32.2	**49.4**
UDN-24-37	DRMR 2020-14	30.0	52.5	38.4	50.0	26.5	35.0	22.2	41.5	**37.0**	27.5	20.0	21.3	23.4	**23.0**
UDN-24-38	DRMRDR 2242	21.1	42.5	34.4	50.0	30.2	33.9	28.9	43.3	**35.5**	32.5	27.5	21.3	16.8	**24.5**
UDN-24-39	DRMRDR 2305	33.4	42.5	35.6	52.5	32.8	42.8	28.9	42.2	**38.8**	27.5	40.0	31.5	26.7	**31.4**
UDN-24-40	**Rohini (SC)**	34.5	60.0	34.8	50.0	34.8	39.5	33.3	39.2	**40.8**	32.5	37.5	27.3	25.1	**30.6**
UDN-24-41	DRMRIJWR 20-12	27.2	55.0	35.5	50.0	10.3	35.0	26.7	37.3	**34.6**	40.0	20.0	21.9	20.5	**25.6**
UDN-24-42	PAB-17-10	24.5	62.5	35.4	35.0	25.2	40.2	24.4	38.0	**35.6**	20.0	10.0	29.4	18.9	**19.6**
UDN-24-43	DRMRDR 2318	28.4	42.5	**NG**	37.5	31.4	38.5	24.4	40.0	**34.7**	22.5	30.0	26.7	16.8	**24.0**
UDN-24-44	DRMRCI 204	26.7	52.5	36.0	57.5	33.0	37.0	24.4	41.6	**38.6**	40.0	30.0	22.8	15.6	**27.1**
UDN-24-45	DRMRIJWR 20-29	35.6	42.5	36.9	62.5	27.4	38.8	23.3	41.9	**38.6**	32.5	20.0	26.6	22.2	**25.3**
UDN-24-46	**PHR 2 (TC-AB)**	30.0	37.5	33.0	50.0	9.4	35.7	22.2	42.4	**32.5**	12.5	7.5	23.9	20.5	**16.1**
UDN-24-47	DRMRSJ 22	26.7	42.5	37.5	50.0	27.2	38.6	24.4	39.0	**35.7**	22.5	20.0	26.2	17.8	**21.6**
UDN-24-48	PAB-2017-24	28.9	52.5	33.2	37.5	31.2	35.5	26.7	41.4	**35.9**	12.5	5.0	22.3	20.5	**15.1**
UDN-24-49	DRMRCI 205	27.8	37.5	34.6	52.5	25.7	38.3	20.0	51.3	**36.0**	27.5	17.5	24.9	15.6	**21.4**
UDN-24-50	**PDZ 1 (QC)**	31.1	57.5	34.5	50.0	9.6	38.7	28.9	43.9	**36.8**	42.5	17.5	26.6	23.4	**27.5**
UDN-24-51	DRMR 2020-15	29.5	52.5	40.8	57.5	30.6	37.9	28.9	44.5	**40.3**	52.5	30.0	25.2	14.5	**30.5**
UDN-24-52	DRMRDR 2320	23.4	50.0	39.8	50.0	27.2	38.7	33.3	45.7	**38.5**	30.0	37.5	26.2	20.5	**28.6**
UDN-24-53	DRMR 2019-20	34.5	62.5	38.5	60.0	20.0	36.6	40.0	47.7	**42.5**	37.5	40.0	23.9	29.5	**32.7**
UDN-24-54	PRD-2014-15	29.5	65.0	34.0	60.0	20.0	36.8	20.0	50.8	**39.5**	27.5	37.5	23.1	22.2	**27.6**
UDN-24-55	DRMRSJ 12	33.4	42.5	37.3	52.5	25.2	38.1	28.9	44.1	**37.7**	47.5	55.0	25.6	23.4	**37.9**
UDN-24-56	DRMR 2021-30	21.1	52.5	41.6	50.0	27.4	36.1	20.0	45.9	**36.8**	40.0	50.0	23.3	13.4	**31.7**
UDN-24-57	**BIOYSR (RC-WR)**	32.2	57.5	40.7	50.0	26.7	34.2	22.2	51.8	**39.4**	27.5	40.0	21.2	14.5	**25.8**
UDN-24-58	DRMR 2019-16	26.7	67.5	39.8	50.0	26.2	32.8	20.0	46.3	**38.6**	17.5	57.5	21.1	15.6	**27.9**
UDN-24-59	DRMRDR 2301	30.0	60.0	32.7	52.5	30.0	35.0	28.9	51.9	**40.1**	27.5	30.0	22.3	21.1	**25.2**
UDN-24-60	DRMRSJ 14	28.4	47.5	33.7	50.0	29.6	36.1	26.7	46.3	**37.3**	55.0	50.0	23.1	20.5	**37.2**
UDN-24-61	RH-1700-3	35.6	57.5	37.2	60.0	10.1	34.8	20.0	53.7	**38.6**	37.5	57.5	22.7	23.4	**35.3**
UDN-24-62	DRMR 2019-15	32.2	42.5	37.0	70.0	32.8	33.3	8.9	49.0	**38.2**	40.0	60.0	22.2	20.5	**35.7**
UDN-24-63	**RH 1222-28(TC-SR)**	33.4	47.5	36.7	60.0	25.2	34.9	12.2	44.5	**36.8**	12.5	50.0	21.6	26.7	**27.7**
UDN-24-64	**DRMRMJA-35 (RC-WR)**	28.9	60.0	34.8	50.0	28.4	32.7	27.8	50.7	**39.2**	27.5	40.0	20.6	21.1	**27.3**
UDN-24-65	DRMRDR 2315	30.0	42.5	42.0	55.0	24.0	37.3	23.3	46.3	**37.6**	25.0	50.0	24.9	20.0	**30.0**
UDN-24-66	DRMRDR 2342	36.7	62.5	40.6	50.0	25.2	33.5	28.9	50.4	**41.0**	27.5	60.0	22.2	25.1	**33.7**
UDN-24-67	**PT 303 (Br-TC)**	41.1	67.5	37.4	70.0	25.7	36.1	22.2	51.3	**43.9**	67.5	72.5	23.2	30.0	**48.3**
UDN-24-68	DRMRDR 2352	32.2	65.0	33.4	60.0	25.8	34.0	27.8	49.5	**41.0**	17.5	57.5	21.7	22.2	**29.7**
UDN-24-69	**GSL 1 (GSC)**	7.8	47.5	14.9	50.0	21.4	35.0	37.8	42.6	**32.1**	7.5	10.0	22.6	6.7	**11.7**
UDN-24-70	**DRMRMJA-35 (RC-WR)**	27.8	60.0	32.2	60.0	10.0	36.6	26.7	41.2	**36.8**	32.5	50.0	23.9	12.8	**29.8**
UDN-24-71	DRMRDR 2343	30.0	67.5	34.1	62.5	20.0	33.9	40.0	33.7	**40.2**	20.0	52.5	22.0	22.2	**29.2**
UDN-24-72	DRMRDR 2317	22.2	57.5	33.8	50.0	10.2	35.7	33.3	34.3	**34.6**	27.5	55.0	25.4	16.8	**31.2**
UDN-24-73	**PHR 2 (TC-AB)**	31.2	62.5	39.5	52.5	29.1	33.8	21.1	46.9	**39.6**	30.0	10.0	21.5	26.7	**22.1**
UDN-24-74	**DLSC 1 (GSC)**	8.4	47.5	15.6	35.0	10.0	37.9	24.4	29.0	**26.0**	17.5	10.0	26.1	6.7	**15.1**
UDN-24-75	DRMRDR 2349	33.4	60.0	40.0	50.0	31.0	35.5	10.0	44.1	**38.0**	37.5	40.0	22.6	23.4	**30.9**
UDN-24-76	DRMRDR 2319	35.6	42.5	40.0	55.0	29.4	36.8	28.9	49.9	**39.8**	35.0	35.0	25.5	24.5	**30.0**
UDN-24-77	PRD-2014-23	24.5	62.5	34.9	50.0	37.5	35.0	25.6	51.6	**40.2**	40.0	10.0	22.4	18.9	**22.8**
UDN-24-78	**NRCHB 101 (SC)**	22.2	65.0	34.8	60.0	26.2	34.1	13.3	48.9	**38.0**	35.0	27.5	22.5	16.8	**25.4**
UDN-24-79	DRMRDR 2322	28.9	52.5	32.2	37.5	28.1	36.8	24.4	50.4	**36.3**	27.5	30.0	23.9	20.5	**25.5**
UDN-24-80	PAB-17-11	27.8	37.5	33.8	35.0	26.3	39.4	31.1	53.1	**35.5**	15.0	7.5	26.8	15.6	**16.2**
UDN-24-81	**DMH 1 (HC)**	31.1	55.0	32.3	50.0	29.6	36.8	31.1	47.1	**39.1**	12.5	30.0	26.9	23.4	**23.2**
UDN-24-82	PRD-2014-8	29.5	47.5	41.4	52.5	28.0	40.0	33.3	51.6	**40.5**	40.0	10.0	28.9	14.5	**23.3**
UDN-24-83	**PT 303 (Br-TC)**	38.9	65.0	39.5	70.0	27.5	38.8	23.3	55.3	**44.8**	72.5	72.5	26.1	28.4	**49.9**
UDN-24-84	**DRMRCI-170**	32.2	62.5	41.8	65.0	30.0	41.2	24.4	51.0	**43.5**	27.5	70.0	31.1	22.2	**37.7**
CD(*P*=0.05)		**4.3**	**8.9**	**2.9**	**2.8**	**1.0**	**3.8**	**-**	**4.1**		**5.8**	**3.2**	**4.4**	**4.6**	
CV (%)		**6.6**	**-**	**4.0**	**3.1**	**2.1**	**5.5**	**19.6**	**5.1**		**-**	**4.7**	**7.8**	**8.5**	

ABL: JAG and **MOR** excluded due to <20% severity in SC

ABP: MOR, **SHL**, **JHS** and **LDH** excluded due to <20% severity in SC

Table 4.2.2: Reaction of oilseed *Brassica* germplasm to WR and PM under UDN

Entries	% WR					% PM								% DM			% SR
	HSR	PNT	JAI	SKN	Mean	MOR	JAI	VAR	NGP	JHS	SKN	NDH	Mean	PNT	NDH	Mean	PNT
DRMRDR 2141	10.0	0.0	20.0	3.9	**8.5**	41.6	66.7	65.0	70.9	25.7	74.5	21.1	**52.2**	22.5	16.7	**19.6**	16.7
DRMRDR 2135	8.4	7.5	44.5	15.6	**19.0**	37.8	62.2	65.0	55.2	30.1	92.0	15.6	**51.1**	32.5	12.2	**22.4**	22.5
DRMRDR 2155	0.0	1.0	1.1	2.8	**1.2**	28.2	60.0	70.0	59.6	30.2	92.3	30.0	**52.9**	15.0	2.2	**8.6**	16.0
DRMRDR 2140	21.1	7.5	36.7	16.7	**20.5**	19.1	64.5	67.5	54.6	37.5	85.5	24.4	**50.4**	25.0	23.3	**24.2**	7.0
DRMRDR 2152	0.0	2.0	0.0	3.9	**1.5**	28.2	66.7	65.0	46.3	37.4	100.0	51.1	**56.4**	22.5	2.2	**12.4**	13.5
DRMRDR 2156	24.5	30.0	35.6	21.7	**27.9**	23.3	65.6	65.0	52.2	35.3	86.3	46.7	**53.5**	17.5	36.7	**27.1**	16.0
Rohini (SC)	35.6	32.5	54.5	54.4	**44.3**	26.3	66.7	67.5	55.2	31.6	87.8	24.4	**51.4**	35.0	27.8	**31.4**	31.5
DRMRDR 2133	20.5	0.0	40.0	26.7	**21.8**	28.9	64.4	67.5	49.8	36.0	80.0	24.4	**50.1**	32.5	25.6	**29.0**	11.5
DRMRDR 2119	15.6	12.5	21.2	6.7	**14.0**	24.0	62.2	65.0	38.3	34.4	83.0	25.6	**47.5**	20.0	17.8	**18.9**	18.5
DRMRDR 2116	31.2	30.5	13.4	7.2	**20.6**	22.9	57.8	65.0	49.2	31.0	82.8	28.9	**48.2**	17.5	34.4	**26.0**	11.5
NRCHB 101 (SC)	46.7	30.0	33.3	24.4	**33.6**	17.8	66.7	70.0	53.6	30.0	74.8	26.7	**48.5**	17.5	20.0	**18.8**	9.0
DRMRCI 201	31.7	12.5	42.3	12.8	**24.8**	31.4	64. 5	65.0	46.9	34.4	95.0	16.7	**48.2**	7.5	23.3	**15.4**	18.0
DRMRDR 2235	21.1	0.0	44.5	5.0	**17.7**	27.1	68.9	70.0	56.9	39.0	83.8	18.9	**52.1**	17.5	30.0	**23.8**	11.5
DRMRDR 2203	0.0	3.5	5.6	5.6	**3.7**	36.9	57.8	70.0	65.1	40.1	85.0	15.6	**52.9**	27.5	38.9	**33.2**	0.0
DRMRCI 203	0.0	0.0	0.0	7.2	**1.8**	26.5	48.9	60.0	45.4	38.2	85.3	37.8	**48.9**	10.0	18.9	**14.4**	5.0
DRMRSJ 9	0.0	3.5	8.9	1.7	**3.5**	26.0	48.9	65.0	62.1	30.0	83.5	35.6	**50.1**	17.5	15.6	**16.5**	2.5
DRMRDR 2195	30.0	7.5	54.5	15.0	**26.8**	32.2	62.2	70.0	53.2	30.0	82.3	31.1	**51.6**	25.0	20.0	**22.5**	9.0
DRMRDR 2201	1.7	7.5	53.4	10.0	**18.2**	22.2	71.1	70.0	60.3	31.0	94.3	32.2	**54.4**	12.5	40.0	**26.3**	5.0
DRMR 2018-26	0.0	0.0	3.3	3.3	**1.7**	27.1	73.3	57.5	44.7	29.2	100.0	13.3	**49.3**	15.0	27.8	**21.4**	17.7
BIOYSR (RC-WR)	0.0	0.0	0.0	0.0	**0.0**	24.9	40.0	57.5	42.4	39.0	97.0	37.8	**48.4**	15.0	23.3	**19.2**	19.7
DRMRDR 2304	2.8	7.5	6.7	6.1	**5.8**	29.3	64.5	70.0	51.8	35.0	100.0	55.6	**58.0**	22.5	24.4	**23.5**	13.5
DRMRDR 2335	4.5	2.0	7.8	6.1	**5.1**	30.9	44.5	75.0	45.9	32.6	80.0	53.3	**51.8**	20.0	36.7	**28.3**	31.5
DRMRDR 2196	24.5	27.5	26.7	8.3	**21.8**	23.3	62.2	80.0	50.4	31.0	85.0	31.1	**51.9**	20.0	32.2	**26.1**	22.5
DRMRDR 2202	1.7	3.5	33.4	4.4	**10.8**	21.1	71.1	67.5	59.7	30.0	84.5	31.1	**52.1**	10.0	42.2	**26.1**	16.0
DRMRDR 2206	0.0	0.0	0.0	2.2	**0.6**	32.0	64.4	50.0	61.9	31.2	93.3	37.8	**52.9**	20.0	23.3	**21.7**	20.5
DRMRDR 2241	0.0	7.5	1.1	1.7	**2.6**	33.6	71.1	70.0	45.3	25.2	94.8	60.0	**57.1**	17.5	11.1	**14.3**	36.0
DRMRDR 2351	42.2	37.5	42.2	31.1	**38.3**	34.2	53.4	52.5	54.9	28.2	82.8	37.8	**49.1**	15.0	15.6	**15.3**	18.0
DRMRCI 202	2.8	20.0	7.8	5.0	**8.9**	35.6	48.9	70.0	54.2	26.4	87.0	24.4	**49.5**	10.0	30.0	**20.0**	20.5
RH 1222-28(TC-SR)	22.2	17.5	54.5	18.9	**28.3**	19.1	57.8	75.0	50.5	29.5	87.3	28.9	**49.7**	15.0	27.8	**21.4**	17.5
DRMRDR 2227	0.0	2.5	16.7	0.6	**4.9**	28.2	68.9	70.0	63.9	30.6	94.3	26.7	**54.6**	27.5	31.1	**29.3**	16.0
PRD-2014-6	5.0	10.0	40.0	4.4	**14.9**	19.8	62.2	75.0	48.9	27.1	78.8	33.3	**49.3**	15.0	14.4	**14.7**	33.5
DRMRIJWR 20-30	0.0	2.5	0.0	2.2	**1.2**	25.8	53.4	70.0	48.4	30.0	96.8	20.0	**49.2**	27.5	42.2	**34.9**	27.0
DRMRDR 2236	25.1	3.5	20.0	15.6	**16.0**	23.8	62.2	62.5	56.4	5.0	81.3	31.1	**46.0**	35.0	4.4	**19.7**	7.0
PRD-2014-27	32.2	30.0	24.5	17.8	**26.1**	34.7	40.0	70.0	51.5	32.9	82.0	17.8	**47.0**	22.5	38.9	**30.7**	20.5
DRMR 2021-28	41.1	30.0	55.6	19.4	**36.5**	32.5	62.2	65.0	48.0	28.3	87.3	22.2	**49.3**	15.0	42.2	**28.6**	18.0
NRCYS-5-2 (YS-C)	0.0	32.5	0.0	0.0	**8.1**	3.3	40.0	65.0	54.5	29.9	63.5	17.8	**39.1**	0.0	44.4	**22.2**	83.4
DRMR 2020-14	0.0	0.0	7.8	6.1	**3.5**	30.0	62.2	70.0	59.7	31.0	95.5	15.6	**52.0**	12.5	31.1	**21.8**	11.5
DRMRDR 2242	21.1	7.5	47.8	6.1	**20.6**	35.3	62.2	72.5	50.3	30.0	96.5	31.1	**54.0**	25.0	4.4	**14.7**	22.5
DRMRDR 2305	31.1	1.0	0.0	8.3	**10.1**	22.2	48.9	60.0	45.0	30.0	98.0	17.8	**46.0**	15.0	23.3	**19.2**	25.0
Rohini (SC)	36.7	26.5	48.9	13.3	**31.4**	32.9	40.0	62.5	49.4	29.7	97.5	24.4	**48.1**	22.5	46.7	**34.6**	24.5
DRMRIJWR 20-12	0.0	0.0	0.0	10.6	**2.6**	21.3	33.3	70.0	69.6	33.9	100.0	17.8	**49.4**	32.5	37.8	**35.1**	11.5
PAB-17-10	1.7	7.5	56.7	1.7	**16.9**	30.9	62.2	52.5	73.7	32.3	85.0	20.0	**50.9**	42.5	33.3	**37.9**	25.0
DRMRDR 2318	24.5	30.0	58.9	6.7	**30.0**	25.1	55.6	60.0	66.5	30.0	79.8	22.2	**48.5**	25.0	31.1	**28.1**	21.0
DRMRCI 204	4.5	7.5	0.0	3.9	**4.0**	28.5	48.9	82.5	60.5	35.0	93.5	20.0	**52.7**	12.5	28.9	**20.7**	15.5
DRMRIJWR 20-29	0.0	3.5	0.0	1.1	**1.2**	32.9	42.2	80.0	55.0	30.0	85.0	28.9	**50.6**	20.0	26.7	**23.3**	22.5
PHR 2 (TC-AB)	22.2	17.5	0.0	6.1	**11.5**	26.2	40.0	77.5	60.1	29.0	82.3	31.1	**49.5**	13.6	4.4	**9.0**	40.0
DRMRSJ 22	30.0	15.0	3.3	8.3	**14.2**	24.2	42.2	82.5	68.2	37.5	95.3	22.2	**53.2**	22.5	37.8	**30.1**	52.5
PAB-2017-24	31.7	12.5	61.1	16.1	**30.4**	14.9	57.8	62.5	53.6	30.0	80.3	26.7	**46.5**	40.0	31.1	**35.6**	17.7
DRMRCI 205	0.0	0.0	0.0	1.7	**0.4**	19.3	44.5	60.0	79.7	36.6	85.5	20.0	**49.4**	15.0	35.6	**25.3**	10.5
PDZ 1 (QC)	0.0	2.5	0.0	3.3	**1.5**	29.1	46.7	65.0	59.0	7.5	96.0	20.0	**46.2**	17.5	13.3	**15.4**	22.5
DRMR 2020-15	0.0	7.5	23.4	5.6	**9.1**	34.3	44.5	65.0	55.4	31.1	100.0	24.4	**50.7**	15.0	5.6	**10.3**	34.5
DRMRDR 2320	10.0	1.0	10.0	6.7	**6.9**	32.9	53.4	62.5	69.2	27.9	95.8	22.2	**52.0**	10.0	21.1	**15.6**	73.9
DRMR 2019-20	0.0	3.5	0.0	3.9	**1.8**	26.0	44.5	70.0	50.9	31.6	92.5	28.9	**49.2**	17.5	44.4	**31.0**	14.0
PRD-2014-15	0.0	7.5	8.9	4.4	**5.2**	32.2	55.6	65.0	59.4	30.0	94.0	26.7	**51.8**	12.5	20.0	**16.3**	7.0
DRMRSJ 12	0.0	2.0	34.5	0.6	**9.3**	17.8	55.6	70.0	70.1	32.7	82.8	20.0	**49.9**	25.0	48.9	**36.9**	22.5
DRMR 2021-30	42.2	12.5	46.7	17.8	**29.8**	26.9	55.6	65.0	55.9	32.7	81.0	5.6	**46.1**	12.5	22.2	**17.4**	38.5
BIOYSR (RC-WR)	0.0	0.0	0.0	1.1	**0.3**	19.8	66.7	70.0	63.3	30.0	81.3	7.8	**48.4**	35.0	73.3	**54.2**	30.5
DRMR 2019-16	0.0	2.5	0.0	2.2	**1.2**	31.6	64.4	70.0	52.1	27.5	96.3	54.4	**56.6**	27.5	23.3	**25.4**	9.5
DRMRDR 2301	1.7	12.5	1.1	5.0	**5.1**	25.1	57.8	65.0	67.7	30.0	87.5	73.3	**58.1**	25.0	14.4	**19.7**	18.5
DRMRSJ 14	0.0	1.0	0.0	3.9	**1.2**	24.9	55.6	65.0	51.5	37.5	75.8	42.2	**50.4**	30.0	33.3	**31.7**	18.5
RH-1700-3	0.0	0.0	1.9	1.1	**0.8**	32.7	55.6	65.0	56.7	30.0	87.8	17.8	**49.4**	17.5	20.0	**18.8**	42.5
DRMR 2019-15	0.0	7.5	0.0	3.3	**2.7**	38.4	66.7	65.0	50.8	36.6	100.0	22.2	**54.2**	17.5	13.3	**15.4**	18.5
RH 1222-28(TC-SR)	40.0	27.5	14.5	11.1	**23.3**	34.7	48.9	65.0	63.1	34.1	97.0	46.7	**55.6**	7.5	20.0	**13.8**	30.5
DRMRMJA-35 (RC-WR)	0.0	0.0	22.2	4.4	**6.7**	34.2	46.7	65.0	47.9	37.5	100.0	28.9	**51.4**	22.5	28.9	**25.7**	26.5
DRMRDR 2315	0.0	0.0	26.7	1.7	**7.1**	35.4	53.4	62.5	55.1	31.4	78.5	24.4	**48.7**	37.5	11.1	**24.3**	14.0
DRMRDR 2342	11.7	32.5	42.2	5.6	**23.0**	32.7	57.8	65.0	63.7	32.8	77.0	22.2	**50.2**	22.5	12.2	**17.4**	14.5
PT 303 (Br-TC)	0.0	2.5	27.8	1.7	**8.0**	0.0	62.2	65.0	53.8	30.0	91.8	17.8	**45.8**	0.0	37.8	**18.9**	71.3
DRMRDR 2352	0.0	7.5	0.0	5.6	**3.3**	10.2	62.2	67.5	53.9	37.5	90.0	3.3	**46.4**	25.0	5.6	**15.3**	13.5
GSL 1 (GSC)	0.0	0.0	0.0	0.0	**0.0**	0.0	35.6	70.0	4.2	30.0	73.8	20.0	**33.4**	7.5	6.7	**7.1**	16.0
DRMRMJA-35 (RC-WR)	0.0	0.0	0.0	2.8	**0.7**	29.6	57.8	70.0	59.7	36.6	100.0	5.6	**51.3**	45.4	5.6	**25.5**	17.2
DRMRDR 2343	0.0	0.0	40.0	3.3	**10.8**	21.1	55.6	70.0	45.3	34.1	100.0	24.4	**50.1**	30.0	4.4	**17.2**	16.0
DRMRDR 2317	0.0	0.0	0.0	1.1	**0.3**	28.2	48.9	70.0	50.8	28.0	91.3	17.8	**47.9**	17.5	21.1	**19.3**	18.5
PHR 2 (TC-AB)	33.4	25.0	13.4	4.4	**19.1**	14.9	66.7	70.0	42.3	27.5	79.0	17.8	**45.5**	27.5	16.7	**22.1**	5.0
DLSC 1 (GSC)	0.0	1.0	0.0	1.1	**0.5**	0.0	42.3	52.5	5.6	30.0	0.0	3.3	**19.1**	0.0	37.8	**18.9**	40.0
DRMRDR 2349	4.5	12.5	35.6	10.6	**15.8**	17.3	62.2	65.0	43.1	28.0	85.0	5.6	**43.7**	25.0	1.1	**13.1**	9.5
DRMRDR 2319	0.0	3.5	20.0	2.8	**6.6**	27.8	64.5	70.0	55.6	30.0	92.5	16.7	**51.0**	42.5	42.2	**42.4**	7.0
PRD-2014-23	38.9	37.5	41.1	23.9	**35.3**	37.8	66.7	67.5	85.7	31.2	74.5	31.1	**56.3**	50.0	28.9	**39.4**	14.0
NRCHB 101 (SC)	46.7	32.5	53.4	20.0	**38.2**	33.6	55.6	70.0	46.2	31.6	89.8	17.8	**49.2**	37.5	37.8	**37.6**	16.0
DRMRDR 2322	0.0	0.0	7.8	3.3	**2.8**	31.1	62.2	57.5	59.7	27.6	94.5	17.8	**50.1**	42.5	44.4	**43.5**	13.5
PAB-17-11	26.7	10.0	57.8	17.2	**27.9**	37.2	64.5	52.5	71.6	31.1	79.8	20.0	**50.9**	52.5	7.8	**30.1**	18.5
DMH 1 (HC)	0.0	3.5	0.0	1.1	**1.2**	33.1	40.0	70.0	75.4	28.6	84.0	31.1	**51.7**	30.0	51.1	**40.6**	9.5
PRD-2014-8	35.6	25.0	42.2	17.8	**30.1**	39.1	62.2	65.0	84.3	30.0	80.0	31.1	**56.0**	47.5	35.6	**41.5**	14.0
PT 303 (Br-TC)	0.0	0.0	42.2	3.3	**11.4**	1.6	44.5	70.0	55.3	28.1	83.0	17.8	**42.9**	7.5	46.7	**27.1**	70.9
DRMRCI-170	4.5	5.0	48.9	3.9	**15.6**	13.2	55.6	70.0	45.0	30.1	83.5	4.4	**43.1**	17.5	15.6	**16.5**	11.5
CD(*P*=0.05)	**5.3**	**5.7**	**5.2**	**6.4**		**3.2**	**3.8**	**3.6**	**3.7**	**1.9**	**7.0**	**8.8**		**6.3**	**12.2**		**5.3**
CV (%)	**19.2**	**-**	**11.6**	**39.6**		**5.4**	**4.0**	**2.9**	**3.9**	**3.7**	**4.0**	**14.9**		**-**	**20.9**		**1.9**

WR: JAG, MOR and **LDH** excluded due to <20% severity in SC, **JHS** and **NDH** excluded due to disease severity in TC/RC is more than SC
PM: JAG and **PNT** excluded due to <20% severity in SC
DM: JAG and **MOR** excluded due to <20% severity in SC
SR: MOR and **LDH** excluded due to <20% severity in SC

Table 4.3.1: Reaction of oilseed Brassica germplasm against AB, WR, DM and SR in NDN for Alternaria blight (artificial condition)

Code No.	Entries	% ABL (100 DAS)							% ABP (15 days before harvest)				% WR (100 DAS)			% DM	% SR
		PNT	SHL	DOL	LDH	HSR	JHS	Mean	PNT	DOL	LDH	Mean	HSR	PNT	Mean	PNT	PNT
NDN-24-01	PAB- 2014-8	62.5	32.7	38.6	70.6	35.6	30.0	**45.0**	17.5	22.3	37.7	**25.8**	2.8	0.0	**1.4**	57.5	20.9
NDN-24-02	DRMRIJWR 20-15	52.5	34.6	39.4	71.0	30.0	10.5	**39.7**	20.0	22.2	39.0	**27.1**	0.0	0.0	**0.0**	45.0	12.5
NDN-24-03	PRD-2014-26	62.5	32.6	46.1	68.4	32.2	33.5	**45.9**	25.0	26.3	34.2	**28.5**	35.6	32.5	**34.1**	77.5	16.7
NDN-24-04	**NRCHB 101 (SC)**	52.5	32.6	34.8	71.1	21.1	10.6	**37.1**	47.5	21.0	38.7	**35.7**	45.6	20.0	**32.8**	87.5	14.2
NDN-24-05	DRMRSJ-349	65.0	34.0	40.0	73.2	30.0	32.9	**45.8**	27.5	27.3	37.2	**30.6**	0.0	0.0	**0.0**	87.5	22.5
NDN-24-06	PAB-2017-1	42.5	26.7	34.0	60.4	24.5	10.1	**33.0**	20.0	21.0	30.6	**23.9**	34.5	25.0	**29.8**	87.5	0.0
NDN-24-07	DRMRIJWR 20-16	42.5	18.0	38.6	72.7	23.4	30.3	**37.6**	22.5	22.3	38.2	**27.6**	4.5	10.0	**7.3**	90.0	20.9
NDN-24-08	**DRMRMJA-35 (RC-WR)**	52.5	33.7	41.3	74.7	27.8	30.7	**43.4**	27.5	24.0	37.2	**29.5**	0.0	0.0	**0.0**	97.5	16.7
NDN-24-09	PAB-2017-18	52.5	24.8	39.5	63.0	31.1	28.2	**39.9**	17.5	22.3	33.8	**24.5**	14.5	12.5	**13.5**	97.5	19.2
NDN-24-10	**NRCHB 101 (SC)**	52.5	36.7	44.0	71.2	22.2	11.5	**39.7**	45.0	24.8	39.0	**36.3**	48.9	17.5	**33.2**	87.5	20.9
NDN-24-11	DRMRSJ 22	42.5	33.9	42.5	71.5	33.4	11.2	**39.2**	27.5	24.4	36.8	**29.6**	12.8	10.0	**11.4**	92.5	25.0
NDN-24-12	PAB-2017-4	42.5	26.4	44.5	58.5	30.0	24.7	**37.8**	10.0	27.6	28.2	**21.9**	31.1	25.0	**28.1**	92.5	8.4
NDN-24-13	PAB-2014-4	45.0	26.2	41.3	63.6	36.7	31.0	**40.6**	12.5	23.9	38.8	**25.1**	2.8	12.5	**7.7**	97.5	10.9
NDN-24-14	**Rohini (SC)**	42.5	37.1	36.8	72.5	21.1	25.5	**39.2**	22.5	23.2	37.7	**27.8**	46.7	30.0	**38.4**	87.5	25.0
NDN-24-15	DRMRIJWR 20-19	50.0	38.7	40.4	73.7	29.5	10.7	**40.5**	27.5	24.6	36.7	**29.6**	0.0	0.0	**0.0**	87.5	16.7
NDN-24-16	PAB-2017-25	50.0	24.5	38.5	58.7	31.1	30.2	**38.8**	10.0	21.3	27.6	**19.6**	28.4	7.5	**18.0**	87.5	0.0
NDN-24-17	**PHR 2 (TC-AB)**	57.5	40.4	42.3	73.9	17.8	31.5	**43.9**	17.5	23.0	39.1	**26.5**	31.2	17.5	**24.4**	67.5	6.7
NDN-24-18	DRMR-PMJ-17	52.5	25.9	38.5	65.0	20.5	11.5	**35.6**	20.0	21.3	35.4	**25.5**	8.4	17.5	**13.0**	57.5	10.9
NDN-24-19	RH-1700-3	52.5	35.0	42.0	61.7	41.1	10.5	**40.5**	5.0	23.3	36.0	**21.4**	2.8	0.0	**1.4**	97.5	15.0
NDN-24-20	**DMH 1 (HC)**	47.5	34.3	40.8	64.6	38.9	11.2	**39.5**	15.0	23.0	36.0	**24.7**	0.0	0.0	**0.0**	77.5	6.7
NDN-24-21	DRMRIJWR 20-11	52.5	26.4	38.8	73.2	36.7	11.7	**39.9**	17.5	22.5	32.0	**24.0**	0.0	1.0	**0.5**	72.5	0.0
NDN-24-22	PAB-2017-22	55.0	26.9	39.8	59.2	33.4	25.8	**40.0**	17.5	22.3	37.1	**25.6**	4.5	0.0	**2.3**	57.5	2.5
NDN-24-23	**PDZ 1 (QC)**	57.5	25.5	37.0	71.4	31.1	27.7	**41.7**	60.0	23.5	37.1	**40.2**	0.0	0.0	**0.0**	37.5	10.9
NDN-24-24	DRMRHJ 3130	67.5	26.8	33.3	70.7	22.2	26.2	**41.1**	25.0	22.0	36.1	**27.7**	41.1	27.5	**34.3**	85.0	0.0
NDN-24-25	**RTM 314 (Es-C)**	57.5	26.4	36.5	75.5	35.6	12.6	**40.7**	50.0	22.5	36.9	**36.5**	0.0	0.0	**0.0**	35.0	79.2
NDN-24-26	PAB- 2014-18	52.5	26.3	39.6	62.3	24.5	30.0	**39.2**	15.0	23.2	35.0	**24.4**	4.5	15.0	**9.8**	52.5	8.4
NDN-24-27	**DRMRMJA-35 (RC-WR)**	57.5	27.2	39.9	75.5	25.1	20.6	**41.0**	37.5	23.0	37.5	**32.7**	0.0	0.0	**0.0**	90.5	10.9
NDN-24-28	PAB-2017-15	50.0	24.3	43.0	60.0	30.0	30.0	**39.5**	7.5	24.1	36.1	**22.5**	2.8	10.0	**6.4**	70.0	20.9
NDN-24-29	**GSL 1 (GSC)**	47.5	16.2	40.5	58.8	7.8	29.0	**33.3**	10.0	23.2	36.5	**23.2**	0.0	1.0	**0.5**	27.5	18.4
NDN-24-30	**PHR 2 (TC-AB)**	57.5	39.6	36.3	67.3	26.7	20.0	**41.2**	15.0	21.5	33.6	**23.4**	40.0	12.5	**26.3**	91.2	9.2
NDN-24-31	**PT 303 (Br-TC)**	62.5	35.6	34.9	74.8	38.9	12.2	**43.1**	62.5	20.8	39.1	**40.8**	0.0	0.0	**0.0**	0.0	47.5
NDN-24-32	**Rohini (SC)**	70.0	37.0	39.9	70.1	23.4	22.0	**43.7**	32.5	23.6	33.6	**29.9**	43.4	37.5	**40.5**	65.0	16.7
NDN-24-33	**BIOYSR (RC-WR)**	72.5	35.8	38.0	74.0	34.5	20.3	**45.8**	22.5	23.2	37.3	**27.7**	0.0	0.0	**0.0**	97.5	13.4
NDN-24-34	**BIOYSR (RC-WR)**	77.5	34.5	40.0	70.0	40.0	20.0	**47.0**	7.5	23.0	37.5	**22.7**	0.0	0.0	**0.0**	70.0	12.5
NDN-24-35	**DLSC 1 (Bc-C)**	47.5	16.5	39.0	46.7	8.4	12.3	**28.4**	7.5	23.3	15.4	**15.4**	0.0	0.0	**0.0**	0.0	16.7
NDN-24-36	PAB- 2014-7	62.5	36.4	35.4	69.4	33.4	25.2	**43.7**	15.0	20.8	32.1	**22.6**	0.0	10.0	**5.0**	82.5	0.0
NDN-24-37	**NRCYS-5-2 (YS-C)**	65.0	37.4	41.2	76.2	41.1	25.0	**47.6**	75.0	23.3	41.2	**46.5**	0.0	32.5	**16.3**	30.0	50.0
CD(P=0.05)		**11.5**	**2.6**	**3.5**	**4.7**	**4.6**	**1.1**		**9.4**	**2.8**	**3.1**		**7.2**	**8.8**		**9.8**	**6.6**
CV (%)		**-**	**3.8**	**4.4**	**4.1**	**7.0**	**1.8**		**-**	**5.0**	**4.1**		**23.9**	**3.1**		**-**	**-**

ABL: JAG excluded due to <20% severity in SC**, MOR** excluded either due to disease severity in TC/RC is more than SC or <20% severity in SC
ABP: JHS, HSR, JAG and **MOR** excluded due to <20% severity in SC, **SHL** excluded either due to disease severity in TC/RC is more than SC or <20% severity in SC
WR: LDH excluded either due to disease severity in TC/RC is more than SC or <20% severity in SC
PM: PNT excluded due to <20% severity in SC
SR: LDH excluded due to <20% severity in SC

Table 4.4.1: Reaction of oilseed *Brassica* germplasm against AB, WR, SR, PM & DM in NDN for White Rust

Code No.	Entries	% ABL			% ABP			% WR				% DM	% SR
		PNT	LDH	Mean	PNT	LDH	Mean	PNT	LDH	HSR	Mean	PNT	PNT
NDN-24-38	DRMRIJWR-20-11	37.5	38.1	**37.8**	27.5	20.3	**23.9**	0.0	1.5	0.0	**0.5**	79.2	68.4
NDN-24-39	PAB 14-7	52.5	40.5	**46.5**	20.0	17.1	**18.5**	12.5	3.3	1.7	**5.8**	92.5	15.0
NDN-24-40	DRMRIJWR-20-26	52.5	40.5	**46.5**	22.5	20.7	**21.6**	12.5	2.9	0.0	**5.1**	92.5	41.8
NDN-24-41	DRMRCI (Q) 57	45.0	50.7	**47.8**	22.5	26.1	**24.3**	1.0	0.0	0.0	**0.3**	32.5	10.9
NDN-24-42	DRMRSJ-271	57.5	38.4	**48.0**	47.5	21.4	**34.5**	3.5	0.0	0.0	**1.2**	52.5	25.0
NDN-24-43	DRMRIJWR-20-13	47.5	37.5	**42.5**	37.5	21.5	**29.5**	0.0	0.0	0.0	**0.0**	62.5	54.2
NDN-24-44	DRMRIJWR-20-24	62.5	37.1	**49.8**	17.5	21.7	**19.6**	0.0	0.0	0.0	**0.0**	82.5	62.5
NDN-24-45	RH- 1700-4	47.5	40.5	**44.0**	35.0	20.9	**27.9**	0.0	0.0	0.0	**0.0**	85.0	22.5
NDN-24-46	DRMRCI 153	60.0	43.2	**51.6**	50.0	22.2	**36.1**	15.0	0.0	0.0	**5.0**	20.0	26.7
NDN-24-47	**GSL 1 (GSC)**	37.5	44.9	**41.2**	37.5	25.1	**31.3**	1.0	0.0	0.0	**0.3**	0.0	15.0
NDN-24-48	DRMRIJ-12-44	60.0	41.1	**50.5**	25.0	25.5	**25.3**	0.0	0.0	0.0	**0.0**	72.8	22.5
NDN-24-49	DRMRIJWR-20-14	50.0	34.1	**42.1**	42.5	18.4	**30.4**	0.0	0.0	0.0	**0.0**	70.0	10.9
NDN-24-50	DRMRSJ-206	42.5	35.2	**38.9**	45.0	20.0	**32.5**	0.0	0.0	0.0	**0.0**	87.5	6.7
NDN-24-51	RH-1700-3	47.5	38.6	**43.0**	47.5	20.6	**34.0**	0.0	0.0	0.0	**0.0**	56.1	0.0
NDN-24-52	DRMRCI 168	52.5	45.5	**49.0**	40.0	26.6	**33.3**	0.0	0.0	0.0	**0.0**	0.0	9.2
NDN-24-53	**DLSC 1 (Bc-C)**	27.5	34.2	**30.8**	7.5	9.3	**8.4**	0.0	0.0	0.0	**0.0**	0.0	6.7
NDN-24-54	DRMRIJ 12-37	57.5	36.5	**47.0**	27.5	20.7	**24.1**	0.0	0.0	0.0	**0.0**	37.5	15.0
NDN-24-55	DRMR 2018-41	45.0	39.5	**42.3**	52.5	24.5	**38.5**	0.0	0.0	0.0	**0.0**	85.0	4.2
NDN-24-56	DRMRDR 2116	52.5	45.2	**48.8**	57.5	24.1	**40.8**	30.0	0.0	5.0	**11.7**	50.0	20.9
NDN-24-57	**NRCYS-5-2 (YS-C)**	57.5	54.9	**56.2**	77.5	36.1	**56.8**	25.0	0.0	0.0	**8.3**	0.0	63.4
NDN-24-58	DRMRCI 169	62.5	40.2	**51.4**	57.5	22.1	**39.8**	0.0	0.0	0.0	**0.0**	62.5	16.7
NDN-24-59	DRMR 2018-26	57.5	42.0	**49.8**	47.5	26.1	**36.8**	2.0	0.0	4.5	**2.2**	82.5	25.9
NDN-24-60	DRMRIJWR-20-15	60.0	42.5	**51.2**	52.5	26.9	**39.7**	0.0	0.0	0.0	**0.0**	82.5	18.4
NDN-24-61	DRMRCI 171	42.5	39.1	**40.8**	37.5	24.0	**30.7**	0.0	0.0	0.0	**0.0**	52.5	15.9
NDN-24-62	DRMRDR 2135	52.5	41.7	**47.1**	47.5	19.9	**33.7**	1.0	0.0	6.7	**2.6**	72.5	42.5
NDN-24-63	PAB 14-8	62.5	42.0	**52.3**	17.5	25.6	**21.5**	10.0	17.6	14.5	**14.0**	80.0	22.5
NDN-24-64	**PT 303 (Br-TC)**	65.0	54.8	**59.9**	67.5	35.9	**51.7**	1.0	0.0	0.0	**0.3**	52.5	61.7
NDN-24-65	**Rohini (SC)**	57.5	40.6	**49.1**	22.5	25.0	**23.7**	35.0	31.5	50.0	**38.8**	92.5	24.2
NDN-24-66	DRMR 2019-15	57.5	39.9	**48.7**	47.5	21.2	**34.3**	3.5	10.1	0.0	**4.5**	57.5	41.8
NDN-24-67	DRMRCI 182	57.5	49.8	**53.6**	40.0	30.2	**35.1**	0.0	0.0	0.0	**0.0**	80.0	26.7
NDN-24-68	DRMRDR 2141	60.0	40.0	**50.0**	27.5	25.4	**26.4**	10.0	0.0	7.8	**5.9**	87.5	28.4
NDN-24-69	PAB 14-18	67.5	53.0	**60.3**	27.5	27.8	**27.6**	0.0	0.0	0.0	**0.0**	67.5	20.9
NDN-24-70	**NRCHB 101 (SC)**	60.0	33.9	**47.0**	47.5	18.5	**33.0**	30.0	20.5	48.9	**33.1**	72.5	20.9
NDN-24-71	**PDZ 1(QC)**	42.5	47.4	**45.0**	37.5	25.4	**31.5**	0.0	0.0	0.0	**0.0**	55.0	0.0
NDN-24-72	DRMRIJWR-20-17	55.0	41.9	**48.5**	42.5	25.5	**34.0**	0.0	0.0	0.0	**0.0**	72.5	22.5
NDN-24-73	DRMR 2020-15	50.0	39.7	**44.8**	30.0	26.5	**28.3**	2.0	0.0	1.7	**1.2**	77.5	15.0
NDN-24-74	DRMRCI 190	62.5	53.6	**58.1**	37.5	29.9	**33.7**	0.0	0.0	0.0	**0.0**	47.5	5.9
NDN-24-75	DRMRDR 2152	55.0	51.0	**53.0**	22.5	27.9	**25.2**	0.0	0.0	2.8	**0.9**	77.5	10.9
NDN-24-76	RH-1700-1	52.5	50.3	**51.4**	37.5	26.4	**32.0**	17.5	0.0	0.0	**5.8**	52.5	32.5
NDN-24-77	DRMR 2018-1	47.5	46.9	**47.2**	40.0	26.0	**33.0**	0.0	0.0	0.0	**0.0**	77.5	10.9
NDN-24-78	**RTM 314 (Es-C)**	62.5	64.5	**63.5**	42.5	41.0	**41.7**	2.5	0.0	0.0	**0.8**	0.0	28.4
NDN-24-79	**Rohini (SC)**	47.5	38.7	**43.1**	32.5	23.9	**28.2**	37.5	41.5	51.1	**43.4**	48.4	4.2
NDN-24-80	**BioYSR (RC-WR)**	67.5	49.8	**58.6**	25.0	27.5	**26.2**	3.5	0.0	0.0	**1.2**	81.7	53.6
NDN-24-81	DRMRIJWR-20-19	42.5	41.8	**42.1**	32.5	26.9	**29.7**	0.0	0.0	0.0	**0.0**	52.5	15.0
NDN-24-82	DRMRCI 191	67.5	38.6	**53.0**	30.0	28.3	**29.2**	10.0	0.0	4.5	**4.8**	77.5	8.4
NDN-24-83	DRMRDR 2195	52.5	41.4	**47.0**	0.0	25.6	**12.8**	3.5	9.9	16.8	**10.1**	63.8	14.7
NDN-24-84	**NRCHB 101 (SC)**	57.5	47.4	**52.5**	12.5	25.3	**18.9**	37.5	17.0	50.0	**34.8**	63.4	42.5
NDN-24-85	DRMRSJ-349	65.0	43.8	**54.4**	10.0	21.6	**15.8**	12.5	23.7	20.5	**18.9**	27.5	4.2
NDN-24-86	DRMRDR 2155	67.5	43.8	**55.6**	12.5	23.2	**17.9**	1.0	0.0	1.7	**0.9**	47.5	0.0
NDN-24-87	DRMRCI-139	67.5	39.6	**53.5**	30.0	23.6	**26.8**	0.0	0.0	0.0	**0.0**	87.5	15.0
NDN-24-88	RH-1700	62.5	39.4	**50.9**	25.0	24.8	**24.9**	10.0	0.0	4.5	**4.8**	87.5	20.9
NDN-24-89	**DMH 1 (HC)**	57.5	41.1	**49.3**	20.0	25.7	**22.8**	0.0	0.0	0.0	**0.0**	62.5	9.2
NDN-24-90	DRMRCI 192	65.0	40.6	**52.8**	32.5	24.1	**28.3**	0.0	0.0	0.0	**0.0**	72.5	0.0
NDN-24-91	DRMRDR 2196	52.5	44.4	**48.4**	20.0	23.7	**21.8**	15.0	3.9	21.1	**13.3**	52.5	18.4
NDN-24-92	**BioYSR (RC-WR)**	77.5	39.9	**58.7**	27.5	25.7	**26.6**	12.5	0.0	0.0	**4.2**	82.5	22.5
NDN-24-93	**DRMRMJA-35 (RC-WR)**	42.5	37.0	**39.8**	25.0	22.5	**23.8**	0.0	0.0	0.0	**0.0**	87.5	16.7
NDN-24-94	DRMRM 18-35-11	55.0	40.3	**47.6**	32.5	26.4	**29.4**	1.0	0.0	0.0	**0.3**	82.5	20.9
NDN-24-95	DRMRIJWR-20-20	52.5	44.8	**48.7**	25.0	23.3	**24.1**	0.0	0.0	0.0	**0.0**	75.0	16.7
NDN-24-96	DRMRCI-131	72.5	47.4	**59.9**	37.5	22.6	**30.1**	0.0	0.0	0.0	**0.0**	97.5	23.4
NDN-24-97	DRMRDR 2235	72.5	39.3	**55.9**	15.0	21.7	**18.3**	20.0	3.2	23.4	**15.5**	52.3	16.7
NDN-24-98	DRMRCI-132	62.5	34.7	**48.6**	32.5	25.8	**29.1**	0.0	0.0	0.0	**0.0**	87.5	17.5
NDN-24-99	**DRMRMJA-35 (RC-WR)**	52.5	36.5	**44.5**	47.5	26.5	**37.0**	30.0	0.0	0.0	**10.0**	52.5	65.9
NDN-24-100	**PHR 2 (TC-AB)**	55.0	37.1	**46.0**	12.5	22.5	**17.5**	30.0	4.6	14.5	**16.4**	37.5	0.0
NDN-24-101	DRMRIJWR-20-21	60.0	30.7	**45.4**	15.0	23.7	**19.3**	10.0	0.0	0.0	**3.3**	40.0	24.2
NDN-24-102	RH 1400-1	52.5	35.4	**43.9**	25.0	25.7	**25.4**	17.5	3.9	32.2	**17.9**	72.5	22.5
NDN-24-103	**PHR 2 (TC-AB)**	**NG**	31.7	31.7	**NG**	22.7	22.7	**NG**	9.5	35.6	**22.6**	**NG**	**NG**
NDN-24-104	DRMRM 18-36-12	57.5	45.3	**51.4**	35.0	26.3	**30.6**	0.0	0.0	0.0	**0.0**	65.0	36.7
NDN-24-105	DRMRIJWR-20-23	**NG**	**37.7**	**37.7**	**NG**	**25.9**	**25.9**	**NG**	0.0	0.0	**0.0**	**NG**	**NG**
NDN-24-106	DRMRM 18-37-13	47.5	36.4	**42.0**	37.5	26.7	**32.1**	0.0	0.0	0.0	**0.0**	67.5	42.5
NDN-24-107	DRMRM-163	45.0	37.5	**41.3**	22.5	24.3	**23.4**	0.0	0.0	7.3	**2.4**	65.0	14.0
NDN-24-145	**PMW-18**	45.0	44.1	**44.5**	27.5	25.8	**26.7**	0.0	2.4	0.0	**0.8**	0.0	0.0
CD(*P*=0.05)		**10.7**	**4.5**		**8.1**	**4.4**		**7.4**	**3.4**	**4.2**		**8.7**	**6.4**
CV (%)		**-**	**5.6**		**-**	**7.5**		**-**	**38.6**	**28.5**		**-**	**-**

ABL: HSR excluded due to disease severity in TC/RC is more than SC
ABP: HSR excluded either due to disease severity in TC/RC is more than SC or <20% severity in SC
WR: MOR and **BPR** excluded due to <20% severity in SC, **JHS** excluded due to disease severity in TC/RC is more than SC
PM: PNT excluded due to <20% severity in SC
SR: LDH excluded due to <20% severity in SC

Table 4.5.1: Reaction of oilseed *Brassica* lines against AB and WR in NDN for Sclerotinia rot under artificial condition

Code No	Entries	% ABL					% ABP				% WR		
		HSR	PNT	SHL	LDH	Mean	PNT	SHL	LDH	Mean	HSR	PNT	Mean
NDN-24-108	DRMRIS 20-11	31.2	47.5	39.7	69.5	**47.0**	15.0	27.2	28.5	**23.6**	0.0	12.5	**6.3**
NDN-24-109	DRMRDR 2320	35.6	52.5	38.8	72.5	**49.8**	17.5	26.2	32.2	**25.3**	11.7	20.0	**15.9**
NDN-24-110	**Rohini (SC)**	20.5	65.0	37.1	68.1	**47.7**	15.0	26.9	27.3	**23.1**	51.1	37.5	**44.3**
NDN-24-111	DRMRIS 20-5	28.4	67.5	40.5	71.0	**51.8**	20.0	24.8	29.2	**24.7**	35.6	32.5	**34.1**
NDN-24-112	**NRCHB 101 (SC)**	26.7	62.5	37.0	64.0	**47.5**	37.5	25.0	26.2	**29.6**	38.9	37.5	**38.2**
NDN-24-113	**NRCHB 101 (SC)**	23.4	47.5	40.3	72.8	**46.0**	40.0	30.4	31.0	**33.8**	48.9	30.0	**39.5**
NDN-24-114	DRMRDR 2322	32.2	57.5	42.1	75.3	**51.8**	17.5	30.8	32.9	**27.0**	0.0	0.0	**0.0**
NDN-24-115	DRMRDR 2237	33.4	67.5	40.1	66.6	**51.9**	15.0	27.9	27.7	**23.5**	0.0	5.0	**2.5**
NDN-24-116	**BioYSR (RC-WR)**	28.4	77.5	39.0	68.2	**53.3**	32.5	26.0	27.3	**28.6**	0.0	0.0	**0.0**
NDN-24-117	DRMRIS 20-4	27.8	75.0	38.4	70.0	**52.8**	20.0	27.6	28.1	**25.2**	34.5	32.5	**33.5**
NDN-24-118	**BioYSR (RC-WR)**	29.5	70.0	41.6	72.8	**53.5**	17.5	22.6	32.0	**24.0**	0.0	0.0	**0.0**
NDN-24-119	DRMRDR 2317	30.0	72.5	34.9	65.3	**50.7**	27.5	26.4	27.4	**27.1**	0.0	1.0	**0.5**
NDN-24-120	**DRMRMJA-35 (RC-WR)**	24.5	47.5	36.1	72.3	**45.1**	17.5	26.3	31.8	**25.2**	0.0	5.0	**2.5**
NDN-24-121	DRMRDR 2349	35.6	57.5	39.4	70.4	**50.7**	27.5	26.7	31.6	**28.6**	8.9	17.5	**13.2**
NDN-24-122	DRMRIS 20-1	24.5	60.0	38.9	73.1	**49.1**	17.5	26.4	32.0	**25.3**	24.5	30.0	**27.3**
NDN-24-123	DRMRDR 2238	35.6	60.0	41.3	65.8	**50.7**	30.0	27.7	27.8	**28.5**	5.0	25.0	**15.0**
NDN-24-124	**DRMRMJA-35 (RC-WR)**	27.8	57.5	41.9	68.4	**48.9**	37.5	27.7	30.2	**31.8**	0.0	0.0	**0.0**
NDN-24-125	DRMRDR 2351	22.2	57.5	44.0	72.1	**48.9**	40.0	29.8	32.8	**34.2**	40.0	32.5	**36.3**
NDN-24-126	DRMRSJ-25	30.0	47.5	35.5	67.4	**45.1**	30.0	20.0	27.9	**26.0**	0.0	0.0	**0.0**
NDN-24-127	DRMRDR 2343	32.2	57.5	45.6	59.5	**48.7**	17.5	30.0	26.3	**24.6**	5.0	1.0	**3.0**
NDN-24-128	**NPC 16 (Bc)**	8.4	42.5	14.3	67.5	**33.2**	5.0	5.3	27.1	**12.5**	0.0	0.0	**0.0**
NDN-24-129	DRMRDR 2119	28.4	52.5	38.9	73.1	**48.2**	32.5	30.8	32.9	**32.1**	14.5	20.0	**17.3**
NDN-24-130	**Rohini (SC)**	32.2	57.5	36.0	65.0	**47.7**	15.0	29.2	27.4	**23.9**	30.0	30.0	**30.0**
NDN-24-131	DRMRDR 2239	33.4	65.0	34.7	62.5	**48.9**	20.0	28.8	27.5	**25.4**	0.0	0.0	**0.0**
NDN-24-132	DRMRDR 2156	23.4	67.5	33.0	71.7	**48.9**	22.5	26.5	31.6	**26.8**	25.1	20.0	**22.6**
NDN-24-133	**NRCYS-5-2 (YS-C)**	40.0	62.5	33.1	63.2	**49.7**	47.5	28.2	27.9	**34.5**	0.0	30.0	**15.0**
NDN-24-134	DRMRDR 2335	34.5	72.5	32.3	73.7	**53.2**	32.5	28.0	32.9	**31.1**	12.8	10.0	**11.4**
NDN-24-135	**NRCYS-5-2 (YS-C)**	36.7	67.5	40.9	72.2	**54.3**	50.0	30.2	31.7	**37.3**	0.0	35.0	**17.5**
NDN-24-136	DRMRDR 2352	27.8	72.5	34.0	68.5	**50.7**	37.5	27.8	27.4	**30.9**	0.0	0.0	**0.0**
NDN-24-137	DRMRSJ 361	24.5	62.5	30.9	67.0	**46.2**	30.0	19.6	27.6	**25.7**	0.0	12.5	**6.3**
NDN-24-138	DRMRDR 2342	32.2	57.5	43.6	68.6	**50.5**	17.5	31.7	32.2	**27.1**	20.5	20.0	**20.3**
NDN-24-139	**RH 1222-28(TC-SR)**	30.0	52.5	36.2	64.3	**45.7**	15.0	25.0	28.7	**22.9**	22.2	32.5	**27.4**
NDN-24-140	DRMRDR 2315	33.4	45.0	31.4	70.2	**45.0**	17.5	20.3	31.2	**23.0**	0.0	0.0	**0.0**
NDN-24-141	**RH 1222-28(TC-SR)**	30.0	57.5	38.9	71.2	**49.4**	30.0	27.2	31.1	**29.4**	11.7	15.0	**13.4**
NDN-24-142	DRMRDR 2220	27.8	62.5	34.6	67.3	**48.1**	45.0	24.8	27.1	**32.3**	4.5	0.0	**2.3**
NDN-24-143	**NPC 16 (Bc)**	7.8	40.0	19.3	68.4	**33.9**	30.0	12.7	28.1	**23.6**	0.0	0.0	**0.0**
NDN-24-144	PAB 2017-25	31.2	57.5	28.0	73.0	**47.4**	17.5	15.1	33.0	**21.9**	5.0	12.5	**8.8**
CD(P=0.05)		**-**	**8.3**	**3.0**	**3.5**		**5.6**	**2.9**	**-**		**-**	**9.0**	
CV(%)		**-**	**-**	**5.0**	**3.0**		**-**	**5.8**	**4.8**		**-**	**-**	

ABP: HSR excluded due to <20% severity in SC
WR: LDH excluded due to <20% severity in SC

Table 4.5.2: Reaction of oilseed *Brassica* germplasm to SR, DM and PM in NDN for Sclerotinia rot under artificial condition

Entries	% SR incidence								SR Lesion length (cm)								Stem Diameter (cm)			% DM
	HSR	MOR	PNT	SHL	BPR	DOL	JHS	Mean	HSR	PNT	SHL	BPR	DOL	JHS	LDH	Mean	SHL	BPR	Mean	PNT
DRMRIS 20-11	85.0	62.5	62.1	93.3	32.9	80.0	64.9	**68.7**	11.7	6.59	23.6	45.3	8.7	24.9	13.8	**19.2**	6.9	1.4	**4.1**	72.5
DRMRDR 2320	65.0	52.5	55.0	93.3	41.7	80.0	63.2	**64.4**	16.5	7.26	16.4	18.3	5.9	35.1	12.8	**16.0**	6.6	1.6	**4.1**	62.5
Rohini (SC)	85.0	60.0	32.5	86.7	40.0	100.0	74.0	**68.3**	19.0	1.69	25.1	12.6	7.6	54.9	9.2	**18.6**	3.7	1.6	**2.6**	87.5
DRMRIS 20-5	75.0	42.5	80.0	80.0	29.2	60.0	75.5	**63.2**	12.4	4.24	18.2	25.7	5.0	45.5	15.0	**18.0**	6.2	2.0	**4.1**	67.5
NRCHB 101 (SC)	65.0	57.5	85.0	93.3	55.0	40.0	80.5	**68.0**	12.0	4.24	26.5	38.5	3.6	34.6	24.3	**20.5**	2.8	1.7	**2.3**	87.5
NRCHB 101 (SC)	85.0	42.5	55.0	86.7	54.2	100.0	78.7	**71.7**	11.2	5.89	22.6	27.4	9.4	51.2	10.8	**19.8**	3.8	1.6	**2.7**	77.5
DRMRDR 2322	60.0	42.5	71.7	86.7	47.3	100.0	70.7	**68.4**	14.6	9.75	20.2	46.7	11.5	44.5	20.9	**24.0**	5.5	1.9	**3.7**	77.5
DRMRDR 2237	55.0	37.5	87.5	100.0	32.4	100.0	71.6	**69.1**	9.9	17.00	27.5	15.9	10.4	53.6	18.1	**21.8**	4.1	1.7	**2.9**	87.5
BioYSR (RC-WR)	65.0	22.5	75.0	86.7	49.1	100.0	71.4	**67.1**	16.9	6.44	22.3	59.3	11.2	43.5	10.7	**24.3**	4.2	2.0	**3.1**	77.5
DRMRIS 20-4	60.0	17.5	61.3	93.3	40.9	60.0	67.1	**57.2**	10.5	2.62	24.8	37.8	5.6	32.9	13.6	**18.2**	3.9	2.0	**2.9**	87.5
BioYSR (RC-WR)	75.0	5.0	68.6	100.0	31.3	80.0	84.4	**63.5**	14.2	6.89	29.4	31.5	6.2	44.8	17.6	**21.5**	4.3	1.8	**3.1**	92.5
DRMRDR 2317	85.0	22.5	49.4	86.7	47.3	100.0	79.0	**67.1**	17.2	5.56	16.7	18.5	12.6	32.8	13.4	**16.7**	5.8	1.7	**3.8**	60.0
DRMRMJA-35 (RC-WR)	55.0	37.5	82.5	93.3	42.0	80.0	77.7	**66.9**	13.8	3.50	30.4	49.8	4.4	25.8	8.1	**19.4**	3.0	1.2	**2.1**	77.5
DRMRDR 2349	65.0	37.5	93.9	100.0	36.4	100.0	61.1	**70.6**	15.6	6.87	20.6	23.8	10.0	32.9	17.0	**18.1**	5.5	1.8	**3.7**	72.5
DRMRIS 20-1	60.0	42.5	93.9	80.0	22.0	100.0	67.6	**66.6**	9.6	4.98	17.9	15.1	10.3	27.8	6.6	**13.2**	5.7	1.7	**3.7**	90.0
DRMRDR 2238	55.0	57.5	82.8	73.3	45.8	20.0	75.1	**58.5**	18.4	4.91	27.9	28.5	2.0	31.2	13.3	**18.0**	5.2	1.4	**3.3**	77.5
DRMRMJA-35 (RC-WR)	65.0	52.5	37.5	80.0	37.2	100.0	80.5	**64.7**	17.6	3.11	20.5	32.8	7.9	37.0	20.1	**19.9**	4.1	1.3	**2.7**	75.0
DRMRDR 2351	60.0	62.5	52.2	93.3	56.3	100.0	71.4	**70.8**	19.5	3.83	20.9	44.1	10.3	61.8	10.7	**24.4**	7.1	1.5	**4.3**	63.3
DRMRSJ-25	50.0	17.5	55.0	73.3	40.1	100.0	76.4	**58.9**	21.6	3.25	20.2	43.0	12.8	44.2	23.2	**24.0**	5.9	1.4	**3.6**	80.0
DRMRDR 2343	75.0	62.5	82.8	93.3	31.5	100.0	66.5	**73.1**	13.6	13.28	22.1	34.0	12.4	37.6	7.8	**20.1**	6.2	1.6	**3.9**	87.5
NPC 16 (Bc)	35.0	57.5	38.3	53.3	35.7	80.0	71.8	**53.1**	7.7	3.97	18.3	14.5	12.5	41.9	28.3	**18.2**	3.4	2.2	**2.8**	0.0
DRMRDR 2119	70.0	57.5	55.0	86.7	38.2	100.0	85.4	**70.4**	22.6	5.97	32.5	28.5	15.2	22.8	26.3	**22.0**	4.8	1.8	**3.3**	68.4
Rohini (SC)	65.0	42.5	38.3	86.7	33.3	80.0	71.3	**59.6**	16.0	5.46	29.9	22.3	3.2	55.2	26.0	**22.6**	4.6	1.3	**3.0**	82.5
DRMRDR 2239	75.0	37.5	71.7	86.7	35.9	100.0	74.6	**68.8**	13.2	6.70	22.5	18.3	16.4	54.3	12.8	**20.6**	5.0	1.5	**3.2**	52.5
DRMRDR 2156	45.0	17.5	26.4	86.7	23.6	80.0	64.6	**49.1**	9.9	2.75	24.9	10.3	8.2	57.2	20.7	**19.1**	5.9	2.0	**4.0**	55.0
NRCYS-5-2 (YS-C)	95.0	57.5	75.0	86.7	40.2	100.0	66.8	**74.5**	28.5	12.79	38.3	27.6	7.9	55.4	11.3	**26.0**	3.8	1.0	**2.4**	17.5
DRMRDR 2335	70.0	62.5	25.0	80.0	36.5	100.0	76.7	**64.4**	15.4	3.61	32.5	13.2	11.4	43.9	45.5	**23.6**	5.2	1.7	**3.5**	72.5
NRCYS-5-2 (YS-C)	100.0	7.5	75.0	100.0	68.9	100.0	70.1	**74.5**	28.0	11.16	32.9	37.7	6.8	51.5	14.1	**26.0**	4.2	1.3	**2.8**	22.5
DRMRDR 2352	85.0	37.5	55.0	86.7	47.8	100.0	61.8	**67.7**	22.7	4.67	18.5	22.4	13.2	15.0	14.5	**15.9**	6.5	1.6	**4.1**	67.5
DRMRSJ 361	65.0	17.5	60.6	86.7	33.0	100.0	87.2	**64.3**	15.3	7.06	18.6	21.2	14.2	24.0	13.9	**16.3**	4.8	1.1	**2.9**	77.5
DRMRDR 2342	40.0	57.5	65.0	93.3	31.0	100.0	71.0	**65.4**	6.7	8.42	30.6	10.9	12.8	33.0	14.8	**16.7**	4.9	1.7	**3.3**	87.5
RH 1222-28(TC-SR)	70.8	62.5	35.0	86.7	56.3	100.0	84.9	**70.9**	15.6	3.58	30.4	20.8	11.2	23.1	11.5	**16.6**	4.1	1.9	**3.0**	57.5
DRMRDR 2315	76.0	57.5	55.0	86.7	51.4	60.0	79.0	**66.5**	15.5	7.10	21.6	25.5	3.9	24.9	24.9	**17.6**	4.7	1.7	**3.2**	92.5
RH 1222-28(TC-SR)	75.0	7.5	38.3	93.3	45.0	100.0	70.3	**61.4**	16.0	4.19	34.9	29.9	9.2	33.9	24.8	**21.8**	4.9	1.5	**3.2**	67.5
DRMRDR 2220	72.0	17.5	67.5	86.7	28.9	100.0	60.4	**61.9**	12.7	5.58	25.9	44.5	8.8	12.5	14.8	**17.8**	4.0	1.9	**2.9**	77.5
NPC 16 (Bc)	37.5	7.5	49.4	66.7	28.2	60.0	61.2	**44.4**	7.6	6.11	15.3	18.0	5.0	8.5	7.3	**9.7**	6.1	2.0	**4.1**	0.0
PAB 2017-25	40.0	0.0	45.0	93.3	32.5	100.0	-	**51.8**	7.1	6.42	33.6	19.4	21.6	-	27.0	**19.2**	4.3	2.9	**3.6**	37.5
CD(P=0.05)	**-**	**6.8**	**9.3**	**20.7**	**5.9**	**11.7**	**1.6**		**-**	**5.3**	**4.3**	**-**	**-**	**2.0**	**9.7**		**0.9**	**-**		**10.0**
CV(%)	**-**	**9.3**	**-**	**17.2**	**7.5**	**7.4**	**2.3**		**-**	**-**	**10.7**	**-**	**-**	**2.7**	**20.1**		**10.9**	**-**		**-**

SR: VAR excluded due to <20% severity in SC
PM: PNT excluded due to <20% severity in SC

Table: 4.6.1: Reaction of IVT entries of Brassica against Alternaria blight under natural condition

Code No.		Entries	% ABL								% ABP					
Plant Pathology	PC Unit		HSR	MOR	PNT	SHL	DOL	LDH	JHS	Mean	HSR	PNT	SHL	DOL	LDH	Mean
SIVT-24-01	YSCN-24-05	**PYS 2021-21**	36.7	25.6	62.5	35.7	39.6	49.2	24.3	**39.1**	30.0	65.0	24.1	28.9	25.5	**34.7**
SIVT-24-02	MCN(E)-24-02	**DRMRHT 13-2**	22.2	41.4	52.5	34.8	40.9	47.7	25.8	**37.9**	16.8	30.0	21.0	30.1	25.8	**24.7**
SIVT-24-03	TCN-24-06	**TKM 24-1**	34.5	31.6	57.5	33.9	38.9	56.6	11.5	**37.8**	22.2	45.0	19.8	28.3	32.2	**29.5**
SIVT-24-04	MCN(E)-24-10	**JD 6 (ZC)**	28.4	30.0	47.5	35.7	39.1	43.9	30.0	**36.4**	21.1	30.0	20.5	29.6	23.5	**24.9**
SIVT-24-05	TCN-24-01	**PTC-2021-1**	35.6	28.5	62.5	34.0	42.8	50.1	27.6	**40.1**	24.5	60.0	20.1	32.2	26.5	**32.7**
SIVT-24-06	TCN-24-03	**BAUT-08-12**	36.7	28.3	57.5	35.1	41.3	53.2	27.2	**39.9**	30.0	55.0	21.4	31.3	27.6	**33.1**
SIVT-24-07	YSCN-24-08	**YSKM 24-1**	34.5	42.0	62.5	36.8	39.6	53.4	11.7	**40.1**	26.7	60.0	22.1	28.3	37.0	**34.8**
SIVT-24-08	MCN(E)-24-03	**RH 2399-2**	24.5	45.4	47.5	36.1	33.5	49.1	25.2	**37.3**	15.6	30.0	23.3	24.9	26.3	**24.0**
SIVT-24-09	MCN(E)-24-11	**PRE 2022-12**	35.6	28.3	42.5	34.9	40.9	44.0	30.0	**36.6**	22.2	40.0	22.0	30.1	24.7	**27.8**
SIVT-24-10	MCN(E)-24-13	**PM 25**	23.4	41.1	52.5	35.4	36.4	45.8	26.4	**37.3**	17.8	40.0	22.4	26.6	25.7	**26.5**
SIVT-24-11	TCN-24-04	**TS 38 (LR)**	33.4	42.3	62.5	34.6	37.1	48.5	23.9	**40.3**	26.7	60.0	20.6	27.8	28.5	**32.7**
SIVT-24-12	YSCN-24-07	**Pitambari (LR)**	41.1	46.7	72.5	36.5	38.3	55.2	30.9	**45.9**	32.2	70.0	22.8	28.7	31.0	**36.9**
SIVT-24-13	MCN(E)-24-09	**KMR (E) 24-1**	29.5	30.7	67.5	35.0	43.3	55.8	30.0	**41.7**	21.1	40.0	21.6	34.0	27.5	**28.8**
SIVT-24-14	TCN-24-02	**JT-17-1**	38.9	21.6	67.5	33.5	40.7	53.7	32.2	**41.1**	28.4	50.0	20.2	31.1	30.1	**32.0**
SIVT-24-15	MCN(E)-24-14	**PRE 2022-6**	30.0	34.7	52.5	35.2	39.7	43.2	30.0	**37.9**	18.9	30.0	21.2	29.4	24.8	**24.9**
SIVT-24-16	MCN(E)-24-05	**GDM 4 (LR)**	24.5	38.4	**NG**	34.5	40.7	49.4	30.0	**36.2**	15.6	**NG**	20.2	31.1	25.9	**23.2**
SIVT-24-17	TCN-24-05	**PTC 2021-2**	36.7	32.9	55.0	33.8	42.2	55.3	25.1	**40.1**	26.7	57.5	21.4	31.4	33.8	**34.1**
SIVT-24-18	MCN(E)-24-08	**DRMRCI 206**	20.5	42.0	65.0	34.8	40.7	49.2	12.2	**37.8**	14.5	47.5	21.1	31.1	24.4	**27.7**
SIVT-24-19	YSCN-24-10	**Benoy (ZC)**	38.9	31.8	72.5	36.3	37.3	56.5	15.0	**41.2**	28.4	67.5	21.9	28.9	34.8	**36.3**
SIVT-24-20	MCN(E)-24-15	**KMR (E) 24-2**	27.8	44.9	52.5	35.3	40.7	51.8	28.8	**40.2**	20.5	42.5	20.9	31.1	28.1	**28.6**
SIVT-24-21	YSCN-24-01	**BRYS 2**	35.6	28.5	62.5	32.0	41.8	54.3	25.8	**40.0**	23.4	70.0	20.0	31.0	31.6	**35.2**
SIVT-24-22	YSCN-24-06	**BYS-24**	33.4	30.0	60.0	32.7	39.1	55.6	21.3	**38.9**	26.7	65.0	20.8	29.5	30.5	**34.5**
SIVT-24-23	TCN-24-08	**TKM 24-2**	36.7	34.5	60.0	37.2	40.1	54.3	32.9	**42.2**	30.0	62.5	22.5	30.9	37.5	**36.7**
SIVT-24-24	MCN(E)-24-06	**HUJM (E) 23-7**	28.4	36.2	52.5	36.0	37.0	53.7	30.0	**39.1**	21.1	37.5	21.8	27.8	26.8	**27.0**
SIVT-24-25	YSCN-24-02	**YSKM 24-2**	40.0	50.0	57.5	35.5	39.1	52.9	24.5	**42.8**	32.2	67.5	22.1	29.8	36.1	**37.5**
SIVT-24-26	YSCN-24-11	**DRMRYS 24-3**	38.9	46.3	60.0	36.0	35.5	55.1	29.7	**43.1**	25.1	62.5	22.0	27.5	32.8	**34.0**
SIVT-24-27	MCN(E)-24-12	**NJI 24-104**	26.7	41.8	57.5	36.5	40.8	46.1	21.1	**38.6**	18.9	37.5	23.6	31.0	26.6	**27.5**
SIVT-24-28	YSCN-24-12	**PYS 2020-3**	41.1	45.6	67.5	35.4	36.1	54.1	26.1	**43.7**	30.0	72.5	21.8	28.9	32.3	**37.1**
SIVT-24-29	YSCN-24-03	**YSH 401 (NC)**	35.6	35.1	67.5	35.2	38.6	55.2	30.0	**42.4**	26.7	72.5	22.0	29.8	28.6	**35.9**
SIVT-24-30	TCN-24-09	**CG Toria-02**	28.9	41.8	67.5	37.7	42.2	55.8	32.3	**43.7**	20.5	27.5	25.9	31.0	27.2	**26.4**
SIVT-24-31	MCN(E)-24-07	**RH 1999-18**	22.2	28.5	62.5	34.5	36.3	52.3	27.8	**37.7**	16.8	42.5	21.6	28.1	29.4	**27.7**
SIVT-24-32	TCN-24-07	**Bhawani (ZC)**	36.7	34.9	57.5	35.7	25.8	56.3	30.0	**39.5**	27.2	22.5	21.6	17.9	32.0	**24.2**
SIVT-24-33	YSCN-24-04	**DRMRYS 202**	35.6	20.7	67.5	35.2	25.0	58.3	21.1	**37.6**	24.5	67.5	21.4	17.3	28.6	**31.9**
SIVT-24-34	MCN(E)-24-04	**Kesari 5113**	33.4	20.7	42.5	32.7	29.1	50.3	33.0	**34.5**	22.2	42.5	21.8	17.9	27.5	**26.4**
SIVT-24-35	TCN-24-10	**PT 303 (NC)**	38.9	23.1	50.0	33.1	37.3	56.2	24.1	**37.5**	28.4	62.5	21.4	29.3	28.4	**34.0**
SIVT-24-36	MCN(E)-24-16	**NPJ 275**	30.0	20.7	42.5	34.1	39.7	52.1	22.8	**34.5**	18.9	22.5	20.9	29.8	26.2	**23.6**
SIVT-24-37	YSCN-24-09	**RMYS 6**	33.4	33.4	57.5	31.0	36.3	54.9	25.2	**38.8**	26.7	57.5	17.1	26.8	29.0	**31.4**
SIVT-24-38	MCN(E)-24-01	**NPJ 274**	20.0	22.2	42.5	33.4	35.7	47.3	24.0	**32.2**	15.6	22.5	19.0	26.8	24.3	**21.6**
SIVT-24-39	MCN-24-14	**RL-19-237**	31.1	38.9	57.5	39.7	30.1	50.4	28.9	**39.5**	18.9	17.5	25.3	20.0	25.6	**21.5**
SIVT-24-40	MCN-24-27	**RCC 4 (ZC)**	26.7	40.0	57.5	38.2	37.9	50.4	31.8	**40.3**	20.5	17.5	21.4	29.3	27.5	**23.2**
SIVT-24-41	MCN-24-04	**DRMRCI 195**	23.4	19.6	62.5	33.9	40.3	50.0	27.0	**36.6**	18.9	32.5	19.0	29.8	28.8	**25.8**
SIVT-24-42	MCNR-24-06	**BAUM 13-6**	28.4	18.9	52.5	32.7	37.3	46.7	24.6	**34.4**	22.2	32.5	19.4	29.3	25.3	**25.7**
SIVT-24-43	MCN-24-01	**TM 416**	32.2	18.0	62.5	32.2	39.9	50.5	30.0	**37.9**	20.5	32.5	21.2	30.1	26.7	**26.2**
SIVT-24-44	MCN-24-16	**HUJM 23-12**	27.8	21.6	40.0	39.1	37.7	53.9	21.8	**34.5**	18.9	17.5	27.0	28.3	27.5	**23.8**
SIVT-24-45	MCNR-24-03	**RH 1424 (LR)**	23.4	38.7	50.0	37.7	37.8	51.8	26.1	**37.9**	15.6	12.5	25.8	27.0	26.2	**21.4**
SIVT-24-46	MCNR-24-10	**NPJ 280**	22.2	42.5	60.0	42.0	35.4	47.5	32.3	**40.3**	16.8	12.5	30.7	24.3	25.0	**21.8**
SIVT-24-47	MCN-24-07	**RL-19-162**	28.4	19.3	70.0	39.7	37.8	50.2	32.6	**39.7**	20.5	42.5	30.2	29.0	26.9	**29.8**
SIVT-24-48	MCN-24-21	**NPJ 278**	30.0	29.2	65.0	36.2	38.3	47.1	26.0	**38.8**	21.1	22.5	19.0	28.9	22.2	**22.7**
SIVT-24-49	MCN-24-24	**AKMS 1003-50**	28.9	15.4	60.0	35.4	36.5	52.2	29.2	**36.8**	22.2	17.5	18.0	27.0	28.5	**22.6**
SIVT-24-50	MCN(E)-24-17	**DRMRHT 22125**	25.1	31.8	65.0	32.9	36.3	55.1	32.7	**39.8**	20.0	12.5	19.3	27.5	29.4	**21.7**
SIVT-24-51	MCN-24-08	**RKM 460**	27.8	16.0	70.0	33.7	40.7	49.9	11.6	**35.7**	18.9	32.5	18.2	31.0	26.5	**25.4**
SIVT-24-52	MCN-24-11	**SKM 2206**	26.7	20.7	67.5	34.6	37.3	46.7	28.1	**37.4**	22.2	27.5	18.3	28.1	23.5	**23.9**
SIVT-24-53	MCN-24-18	**PR-2020-16**	27.2	30.5	60.0	37.4	36.6	50.2	26.4	**38.3**	16.8	15.0	20.5	28.1	27.5	**21.6**
SIVT-24-54	MCN-24-28	**DRMR 2022-4**	31.7	36.5	55.0	33.7	44.3	49.6	25.1	**39.4**	24.5	37.5	20.9	34.4	26.9	**28.8**
SIVT-24-55	MCNR-24-05	**RKM 588**	30.0	17.4	70.0	39.6	41.8	52.6	30.0	**40.2**	22.2	12.5	27.2	31.0	28.5	**24.3**
SIVT-24-56	MCNR-24-08	**DRMRHT 2090**	28.4	23.1	**NG**	32.2	40.5	51.5	27.3	**33.8**	16.8	**NG**	21.7	32.2	28.9	**24.9**
SIVT-24-57	MCN-24-03	**ORM 2019-31**	23.4	20.0	60.0	33.5	38.9	46.8	24.9	**35.4**	20.0	30.0	22.6	26.8	25.4	**24.9**
SIVT-24-58	MCN-24-09	**RGN 593**	31.2	40.7	55.0	35.7	37.1	55.9	22.9	**39.8**	18.9	25.0	23.2	26.4	29.2	**24.5**
SIVT-24-59	MCN-24-19	**CS 2009-219**	27.8	22.7	60.0	40.2	40.3	49.8	30.0	**38.7**	20.0	55.0	27.2	30.1	25.8	**31.6**
SIVT-24-60	MCN-24-22	**RH 2263**	24.5	16.5	45.0	38.7	40.6	46.1	32.1	**34.8**	18.9	30.0	25.2	29.4	27.3	**26.2**
SIVT-24-61	MCN-24-26	**RB 118**	32.2	30.7	40.0	43.3	41.8	52.3	31.6	**38.8**	25.1	22.5	28.9	31.0	26.3	**26.8**
SIVT-24-62	MCNR-24-09	**CAURM 4-1S**	30.0	20.0	65.0	35.2	37.5	43.3	31.6	**37.5**	21.1	30.0	20.6	26.4	26.7	**24.9**
SIVT-24-63	MCNR-24-01	**RH 2299-64**	23.4	26.7	50.0	32.5	38.1	45.9	16.6	**33.3**	16.8	20.0	18.2	26.8	27.5	**21.8**
SIVT-24-64	MCN-24-12	**NPJ 279**	25.1	32.0	62.5	41.5	40.3	53.9	35.1	**41.5**	20.5	32.5	26.9	30.1	27.9	**27.6**
SIVT-24-65	MCN-24-05	**KMR 24-4**	27.2	28.9	67.5	41.2	37.5	50.3	30.6	**40.4**	16.8	25.0	30.9	30.0	26.8	**25.9**
SIVT-24-66	MCNR-24-07	**NPJ 281**	29.5	27.1	42.5	38.3	37.9	38.9	28.1	**34.6**	17.8	20.0	21.6	28.6	20.9	**21.8**
SIVT-24-67	MCN-24-20	**18-52**	27.8	19.8	52.5	34.9	37.1	38.2	30.0	**34.3**	18.9	27.5	18.1	27.6	22.0	**22.8**
SIVT-24-68	MCN-24-13	**DRMRIJ 21-57**	28.4	34.7	57.5	38.4	36.4	35.0	36.8	**38.2**	21.1	45.0	20.0	27.6	23.2	**27.4**
SIVT-24-69	MCN-24-06	**SKM 2209**	24.5	24.0	62.5	37.2	43.9	53.0	27.6	**38.9**	20.5	27.5	20.6	31.5	27.9	**25.6**
SIVT-24-70	MCN-24-02	**PYR 2018-1**	33.4	27.8	62.5	31.8	44.7	44.7	22.9	**38.2**	22.2	45.0	18.8	33.4	25.9	**29.0**
SIVT-24-71	MCN-24-10	**RH 2399-6**	28.4	26.4	57.5	31.7	36.4	42.5	26.0	**35.6**	16.8	30.0	21.5	26.8	27.2	**24.4**
SIVT-24-72	MCN(E)-24-18	**Pro 5111 (H. Check)**	31.2	24.0	52.5	30.4	32.8	41.7	32.1	**35.0**	21.1	40.0	20.8	24.2	23.9	**26.0**
SIVT-24-73	MCN-24-15	**Kranti (NC)**	24.5	30.3	50.0	32.8	35.4	41.9	23.7	**34.1**	20.5	40.0	20.8	28.9	26.5	**27.3**
SIVT-24-74	MCN-24-23	**KMR 24-3**	27.2	28.5	52.5	34.3	36.4	45.8	27.0	**35.9**	23.4	12.5	20.1	29.3	26.1	**22.3**
SIVT-24-75	MCNR-24-02	**HUJM 23-12**	28.9	22.0	37.5	33.5	36.4	52.2	29.1	**34.2**	24.5	17.5	18.5	26.8	29.9	**23.4**
SIVT-24-76	MCNR-24-04	**DRMR 2019-16**	34.5	30.5	55.0	39.0	43.3	41.6	30.7	**39.2**	22.2	30.0	24.0	30.9	23.4	**26.1**
SIVT-24-77	MCNR-24-11	**DRMRIJ 138**	27.8	22.7	42.5	33.2	33.1	39.9	29.5	**32.7**	18.9	25.0	19.0	22.2	26.9	**22.4**
SIVT-24-78	MCN-24-17	**ACN231**	31.2	24.5	37.5	39.5	33.9	38.7	24.1	**32.8**	20.5	32.5	24.6	25.6	24.8	**25.6**
SIVT-24-79	MCN-24-25	**RH 1975 (LR)**	32.2	28.5	42.5	32.4	38.3	39.7	30.0	**34.8**	22.2	40.0	19.7	28.1	25.7	**27.1**
SIVT-24-80	MCNL-24-10	**NPJ 276**	31.1	20.7	47.5	33.1	38.9	36.9	26.9	**33.6**	24.5	40.0	18.4	27.4	23.1	**26.7**
SIVT-24-81	MCNL-24-03	**DRMR 2022-16**	23.4	26.2	47.5	40.3	38.3	35.4	29.0	**34.3**	20.5	47.5	22.0	28.1	25.5	**28.7**
SIVT-24-82	MCNR-24-13	**RH 725 (ZC)**	27.8	32.5	62.5	32.4	34.3	46.2	30.0	**37.9**	18.9	20.0	20.8	26.4	27.5	**22.7**
SIVT-24-83	MH-24-02	**US 8787**	27.2	41.3	52.5	33.2	31.2	43.6	24.9	**36.3**	16.8	30.0	21.3	22.5	28.4	**23.8**
SIVT-24-84	MH-24-08	**NRCHB 506**	33.4	44.2	42.5	31.5	36.9	37.8	32.8	**37.0**	23.4	17.5	18.5	26.5	24.8	**22.1**
SIVT-24-85	MCNL-24-15	**PRL-2022-5**	28.4	38.5	57.5	40.3	37.3	40.3	31.3	**39.1**	16.8	22.5	26.3	27.0	26.5	**23.8**

SIVT-24-86	MH-24-05	**NJH 24-101**	23.4	42.9	62.5	39.4	38.9	40.4	29.0	**39.5**	20.5	15.0	24.3	27.4	27.4	**22.9**
SIVT-24-87	MCNL-24-17	**KMR (L) 24-6**	31.2	41.6	42.5	40.8	40.6	42.6	29.6	**38.4**	18.9	50.0	23.8	29.0	24.3	**29.2**
SIVT-24-88	MCNL-24-06	**Radhika (LR)**	33.4	41.4	52.5	33.3	29.4	37.6	32.1	**37.1**	21.1	30.0	18.1	20.4	22.3	**22.4**
SIVT-24-89	MCNR-24-18	**DRMRCI 196**	29.5	42.7	57.5	45.2	44.7	42.3	32.6	**42.1**	17.8	25.0	25.0	32.8	24.4	**25.0**
SIVT-24-90	MH-24-11	**RHH 2401**	30.0	32.7	52.5	41.4	32.3	39.5	37.5	**38.0**	22.2	35.0	27.4	23.1	25.2	**26.6**
SIVT-24-91	MCNR-24-16	**RGN 599**	32.2	52.7	67.5	40.5	34.3	49.7	36.2	**44.7**	25.1	22.5	26.5	26.4	27.4	**25.6**
SIVT-24-92	MCNL-24-08	**PM 26 (ZC)**	31.7	32.9	52.5	39.9	30.3	43.1	26.6	**36.7**	20.5	50.0	26.1	20.8	27.8	**29.0**
SIVT-24-93	MCNL-24-13	**SVJH-78**	28.9	31.8	57.5	40.1	36.4	45.5	31.6	**38.8**	21.1	25.0	25.3	25.3	25.8	**24.5**
SIVT-24-94	MCNL-24-21	**HUJM 23-4**	25.1	38.9	57.5	39.3	26.8	50.6	24.8	**37.6**	18.9	35.0	25.8	18.3	23.8	**24.3**
SIVT-24-95	MH-24-06	**PHR 10265**	23.4	43.6	57.5	40.3	28.9	47.5	30.0	**38.7**	15.6	37.5	26.6	21.8	24.2	**25.1**
SIVT-24-96	MH-24-09	**SVJH-77**	26.7	40.0	37.5	31.9	32.7	39.8	31.6	**34.3**	22.2	45.0	20.5	21.5	23.7	**26.6**
SIVT-24-97	MCNR-24-17	**RH 2265**	27.2	23.1	52.5	34.5	33.9	42.1	22.8	**33.7**	16.8	30.0	19.6	23.2	23.4	**22.6**
SIVT-24-98	MCNL-24-04	**PRL 2022-1**	31.7	44.0	57.5	38.7	35.2	35.1	31.6	**39.1**	24.5	32.5	21.3	25.4	22.8	**25.3**
SIVT-24-99	MCNL-24-11	**RH 2374**	30.0	27.4	47.5	39.7	40.3	48.2	33.2	**38.0**	22.2	35.0	21.3	29.4	27.5	**27.1**
SIVT-24-100	MCNL-24-19	**TM 132-1**	25.1	39.8	52.5	31.4	44.4	48.8	31.0	**39.0**	20.0	22.5	20.1	31.7	27.7	**24.4**
SIVT-24-101	MCNL-24-20	**DRMRDR 2141**	34.5	30.0	47.5	34.1	42.8	43.6	28.7	**37.3**	22.2	30.0	21.1	30.0	26.7	**26.0**
SIVT-24-102	MH-24-22	**RHH 2402**	31.1	34.7	42.5	34.1	44.7	56.2	25.9	**38.4**	18.9	22.5	20.0	32.3	27.4	**24.2**
SIVT-24-103	MH-24-07	**KBH 5256**	28.9	40.7	47.5	31.5	42.5	53.4	32.0	**39.5**	21.1	40.0	20.5	30.0	26.3	**27.6**
SIVT-24-104	MCNL-24-18	**RH 2370**	26.7	34.7	42.5	34.3	41.8	54.8	27.7	**37.5**	20.0	20.0	21.3	29.4	25.6	**23.2**
SIVT-24-105	MCNL-24-09	**RGN 592**	29.5	42.5	45.0	35.5	44.4	56.3	33.9	**41.0**	22.2	17.5	21.8	31.7	24.8	**23.6**
SIVT-24-106	MCNL-24-01	**NPJ 277**	31.1	29.6	52.5	36.2	38.3	45.2	27.3	**37.2**	24.5	20.0	22.3	29.0	22.5	**23.6**
SIVT-24-107	MCNL-24-05	**ORM 2019-30**	33.4	29.1	47.5	34.2	38.9	48.3	25.7	**36.7**	23.4	40.0	21.5	28.7	23.3	**27.4**
SIVT-24-108	MCNR-24-14	**RMM 19-06**	30.0	43.8	52.5	34.0	39.9	53.4	34.2	**41.1**	22.2	25.0	20.2	25.3	27.9	**24.1**
SIVT-24-109	MCNR-24-12	**RAURD 14-18**	22.2	31.2	57.5	39.5	40.9	45.4	27.5	**37.7**	16.8	50.0	28.0	28.9	23.5	**29.4**
SIVT-24-110	MCNL-24-07	**RMWR 19-01**	27.8	46.2	42.5	35.7	44.4	47.1	24.1	**38.3**	21.1	22.5	20.2	30.3	24.3	**23.7**
SIVT-24-111	MCNL-24-16	**RKM 599**	28.9	42.7	47.5	37.9	43.1	50.1	32.0	**40.3**	20.5	40.0	22.1	31.7	28.5	**28.5**
SIVT-24-112	MH-24-01	**Pusa MH 194**	31.7	33.1	42.5	39.3	38.8	51.4	37.2	**39.1**	18.9	25.0	22.7	25.3	24.6	**23.3**
SIVT-24-113	MCNL-24-14	**Pusa MH 218**	21.1	34.3	47.5	34.3	37.3	51.9	30.0	**36.6**	16.8	40.0	19.5	26.1	26.8	**25.8**
SIVT-24-114	MH-24-10	**DRMRHJ 520**	30.0	36.5	52.5	41.2	41.4	49.8	30.5	**40.3**	23.4	20.0	27.4	28.9	27.9	**25.5**
SIVT-24-115	MCNL-24-02	**KMR (L) 24-5**	25.1	37.2	52.5	42.5	45.5	45.4	22.8	**38.7**	14.5	15.0	28.5	30.5	22.0	**22.1**
SIVT-24-116	MCNL-24-12	**DRMRIJ 22-2**	33.4	35.6	47.5	41.3	44.4	35.4	25.6	**37.6**	20.5	20.0	29.1	30.6	19.4	**23.9**
SIVT-24-117	MH-24-03	**HT 7262**	23.4	29.6	52.5	40.3	36.8	51.1	23.6	**36.7**	17.8	40.0	27.9	26.4	27.4	**27.9**
SIVT-24-118	MH-24-12	**DRMRHJ 2420**	26.7	30.0	**NG**	34.6	36.2	46.2	29.5	**33.9**	18.9	**NG**	23.8	26.4	26.6	**23.9**
SIVT-24-119	MH-24-24	**RH 749 (ZC)**	21.1	32.0	47.5	33.7	30.1	51.9	30.0	**35.2**	16.8	17.5	22.0	21.1	24.5	**20.4**
SIVT-24-120	QM-24-07	**PM 30 (NC)**	22.2	37.6	62.5	46.2	36.4	50.5	24.3	**39.9**	15.6	32.5	29.5	26.1	26.2	**26.0**
SIVT-24-121	PP-150	**NRCHB 101 (SC)**	29.5	40.0	47.5	46.9	41.4	47.2	27.0	**39.9**	22.2	42.5	30.3	28.1	26.4	**29.9**
SIVT-24-122	PP-156	**NRCHB 101 (SC)**	24.5	34.5	42.5	42.5	37.8	48.6	27.6	**36.8**	17.8	37.5	21.0	25.4	27.3	**25.8**
SIVT-24-123	MH-24-23	**AMH-511**	31.7	27.8	47.5	32.3	33.9	47.8	25.3	**35.2**	18.9	27.5	20.8	23.8	25.3	**23.2**
SIVT-24-124	MH-24-17	**PHR 10143**	30.0	43.8	62.5	42.2	32.8	51.9	36.2	**42.8**	23.4	42.5	31.5	22.8	25.5	**29.1**
SIVT-24-125	MH-24-13	**NIMOH-02**	28.9	47.8	67.5	37.2	34.9	46.2	30.0	**41.8**	20.5	27.5	21.8	24.4	25.1	**23.8**
SIVT-24-126	QM-24-12	**DRMRCI (Q) 197**	33.4	34.2	52.5	35.9	36.8	53.7	31.8	**39.8**	21.1	32.5	20.5	26.1	26.4	**25.3**
SIVT-24-127	PP-154	**DMH 1(HC)**	30.0	52.5	42.5	34.2	38.8	51.6	25.3	**39.3**	24.5	22.5	19.4	26.8	24.8	**23.6**
SIVT-24-128	PP-159	**PHR 2 (TC-AB)**	27.8	16.0	42.5	37.3	36.4	42.8	32.8	**33.7**	20.5	15.0	20.3	26.1	25.9	**21.5**
SIVT-24-129	QM-24-03	**DRMRCI (Q) 198**	29.5	40.5	70.0	29.8	39.4	46.2	35.4	**41.5**	22.2	52.5	17.5	28.1	23.7	**28.8**
SIVT-24-130	MH-24-20	**4205D300-01**	24.5	28.9	60.0	31.2	37.3	45.1	30.0	**36.7**	16.8	42.5	19.0	26.1	24.2	**25.7**
SIVT-24-131	QM-24-10	**PMAS 1604**	31.7	36.0	55.0	31.8	43.9	52.9	33.5	**40.7**	18.9	37.5	19.7	31.1	25.5	**26.5**
SIVT-24-132	QM-24-16	**PMAS 1602**	31.1	34.5	65.0	30.2	41.8	50.1	25.8	**39.8**	24.5	47.5	18.6	28.8	24.8	**28.8**
SIVT-24-133	PP-152	**DRMRMJA-35 (RC-WR)**	33.4	20.7	55.0	38.0	39.7	48.4	35.9	**38.7**	22.2	37.5	25.0	25.3	24.9	**27.0**
SIVT-24-134	QM-24-01	**RGN 73 (ZC)**	30.0	29.1	60.0	34.4	40.3	54.6	29.1	**39.6**	24.5	37.5	20.7	25.3	25.9	**26.8**
SIVT-24-135	MH-24-18	**PA 5235**	28.4	23.1	67.5	37.3	44.4	55.4	21.4	**39.6**	16.8	47.5	21.8	31.1	24.8	**28.4**
SIVT-24-136	MH-24-15	**NMH90M03**	23.4	24.7	60.0	38.5	37.3	42.7	22.6	**35.6**	20.0	27.5	22.8	27.2	22.1	**23.9**
SIVT-24-137	QM-24-14	**PDZ-11 (DLC)**	33.4	22.7	50.0	32.0	41.4	53.2	30.0	**37.5**	22.2	27.5	20.4	24.2	27.8	**24.4**
SIVT-24-138	PP-157	**BioYSR (RC-WR)**	28.4	42.9	60.0	32.9	32.8	51.3	37.7	**40.8**	21.1	37.5	19.6	21.5	27.9	**25.5**
SIVT-24-139	QM-24-13	**DH-2'00'7G**	31.1	18.9	60.0	31.7	36.0	51.7	37.7	**38.1**	24.5	42.5	18.3	23.3	27.9	**27.3**
SIVT-24-140	QM-24-04	**RH (OE) 1702**	27.2	21.4	62.5	30.3	36.4	39.0	33.9	**35.8**	16.8	37.5	19.3	22.2	23.6	**23.9**
SIVT-24-141	MH-24-19	**DMH 1 (H. Check)**	31.2	34.9	50.0	29.0	32.2	53.7	30.0	**37.3**	21.1	37.5	19.4	20.4	27.9	**25.2**
SIVT-24-142	QM-24-15	**RH (OE) 1704**	30.0	16.0	60.0	34.4	37.3	39.8	21.5	**34.1**	18.9	42.5	20.3	26.1	25.3	**26.6**
SIVT-24-143	PP-153	**PHR 2 (TC-AB)**	28.4	35.6	45.0	30.8	38.9	43.7	30.0	**36.0**	17.8	37.5	16.8	27.5	26.3	**25.2**
SIVT-24-144	PP-155	**Rohini (SC)**	31.2	16.9	57.5	31.2	40.6	42.7	33.9	**36.3**	27.2	37.5	17.8	25.3	25.7	**26.7**
SIVT-24-145	MH-24-21	**Pusa MH 226**	29.5	19.2	65.0	33.3	42.0	55.6	38.8	**40.5**	21.1	37.5	19.6	26.1	28.1	**26.5**
SIVT-24-146	QM-24-05	**PDZ-22#**	31.1	23.1	10.0	31.3	38.3	48.3	26.0	**29.7**	24.5	50.0	17.0	24.2	25.9	**28.3**
SIVT-24-147	QM-24-11	**LES-70**	33.4	25.4	65.0	32.8	39.3	46.8	28.6	**38.7**	26.7	45.0	18.3	24.2	23.9	**27.6**
SIVT-24-148	PP-149	**Rohini (SC)**	25.1	27.4	50.0	33.2	43.9	45.8	38.2	**37.6**	18.9	37.5	19.5	27.5	24.8	**25.6**
SIVT-24-149	PP-158	**DRMRMJA-35 (RC-WR)**	30.0	26.0	60.0	34.4	41.8	38.7	31.8	**37.5**	22.2	35.0	20.1	28.1	22.9	**25.6**
SIVT-24-150	QM-24-06	**BPMQ 47 (Filler)**	27.8	21.8	45.0	36.1	39.7	50.4	30.8	**35.9**	21.1	32.5	21.3	27.5	29.5	**26.4**
SIVT-24-151	MH-24-16	**DRMRHJ 410**	23.4	33.4	47.5	40.8	37.3	49.1	25.4	**36.7**	20.0	37.5	26.0	24.2	24.8	**26.5**
SIVT-24-152	QM-24-08	**PDZ-23#**	29.5	30.2	62.5	34.4	34.9	46.2	24.7	**37.5**	17.8	42.5	20.2	22.2	23.2	**25.2**
SIVT-24-153	MH-24-14	**SBH 618**	26.7	26.3	60.0	33.9	35.8	46.2	21.4	**35.7**	18.9	40.0	20.9	22.8	25.8	**25.7**
SIVT-24-154	QM-24-09	**LES-71**	28.4	32.7	55.0	34.9	32.2	44.8	23.5	**35.9**	16.8	32.5	21.1	20.4	26.2	**23.4**
SIVT-24-155	PP-151	**BioYSR (RC-WR)**	30.0	25.8	50.0	33.9	37.3	44.3	27.5	**35.5**	24.5	37.5	20.7	23.7	26.3	**26.5**
SIVT-24-156	QM-24-02	**PM 34 (LR)**	27.2	28.3	60.0	35.4	42.2	49.4	24.4	**38.1**	16.8	47.5	20.5	28.1	26.6	**27.9**
SIVT-24-157	MCNR-24-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SIVT-24-158	MCNL-24-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SIVT-24-159	MH-24-04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CD(*P*=0.05)			**4.6**	**2.1**	**13.9**	**2.7**	**3.5**	**5.1**	**0.8**		**4.2**	**11.5**	**3.2**	**3.2**	**2.8**	
CV(%)			**7.1**	**6.1**	**-**	**3.7**	**4.6**	**5.4**	**3.3**		**7.7**	**-**	**5.8**	**5.2**	**4.6**	

ABP: MOR and **JHS** excluded due to <20% severity in SC

Table 4.6.2: Reaction of IVT entries of oilseed *Brassica* to WR, PM, DM and SR

Coding		Entries	% WR						% PM					% DM
Plant Pathology	PC Unit		HSR	LDH	SKN	PNT	Mean	MOR	MOR	NGP	SKN	JHS	Mean	PNT
SIVT-24-01	YSCN-24-05	**PYS 2021-21**	0.0	0.0	0.0	32.5	**8.1**	0.0	35.1	7.0	77.3	28.6	**37.0**	32.5
SIVT-24-02	MCN(E)-24-02	**DRMRHT 13-2**	51.1	4.5	16.1	12.5	**21.1**	9.1	37.4	54.1	85.3	31.6	**52.1**	77.5
SIVT-24-03	TCN-24-06	**TKM 24-1**	0.0	0.0	6.1	0.0	**1.5**	2.0	21.8	7.5	81.0	5.0	**28.8**	25.0
SIVT-24-04	MCN(E)-24-10	**JD 6 (ZC)**	31.1	16.0	11.7	15.0	**18.4**	19.4	31.4	54.5	93.8	30.0	**52.4**	67.5
SIVT-24-05	TCN-24-01	**PTC-2021-1**	0.0	1.0	9.4	0.0	**2.6**	0.0	24.2	5.4	94.0	25.9	**37.4**	47.5
SIVT-24-06	TCN-24-03	**BAUT-08-12**	0.0	0.0	2.8	0.0	**0.7**	0.0	16.7	7.8	94.8	23.3	**35.6**	30.0
SIVT-24-07	YSCN-24-08	**YSKM 24-1**	0.0	0.0	0.0	5.0	**1.3**	0.0	20.3	5.3	51.3	5.0	**20.5**	57.5
SIVT-24-08	MCN(E)-24-03	**RH 2399-2**	30.0	3.0	16.1	17.5	**16.7**	4.9	31.8	63.9	90.0	32.4	**54.5**	82.5
SIVT-24-09	MCN(E)-24-11	**PRE 2022-12**	20.5	0.0	7.2	0.0	**6.9**	0.7	32.0	51.9	84.3	27.9	**49.0**	82.5
SIVT-24-10	MCN(E)-24-13	**PM 25**	31.7	7.0	18.3	17.5	**18.6**	4.9	30.5	59.7	80.0	32.8	**50.7**	87.5
SIVT-24-11	TCN-24-04	**TS 38 (LR)**	0.0	0.0	5.6	0.0	**1.4**	0.0	14.3	5.6	85.0	38.1	**35.7**	32.5
SIVT-24-12	YSCN-24-07	**Pitambari (LR)**	0.0	0.0	3.9	25.0	**7.2**	0.0	10.9	51.1	53.3	5.0	**30.1**	77.5
SIVT-24-13	MCN(E)-24-09	**KMR (E) 24-1**	35.6	26.5	15.6	25.0	**25.7**	6.5	30.3	58.2	90.0	32.7	**52.8**	92.5
SIVT-24-14	TCN-24-02	**JT-17-1**	0.0	0.0	4.4	0.0	**1.1**	0.0	17.4	5.0	72.5	30.0	**31.2**	35.0
SIVT-24-15	MCN(E)-24-14	**PRE 2022-6**	32.2	3.3	17.2	15.0	**16.9**	3.8	26.2	56.2	90.0	28.2	**50.1**	42.5
SIVT-24-16	MCN(E)-24-05	**GDM 4 (LR)**	38.9	5.5	19.4	NG	**21.3**	2.7	35.4	50.3	83.5	32.3	**50.4**	NG
SIVT-24-17	TCN-24-05	**PTC 2021-2**	0.0	0.0	11.7	0.0	**2.9**	0.2	7.3	7.5	84.8	26.7	**31.6**	52.5
SIVT-24-18	MCN(E)-24-08	**DRMRCI 206**	40.0	22.0	12.8	37.5	**28.1**	6.0	22.7	57.4	90.3	33.9	**51.1**	77.5
SIVT-24-19	YSCN-24-10	**Benoy (ZC)**	0.0	0.0	1.7	0.0	**0.4**	0.0	8.7	8.2	73.3	5.0	**23.8**	77.5
SIVT-24-20	MCN(E)-24-15	**KMR (E) 24-2**	36.7	0.8	19.4	17.5	**18.6**	9.8	16.0	47.6	43.5	32.7	**35.0**	52.5
SIVT-24-21	YSCN-24-01	**BRYS 2**	0.0	0.0	3.9	15.0	**4.7**	1.1	8.7	4.8	50.0	15.0	**19.6**	47.5
SIVT-24-22	YSCN-24-06	**BYS-24**	0.0	0.0	1.7	27.5	**7.3**	2.9	18.7	4.4	54.0	10.0	**21.8**	70.0
SIVT-24-23	TCN-24-08	**TKM 24-2**	0.0	0.0	3.3	0.0	**0.8**	0.0	6.9	4.7	83.0	33.7	**32.1**	47.5
SIVT-24-24	MCN(E)-24-06	**HUJM (E) 23-7**	31.1	19.5	11.7	7.5	**17.4**	12.9	22.0	51.8	80.0	30.0	**45.9**	82.5
SIVT-24-25	YSCN-24-02	**YSKM 24-2**	0.0	0.0	1.7	0.0	**0.4**	2.5	27.6	7.8	55.0	32.2	**30.6**	73.4
SIVT-24-26	YSCN-24-11	**DRMRYS 24-3**	0.0	0.0	1.7	2.0	**0.9**	0.0	26.5	5.3	64.5	10.0	**26.6**	62.5
SIVT-24-27	MCN(E)-24-12	**NJI 24-104**	35.6	3.0	19.4	32.5	**22.6**	12.9	26.0	48.4	90.0	15.0	**44.9**	87.5
SIVT-24-28	YSCN-24-12	**PYS 2020-3**	0.0	0.0	3.9	30.0	**8.5**	1.1	18.9	6.3	50.5	25.2	**25.2**	95.0
SIVT-24-29	YSCN-24-03	**YSH 401 (NC)**	0.0	0.0	1.1	10.0	**2.8**	4.5	13.3	5.0	52.5	25.7	**24.1**	87.5
SIVT-24-30	TCN-24-09	**CG Toria-02**	33.4	26.5	18.3	30.0	**27.1**	12.5	19.1	70.3	84.8	29.5	**50.9**	87.5
SIVT-24-31	MCN(E)-24-07	**RH 1999-18**	45.6	23.5	37.8	30.0	**34.2**	20.9	26.2	50.9	97.0	21.2	**48.8**	95.0
SIVT-24-32	TCN-24-07	**Bhawani (ZC)**	0.0	0.0	4.4	0.0	**1.1**	1.1	5.1	5.5	80.0	20.4	**27.8**	57.5
SIVT-24-33	YSCN-24-04	**DRMRYS 202**	0.0	0.0	2.8	32.5	**8.8**	0.0	12.2	61.6	52.0	25.8	**37.9**	27.5
SIVT-24-34	MCN(E)-24-04	**Kesari 5113**	2.8	0.0	4.4	15.0	**5.6**	0.0	8.0	4.3	70.0	25.9	**27.1**	32.5
SIVT-24-35	TCN-24-10	**PT 303 (NC)**	0.0	0.0	3.3	0.0	**0.8**	1.1	9.8	63.0	93.5	23.0	**47.3**	30.0
SIVT-24-36	MCN(E)-24-16	**NPJ 275**	24.5	0.0	12.2	12.5	**12.3**	5.1	23.3	4.7	97.0	22.6	**36.9**	67.5
SIVT-24-37	YSCN-24-09	**RMYS 6**	0.0	0.0	1.7	0.0	**0.4**	0.0	24.0	5.5	55.5	27.1	**28.0**	87.5
SIVT-24-38	MCN(E)-24-01	**NPJ 274**	51.1	6.0	11.1	20.0	**22.1**	6.3	14.2	54.3	88.3	25.9	**45.7**	67.5
SIVT-24-39	MCN-24-14	**RL-19-237**	35.6	16.5	8.3	27.5	**22.0**	14.0	16.2	75.1	85.0	27.2	**50.9**	95.0
SIVT-24-40	MCN-24-27	**RCC 4 (ZC)**	38.9	23.0	19.4	32.5	**28.5**	15.6	19.1	62.5	99.3	20.7	**50.4**	87.5
SIVT-24-41	MCN-24-04	**DRMRCI 195**	32.2	22.5	10.0	0.0	**16.2**	2.0	22.7	53.2	95.0	23.2	**48.5**	77.5
SIVT-24-42	MCNR-24-06	**BAUM 13-6**	31.2	4.5	15.6	10.0	**15.3**	1.6	26.9	48.3	96.5	25.0	**49.2**	77.5
SIVT-24-43	MCN-24-01	**TM 416**	7.3	3.5	5.6	0.0	**4.1**	0.7	15.3	74.4	95.3	27.4	**53.1**	87.5
SIVT-24-44	MCN-24-16	**HUJM 23-12**	33.4	13.0	22.2	32.5	**25.3**	7.2	19.1	69.8	90.0	21.8	**50.2**	60.0
SIVT-24-45	MCNR-24-03	**RH 1424 (LR)**	42.2	14.5	20.6	32.5	**27.4**	24.9	26.2	78.4	97.3	22.6	**56.1**	57.5
SIVT-24-46	MCNR-24-10	**NPJ 280**	34.5	12.0	21.1	10.0	**19.4**	11.2	24.0	70.1	90.0	24.7	**52.2**	95.0
SIVT-24-47	MCN-24-07	**RL-19-162**	22.2	17.5	8.9	25.0	**18.4**	21.4	33.9	47.7	97.8	25.6	**51.2**	77.5
SIVT-24-48	MCN-24-21	**NPJ 278**	10.6	0.0	2.2	27.5	**10.1**	0.0	29.3	54.3	89.0	28.5	**50.3**	85.0
SIVT-24-49	MCN-24-24	**AKMS 1003-50**	36.7	18.5	19.4	42.5	**29.3**	10.9	24.7	64.7	81.8	14.8	**46.5**	62.5
SIVT-24-50	MCN(E)-24-17	**DRMRHT 22125**	34.5	12.5	18.9	15.0	**20.2**	22.0	32.7	54.7	94.5	27.6	**52.4**	87.5
SIVT-24-51	MCN-24-08	**RKM 460**	38.9	16.0	18.9	32.5	**26.6**	33.8	34.0	78.3	95.5	5.0	**53.2**	50.0
SIVT-24-52	MCN-24-11	**SKM 2206**	30.0	12.5	23.3	25.0	**22.7**	4.5	34.9	50.7	89.8	19.6	**48.7**	87.5
SIVT-24-53	MCN-24-18	**PR-2020-16**	31.7	17.5	26.7	32.5	**27.1**	10.9	38.7	51.2	100.0	20.0	**52.5**	95.0
SIVT-24-54	MCN-24-28	**DRMR 2022-4**	21.1	4.0	11.1	17.5	**13.4**	3.6	35.8	54.2	90.0	22.7	**50.7**	92.5
SIVT-24-55	MCNR-24-05	**RKM 588**	31.1	22.0	23.3	32.5	**27.2**	5.4	34.0	62.6	100.0	27.5	**56.0**	72.5
SIVT-24-56	MCNR-24-08	**DRMRHT 2090**	38.9	32.5	22.8	NG	**31.4**	17.1	33.1	73.2	92.5	28.8	**56.9**	NG
SIVT-24-57	MCN-24-03	**ORM 2019-31**	12.8	8.0	18.9	37.5	**19.3**	0.0	41.1	77.2	80.0	21.2	**54.9**	88.8
SIVT-24-58	MCN-24-09	**RGN 593**	4.5	18.0	2.2	20.0	**11.2**	3.6	37.8	83.6	84.0	20.5	**56.5**	76.7
SIVT-24-59	MCN-24-19	**CS 2009-219**	36.7	25.0	22.2	42.5	**31.6**	6.7	22.7	53.7	95.3	24.7	**49.1**	60.0
SIVT-24-60	MCN-24-22	**RH 2263**	31.2	23.0	13.3	45.0	**28.1**	12.9	26.2	64.9	96.3	23.1	**52.6**	75.0
SIVT-24-61	MCN-24-26	**RB 118**	33.4	6.0	17.8	50.0	**26.8**	18.2	31.1	53.9	83.8	27.6	**49.1**	95.0
SIVT-24-62	MCNR-24-09	**CAURM 4-1S**	25.1	18.5	7.2	20.0	**17.7**	3.8	23.3	50.7	97.3	22.0	**48.3**	57.5
SIVT-24-63	MCNR-24-01	**RH 2299-64**	35.6	29.0	17.8	40.0	**30.6**	10.5	25.1	54.2	95.3	27.0	**50.4**	80.0
SIVT-24-64	MCN-24-12	**NPJ 279**	46.7	40.0	25.6	32.5	**36.2**	33.8	28.9	54.4	89.5	23.7	**49.1**	85.0
SIVT-24-65	MCN-24-05	**KMR 24-4**	42.2	18.5	31.1	42.5	**33.6**	27.1	33.1	48.9	94.0	25.5	**50.4**	92.5
SIVT-24-66	MCNR-24-07	**NPJ 281**	36.7	18.0	20.0	50.0	**31.2**	19.3	33.6	52.3	93.3	30.0	**52.3**	97.5
SIVT-24-67	MCN-24-20	**18-52**	38.9	24.5	11.1	1.0	**18.9**	11.0	30.0	57.2	91.0	24.3	**50.6**	75.0
SIVT-24-68	MCN-24-13	**DRMRIJ 21-57**	48.9	23.1	13.9	30.0	**29.0**	21.8	35.3	44.8	83.3	23.4	**46.7**	67.5
SIVT-24-69	MCN-24-06	**SKM 2209**	42.2	16.5	15.0	45.0	**29.7**	16.3	28.7	47.2	90.0	22.8	**47.2**	95.0
SIVT-24-70	MCN-24-02	**PYR 2018-1**	0.0	5.1	20.0	15.0	**10.0**	21.8	35.1	49.1	90.0	20.5	**48.7**	75.0
SIVT-24-71	MCN-24-10	**RH 2399-6**	31.7	2.5	18.9	25.0	**19.5**	4.7	19.8	44.8	87.3	19.4	**42.8**	95.0
SIVT-24-72	MCN(E)-24-18	**Pro 5111 (H. Check)**	5.0	3.2	6.7	7.5	**5.6**	2.5	23.1	54.3	72.5	25.7	**43.9**	45.0
SIVT-24-73	MCN-24-15	**Kranti (NC)**	35.6	3.5	13.3	30.0	**20.6**	6.9	32.0	54.2	72.3	25.8	**46.1**	65.0
SIVT-24-74	MCN-24-23	**KMR 24-3**	31.1	16.0	18.3	32.5	**24.5**	6.0	30.2	53.7	89.3	21.0	**48.5**	77.5
SIVT-24-75	MCNR-24-02	**HUJM 23-12**	33.4	25.0	14.4	17.5	**22.6**	11.8	30.0	44.4	97.8	27.7	**50.0**	80.0
SIVT-24-76	MCNR-24-04	**DRMR 2019-16**	0.0	0.0	6.1	0.0	**1.5**	0.0	33.8	51.2	100.0	21.9	**51.7**	65.0
SIVT-24-77	MCNR-24-11	**DRMRIJ 138**	34.5	20.0	24.4	32.5	**27.9**	9.6	27.1	51.3	100.0	25.8	**51.1**	85.0
SIVT-24-78	MCN-24-17	**ACN231**	23.4	14.1	18.9	32.5	**22.2**	8.9	22.7	64.2	100.0	23.9	**52.7**	85.0
SIVT-24-79	MCN-24-25	**RH 1975 (LR)**	25.1	17.1	25.6	30.0	**24.4**	7.1	36.0	84.5	81.8	24.8	**56.8**	60.0
SIVT-24-80	MCNL-24-10	**NPJ 276**	10.0	14.2	2.8	7.5	**8.6**	19.8	33.1	77.9	90.0	25.3	**56.6**	85.0
SIVT-24-81	MCNL-24-03	**DRMR 2022-16**	32.2	11.5	23.3	27.5	**23.6**	14.3	26.9	49.5	90.0	28.0	**48.6**	92.5

SIVT-24-82	MCNR-24-13	**RH 725 (ZC)**	35.6	12.5	25.6	15.0	**22.2**	14.5	33.3	61.4	90.0	27.4	**53.0**	80.0
SIVT-24-83	MH-24-02	**US 8787**	30.0	15.0	12.2	20.0	**19.3**	7.2	25.3	47.9	93.0	21.8	**47.0**	62.5
SIVT-24-84	MH-24-08	**NRCHB 506**	1.7	6.5	13.3	5.0	**6.6**	1.1	27.3	79.8	100.0	20.2	**56.8**	85.0
SIVT-24-85	MCNL-24-15	**PRL-2022-5**	31.2	11.5	16.7	30.0	**22.3**	4.7	26.9	73.7	98.3	26.2	**56.3**	62.5
SIVT-24-86	MH-24-05	**NJH 24-101**	34.5	12.5	13.9	17.5	**19.6**	5.1	22.9	83.4	99.8	23.4	**57.4**	55.0
SIVT-24-87	MCNL-24-17	**KMR (L) 24-6**	29.5	6.0	22.8	10.0	**17.1**	3.6	34.0	53.7	90.0	23.4	**50.3**	80.0
SIVT-24-88	MCNL-24-06	**Radhika (LR)**	5.0	11.1	10.6	1.0	**6.9**	7.1	28.7	47.5	100.0	27.9	**51.0**	90.0
SIVT-24-89	MCNR-24-18	**DRMRCI 196**	31.7	16.0	30.0	12.5	**22.6**	7.6	30.0	85.4	98.3	28.6	**60.6**	95.0
SIVT-24-90	MH-24-11	**RHH 2401**	20.5	10.0	15.6	15.0	**15.3**	0.0	28.9	50.3	100.0	24.4	**50.9**	65.0
SIVT-24-91	MCNR-24-16	**RGN 599**	8.4	15.5	17.8	17.5	**14.8**	4.3	34.2	53.9	98.3	23.6	**52.5**	60.0
SIVT-24-92	MCNL-24-08	**PM 26 (ZC)**	18.9	17.2	23.9	0.0	**15.0**	1.1	21.8	47.8	97.0	24.4	**47.7**	88.3
SIVT-24-93	MCNL-24-13	**SVJH-78**	30.0	13.5	30.0	15.0	**22.1**	0.7	34.0	46.7	89.3	20.3	**47.6**	85.0
SIVT-24-94	MCNL-24-21	**HUJM 23-4**	31.2	20.0	26.1	7.5	**21.2**	3.8	32.5	63.7	95.3	28.9	**55.1**	55.0
SIVT-24-95	MH-24-06	**PHR 10265**	26.7	16.5	25.6	15.0	**20.9**	2.0	17.8	47.3	88.8	25.3	**44.8**	70.0
SIVT-24-96	MH-24-09	**SVJH-77**	35.6	11.0	26.7	12.5	**21.4**	7.6	22.7	50.7	94.8	23.4	**47.9**	75.0
SIVT-24-97	MCNR-24-17	**RH 2265**	31.1	11.0	16.7	17.5	**19.1**	4.9	18.4	57.9	95.0	26.3	**49.4**	85.0
SIVT-24-98	MCNL-24-04	**PRL 2022-1**	25.1	2.3	6.7	0.0	**8.5**	2.3	21.1	64.8	84.8	33.0	**50.9**	85.0
SIVT-24-99	MCNL-24-11	**RH 2374**	28.9	13.7	17.8	15.0	**18.8**	1.6	14.0	50.4	97.3	27.7	**47.3**	90.0
SIVT-24-100	MCNL-24-19	**TM 132-1**	43.4	19.5	16.7	12.5	**23.0**	1.8	21.8	47.4	100.0	29.1	**49.6**	60.0
SIVT-24-101	MCNL-24-20	**DRMRDR 2141**	0.0	0.0	2.8	0.0	**0.7**	0.0	19.1	53.5	83.5	22.3	**44.6**	70.0
SIVT-24-102	MH-24-22	**RHH 2402**	26.7	21.0	13.9	27.5	**22.3**	2.3	25.1	48.1	100.0	24.2	**49.3**	85.0
SIVT-24-103	MH-24-07	**KBH 5256**	24.5	6.5	13.3	12.5	**14.2**	1.1	18.2	57.2	99.8	22.8	**49.5**	92.5
SIVT-24-104	MCNL-24-18	**RH 2370**	28.4	13.0	9.4	10.0	**15.2**	2.0	34.0	44.9	96.5	24.0	**49.9**	82.5
SIVT-24-105	MCNL-24-09	**RGN 592**	30.0	15.3	13.3	32.5	**22.8**	3.8	24.7	56.0	69.8	26.5	**44.2**	75.0
SIVT-24-106	MCNL-24-01	**NPJ 277**	27.2	1.5	8.3	12.5	**12.4**	0.7	25.8	56.9	90.0	29.0	**50.4**	80.0
SIVT-24-107	MCNL-24-05	**ORM 2019-30**	30.0	4.2	12.2	5.0	**12.9**	2.9	23.1	44.9	80.0	20.5	**42.1**	75.0
SIVT-24-108	MCNR-24-14	**RMM 19-06**	10.6	16.0	8.9	12.5	**12.0**	0.0	20.7	66.0	83.0	22.8	**48.1**	90.0
SIVT-24-109	MCNR-24-12	**RAURD 14-18**	36.7	14.2	24.4	30.0	**26.3**	4.9	34.0	52.2	100.0	25.4	**52.9**	45.0
SIVT-24-110	MCNL-24-07	**RMWR 19-01**	12.8	5.0	6.1	12.5	**9.1**	1.4	28.2	67.3	96.3	30.4	**55.5**	65.0
SIVT-24-111	MCNL-24-16	**RKM 599**	33.4	17.0	13.9	20.0	**21.1**	7.2	37.3	82.3	90.0	21.2	**57.7**	85.0
SIVT-24-112	MH-24-01	**Pusa MH 194**	35.6	25.0	31.1	30.0	**30.4**	2.9	33.3	44.7	95.3	21.1	**48.6**	80.0
SIVT-24-113	MCNL-24-14	**Pusa MH 218**	31.2	21.0	9.4	12.5	**18.5**	1.3	33.1	47.8	81.0	19.9	**45.4**	80.0
SIVT-24-114	MH-24-10	**DRMRHJ 520**	14.5	10.5	2.8	15.0	**10.7**	1.1	33.3	77.6	97.5	28.3	**59.2**	60.0
SIVT-24-115	MCNL-24-02	**KMR (L) 24-5**	36.7	5.5	12.2	17.5	**18.0**	5.1	40.9	55.1	97.3	24.3	**54.4**	85.0
SIVT-24-116	MCNL-24-12	**DRMRIJ 22-2**	0.0	0.0	4.4	0.0	**1.1**	0.0	36.2	48.9	86.5	31.0	**50.7**	85.0
SIVT-24-117	MH-24-03	**HT 7262**	30.0	11.0	10.0	17.5	**17.1**	0.7	35.1	52.7	93.5	22.5	**50.9**	75.0
SIVT-24-118	MH-24-12	**DRMRHJ 2420**	31.7	9.8	16.1	NG	**19.2**	0.0	39.8	69.1	75.5	20.5	**51.2**	NG
SIVT-24-119	MH-24-24	**RH 749 (ZC)**	25.1	9.7	17.8	15.0	**16.9**	4.0	40.0	78.9	85.0	22.3	**56.5**	77.5
SIVT-24-120	QM-24-07	**PM 30 (NC)**	28.4	9.7	15.6	17.5	**17.8**	3.8	39.3	84.6	95.0	21.3	**60.0**	77.5
SIVT-24-121	PP-150	**NRCHB 101 (SC)**	35.6	13.5	8.9	12.5	**17.6**	1.6	44.0	56.4	85.5	31.9	**54.5**	77.5
SIVT-24-122	PP-156	**NRCHB 101 (SC)**	38.9	21.2	8.9	20.0	**22.2**	11.8	37.3	77.3	82.8	27.9	**56.3**	92.5
SIVT-24-123	MH-24-23	**AMH-511**	32.2	18.0	23.3	5.0	**19.6**	2.3	42.9	52.3	73.0	25.7	**48.5**	37.5
SIVT-24-124	MH-24-17	**PHR 10143**	24.5	15.0	8.3	1.0	**12.2**	0.7	34.7	62.3	97.0	33.7	**56.9**	60.0
SIVT-24-125	MH-24-13	**NIMOH-02**	29.5	5.5	12.8	20.0	**16.9**	0.0	32.9	45.1	94.3	26.2	**49.6**	72.5
SIVT-24-126	QM-24-12	**DRMRCI (Q) 197**	0.0	3.5	2.2	7.5	**3.3**	0.0	27.3	55.4	83.0	27.6	**48.3**	57.5
SIVT-24-127	PP-154	**DMH 1(HC)**	0.0	0.0	3.3	1.0	**1.1**	0.0	26.9	46.8	80.0	24.8	**44.6**	27.5
SIVT-24-128	PP-159	**PHR 2 (TC-AB)**	12.3	18.2	3.9	20.0	**13.6**	1.4	33.1	62.9	90.0	34.2	**55.1**	0.0
SIVT-24-129	QM-24-03	**DRMRCI (Q) 198**	20.0	5.5	17.8	1.0	**11.1**	1.1	38.7	52.4	95.0	31.0	**54.3**	62.5
SIVT-24-130	MH-24-20	**4205D300-01**	31.7	21.0	11.1	12.5	**19.1**	0.0	35.1	88.0	90.0	28.7	**60.5**	67.5
SIVT-24-131	QM-24-10	**PMAS 1604**	4.5	0.0	7.8	12.5	**6.2**	3.8	26.0	58.8	89.8	23.8	**49.6**	32.5
SIVT-24-132	QM-24-16	**PMAS 1602**	2.8	0.0	11.1	3.5	**4.4**	5.1	31.1	46.9	100.0	31.7	**52.4**	37.5
SIVT-24-133	PP-152	**DRMRMJA-35 (RC-WR)**	0.0	0.0	0.0	0.0	**0.0**	10.7	31.3	75.4	99.5	28.6	**58.7**	85.0
SIVT-24-134	QM-24-01	**RGN 73 (ZC)**	24.5	12.0	17.8	25.0	**19.8**	8.3	26.2	52.2	90.3	22.1	**47.7**	77.5
SIVT-24-135	MH-24-18	**PA 5235**	26.7	5.0	28.9	17.5	**19.5**	1.6	33.1	55.5	90.0	28.5	**51.8**	72.5
SIVT-24-136	MH-24-15	**NMH90M03**	28.4	7.8	27.8	7.5	**17.9**	2.2	34.0	64.2	80.0	22.0	**50.1**	57.5
SIVT-24-137	QM-24-14	**PDZ-11 (DLC)**	0.0	0.0	0.0	0.0	**0.0**	0.0	34.0	70.6	80.0	22.1	**51.7**	42.5
SIVT-24-138	PP-157	**BioYSR (RC-WR)**	0.0	0.0	0.0	0.0	**0.0**	0.2	28.7	50.8	80.0	18.5	**44.5**	52.5
SIVT-24-139	QM-24-13	**DH-2'00'7G**	30.0	0.0	19.4	10.0	**14.9**	10.0	30.5	46.8	84.0	21.0	**45.6**	62.5
SIVT-24-140	QM-24-04	**RH (OE) 1702**	31.1	10.2	31.1	7.5	**20.0**	6.3	34.9	48.3	96.0	22.8	**50.5**	77.5
SIVT-24-141	MH-24-19	**DMH 1 (H. Check)**	0.0	1.0	1.7	1.0	**0.9**	0.2	25.8	54.5	85.0	27.7	**48.3**	37.5
SIVT-24-142	QM-24-15	**RH (OE) 1704**	22.2	5.5	19.4	12.5	**14.9**	5.8	36.0	55.3	94.5	5.0	**47.7**	87.5
SIVT-24-143	PP-153	**PHR 2 (TC-AB)**	25.1	23.0	6.1	17.5	**17.9**	1.4	27.8	57.9	80.0	23.8	**47.4**	47.5
SIVT-24-144	PP-155	**Rohini (SC)**	35.6	19.5	18.3	40.0	**28.4**	5.8	30.7	69.8	87.5	16.8	**51.2**	72.5
SIVT-24-145	MH-24-21	**Pusa MH 226**	38.9	24.0	35.6	20.0	**29.6**	3.6	35.4	60.8	80.0	22.7	**49.7**	40.0
SIVT-24-146	QM-24-05	**PDZ-22#**	1.7	0.0	6.1	17.5	**6.3**	3.2	30.9	50.3	80.0	19.4	**45.1**	57.5
SIVT-24-147	QM-24-11	**LES-70**	0.0	0.0	2.8	0.0	**0.7**	1.3	37.8	57.2	100.0	22.9	**54.5**	75.0
SIVT-24-148	PP-149	**Rohini (SC)**	38.9	20.2	30.0	30.0	**29.8**	5.4	30.7	52.2	90.3	14.9	**47.0**	47.5
SIVT-24-149	PP-158	**DRMRMJA-35 (RC-WR)**	0.0	0.0	1.1	0.0	**0.3**	0.0	26.0	49.4	96.5	16.4	**47.1**	92.5
SIVT-24-150	QM-24-06	**BPMQ 47 (Filler)**	0.0	3.5	10.0	30.0	**10.9**	0.5	21.8	51.8	90.0	23.0	**46.6**	15.0
SIVT-24-151	MH-24-16	**DRMRHJ 410**	31.2	18.0	32.2	12.5	**23.5**	9.1	31.4	62.2	98.3	5.0	**49.2**	87.5
SIVT-24-152	QM-24-08	**PDZ-23#**	0.0	0.0	2.8	7.5	**2.6**	0.0	30.0	50.9	83.5	5.0	**42.3**	20.0
SIVT-24-153	MH-24-14	**SBH 618**	30.0	7.0	28.9	12.5	**19.6**	3.4	28.7	52.5	98.3	5.0	**46.1**	62.5
SIVT-24-154	QM-24-09	**LES-71**	0.0	4.0	6.1	15.0	**6.3**	1.4	34.9	67.5	90.0	24.1	**54.1**	70.0
SIVT-24-155	PP-151	**BioYSR (RC-WR)**	0.0	0.0	0.0	30.0	**7.5**	0.0	19.8	78.3	84.0	16.6	**49.7**	72.5
SIVT-24-156	QM-24-02	**PM 34 (LR)**	17.8	9.7	6.1	1.0	**8.7**	10.9	21.3	85.1	100.0	22.2	**57.1**	52.5
SIVT-24-157	MCNR-24-15	-	-	-	-	-	-	-	-	-	-	-	-	-
SIVT-24-158	MCNL-24-22	-	-	-	-	-	-	-	-	-	-	-	-	-
SIVT-24-159	MH-24-04	-	-	-	-	-	-	-	-	-	-	-	-	-
CD(*P*=0.05)			**4.7**	**6.2**	**10.6**	**2.6**		**2.5**	**3.3**	**2.4**	**6.5**	**1.5**		**11.2**
CV(%)			**9.7**	**20.6**	**39.4**	**-**		**11.2**	**5.3**	**2.7**	**3.7**	**6.1**		**-**

WR: MOR data excluded from mean due to <20% severity in SC
DM: MOR excluded due to <20% severity in SC
PM: PNT excluded due to <20% severity in SC
SR: MOR, PNT and **LDH** excluded due to <20% severity in SC

Table:4.8.1: Epidemiology of WR, AB and SR disease at HSR during 2024-25

A. White rust

Date of sowing	First appearance (DAS)	% White rust (DAS)																							
Varuna		49	52	56	59	63	66	70	73	77	80	84	87	91	94	98	101	105	108	112	115	119	122	126	129
Oct. 01	121	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.0	2.5
Oct. 08	98	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.7	3.3	5.0	6.7	10.6	11.1	12.3		-
Oct. 15	83	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	2.5	4.5	5.0	5.0	6.7	10.0	15.6	20.0	20.5	-	-		-
Oct. 22	81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	2.5	3.3	5.0	8.9	13.4	20.5	23.4		-	-	-		-
Oct. 29	65	0.0	0.0	0.0	0.0	0.0	0.7	0.9	1.0	3.3	4.5	5.0	8.4	15.6	33.4	35.6	38.9	-	-		-	-	-		-
Nov. 05	65	0.0	0.0	0.0	0.0	0.0	0.8	1.0	3.3	5.0	7.6	11.1	25.1	34.5	40.0	-	-	-	-		-	-	-		-
Nov.12	60	0.0	0.0	0.0	0.0	1.0	1.7	2.5	4.5	10.6	25.1	35.6	42.2	-	-	-	-	-	-		-	-	-		-
Nov.19	46	0.7	1.0	1.7	4.5	5.0	6.7	12.3	25.1	36.7	45.6	-	-	-	-	-	-	-	-		-	-	-		-
RH 30																									
Oct. 01	121	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.7	3.3
Oct. 08	98	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.9	1.7	2.5	3.3	5.0	7.6	10.6		-
Oct. 15	87	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.0	1.7	3.3	5.0	8.9	12.3	15.6	18.9	-	-		-
Oct. 22	77	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	3.3	4.5	5.0	6.7	8.9	10.0	12.3	18.9	20.5		-	-	-		-
Oct. 29	72	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.7	2.5	4.5	5.0	8.9	24.5	32.2	35.6	-	-		-	-	-		-
Nov.05	64	0.0	0.0	0.0	0.0	0.0	0.7	1.7	4.5	6.7	8.9	12.3	20.5	31.2	36.7	-	-	-	-		-	-	-		-
Nov.12	61	0.0	0.0	0.0	0.0	0.7	1.7	2.5	3.3	8.9	18.9	31.7	38.9	-	-	-	-	-	-		-	-	-		-
Nov.19	48	0.8	1.0	1.7	2.5	3.3	4.5	11.1	20.5	32.2	40.0	-	-	-	-	-	-	-	-		-	-	-		-

B. Staghead

Date of sowing	First appearance (DAS)	% Staghead															
Varuna		77	80	84	87	91	94	98	101	105	108	112	115	119	122	126	129
Oct. 01	NF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oct. 08	NF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oct. 15	106	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.1	2.2	2.2	3.3	5.4	5.4
Oct. 22	101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.9	0.9	1.8	3.5	5.3	6.1	-	-
Oct. 29	92	0.0	0.0	0.0	0.0	0.0	1.6	1.6	3.2	4.0	6.3	8.7	9.5	-	-	-	-
Nov. 05	87	0.0	0.0	0.0	0.7	1.4	2.7	4.1	6.8	8.8	10.2	-	-	-	-	-	-
Nov.12	81	0.0	0.0	2.2	3.6	6.5	7.9	9.4	10.8	-	-	-	-	-	-	-	-
Nov.19	76	1.5	4.5	9.8	12.8	14.3	15.0	-	-	-	-	-	-	-	-	-	-
RH 30																	
Oct. 01	NF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oct. 08	NF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oct. 15	108	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	1.1	1.1	1.1	2.2	3.3	4.3	4.3
Oct. 22	101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	1.4	2.8	4.2	5.6	5.6	-	-
Oct. 29	93	0.0	0.0	0.0	0.0	0.0	0.7	1.4	4.2	6.3	7.7	8.5	9.2	-	-	-	-
Nov. 05	86	0.0	0.0	0.0	0.7	1.4	3.5	8.3	9.0	9.7	9.7	-	-	-	-	-	-
Nov.12	82	0.0	0.0	0.7	1.4	3.6	8.6	10.1	10.1	-	-	-	-	-	-	-	-
Nov.19	76	0.7	1.4	5.0	9.2	10.6	12.8	-	-	-	-	-	-	-	-	-	-

C. Alternaria Blight on leaves

Date of sowing	First appearance (DAS)	% Alternaria blight on leaves (DAS)																			
Varuna		77	80	84	87	91	94	98	101	105	108	112	115	119	122	126	129	133	136	140	143
Oct. 01	113	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	9.0	1.7	3.3	4.5	6.7	10.6	12.3	15.6
Oct. 08	106	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.0	1.7	2.5	5.0	11.1	15.6	16.7	20.5		-
Oct. 15	107	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.7	3.3	5.0	12.3	18.9	23.4	-	-		-
Oct. 22	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	2.5	5.0	13.4	20.5	22.2	25.1	-	-	-	-		-
Oct. 29	94	0.0	0.0	0.0	0.0	0.0	1.0	3.3	8.9	12.3	16.8	18.9	20.5	-	-	-	-	-	-		-
Nov. 05	87	0.0	0.0	0.0	1.0	4.5	5.0	10.6	14.5	18.9	20.0	-	-	-	-	-	-	-	-		-
Nov. 12	82	0.0	0.0	1.7	4.5	7.6	11.1	15.6	18.9	-	-	-	-	-	-	-	-	-	-		-
Nov. 19	77	0.7	1.0	5.0	10.0	14.5	15.6	-	-	-	-	-	-	-	-	-	-	-	-		-
RH 30																					
Oct. 01	113	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.0	1.7	2.5	5.0	8.9	10.0	11.1	13.4
Oct. 08	108	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.7	2.5	4.5	6.7	11.1	13.4	16.8	18.9		-
Oct. 15	107	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.0	3.3	6.7	12.3	18.9	23.4	-	-	-	-
Oct. 22	101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	2.5	6.7	12.8	18.9	22.2	24.5	-	-	-	-	-	-
Oct. 29	95	0.0	0.0	0.0	0.0	0.0	0.0	1.0	5.6	8.9	12.8	14.5	18.9	-	-	-	-	-	-	-	-
Nov. 05	88	0.0	0.0	0.0	0.0	1.7	4.5	8.9	13.4	15.6	16.8	-	-	-	-		-	-	-	-	-
Nov. 12	82	0.0	0.0	1.0	3.3	4.5	5.6	10.6	15.6	-	-	-	-	-	-	-	-	-	-	-	-
Nov. 19	76	0.7	1.0	2.5	6.7	10.6	12.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-

D. Sclerotinia rot

Date of sowing	First appearance (DAS)	% Sclerotinia rot																				Seed Yield (Kg/ha)
Varuna		77	80	84	87	91	94	98	101	105	108	112	115	119	122	126	129	133	136	140	143	
Oct. 01	101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.7	4.3	4.3	5.2	6.1	7.0	7.8	7.8	8.7	9.6	9.6	10.4	3067
Oct. 08	88	0.0	0.0	0.0	0.0	1.4	5.4	8.8	10.2	11.6	12.2	12.9	15.0	17.0	18.4	18.4	19.7	20.4	20.4		-	2755
Oct. 15	77	0.0	1.4	1.4	4.3	8.7	13.0	15.9	15.9	18.8	20.3	23.2	23.2	26.1	26.1	26.1	26.1	-	-	-	-	2690
Oct. 22	89	0.0	0.0	0.0	0.0	0.9	0.9	2.6	3.5	4.4	5.3	8.8	9.6	12.3	14.9	-	-	-	-	-	-	1993
Oct. 29	89	0.0	0.0	0.0	0.0	0.0	1.6	1.6	4.0	7.1	7.9	9.5	9.5	-	-	-	-	-	-	-	-	1603
Nov. 05	88	0.0	0.0	0.0	0.0	1.4	1.4	3.4	4.8	6.1	8.2	-	-	-	-	-	-	-	-	-	-	1493
Nov.12	85	0.0	0.0	0.0	0.7	2.2	3.6	5.1	5.8	-	-	-	-	-	-	-	-	-	-	-	-	1411
Nov.19	78	0.0	0.7	0.7	1.4	3.6	4.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3067
RH 30																						
Oct. 01	101	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	2.0	2.9	2.9	3.9	4.9	5.9	6.9	8.8	8.8	9.8	9.8	3078
Oct. 08	87	0.0	0.0	0.0	0.7	0.7	2.8	4.1	9.0	11.0	11.0	12.4	16.6	17.9	18.6	18.6	19.3	19.3	20.0		-	2985
Oct. 15	81	0.0	0.0	2.3	4.6	11.5	12.6	13.8	13.8	14.9	18.4	20.7	20.7	21.8	24.1	24.1	24.1	-	-	-	-	2771
Oct. 22	88	0.0	0.0	0.0	0.0	1.0	5.0	9.0	12.0	13.0	15.0	15.0	16.0	18.0	18.0	-	-	-	-	-	-	2721
Oct. 29	87	0.0	0.0	0.0	0.7	1.4	1.4	2.1	2.8	5.6	7.7	8.5	9.2	-	-	-	-	-	-	-	-	2024
Nov. 05	89	0.0	0.0	0.0	0.0	0.7	2.8	4.2	5.6	6.3	7.6	-	-	-	-	-	-	-	-	-	-	1767
Nov.12	85	0.0	0.0	0.0	1.5	2.9	3.7	4.4	5.1	-	-	-	-	-	-	-	-	-	-	-	-	1583
Nov.19	77	0.0	0.7	1.4	2.9	3.6	3.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1455

Table 4.8.2: Epidemiology of DM, PM and AB disease of mustard at JAG during 2024-25.

A. Downy mildew, Powdery mildew and Alternaria leaf blight

Date of sowing	First appearance (DAS)	% Downy mildew (DAS)				First appearance (DAS)	% Powdery mildew (DAS)				First appearance (DAS)	% Alternaria leaf blight (DAS)					Yield (Kg./ha)
Varuna		**40**	**50**	**60**	**70**		**80**	**90**	**100**	**110**		**50**	**60**	**70**	**80**	**90**	
Oct. 01	**26**	-	2.6	30.0	4.0	**-**	-	-	-	-	**-**	-	-	-	-	-	1640
Oct. 08	**22**	-	2.0	23.0	5.0	**-**			-	-	**-**	-	-	-	-	-	1630
Oct. 15	**18**	-	2.9	32.0	6.0	**-**	-	-	-	-	**-**	-	-	-	-	-	1630
Oct. 22	**14**	-	1.6	20.0	0.0	**-**	-	-	-	-	**71**	-	1.2	6.5	9.6	15.3	1600
Oct. 29	**10**	2.8	35.0	0.0	-	**-**	-	-	-	-	**62**	1.3	4.7	7.3	9.8	17.4	1465
Nov. 05	**8**	3.7	40.0	0.0	-	**-**	-	-	-	-	**56**	1.1	3.4	5.3	8.7	19.5	1430
Nov. 12	**7**	1.8	71.0	6.0	-	**84**	-	4.0	45.0	62.0	**52**	2.4	5.7	7.4	15.5	21.7	1140
Nov. 19	**5**	2.8	2.6	30.0	4.6	**78**	5.0	70.0	82.0	85.0	**50**	1.7	11.7	13.4	16.5	23.2	1120
CG Sarson																	
Oct. 01	**26**	-	1.0	19.0	2.0	**-**	-	-	-	-	**-**	-	-	-	-	-	1464
Oct. 08	**22**	-	1.4	18.0	6.0	**-**	-	-	-	-	**-**	-	-	-	-	-	1460
Oct. 15	**18**	-	2.3	32.0	5.0	**-**	-	-	-	-	**-**	-	-	-			1435
Oct. 22	**14**	-	1.2	16.0	0.0	**-**	-	-	-	-	**68**	-	-	2.3	6.9	13.4	1410
Oct. 29	**10**	-	1.5	17.0	0.0	**-**	-	-	-	-	**62**	-	-	1.8	5.7	16.4	1264
Nov. 05	**8**	-	1.6	26.0	2.0	**-**	-	-	-	-	**56**	-	2.4	5.3	19.7	-	1187
Nov. 12	**7**	1.4	51.6	6.0	-	**84**	-	3.0	35.0	54.0	**52**	-	2.1	8.1	17.5	-	920
Nov. 19	**5**	2.3	46.0	5.0	-	**78**	4.0	70.0	78.0	81.0	**49**	2.3	8.7	16	22.4	-	815

Table: 4.8.3: Epidemiology of AB, WR, PM, DM and SR at MOR during 2024-25.

A. Alternaria Blight on leaves, Pod and White Rust

Date of sowing	First appearance (DAS)	% Alternaria blight on leaves (DAS)											First appearance (DAS)	% Alternaria blight on Pod (DAS)						First appearance (DAS)	% White Rust (DAS)										
VARUNA		40	50	60	70	80	90	100	110	120	130	140		90	100	110	120	130	140		40	50	60	70	80	90	100	110	120	130	140
Oct. 01	92	-	-	-	-	-	0.4	0.9	1.3	8.4	16.7	17.1	112	-	-		1.3	6.2	2.7	90	-	-	-	-	-	-	-	-	-	-	-
Oct. 08	91	-	-	-	-	0.9	0.9	1.3	9.3	13.1	18.4	19.1	110	-	-	-	2.2	3.1	4.0	81	-	-	-	-	-	-	-	-	-	-	-
Oct. 15	85	-	-	-	0.4	0.9	1.3	10.2	15.3	21.6	26.7	28.0	100	-	-	1.8	5.3	6.2	5.8	70	-	-	-	-	-	-	-	-	0.9	1.8	2.2
Oct. 22	80	-	-	-	0.2	0.7	11.3	17.1	27.6	28.0	29.3	32.0	91	-	-	1.3	5.8	6.2	6.7	70	-	-	-	-	-	-	2.2	5.6	6.7	7.1	9.8
Oct. 29	75	-	-	0.2	0.7	0.9	6.7	14.7	27.1	28.9	30.2	33.3	90	-	1.8	4.0	6.2	7.1	7.6	60	-	-	-	0.2	7.1	9.3	9.3	9.3	11.1	13.3	-
Nov. 05	72	-	-	0.2	0.4	5.8	11.1	28.0	29.8	31.1	32.4	-	81	-	0.4	4.9	7.1	7.6	8.4	55	-	-	0.4	6.2	8.9	9.1	9.1	12.9	13.3	15.6	-
Nov. 12	70	-	0.4	5.1	8.0	20.9	25.8	32.0	33.3	-	-	-	80	0.4	1.8	2.2	10.2	12.0	1.4	48	-	0.2	5.3	14	15.1	16.4	17.8	18.7	-	-	-
Nov. 19	70	0.7	3.3	15.1	16.7	30.2	33.3	34.2	-	-	-	-	80	1.3	2.2	3.1	15.1	15.6	16.9	48	0.4	1.8	7.3	8.0	16.9	19.1	20.0	-	-	-	-
ROHINI																															
Oct. 01	92	-	-	-	-	-	0.4	0.9	1.1	9.3	17.1	17.1	110	-	-	-	-	2.7	3.6	90	-	-	-	-	-	-	-	-	-		
Oct. 08	91	-	-	-	-	0.7	0.9	1.1	8.4	13.8	21.1	23.1	110	-	-	-	1.3	3.6	4.9	81	-	-	-	-	-	-	-	-	-		
Oct. 15	85	-	-	-	0.4	0.9	1.3	4.9	22.4	25.3	26.7	28.4	100	-	-	2.7	4.0	4.4	4.9	70	-	-	-	-	-	-	-	0.7	1.3	4.0	5.8
Oct. 22	80	-	-	-	0.4	0.9	6.7	25.6	26.0	28.0	30.2	31.6	91	-	-	1.8	4.9	5.8	6.2	70	-	-	-	-	2.0	3.6	3.6	5.8	6.2	6.7	-
Oct. 29	75	-	-	0.4	0.7	0.9	5.3	21.3	23.1	5.3	31.1	32.0	95	-	-	2.2	5.3	6.2	6.7	60	-	-	-	0.7	8.0	10.7	11.1	11.6	14.2	15.3	-
Nov. 05	72	-	-	0.4	6.4	10.7	21.3	24.0	27.1	32.4	32.9	-	80	-	1.8	4.4	5.8	6.7	7.6	55	-	-	0.9	7.1	11.1	11.3	15.1	18.7	20.9	-	-
Nov. 12	70	-	0.4	8.0	13.3	27.8	35.6	36.0	36.4	36.9	-	-	80	-	2.2	4.9	6.7	7.6	8.9	48	-	0.4	6.7	15	16.0	18.2	19.6	21.3	-	-	-
Nov. 19	70	0.2	5.3	21.6	28.0	35.1	37.3	37.8	37.8	-	-	-	80	1.3	5.3	6.2	6.7	7.1	11.6	48	0.2	2.2	8.0	9.1	12.0	16.0	17.3	-	-	-	-

B. Powdery Mildew, Downy Mildew and Sclerotinia Rot

Date of sowing	First appearance (DAS)	% Powdery Mildew (DAS)								% Downy Mildew (DAS)							Disease appearance (DAS)	% Sclerortinia Rot (DAS)						Seed Yield (kg/ha)
VARUNA		70	80	90	100	110	120	130	140	80	90	100	110	120	130	140		90	100	110	120	130	140	
Oct. 01	110	-	-	-	-	-	-	13.3	14.7	-	-	-	-	-	-	-	130	-	-	-	-	5.0	10.0	2162
Oct. 08	105	-	-	-	-	-	-	11.1	15.6	-	-	-	-	-	-	-	130	-	-	-	5.0	10.0	15.0	2618
Oct. 15	98	-	-	-	-	-	16.2	17.3	-	-	-	-	-	-	-	-	120	-	-	-	5.0	15.0	20.0	1813
Oct. 22	96	-	-	-	-	7.6	24.9	33.3	-	-	-	-	0.7	1.3	2.7	2.7	120	-	-	5.0	10.0	10.0	20.0	2631
Oct. 29	87	-	-	-	6.7	16.9	23.1	-	-	-	-	-	3.1	4.4	5.8		110	-	5.0	5.0	10.0	15.0	20.0	1440
Nov. 05	83	-	-	7.6	21.8	27.1	-	-	-	-	-	6.2	8.0	9.8	-	-	100	-	10.0	15.0	20.0	25.0	35.0	1714
Nov. 12	80	-	7.1	17.3	25.3	-	-	-	-	-	8.0	9.3	10.7	-	-	-	100	5.0	10.0	20.0	25.0	35.0	40.0	1314
Nov. 19	80	6.2	16.4	30.2	-	-	-	-	-	8.9	10.2	11.1	-	-	-	-	100	10.0	15.0	20.0	25.0	40.0	45.0	2162
ROHINI																								
Oct. 01	110	-	-	-	-	-	-	5.3	26.7	-	-	-	-	-	-	-	130	-	-	-	-	5.0	15.0	2645
Oct. 08	105	-	-	-	-	-	-	4.9	24.9	-	-	-	-	-	-	-	130	-	-	-	10.0	15.0	20.0	2450
Oct. 15	100	-	-	-	-	-	6.2	21.3	-	-	-	-	-	2.7	3.6	4.9	120	-	-	5.0	10.0	15.0	20.0	2471
Oct. 22	96	-	-	-	-	8.4	20.9	23.1	-	-	-	-	3.6	5.3	10.7	-	120	-	-	5.0	10.0	15.0	20.0	2453
Oct. 29	90	-	-	-	9.8	15.3	22.2	-	-	-	-	-	3.1	4.9	12	-	110	-	-	10.0	15.0	20.0	30.0	1312
Nov. 05	83	-	-	12.4	24.0	27.1	-	-	-	-	-	3.6	5.8	11.1	-	-	100	-	5.0	10.0	15.0	20.0	35.0	1437
Nov. 12	80	-	10.7	25.8	29.3	-	-	-	-	-	6.2	7.6	9.3	-	-	-	100	10.0	15.0	20.0	25.0	30.0	35.0	1592
Nov. 19	80	11.6	20.7	28.4	-	-	-	-	-	5.8	6.7	8.9	-	-	-	-	100	5.0	15.0	25.0	30.0	35.0	40.0	2645

Table 4.8.4: Epidemiology of Downy mildew, White rust, Alternaria blight and Powdery Mildew at PNT during 2024-25.

A. Downy mildew

Date of sowing	First appearance (DAS)	% Downy mildew (DAS)																								
Varuna		10	13	17	20	24	27	31	34	38	41	45	48	52	55	59	62	66	69	73	76	80	83	87	90	94
Oct. 01	41	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	100.0	100.0	40.0	40.0	40.0	50.0	50.0	40.0	25.0	15.0	15.0	20.0	15.0	10.0	10.0
Oct. 08	35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.0	100.0	100.0	60.0	50.0	60.0	60.0	60.0	50.0	35.0	15.0	15.0	5.0	5.0	10.0	15.0	15.0
Oct. 15	28	0.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	100.0	80.0	70.0	60.0	55.0	55.0	50.0	40.0	20.0	25.0	35.0	30.0	30.0	35.0	25.0	25.0	20.0
Oct. 22	21	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0	90.0	75.0	70.0	60.0	60.0	50.0	35.0	35.0	30.0	30.0	30.0	25.0	20.0	15.0	15.0	10.0	10.0
Oct. 29	14	0.0	0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.0	85.0	60.0	50.0	35.0	25.0	40.0	20.0	25.0	15.0	15.0	10.0	10.0	5.0	5.0	5.0
Nov. 05	10	100.0	100.0	100.0	100.0	100.0	90.0	75.0	45.0	40.0	50.0	50.0	50.0	50.0	35.0	20.0	15.0	15.0	15.0	10.0	5.0	5.0	2.0	0.0	0.0	0.0
Nov. 12	16	0.0	0.0	100.0	100.0	90.0	80.0	55.0	30.0	75.0	50.0	50.0	50.0	45.0	25.0	20.0	10.0	10.0	5.0	5.0	2.0	2.0	0.0	0.0	0.0	0.0
Nov. 19	16	0.0	0.0	100.0	90.0	60.0	30.0	75.0	75.0	60.0	60.0	45.0	45.0	30.0	25.0	25.0	20.0	5.0	5.0	5.0	5.0	0.0	0.0	0.0	0.0	0.0

B. White rust & Powdery mildew

Date of sowing	First appearance (DAS)	% White Rust (DAS)																First appearance (DAS)	% Powdery Mildew (DAS)									
Varuna		49	52	55	59	62	66	69	73	76	80	83	87	90	94	97	101		111	115	118	122	125	129	132	136	139	143
Oct. 01	89	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	5.0	10.0	25.0	130	0.0	0.0	0.0	0.0	0.0	0.0	25.0	25.0	60.0	60.0
Oct. 08	83	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	5.0	10.0	20.0	20.0	35.0	123	0.0	0.0	0.0	0.0	10.0	25.0	45.0	45.0	60.0	60.0
Oct. 15	80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	5.0	15.0	25.0	25.0	40.0	45.0	116	0.0	0.0	10.0	20.0	40.0	45.0	45.0	55.0	65.0	65.0
Oct. 22	73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	15.0	25.0	25.0	45.0	55.0	40.0	35.0	116	0.0	0.0	10.0	25.0	30.0	50.0	50.0	65.0	65.0	65.0
Oct. 29	69	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	20.0	35.0	55.0	65.0	60.0	60.0	45.0	30.0	120	0.0	0.0	0.0	25.0	30.0	55.0	55.0	65.0	70.0	70.0
Nov. 05	62	0.0	0.0	0.0	0.0	2.0	5.0	10.0	25.0	40.0	75.0	75.0	70.0	70.0	65.0	0.0	0.0	113	0.0	5.0	25.0	30.0	30.0	45.0	45.0	55.0	55.0	60.0
Nov. 12	55	0.0	0.0	1.0	2.0	10.0	30.0	55.0	75.0	75.0	70.0	60.0	60.0	55.0	55.0	0.0	0.0	113	0.0	5.0	20.0	20.0	25.0	40.0	40.0	60.0	65.0	65.0
Nov. 19	49	1.0	1.0	2.0	5.0	25.0	60.0	65.0	65.0	60.0	60.0	60.0	55.0	50.0	50.0	0.0	0.0	110	2.0	10.0	15.0	15.0	25.0	35.0	35.0	55.0	55.0	60.0

C. Alternaria blight on leaves and Pod

Date of sowing	First appearance (DAS)	% Alternaria leaf blight (DAS)															First appearance (DAS)	% Alternaria Pod blight (DAS)													Yield(kg./ha)
Varuna		53	55	59	62	66	69	73	76	80	83	87	90	94	97	101		101	104	108	111	115	118	122	125	129	132	136	139	143	
Oct. 01	66	0.0	0.0	0.0	0.0	2.0	2.0	4.0	10.0	20.0	20.0	25.0	50.0	60.0	65.0	65.0	130	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.0	5.0	10.0	2930
Oct. 08	68	0.0	0.0	0.0	0.0	0.0	1.0	2.0	5.0	15.0	15.0	20.0	45.0	55.0	55.0	60.0	128	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	10.0	20.0	30.0	35.0	3330
Oct. 15	59	0.0	0.0	1.0	2.0	2.0	5.0	15.0	15.0	20.0	40.0	50.0	60.0	75.0	80.0	80.0	120	0.0	0.0	0.0	0.0	0.0	0.0	2.0	2.0	20.0	35.0	50.0	55.0	65.0	3070
Oct. 22	55	0.0	1.0	1.0	5.0	10.0	10.0	15.0	35.0	35.0	55.0	65.0	80.0	80.0	85.0	85.0	120	0.0	0.0	0.0	0.0	0.0	0.0	2.0	5.0	20.0	45.0	65.0	65.0	70.0	2800
Oct. 29	58	0.0	0.0	1.0	2.0	5.0	5.0	10.0	25.0	30.0	55.0	75.0	80.0	80.0	80.0	80.0	114	0.0	0.0	0.0	0.0	5.0	25.0	45.0	45.0	45.0	60.0	65.0	70.0	70.0	2130
Nov. 05	58	0.0	0.0	1.0	2.0	2.0	5.0	15.0	25.0	80.0	75.0	75.0	75.0	75.0	75.0	75.0	111	0.0	0.0	0.0	10.0	25.0	25.0	35.0	35.0	40.0	45.0	50.0	60.0	60.0	1070
Nov. 12	60	0.0	0.0	0.0	1.0	2.0	15.0	25.0	65.0	65.0	65.0	65.0	70.0	70.0	70.0	70.0	108	0.0	0.0	10.0	15.0	30.0	35.0	35.0	35.0	40.0	40.0	55.0	55.0	60.0	1000
Nov. 19	53	1.0	2.0	10.0	25.0	55.0	55.0	60.0	65.0	65.0	70.0	70.0	75.0	75.0	75.0	75.0	101	20.0	20.0	25.0	35.0	35.0	35.0	40.0	40.0	45.0	45.0	55.0	55.0	55.0	930

Table 4.8.5: Epidemiology of Alternaria blight disease at SHL during 2024-25.

A. Alternaria Blight on leaves and Pod

Date of sowing	First appearance (DAS)	% Alternaria leaf blight (DAS)									First appearance (DAS)	% Alternaria Pod blight (DAS)				Yield (kg/ha)
Varuna		**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**		**90**	**100**	**110**	**120**	
Oct-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oct-08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oct-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oct-22	**50**	0.0	0.0	4.7	6.0	11.8	15.3	21.9	27.2	32.8	**109**	0.0	0.0	5.3	8.9	1733
Oct-29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nov-05	**42**	0.0	3.9	8.2	16.3	18.7	22.9	28.5	33.5	0.0	**90**	0.0	8.3	14.2	19.7	1853
Nov-12	**36**	3.5	5.5	11.9	18.2	23.8	26.1	34.8	38.1	0.0	**89**	2.5	8.9	15.6	25.7	1613
Nov-19	**35**	3.3	8.5	15.2	20.8	27.9	31.2	36.2	0.0	0.0	**84**	7.5	14.3	23.7	0.0	1307
TM 2																
Oct-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oct-08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oct-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oct-22	**50**	0.0	0.0	5.9	6.1	14.2	18.1	22.9	26.8	33.1	**109**	0.0	0.0	6.2	12.2	1667
Oct-29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nov-05	**42**	0.0	3.7	9.4	15.6	19.8	26.2	29.1	36.8	0.0	**90**	2.5	9.7	16.9	22.5	1760
Nov-12	**36**	3.8	6.1	15.1	20.5	25.2	30.7	34.1	37.8	0.0	**89**	2.7	11.5	20.7	27.4	1453
Nov-19	**34**	3.9	11.2	17.2	22.8	30.2	31.8	38.5	0.0	0.0	**84**	5.5	13.2	24.8	0.0	1213

*1st, 8th, 15th & 29th Oct 2024 sowing could not be done due to heavy rainfall

Table 4.8.6: Epidemiology of Alternaria blight, white rust and powdery mildew at JHS during 2024-25.

A. Alternaria Blight on leaves and Pod **B. White rust**

Date of Sowing	First appearance (DAS)	% Alternaria blight on leaves (DAS)					First appearance (DAS)	% AB on siliqua (DAS)				First appearance (DAS)	% White rust (DAS)					First appearance (DAS)	% Staghead (DAS)			
Giriraj		70	80	90	100	110		90	100	110	120		70	80	90	100	110		100	110	120	130
Oct. 01	91	-	-	-	5.0	5.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oct. 08	86	-	-	5.0	5.0	10.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oct. 15	76	-	5.0	10.0	10.0	10.0	-	-	-	-	-	90	-	-	20.0	30.0	30.0	-	-	-	-	-
Oct. 22	69	5.0	10.0	10.0	20.0	20.0	-	-	-	-	-	85	-	-	30.0	30.0	30.0	112	1.0	1.0	1.0	1.0
Oct. 29	59	10.0	20.0	20.0	30.0	20.0	97	-	5.0	20.0	0.0	82	-	20.0	20.0	30.0	30.0	100	1.0	1.0	1.0	1.0
Nov. 05	50	10.0	20.0	20.0	20.0	-	92	-	10.0	30.0	0.0	75	20.0	20.0	30.0	30.0	30.0	100	1.0	1.0	1.0	2.0
Nov. 12	57	20.0	20.0	30.0	30.0	-	90	10.0	20.0	0.0	0.0	82	20.0	30.0	30.0	30.0	30.0	100	-	-	-	-
Nov. 19	55	20.0	20.0	30.0	30.0	-	88	20.0	20.0	0.0	0.0	89	20.0	30.0	30.0	30.0	30.0	98	-	-	-	-
Varuna																						
Oct. 01	89	-	-	5.0	5.0	5.0	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
Oct. 08	80	-	5.0	5.0	10.0	10.0	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-
Oct. 15	72	-	5.0	10.0	20.0	10.0	-	-	-	-	-	80	-	-	20.0	30.0	30.0	110	-	-	-	-
Oct. 22	60	5.0	10.0	10.0	20.0	30.0	-	-	-	-	-	88	-	-	20.0	30.0	30.0	108	1.0	1.0	1.0	1.0
Oct. 29	52	10.0	20.0	20.0	20.0	-	94	-	10.0	10.0	0.0	78	-	20.0	30.0	30.0	30.0	107	1.0	1.0	1.0	2.0
Nov. 05	50	20.0	30.0	20.0	20.0	-	90	20.0	20.0	20.0	0.0	72	20.0	30.0	30.0	30.0	30.0	103	2.0	2.0	2.0	3.0
Nov. 12	51	20.0	30.0	30.0	30.0	-	89	30.0	30.0	30.0	0.0	75	20.0	30.0	30.0	30.0	30.0	101	-	-	-	-
Nov. 19	51	30.0	30.0	30.0	30.0	-	83	30.0	30.0	30.0	0.0	70	20.0	30.0	30.0	30.0	30.0	96	-	-	-	-

C. Powdery mildew

Date of Sowing	First appearance (DAS)	% Powdery mildew (DAS)					Yield(kg/ha)
Giriraj		80	90	100	110	120	
Oct. 01	120	-	-	-	-	30.0	1850
Oct. 08	108	-	-	-	50.0	50.0	1910
Oct. 15	102	-	-	-	50.0	50.0	2280
Oct. 22	100	-	-	50.0	50.0	50.0	2550
Oct. 29	95	-	-	50.0	50.0	50.0	2410
Nov. 05	88	50.0	50.0	50.0	50.0	50.0	1880
Nov. 12	85	50.0	50.0	50.0	50.0	50.0	1350
Nov. 19	80	50.0	50.0	50.0	50.0	50.0	1340
Varuna							
Oct. 01	107	-	-	-	50.0	50.0	1220
Oct. 08	112	-	-	-	-	50.0	1280
Oct. 15	103	-	-	-	50.0	50.0	1550
Oct. 22	99	50.0	50.0	50.0	50.0	50.0	1740
Oct. 29	87	50.0	50.0	50.0	50.0	50.0	1680
Nov. 05	88	50.0	50.0	50.0	50.0	50.0	1370
Nov. 12	82	-	50.0	50.0	50.0	50.0	890
Nov. 19	78	50.0	50.0	50.0	50.0	50.0	810

Table: 4.8.7: Epidemiology of Alternaria blight, White rust, Powdery mildew and Downy mildew at DOL during 2024-25.

A. Alternaria blight on leaves

Date of sowing	First appearance (DAS)	% Alternaria blight on leaves (DAS)									Yield(Kg/ha)
Varuna		**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	**130**	
Oct, 01	**66**	0.0	0.0	2.2	9.1	16.6	23.3	29.9	36.6	38.9	975
Oct, 08	**59**	0.0	1.1	7.7	13.3	15.5	21.1	32.2	35.6	40.0	1150
Oct, 15	**52**	0.0	7.7	16.6	21.1	28.9	35.6	37.7	40.0	46.1	1350
Oct, 22	**45**	2.2	9.1	16.6	22.2	28.9	32.2	35.6	38.9	45.6	1450
Oct, 29	**38**	13.3	16.6	23.3	31.4	35.6	37.7	38.8	40.0	46.1	1375
Nov, 05	**31**	15.5	18.8	22.2	28.9	31.5	39.8	41.4	42.3	43.5	1100
Nov, 12	**24**	16.6	19.6	24.4	28.5	32.5	38.8	40.4	41.4	41.4	1050
Nov, 19	**17**	22.2	28.9	29.9	31.4	35.6	37.7	38.9	40.0	41.4	790
Rajendra Suflam 1											
Oct, 01	**72**	0.0	0.0	0.0	7.7	13.3	16.6	22.2	28.9	29.5	1050
Oct, 08	**65**	0.0	0.0	4.4	9.1	12.2	15.5	21.1	29.9	31.4	1240
Oct, 15	**58**	0.0	1.1	7.7	9.1	12.2	16.6	24.4	28.5	32.5	1460
Oct, 22	**51**	0.0	7.7	13.3	16.6	19.6	22.2	28.9	31.4	33.3	1630
Oct, 29	**44**	4.4	7.7	11.1	13.3	16.6	21.1	23.3	29.9	31.4	1580
Nov, 05	**37**	7.7	9.1	13.3	16.6	21.1	22.2	24.4	28.9	31.4	1190
Nov, 12	**30**	11.1	16.6	21.1	22.2	24.4	26.1	28.9	29.5	31.4	1140
Nov, 19	**23**	16.6	21.1	23.3	24.4	26.1	28.9	29.5	31.4	32.2	860

Table 4.8.8: Epidemiology of WR and PM at SKN during 2024-25

A. White Rust

Date of sowing	Disease appearance (DAS)	% White Rust (DAS)															
		60	64	67	71	74	78	81	85	88	92	95	99	102	106	109	113
Varuna																	
Oct. 01	85	-	-	-	-	-	-	-	-	0.3	1.4	4.4	7.1	9.7	13.2	18.1	25.0
Oct. 08	82	-	-	-	-	-	-	-	1.5	4.5	8.8	12.5	16.2	20.8	24.4	29.9	-
Oct. 15	78	-	-	-	-	-	-	1.0	3.4	6.8	10.2	15.3	21.6	26.7	30.4	33.4	-
Oct. 22	75	-	-	-	-	-	0.4	3.3	7.7	13.7	18.5	24.0	30.9	34.3	37.7	-	-
Oct. 29	70	-	-	-	1.8	5.3	9.8	16.0	22.0	27.7	34.2	38.8	43.2	-	-	-	-
Nov. 05	64	-	-	0.5	2.7	6.7	13.7	19.0	23.8	26.4	30.2	35.7	40.3	-	-	-	-
Nov. 12	61	-	1.4	2.9	6.3	10.3	17.6	20.3	23.4	30.0	34.1	-	-	-	-	-	-
Nov. 19	57	0.4	2.4	5.7	11.0	16.0	19.6	22.7	27.9	-	-	-	-	-	-	-	-
GM 2																	
Oct. 01	89	-	-	-	-	-	-	-	-	-	0.8	3.6	6.9	9.5	12.7	16.8	20.3
Oct. 08	84	-	-	-	-	-	-	-	-	1.7	4.2	8.3	14.7	19.5	23.8	29.1	-
Oct. 15	81	-	-	-	-	-	-	-	2.0	4.9	9.6	14.5	19.3	24.8	29.1	32.9	-
Oct. 22	78	-	-	-	-	-	-	2.1	5.8	11.0	16.5	23.1	29.7	33.0	36.0	-	-
Oct. 29	72	-	-	-	-	1.4	7.2	13.1	19.0	25.8	31.3	36.0	40.4	-	-	-	-
Nov. 05	67	-	-	-	0.5	4.0	10.3	17.8	22.2	26.0	29.4	34.0	38.0	-	-	-	-
Nov. 12	62	-	1.3	3.5	6.0	9.7	14.4	17.8	21.1	28.9	32.4	-	-	-	-	-	-
Nov. 19	58	0.3	1.3	4.5	9.6	16.0	18.7	21.9	26.6	-	-	-	-	-	-	-	-

B. Powdery mildew

Date of sowing	Disease pearance (DAS)	% Powdery mildew (DAS)													Yield (kg./ha)
		85	88	92	95	99	102	106	109	113	116	120	123	127	
Varuna															
Oct. 01	112	-	-	-	-	-	-	-	-	0.5	1.3	4.0	8.7	14.0	1850
Oct. 08	107	-	-	-	-	-	-	-	1.2	3.2	7.0	12.5	19.2	27.3	1590
Oct. 15	104	-	-	-	-	-	-	-	1.0	4.9	10.7	18.0	27.5	44.0	1450
Oct. 22	105	-	-	-	-	-	-	3.2	9.0	18.8	30.7	42.0	57.5	-	1210
Oct. 29	99	-	-	-	-	-	5.6	12.4	18.5	30.8	48.5	68.0	-	-	1020
Nov. 05	97	-	-	-	-	5.7	10.2	19.0	34.5	50.5	67.5	81.5	-	-	950
Nov. 12	91	-	-	2.8	6.5	16.9	29.5	47.0	68.0	89.5	99.0	-	-	-	860
Nov. 19	84	1.9	4.2	10.4	23.9	47.0	73.5	93.0	100.0	100.0	-	-	-	-	770
GM 2															
Oct. 01	112	-	-	-	-	-	-	-		0.4	1.1	3.3	6.7	11.7	1910
Oct. 08	108	-	-	-	-	-	-	-	0.8	2.1	5.2	10.1	16.9	24.5	1670
Oct. 15	107	-	-	-	-	-	-	-	0.7	2.7	7.4	15.2	25.6	39.8	1550
Oct. 22	106	-	-	-	-	-	-	1.6	5.7	13.1	25.3	40.3	54.0	-	1360
Oct. 29	101	-	-	-	-	-	1.4	6.5	12.7	22.6	43.3	60.5	-	-	1100
Nov. 05	98	-	-	-	-	4.5	10	17.9	30.5	47.5	64.0	76.5	-	-	980
Nov. 12	91	-	-	1.1	2.8	9.3	18.7	38.4	62.5	80.0	96.0	-	-	-	830
Nov. 19	85	0.8	2.3	7.4	16.5	32.8	60.5	80	96.5	100.0	-	-	-	-	730

Entomology

5. Entomology

The 2024-25 crop season witnessed moderate to high population development of mustard aphid on different Brassica species.

5.1 Screening of advanced breeding germplasm against mustard aphid

One hundred fifty-three strains (IVT) were evaluated against mustard aphid including susceptible/tolerant checks. Aphid pressure was low at **KPR** centre and moderate to severe at **MOR, HSR, SKN, NDH, LDH, DOL and SHL** centres. Out of 153 IVT entries, none of the entry fell in the resistant category; however, 29 entries RH 1999-18, JD 6, KMR (E) 24-2, PM 25, NPJ 274, NJI24-401, NPJ 278, RL-19-237, RL-19-162, RCC-4 (ZC), KMR-24-4, SKM-2209, RAURD-14-18, NPJ-280, RH-2265, RKM-588, RH 2299-64, RH 1424, NPJ 281, RAURD-14-18, DRMRIJ-22-2, RH 2370, NPJ 280, RGN-592, NPJ-276, ORM-2019-30, 4205D300-01, KBH-5256 and PM-30 (NC) were comparatively better since these recorded AII of <2.0 (Table 5.1A). Among the 46 (AVT I and AVT II) entries screened against mustard aphid, no entry fell in resistant category, however, eight entries Basanti (WRR Check), CS-60 (LR), DRMRHT-18-65, NPJ-268, NRCHB-101 (ZC), Varuna, RH-2299-63 and NPJ-271 recorded the AII <2.0 (Table 5.1B). Among the 10 AVT II entries screened under artificial conditions, all were found susceptible (Table 5.1C).

5.2 Assessment of yield losses due to insect pests in Brassica crops

The highest yield losses were observed in RH 1975 (35.9%), BPM 11 (28.0%) and PBR 357 (25.8%) at **Ludhiana** and RH 1975 (25.45%) and BPM 11 (24.50%) at **Dholi** (Table 5.2). It was followed by 21.09% yield loss in TS 38 at Shillongani and 20.56% in BPM 11 at **New Delhi,** 17.60% in BPM 11 at **Hisar** and 17.6% in Varuna at **Pantnagar**. The highest yield loss among the entries evaluated in other centres was 12.3% in RVM-3 at **Morena.**

5.3 Population dynamics of various insect-pests on *Brassica* crops

Incidence of various insect-pests on *Brassica* crops

At **Hisar**, aphid population remained low and was observed from 48th to 13th std. week with peak during 11th std. week. The aphid population was observed till 13th std. week. Low activity of cabbage caterpillar was observed during 8th to 10th std. week on BSH 1 under late sown conditions. The activity of coccinellid predators was observed from 47th to 13th std. week along with some activity of syrphid fly (Table 5.3.1A-D). At **Dholi**, moderate to high population of mustard aphid was recorded. It remained active from 2nd to 13th SMW with peak activity during 7th-9th SMW (Table 5.3.2). At **Pant Nagar** low to high population of mustard aphid was recorded on DRMR IJ 31, T 27, GSC 7, BSH 1, YST 151, *B. nigra, B. alba* and Varuna during 3rd to 13th std. week (Table 5.3.3A, B). Under late sown conditions, the peak activity of mustard aphid was observed from 6th-8th SMW. The different natural enemies remained active from 3rd-12th std. week with peak activity during 8th-11th std. week. At **Ludhiana**, activity of both mustard aphid and cabbage aphid was recorded with low activity under timely sown conditions and moderate to high activity under late sown conditions. Under timely sown conditions first appearance of mustard aphid was recorded during 4rd standard week on DRMR IJ 31 and BSH 1 which remained active till 12th std. week, and under late sown conditions also it remained active from 6th to 13th std. week (Table 5.3.4A, B). Cabbage aphid remained active from 8th to 14th std. week under late sown conditions. Low to moderate activity of cabbage caterpillar was recorded both under timely and late sown conditions. Cabbage caterpillar appeared on 5th std. week under timely and on 8th std. week under late sown conditions and remained active till 12th std. week (Table 5.3.4A-B). At **SK Nagar**, population of mustard aphid was recorded from 1st to 12th std. week in timely and late sown crop with moderate to high population (Table 5.3.5A, B). At **Shillongani** peak population of mustard aphid was recorded in 51st to 13th std. week, sawfly during 49th to 7th std. week, flea beetle activity from 49th to 11th std. week and coccinellid predators' activity during 52nd and 13th std. week (Table 5.3.7A-D). At **Morena**, mustard aphid remained active from 49th to 13th std. week, while the activity of coccinellid beetles was observed from 50th to 13th std. week. Some activity of painted bug was also recorded from 42nd to 48th std week. (Table 5.3.8A-D).

5.3 (B) Monitoring of alate mustard aphids on yellow sticky traps

The alate aphid population was recorded by seven centres. At **Hisar**, the alate population appeared during 47th std. week, peaked (376.5 aphids/ trap) during 10th std. week and disappeared after 14th std. week. At **S.K. Nagar**, alate mustard aphid population appeared during 48th std. week, reached its peak (6447.6 aphids/ trap) during 9th std. week and disappeared after 13th std. week. At **Ludhiana**, alate aphid appeared as early as 43rd std week and remained active upto 15th std week with peak (145.4 aphids/ trap) during 13th std. week. At **Pant Nagar**, the alate aphid appeared in 3rd std. week and peaked (177.0 aphids/ trap) during 11th std. week. At **Kanpur**, it appeared during 9th std. week and disappeared after 11th std. week. At **Morena**, it appeared during 47th std. week, peaked (118.9 aphids/ trap) during 7th std. week and disappeared after 12th std. week. At **Dholi**, its first appearance was recorded during 3rd std. week with peak activity (106.8 aphids/ trap) during 10th std. week and disappeared after 13th std. week (Table 5.3.8).

5.4 Management of mustard aphid with exogenous application of salicylic acid on mustard aphid

At **Hisar**, application of salicylic acid @ 0.5, 1.0 and 1.5 mM resulted in significantly lower aphid population than control after 3, 7, 10 and 14 days of spray. Among the different salicylic acid treatments, salicylic acid @ 1.5 mM remained the most effective. The yield in this treatment was also the highest (2281.2 kg/ha), however, the maximum IBCR of 33.3 was obtained in the treatment thiamethoxam 25 WG @ 0.1 g/L water (Table 5.4.1 A, B). At **Morena**, almost similar trend was observed with significantly low aphid population in all the first four treatments. However, maximum yield of 2025.0 kg/ha was obtained in the case of treatment T_4 i.e. spray of thiamethoxam @ 0.1 g/l water (Table 5.4.2 A, B). At **SK Nagar** also, the aphid population was significantly lower than the untreated control in all the spray treatments during 3 and 7, 10 and 14 DAS except salicylic acid 0.5mM at 10 DAS. The maximum seed yield of 1245.0 kg/ha was recorded in thiamethoxam 25 WG @ 0.1g/L which was significantly higher than control (718.0 kg/ha). It was followed by salicylic acid 1.5 mM, 1.0 mM and 0.5 mM with respective seed yield of 950.0, 937.0 and 926.0 kg/ha (Table 5.4.3A, B). At **Dholi**, mustard aphid population in all the spray treatments remained significantly lower than that in the control with minimum population observed in case of thiamethoxam 25 WG @ 0.1 g/ l water followed by salicylic acid 1.5, 1.0 and 0.5 mM. The maximum yield (1197.50 kg/ha) was also obtained in thiamethoxam 25 WG @ 0.1 g/l (Table 5.4.4A, B). Almost similar trend was reported at **Shillongani** (Table 5.4.5A, B). At **Ludhiana**, after one day of spray, aphid population was significantly lower in thiamethoxam 25 WG @ 0.1 g/l and salicylic acid 1.0 and 1.5 mM, however, after three days, it was significantly lower in all the spray treatments than control with maximum reduction in population over control observed in thiamethoxam 0.1 g/l (91.9%) followed by salicylic acid treatments (13.7-20.9%). After 7 days of treatment, this reduction was in the order of thiamethoxam 25 WG @ 0.1 g/l water (99.5%) followed by salicylic acid @ 1.5 mM (38.9%), 1.0 mM (21.3%) and 0.5 mM (14.9%). The trend was more or less similar thereafter. Significantly high and maximum seed yield of 2022.2 kg/ha was obtained in thiamethoxam 25 WG @ 0.1 g/l followed by salicylic acid @ 1.5 mM (1902.8 kg/ha), 1.0 mM (1769.4 kg/ha) and 0.5 mM (1550.0 kg/ha) with respective IBCR of 47.3, 26.2, 23.7 and 15.7 (Table 5.4.6A, B).

5.5 Effect of aphid herbivory on changes in biochemical parameters of Brassica plants

Aphid feeding on host plants resulted in changes in their biochemical parameters. At **Hisar**, there was 22.6 to 35.5% increase in enzymatic activity of peroxidase on infested plants over uninfested. Similarly, an increase in myrosinase activity was reported in all the genotypes which ranged from 18.36 to 29.41% (Table 5.6.1). On the other hand, a reduction in glucosinolates content was observed in all the genotypes which ranged from -6.1 to -21.7%. A general trend of induction in total phenols, ortho-dihydroxy phenols and flavonols content was observed in all the cultivars after aphid infestation. At **Ludhiana**, the induction in peroxidise activity after aphid infestation varied from 100.0% in DRMR IJ 31 to as high as 150.0% in GSC 7. Similarly, the induction in myrosinase activity after aphid infestation varied from 23.07 to 462.50 %. In general, conventional cultivars of both *B. juncea* and *B. napus* witnessed lower induction compared to quality cultivars (Table 5.5.2). For glucosinolates, a general trend of reduction in glucosinolates content after aphid feeding was observed in all the genotypes with maximum reduction (-22.26%) in GSC 7. For total phenols, ortho-dihydroxy phenols and flavonols, a general trend of induction after aphid feeding was observed in all the genotypes. At **Pantnagar,** a general trend of increase in all the biochemicals after aphid infestation was observed in all the varieties. For peroxidise, myrosinase activity, total glucosinolates and total phenols, this induction was more in conventional cultivars than in quality cultivars, however, for ortho-dihydroxy phenols it was opposite only for *B. juncea* cultivars (Table 5.5.3).

5.6 Survey and surveillance of insect pests and their natural enemies

Survey and surveillance of insect pests was conducted at **Hisar, Morena, Pantnagar, SK Nagar, Shillongani and Ludhiana** (Table 5.6.1 to 5.6.6). At **Hisar**, the mustard aphid was reported from January to March, with low activity of flea beetle, hairy caterpillar and painted bug during January, January and December, respectively while the coccinellids predators were reported from February to March and syrphids from December to February. At **Morena**, aphid activity was reported from first fortnight of December to first fortnight of February while painted bug remained active from second fortnight of October to second fortnight of December and coccinellid predators remained active from first fortnight of December to second fortnight of February. At **Pantnagar,** aphid activity was recorded from 45th standard meteorological week to 13th week, while mustard sawfly remained active from 45th standard meteorological week to 11th standard week. High activity of coccinellids was recorded from 45th standard week to 13th standard week. At **SK Nagar,** low aphid activity was recorded from second fortnight of December to 2nd fortnight of February. Similarly, the population of coccinellids remained low from 1st fortnight of December to 2nd fortnight of February. At **Shillongani,** aphid activity remained below economic threshold level. At **Ludhiana** aphid population was recorded on 1st fortnight of February till second fortnight of March with low to high population. The cabbage caterpillar and coccinellid predators remained active from second fortnight of February to second fortnight of March with low population levels.

Table 5.1 (A). Reaction of IVT entries to mustard aphid infestation

S. No.	Code No.	Entries	Aphid Infestation Index (AII)								
			MOR	HSR	KPR	SKN	NDH	LDH	DOL	SHL	Mean
IVT Toria											
1	SBG 24-1	Bhawani (ZC)	0.8	2.2	0.0	3.1	1.5	4.1	2.0	3.1	**2.4**
2	SBG 24-2	PT-303 (NC)	0.6	1.3	0.0	3.0	1.5	4.3	2.6	3.1	**2.3**
3	SBG 24-3	PTC 2021-2	1.0	1.5	0.0	3.1	1.5	4.5	2.0	3.2	**2.4**
4	SBG 24-4	BAUT 08-12	1.0	1.1	0.0	2.8	1.0	4.3	2.6	3.2	**2.3**
5	SBG 24-5	CG Toria-02	0.4	2.4	0.0	2.8	1.5	2.5	2.2	3.1	**2.1**
6	SBG 24-6	JT-17-1	0.6	1.4	0.0	3.0	1.4	2.1	2.7	3.2	**2.1**
7	SBG 24-7	TKM 24-2	0.6	1.5	0.0	2.8	1.5	2.3	2.0	3.2	**2.0**
8	SBG 24-8	TKM 24-1	0.4	2.2	0.0	2.7	1.0	2.1	3.6	3.1	**2.2**
9	SBG 24-9	TS-38 (LR)	1.0	2.1	0.0	2.8	1.3	2.4	3.2	3.1	**2.3**
10	SBG 24-10	PTC-2021-1	1.2	2.1	0.0	2.8	1.1	3.0	2.0	3.4	**2.2**
11	SBG 24-11	**BSH-1 (SC)**	0.6	1.3	0.0	2.7	1.0	3.1	2.0	3.3	**2.0**
IVT Yellow *Sarson*											
12	SBG 24-12	DRMRYS 202	0.4	1.5	0.0	2.7	1.4	3.1	2.2	3.2	**2.1**
13	SBG 24-13	RMYS 6	0.8	1.7	0.0	2.8	1.0	4.1	3.0	3.2	**2.4**
14	SBG 24-14	YSKM 24-1	0.4	2.7	0.0	2.7	1.0	4.1	1.4	3.2	**2.2**
15	SBG 24-15	Pitambari (LR)	0.6	1.8	0.0	2.7	1.0	4.7	2.8	3.2	**2.4**
16	SBG 24-16	Binoy (ZC)	1.0	1.5	0.0	2.8	1.0	3.7	2.2	3.4	**2.2**
17	SBG 24-17	YSH 401 (NC)	1.0	1.3	0.0	2.8	1.0	4.3	3.4	3.1	**2.4**
18	SBG 24-18	PYS 2020-3	1.0	1.0	0.0	2.8	1.2	4.5	2.0	3.3	**2.3**
19	SBG 24-19	PYS -24	2.0	1.4	0.0	2.7	1.3	4.1	2.4	3.2	**2.4**
20	SBG 24-20	DRMRYS 24-3	1.2	1.7	0.0	2.6	1.0	4.1	2.1	1.8	**2.1**
21	SBG 24-21	YSKM 24-1	1.0	2.5	0.0	2.7	1.3	4.9	2.8	3.0	**2.6**
22	SBG 24-22	BRYS -2	2.0	2.7	0.0	2.7	1.0	4.3	2.6	3.1	**2.6**
23	SBG 24-23	PYS 2021-21	1.0	1.5	0.0	2.6	1.0	4.0	3.0	2.9	**2.3**
24	SBG 24-24	**NRCYS 05-02**	0.4	1.4	0.0	2.6	1.0	3.9	2.4	2.9	**2.1**
IVT (Early mustard)											
25	SBG 24-25	PRE -2022-6	0.6	1.5	0.0	2.5	1.5	3.4	2.0	3.0	**2.1**
26	SBG 24-26	RH 1999-18	0.6	1.1	0.0	2.7	1.5	2.9	2.8	1.9	**1.9**
27	SBG 24-27	JD 6 (ZC)	0.4	1.4	0.0	2.7	1.0	2.6	2.0	3.0	**1.9**
28	SBG 24-28	PRO 5111 (HC)	1.0	1.8	0.0	2.6	1.5	2.9	3.4	3.0	**2.3**
29	SBG 24-29	HUJM (E) 23-7	1.2	2.9	0.0	2.6	1.5	3.7	3.8	3.0	**2.7**
30	SBG 24-30	Kesari 5113	0.6	1.8	0.0	2.6	1.0	3.5	2.0	3.0	**2.1**
31	SBG 24-31	KMR (E) 24-2	0.4	1.9	0.0	2.6	1.0	3.5	2.0	1.9	**1.9**
32	SBG 24-32	KMR (E) 24-1	0.8	1.4	0.0	2.6	1.0	4.2	3.2	3.0	**2.3**
33	SBG 24-33	PM-25	0.4	1.4	0.0	2.7	1.0	3.1	2.0	2.9	**1.9**
34	SBG 24-34	NPJ-274	0.6	1.6	0.0	2.6	1.0	2.3	2.2	2.9	**1.9**
35	SBG 24-35	GDM-4 (LR)	1.0	1.2	0.0	2.8	1.0	3.1	2.0	3.1	**2.0**
36	SBG 24-36	PRE-2022-12	1.0	1.4	0.0	2.6	1.0	2.2	3.8	3.1	**2.2**
37	SBG 24-37	NPJ-275	1.0	1.2	0.0	2.7	1.0	2.6	2.2	3.1	**2.0**
38	SBG 24-38	DRMRHT -13-2	2.0	1.3	0.0	2.5	1.0	2.4	2.0	2.9	**2.0**
39	SBG 24-39	DRMRHT -22125	1.2	1.6	0.0	2.6	1.8	3.1	2.2	2.9	**2.2**
40	SBG 24-40	NJI24-401	1.0	1.2	0.0	2.5	1.0	2.0	2.6	3.0	**1.9**
41	SBG 24-41	DRMRCI-206	2.0	1.3	0.0	2.6	1.0	2.2	2.0	3.1	**2.0**
42	SBG 24-42	RH 2399-2	1.0	2.1	0.0	2.6	1.0	2.3	2.2	3.1	**2.0**
43	SBG 24-43	**IM -126 (Check)**	0.4	1.9	0.0	2.6	1.0	2.6	3.4	3.1	**2.1**
IVT Timely Sown											
44	SBG 24-44	RH 1975 (LR)	0.6	2.5	1.8	2.5	1.0	2.3	2.4	3.1	**2.1**
45	SBG 24-45	NPJ-279	0.6	1.8	2.1	2.7	1.0	2.9	2.9	3.1	**2.1**
46	SBG 24-46	NPJ-278	0.4	1.5	0.0	2.6	1.0	3.3	2.7	2.0	**1.9**
47	SBG 24-47	ACN-231	1.0	1.8	0.0	2.8	1.0	2.5	2.1	3.1	**2.0**
48	SBG 24-48	RB-118	1.2	1.9	0.9	2.5	1.0	2.4	2.3	3.0	**2.0**
49	SBG 24-49	RKM-460	0.6	1.9	0.0	2.6	1.0	2.7	2.2	2.9	**2.0**
50	SBG 24-50	PYR 2018-1	0.4	1.7	0.0	2.6	1.0	2.4	2.5	3.1	**2.0**
51	SBG 24-51	DRMRCI -195	0.8	2.8	0.0	2.6	1.0	2.5	2.9	3.0	**2.2**
52	SBG 24-52	RGN -593	0.4	1.8	0.0	2.6	1.0	2.5	3.3	2.9	**2.1**
53	SBG 24-53	RL-19-237	0.6	1.3	0.0	2.7	1.0	2.1	2.8	1.9	**1.8**

54	SBG 24-54	CS-2009-219	1.0	1.7	0.0	2.7	1.0	2.1	2.4	3.1	**2.0**
55	SBG 24-55	RL-19-162	1.0	1.5	1.1	2.6	1.0	2.3	2.0	3.0	**1.9**
56	SBG 24-56	HUJM-23-12	0.4	1.7	0.0	2.7	1.0	2.9	2.2	2.9	**2.0**
57	SBG 24-57	RH-2263	0.6	2.1	0.0	2.5	1.0	3.1	1.4	3.1	**2.0**
58	SBG 24-58	TM-416	0.6	1.2	0.0	2.6	1.0	2.9	3.0	3.2	**2.1**
59	SBG 24-59	RCC-4 (ZC)	0.4	1.3	0.0	2.7	1.0	2.9	2.2	3.0	**1.9**
60	SBG 24-60	SKM-2206	1.0	2.0	0.0	2.7	1.0	2.8	2.4	3.0	**2.1**
61	SBG 24-61	18-52	1.2	2.7	0.0	2.6	1.0	3.3	2.0	2.0	**2.1**
62	SBG 24-62	KMR-24-4	0.6	1.2	1.2	2.7	1.0	2.9	1.2	3.1	**1.8**
63	SBG 24-63	DRMRIJ-21-57	0.4	2.2	0.0	2.6	1.0	2.7	3.0	3.1	**2.1**
64	SBG 24-64	DRMR 2022-4	0.8	1.2	0.0	2.5	1.0	2.9	2.2	3.1	**2.0**
65	SBG 24-65	SKM-2209	0.4	1.5	0.0	2.6	1.0	2.0	2.2	3.0	**1.8**
66	SBG 24-66	Kranti (NC)	0.6	2.1	0.0	2.7	1.0	2.5	2.0	3.1	**2.0**
67	SBG 24-67	AKMS-1003-50	1.0	2.4	0.0	2.6	1.0	2.0	2.6	3.0	**2.1**
68	SBG 24-68	RH-2399-6	1.0	2.8	0.0	2.6	1.0	2.4	2.0	3.0	**2.1**
69	SBG 24-69	ORM-2019-31	1.0	1.8	0.0	2.5	1.0	2.8	2.8	2.9	**2.1**
70	SBG 24-70	KMR-24-3	2.0	1.2	0.0	2.6	1.0	2.8	3.2	3.0	**2.3**
71	SBG 24-71	PR-2020-16	1.2	1.5	0.0	2.7	1.0	2.5	3.6	3.1	**2.2**
72	SBG 24-72	**RH-749 (CC)**	1.0	1.7	0.0	2.8	1.0	2.7	2.0	2.9	**2.0**
IVT (Rainfed)											
73	SBG 24-73	RH-1424 (LR)	2.0	1.2	0.0	2.6	1.0	2.2	2.0	2.9	**2.0**
74	SBG 24-74	NPJ-281	1.0	1.2	0.0	2.6	3.3	2.7	2.2	3.0	**2.3**
75	SBG 24-75	RAURD-14-18	0.4	1.4	0.0	2.0	1.0	2.0	3.6	3.0	**1.9**
76	SBG 24-76	NPJ-280	0.6	1.3	0.0	2.7	1.0	2.5	2.0	3.1	**1.9**
77	SBG 24-77	RH-2265	0.6	1.4	0.0	2.6	1.0	1.6	2.8	3.0	**1.9**
78	SBG 24-78	RKM-588	0.4	1.0	0.0	2.5	1.0	2.4	1.2	2.9	**1.6**
79	SBG 24-79	RH-2299-64	1.0	1.6	0.3	2.6	1.0	2.5	1.4	2.9	**1.9**
80	SBG 24-80	RH-725 (ZC)	1.2	1.5	0.0	2.7	1.0	2.2	2.8	2.9	**2.0**
81	SBG 24-81	DRMRHT -2090	0.6	1.4	0.0	2.6	1.0	2.6	2.6	2.9	**2.0**
82	SBG 24-82	HUJM-23-12	0.4	1.6	0.0	2.7	1.0	2.6	2.5	3.0	**2.0**
83	SBG 24-83	BAUM-13-6	0.8	3.0	0.0	2.6	1.0	2.6	2.5	3.0	**2.2**
84	SBG 24-84	RMM-19-06	0.4	1.9	0.0	2.8	1.0	2.0	3.5	3.1	**2.1**
85	SBG 24-85	DRMRIJ-138	0.6	1.8	0.0	2.6	1.0	2.9	3.1	3.1	**2.2**
86	SBG 24-86	RGN-599	1.0	1.8	0.0	2.7	1.0	2.3	2.5	3.0	**2.0**
87	SBG 24-87	CAURM-4-1S	1.0	1.5	0.0	2.6	1.0	2.5	2.6	3.2	**2.1**
88	SBG 24-88	DRMR 2019-16	1.0	1.4	0.0	2.6	1.0	2.7	2.9	3.2	**2.1**
89	SBG 24-89	DRMRCI-196	2.0	2.8	0.0	2.6	1.0	3.0	2.8	3.2	**2.5**
90	SBG 24-90	**Kranti (NC)**	1.2	1.3	0.0	2.6	1.0	2.3	3.2	3.2	**2.1**
IVT (Late sown)											
91	SBG 24-91	RH-1424 (LR)	1.0	1.5	0.0	2.5	1.0	1.9	2.2	3.2	**1.9**
92	SBG 24-92	NPJ-281	2.0	1.1	0.0	2.6	1.0	1.7	2.0	3.2	**1.9**
93	SBG 24-93	RAURD-14-18	1.0	3.1	0.0	2.6	1.0	1.1	2.0	1.9	**1.8**
94	SBG 24-94	DRMRIJ-22-2	0.4	2.8	0.0	2.6	1.0	1.4	1.8	3.2	**1.9**
95	SBG 24-95	RH-2370	0.6	2.5	0.0	2.5	1.0	0.9	2.0	3.2	**1.8**
96	SBG 24-96	NPJ-280	0.6	1.5	0.0	2.7	1.0	2.1	2.0	3.1	**1.9**
97	SBG 24-97	TM-132-1	0.4	2.8	0.0	2.6	1.0	2.5	2.6	3.1	**2.1**
98	SBG 24-98	PusaMH-218	1.0	1.9	0.0	2.6	1.3	2.5	2.2	3.1	**2.1**
99	SBG 24-99	RGN-592	1.2	1.6	0.0	2.5	1.0	1.4	2.6	3.0	**1.9**
100	SBG 24-100	Radhika (LR)	0.6	1.5	0.0	2.6	1.0	2.1	3.6	3.1	**2.1**
101	SBG 24-101	NPJ-276	0.4	1.2	0.0	2.5	1.0	2.3	3.2	3.0	**1.9**
102	SBG 24-102	ORM -2019-30	0.8	1.0	0.0	2.6	1.0	2.2	2.2	3.0	**1.8**
103	SBG 24-103	RKM-599	0.4	2.9	0.0	2.5	1.8	2.4	2.8	3.1	**2.3**
104	SBG 24-104	SVJH-78	0.6	2.3	0.0	2.6	1.0	2.1	2.4	3.0	**2.0**
105	SBG 24-105	KMR (L) -24-5	1.0	5.5	0.0	2.6	1.0	3.0	3.6	3.1	**2.8**
106	SBG 24-106	PM-26 (ZC)	1.0	2.8	0.0	2.6	1.0	2.6	3.2	3.1	**2.3**
107	SBG 24-107	PRL-2022-5	1.0	2.3	0.0	2.6	1.0	2.7	2.4	3.0	**2.1**
108	SBG 24-108	DRMRDR-2141	2.0	2.0	0.0	2.5	1.7	2.7	2.8	3.0	**2.4**
109	SBG 24-109	KMR (L) -24-6	1.2	1.2	0.0	2.5	2.3	2.7	3.2	2.9	**2.3**
110	SBG 24-110	RH-2374	1.0	1.3	0.0	2.6	1.0	3.2	3.5	3.0	**2.2**
111	SBG 24-111	PRL-2022-1	2.0	1.1	0.0	2.6	1.0	2.9	3.4	3.0	**2.3**
112	SBG 24-112	**BPM-11 (LR)**	1.0	1.8	0.0	2.5	1.0	3.7	2.8	3.1	**2.3**

IHT											
113	SBG 24-113	NJH-24-101	0.4	1.5	0.0	2.6	1.0	3.2	2.4	3.0	**2.0**
114	SBG 24-114	SVJH-77	0.6	1.9	0.0	2.6	1.0	2.6	2.8	3.1	**2.1**
115	SBG 24-115	PHR-10143	0.6	1.2	0.0	2.6	1.0	3.1	2.5	3.0	**2.0**
116	SBG 24-116	DRMRHJ-2420	0.4	1.7	1.0	2.5	1.0	3.0	2.6	3.1	**2.0**
117	SBG 24-117	4205D300-01	0.4	1.2	0.0	2.5	1.0	2.5	2.9	2.0	**1.8**
118	SBG 24-118	Pusa MH -194	0.6	1.4	0.0	2.7	1.0	2.6	2.2	3.2	**2.0**
119	SBG 24-119	KBH-5256	0.6	1.0	0.0	2.7	1.0	2.3	2.6	3.1	**1.9**
120	SBG 24-120	Pusa MH-226	0.4	2.9	0.0	2.6	1.0	3.2	2.7	3.1	**2.3**
121	SBG 24-121	DRMRHJ-410	1.0	1.2	0.0	2.6	1.0	3.7	2.4	2.0	**2.0**
122	SBG 24-122	RHH-2401	1.2	1.4	0.0	2.5	1.0	3.7	3.2	3.1	**2.3**
123	SBG 24-123	AMH-511	0.6	1.5	0.0	2.6	1.0	3.4	2.4	3.1	**2.1**
124	SBG 24-124	SBH-618	0.4	1.2	0.0	2.6	1.0	3.1	3.0	3.2	**2.1**
125	SBG 24-125	US-8787	0.8	1.6	0.0	2.6	1.0	3.3	2.6	3.1	**2.1**
126	SBG 24-126	NRCHB-506	0.4	1.4	0.0	2.5	1.0	3.5	3.2	3.1	**2.2**
127	SBG 24-127	NMH90M03	0.6	1.2	0.0	2.6	1.0	3.1	2.9	3.0	**2.1**
128	SBG 24-128	RHH-2402	1.0	1.1	0.0	2.6	1.0	2.9	3.2	3.1	**2.1**
129	SBG 24-129	DRMRHJ-520	1.0	1.7	0.0	2.5	1.0	3.1	2.6	3.1	**2.1**
130	SBG 24-130	PA-5235	1.0	1.5	0.0	2.6	1.0	2.9	2.5	3.3	**2.1**
131	SBG 24-131	NIMOH-02	2.0	1.3	0.0	2.6	1.0	2.9	2.2	3.1	**2.2**
132	SBG 24-132	PHR-10265	1.2	1.6	0.0	2.6	2.0	2.5	3.4	3.2	**2.4**
133	SBG 24-133	DMH-1 (HC)	1.0	1.2	0.0	2.5	1.0	2.7	3.1	3.0	**2.1**
134	SBG 24-134	HT-7262	2.0	1.7	0.0	2.5	1.0	2.9	3.5	3.1	**2.4**
135	SBG 24-135	RH-749 (ZC)	1.0	1.3	0.0	2.5	1.0	2.5	2.6	3.1	**2.0**
136	SBG 24-136	**45S46 (HC)**	0.4	1.8	0.0	2.7	1.5	3.3	2.4	3.2	**2.2**
IVT (Quality)											
137	SBG 24-137	DH-Z’00’7G	0.6	1.3	0.0	2.9	2.0	3.4	2.7	3.2	**2.3**
138	SBG 24-138	PM-30 (NC)	0.6	1.1	0.0	2.5	1.0	2.7	2.5	3.1	**1.9**
139	SBG 24-139	DRMRCI (Q)-198	0.4	1.6	0.0	2.6	1.0	3.0	2.3	3.1	**2.0**
140	SBG 24-140	PMAS-1604	1.0	1.0	0.0	2.6	1.0	3.5	2.4	3.2	**2.1**
141	SBG 24-141	PMAS -1602	1.2	1.8	0.0	2.6	1.0	2.9	3.1	3.0	**2.2**
142	SBG 24-142	RGN-73 (ZC)	0.6	1.4	0.0	2.7	1.0	3.0	2.8	3.0	**2.1**
143	SBG 24-143	LES-70	0.4	2.7	0.0	2.6	1.0	3.0	2.3	3.1	**2.2**
144	SBG 24-144	RH (OE)-1704	0.8	2.4	0.0	2.6	1.0	2.4	2.4	3.1	**2.1**
145	SBG 24-145	RH (OE) 1702	3.0	1.8	0.0	2.6	1.0	2.8	2.7	3.0	**2.4**
146	SBG 24-146	PDZ-23#	1.2	1.1	0.0	2.6	1.3	2.5	2.8	3.0	**2.1**
147	SBG 24-147	PDZ-11 (DLC)	0.8	1.6	0.0	2.7	2.0	2.6	3.3	3.0	**2.3**
148	SBG 24-148	PDZ-22#	3.2	1.3	0.0	2.7	1.0	2.9	2.9	3.0	**2.4**
149	SBG 24-149	LES-71	2.0	1.1	0.0	2.7	1.0	2.7	2.7	3.1	**2.2**
150	SBG 24-150	PM-34 (LR)	0.8	1.4	0.0	2.8	1.0	2.7	2.5	3.1	**2.0**
151	SBG 24-151	BPMQ-47 (Filler)	1.0	1.9	0.0	3.1	1.0	3.3	2.4	3.0	**2.2**
152	SBG 24-152	DRMRQCI (Q)-197	2.9	1.3	0.0	2.7	1.8	2.5	2.1	3.0	**2.3**
153	SBG 24-153	**PM-34 (QC)**	3.0	2.8	0.0	2.9	1.0	2.8	2.4	3.0	**2.6**
Mean			**0.9**	**1.7**	**0.1**	**2.6**	**1.1**	**2.8**	**2.6**	**3.0**	**2.1**

- Missing entry

Note: Kanpur data not included for mean calculation due to very low aphid pressure

Table 5.1 (B). Reaction of AVT I and AVT II entries of *Brassica* to mustard aphid infestation

S. No.	Code No.	Entries	Aphid Infestation Index (AII)								
			MOR	HSR	KPR	SKN	NDH	LDH	DOL	SHL	Mean
1	SAG 24-1	Basanti (WRR Check)	1.2	1.1	0.0	2.8	2.3	1.3	2.0	2.9	**1.9**
2	SAG 24-2	**BSH-1 (SC)**	1.0	2.3	0.0	2.8	1.8	1.5	2.2	2.9	**2.1**
3	SAG 24-3	DRMRCI (Q) -179**	2.0	3.0	0.0	2.8	2.0	2.1	1.4	2.9	**2.3**
4	SAG 24-4	4205B284-01	1.0	1.2	0.0	2.7	1.0	2.6	3.0	2.8	**2.0**
5	SAG 24-5	CS-60 (LR)	0.4	1.3	0.0	2.7	1.0	1.3	2.2	2.8	**1.7**
6	SAG 24-6	DRMRHT-18-65	0.6	1.0	0.0	2.6	1.2	2.0	2.4	2.6	**1.8**
7	SAG 24-7	**Kranti (NC)**	0.6	1.1	0.0	2.6	1.0	3.6	2.0	2.8	**2.0**
8	SAG 24-8	NPJ-268	0.4	1.2	0.0	2.5	1.2	3.1	1.2	2.9	**1.8**
9	SAG 24-9	NPJ-267	1.0	1.2	0.0	2.6	1.0	3.6	3.0	1.9	**2.0**
10	SAG 24-10	45S46 (HC)	1.2	1.4	0.0	2.7	1.0	3.9	2.2	2.7	**2.2**
11	SAG 24-11	Maya (ZC)	0.6	3.2	0.0	2.7	1.0	3.5	2.2	3.0	**2.3**
12	SAG 24-12	RSPT-6	1.2	1.1	0.0	3.1	1.0	3.2	2.9	3.0	**2.2**
13	SAG 24-13	CS-54 (SC)	0.8	1.5	0.0	2.6	1.2	2.3	3.2	3.1	**2.1**
14	SAG 24-14	**PM-30 (NC)**	1.0	1.7	0.0	2.8	1.0	3.6	2.6	2.0	**2.1**
15	SAG 24-15	NRCHB-101	1.2	2.7	0.0	2.6	1.3	2.7	2.5	2.9	**2.3**
16	SAG 24-16	Q90033	1.0	1.0	0.0	2.6	1.2	2.9	2.2	2.8	**2.0**
17	SAG 24-17	PYS-2018-1	1.0	1.1	0.0	2.6	1.2	3.4	3.4	1.9	**2.1**
18	SAG 24-18	SVJH-73	0.4	1.8	0.0	2.6	1.0	3.1	3.1	2.8	**2.1**
19	SAG 24-19	SKMH-1901	0.6	1.5	0.0	2.5	1.2	2.7	3.5	2.8	**2.1**
20	SAG 24-20	Bio-902 (ZC)	0.6	1.2	0.0	2.6	1.2	3.6	2.6	2.9	**2.1**
21	SAG 24-21	**NRCHB- 101 (ZC)**	0.4	1.7	0.0	2.6	1.0	2.8	2.4	2.0	**1.8**
22	SAG 24-22	DRMRCI(Q)-181**	0.4	1.2	0.6	2.6	1.2	3.3	2.7	2.9	**2.0**
23	SAG 24-23	BPM-11 (LR)	0.6	1.9	0.0	2.7	1.0	3.1	2.5	2.6	**2.1**
24	SAG 24-24	LES-68**	0.6	1.5	0.0	2.9	1.0	2.6	2.8	2.9	**2.0**
25	SAG 24-25	RH (OE) -1710	0.4	1.4	0.0	2.9	1.0	2.9	2.6	2.9	**2.0**
26	SAG 24-26	KMR (E) -22-2	1.0	1.8	0.0	2.8	1.3	2.3	2.5	2.9	**2.1**
27	SAG 24-27	JKJH-11	0.4	1.8	0.0	2.8	1.2	3.5	2.5	2.9	**2.2**
28	SAG 24-28	**BPM-11 (LR)**	0.6	1.6	0.0	2.8	1.3	3.3	3.5	2.4	**2.2**
29	SAG 24-29	GED$-1	0.6	1.9	0.0	2.8	1.2	2.3	3.1	2.9	**2.1**
30	SAG 24-30	DRMR-150-35 (LR)	0.4	1.4	0.0	2.8	1.0	2.9	2.5	2.9	**2.0**
31	SAG 24-31	Varuna	0.4	1.1	0.0	2.8	1.2	2.3	2.6	2.9	**1.9**
32	SAG 24-32	SKM-2104	0.6	2.5	0.0	2.7	-	3.5	2.9	1.9	**2.0**
33	SAG 24-33	RH-2299-63	0.6	2.4	0.0	2.9	1.1	2.1	2.2	1.9	**1.9**
34	SAG 24-34	Uttra	0.4	1.3	0.0	2.9	1.3	4.7	2.6	2.9	**2.3**
35	SAG 24-35	**PM-34 (QC)**	2.0	1.1	0.0	2.9	1.0	2.3	3.6	2.9	**2.3**
36	SAG 24-36	PBR-813-2	1.2	2.1	0.0	2.7	1.2	2.9	3.2	2.9	**2.3**
37	SAG 24-37	HRH-191290	0.6	1.4	0.0	2.7	1.2	2.9	2.2	2.9	**2.0**
38	SAG 24-38	PM-32 (QLR)	0.4	2.2	0.0	2.6	1.2	2.9	2.8	2.9	**2.1**
39	SAG 24-39	NPJ-271	0.8	2.0	0.0	2.9	1.0	2.6	2.4	1.9	**1.9**
40	SAG 24-40	GED$-2	0.4	1.7	0.0	2.9	1.0	2.7	3.6	2.8	**2.2**
41	SAG 24-41	CS-56 (LR)	0.6	1.7	0.0	2.8	1.0	3.1	3.2	2.9	**2.2**
42	SAG 24-42	**45S46 (HC)**	1.0	1.3	0.0	2.7	1.2	2.5	2.4	2.8	**2.0**
43	SAG 24-43	4205B296-01	0.4	2.1	0.9	2.8	1.2	2.1	2.8	2.6	**2.0**
44	SAG 24-44	DRMR-2018-1	0.6	2.7	0.5	2.9	1.9	1.7	3.2	2.9	**2.3**
45	SAG 24-45	KMR(E) -23-1	0.6	1.2	0.0	2.7	1.0	2.1	3.5	2.8	**2.0**
46	SAG 24-46	**Giriraj (LR)**	0.4	2.8	0.0	2.7	1.3	3.4	3.4	2.0	**2.3**
Mean			**0.7**	**1.7**	**0.0**	**2.7**	**1.2**	**2.8**	**2.7**	**2.7**	**2.1**

- Missing entry

Note: Kanpur data not included for mean calculation due to very low aphid pressure

Table 5.1 (C). Reaction of AVT I and AVT II entries of *Brassica* to mustard aphid infestation (under artificial infestation conditions)

S. No.	Code No.	Entries	Aphid Infestation Index (AII)								
			MOR	HSR	KPR	SKN	NDH	LDH	DOL	SHL	Mean
AVT II (Timely sown, Irrigated/Quality/WRR)											
1	SPG 24-1	NPJ-261	5.0	1.5	-	2.8	3.5	3.9	2.8	1.7	**3.0**
2	SPG 24-2	**PM-34 (QC)**	4.8	1.5	-	2.6	4.3	3.2	3.2	2.9	**3.2**
3	SPG 24-3	DRMR 2018-25	4.0	1.3	-	2.6	2.5	3.7	2.4	2.9	**2.8**
4	SPG 24-4	**Kranti (NC)**	5.0	1.4	-	2.8	3.5	3.3	2.2	2.8	**3.0**
5	SPG 24-5	DRMRCI (Q) 172	4.6	1.0	-	2.6	4.0	3.5	2.8	2.0	**2.9**
6	SPG 24-6	**BSH-1 (SC)**	3.9	1.7	-	2.7	3.8	2.7	3.2	2.6	**2.9**
AVT II (Hybrid mustard)											
7	SPG 24-7	CS-2020-10	5.0	1.5	-	2.8	3.3	2.7	2.0	2.0	**2.8**
8	SPG 24-8	**45S46 (HC)**	4.8	1.1	-	2.6	3.4	2.4	2.0	2.9	**2.7**
9	SPG 24-9	18J408C	4.4	1.1	-	2.5	3.1	2.5	2.8	1.9	**2.6**
10	SPG 24-10	**DMH-1 (HC)**	4.0	1.7	-	2.5	4.0	2.5	3.0	2.0	**2.8**
Mean			**4.6**	**1.4**	**-**	**2.6**	**3.5**	**3.0**	**2.6**	**2.4**	**2.9**

-Data not collected by Kanpur centre due to low aphid pressure.

Table 5.2. Assessment of avoidable yield losses due to insect pests in *Brassicas*

Centre	Mustard aphid population in unprotected plot (No./plant)		Yield (kg/ha)		Avoidable yield losses (%)
			Protected	Unprotected	
Hisar					
BPM 11	39.1		2317.6	1910.2	17.6
RH 1975	37.5		2488.9	2133.1	14.3
RH 725	44.7		2252.3	2022.2	10.2
CD (p≤0.05)	**NS**		**129.04**	**169.19**	**--**
Dholi					
BPM 11	26.26		1226.84	926.24	24.50
RH 1975	31.84		1186.28	884.26	25.45
Rajendra Sufalam	39.26		992.88	848.44	14.54
CD (p≤0.05)	**5.83**		**202.87**	**158.11**	--
Ludhiana	**Aphids/ plant**	**Cabbage caterpillars/ plant**			
BPM 11	141.6	26.0	2035.4	1464.6	28.0
RH 1975	89.9	30.3	2139.6	1370.8	35.9
PBR 357	93.4	18.4	2020.8	1497.9	25.8
CD (p≤0.05)	**16.4**	**7.5**	**72.9**	**59.4**	**-**
Morena					
BPM 11	120.6		2270.0	2075.0	8.6
RH 1975	124.4		2250.0	1985.0	11.7
RVM-3	124.8		2225.0	1950.0	12.3
CD (p≤0.05)	**NS**		**36.4**	**70.5**	**-**
New Delhi					
BPM 11	36.5		2794.4	2219.7	20.56
RH 1975	53.8		2811.5	2512.1	10.64
PM 37	25.3		2712.3	2259.9	16.67
Pant Nagar					
BPM 11	188.86 (41.19)*		1701.0	1447.0	14.92
RH 1975	221.88 (44.70)		1845.0	1558.0	15.55
Varuna	187.06 (41.07)		1969.0	1623.0	17.60
CD (p≤0.005)	**(2.88)**		**90.57**	**84.75**	--
*Figures in parentheses are square root transformed values.					
Shillongani					
BPM 11	125.93		1401.65	1147.90	18.10
RH 1975	98.50		1827.68	1488.55	18.56
TS 38	111.03		1232.53	972.55	21.09
CD (p≤0.05)	**19.80**		**153.71**	**116.88**	**--**

Table 5.3.1 (A). Population dynamics of cabbage caterpillar (CC) on *Brassica* varieties at Hisar

Population dynamics of cabbage caterpillar on *Brassica* varieties														
Std Week	**Meteorological observations**						**No. of larvae/ 10plants**							
							Timely Sown				**Late Sown**			
	Temperature (ºC)		**RH (%)**		**Sunshine hours**	**Rain fall (mm)**	***B. juncea***	***Eruca sativa***	***B. napus***	***B. rapa***	***B. juncea***	***Eruca sativa***	***B. napus***	***B. rapa***
	Max.	**Min.**	**Morn.**	**Even.**			**DRMRIJ 31**	**T 27**	**GSC 7**	**BSH 1**	**DRMRIJ 31**	**T 27**	**GSC 7**	**BSH 1**
49	25.1	7.4	83.9	32.3	7.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	21.5	2.7	98.1	29.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	21.1	5.0	98.3	58.7	2.4	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	16.3	8.4	98.4	76.7	1.2	23.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	15.2	7.0	98.6	77.4	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	16.9	6.1	97.1	70.5	3.5	12.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	18.0	7.3	98.4	70.1	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	22.5	4.5	94.0	38.5	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	21.5	8.7	98.5	71.1	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	23.7	5.5	97.4	40.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	25.5	7.9	91.4	33.6	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	24.7	8.9	96.3	45.6	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1
9	25.4	12.5	87.9	50.7	5.5	13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2
10	28.5	11.2	84.3	34.8	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7
11	29.0	12.6	87.7	45.5	7.3	0.8	Harvested	Harvested	Harvested	Harvested	0.0	0.0	0.0	0.0
12	32.2	12.4	79.2	24.7	8.4	0.0					0.0	0.0	0.0	0.0
13	32.5	10.7	71.5	18.1	8.3	0.0					0.0	0.0	0.0	0.0

Note: Weather data provided by the Department of Agricultural Meteorology, CCS HAU, Hisar

Table 5.3.1(B). Population dynamics of mustard aphid on *Brassica* varieties at Hisar

Population dynamics of mustard aphid on *Brassica* varieties														
Std. Week	Meteorological observations						No. of aphids / top 10 cm central twig							
							Timely Sown				Late Sown			
	Temp. (ºC)		RH (%)		Sunshine hours	Rainfall (mm)	*B. juncea*	*E. sativa*	*B. napus*	*B. rapa*	*B. juncea*	*E. sativa*	*B. napus*	*B. rapa*
	Max.	Min.	Morn.	Even.			DRMR IJ 31	T 27	GSC 7	BSH 1	DRMR IJ-31	T 27	GSC 7	BSH 1
48	26.2	9.1	92.6	36.3	5.7	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0
49	25.1	7.4	83.9	32.3	7.2	0.0	0.0	0.0	0.0	14.7	0.0	0.0	0.0	0.0
50	21.5	2.7	98.1	29.0	7.0	0.0	0.0	0.0	0.0	8.6	0.0	0.0	0.0	0.0
51	21.1	5.0	98.3	58.7	2.4	2.4	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0
52	16.3	8.4	98.4	76.7	1.2	23.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	15.2	7.0	98.6	77.4	1.8	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0
2	16.9	6.1	97.1	70.5	3.5	12.8	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0
3	18.0	7.3	98.4	70.1	3.1	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0
4	22.5	4.5	94.0	38.5	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	21.5	8.7	98.5	71.1	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	23.7	5.5	97.4	40.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	25.5	7.9	91.4	33.6	8.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.3
8	24.7	8.9	96.3	45.6	6.6	0.0	0.0	0.0	0.0	0.0	3.2	0.0	0.0	1.9
9	25.4	12.5	87.9	50.7	5.5	13.1	0.0	0.0	0.0	0.0	9.9	0.0	0.7	16.8
10	28.5	11.2	84.3	34.8	7.4	0.0	0.0	0.0	0.0	0.0	22.6	0.0	11.8	31.4
11	29.0	12.6	87.7	45.5	7.3	0.8	Harvested	Harvested	Harvested	Harvested	36.2	0.0	39.8	52.5
12	32.2	12.4	79.2	24.7	8.4	0.0					4.5	0.0	3.8	11.5
13	32.5	10.7	71.5	18.1	8.3	0.0					0.6	0.0	2.6	2.1

Note: Weather data provided by the department of Agricultural Meteorology, CCS HAU, Hisar

Table 5.3.1(C). Population dynamics of various natural enemies on *Brassica* varieties at Hisar

Std. Week	Meteorological observations						Coccinellids (Grubs + Beetles)/ plant (Other NEs in parentheses)							
							Timely Sown				Late Sown			
	Temp. (ºC)		RH (%)		Sunshine hours	Rainfall (mm)	*B. juncea*	*E. sativa*	*B. napus*	*B. rapa*	*B. juncea*	*E. sativa*	*B. napus*	*B. Rapa*
	Max.	Min.	Morn.	Even.			DRMR IJ 31	T 27	GSC 7	BSH 1	DRMR IJ 31	T 27	GSC 7	BSH 1
47	27.5	10.3	93.5	33.2	5.1	0.0	0.1sf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	26.2	9.1	92.6	36.3	5.7	0.0	0.4sf	0.2sf, 0.1lb	0.0	0.0	0.0	0.0	0.0	0.0
49	25.1	7.4	83.9	32.3	7.2	0.0	0.1sf	0.3sf	0.0	0.0	0.0	0.0	0.0	0.0
50	21.5	2.7	98.1	29.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	21.1	5.0	98.3	58.7	2.4	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	16.3	8.4	98.4	76.7	1.2	23.8	0.0	0.4sf	0.0	0.0	0.0	0.0	0.0	0.0
1	15.2	7.0	98.6	77.4	1.8	0.0	0.1lb 0.1sf	0.0	0.0	0.0	0.0	0.0	0.0	1.2sf
2	16.9	6.1	97.1	70.5	3.5	12.8	0.0	0.9sf	0.0	0.0	0.0	0.0	0.0	0.0
3	18.0	7.3	98.4	70.1	3.1	0.0	0.4sf	0.8sf	0.0	0.0	0.2sf	0.0	0.0	0.0
4	22.5	4.5	94.0	38.5	7.8	0.0	0.0	0.0	0.0	0.0	1.1sf	0.0	0.0	0.8sf
5	21.5	8.7	98.5	71.1	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	23.7	5.5	97.4	40.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	25.5	7.9	91.4	33.6	8.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4lb	0.0	0.0
8	24.7	8.9	96.3	45.6	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3lb	0.0
9	25.4	12.5	87.9	50.7	5.5	13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2lb	0.0
10	28.5	11.2	84.3	34.8	7.4	0.0	0.0	0.3sf	0.0	0.0	0.0	0.4lb,	1.3lb	0.0
11	29.0	12.6	87.7	45.5	7.3	0.8	Harvested	Harvested	Harvested	Harvested	0.2lb	0.5lb	2.1lb	0.0
12	32.2	12.4	79.2	24.7	8.4	0.0					2.4lb	0.6lb, 0.9sf	0.5lb	0.6sf
13	32.5	10.7	71.5	18.1	8.3	0.0	1	2	3	4	0.8lb	0.0	0.2lb	0.0

LB: Lady beetle/plant, SF: Syrphid fly/minute/sq meter

Note: Weather data provided by the department of Agricultural Meteorology, CCS HAU, Hisar

Table 5.3.1 (D). Activity of various honey bees/pollinators on *Brassica* varieties at Hisar

Activity of honey bees+pollinators on *Brassica* varieties														
Std. Week	Meteorological observations						No. of honey bees+pollinators/ minute/sq. meter							
							Timely Sown				Late Sown			
	Temp. (ºC)		RH (%)		Sunshine Hours	Rainfall (mm)	*B. juncea*	*E. sativa*	*B. napus*	*B. rapa*	*B. juncea*	*E. sativa*	*B. napus*	*B. rapa*
	Max.	Min.	Morn.	Even.			DRMRIJ 31	T 27	GSC 7	BSH 1	DRMRIJ 31	T 27	GSC 7	BSH 1
47	27.5	10.3	93.5	33.2	5.1	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0
48	26.2	9.1	92.6	36.3	5.7	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0
49	25.1	7.4	83.9	32.3	7.2	0.0	1.1	0.0	1.6	3.8	0.0	0.0	0.0	0.0
50	21.5	2.7	98.1	29.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	21.1	5.0	98.3	58.7	2.4	2.4	3.8	4.0	2.4	3.2	0.0	0.0	0.0	0.0
52	16.3	8.4	98.4	76.7	1.2	23.8	4.1	5.4	4.6	2.5	0.0	0.0	0.0	0.0
1	15.2	7.0	98.6	77.4	1.8	0.0	1.2	4.4	9.5	0.8	0.0	0.0	0.0	0.0
2	16.9	6.1	97.1	70.5	3.5	12.8	0.6	10.6	3.6	0.0	0.0	0.0	0.0	0.0
3	18.0	7.3	98.4	70.1	3.1	0.0	1.4	11..2	2.2	1.8	0.6	1.7	0.0	0.6
4	22.5	4.5	94.0	38.5	7.8	0.0	2.4	13.2	9.6	1.2	0.8	8.4	0.5	5.4
5	21.5	8.7	98.5	71.1	4.8	0.0	2.4	3.4	1.6	0.0	2.4	7.2	3.4	5.0
6	23.7	5.5	97.4	40.0	7.0	0.0	0.8	3.2	1.5	0.0	2.9	9.4	6.0	7.1
7	25.5	7.9	91.4	33.6	8.0	0.0	1.6	2.6	1.5	0.0	1.7	5.3	11.8	2.2
8	24.7	8.9	96.3	45.6	6.6	0.0	0.2	1.4	0.9	0.0	1.8	1.1	5.6	1.7
9	25.4	12.5	87.9	50.7	5.5	13.1	0.2	0.5	1.0	0.0	0.4	0.7	5.2	0.0
10	28.5	11.2	84.3	34.8	7.4	0.0	0.2	0.0	0.0	0.0	0.8	0.5	2.0	0.0
11	29.0	12.6	87.7	45.5	7.3	0.8	Harvested	Harvested	Harvested	Harvested	0.5	0.0	1.9	0.0
12	32.2	12.4	79.2	24.7	8.4	0.0					0.0	0.0	0.0	0.0
13	32.5	10.7	71.5	18.1	8.3	0.0					0.0	0.0	0.0	0.0

Table 5.3.2. Population dynamics of mustard aphid on *Brassica* crops (Late Sown) at Dholi

Std. Week	Weather parameters				Rainfall (mm)	Aphid population/10 cm twig on				
	Temperature (ºC)		RH (%)			DRMR IJ 31	BSH 1	GSC 7	T 27	Rajendra Suflam
	Max.	Min.	Morn.	Even.						
51	26.30	8.00	99.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00
52	24.70	10.60	98.00	58.00	0.00	0.00	0.00	0.00	0.00	0.00
1	19.21	9.34	98.71	76.29	0.00	0.00	0.00	0.00	0.00	0.00
2	21.33	9.00	96.14	65.29	0.00	10.80	15.80	11.60	9.60	19.30
3	19.80	9.44	98.14	72.29	0.00	24.30	32.20	20.70	17.50	28.50
4	20.06	9.34	95.14	70.71	0.00	31.10	40.00	24.40	21.00	36.50
5	24.99	8.84	97.71	53.86	0.00	45.90	57.40	34.30	26.60	53.80
6	25.47	9.89	93.57	58.71	0.00	55.40	71.00	46.80	37.00	68.90
7	26.26	10.39	94.29	65.71	0.00	63.50	85.40	52.20	48.20	76.60
8	28.84	12.17	96.14	66.86	0.00	63.60	113.60	81.10	72.20	115.20
9	28.70	13.14	95.86	65.00	0.00	90.30	123.10	96.20	88.10	127.40
10	29.09	12.44	92.43	60.43	0.00	62.90	81.80	66.00	50.10	82.00
11	32.69	16.67	91.43	64.57	0.00	47.60	57.70	41.20	33.10	53.30
12	31.33	16.17	88.00	56.83	0.00	22.50	38.20	27.80	21.80	36.70
13	35.11	16.07	85.71	43.86	0.00	4.00	9.50	2.10	1.20	8.30

Results of timely sown trial not provided by Dholi centre.

Table 5.3.3(A). Population dynamics of mustard aphid on *Brassicas* at Pant Nagar (Timely sown)

Std. Week	Temperature		Rainfall (mm)	R.H. (%)		Sunshine hours	Number of aphids/ top 10 cm central twig							
	Max.	Min.		Max.	Min.		DRMR IJ 31	T 27	GSC 7	BSH 1	YST 151	*B. nigra*	*B. alba*	PM 30
3	20.70	8.90	1.40	95.40	65.60	4.80	10.13	0.63	14.33	6.43	6.67	1.27	36.50	25.80
4	20.90	6.90	0.00	94.70	60.00	4.60	18.07	4.27	16.67	9.83	16.93	12.60	50.23	37.23
5	24.20	7.20	0.00	92.70	42.40	8.00	27.80	10.07	12.87	12.50	25.63	12.93	59.47	35.43
6	23.50	6.80	0.00	94.00	49.30	7.90	**38.43**	10.90	13.00	16.33	26.40	**27.90**	78.23	**47.80**
7	24.50	6.90	0.00	91.60	40.60	8.40	41.87	12.33	13.00	22.77	44.53	22.00	93.37	47.43
8	25.80	9.30	2.00	92.00	43.40	7.70	38.27	11.20	16.70	**27.17**	**49.73**	27.33	**86.37**	46.67
9	25.10	12.10	14.00	89.30	58.60	5.20	31.73	**13.57**	**18.60**	34.47	37.47	23.27	68.37	34.10
10	26.30	10.70	0.00	88.90	40.60	9.10	26.37	9.53	16.77	34.63	25.83	16.67	53.70	29.63
11	30.90	13.90	6.40	81.70	33.90	8.70	15.23	8.67	13.20	16.17	10.73	16.83	45.83	21.30
12	30.50	11.80	0.00	84.40	30.40	10.20	8.37	1.60	10.50	6.40	9.10	4.37	37.17	9.87
13	33.20	12.20	0.00	77.60	22.70	9.80	7.33	1.43	9.37	4.00	10.00	3.73	34.33	8.67

Table 5.3.3(B). Population dynamics of mustard aphid on *Brassicas* at Pant Nagar (Late sown)

Std. Week	Temperature		Rainfall (mm)	R.H. (%)		Sunshine hours	Number of aphids/ top 10 cm central twig							
	Max.	Min.		Max.	Min.		DRMR IJ 31	T 27	GSC 7	BSH 1	YST 151	*B. nigra*	*B. alba*	PM 30
3	20.70	8.90	1.40	95.40	65.60	4.80	32.17	33.33	30.00	33.17	38.50	32.83	88.87	34.17
4	20.90	6.90	0.00	94.70	60.00	4.60	45.30	46.17	42.20	46.23	53.17	46.03	60.77	46.80
5	24.20	7.20	0.00	92.70	42.40	8.00	54.70	47.07	43.90	53.30	54.60	53.43	54.77	55.57
6	23.50	6.80	0.00	94.00	49.30	7.90	**61.07**	51.70	49.07	59.13	63.63	71.93	69.30	71.50
7	24.50	6.90	0.00	91.60	40.60	8.40	59.97	60.57	**52.30**	65.77	**73.33**	**75.50**	92.23	**77.57**
8	25.80	9.30	2.00	92.00	43.40	7.70	55.73	**69.93**	51.87	**67.20**	75.30	69.07	**149.27**	74.67
9	25.10	12.10	14.00	89.30	58.60	5.20	49.43	59.83	49.30	55.97	64.37	54.50	111.03	64.70
10	26.30	10.70	0.00	88.90	40.60	9.10	45.27	50.77	44.83	48.53	50.83	47.27	86.30	50.83
11	30.90	13.90	6.40	81.70	33.90	8.70	42.33	43.40	41.97	42.70	41.70	42.37	62.73	42.83
12	30.50	11.80	0.00	84.40	30.40	10.20	33.33	34.50	33.17	33.67	32.50	33.33	53.50	33.83
13	33.20	12.20	0.00	77.60	22.70	9.80	31.67	32.33	31.00	31.33	30.83	31.17	46.50	31.67

Table 5.3.3(C). Population dynamics of Coccinellids (grubs and adults/ plant) on *Brassicas* at Pant Nagar (Timely sown)

Standard Week	Temperature		R.H. (%)		Rainfall (mm)	Wind speed (km/h)	Sunshine hours	BSH 1	YST 151	GSC 7	T 27	DRMRIJ 31	*B. nigra*	*B. alba*	PM 30
	Max.	Min.	Max.	Min.											
3	20.70	8.90	95.40	65.60	1.40	3.80	4.80	1.65	1.53	1.78	1.67	2.02	1.71	2.85	4.99
4	20.90	6.90	94.70	60.00	0.00	1.40	4.60	1.65	1.40	1.78	3.33	1.56	1.71	3.16	7.65
5	24.20	7.20	92.70	42.40	0.00	2.50	8.00	3.30	2.30	3.86	5.00	4.37	1.71	3.80	3.99
6	23.50	6.80	94.00	49.30	0.00	4.40	7.90	2.47	2.30	2.38	8.33	3.03	4.00	7.29	5.32
7	24.50	6.90	91.60	40.60	0.00	4.20	8.40	4.67	2.81	5.05	11.10	4.37	7.43	4.44	10.30
8	25.80	9.30	92.00	43.40	2.00	2.50	7.70	6.04	3.83	8.31	10.27	**10.43**	5.14	10.76	4.66
9	25.10	12.10	89.30	58.60	14.00	2.30	5.20	6.04	5.61	**12.47**	**12.22**	7.75	**9.71**	7.60	9.31
10	26.30	10.70	88.90	40.60	0.00	2.90	9.10	**7.97**	**10.46**	9.20	7.50	9.77	5.14	**19.31**	7.98
11	30.90	13.90	81.70	33.90	6.40	1.80	8.70	5.77	8.67	10.99	9.16	8.08	7.99	13.30	**12.30**
12	30.50	11.80	84.40	30.40	0.00	1.40	10.20	5.50	3.57	7.13	8.89	4.04	8.29	11.09	10.64

Table 5.3.3(D). Population dynamics of Coccinellids (grubs and adults/ plant) on *Brassicas* at Pant Nagar (Late sown)

Standard Week	Temperature		R.H. %		Rainfall (mm)	Wind speed (Km/h)	Sunshine hours	BSH 1	YST 151	GSC 7	T 27	DRMRIJ 31	*B. nigra*	*B. alba*	PM 30
	Max.	Min.	Max.	Min.											
4	20.90	6.90	94.70	60.00	0.00	1.40	4.60	2.72	2.67	4.14	3.64	1.44	1.92	2.88	2.76
5	24.20	7.20	92.70	42.40	0.00	2.50	8.00	3.81	2.91	4.41	2.52	1.90	3.02	3.20	2.46
6	23.50	6.80	94.00	49.30	0.00	4.40	7.90	5.98	4.61	3.59	4.49	4.11	4.12	3.84	3.38
7	24.50	6.90	91.60	40.60	0.00	4.20	8.40	7.61	7.28	7.18	5.89	2.85	3.84	7.36	4.91
8	25.80	9.30	92.00	43.40	2.00	2.50	7.70	9.25	5.58	9.66	5.89	4.11	6.03	4.48	5.53
9	25.10	12.10	89.30	58.60	14.00	2.30	5.20	10.61	8.49	9.60	5.61	**9.81**	**8.50**	10.88	**6.75**
10	26.30	10.70	88.90	40.60	0.00	2.90	9.10	**13.33**	**10.19**	**10.21**	**8.98**	7.29	8.23	7.68	4.30
11	30.90	13.90	81.70	33.90	6.40	1.80	8.70	7.07	8.24	6.07	5.05	9.19	7.14	**19.52**	3.69
12	30.50	11.80	84.40	30.40	0.00	1.40	10.20	5.13	6.19	5.96	4.32	8.48	5.36	17.45	2.57

Table 5.3.4 (A). Population dynamics of mustard aphid, cabbage aphid and cabbage caterpillar on *Brassicas* at Ludhiana (Timely sown)

SMW*	Weather Parameters						No of aphids/ top 10 cm central twig								Cabbage caterpillars/ plant			
	Temp. (^{0}C)		R.H. (%)		Rainfall (mm)	Sunshine hours	GSC 7		DRMR-IJ 31		BSH 1		T27		GSC 7	DRMR-IJ 31	BSH 1	T27
	Max.	Min.	M	E			MA	CA	MA	CA	MA	CA	MA	CA				
51	20.5	5.8	92.0	45.0	2.6	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	17.1	8.5	93.0	67.0	32	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	15.2	8.6	94.0	79.0	1.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	17.1	7.3	95.0	62.0	5.8	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	19.4	8.2	92.0	55.0	0.0	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	21.7	5.8	93.0	41.0	0.0	9.2	0.0	0.0	1.3	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	20.0	9.6	94.0	64.0	1.2	2.6	0.0	0.0	4.7	0.0	10.0	0.0	0.0	0.0	0.0	7.3	0.0	0.0
6	22.9	7.7	91.0	36.0	0.0	8.7	0.5	0.0	3.9	0.0	7.3	0.0	0.0	0.0	0.0	1.0	0.0	0.0
7	23.7	9.2	88.0	31.0	0.0	8.3	2.2	0.0	1.5	0.0	10.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	22.9	10.2	91.0	50.0	17.6	6.8	26.0	1.1	3.5	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	22.9	13.2	86.0	61.0	12.2	5.6	30.3	0.0	6.2	0.6	7.5	19.0	0.0	0.0	0.0	0.2	0.0	0.0
10	26.6	11.0	85.0	40.0	0.0	9.2	10.6	9.3	3.0	2.1	6.7	11.3	0.0	0.0	1.7	0.0	0.0	0.0
11	22.5	13.4	87.0	45.0	2.6	8.5	1.7	16.3	0.0	1.3	14.5	43.5	0.0	0.0	1.4	0.2	0.1	0.0
12	31.4	13.9	84.0	30.0	0.0	10.7	0.1	6.3	0.0	0.0	-	-	-	-	0.2	0.0	--	0.0
13	26.5	13.8	68.0	45	0.0	10.6	0.0	0.0	0.0	0.0	-	-	-	-	-	--	--	--
14	35.8	16.9	66.0	20.0	0.0	10.7	-	-	-	-	-	-	-	-	-	--	--	--

*** SMW: Standard Meteorological Week; MA: Mustard aphid, CA: Cabbage aphid**

Table 5.3.4(B). Population dynamics of mustard aphid, cabbage aphid and cabbage caterpillar on *Brassicas* at Ludhiana (Late sown)

SMW*	Weather Parameters						No of aphids/ top 10 cm central twig								Cabbage caterpillars/ plant			
	Temp. (^{0}C)		R.H. (%)		Rainfall (mm)	Sunshine (hrs)	GSC 7		DRMR-IJ 31		BSH 1		T27		GSC 7	DRMR-IJ 31	BSH 1	T27
	Max.	Min.	M	E			MA	CA	MA	CA	MA	CA	MA	CA				
52	17.1	8.5	93.0	67.0	32	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	15.2	8.6	94.0	79.0	1.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	17.1	7.3	95.0	62.0	5.8	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	19.4	8.2	92.0	55.0	0.0	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	21.7	5.8	93.0	41.0	0.0	9.2	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	20.0	9.6	94.0	64.0	1.2	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	22.9	7.7	91.0	36.0	0.0	8.7	0.0	0.0	8.5	0.0	11.8	0.0	3.5	0.0	0.0	0.0	0.0	0.0
7	23.7	9.2	88.0	31.0	0.0	8.3	1.7	0.0	7.6	0.0	36.7	0.0	4.9	0.0	0.0	0.0	0.0	0.0
8	22.9	10.2	91.0	50.0	17.6	6.8	3.1	0.5	17.1	1.5	111.5	71.7	1.1	0.2	0.0	1.1	3.5	1.0
9	22.9	13.2	86.0	61.0	12.2	5.6	23.3	6.8	20.1	3.5	45.6	8.9	1.4	0.0	1.3	1.6	3.9	0.4
10	26.6	11.0	85.0	40.0	0.0	9.2	125.8	10.1	155.6	31.0	16.2	11.4	0.0	0.0	2.5	1.6	3.0	0.0
11	22.5	13.4	87.0	45.0	2.6	8.5	56.6	43.3	70.4	46.3	6.3	18.6	0.9	0.0	4.3	0.9	1.2	0.0
12	31.4	13.9	84.0	30.0	0.0	10.7	5.6	58.1	5.7	132.6	1.6	11.6	0.1	0.0	0.7	0.2	0.0	0.4
13	26.5	13.8	68.0	45	0.0	10.6	0.0	177.3	0.0	26.5	-	-	1.3	0.0	0.0	0.0	0.0	0.0
14	35.8	16.9	66.0	20.0	0.0	10.7	0.0	8.8	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0

*** SMW: Standard Meteorological Week; MA: Mustard aphid, CA: Cabbage aphid**

Table 5.3.5(A). Population dynamic of mustard aphid on *Brassicas* crops at SK Nagar under timely and late sown conditions

Std. week	Weather Parameters						Aphids/ top 10 cm central twig													
	Temp. (ºC)		RH (%)		Rainfall (mm)	Sun Shine (hrs)	DRMR IJ 31		T 27		GSC 7		BSH 1		GDM 4		GM 6		GM 7	
	Max.	Min.	Morn.	Even.			TS*	LS	TS	LS	TS	LS	TS	LS	TS	LS	TS	LS	TS	LS
1	28.2	10.4	82	32	0.0	9.1	0.0	3.4	0.0	0.0	6.5	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0
2	26.4	7.8	86	34	0.0	8.2	5.3	6.9	0.0	0.0	25.6	0.0	8.0	4.8	5.2	3.6	0.0	4.8	0.0	5.7
3	26.4	11.0	84	39	0.0	5.8	26.0	26.4	0.0	0.0	39.5	0.0	26.8	8.5	19.8	8.2	3.0	8.6	1.9	7.6
4	27.6	10.5	85	28	0.0	7.9	38.9	66.4	0.0	0.0	73.1	4.7	38.1	28.8	25.8	30.2	8.2	27.1	6.6	28.1
5	28.5	11.3	83	29	0.0	8.6	19.6	82.4	5.7	46.9	165.4	22.9	63.1	51.0	17.9	53.9	23.2	52.1	26.3	56.0
6	29.0	9.0	81	41	0.0	9.9	8.3	174.2	35.5	158.0	171.1	52.3	148.4	81.3	7.6	100.8	36.4	91.2	28.0	79.4
7	32.0	12.8	83	34	0.0	9.7	3.7	286.5	101.5	287.9	62.1	139.6	190.2	195.5	6.0	183.2	22.7	184.4	18.6	179.6
8	32.8	15.0	72	37	0.0	8.5	0.0	175.9	42.1	197.4	13.7	233.6	88.6	301.6	0.0	213.6	10.7	278.0	10.6	260.5
9	33.1	16.1	77	29	0.0	8.3	0.0	97.7	12.5	110.6	0.0	181.1	18.2	161.7	0.0	94.9	4.7	172.1	2.9	164.2
10	34.6	13.1	65	13	0.0	10.1	-	20.7	-	22.8	-	119.3	-	79.5	-	40.0	-	97.4	-	92.2
11	36.2	16.9	63	18	0.0	10.2	-	0.0	-	0.0	-	45.2	-	15.2	-	6.6	-	21.9	-	18.6
12	36.7	16.7	59	15	0.0	10.2	-	0.0	-	0.0	-	8.5	-	0.0	-	0.0	-	0.0	-	0.0

***TS: Timely sown, LS: Late sown**

Table 5.3.5 (B). Population dynamic of natural enemies on *Brassicas* crops at SK Nagar under timely and late sown conditions

Std. week	Weather Parameters						No of natural enemies/ plant																											
	Temp. (ºC)		RH (%)		Rain-fall (mm)	Sun Shine (hrs)	DRMR IJ 31				T 27				GSC 7				BSH 1				GDM 4				GM 6				GM 7			
							TS*		LS		TS		LS		TS		LS		TS		LS		TS		LS		TS		LS		TS		LS	
	Max.	Min.	Morn.	Even.			C**	S	C	S	C	S	C	S	C	S	C	S	C	S	C	S	C	S	C	S	C	S	C	S	C	S	C	S
3	26.4	11.0	84	39	0.0	5.8	-	-	0.5	0.7	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	0.0
4	27.6	10.5	85	28	0.0	7.9	0.3	0.3	1.0	1.1	0.2	0.4	0.3	0.4	0.3	0.7	0.8	0.7	0.4	0.7	0.6	0.5	0.4	0.5	0.2	0.6	0.4	0.4	0.7	0.8	0.4	0.0	0.9	0.6
5	28.5	11.3	83	29	0.0	8.6	0.4	0.4	1.3	1.4	0.5	0.7	0.7	1.0	0.6	1.1	1.1	1.1	0.7	0.8	0.9	1.1	0.6	0.8	0.2	0.7	0.6	0.7	1.4	1.2	0.7	0.5	1.0	0.9
6	29.0	9.0	81	41	0.0	9.9	0.5	0.5	1.7	1.5	0.7	0.7	1.1	1.3	1.0	1.2	1.5	1.5	1.2	0.9	1.4	1.3	0.9	0.8	0.4	1.1	0.8	0.8	1.6	1.4	0.7	0.6	1.4	1.4
7	32.0	12.8	83	34	0.0	9.7	2.5	0.7	6.9	1.0	5.5	0.6	1.8	0.9	2.3	0.9	1.6	0.6	2.4	0.6	1.7	1.2	3.7	0.5	0.7	0.9	3.2	0.8	1.8	1.0	3.3	0.8	2.3	0.8
8	32.8	15.0	72	37	0.0	8.5	2.9	0.6	14.9	0.3	4.5	0.4	15.5	0.6	6.0	0.4	12.7	0.6	6.4	0.4	9.1	0.6	3.1	0.5	10.1	0.6	2.7	0.3	8.5	0.6	3.4	0.4	6.5	0.5
9	33.1	16.1	77	29	0.0	8.3	0.0	0.0	7.8	0.2	8.1	0.2	26.8	0.4	8.7	0.4	20.4	0.3	8.0	0.3	14.9	0.3	2.3	0.0	15.3	0.2	0.0	0.0	17.0	0.3	0.0	0.2	15.7	0.3
10	34.6	13.1	65	13	0.0	10.1	-	-	2.7	0.1	-	-	3.6	0.1	-	-	2.9	0.0	-	-	1.7	0.2	-	-	1.7	0.2	-	-	2.9	0.1	-	-	3.2	0.2

***TS: Timely sown, LS: Late sown**
****C: Coccinellids, S: Syrphids**

Table 5.3.6(A). Population dynamics of mustard sawfly larvae in *Brassicas* at Shillongani under timely and late sown conditions

Std. Week	Weather parameters					Sawfly larvae/ plant							
						DRMR IJ 31		T 27		GSC 7		BSH 1	
	Temp. (ºC)		RH (%)		Rain fall (mm)	Timely	Late	Timely	Late	Timely	Late	Timely	Late
	Max	Min	Morn.	Even.									
47	29.0	16.4	85	70	6.0	0	-	0	-	0	-	0	-
48	27.3	14.5	86	71	0.0	0	-	0	-	0	-	0	-
49	26.6	13.8	91	63	0.0	0.30	-	0.40	-	0	-	0.20	-
50	23.9	13.4	94	67	0.0	0.50	-	0.70	-	0	-	0.75	-
51	25.7	12.9	89	65	0.0	0.65	0	0.85	0	0.75	0.80	0.85	0.70
52	24.6	11.8	89	57	0.0	1.30	0	1.50	0	1.60	1.60	1.60	1.55
1	24.9	12.8	84	64	0.0	1.15	1.30	1.40	1.45	1.35	1.30	1.35	1.30
2	23.3	12.8	90	68	24.0	1.60	1.75	1.60	1.30	1.70	1.80	1.80	1.75
3	25.4	12.0	86	57	0.0	0.75	0.90	0.85	1.60	0.95	0.90	0.95	0.90
4	23.6	12.3	89	64	0.0	0.35	0.35	0	0.90	0.40	0.50	0.50	0.50
5	23.6	13.9	94	64	0.0	0.15	0	0	0.35	0.35	1.05	1.70	0.80
6	25.1	14.4	**88**	58	0.0	0	0	0	0	0.40	0	1.35	1.50
7	23.9	13.4	**85**	53	3.6	0	0	0	0	0	0	0.25	1.15
8	26.4	14.9	87	56	10.0	0	0	0	0	0	0	0	0
9	27.5	14.9	84	52	9.6	0	0	0	0	0	0	0	0
10	28.1	16.0	81	49	0.0	0	0	0	0	0	0	0	0
11	27.5	17.0	85	56	33.0	0	0	0	0	0	0	0	0
12	25.9	16.9	85	56	0.0	0	0	0	0	0	0	0	0
13	31.6	17.2	83	53	0.0	0	0	0	0	0	0	0	0

Table 5.3.6 (B). Population dynamics of mustard flea beetles in *Brassicas* at Shillongani under timely and late sown conditions

Std. Week	Weather parameters					Flea beetles/ plant							
	Temp. (ºC)		RH (%)		Rain fall (mm)	DRMR IJ 31		T 27		GSC 7		BSH 1	
	Max	Min	Morn.	Even.		Timely	Late	Timely	Late	Timely	Late	Timely	Late
47	29.0	16.4	85	70	6.0	0	-	0	-	0	-	0	-
48	27.3	14.5	86	71	0.0	0	-	0	-	0	-	0	-
49	26.6	13.8	91	63	0.0	0.5	-	0.5	-	1.1	-	0	-
50	23.9	13.4	94	67	0.0	1	-	1.1	-	1.7	-	0.5	-
51	25.7	12.9	89	65	0.0	1.3	0	1.1	0	1.6	0	0.9	0
52	24.6	11.8	89	57	0.0	1.7	0	1.9	1.1	2.1	1.8	1.6	0
1	24.9	12.8	84	64	0.0	1.4	0	1.6	1.6	1.2	1.3	1.4	1.5
2	23.3	12.8	90	68	24.0	1.9	0	1.9	1.5	0.7	1.9	1.8	1.6
3	25.4	12.0	86	57	0.0	1.3	0.8	1.2	1.7	0.6	0.9	1.3	1.7
4	23.6	12.3	89	64	0.0	0.8	1.6	1	1.1	0.6	0.5	0.8	0.8
5	23.6	13.9	94	64	0.0	1.1	1.5	1.8	0.3	0.6	0.5	1.7	1.7
6	25.1	14.4	**88**	58	0.0	0.5	1.7	1.6	1.8	0.5	1.9	1.2	1.3
7	23.9	13.4	**85**	53	3.6	0.4	1.5	1.8	2.0	1.0	0.9	0.7	0.8
8	26.4	14.9	87	56	10.0	0.4	2.0	0.7	1.4	0.6	0.7	0.6	1.7
9	27.5	14.9	84	52	9.6	0	0.8	0	1.3	0.5	0.6	1.7	1.3
10	28.1	16.0	81	49	0.0	0	0	0	0	0	0.4	0.9	1.3
11	27.5	17.0	85	56	33.0	0	0	0	0	0	0	0.3	0.8
12	25.9	16.9	85	56	0.0	0	0	0	0	0	0	0	0
13	31.6	17.2	83	53	0.0	0	0	0	0	0	0	0	0

Table 5.3.6(C). Population dynamics of mustard aphid in *Brassicas* at Shillongani under timely and late sown conditions

Std. Week	Weather parameters					No of aphids/ top 10 cm central twig							
						DRMR IJ 31		T 27		GSC 7		BSH 1	
	Temp. (ºC)		RH (%)		Rain fall (mm)	Timely	Late	Timely	Late	Timely	Late	Timely	Late
	Max	Min	Morn.	Even.									
47	29.0	16.4	85	70	6.0	0	-	0	-	0	-	0	-
48	27.3	14.5	86	71	0.0	0	-	0	-	0	-	0	-
49	26.6	13.8	91	63	0.0	0	-	0	-	0	-	0	-
50	23.9	13.4	94	67	0.0	0	-	0	-	0	-	0	-
51	25.7	12.9	89	65	0.0	0	0	0	1.00	0	0	0	0
52	24.6	11.8	89	57	0.0	5.23	0.90	0	2.03	1.03	1.95	1.05	0.95
1	24.9	12.8	84	64	0.0	7.35	2.88	0	13.00	6.68	4.90	11.30	8.20
2	23.3	12.8	90	68	24.0	17.63	17.18	1.03	17.50	19.88	21.50	17.43	29.58
3	25.4	12.0	86	57	0.0	29.98	49.63	4.60	43.80	33.18	48.83	41.45	50.03
4	23.6	12.3	89	64	0.0	25.10	59.48	16.50	49.73	25.60	58.50	27.73	56.80
5	23.6	13.9	94	64	0.0	17.03	35.98	35.78	27.65	23.73	39.53	42.30	39.23
6	25.1	14.4	88	58	0.0	10.58	18.40	30.48	17.53	13.20	16.80	25.60	17.10
7	23.9	13.4	85	53	3.6	7.93	27.23	19.75	20.33	15.95	17.80	13.50	18.08
8	26.4	14.9	87	56	10.0	7.00	13.40	15.60	9.25	6.68	11.28	4.98	12.60
9	27.5	14.9	84	52	9.6	3.55	12.30	10.78	6.45	7.58	8.58	5.88	10.85
10	28.1	16.0	81	49	0.0	0.90	8.90	8.53	3.83	2.90	4.75	6.60	4.58
11	27.5	17.0	85	56	33.0	0	1.85	7.85	1.20	1.05	1.98	2.00	2.78
12	25.9	16.9	85	56	0.0	0	1.20	1.70	1.20	1.00	0.98	1.00	1.88
13	31.6	17.2	83	53	0.0	0	0.85	1.00	0	0.13	0.95	0.08	0.88

Table 5.3.6(D). Population dynamics of coccinellids (adults+grubs) in *Brassicas* at Shillongani under timely and late sown conditions

Std. Week	Weather parameters					Coccinellids (Adults+Grubs)/ plant							
	Temp. (^{0}C)		RH (%)		Rain fall (mm)	DRMR IJ 31		T 27		GSC 7		BSH 1	
	Max	Min	Morn.	Even.		Timely	Late	Timely	Late	Timely	Late	Timely	Late
47	29.0	16.4	85	70	6.0	0	-	0	-	0	-	0	-
48	27.3	14.5	86	71	0.0	0	-	0	-	0	-	0	-
49	26.6	13.8	91	63	0.0	0	-	0	-	0	-	0	-
50	23.9	13.4	94	67	0.0	0	-	0	-	0	-	0	-
51	25.7	12.9	89	65	0.0	0	0	0	0	0	0	0	0
52	24.6	11.8	89	57	0.0	0	0	0	0	0	0	0	0.8
1	24.9	12.8	84	64	0.0	1.0	1.1	1.2	0	0	0.8	0	1.0
2	23.3	12.8	90	68	24.0	2.0	1.8	2.0	1.5	1.1	1.3	1.2	0.9
3	25.4	12.0	86	57	0.0	1.4	1.4	1.7	1.7	1.4	1.7	1.6	1.1
4	23.6	12.3	89	64	0.0	1.0	0.7	1.0	1.6	1.5	0.9	1.8	2.0
5	23.6	13.9	94	64	0.0	1.2	1.1	1.3	2.4	1.2	1.5	1.4	1.7
6	25.1	14.4	88	58	0.0	0.6	0.7	0.8	1.7	1.5	1.6	1.6	1.4
7	23.9	13.4	85	53	3.6	0.6	0.7	0.8	2.1	1.5	1	1.6	1.4
8	26.4	14.9	87	56	10.0	0.8	0.9	0.8	1.3	1.2	0.8	1.3	1.0
9	27.5	14.9	84	52	9.6	1.3	1.2	1.4	1	1.1	0.7	1.2	1.4
10	28.1	16.0	81	49	0.0	1.4	1.3	1.5	1.4	1.4	1.3	1.5	1.2
11	27.5	17.0	85	56	33.0	1.9	1.8	1.0	1.1	2.1	1.1	2.2	1.4
12	25.9	16.9	85	56	0.0	0	1.5	0	1.1	1.9	1.3	1.9	0.8
13	31.6	17.2	83	53	0.0	0	0.4	0	1.8	2.1	0.6	0	0.8

Table 5.3.7 (A). Population dynamics of mustard aphid on *Brassicas* crops at Morena under timely and late sown conditions

Std. Week	Weather parameters				Rainfall (mm)	Aphid population/ top 10 cm central twig							
	Temperature (ºC)		RH (%)			Timely sown				Late sown			
	Max.	Min.	Morn.	Even.		*B. juncea*	*E. sativa*	*B. napus*	*B. rapa*	*B. juncea*	*E. sativa*	*B. napus*	*B. rapa*
						DRMR IJ 31	T 27	GSC 7	BSH 1	DRMR IJ 31	T 27	GSC 7	BSH 1
45	27.2	18.3	66.9	49.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	29.1	15.5	70.1	53.2	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	27.1	11.8	72.3	55.6	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	26.8	10.6	73.2	56.1	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	25.7	9.8	71.6	43.7	-	0.0	1.2	2.0	3.2	0.0	0.0	0.0	1.6
50	22.3	6.1	72.4	45.1	-	1.0	1.0	2.1	2.0	1.2	1.0	2.8	2.6
51	23.3	7.5	78.0	46.0	-	1.0	1.0	2.6	2.4	1.0	1.2	2.6.	2.8
52	23.9	10.7	84.3	58.8	10.5	1.2	1.2	2.4	2.5	1.2	1.2	2.4	2.8
1	19.8	8.1	68.4	59.0		1.0	1.2	1.8	2.4	2.0	1.2	2.4	2.4
2	19.9	8.0	66.9	57.5	4.5	1.2	1.4	2.4	1.6	2.1	2.8	2.8	2.8
3	19.9	9.8	65.9	57.2	6.5	1.0	1.0	1.9	1.8	2.5	2.8	2.6	2.8
4	24.0	9.5	64.6	58.6	-	1.0	1.6	1.4	2.4	2.4	1.6	2.4	2.9
5	24.9	10.0	66.8	57.1	-	1.6	1.2	1.4	2.5	2.8	1.9	2.4	2.6
6	25.5	10.2	68.5	55.2	-	2.4	1.9	2.8	2.4	2.8	2.6	2.8	2.6
7	28.5	12.2	58.0	54.3	2.0	2.6	2.0	2.8	2.6	2.0	2.5	2.6	2.4
8	26.9	13.1	56.1	51.1	-	2.0	1.8	2.4	2.4	2.6	1.8	2.8	2.4
9	30.2	15.4	58.9	49.4	-	2.0	1.6	2.4	2.4	1.8	2.1	2.0	2.0
10	30.8	13.9	58.4	51.0	-	1.0	1.4	3.8	1.6	1.0	3.1	2.6	2.4
11	34.9	17.7	57.2	49.8	-	0.0	0.8	1.0	2.1	1.0	2.0	1.4	2.1
12	33.2	16.6	56.9	48.6	-	0.0	0.2	1.0	0.8	1.0	0.2	1.4	1.6
13	35.4	17.3	56.4	48.2	-	0.0	0.2	0.2	0.4	0.8	0.0	1.2	1.2

Note: Weather data provided by *Gramin Mausam Krishi Sewa*, ZARS, Morena, MP

Table 5.3.7 (B). Population dynamics of painted bug on *Brassicas* crops at Morena under timely and late sown conditions

Std. Week	Weather parameters					Number of painted bugs/ metre row length (mrl)							
	Temperature (ºC)		RH (%)		Rainfall (mm)	Timely sown				Late sown			
	Max.	Min.	Morn.	Even.		*B. juncea* DRMR IJ 31	*E. sativa* T 27	*B. napus* GSC 7	*B. rapa* BSH 1	*B. juncea* DRMR IJ 31	*E. sativa* T 27	*B. napus* GSC 7	*B. rapa* BSH 1
42	33.9	20.9	68.5	54.2	-	1.0	1.0	0.8	1.6	1.2	1.0	1.4	1.2
43	33.6	19.9	66.3	51.2	-	1.2	1.2	1.2	1.0	1.0	1.2	0.8	1.2
44	32.7	19.9	64.3	43.1	-	1.2	1.0	1.0	1.2	1.0	1.2	1.2	1.4
45	27.2	18.3	66.9	49.0	-	1.2	1.4	1.2	1.0	1.8	1.0	1.0	1.6
46	29.1	15.5	70.1	53.2	-	0.0	1.2	1.2	0.8	1.2	1.0	0.1	0.8
47	27.1	11.8	72.3	55.6	-	1.0	1.0	0.8	1.6	1.2	1.0	1.4	0.6
48	26.8	10.6	73.2	56.1	-	1.2	1.2	1.2	1.0	1.0	1.2	0.8	0.6
49	25.7	9.8	71.6	43.7	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	22.3	6.1	72.4	45.1	10.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	23.3	7.5	78.0	46.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52	23.9	10.7	84.3	58.8	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	19.8	8.1	68.4	59.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	19.9	8.0	66.9	57.5	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	19.9	9.8	65.9	57.2	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	24.0	9.5	64.6	58.6	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	24.9	10.0	66.8	57.1	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	25.5	10.2	68.5	55.2	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	28.5	12.2	58.0	54.3	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	26.9	13.1	56.1	51.1	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	30.2	15.4	58.9	49.4	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	30.8	13.9	58.4	51.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	34.9	17.7	57.2	49.8	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	33.2	16.6	56.9	48.6	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	35.4	17.3	56.4	48.2	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: Weather data provided by *Gramin Mausam Krishi Sewa*, ZARS, Morena, MP

Table 5.3.7 (C). Population dynamic of Coccinellids on *Brassicas* crops at Morena under timely and late sown conditions

Std. Week	Weather parameters					Number of cocinellids (Adults+Grubs)/ plant							
	Temperature (ºC)		RH (%)		Rainfall (mm)	Timely sown				Late sown			
						B. juncea	*E. sativa*	*B. napus*	*B. rapa*	*B. juncea*	*E. sativa*	*B. napus*	*B. rapa*
	Max.	Min.	Morn.	Even.		DRMR IJ 31	T 27	GSC 7	BSH 1	DRMR IJ 31	T 27	GSC 7	BSH 1
45	27.2	18.3	66.9	49.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	29.1	15.5	70.1	53.2	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	27.1	11.8	72.3	55.6	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	26.8	10.6	73.2	56.1	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	25.7	9.8	71.6	43.7	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	22.3	6.1	72.4	45.1	-	1.0	1.0	0.8	1.6	1.2	1.0	1.4	1.2
51	23.3	7.5	78.0	46.0	-	1.0	1.0	0.8	1.6	1.2	1.0	1.4	1.2
52	23.9	10.7	84.3	58.8	10.5	1.0	1.0	0.8	1.6	1.2	1.0	1.4	1.2
1	19.8	8.1	68.4	59.0		1.0	1.0	0.8	1.6	1.2	1.0	1.4	1.2
2	19.9	8.0	66.9	57.5	4.5	0.0	1.2	1.2	0.8	1.2	1.0	0.1	0.8
3	19.9	9.8	65.9	57.2	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	24.0	9.5	64.6	58.6	-	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0
5	24.9	10.0	66.8	57.1	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	25.5	10.2	68.5	55.2	-	0.0	0.6	0.6	0.0	0.0	0.0	0.4	0.0
7	28.5	12.2	58.0	54.3	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.8
8	26.9	13.1	56.1	51.1	-	1.0	0.0	0.4	0.0	0.0	0.0	0.0	0.8
9	30.2	15.4	58.9	49.4	-	0.0	0.0	0.0	0.4	1.2	1.6	1.2	2.8
10	30.8	13.9	58.4	51.0	-	0.0	0.0	0.0	0.4	1.0	1.0	0.0	0.4
11	34.9	17.7	57.2	49.8	-	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0
12	33.2	16.6	56.9	48.6	-	0.0	0.0	0.0	0.0	0.8	1.0	0.6	1.0
13	35.4	17.3	56.4	48.2	-	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0

Note: Weather data provided by *Gramin Mausam Krishi Sewa*, ZARS, Morena. MP

Table 5.3.7 (D). Activity of honey bees on *Brassicas* at Morena under timely and late sown conditions

Std. Week	Weather parameters					Number of honey bee visits/ min/ plant							
	Temperature (ºC)		RH (%)		Rainfall (mm)	Timely sown				Late sown			
	Max.	Min.	Morn.	Even.		*B. juncea* DRMR IJ 31	*E. sativa* T 27	*B. napus* GSC 7	*B. rapa* BSH 1	*B. juncea* DRMR IJ 31	*E. sativa* T 27	*B. napus* GSC 7	*B. rapa* BSH 1
45	27.2	18.3	66.9	49.0	-	1.4	1.6	2.4	1.4	1.4	1.6	2.6	3.4
46	29.1	15.5	70.1	53.2	-	1.2	2.4	2.6	1.6	1.6	1.2	2.8	2.8
47	27.1	11.8	72.3	55.6	-	2.0	2.8	2.8	1.8	2.4	1.8	3.2	2.0
48	26.8	10.6	73.2	56.1	-	1.8	2.4	1.5	2.0	2.0	2.4	3.2	2.4
49	25.7	9.8	71.6	43.7	-	1.8	2.4	1.9	2.0	2.5	2.5	3.2	1.6
50	22.3	6.1	72.4	45.1	-	2.0	2.8	1.6	1.8	1.1	2.8	1.8	2.4
51	23.3	7.5	78.0	46.0	-	2.6	2.6	1.9	1.6	1.2	3.2	1.8	3.6
52	23.9	10.7	84.3	58.8	10.5	2.5	2.5	1.6	1.4	3.1	3.2	2.1	3.0
1	19.8	8.1	68.4	59.0		2.1	1.5	2.8	1.6	2.4	3.4	1.6	2.8
2	19.9	8.0	66.9	57.5	4.5	1.0	2.0	2.5	2.8	1.6	2.0	1.4	2.4
3	19.9	9.8	65.9	57.2	6.5	2.8	1.0	1.8	1.5	2.5	2.1	3.6	2.0
4	24.0	9.5	64.6	58.6	-	1.2	2.0	1.8	1.8	1.0	3.2	1.6	2.0
5	24.9	10.0	66.8	57.1	-	2.0	0.0	2.7	1.0	1.0	1.0	2.4	2.2
6	25.5	10.2	68.5	55.2	-	2.4	0.0	2.4	1.2	1.8	1.0	2.1	3.2
7	28.5	12.2	58.0	54.3	2.0	2.8	0.0	1.4	1.5	0.0	2.1	2.1	3.8
8	26.9	13.1	56.1	51.1	-	2.4	0.0	1.4	2.6	0.0	1.0	1.4	0.0
9	30.2	15.4	58.9	49.4	-	1.0	0.0	0.8	0.4	0.0	0.4	1.2	1.6
10	30.8	13.9	58.4	51.0	-	0.4	0.0	0.0	0.4	0.0	0.4	1.0	1.0
11	34.9	17.7	57.2	49.8	-	0.0	0.0	0.0	0.2	0.0	0.1	0.4	0.0
12	33.2	16.6	56.9	48.6	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	35.4	17.3	56.4	48.2	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: Weather data provided by *Gramin Mausam Krishi Sewa*, ZARS, Morena, MP

Table 5.3.8. Monitoring of alate mustard aphids on sticky traps

Std. week	Mean mustard aphid (alate) population per trap						
	HSR	SKN	LDH	PTN	KAN	MOR	DHO
40	-	-	0.0	-	-	0.0	0.0
41	-	-	0.0	-	-	0.0	0.0
42	-	-	0.0	-	-	0.0	0.0
43	-	-	2.0	-	0.0	0.0	0.0
44	-	-	40.6	-	0.0	0.0	0.0
45	-	-	39.6	-	0.0	0.0	0.0
46	-	-	34.2	-	0.0	0.0	0.0
47	1.5	-	25.2	-	0.0	2.1	0.0
48	1.3	2.80	24.2	-	0.0	2.6	0.0
49	0.0	7.40	18.4	-	0.0	2.6	0.0
50	0.5	24.00	13.0	-	0.0	2.1	0.0
51	1.5	73.40	11.4	-	0.0	2.0	0.0
52	0.0	89.60	13.0	-	0.0	10.4	0.0
1	0.2	106.40	9.4	-	0.0	35.6	0.0
2	0.0	490.60	20.0	-	0.0	42.6	0.0
3	0.0	761.20	16.3	29.0	0.0	10.8	3.2
4	6.8	1105.00	21.2	56.0	0.0	10.6	5.6
5	8.3	1531.60	20.8	80.4	0.0	56.8	8.4
6	1.0	1973.80	28.6	97.2	0.0	112.4	11.2
7	1.8	2462.00	69.4	114.0	0.0	118.9	18.6
8	26.5	4402.80	98.4	125.0	0.0	98.6	34.6
9	106.5	6447.60	104.8	139.0	1.0	68.8	88.4
10	376.5	4184.00	135.8	159.0	2.9	58.8	106.8
11	117.2	987.60	133.8	177.0	3.2	18.8	42.4
12	3.3	100.40	130.0	153.0	0.0	8.0	22.6
13	9.5	12.50	145.4	-	0.0	0.0	2.8
14	1.8	-	50.0	-	-	0.0	-
15	-	-	4.8	-	-	0.0	-
16	-	-	0.0	-	-	0.0	-
17	-	-	0.0	-	-	0.0	-

Table 5.4.1 (A). Efficacy of exogenous application of salicylic acid on mustard aphid population at Hisar

Treatments	Aphids/10 cm top twig												Yield Kg/ha
	BS*	1 DAS**	ROC (%)	3 DAS	ROC (%)	7 DAS	ROC (%)	10 DAS	ROC (%)	14 DAS	ROC (%)	Mean	
T_1: Salicylic acid @ 0.5mM (69ppm)	77.9	70.1	23.8	46.8	52.2	46.9	58.7	42.4	67.9	46.3	69.6	**55.1**	2,180.6
T_2: Salicylic acid @ 1.0mM (138ppm)	82.7	74.1	19.5	68.5	30.1	55.0	51.6	43.5	67.1	43.8	71.2	**61.3**	2,256.1
T_3: Salicylic acid @ 1.5mM (207ppm)	81.6	70.5	23.4	61.3	37.5	45.3	60.1	35.7	73.0	39.8	73.9	**55.7**	2,281.2
T_4: Thiamethoxam 25 WG @ 0.1 g//L	75.3	48.4	47.4	14.5	85.2	4.1	96.3	1.1	99.1	22.8	85.1	**27.7**	2,562.4
T_5: Control	86.9	92.1	-	98.1	-	113.8	-	132.4	-	152.6	**-**	**112.6**	1,849.4
Mean	**80.9**	**71.0**	**-**	**57.8**	**-**	**53.0**	**-**	**51.0**	**-**	**61.1**	**-**	**-**	**2225.9**
CD (p=0.05)	NS	9.9		21.8		23.1		26.6		26.1			189.167

***BS=Before spray, **DAS=days after spray, ROC=Reduction over control**

Table 5.4.1 (B). Economics of different treatments at Hisar

Treatments	Cost of insecticide/ SA (Rs)	No. of labour required/ha	Labour cost (Rs/ha)	Total expenditure (Rs/ha) (4+6)	Yield (kg/ha)	Gross income (Rs/ha) (8xmsp)	Net returns over control (Rs/ha) (9-control)	IBCR (10/7)
T_1: Salicylic acid @ 0.5mM	184.6	2	1220	1404.6	2,180.6	129743.1	19704.8	14.1
T_2: Salicylic acid @ 1.0mM	369.2	2	1220	1589.2	2,256.1	134242.3	24204.0	15.2
T_3: Salicylic acid @ 1.5mM	553.7	2	1220	1773.7	2,281.2	135729.8	25691.5	14.5
T_4: Thiamethoxam 25 WG @ 0.1 g//L	54.0	2	1220	1274.0	2,562.4	152459.6	42421.3	33.3
T_5: Control	*	*	*	*	1,849.4	110038.3		

Salicylic acid = Rs. 535/50g, Thiamethoxam 25 WG = Rs. 2160/kg, *No application, MSP=59.50, Labour cost=Rs. 610/-

Table 5.4.2 (A). Efficacy of exogenous application of salicylic acid on mustard aphid population at Morena

S.N.	Treatments	Number of aphids per 10 cm top twig					
		24 hrs Before spray	3 DAS*	7 DAS	10 DAS	14 DAS	Yield (kg/ha)
1	T_1: Salicylic acid 0.5 mM (69ppm)	30.8	4.6	10.8	24.2	32.8	1890.0
2	T_2 : Salicylic acid 1.0 mM (138ppm)	38.4	6.8	12.2	28.2	26.6	1950.0
3	T_3: Salicylic acid 1.5 mM (207ppm)	32.6	8.6	25.4	26.9	26.0	1960.0
4	T_4: Thiamethoxam 25 WG @ 0.1g/ l	38.8	16.6	24.8	22.6	26.2	2025.0
6	T_5: Control	38.2	38.7	43.6	48.4	48.8	1800.0
CD ($p \leq 0.05$)		**NS**	**NS**	**NS**	**NS**	**NS**	**-**

***DAS: Days after spray**

Table 5.4.2 (B). Economics of exogenous application of salicylic acid at Morena

S. No.	Treatments	Yield (kg/ha)	Cost of Cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	BCR
1	T_1: Salicylic acid 0.5 mM (69ppm)	1890.0	38900.0	112455.0	73555.0	2.8
2	T_2 : Salicylic acid 1.0 mM (138ppm)	1950.0	38900.0	116025.0	77125.0	2.1
3	T_3: Salicylic acid 1.5 mM (207ppm)	1960.0	38900.0	116620.0	77720.0	2.9
5	T_4: Thiamethoxam 25 WG @0.1g/lit	2025.0	38900.0	120487.0	81587.0	3.0
6	T_5: Control (water spray)	1800.0	38900.0	107100.0	68200.0	2.7

Salicylic acid = Rs. 535/50g, Thiamethoxam 25 WG = Rs. 2160/kg

5.4.3 (A). Management of mustard aphid with exogenous application of salicylic acid at SK Nagar

Tr. No.	Treatments	Number of aphids/ plant				
		DBS*	3 DAS**	7 DAS	10 DAS	14 DAS
1	Salicylic acid 0.5 mM (69 ppm)	112.90 (10.64)	125.95 (11.08)	213.80 (14.36)	248.25 (15.75)	284.15 (16.86)
2	Salicylic acid 1.0 mM (138 ppm)	111.50 (10.51)	118.75 (10.89)	211.30 (14.52)	231.45 (15.18)	276.70 (16.64)
3	Salicylic acid 1.5 mM (207 ppm)	110.60 (10.54)	105.35 (10.16)	201.70 (14.17)	225.05 (14.84)	274.00 (16.57)
4	Thiamethoxam 25 @ 0.1 g/ l	113.10 (10.65)	27.00 (5.24)	29.85 (5.49)	53.75 (7.22)	62.40 (7.92)
5	Control	111.05 (10.54)	174.10 (13.15)	234.95 (15.30)	248.25 (16.80)	301.15 (17.06)
	C.D. ($p \leq 0.05$)	**NS**	**1.30**	**2.40**	**2.70**	**2.78**

***DBS-Days before spray**
**** DAS-Days after spray**

5.4.3 (B). Yield and economics of different treatments on mustard at SK Nagar

Tr. No.	Treatments	Yield (kg/ha)	Gross returns (Rs/ha)	Cost of cultivation (Rs/ha)	Net returns (Rs/ha)	BCR
1	Salicylic acid 0.5 mM (69 ppm)	926.0	55097	36325	18772	1.52
2	Salicylic acid 1.0 mM (138 ppm)	937.0	55752	36699	19052	1.52
3	Salicylic acid 1.5 mM (207 ppm)	950.0	56525	37063	19462	1.53
4	Thiamethoxam 25 @ 0.1 g/ l	1245.0	74078	36211	37867	2.05
5	Control	718.0	42721	35961	6760	1.19
	C.D. ($p \leq 0.05$)	**170.3**				

MSP of mustard: Rs 59.50/kg

5.4.4 (A). Management of mustard aphid with exogenous application of salicylic acid at Dholi

Tr. No.	Treatments	DBS*	1 DAS*	3 DAS	7 DAS	10 DAS	14 DAS
1	Salicylic acid 0.5 mM (69 ppm)	23.25	20.25	17.5	16.75	17.25	19.25
2	Salicylic acid 1.0 mM (138 ppm)	24.75	19.75	16.75	15.25	15.75	18.50
3	Salicylic acid 1.5 mM (207 ppm)	24.00	18.25	15.25	13.5	14.25	16.75
4	Thiamethoxam 25 @ 0.1 g/ l	24.00	12.25	4.75	2.00	3.75	4.50
5	Control	23.75	24.75	23.75	24.75	25.25	25.50
	C.D. ($p \leq 0.05$)	**NS**	**3.51**	**2.94**	**2.63**	**1.58**	**2.58**

***DBS: Days before spray**
****DAS: Days after spray**

5.4.4 (B). Yield and economics of different treatments on mustard at Dholi

Treatments	Dose /ha	Cost of insecticide (Rs)	Cost of cultivation (Rs)	No. of labour required/ ha	Labour cost (Rs/ha)	Total expenditure (Rs/ha)	Yield (kg/ha)	Gross income (Rs/ha)	Net returns over control (Rs/ha)	BCR
T_1: Salicylic acid @ 0.5mM (69 ppm)	17.25 g	184.58	37525	2	900	38609.58	1100.25	100773.71	62164.13	1.61
T_2: Salicylic acid @ 1.0mM (138 ppm)	34.50 g	369.15	37525	2	900	38794.15	1085.64	100132.81	61338.66	1.58
T_3: Salicylic acid @ 1.5mM (207 ppm)	51.75 g	553.73	37525	2	900	38978.73	995.82	95242.56	56263.83	1.44
T_4: Thiamethoxam 25 @ 0.1 g//l	25 g	54	37525	2	900	38479.00	1197.5	106137.75	67658.75	1.76
T_5: Control	-	0	37525	0	0	38425.00	950	92100.00	53675.00	1.40

Table 5.4.5 (A). Effect of Salicylic acid on population of mustard aphid (no./10 cm central twig) at Shillongani

Sr. No.	Treatments	Before	1 DAS	3 DAS	7 DAS	10 DAS	14 DAS	Yield (kg/ha)	IOC (%)
T_1	Salicylic acid 0.5 mM (69 ppm)	71.0	69.00	52.93	49.43	48.53	43.00	1066.67	10.96
T_2	Salicylic acid 1.0 mM (138 ppm)	68.6	68.00	28.03	29.97	25.73	18.60	1172.33	21.95
T_3	Salicylic acid 1.5 mM (207 ppm)	69.3	67.00	14.07	19.30	13.33	5.20	1483.33	54.30
T_4	Thiamethoxam 25 @ 0.1 g/ l	70.1	66.83	27.23	28.83	24.97	16.60	1484.67	54.44
T_5	Control	71.9	72.27	70.37	68.43	69.40	68.23	961.33	
CD ($p \leq 0.05$)		NS	0.43	0.29	4.09	2.69	1.48	57.31	

***IOC= Increase in yield over control**

Table 5.4.5 (B). Economics of different treatments at Shillongani

Sr. No.	Treatments	Yield (kg/ha)	Gross returns (Rs/ha)	Cost of cultivation (Rs/ha)	Net returns (Rs/ha)	BCR
1	2	3	4	5	6	7
T_1	Salicylic acid 0.5 mM (69 ppm)	1066.67	63466.67	27279.6	36187.07	1.33
T_2	Salicylic acid 1.0 mM (138 ppm)	1172.33	69753.83	27814.6	41939.23	1.51
T_3	Salicylic acid 1.5 mM (207 ppm)	1483.33	88258.33	28349.6	59908.73	2.11
T_4	Thiamethoxam 25 @ 0.1 g/ l	1484.67	88337.67	29834.6	58503.07	1.96
T_5	Control	961.33	57199.33	26744.6	30454.73	1.14

MSP of Mustard: Rs. 59.50/ kg

Table 5.4.6 (A). Efficacy of exogenous application of salicylic acid on mustard aphid population at Ludhiana

Treatments	Number of aphids/10 cm top twig											Yield (kg/ha)
	BS	1 DAS*	PROC**	3 DAS	PROC	7 DAS	PROC	10 DAS	PROC	14 DAS	PROC	
T_1: Salicylic acid @ 0.5mM (69ppm)	50.5	53.2	2.3	54.8	13.7	78.1	14.9	94.0	20.8	105.0	35.5	1550.0
T_2: Salicylic acid @ 1.0mM (138ppm)	50.8	47.9	12.1	50.2	20.9	72.2	21.3	80.7	32.1	95.0	41.6	1769.4
T_3: Salicylic acid @ 1.5mM (207ppm)	55.0	45.7	1.5	53.5	15.7	56.0	38.9	62.3	47.5	88.1	45.8	1902..8
T_4: Thiamethoxam 25 @ 0.1 g//L	49.6	31.4	42.3	5.1	91.9	0.4	99.5	0.0	100.0	33.5	79.4	2022.2
T_5: Control	52.0	54.5	-	63.5	-	91.8	-	118.8	-	162.8	-	1263.9
CD ($p\leq0.05$)	**NS**	**5.83**	**-**	**5.30**	**-**	**8.3**	**-**	**12.7**	**-**	**11.12**	**-**	**121.8**

***DAS: Days after spray**
***PROC: Per cent reduction over control**

Table 5.4.6 (B). Economics of different treatments at Ludhiana

Treatment	Dose /ha	Cost of insecticide/ SA (Rs)	No. of labour required/ha	Labour cost (Rs/ha)	Total expenditure (Rs/ha) (4+6)	Yield (kg/ha)	Gross income (Rs/ha) (8xmsp)	Net returns over control (Rs/ha) (9-control)	IBCR (10/7)
T_1: Salicylic acid @ 0.5mM (69 ppm)	17.25 g	184.6	2	900	1084.6	1550.0	92225.0	17022.9	15.7
T_2: Salicylic acid @ 1.0mM (138 ppm)	34.50 g	369.2	2	900	1269.2	1769.4	105279.3	30077.2	23.7
T_3: Salicylic acid @ 1.5mM (207 ppm)	51.75 g	553.7	2	900	1453.7	1902.8	113216.6	38014.5	26.2
T_4: Thiamethoxam 25 @ 0.1 g//L	25 g	54.0	2	900	954.0	2022.2	120320.9	45118.8	47.3
T_5: Control	-	-	-	-		1263.9	75202.1		

Salicylic acid = Rs. 535/50g, Thiamethoxam 25 WG = Rs. 2160/kg, MSP of mustard: 59.50

Table 5.5.1. Biochemical components in mustard genotypes in relation to aphid infestation (Hisar)

Sr. No.	Variety	Biochemical parameters							Yield (kg/ha)
		No of aphids/ top 10 cm central twig	Peroxidase (µmole/min/mg protein)	Myrosinase (U/g)	Total glucosinolates (µmole/g)	Total phenols* (%)	Ortho-dihydroxy phenols (mg/g)	Flavonols (mg/g)	
1	DRMRIJ 31 **(Uninfested)**	2.7	0.49	0.75	45.26	10.23	0.47	2.05	2,360.5
2	GSL 1 **(Uninfested)**	3.2	0.34	0.49	39.72	13.45	0.49	2.71	2,370.4
3	PM 30 **(Uninfested)**	4.4	0.53	0.82	33.58	12.10	0.39	2.41	2,250.3
4	GSC 7 **(Uninfested)**	4.1	0.45	0.68	15.75	10.65	0.35	2.46	2,429.3
	Mean	**3.6**	**0.45**	**0.69**	**33.58**	**11.61**	**0.43**	**2.41**	**2352.5**
1	DRMRIJ 31 **(Infested)**	95.7	0.61	0.92	42.51	15.51	0.56	2.89	2,221.9
2	GSL 1 **(Infested)**	89.3	0.49	0.58	35.11	17.84	0.61	3.08	2,008.0
3	PM 30 **(Infested)**	118.6	0.65	1.03	31.42	15.28	0.50	3.02	2,018.5
4	GSC 7 **(Infested)**	130.6	0.61	0.88	12.33	13.78	0.48	2.94	2,050.9
	Mean	**108.5**	**0.59**	**0.85**	**30.34**	**15.60**	**0.54**	**2.98**	**2074.8**
	CD ($p \leq 0.05$)	8.891	0.085	0.173	3.627	2.959	0.188	0.214	168.858
	Increase/Decrease (%) over uninfested								
1	DRMR IJ 31	-	+24.4	+22.66	-6.1	+51.6	+19.1	+40.9	-6.3
2	GSL 1	-	+30.6	+18.36	-11.6	+32.6	+24.4	+13.6	-15.3
3	PM 30	-	+22.6	+25.61	-6.4	+26.2	+28.2	+25.3	-10.3
4	GSC 7	-	+35.5	+29.41	-21.7	+29.3	+37.1	+19.5	-15.6

Table 5.5.2. Biochemical components in mustard genotypes in relation to aphid infestation (Ludhiana)

Sr. No.	Variety	Biochemical parameters							Yield (kg/ha)
		No of aphids/ top 10 cm central twig	Peroxidase (ΔA/min/mg protein)	Myrosinase (U/g)	Total glucosinolates (µmole/g DW)	Total phenols (mg/g DW)	Ortho-dihydroxy phenols (mg/g DW)	Flavonols (mg/g DW)	
1	DRMRIJ 31 **(Uninfested)**	1.43	0.3	0.13	24.9	12.76	0.54	3.68	1650.00
2	GSL 1 **(Uninfested)**	1.27	0.6	0.30	22.5	11.53	1.16	4.91	1805.56
3	PM 30 **(Uninfested)**	0.97	0.3	0.34	24.0	10.96	1.49	4.38	1838.89
4	GSC 7 **(Uninfested)**	1.03	0.4	0.16	29.2	10.78	0.51	3.44	1966.67
	Mean	**1.17**	**0.4**	**0.23**	**25.1**	**11.51**	**0.93**	**4.10**	**1815.28**
1	DRMRIJ 31 **(Infested)**	169.63	0.6	0.16	23.8	17.67	0.65	4.45	1458.33
2	GSL 1 **(Infested)**	167.33	1.3	0.51	21.0	14.87	1.22	5.59	1233.33
3	PM 30 **(Infested)**	146.83	0.6	0.76	22.7	14.01	1.76	5.01	1430.56
4	GSC 7 **(Infested)**	155.57	1.0	0.90	22.7	13.22	0.57	3.51	1383.33
	Mean	**159.84**	**0.9**	**0.58**	**22.5**	**14.94**	**1.05**	**4.64**	**1376.38**
	CD (p≤0.05) **Genotypes** **Infestation** **G x I**	 **NS** **9.27** **NS**	 **0.12** **0.09** **NS**	 **0.27** **0.19** **NS**	 **1.88** **1.33** **2.67**	 **1.63** **1.15** **NS**	 **0.17** **0.12** **NS**	 **0.57** **0.41** **NS**	 **119.13** **84.24** **168.48**
	Increase/Decrease (%) over uninfested								
1	DRMR IJ 31	-	100.00	23.07	-4.41	38.47	20.37	20.92	-11.61
2	GSL 1	-	116.67	70.00	-6.67	28.96	5.17	13.84	-31.69
3	PM 30	-	100.00	123.53	-5.41	27.82	18.12	14.38	-22.20
4	GSC 7	-	150.00	462.50	-22.26	22.63	11.76	2.03	-29.66

Table 5.5.3. Biochemical components in mustard genotypes in relation to aphid infestation (Pantnagar)

Sr. No.	Variety	Biochemical parameters						
		No of aphids/ top 10 cm central twig	Peroxidase (ΔA/min/mg protein)	Total glucosinolates (µmole/g)	Myrosinase (U/g)	Total phenols* (mg/g DW)	Ortho-dihydroxy phenols (mg/g DW)	Flavonols (mg/g DW)
1	DRMRIJ 31 **(Uninfested)**	1.93	0.38	38.13	2.18	6.05	0.56	0.41
2	GSL 1 **(Uninfested)**	1.70	0.47	31.70	2.07	6.88	0.51	0.49
3	PM 30 **(Uninfested)**	1.22	0.53	63.05	1.88	7.91	0.63	0.64
4	**GSC 7 (Uninfested)**	2.38	0.58	68.27	1.96	8.10	0.69	0.77
	Mean	**1.80**	**0.49**	**50.28**	**2.02**	**7.23**	**0.59**	**0.57**
1	DRMRIJ 31 **(Infested)**	34.80	0.72	44.25	3.54	8.86	0.74	0.79
2	GSL 1 **(Infested)**	33.63	0.75	38.23	3.37	8.77	0.71	0.62
3	PM 30 **(Infested)**	35.10	0.88	70.52	2.96	9.26	0.95	0.93
4	GSC 7 **(Infested)**	29.63	0.80	75.17	2.83	9.58	0.87	0.95
	Mean	**33.29**	**0.78**	**57.04**	**3.17**	**9.11**	**0.81**	**0.82**
	CD ($p \leq 0.05$)	**4.10**	**0.4**	**1.17**	**0.10**	**0.12**	**0.03**	**0.03**
	Increase/Decrease (%) over uninfested							
1	DRMR IJ 31	-	**+47.22%**	**+13.83%**	**+38.41%**	**+31.71%**	**+24.32%**	**+48.10%**
2	GSL 1	-	**+37.33%**	**+17.08%**	**+38.57%**	**+21.55%**	**+28.16%**	**+20.96%**
3	PM 30	-	**+39.77%**	**+10.59%**	**+36.48%**	**+14.57%**	**+33.68%**	**+22.58%**
4	GSC 7	-	**+27.50%**	**+9.17%**	**+30.74%**	**+15.44%**	**+20.68%**	**+18.94%**

Table 5.6.1. Survey and surveillance of insect-pests at Hisar

Month	Aphids/10 cm top twig	Flea beetle/plant	Hairy caterpillar/plant	Painted bug/m row length	Coccinella/plant (adult+grubs)	Syrphid fly/sq. meter/minute
November, 2024	0.0	0.0	0.0	0.0	0.0	0.0
December, 2024	0.0	0.0	0.0	0.4	0.0	0.1
January, 2025	0.5	0.3	0.8	0.0	0.0	0.4
February, 2025	2.8	0.0	0.0	0.0	0.3	0.1
March, 2025	13.5	0.0	0.0	0.0	0.8	0.0

Table 5.6.2. Survey and surveillance of insect- pests and their natural enemies in rapeseed-mustard farmers' fields at Morena

Name of Village	Month	Fortnight	Painted bug/m row/length	(Aphid/ 10 cm top twig)	*Coccinellids* beetle/plant
Jigni. Silaytha, Kok Singh ka pura, Ghusgawan , Barauli, Babripura Ajit pura, Banmore, Ahrauli. Jebra khera	October	I	0.0	0.0	0.0
		II	4.5	0.0	0.0
	November	I	2.1	0.0	0.0
		II	1.6	0.0	0.0
	December	I	3.6	1.0	1.2
		II	1.6	1.4	1.0
	January	I	0.0	2.6	2.2
		II	0.0	2.8	1.6
	February	I	0.0	1.6	1.8
		II	0.0	0.0	1.2
	March	I	0.0	0.0	0.0
		II	0.0	0.0	0.0

Mean of ten locations

Table 5.6.3. Survey and surveillance of insect-pests and natural enemies at Pantnagar

SMW	Mean population of insect pests and natural enemies in different locations (insects/plant)																							
	Pantnagar			Shantipuri I			Shantipuri II			Jawahar Nagar			Kanakpur			Dopahariya (Kicha)			Anandpur			Jaynagar		
	Mustard sawfly	Aphid	Coccinellids	Mustard sawfly	Aphid	Coccinellids	Mustard sawfly	Aphid	Coccinellids	Mustard sawfly	Aphid	Coccinellids	Mustard sawfly	Aphid	Coccinellids	Mustard sawfly	Aphid	Coccinellids	Mustard sawfly	Aphid	Coccinellids	Mustard sawfly	Aphid	Coccinellids
45th	0.00	0.00	0.00	0.70	0.00	0.10	1.25	1.75	0.55	1.05	1.75	0.00	1.40	2.50	0.90	1.15	0.00	0.00	1.70	8.75	1.35	1.45	0.85	0.00
47th	0.00	0.00	0.00	1.25	0.00	1.70	1.45	4.75	0.75	1.45	4.05	0.35	1.15	3.75	2.25	0.75	1.00	0.00	1.35	9.50	2.15	0.80	1.75	0.40
49th	2.10	0.00	0.75	1.55	9.50	1.80	1.30	8.50	0.80	0.95	10.25	0.60	1.30	11.00	2.60	0.40	1.75	0.15	1.20	10.50	3.60	1.20	9.75	1.10
51st	3.05	0.00	1.20	1.20	19.00	2.70	1.75	10.75	1.05	0.70	3.50	1.70	0.20	5.40	1.65	1.80	5.50	0.45	0.75	1.25	4.00	1.95	6.00	2.55
1st	0.70	6.95	2.50	0.95	4.50	2.85	0.65	15.75	1.10	0.25	5.75	3.20	0.00	15.20	2.45	1.35	9.25	1.00	0.30	6.25	1.35	0.70	11.30	3.75
3rd	2.15	13.20	2.80	0.00	7.25	2.80	0.00	12.50	1.40	0.00	10.55	2.35	0.00	10.75	2.75	1.10	3.00	0.90	0.00	9.00	1.50	0.20	18.25	6.40
5th	1.15	22.60	3.40	0.00	16.75	1.75	0.00	11.00	0.85	0.00	9.00	2.20	0.00	6.50	2.60	0.65	6.50	1.15	0.00	11.00	2.45	0.00	14.25	5.70
7th	0.25	35.70	4.15	0.00	7.00	0.50	0.00	3.75	0.35	0.00	0.00	1.40	0.00	0.25	0.00	0.35	11.25	2.90	0.00	7.75	1.40	0.00	3.25	3.75
9th	0.45	23.60	7.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00	1.65	0.00	0.00	0.00	0.00	0.75	0.00
11th	0.35	49.45	13.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13th	0.00	48.75	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 5.6.4 (A). Survey and surveillance of insect pests and their natural enemies in rapeseed-mustard at SK Nagar

Sr. No	Name of the village surveyed	No. of Aphids/ 10 cm top twig during									Overall Mean
		2nd fortnight of October 2024	1st fortnight of November 2024	2nd fortnight of November 2024	1st fortnight of December 2024	2nd fortnight of December 2024	1st fortnight of January 2025	2nd fortnight of January 2025	1st fortnight of February 2025	2nd fortnight of February 2025	
1	Bhadli Kotha	0.00	0.00	0.00	0.00	1.05	2.15	19.80	6.45	2.10	3.51
2	Fatepura	0.00	0.00	0.00	0.00	0.15	1.40	32.05	11.25	2.70	5.28
3	Lunpur	0.00	0.00	0.00	0.00	0.40	1.30	33.70	9.10	1.90	5.16
4	Saviyana	0.00	0.00	0.00	0.00	0.85	1.50	24.30	17.30	1.90	5.09
5	Parkhadi	0.00	0.00	0.00	0.00	0.20	1.25	16.20	14.00	3.15	3.87
6	Andhariya	0.00	0.00	0.00	0.00	1.00	0.85	19.95	7.95	1.65	3.49
7	Vagdadi	0.00	0.00	0.00	0.00	0.35	0.85	23.20	10.10	2.40	4.10
8	Nandotra	0.00	0.00	0.00	0.00	0.20	1.35	28.85	18.40	1.90	5.63
9	Balol	0.00	0.00	0.00	0.00	1.05	2.35	18.70	10.20	3.75	4.01
10	Ravalavas	0.00	0.00	0.00	0.00	0.60	1.15	20.95	9.50	1.40	3.73

Table 5.6.4 (B). Survey and surveillance of insect pests and their natural enemies in rapeseed-mustard at SK Nagar

Sr. No	Name of the village surveyed	No. of Coccinellids/plant during									Overall Mean
		2nd fortnight of October 2024	1st fortnight of November 2024	2nd fortnight of November 2024	1st fortnight of December 2024	2nd fortnight of December 2024	1st fortnight of January 2025	2nd fortnight of January 2025	1st fortnight of February 2025	2nd fortnight of February 2025	
1	Bhadli Kotha	0.00	0.00	0.00	0.15	0.35	0.65	0.50	0.25	0.00	0.21
2	Fatepura	0.00	0.00	0.00	0.10	0.20	0.20	0.45	0.30	0.00	0.14
3	Lunpur	0.00	0.00	0.00	0.35	0.20	0.20	0.40	0.35	0.25	0.19
4	Saviyana	0.00	0.00	0.00	0.30	0.35	0.35	0.80	0.25	0.05	0.23
5	Parkhadi	0.00	0.00	0.00	0.20	0.05	0.05	0.60	0.10	0.20	0.13
6	Andhariya	0.00	0.00	0.00	0.25	0.15	0.15	1.10	0.10	0.05	0.20
7	Vagdadi	0.00	0.00	0.00	0.20	0.10	0.15	0.70	0.05	0.10	0.14
8	Nandotra	0.00	0.00	0.00	0.30	0.20	0.20	0.45	0.20	0.00	0.15
9	Balol	0.00	0.00	0.00	0.15	0.50	0.50	0.60	0.00	0.05	0.20
10	Ravalavas	0.00	0.00	0.00	0.15	0.15	0.20	0.45	0.15	0.00	0.12

Table 5.6.5. Survey and surveillance of insect-pests and natural enemies at Shillongani

Date of visit	Site details with credentials		Variety	Area cultivated (ha)	Date of sowing	Stage of the crop	Insect pests recorded		Natural enemies recorded
	Village	District					Name	Level of infestation	
24.12.24	Takowbari	Nagaon	TS-38	1	Mid Nov	Vegetative	Aphid, sawfly		
25.12.24	Senchowa	Nagaon	TS-38	100	Mid Nov	Vegetative	Aphid, sawfly	Bellow ETL	Hover fly, Predatory LBB
25.12.24	Haldhi-ati	Nagaon	TS-38	100	Mid Nov	Vegetative	Aphid, sawfly	Bellow ETL	Hover fly, Predatory LBB
22.01.25	Raidongia	Nagaon	TS-38	20	Mid Nov	Flowering	Aphid, sawfly	Bellow ETL	Hover fly, Predatory LBB
27.12.24	Simaluguri	Nagaon	TS-38	2	Mid Nov	Flowering	Aphid, sawfly	Bellow ETL	Hover fly, Predatory LBB
28.12.24	Bajiagaon	Nagaon	TS-38	2	Mid Nov	Flowering	Aphid, sawfly	Bellow ETL	Hover fly, Predatory LBB

LBB= Lady bird beetle

Table 5.6.6: Survey of insect-pests and natural enemies at farmers' fields at Ludhiana

Month	Fortnight	(Number of aphids/10cm top twig)	Cabbage caterpillar (larvae/plant)	*Coccinella*/plant (Grubs+Adults)
Dec	**II**	**0.0**	**0.0**	**0.0**
Jan	**I**	**0.0**	**0.0**	**0.0**
	II	**0.0**	**0.0**	**0.0**
Feb	**I**	**5.4**	**0.0**	**0.0**
	II	**33.2**	**1.6**	**0.2**
Mar	**I**	**68.4**	**2.8**	**0.8**
	II	**143.2**	**1.6**	**1.6**

Plant Physiology

6. Plant Physiology

6.1: Screening of genotypes from different agro-climatic zones for high-temperature tolerance at seedling stage.

Thirty-five genotypes of Indian mustard (*Brassica juncea*) were assessed for their tolerance to high temperatures during the seedling stage under laboratory (Hisar and Ludhiana) and field conditions at Hisar, Mandore and Ludhiana. Lower seedling mortality indicated greater tolerance to heat stress, while higher mortality indicated susceptibility.

In the laboratory experiment, genotypes were sown in plastic trays filled with 5 kg of soil at optimal moisture levels and kept in a seed germinator at 25°C ± 1°C. After 4-5 days, when the seedlings reached ~2.5 cm in height, they were exposed to high temperatures (45°C ± 1°C) and 30-40% relative humidity for four hours daily over four days. After 10 days, seedling mortality and dry weight of 10 seedlings were recorded at respective locations.

Seedling mortality ≤ 20% was recorded in NPJ 267 and HUJM(E) 23-7 genotypes at Hisar; DRMRDR 2116, DRMRDR 2133, DRMR 19-36 and KMR(E) 24-2 at Mandore center. No genotype met this threshold at Ludhiana under laboratory conditions. At Ludhiana, all genotypes had dry weight ≥ 35 mg per 10 seedlings. At Hisar, all genotypes except DRMRSJ 272 and NPJ 274 met this benchmark. At Mandore, 14 genotypes met the dry weight criteria. Genotypes with seedling mortality ≤ 20% and dry weight ≥ 35 mg per 10 seedlings were rated as tolerant under controlled conditions. However, none of the genotypes qualified as tolerant to high temperatures at the seedling stage under laboratory conditions (Table 6.1.1).

The same sets of genotypes were tested under field conditions at Mandore and Ludhiana. A total number of 100 seeds per genotype were sown in 2 meters long rows. After 30 days, seedling mortality and dry weight of 10 plants were recorded (Table 6.1.2).

Thirty-two genotypes exhibited seedling mortality ≤ 20% except NPJ 267, NPJ 275 and DRMR 20-33 genotypes. PRO 5111 (26.1 g), DRMRCI 125 (25.8 g) and NJI 24-401 (25.4 g) had the highest dry matter of 10 plants. However, none of the genotypes met the selection criteria (≤ 2 0% seedling mortality and ≥ 35 g dry weight per 10 plants), indicating no genotype was tolerant to high temperatures under field conditions.

6.2 Screening of genotypes for drought tolerance

Thirty-one genotypes of *Brassica juncea* were evaluated for drought tolerance under field conditions at Bharatpur, Dholi, Hisar, Mandore and Ludhiana. Genotypes were sown in five rows, each 2.5 meters long with 30 cm row spacing, following pre-sowing irrigation. The experiment was laid out in a randomized block design (RBD) in three replications. Two experimental blocks were maintained, one irrigated (IR) with two post-sowing irrigations (at 35 and 65 days after sowing) and other *rainfed* (RF) with no post-sowing irrigation. Analysis of variance revealed significant genotypic differences for relative water content, canopy temperature, photosynthetic pigments, SPAD values, yield and yield attributes (Tables 6.2.1 to 6.2.9).

Minimum RWC reduction (≤ 20%) was observed in DRMR 2019-19, Kranti, RAURD 14-18, NPJ 281, NPJ 280 and RKM 588 genotypes at Bharatpur, Dholi, Hisar and Ludhiana centers. Lesser reduction in total chlorophyll was recorded in Kranti, DRMR 2019-16 and NPJ 281 at Bharatpur, Dholi and Ludhiana; in DRMRCI 148 and CAURM 4-1S at Dholi, Hisar and Ludhiana; whereas, RKM 588 at Bharatpur, Hisar and Ludhiana centers. Minimum reduction (≤ 10%) in 1000 seed weight was observed in RH 2299-64, RMM 19-06, DRMR 21-17, DRMR 2020-3, DRMRIJ-138 and DRMR 2019-7 at Bharatpur, Hisar, Mandore and Ludhiana centers. Among the genotypes, those exhibiting ≤ 20% seed yield reduction, ≤ 0.5 DSI and YSI ≥ 0.9 were considered highly tolerant to drought. These included RH 2299-64, DRMR 2019-19, DRMR 2020-3, DRMRCI 148, DRMRCI 163, DRMRCI 161 and NPJ 281 at Bharatpur center; RH 2265 at Dholi; DRMR 21-17, DRMR 2020-3, DRMRCI 148, DRMRCI 207 and RGN 229 at Hisar; RGN 599, DRMRHT 2090, BAUM 13-6, DRMRDR 2141, DRMR 2019-7, RGN 229 and

DRMR 19-21 at Mandore; DRMR 21-17, DRMR 2020-3, DRMRCI 161, DRMR 2019-7, RH 2265 and RKM 588 at Ludhiana center. These genotypes also maintained higher RWC, chlorophyll content, and SPAD values with relatively low reductions in total siliquae per plant, seeds per siliqua, and 1000 seed weight.

6.3 Screening of genotypes for high-temperature tolerance at terminal stage

In a field study, thirty-one mustard genotypes were sown at two different dates i.e. normal sowing (NS) in the third week of October and late sowing (LS) in the last week of November. The genotypes were planted in 5 meter paired rows using a randomized block design (RBD). The late-sown crop faced high temperatures (≥ 30°C) during the pod-filling stage, leading to reductions in various traits compared to normal sown condition.

Environmental variations due to planting dates significantly impacted several traits, including membrane stability, number of seeds per siliqua, 1000-seed weight and seed yield. The interaction effects between environment and genotypes (ExG) were found significant for membrane stability at Dholi and Ludhiana centers, for canopy temperature at Hisar and Ludhiana centers, for number of seeds per silique at Dholi, Mandore and Ludhiana centers, for 1000-seed weight at Mandore and Ludhiana centers, and for seed yield at Dholi, Mandore and Ludhiana (as shown in Table 6.3.1 to 6.3.5).

The minimum reduction (≤ 10%) in membrane stability was recorded in genotypes DRMRDR 2141, RGN 592 and DRMR 2019-19 at Bharatpur, Dholi, Hisar and Ludhiana centers; in genotypes RH 2370, BPM 11, NPJ 277, KMR(L) 24-5, DRMR 2018-1 and NRCHB 101 at Bharatpur, Hisar and Ludhiana. The minimum reduction (≤ 10%) was observed in number of seeds per siliqua in genotype DRMRIJ 22-2 at all the five locations; whereas, in genotypes RKM 599, BPM 11, PRL 2022-1, DRMR 2019-19, DRMR 2018-1 and NRCHB 101 at Bharatpur, Hisar, Mandore and Ludhiana centers. The test weight (1000 seed weight) shows minimum reduction (≤ 10%) in NPJ 268, DRMRDR 2141, PRL 2022-1, NPJ 277, KMR(L) 24-5, RGN 592, NPJ 276, DRMR 2019-19 and DRMR 150-35 at Bharatpur, Hisar and Ludhiana centers; while, in DRMRCI 212 and KMR(L) 24-6 at Bharatpur, Hisar and Mandore centers. Among the genotypes, those exhibiting tolerance to terminal heat stress with ≤ 20% seed yield reduction, ≤ 0.5 HSI and YSI ≥ 0.9 included RKM 599, NPJ 267, PRL 2022-5, DRMRDR 2195, ORM 2019-30 and NPJ 276 at Bharatpur center; DRMR 2018-1 at Hisar and none of the genotype found tolerance at Dholi, Mandore and Ludhiana centers. The moderately tolerance genotypes to terminal heat stress with ≤ 20% seed yield reduction, ≤ 1 HSI and YSI ≥ 0.8 included NPJ 268, DRMRDR 2141, DRMR 2017-27, KMR(L) 24-6, DRMR 2022-16, RMWR 19-01, DRMR 2019-19, DRMR 2018-1, DRMR 150-35 at Bharatpur center; RKM 599, DRMRDR 2141, DRMR 2017-27, PRL 2022-1, KMR(L) 24-6, RMWR 19-01, TM 132-1 at Dholi center; HUJM 23-4, BPM 11, DRMR 2017-27, PRL 2022-1, NPJ 277, SVJH-78, NPJ 267, NPJ 276 at Hisar; HUJM 23-4, BPM 11, NPJ 267 at Ludhiana center and none of the genotype found even moderately tolerance at Mandore center. These genotypes exhibiting tolerance to terminal heat stress was also supported by other physiological and yield attributes.

6.4 Effect of biostimulants to mitigate drought stress

A *rainfed* study at five locations (Bharatpur, Dholi, Hisar, Mandore and Ludhiana) tested foliar sprays of biostimulants at flower initiation and 50% flowering in mustard crop. The goal of this study was to mitigate moisture stress under *rainfed* conditions. Specifically, foliar sprays of three biostimulants were tested i.e. sodium thiosulphate at 3 and 5 mM, seaweed at 3 and 5ml and orthosilicic acid at 3 and 5ml concentrations. The drought tolerant varieties were used to assess biostimulant efficacy.

The biostimulants proved effective in enhancing seed yield and biological yield by positively impacting several attributes of mustard crop, including relative water content, membrane stability, photosynthetic pigments, silique on main shoot, total siliquae per plant, no. of seeds per siliqua and 1000-seed weight. The higher value of CSI was observed with water spray treatment at four locations (Bharatpur, Dholi, Hisar and Ludhiana). The maximum seed yield improvements observed due to foliar application of sodium thiosulphate (5 mM) at Bharatpur and Dholi locations; whereas, orthosilicic acid (5ml) at Hisar and Mandore centers. The best B:C ratio was recorded for sodium thiosulphate (5 mM) at Bharatpur and Hisar centers; and orthosilicic acid (5ml) at Mandore center.

6.5: Microbes for mitigating heat stress at terminal stage in mustard

Field trials were conducted using three mustard varieties to evaluate the efficiency of stress-adaptive microbial formulation developed by CSIR-NBRI, Lucknow at Hisar and Ludhiana centers. The formulation was applied as seed treatment at the time of sowing. Trials conducted in both normal and late-sown conditions at respective centers, and variations were observed among the three varieties for the studied traits.

Results showed improved membrane stability, relative water content, photosynthetic pigments, 1000 seed weight, biological yield and seed yield in treated plots under both sowing conditions at Hisar and Ludhiana location. However, in treated plots there is no improvement was observed in canopy temperature reduction under late-sown condition and total siliquae per plant under both normal and late-sown conditions at Hisar centers. All the observed traits showed overall reduction in parameters under late sown condition compare to normal/timely sown condition.

At Hisar, RH 1975 recorded the highest total siliquae per plant, 1000 seed weight, biological yield and seed yield under both treated and control conditions. Overall, microbial treatment enhanced biological yield and seed yield across varieties and sowing conditions at Hisar and Ludhiana, except BPM 1825 at Ludhiana center, which showed reduced biological yield under normal sowing.

Table 6.1.1: Screening of genotypes from different agro-climatic zones for high temperature tolerance at seedling stage.

Laboratory Conditions									
Code	Entries	Seedling Mortality (%)				DW/ 10 seedling (mg)			
		HSR	MDR	LDH	Avg	HSR	MDR	LDH	Avg
Phy-24-01	DRMR 2019-7	50.5	44.9	35.2	43.5	38.6	65.5	45.8	50.0
Phy-24-02	PM 25	40.5	39.4	42.8	40.9	43.1	50.1	38.9	44.0
Phy-24-03	DRMRSJ 272	47.4	42.8	36.4	42.2	32.3	32.8	37.2	34.1
Phy-24-04	NPJ 267	13.6	46.1	28.4	29.4	53.3	61.9	50.2	55.1
Phy-24-05	NPJ 275	30.1	43.6	27.9	33.9	37.1	30.2	37.9	35.1
Phy-24-06	HUJM(E)-23-7	17.8	57.4	30.7	35.3	60.8	30.1	55.7	48.9
Phy-24-07	DRMRCI-188	35.5	29.6	37.2	34.1	46.1	35.2	52.3	44.5
Phy-24-08	JD 6	34.7	23.9	32.7	30.4	55.8	40.7	45.9	47.5
Phy-24-09	NPJ 274	40.4	47.0	47.8	45.1	34.8	52.1	36.8	41.2
Phy-24-10	DRMRDR-2198	44.9	31.5	39.4	38.6	40.4	60.8	53.4	51.5
Phy-24-11	DRMR-20-33	52.6	42.8	46.7	47.4	40.3	49.2	35.8	41.8
Phy-24-12	4205B296-01	20.6	23.7	32.5	25.6	63.0	30.2	48.2	47.1
Phy-24-13	DRMRHT-18-65	50.0	45.1	39.5	44.9	37.8	53.7	38.4	43.3
Phy-24-14	DRMRCI-187	20.6	24.2	28.5	24.4	58.2	55.5	43.2	52.3
Phy-24-15	PRE-2022-6	20.5	40.4	26.5	29.1	58.2	30.4	55.6	48.1
Phy-24-16	DRMR-19-35	23.7	33.9	24.8	27.5	57.4	29.5	47.5	44.8
Phy-24-17	DRMRHT-22125	53.0	21.5	42.3	38.9	44.2	50.1	46.8	47.0
Phy-24-18	KMR(E) 23-1	50.2	21.4	46.8	39.5	52.9	32.4	49.2	44.8
Phy-24-19	PRE-2022-12	33.6	49.7	35.8	39.7	54.0	35.0	46.8	45.3
Phy-24-20	DRMRCI 206	28.0	35.1	29.5	30.9	44.9	34.2	52.9	44.0
Phy-24-21	GDM-4	33.1	39.1	38.4	36.9	44.2	59.7	47.2	50.4
Phy-24-22	RH 2399-2	38.1	41.6	42.5	40.7	59.4	31.0	52.8	47.7
Phy-24-23	DRMRCI-125	33.6	52.7	33.8	40.0	43.8	29.5	41.8	38.4
Phy-24-24	NRCHB-101	56.3	21.5	50.2	42.7	51.6	31.9	52.8	45.4
Phy-24-25	PRO 5111	51.5	39.0	45.6	45.4	52.6	31.5	42.3	42.1
Phy-24-26	NJI 24-401	51.5	20.5	47.3	39.8	37.3	31.0	52.6	40.3
Phy-24-27	DRMRDR-2116	53.7	16.2	38.9	36.3	40.9	32.6	45.2	39.6
Phy-24-28	RH 1999-18	50.1	23.8	34.7	36.2	63.6	30.6	42.1	45.4
Phy-24-29	DRMRDR-2133	51.1	13.8	42.5	35.8	38.4	29.2	49.2	38.9
Phy-24-30	DRMRHT-13-2	21.7	27.3	44.9	31.3	58.8	35.4	48.3	47.5
Phy-24-31	DRMR 19-36	21.6	12.8	48.2	27.5	58.8	34.0	52.6	48.5
Phy-24-32	KMR(E) 24-1	21.7	36.9	25.8	28.1	58.8	31.0	35.8	41.9
Phy-24-33	KMR(E) 24-2	21.6	17.0	32.5	23.7	58.8	34.6	48.2	47.2
Phy-24-34	Kesari 5113	24.8	33.8	37.2	31.9	58.0	1.0	46.5	35.2
Phy-24-35	DRMRCI-165	54.1	23.3	28.6	35.3	44.8	2.7	48.3	31.9
	Mean	37.9	33.2	37.2		48.6	37.3	46.4	
	CD(p=0.05)	-	2.6	1.1		-	2.7	2.3	

Table 6.1.2: Screening of genotypes from different agro-climatic zones for high temperature tolerance at seedling stage.

Field Conditions												
Code	Entries	Seedling Mortality (%)			DW/10seedling (g)			CT (°C)	MS (%)	STI	SSTI
		MDR	LDH	Avg	MDR	LDH	Avg	LDH			
Phy-24-01	DRMR 2019-7	10.7	17.3	14.0	23.3	24.6	23.9	22.2	63.9	86.9	61.4
Phy-24-02	PM 25	16.3	11.7	14.0	14.7	17.6	16.1	18.6	68.7	89.8	63.8
Phy-24-03	DRMRSJ 272	18.0	12.9	15.4	9.0	18.6	13.8	17.5	66.6	88.6	67.2
Phy-24-04	NPJ 267	19.3	29.6	24.5	12.1	12.5	12.3	21.2	68.8	73.0	53.7
Phy-24-05	NPJ 275	17.3	35.4	26.4	12.0	16.4	14.2	18.7	69.9	75.5	56.3
Phy-24-06	HUJM(E)-23-7	7.0	7.1	7.1	4.2	16.3	10.2	20.5	61.7	93.4	67.7
Phy-24-07	DRMRCI-188	6.3	12.5	9.4	9.0	16.0	12.5	19.6	67.8	89.0	65.7
Phy-24-08	JD 6	12.7	9.5	11.1	13.0	8.9	11.0	19.8	63.8	91.3	67.0
Phy-24-09	NPJ 274	6.3	18.1	12.2	9.0	13.8	11.4	17.0	71.5	85.2	61.2
Phy-24-10	DRMRDR-2198	18.7	14.9	16.8	5.7	20.3	13.0	18.0	72.4	87.7	61.2
Phy-24-11	DRMR-20-33	21.7	20.3	21.0	13.0	21.3	17.1	18.8	62.6	82.8	59.7
Phy-24-12	4205B296-01	17.0	14.6	15.8	16.0	23.1	19.5	19.6	73.7	87.3	61.2
Phy-24-13	DRMRHT-18-65	7.3	18.2	12.8	23.7	17.8	20.7	18.9	63.5	85.4	61.3
Phy-24-14	DRMRCI-187	18.3	12.9	15.6	15.9	18.9	17.4	17.9	65.8	89.5	65.5
Phy-24-15	PRE-2022-6	8.3	19.7	14.0	22.0	21.0	21.5	20.8	63.8	85.8	64.7
Phy-24-16	DRMR-19-35	3.0	27.6	15.3	25.7	18.3	22.0	18.8	75.8	79.0	58.1
Phy-24-17	DRMRHT-22125	8.0	6.6	7.3	18.9	24.4	21.6	19.5	70.1	94.0	66.3
Phy-24-18	KMR(E) 23-1	5.3	16.2	10.8	8.1	11.0	9.5	19.4	71.6	86.3	56.1
Phy-24-19	PRE-2022-12	6.7	11.9	9.3	11.6	16.1	13.9	19.9	62.7	89.5	60.3
Phy-24-20	DRMRCI 206	6.0	24.1	15.0	12.8	15.3	14.1	19.9	69.0	80.9	57.5
Phy-24-21	GDM-4	3.0	10.4	6.7	13.8	18.6	16.2	19.4	65.4	91.1	68.3
Phy-24-22	RH 2399-2	5.3	14.7	10.0	19.7	23.0	21.3	20.5	67.5	89.1	62.9
Phy-24-23	DRMRCI-125	3.3	10.4	6.9	29.3	22.4	25.8	20.6	65.5	90.7	65.8
Phy-24-24	NRCHB-101	4.7	27.3	16.0	21.2	21.9	21.6	21.2	69.7	79.7	57.1
Phy-24-25	PRO 5111	3.3	6.6	5.0	28.4	23.7	26.1	18.7	70.7	93.9	70.2
Phy-24-26	NJI 24-401	4.3	6.9	5.6	31.1	19.7	25.4	18.9	68.9	93.6	65.5
Phy-24-27	DRMRDR-2116	6.7	18.2	12.4	13.2	18.9	16.1	18.9	66.1	80.6	56.4
Phy-24-28	RH 1999-18	2.3	14.8	8.5	7.3	23.6	15.4	18.4	74.5	87.5	64.7
Phy-24-29	DRMRDR-2133	3.3	15.4	9.4	18.7	20.1	19.4	18.3	68.7	87.3	62.0
Phy-24-30	DRMRHT-13-2	4.0	17.3	10.6	14.8	16.3	15.5	18.8	68.6	87.0	62.8
Phy-24-31	DRMR 19-36	6.3	4.6	5.5	17.3	17.2	17.3	19.4	68.8	95.6	69.6
Phy-24-32	KMR(E) 24-1	5.3	8.1	6.7	11.3	21.8	16.5	18.9	68.7	91.1	63.1
Phy-24-33	KMR(E) 24-2	17.3	15.8	16.6	19.2	10.4	14.8	16.7	67.9	87.1	60.5
Phy-24-34	Kesari 5113	6.7	15.5	11.1	21.4	16.1	18.7	19.1	63.8	86.8	59.2
Phy-24-35	DRMRCI-165	17.0	10.2	13.6	30.8	15.4	23.1	19.8	59.3	91.0	74.4
	Mean	9.4	15.4		16.5	18.3		19.2	67.6	87.2	62.8
	CD(p=0.05)	2.8	3.2		3.2	0.9		2.1	3.2	1.1	1.0

Table 6.2.1: Effect of moisture stress on relative water content (RWC) and canopy temperature (CT)

Code	Entries	RWC(%)												CT (°C)					
		BPR			DOL			HSR			LDH			BPR		HSR		LDH	
		IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	IR	RF	IR	RF
Phy-24-36	RGN 599	91.8	78.9	14.1	78.6	60.1	23.5	71.2	62.4	12.4	68.3	66.7	2.4	16.3	18.1	31.2	29.1	21.8	23.1
Phy-24-37	RH 2299-64	90.5	78.4	13.3	82.8	62.5	24.6	77.3	69.2	10.5	71.0	62.4	12.2	16.8	18.3	31.3	30.7	21.6	22.4
Phy-24-38	RMM 19-06	88.9	79.7	10.4	80.7	67.5	16.4	79.0	68.6	13.1	68.5	52.7	23.1	17.3	17.6	32.0	29.5	27.2	27.2
Phy-24-39	DRMR 2019-19	89.7	78.6	12.4	77.7	63.2	18.8	81.9	73.2	10.6	73.5	69.1	6.1	17.3	18.5	30.8	29.5	20.7	23.9
Phy-24-40	DRMR 21-17	82.7	74.3	10.2	84.8	66.9	21.2	74.1	67.5	8.9	75.7	58.6	22.6	17.4	19.3	30.3	29.9	24.7	25.1
Phy-24-41	DRMR 2020-3	90.4	76.8	15.0	84.2	63.2	25.0	79.6	70.9	10.9	71.3	68.2	4.4	16.7	16.8	31.2	29.7	26.2	26.2
Phy-24-42	DRMRCI-148	93.6	79.9	14.7	83.9	64.2	23.5	78.0	70.1	10.1	70.4	65.1	7.5	16.2	17.5	31.2	30.3	17.9	22.4
Phy-24-43	DRMRCI-163	91.7	80.9	11.8	82.3	63.4	23.0	81.4	72.2	11.2	61.3	54.7	10.6	14.8	17.4	30.8	29.2	22.4	22.7
Phy-24-44	DRMRCI-196	90.7	76.7	15.5	79.3	61.4	22.7	78.3	69.4	11.4	75.7	57.5	24.1	16.0	17.4	31.0	29.1	27.3	26.2
Phy-24-45	RH 1424	86.9	80.8	7.0	79.9	64.3	19.6	70.5	61.7	12.5	66.5	48.1	27.6	16.3	16.4	31.8	29.6	18.0	20.9
Phy-24-46	DRMRHT-2090	90.2	79.2	12.2	75.2	56.5	24.9	72.3	58.4	19.2	87.2	57.0	34.7	16.3	17.4	30.7	28.5	19.4	22.2
Phy-24-47	BAUM 13-6	88.1	64.0	27.4	79.1	59.8	24.4	82.7	73.7	10.9	67.6	61.0	9.8	16.1	17.5	31.4	30.0	23.5	23.9
Phy-24-48	Kranti (NC)	88.1	82.3	6.6	81.9	66.4	18.9	72.9	63.7	12.6	69.0	62.4	9.6	16.3	16.7	30.6	28.3	24.4	23.2
Phy-24-49	DRMR 2019-16	87.3	79.9	8.5	80.9	63.0	22.1	80.2	68.2	15.0	57.9	53.7	7.4	15.5	16.9	31.5	29.7	18.0	21.3
Phy-24-50	RAURD 14-18	90.9	76.0	16.4	81.1	66.7	17.7	79.3	69.9	11.8	72.4	64.3	11.2	16.2	16.8	30.9	29.0	23.8	26.7
Phy-24-51	DRMRCI-161	90.2	79.6	11.7	79.5	61.0	23.3	72.4	63.6	12.1	74.4	70.2	5.6	15.7	17.4	30.3	28.5	22.9	20.6
Phy-24-52	DRMRIJ-138	87.5	84.1	3.9	85.7	64.8	24.3	71.0	61.4	13.6	68.9	64.4	6.5	16.5	17.3	30.2	27.7	17.2	21.9
Phy-24-53	NPJ 281	88.7	78.5	11.5	78.5	64.8	17.3	60.9	52.0	14.6	75.3	62.2	17.4	15.7	17.4	32.9	29.0	22.8	12.9
Phy-24-54	DRMRDR 2141	89.3	76.8	14.0	83.1	64.5	22.4	70.5	61.7	12.5	75.4	59.0	21.8	16.6	17.4	30.7	28.6	21.7	23.2
Phy-24-55	HUJM 23-12	89.1	80.5	9.7	85.5	65.9	22.9	80.2	68.2	15.0	76.7	62.8	18.1	15.8	16.9	31.2	28.9	17.8	21.3
Phy-24-56	RH 725 (ZC)	87.7	81.8	6.7	79.8	60.6	24.1	79.6	70.9	10.9	75.2	64.9	13.6	16.0	17.3	30.8	29.3	17.3	19.7
Phy-24-57	DRMR 2019-7	89.7	79.4	11.5	86.3	66.6	22.8	78.0	69.3	11.1	72.2	68.1	5.7	16.1	16.6	30.8	29.3	17.2	18.9
Phy-24-58	RH 2265	89.1	78.4	12.0	82.3	62.4	24.2	74.1	66.1	10.8	88.4	76.4	13.7	16.1	16.5	30.4	29.1	20.1	22.5
Phy-24-59	DRMRCI 207	84.4	76.3	9.7	83.4	64.1	23.2	79.7	72.3	9.3	86.0	69.8	18.8	15.9	16.2	29.7	29.2	19.8	22.1
Phy-24-60	NPJ 280	90.8	78.3	13.7	84.0	68.3	18.8	72.4	63.6	12.1	79.2	69.6	12.1	16.3	16.7	31.1	29.2	22.1	23.6
Phy-24-61	RGN 229	84.6	82.0	3.1	77.7	59.6	23.3	79.7	73.0	8.4	70.6	69.7	1.3	16.0	16.4	29.7	29.3	20.5	23.5
Phy-24-62	DRMR 19-21	86.0	78.9	8.2	83.2	62.6	24.7	80.8	69.3	14.2	73.1	65.1	10.9	15.9	16.9	32.0	29.3	20.1	22.3
Phy-24-63	DRMRDR 2135	90.7	80.7	11.0	80.2	62.2	22.4	72.3	58.4	19.2	71.7	52.0	27.5	15.9	17.1	33.2	30.0	15.2	19.6
Phy-24-64	DRMRSJ 276	85.4	79.5	6.9	84.0	65.2	22.4	82.0	72.7	11.3	83.6	58.3	30.3	17.0	17.2	30.6	29.9	20.7	20.0
Phy-24-65	CAURM 4-1S	89.5	79.4	11.3	81.2	63.3	22.1	83.2	74.1	11.0	77.0	76.8	0.2	15.9	16.8	31.7	30.2	15.0	20.5
Phy-24-66	RKM 588	93.4	83.5	10.6	76.5	63.9	16.4	78.3	69.4	11.4	69.7	65.4	6.1	16.1	16.9	31.9	30.2	18.6	19.8
	Mean	88.9	78.8		81.4	63.5					73.4	63.1		16.2	17.2			20.8	22.2
CD(p=0.05)	E	1.7			1.0			2.40			2.0			0.5		NS		0.96	
	G	NS			3.9			0.61			8.5			NS		0.66		4.00	
	E×G	NS			NS			NS			12.0			NS		NS		NS	

IR=Irrigated RF= *Rainfed*

Table 6.2.2: Effect of moisture stress on chlorophyll a and chlorophyll b and Carotenoid (mg/gFW)

Code	Entries	Chl a (mg/gFW)						Chl b (mg/gFW)						Carotenoid (mg/gFW)					
		BPR			LDH			BPR			LDH			BPR			LDH		
		IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)
Phy-24-36	RGN 599	0.63	0.51	18.3	1.40	0.87	37.9	0.19	0.17	12.7	0.46	0.30	34.8	0.033	0.019	40.7	0.475	0.377	20.6
Phy-24-37	RH 2299-64	0.62	0.41	34.3	1.35	1.28	5.0	0.11	0.10	14.7	0.38	0.31	18.4	0.027	0.017	37.4	0.462	0.442	4.4
Phy-24-38	RMM 19-06	0.75	0.51	31.4	1.38	0.96	30.5	0.14	0.13	5.4	0.38	0.20	46.3	0.034	0.027	22.6	0.457	0.338	26.0
Phy-24-39	DRMR 2019-19	0.67	0.62	8.0	1.34	1.27	5.2	0.14	0.11	20.6	0.33	0.31	6.6	0.034	0.031	9.9	0.432	0.397	8.1
Phy-24-40	DRMR 21-17	0.59	0.38	36.0	1.41	1.28	8.9	0.12	0.11	9.4	0.40	0.22	44.8	0.025	0.014	45.4	0.483	0.443	8.3
Phy-24-41	DRMR 2020-3	0.66	0.54	18.4	1.40	1.27	9.6	0.14	0.11	19.3	0.45	0.27	40.4	0.035	0.025	28.0	0.396	0.336	15.2
Phy-24-42	DRMRCI-148	0.67	0.40	40.1	1.30	1.24	4.4	0.14	0.12	18.9	0.31	0.22	27.8	0.031	0.017	44.9	0.374	0.344	8.2
Phy-24-43	DRMRCI-163	0.61	0.39	35.9	1.34	1.27	5.5	0.12	0.11	3.8	0.26	0.18	32.0	0.028	0.015	48.4	0.431	0.330	23.4
Phy-24-44	DRMRCI-196	0.53	0.46	14.7	1.35	1.27	6.3	0.10	0.09	10.8	0.23	0.22	5.1	0.022	0.018	20.5	0.421	0.354	16.0
Phy-24-45	RH 1424	0.66	0.50	24.8	1.36	1.27	6.4	0.18	0.12	30.0	0.31	0.28	9.8	0.036	0.025	31.1	0.434	0.430	0.9
Phy-24-46	DRMRHT-2090	0.43	0.39	9.0	1.17	1.07	8.5	0.12	0.10	17.7	0.21	0.11	48.5	0.017	0.016	4.7	0.330	0.317	4.0
Phy-24-47	BAUM 13-6	0.54	0.50	6.7	1.05	1.00	5.4	0.12	0.11	9.9	0.34	0.22	33.8	0.024	0.023	5.0	0.331	0.318	3.8
Phy-24-48	Kranti (NC)	0.46	0.43	7.9	1.39	1.38	0.7	0.09	0.09	9.0	0.45	0.41	7.9	0.017	0.014	14.6	0.443	0.438	1.1
Phy-24-49	DRMR 2019-16	0.56	0.55	1.7	1.3	1.3	0.6	0.12	0.10	15.2	0.3	0.3	11.1	0.027	0.024	13.1	0.4	0.4	0.9
Phy-24-50	RAURD 14-18	0.56	0.53	5.3	1.33	1.16	12.7	0.13	0.12	11.9	0.30	0.25	17.0	0.024	0.024	2.2	0.424	0.404	4.7
Phy-24-51	DRMRCI-161	0.50	0.48	3.1	1.48	1.26	15.4	0.12	0.11	10.5	0.30	0.28	5.0	0.020	0.018	11.0	0.477	0.404	15.3
Phy-24-52	DRMRIJ-138	0.70	0.58	17.0	1.13	0.98	13.4	0.16	0.15	8.7	0.37	0.24	35.9	0.041	0.035	16.1	0.365	0.318	12.8
Phy-24-53	NPJ 281	0.50	0.47	5.7	1.32	1.19	10.0	0.10	0.09	10.0	0.30	0.16	44.6	0.016	0.013	14.2	0.411	0.393	4.4
Phy-24-54	DRMRDR 2141	0.53	0.48	10.7	1.12	1.05	5.8	0.07	0.07	8.0	0.24	0.21	13.8	0.021	0.020	4.5	0.346	0.338	2.4
Phy-24-55	HUJM 23-12	0.60	0.46	22.6	1.41	1.27	9.9	0.11	0.11	3.6	0.42	0.24	41.9	0.030	0.019	36.9	0.490	0.411	16.1
Phy-24-56	RH 725 (ZC)	0.67	0.45	33.0	1.46	1.27	13.2	0.13	0.12	4.2	0.31	0.29	6.2	0.037	0.024	33.1	0.464	0.422	9.2
Phy-24-57	DRMR 2019-7	0.60	0.49	18.9	1.31	1.13	13.7	0.11	0.10	6.6	0.40	0.22	45.5	0.030	0.021	28.8	0.422	0.361	14.3
Phy-24-58	RH 2265	0.62	0.51	17.4	1.24	1.20	3.3	0.16	0.14	10.9	0.34	0.25	24.5	0.034	0.029	15.9	0.408	0.386	5.2
Phy-24-59	DRMRCI 207	0.47	0.44	6.3	1.21	1.07	11.3	0.11	0.09	16.2	0.29	0.27	8.9	0.021	0.018	12.7	0.372	0.334	10.3
Phy-24-60	NPJ 280	0.59	0.48	18.3	1.47	1.12	24.0	0.13	0.12	7.0	0.43	0.32	25.0	0.030	0.017	45.6	0.498	0.359	28.0
Phy-24-61	RGN 229	0.57	0.51	9.4	1.24	1.03	16.9	0.14	0.13	8.8	0.30	0.30	0.2	0.029	0.023	21.5	0.393	0.328	16.5
Phy-24-62	DRMR 19-21	0.51	0.45	12.4	1.13	1.07	4.8	0.09	0.09	5.6	0.31	0.24	24.8	0.022	0.013	43.0	0.370	0.357	3.3
Phy-24-63	DRMRDR 2135	0.54	0.44	18.9	1.27	1.06	17.0	0.12	0.10	12.3	0.37	0.27	26.0	0.025	0.014	44.0	0.409	0.347	15.2
Phy-24-64	DRMRSJ 276	0.56	0.51	8.7	1.28	1.18	7.9	0.14	0.12	9.1	0.31	0.19	38.7	0.030	0.023	24.1	0.427	0.364	14.8
Phy-24-65	CAURM 4-1S	0.68	0.46	32.7	1.19	1.15	3.2	0.20	0.11	43.9	0.34	0.22	37.0	0.044	0.016	64.8	0.376	0.369	1.9
Phy-24-66	RKM 588	0.51	0.48	5.9	1.29	1.15	10.9	0.11	0.10	2.6	0.33	0.33	0.5	0.024	0.023	2.0	0.408	0.363	11.0
	Mean	0.58	0.48		1.31	1.16		0.13	0.11		0.34	0.26		0.028	0.020		0.419	0.369	
CD(p=0.05)	E	0.03			0.02			0.01			0.02			0.004			0.012		
	G	NS			0.36			0.04			0.10			NS			0.050		
	E×G	NS			0.51			NS			0.14			NS			0.707		

IR=Irrigated RF= *Rainfed*

Table 6.2.3: Effect of moisture stress on total chlorophyll and SPAD Value

Code	Entries	Total Chl (mg/gFW)												SPAD Value					
		BPR			DOL			HSR			LDH			HSR			LDH		
		IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)
Phy-24-36	RGN 599	0.82	0.68	17.0	2.05	1.88	8.2	2.49	1.75	29.5	1.86	1.07	42.5	32.1	31.2	2.8	43.3	40.3	6.9
Phy-24-37	RH 2299-64	0.73	0.50	31.3	2.20	2.08	5.6	3.23	2.79	13.4	1.73	1.62	6.4	36.3	33.0	9.1	46.5	45.5	2.0
Phy-24-38	RMM 19-06	0.88	0.64	27.4	2.07	1.90	8.3	2.06	1.48	28.2	1.76	0.99	43.8	34.9	33.7	3.5	50.1	47.6	5.0
Phy-24-39	DRMR 2019-19	0.81	0.73	10.1	2.20	2.05	6.9	2.75	2.32	15.6	1.71	1.57	8.0	33.5	33.3	0.8	57.8	47.0	18.7
Phy-24-40	DRMR 21-17	0.71	0.49	31.6	2.07	1.89	8.5	2.22	2.01	9.4	1.90	1.50	20.8	35.1	33.7	3.9	47.9	47.5	0.7
Phy-24-41	DRMR 2020-3	0.80	0.65	18.6	2.11	1.94	7.8	1.80	1.53	15.1	1.83	1.54	16.1	29.9	29.5	1.3	47.9	44.6	6.9
Phy-24-42	DRMRCI-148	0.81	0.52	36.3	2.18	2.00	8.2	2.39	2.16	9.8	1.56	1.46	6.5	35.7	32.4	9.2	41.9	40.4	3.6
Phy-24-43	DRMRCI-163	0.73	0.50	30.7	2.16	1.98	8.0	2.44	1.90	22.0	1.60	1.52	4.8	34.6	30.9	10.7	50.6	47.6	5.9
Phy-24-44	DRMRCI-196	0.63	0.55	14.1	2.24	2.12	5.3	2.65	1.81	31.7	1.67	1.59	4.8	37.8	34.2	9.3	49.3	47.2	4.3
Phy-24-45	RH 1424	0.84	0.62	25.9	2.24	2.05	8.3	2.52	2.20	12.9	1.69	1.64	3.0	38.4	35.5	7.5	49.0	45.6	6.8
Phy-24-46	DRMRHT-2090	0.55	0.49	10.8	2.06	1.89	8.5	2.65	1.81	31.9	1.48	1.17	20.7	32.5	28.5	12.6	49.5	38.2	22.9
Phy-24-47	BAUM 13-6	0.66	0.61	7.3	2.04	1.88	8.1	2.44	1.90	22.0	1.55	1.22	21.3	40.3	35.6	11.6	43.8	40.2	8.2
Phy-24-48	Kranti (NC)	0.56	0.51	8.1	2.10	1.94	7.7	2.67	1.90	28.8	1.86	1.79	3.6	35.6	34.8	2.4	47.3	42.3	10.6
Phy-24-49	DRMR 2019-16	0.67	0.65	4.0	2.1	1.9	8.0	2.06	1.41	31.5	1.6	1.6	1.5	38.7	31.3	19.2	51.0	40.6	20.3
Phy-24-50	RAURD 14-18	0.70	0.65	6.6	2.15	1.99	7.2	2.67	1.83	31.6	1.69	1.29	23.7	36.5	31.3	14.3	49.3	45.8	7.0
Phy-24-51	DRMRCI-161	0.62	0.60	4.6	2.10	1.93	8.0	2.48	2.22	10.6	1.77	1.50	15.3	30.0	26.3	12.2	48.5	47.2	2.7
Phy-24-52	DRMRIJ-138	0.86	0.73	15.5	2.05	1.87	8.6	2.52	2.12	16.0	1.37	1.22	11.5	31.2	30.0	3.8	40.8	40.5	0.6
Phy-24-53	NPJ 281	0.60	0.56	6.4	2.22	2.02	9.1	3.23	2.79	13.4	1.49	1.41	5.4	26.8	25.5	5.2	45.2	43.4	3.9
Phy-24-54	DRMRDR 2141	0.61	0.54	10.4	2.21	2.07	6.6	1.98	1.40	29.6	1.33	1.13	15.0	26.0	24.4	5.9	41.3	37.5	9.1
Phy-24-55	HUJM 23-12	0.71	0.57	19.6	2.08	1.90	8.6	2.65	1.81	31.7	1.83	1.73	5.5	29.4	28.7	2.3	44.6	42.0	5.8
Phy-24-56	RH 725 (ZC)	0.80	0.57	28.4	2.23	2.05	8.2	2.74	2.11	23.2	1.93	1.56	19.1	32.1	29.8	7.2	44.2	41.9	5.3
Phy-24-57	DRMR 2019-7	0.71	0.59	17.0	2.41	2.20	8.8	1.76	1.40	20.3	1.43	1.35	6.1	31.6	28.1	11.1	53.8	43.7	18.8
Phy-24-58	RH 2265	0.78	0.65	16.1	2.11	1.97	6.8	2.91	2.60	10.3	1.49	1.48	0.7	25.5	23.4	8.2	42.2	40.5	4.1
Phy-24-59	DRMRCI 207	0.59	0.54	8.2	2.30	2.13	7.4	2.68	2.37	11.4	1.50	1.14	24.0	25.7	25.7	0.3	45.9	39.1	14.8
Phy-24-60	NPJ 280	0.71	0.60	16.3	2.12	1.94	8.3	2.17	1.83	15.4	1.90	1.36	28.4	32.2	30.2	6.2	50.8	40.1	21.1
Phy-24-61	RGN 229	0.71	0.64	9.2	2.04	1.87	8.7	2.72	2.42	11.1	1.54	1.21	21.4	30.8	29.0	5.9	49.4	44.3	10.3
Phy-24-62	DRMR 19-21	0.61	0.54	11.3	2.07	1.88	9.2	2.15	2.07	3.5	1.37	1.18	13.9	33.1	30.5	7.7	43.5	43.2	0.7
Phy-24-63	DRMRDR 2135	0.66	0.54	17.7	2.39	2.14	10.3	2.74	2.11	23.2	1.64	1.18	28.0	31.8	28.8	9.3	43.3	37.8	12.7
Phy-24-64	DRMRSJ 276	0.69	0.63	8.8	2.05	1.81	11.8	2.35	2.06	12.2	1.73	1.37	20.4	36.2	31.8	12.1	46.1	45.4	1.5
Phy-24-65	CAURM 4-1S	0.89	0.57	35.3	2.27	2.04	9.9	2.02	1.82	9.9	1.49	1.43	4.0	38.2	36.9	3.2	49.2	42.5	13.7
Phy-24-66	RKM 588	0.62	0.59	5.3	2.08	1.87	10.1	2.15	1.96	8.8	1.61	1.51	6.2	37.6	35.3	6.1	40.6	40.0	1.6
	Mean	0.71	0.59		2.15	1.97		2.46	2.00		1.65	1.40		33.2	30.7		46.9	42.9	
CD(p=0.05)	E	0.04			0.212			0.228			0.1			4.903			0.89		
	G	0.1			0.054			0.058			0.3			1.245			3.73		
	E×G	NS			NS			0.323			0.4			NS			5.28		

IR=Irrigated RF= *Rainfed*

Table 6.2.4: Effect of moisture stress on siliquae on main shoot (SMS)

Code	Entries	Siliqua on main shoot														
		BPR			DOL			HSR			MDR			LDH		
		IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)
Phy-24-36	RGN 599	55.3	53.0	4.2	42.0	36.0	13.4	47.2	43.2	8.5	47.3	43.3	9.2	48.5	39.5	18.7
Phy-24-37	RH 2299-64	46.0	43.8	4.7	45.0	35.0	22.2	52.2	45.0	13.7	44.1	37.2	18.5	38.6	38.3	0.9
Phy-24-38	RMM 19-06	52.2	43.5	16.6	46.0	36.0	23.3	49.2	37.2	24.4	45.9	43.7	5.0	36.8	35.5	3.4
Phy-24-39	DRMR 2019-19	42.3	38.7	8.7	46.0	30.0	35.3	51.5	44.0	14.6	46.3	40.2	15.2	32.1	30.3	5.6
Phy-24-40	DRMR 21-17	53.2	49.2	7.5	50.0	38.0	23.0	39.7	39.3	0.8	49.2	42.4	16.0	37.9	31.1	17.8
Phy-24-41	DRMR 2020-3	53.0	44.7	15.7	61.0	54.0	10.8	39.5	38.0	3.8	40.8	35.0	16.6	36.5	30.9	15.3
Phy-24-42	DRMRCI-148	46.2	42.8	7.2	65.0	45.0	31.5	46.3	42.3	8.6	47.2	39.7	18.9	33.8	33.3	1.5
Phy-24-43	DRMRCI-163	51.0	44.7	12.4	47.0	42.0	10.0	49.0	40.0	18.4	39.5	36.2	9.1	39.0	28.3	27.4
Phy-24-44	DRMRCI-196	47.3	45.8	3.2	71.0	54.0	24.1	55.0	46.0	16.4	48.9	44.1	10.9	38.5	34.9	9.5
Phy-24-45	RH 1424	46.8	42.7	8.9	51.0	39.0	24.7	48.3	45.8	5.2	42.0	40.0	5.0	40.8	34.9	14.5
Phy-24-46	DRMRHT-2090	55.5	48.5	12.6	43.0	26.0	38.4	53.0	46.0	13.2	45.3	42.8	5.8	43.3	34.4	20.6
Phy-24-47	BAUM 13-6	40.2	38.7	3.7	51.0	45.0	10.8	53.8	40.8	24.1	31.0	26.1	18.8	35.0	29.7	15.1
Phy-24-48	Kranti (NC)	51.0	48.3	5.2	42.0	34.0	17.6	42.0	34.5	17.9	48.3	39.7	21.7	32.5	29.9	7.8
Phy-24-49	DRMR 2019-16	47.5	41.5	12.6	38.0	32.0	16.1	50.7	37.8	25.3	43.3	36.1	19.9	35.9	33.9	5.4
Phy-24-50	RAURD 14-18	50.7	42.8	15.5	55.0	35.0	36.0	52.2	43.0	17.6	50.1	41.7	20.1	42.7	37.5	12.0
Phy-24-51	DRMRCI-161	45.0	43.2	4.1	48.0	34.0	28.7	45.7	43.0	5.8	46.6	40.4	15.3	33.5	28.7	14.3
Phy-24-52	DRMRIJ-138	52.2	49.8	4.5	72.0	64.0	11.7	45.5	39.0	14.3	44.8	38.2	17.3	35.8	32.1	10.2
Phy-24-53	NPJ 281	58.3	51.5	11.7	51.0	45.0	12.5	54.0	47.2	12.7	47.9	39.3	21.9	41.1	38.3	7.0
Phy-24-54	DRMRDR 2141	52.8	46.8	11.4	63.0	44.0	31.1	58.3	52.5	10.0	46.0	38.8	18.6	43.9	41.7	5.0
Phy-24-55	HUJM 23-12	49.5	45.0	9.1	53.0	45.0	16.4	53.7	40.8	23.9	45.4	38.0	19.5	37.1	32.9	11.2
Phy-24-56	RH 725 (ZC)	48.5	46.7	3.8	58.0	40.0	30.6	53.7	47.8	16.3	46.7	38.9	20.1	42.4	38.8	8.5
Phy-24-57	DRMR 2019-7	49.2	48.5	1.4	72.0	48.0	34.2	52.2	39.8	23.6	36.5	30.7	18.9	32.1	30.9	3.5
Phy-24-58	RH 2265	54.8	49.7	9.4	40.0	31.0	23.3	49.0	45.7	6.8	49.0	40.0	22.5	34.2	30.9	9.6
Phy-24-59	DRMRCI 207	51.3	44.0	14.3	45.0	42.0	6.3	44.8	44.0	1.9	46.3	39.4	17.5	37.4	34.0	9.1
Phy-24-60	NPJ 280	50.8	41.3	18.7	57.0	38.0	32.7	51.3	42.0	18.2	46.5	41.6	11.8	38.7	31.3	19.3
Phy-24-61	RGN 229	54.0	47.5	12.0	73.0	54.0	27.1	47.5	45.7	3.9	52.1	47.2	10.4	47.3	37.6	20.5
Phy-24-62	DRMR 19-21	50.2	49.2	2.0	60.0	50.0	16.6	44.7	41.0	8.2	26.1	24.9	4.8	38.3	31.4	17.9
Phy-24-63	DRMRDR 2135	48.0	46.8	2.4	73.0	47.0	35.5	58.0	43.5	25.0	36.0	29.7	21.2	35.1	31.0	11.6
Phy-24-64	DRMRSJ 276	50.5	45.7	9.6	61.0	41.0	33.7	42.5	41.7	2.0	36.7	33.2	10.5	36.9	36.7	0.5
Phy-24-65	CAURM 4-1S	44.7	44.2	1.1	50.0	35.0	28.9	54.0	45.8	15.1	30.5	29.4	3.7	38.9	34.8	10.6
Phy-24-66	RKM 588	52.0	42.2	18.9	43.0	33.0	22.7	45.0	37.3	17.0	33.0	26.8	23.1	34.5	30.7	11.0
	Mean	50.0	45.5		54.0	41.0		49.3	42.6		43.2	37.6		38.0	33.7	
CD(p=0.05)	E	1.63			0.99			1.41			6.2			1.4		
	G	6.4			3.91			5.56			6.1			6.0		
	E×G	NS			5.57			NS			4.4			NS		

IR=Irrigated RF= *Rainfed*

Table 6.2.5: Effect of moisture stress on seeds/siliqua

Code	Entries	Seeds/siliqua														
		BPR			DOL			HSR			MDR			LDH		
		IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)
Phy-24-36	RGN 599	14.9	14.7	1.3	14.7	13.1	10.5	12.1	10.2	15.4	16.3	16.1	1.7	13.2	13.0	1.5
Phy-24-37	RH 2299-64	17.8	16.2	9.0	10.7	9.3	13.1	12.1	11.0	9.6	13.6	12.6	7.4	14.9	12.1	18.8
Phy-24-38	RMM 19-06	14.9	14.3	4.0	11.7	10.7	8.6	9.9	8.9	10.1	15.2	14.6	4.6	16.0	11.9	25.8
Phy-24-39	DRMR 2019-19	16.3	15.6	4.3	13.0	10.7	18.0	12.7	10.7	16.0	13.6	13.0	4.9	14.6	11.6	20.5
Phy-24-40	DRMR 21-17	14.7	13.8	6.1	12.0	10.3	13.9	12.8	12.4	2.6	13.2	12.3	7.1	13.1	11.9	8.7
Phy-24-41	DRMR 2020-3	15.1	14.6	3.3	14.3	9.2	36.1	10.7	10.5	1.7	15.3	15.0	2.3	12.4	12.2	1.6
Phy-24-42	DRMRCI-148	15.7	14.9	5.1	14.3	10.0	30.2	11.1	11.0	0.9	14.8	14.3	3.6	13.9	13.5	2.4
Phy-24-43	DRMRCI-163	14.6	13.6	6.8	10.1	8.0	20.6	11.4	10.8	5.0	15.6	14.4	8.3	13.7	12.0	12.4
Phy-24-44	DRMRCI-196	16.7	15.4	7.8	11.7	8.7	25.8	14.1	11.8	16.3	15.2	14.0	8.6	13.7	12.7	7.8
Phy-24-45	RH 1424	13.5	13.1	3.0	12.0	9.3	22.1	11.1	9.8	12.0	14.7	13.7	6.8	12.8	12.3	3.9
Phy-24-46	DRMRHT-2090	16.5	16.3	1.2	14.0	12.2	13.1	12.8	11.7	8.4	16.6	15.6	6.3	14.9	13.9	7.1
Phy-24-47	BAUM 13-6	16.3	15.6	4.3	13.6	12.2	10.6	11.6	10.4	9.8	14.5	14.3	1.5	12.7	12.1	4.7
Phy-24-48	Kranti (NC)	14.8	13.7	7.4	15.3	11.8	23.0	12.0	10.0	16.2	16.1	12.5	29.0	15.8	13.5	14.8
Phy-24-49	DRMR 2019-16	17.1	17.0	0.6	10.7	9.1	14.4	11.7	9.3	20.5	14.9	14.2	5.0	13.5	13.3	1.5
Phy-24-50	RAURD 14-18	16.3	13.2	19.0	14.4	12.0	16.5	11.2	9.0	19.1	14.4	14.0	2.8	12.4	11.8	4.8
Phy-24-51	DRMRCI-161	17.8	15.4	13.5	12.5	10.1	18.7	11.6	11.0	5.2	15.8	14.1	12.3	14.2	12.1	15.0
Phy-24-52	DRMRIJ-138	17.0	16.3	4.1	13.6	10.0	26.2	11.3	10.3	9.4	17.1	14.2	20.0	14.6	12.9	11.9
Phy-24-53	NPJ 281	17.2	16.8	2.3	15.0	11.3	24.4	13.4	10.7	20.1	15.3	14.2	7.4	15.5	12.9	16.8
Phy-24-54	DRMRDR 2141	13.6	12.8	5.9	11.7	10.2	13.0	10.6	9.8	7.6	14.4	14.0	3.0	11.9	11.0	7.6
Phy-24-55	HUJM 23-12	17.0	16.8	1.2	13.3	12.0	10.0	11.5	9.4	18.2	17.9	15.7	13.9	13.2	12.5	5.6
Phy-24-56	RH 725 (ZC)	15.0	14.5	3.3	18.0	12.0	33.3	11.5	10.0	13.3	16.6	14.3	15.6	14.2	12.1	14.8
Phy-24-57	DRMR 2019-7	15.9	15.6	1.9	13.0	10.3	20.8	12.1	11.5	5.2	17.8	14.9	19.6	14.4	13.4	6.9
Phy-24-58	RH 2265	14.5	14.0	3.4	12.1	8.5	29.9	12.4	10.8	13.2	14.4	12.9	11.2	12.8	12.3	3.6
Phy-24-59	DRMRCI 207	15.9	13.8	13.2	14.0	9.5	32.0	10.0	9.7	3.3	18.0	15.2	17.9	12.5	11.5	8.0
Phy-24-60	NPJ 280	17.9	14.8	17.3	14.5	11.6	20.2	12.3	11.9	3.0	13.7	13.4	2.2	12.4	11.8	4.8
Phy-24-61	RGN 229	14.5	13.6	6.2	12.4	9.7	22.1	10.4	10.1	2.9	17.2	15.3	12.3	12.7	12.3	3.7
Phy-24-62	DRMR 19-21	15.3	13.7	10.5	12.0	9.2	23.3	11.2	10.4	7.4	15.8	12.4	27.3	12.9	12.5	3.1
Phy-24-63	DRMRDR 2135	13.0	12.8	1.5	13.6	12.0	12.0	10.8	9.6	11.4	16.4	12.7	29.5	11.4	10.3	9.9
Phy-24-64	DRMRSJ 276	14.9	13.5	9.4	12.7	12.3	2.6	10.1	9.7	3.1	14.9	14.6	1.7	13.5	13.0	3.7
Phy-24-65	CAURM 4-1S	14.3	13.8	3.5	13.7	9.7	29.3	10.9	10.6	3.1	18.2	13.1	39.2	12.1	12.0	1.1
Phy-24-66	RKM 588	15.9	14.9	6.3	13.6	9.7	28.4	12.2	11.4	6.8	16.6	14.7	13.1	14.5	13.0	10.1
	Mean	15.6	14.7		13.2	10.5		11.6	10.5		15.6	14.1		13.6	12.4	
CD(p=0.05)	E	0.55			0.39			0.25			1.89			0.45		
	G	2.2			1.54			0.98			1.84			1.79		
	E×G	NS			NS			NS			1.19			2.10		

IR=Irrigated RF= *Rainfed*

Table 6.2.6: Effect of moisture stress on 1000 seed weight and oil content

Code	Entries	1000 Seed Weight (g)										Oil content (%)					
		BPR		DOL		HSR		MDR		LDH		BPR		HSR		MDR	
		IR	RF	IR	RF	IR	RF	IR	RF	IR	RF	IR	RF	IR	RF	IR	RF
Phy-24-36	RGN 599	4.7	4.8	4.1	3.6	5.2	4.4	4.6	4.2	6.2	5.7	41.7	39.4	37.5	36.5	39.4	42.4
Phy-24-37	RH 2299-64	5.2	5.5	5.7	3.6	5.3	5.1	5.6	5.1	6.6	6.3	41.5	40.3	39.7	36.9	39.3	43.1
Phy-24-38	RMM 19-06	4.1	4.2	4.9	3.2	5.0	4.6	5.0	4.8	5.8	5.5	42.1	42.0	39.8	38.5	40.5	42.6
Phy-24-39	DRMR 2019-19	4.6	5.0	5.0	2.9	5.7	4.8	5.1	5.0	6.2	5.6	40.9	40.0	37.5	37.2	42.2	42.1
Phy-24-40	DRMR 21-17	4.7	4.7	5.5	3.7	4.5	4.4	6.1	6.0	7.1	6.6	38.9	40.9	37.0	40.2	40.1	42.7
Phy-24-41	DRMR 2020-3	4.5	4.6	4.9	2.7	5.4	4.8	5.4	5.2	6.8	6.7	39.9	42.0	40.0	37.1	40.4	40.8
Phy-24-42	DRMRCI-148	3.7	4.2	4.2	2.7	5.3	5.2	5.2	4.8	6.2	5.8	42.2	40.4	38.9	38.1	40.8	44.1
Phy-24-43	DRMRCI-163	4.2	4.6	5.0	3.0	5.3	4.4	5.8	5.1	6.5	5.2	42.1	40.8	38.0	38.4	41.1	43.0
Phy-24-44	DRMRCI-196	4.7	5.0	5.3	3.3	5.7	5.1	5.7	5.2	7.0	6.8	42.9	42.1	37.8	38.5	44.2	42.3
Phy-24-45	RH 1424	5.2	5.7	4.9	3.4	5.9	5.2	6.8	6.1	7.4	6.9	41.9	42.0	38.2	40.1	40.8	42.4
Phy-24-46	DRMRHT-2090	3.6	4.0	4.6	3.6	5.3	4.5	5.3	4.8	7.6	5.3	43.0	41.2	38.4	40.3	40.7	40.5
Phy-24-47	BAUM 13-6	3.5	3.9	4.7	2.7	4.5	4.0	5.0	4.8	5.9	5.5	41.9	41.5	40.5	37.9	40.1	42.2
Phy-24-48	Kranti (NC)	3.4	3.9	4.3	3.8	4.9	4.5	5.5	5.0	6.8	6.0	42.1	40.0	38.2	38.9	40.6	41.6
Phy-24-49	DRMR 2019-16	4.5	5.1	5.7	4.9	5.5	4.9	6.2	5.3	6.6	6.2	42.8	41.8	38.6	37.4	39.5	42.4
Phy-24-50	RAURD 14-18	4.3	5.2	5.7	3.5	5.5	5.0	6.0	5.8	8.6	6.2	42.6	42.0	38.9	37.6	40.8	42.8
Phy-24-51	DRMRCI-161	4.3	4.4	4.9	3.9	5.4	5.0	5.2	5.1	7.3	6.2	41.9	43.0	39.5	37.5	39.7	42.2
Phy-24-52	DRMRIJ-138	5.5	5.6	5.7	3.6	5.5	5.2	6.4	6.0	6.8	6.7	41.0	41.0	38.0	38.7	40.6	40.5
Phy-24-53	NPJ 281	4.2	4.7	4.8	3.1	5.8	5.0	5.8	5.4	6.8	6.5	40.9	41.0	39.3	38.1	41.1	40.1
Phy-24-54	DRMRDR 2141	5.0	5.7	6.1	4.7	5.3	4.9	6.2	5.8	7.5	7.2	41.0	41.2	40.3	39.0	41.8	41.5
Phy-24-55	HUJM 23-12	3.7	4.4	4.5	4.1	5.9	4.8	5.2	4.7	6.5	5.3	39.7	42.0	37.8	38.9	40.0	42.0
Phy-24-56	RH 725 (ZC)	4.6	5.1	5.2	3.7	5.2	4.8	5.7	5.3	6.3	5.2	42.0	40.0	38.3	40.0	41.8	41.4
Phy-24-57	DRMR 2019-7	4.7	4.9	5.9	4.2	5.5	5.4	6.2	6.0	8.6	7.8	42.8	42.0	39.2	37.5	42.4	42.9
Phy-24-58	RH 2265	4.9	5.1	6.3	4.9	5.7	5.7	5.9	5.5	6.2	5.3	42.0	42.0	40.2	38.5	41.3	41.2
Phy-24-59	DRMRCI 207	5.0	5.1	5.3	3.3	6.2	5.2	6.3	6.0	7.9	7.5	41.4	43.2	40.0	40.5	37.2	42.0
Phy-24-60	NPJ 280	4.4	5.3	5.0	3.0	5.0	4.7	5.8	5.2	7.3	5.9	40.3	42.2	39.9	38.8	42.2	40.9
Phy-24-61	RGN 229	3.4	3.7	5.2	3.5	5.6	5.4	5.1	4.7	6.7	6.0	38.4	41.1	38.0	40.8	40.7	41.3
Phy-24-62	DRMR 19-21	4.6	5.1	5.9	3.9	4.8	4.3	5.9	5.4	5.8	5.3	42.1	38.8	38.0	36.5	39.9	42.6
Phy-24-63	DRMRDR 2135	5.0	5.3	5.3	3.5	5.1	4.2	6.1	5.7	7.2	5.9	42.6	39.0	38.5	36.7	38.0	43.3
Phy-24-64	DRMRSJ 276	4.6	5.2	5.3	3.0	5.9	5.6	6.2	5.9	6.0	5.5	41.0	42.0	38.0	37.5	40.9	40.1
Phy-24-65	CAURM 4-1S	3.2	3.5	5.1	2.4	5.1	4.4	4.4	4.3	5.5	3.5	42.6	41.9	37.8	36.3	40.4	41.8
Phy-24-66	RKM 588	3.4	3.8	4.6	2.5	5.4	5.0	5.1	4.9	7.1	6.0	41.7	42.8	37.9	36.9	41.7	41.6
	Mean	4.4	4.7	5.1	3.5	5.4	4.9	5.6	5.3	6.8	6.0						
CD(p=0.05)	E	0.2				0.1		0.6		0.2							
	G	0.9				0.5		0.7		0.5							
	E×G	NS				NS		0.5		0.8							

IR=Irrigated RF= *Rainfed*

Table 6.2.7: Effect of moisture stress on biological yield

Code	Entries	Biological yield (kg/ha)														
		BPR			DOL			HSR			MDR			LDH		
		IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)
Phy-24-36	RGN 599	12133	9600	20.9	4960	4169	16.0	191.4	96.9	49.4	6842	5782	18.3	7141	6169	13.6
Phy-24-37	RH 2299-64	9778	8604	12.0	4784	3775	21.1	91.9	73.7	19.8	6083	4890	24.4	8508	5951	30.1
Phy-24-38	RMM 19-06	12222	9458	22.6	4432	3303	25.5	108.2	74.1	31.5	7603	6424	18.4	8098	6622	18.2
Phy-24-39	DRMR 2019-19	8489	7182	15.4	5644	3736	33.8	73.1	54.1	26.0	5773	4611	25.2	5765	5335	7.5
Phy-24-40	DRMR 21-17	11822	9280	21.5	5270	4495	14.7	107.5	102.6	4.6	5993	4741	26.4	8942	7422	17.0
Phy-24-41	DRMR 2020-3	8800	7964	9.5	4555	3902	14.3	81.3	75.0	7.7	6213	4499	38.1	6882	6436	6.5
Phy-24-42	DRMRCI-148	8489	8107	4.5	4424	3994	9.7	87.8	59.0	32.8	5920	4466	32.6	6500	5772	11.2
Phy-24-43	DRMRCI-163	9289	8462	8.9	5219	4315	17.3	72.8	50.8	30.2	7205	5664	27.2	7214	6551	9.2
Phy-24-44	DRMRCI-196	9644	8462	12.3	4480	4288	4.3	87.6	69.8	20.3	6740	5465	23.3	6439	6261	2.8
Phy-24-45	RH 1424	7067	6471	8.4	4960	3893	21.5	79.7	63.3	20.6	5389	4592	17.4	6846	5892	13.9
Phy-24-46	DRMRHT-2090	10133	7822	22.8	5510	4552	17.4	111.9	54.9	50.9	7283	6176	17.9	7502	6304	16.0
Phy-24-47	BAUM 13-6	6978	5547	20.5	4928	4224	14.3	77.2	43.3	43.9	4676	3737	25.1	6302	6212	1.4
Phy-24-48	Kranti (NC)	8222	6258	23.9	4818	3641	24.4	68.9	40.2	41.7	6993	5586	25.2	5716	4862	14.9
Phy-24-49	DRMR 2019-16	9067	6827	24.7	6102	5151	15.6	106.2	47.8	55.0	5893	4590	28.4	6476	5227	19.3
Phy-24-50	RAURD 14-18	9533	7253	23.9	5059	4134	18.3	86.6	50.4	41.8	6481	5387	20.3	7468	7157	4.2
Phy-24-51	DRMRCI-161	10089	8676	14.0	5927	4776	19.4	93.6	70.7	24.5	7429	6134	21.1	7033	6524	7.2
Phy-24-52	DRMRIJ-138	9178	7253	21.0	6360	4966	21.9	86.2	53.3	38.2	5914	5144	15.0	6850	5860	14.5
Phy-24-53	NPJ 281	8167	7253	11.2	5103	3748	26.6	99.7	66.9	32.9	5994	4764	25.8	6572	6359	3.2
Phy-24-54	DRMRDR 2141	8333	6933	16.8	4793	3714	22.5	88.7	63.7	28.2	5547	4680	18.5	7063	7017	0.7
Phy-24-55	HUJM 23-12	11722	8889	24.2	4934	4119	16.5	142.8	66.2	53.6	5668	4036	40.4	7308	5373	26.5
Phy-24-56	RH 725 (ZC)	7567	6116	19.2	6203	5186	16.4	79.4	62.1	21.8	5014	3884	29.1	6726	5851	13.0
Phy-24-57	DRMR 2019-7	8178	6898	15.7	4319	3938	8.8	83.1	63.7	23.3	5727	4870	17.6	7548	5156	31.7
Phy-24-58	RH 2265	7778	5831	25.0	4568	4311	5.6	76.9	63.4	17.6	6044	5049	19.7	5861	5353	8.7
Phy-24-59	DRMRCI 207	12578	9102	27.6	5144	4272	17.0	94.0	90.4	3.8	5591	4946	13.0	8103	7483	7.7
Phy-24-60	NPJ 280	11022	8498	22.9	4819	3883	19.4	89.4	68.4	23.5	5901	4448	32.7	8140	6661	18.2
Phy-24-61	RGN 229	11878	8533	28.2	6017	5232	13.1	104.8	86.3	17.7	5855	5545	5.6	7280	6873	5.6
Phy-24-62	DRMR 19-21	10700	7609	28.9	4937	4080	17.4	79.4	61.9	22.0	5990	5020	19.3	7655	5911	22.8
Phy-24-63	DRMRDR 2135	9944	7111	28.5	5446	4951	9.1	71.1	36.1	49.2	6122	4937	24.0	7609	5943	21.9
Phy-24-64	DRMRSJ 276	9811	7040	28.2	5827	5079	12.8	76.5	52.7	31.1	5919	4921	20.3	8240	7188	12.8
Phy-24-65	CAURM 4-1S	8289	8107	2.2	5732	5117	10.7	89.0	71.6	19.6	4878	3497	39.5	6249	5742	8.1
Phy-24-66	RKM 588	9200	7040	23.5	6073	4659	23.3	99.6	81.9	17.8	5009	3888	28.8	8254	5867	28.9
	Mean	9552	7683		5205	4310		93.1	65.0		6054	4915		7171	6172	
CD(p=0.05)	E	722.90			131.00			21.96			531.70			149.67		
	G	NS			515.00			5.578			470.90			626.10		
	E×G	NS			NS			31.057			389.90			885.50		

IR=Irrigated RF= *Rainfed*

Table 6.2.8: Effect of moisture stress on seed yield

Code	Entries	Seed yield (kg/ha)														
		BPR			DOL			HSR			MDR			LDH		
		IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)	IR	RF	Red (%)
Phy-24-36	RGN 599	3422	2687	21.5	1184	956	19.3	28.8	26.5	7.7	2297	2125	8.1	1671	1284	23.1
Phy-24-37	RH 2299-64	2244	2136	4.9	1191	876	26.4	23.9	20.2	15.3	1820	1545	17.8	2080	1476	29.1
Phy-24-38	RMM 19-06	2667	2342	12.2	1059	744	29.8	20.8	17.5	15.8	2634	2190	20.3	1913	1717	10.2
Phy-24-39	DRMR 2019-19	2289	2136	6.7	1355	861	36.4	20.0	17.7	11.6	1980	1490	32.9	1529	1401	8.4
Phy-24-40	DRMR 21-17	3222	2549	20.9	1410	1002	28.9	21.7	20.0	7.5	2057	1720	19.6	2123	2046	3.6
Phy-24-41	DRMR 2020-3	2400	2308	3.8	1062	820	22.8	22.3	20.6	7.5	2134	1498	42.5	1634	1539	5.8
Phy-24-42	DRMRCI-148	1956	1860	4.9	1028	913	11.2	19.7	18.2	7.6	2120	1562	35.7	1878	1367	27.2
Phy-24-43	DRMRCI-163	2133	1998	6.4	1115	892	20.0	18.4	15.7	14.5	2205	1930	14.2	1773	1582	10.8
Phy-24-44	DRMRCI-196	2178	1863	14.4	1049	910	13.3	21.6	18.1	16.1	2354	1890	24.6	1745	1426	18.3
Phy-24-45	RH 1424	1822	1636	10.2	1313	973	25.9	22.4	19.2	14.3	1930	1702	13.4	1674	1194	28.7
Phy-24-46	DRMRHT-2090	2356	1739	26.2	1172	937	20.1	21.1	15.9	24.6	2420	2331	3.8	1944	1568	19.4
Phy-24-47	BAUM 13-6	1689	1447	14.3	1234	1006	18.4	21.2	16.6	21.4	1575	1503	4.8	1475	1340	9.2
Phy-24-48	Kranti (NC)	2222	1681	24.4	1086	748	31.2	19.1	16.2	14.9	2151	1941	10.8	1543	1277	17.2
Phy-24-49	DRMR 2019-16	2222	1653	25.6	1342	1050	21.8	23.7	18.2	23.3	2130	1598	33.3	1680	1286	23.5
Phy-24-50	RAURD 14-18	2578	1860	27.8	1216	942	22.5	25.3	19.8	21.5	2010	1511	33.0	1990	1556	21.8
Phy-24-51	DRMRCI-161	2089	1929	7.7	1392	1041	25.2	23.1	18.6	19.3	2234	2010	11.1	1674	1572	6.1
Phy-24-52	DRMRIJ-138	2178	1798	17.4	1647	1136	31.0	19.6	16.8	14.1	2356	2110	11.7	1504	1335	11.2
Phy-24-53	NPJ 281	1689	1584	6.2	1284	904	29.6	24.0	18.7	21.9	2160	1980	9.1	1489	1087	27.0
Phy-24-54	DRMRDR 2141	1956	1722	11.9	1312	844	35.7	26.5	24.3	8.1	1968	1880	4.7	1990	1436	27.8
Phy-24-55	HUJM 23-12	2756	2032	26.3	1035	827	20.0	28.7	21.9	23.6	2310	1659	39.2	1787	1430	20.0
Phy-24-56	RH 725 (ZC)	1867	1584	15.1	1558	1143	26.7	19.7	16.6	15.8	2090	1663	25.7	1332	1187	10.9
Phy-24-57	DRMR 2019-7	2044	1826	10.7	1122	984	12.3	24.1	20.1	16.6	2145	2110	1.7	1607	1533	4.6
Phy-24-58	RH 2265	1844	1584	14.1	1063	951	10.5	27.1	22.6	16.4	2108	1750	20.5	1402	1344	4.2
Phy-24-59	DRMRCI 207	2444	1722	29.5	1180	919	22.1	20.0	18.5	7.1	2282	2076	9.9	1627	1206	25.9
Phy-24-60	NPJ 280	2178	1722	20.9	1188	910	23.4	25.0	21.7	13.2	2350	1552	51.4	1845	1392	24.5
Phy-24-61	RGN 229	2067	1516	26.7	1651	1160	29.7	16.7	15.4	7.3	1931	1857	4.0	1640	1418	13.6
Phy-24-62	DRMR 19-21	1911	1464	23.4	1292	956	26.0	18.5	15.8	14.4	1900	1786	6.4	1752	1541	12.0
Phy-24-63	DRMRDR 2135	2667	2273	14.8	1514	1249	17.5	21.2	16.3	23.1	2460	2175	13.1	1652	1404	15.0
Phy-24-64	DRMRSJ 276	2400	2094	12.7	1521	1054	30.7	18.4	17.0	7.6	2345	2056	14.1	1816	1366	24.7
Phy-24-65	CAURM 4-1S	1689	1281	24.1	1374	1185	13.8	20.2	18.1	10.1	1870	1349	38.6	1773	1567	11.6
Phy-24-66	RKM 588	2311	1808	21.8	1489	1111	25.4	28.1	22.6	19.6	1936	1458	32.8	1670	1645	1.5
	Mean	2242	1866		1272	968		22.3	18.9		2137	1807		1717	1436	
CD(p=0.05)	E	173.53			31.00			4.127			308.50			76.40		
	G	683.2			123.00			1.048			210.60			119.60		
	E×G	NS			174.00			NS			228.10			252.00		

IR=Irrigated RF= *Rainfed*

Table 6.2.9: Effect of moisture stress on harvest index, DSI and YSI

Code	Entries	Harvest Index (HI)										DSI					YSI				
		BPR		DOL		HSR		MDR		LDH		BPR	DOL	HSR	MDR	LDH	BPR	DOL	HSR	MDR	LDH
		IR	RF	IR	RF	IR	RF	IR	RF	RF	IR	DSI	DSI	DSI	DSI	DSI	YSI	YSI	YSI	YSI	YSI
Phy-24-36	RGN 599	28	30	24.0	23.0	15.9	27.0	33.6	36.8	23.4	20.8	1.26	0.81	0.51	0.48	1.39	0.79	0.81	0.92	0.93	0.77
Phy-24-37	RH 2299-64	23	25	25.1	23.3	26.3	24.6	29.9	31.6	24.5	24.8	0.29	1.11	1.02	0.97	1.75	0.95	0.74	0.85	0.85	0.71
Phy-24-38	RMM 19-06	22	25	24.0	22.5	19.7	21.6	34.6	34.2	25.9	23.6	0.72	1.25	1.06	1.09	0.62	0.88	0.70	0.84	0.83	0.90
Phy-24-39	DRMR 2019-19	28	30	24.0	23.1	27.8	30.5	34.3	32.3	26.5	26.3	0.39	1.52	0.77	1.60	0.51	0.93	0.64	0.88	0.75	0.92
Phy-24-40	DRMR 21-17	27	26	26.8	22.6	20.2	16.5	34.2	36.3	27.5	23.7	1.23	1.21	0.50	1.06	0.22	0.79	0.71	0.93	0.84	0.96
Phy-24-41	DRMR 2020-3	27	28	23.4	21.0	27.4	26.3	34.4	32.8	23.7	23.9	0.23	0.96	0.50	1.93	0.35	0.96	0.77	0.92	0.70	0.94
Phy-24-42	DRMRCI-148	23	23	23.2	22.9	22.5	29.7	35.9	34.5	28.9	23.7	0.29	0.47	0.50	1.70	1.64	0.95	0.89	0.92	0.74	0.73
Phy-24-43	DRMRCI-163	23	24	21.4	20.8	25.2	31.7	30.6	34.1	24.6	24.1	0.37	0.83	0.97	0.81	0.65	0.94	0.80	0.85	0.88	0.89
Phy-24-44	DRMRCI-196	23	22	23.5	21.2	24.7	25.1	34.9	34.6	27.1	22.8	0.85	0.55	1.07	1.27	1.10	0.86	0.87	0.84	0.80	0.82
Phy-24-45	RH 1424	26	25	26.5	25.1	28.4	28.7	35.8	37.1	24.5	20.3	0.60	1.08	0.95	0.76	1.73	0.90	0.74	0.86	0.88	0.71
Phy-24-46	DRMRHT-2090	23	23	21.4	20.6	19.0	30.6	33.2	37.8	25.9	24.9	1.54	0.84	1.64	0.24	1.17	0.74	0.80	0.75	0.96	0.81
Phy-24-47	BAUM 13-6	24	26	25.3	23.8	27.5	35.5	33.8	40.2	23.4	21.6	0.84	0.77	1.43	0.30	0.55	0.86	0.82	0.79	0.95	0.91
Phy-24-48	Kranti (NC)	27	27	22.5	20.4	27.6	38.5	31.2	34.8	27.0	26.3	1.43	1.30	0.99	0.63	1.04	0.76	0.69	0.85	0.90	0.83
Phy-24-49	DRMR 2019-16	25	24	21.9	20.4	22.6	35.7	36.2	34.3	26.0	24.6	1.51	0.91	1.55	1.61	1.41	0.74	0.78	0.77	0.75	0.77
Phy-24-50	RAURD 14-18	27	26	24.2	22.7	30.4	36.0	31.0	28.0	26.6	21.7	1.64	0.94	1.43	1.60	1.31	0.72	0.78	0.79	0.75	0.78
Phy-24-51	DRMRCI-161	21	22	23.4	21.8	24.7	25.5	30.1	32.9	24.1	23.8	0.45	1.06	1.28	0.65	0.37	0.92	0.75	0.81	0.90	0.94
Phy-24-52	DRMRIJ-138	24	25	25.9	22.9	22.8	28.7	39.8	41.0	22.8	22.0	1.03	1.30	0.94	0.67	0.67	0.83	0.69	0.86	0.90	0.89
Phy-24-53	NPJ 281	21	22	25.3	24.8	24.8	28.0	36.0	41.6	22.7	17.1	0.36	1.24	1.46	0.54	1.63	0.94	0.70	0.78	0.92	0.73
Phy-24-54	DRMRDR 2141	24	25	27.4	22.9	30.6	39.3	35.5	41.3	28.2	20.5	0.70	1.49	0.54	0.29	1.68	0.88	0.64	0.92	0.96	0.72
Phy-24-55	HUJM 23-12	24	24	21.0	20.0	20.4	32.7	40.7	40.5	26.6	24.5	1.54	0.84	1.58	1.82	1.20	0.74	0.80	0.76	0.72	0.80
Phy-24-56	RH 725 (ZC)	25	26	25.1	22.2	24.8	24.2	41.6	42.7	20.3	19.8	0.89	1.12	1.05	1.32	0.66	0.85	0.73	0.84	0.80	0.89
Phy-24-57	DRMR 2019-7	25	27	26.0	25.0	28.7	29.4	37.4	43.5	29.7	21.3	0.63	0.51	1.11	0.10	0.28	0.89	0.88	0.83	0.98	0.95
Phy-24-58	RH 2265	24	28	23.4	22.3	35.1	31.3	34.9	35.0	25.1	23.9	0.83	0.44	1.09	1.10	0.25	0.86	0.90	0.84	0.83	0.96
Phy-24-59	DRMRCI 207	19	19	23.1	21.6	21.6	19.7	40.8	42.0	20.1	16.1	1.74	0.93	0.47	0.58	1.56	0.70	0.78	0.93	0.91	0.74
Phy-24-60	NPJ 280	20	21	24.7	23.5	28.8	30.4	39.8	34.6	22.7	20.9	1.23	0.98	0.88	2.19	1.48	0.79	0.77	0.87	0.66	0.75
Phy-24-61	RGN 229	17	19	27.4	22.3	17.2	14.6	31.5	35.0	22.5	20.6	1.57	1.24	0.49	0.25	0.82	0.73	0.70	0.93	0.96	0.86
Phy-24-62	DRMR 19-21	18	20	26.4	23.5	23.3	22.3	31.7	35.5	26.1	22.9	1.38	1.09	0.96	0.39	0.72	0.77	0.74	0.86	0.94	0.88
Phy-24-63	DRMRDR 2135	27	36	27.9	25.4	29.8	42.4	40.2	44.0	23.6	21.7	0.87	0.73	1.41	0.75	0.91	0.85	0.83	0.79	0.88	0.85
Phy-24-64	DRMRSJ 276	25	30	26.1	20.8	25.2	27.1	39.6	41.8	22.0	19.0	0.75	1.28	0.51	0.79	1.49	0.87	0.69	0.92	0.88	0.75
Phy-24-65	CAURM 4-1S	20	18	24.1	23.2	22.7	23.9	38.3	36.4	28.0	20.2	1.42	0.58	0.68	1.80	0.70	0.76	0.86	0.90	0.72	0.88
Phy-24-66	RKM 588	25	25	24.4	23.9	29.2	26.6	38.6	37.5	23.1	21.8	1.28	1.06	1.31	1.60	0.09	0.78	0.75	0.80	0.75	0.99
	Mean	24	25	24.5	22.6	25.0	28.5	35.5	36.9	24.9	22.2										
CD(p=0.05)	E			0.63		7.100		4.26		1.6											
	G			2.46		1.803		3.72		0.8											
	E×G			NS		NS		3.19		2.3											

IR=Irrigated RF= *Rainfed*

Table 6.3.1: Effect of terminal heat stress on membrane stability

Code	Entries	MS (%)											
		BPR			DOL			HSR			LDH		
		NS	LS	Red (%)	NS	LS	Red (%)	NS	LS	Red (%)	NS	LS	Red (%)
Phy-24-67	RKM 599	62.1	44.2	28.8	60.0	52.0	13.4	68.7	62.8	8.7	82.0	77.0	6.1
Phy-24-68	NPJ 268	63.7	44.8	29.7	67.6	55.2	18.4	64.2	54.6	14.9	81.7	77.5	5.2
Phy-24-69	HUJM 23-4	59.5	54.8	8.0	63.5	54.3	14.5	58.6	50.8	13.4	76.8	74.2	3.4
Phy-24-70	Radhika	57.9	48.7	15.8	74.2	62.3	16.0	57.4	52.5	8.6	85.3	76.4	10.4
Phy-24-71	RH 2374	69.8	52.7	24.5	64.0	53.8	15.8	78.1	71.8	8.0	81.4	79.5	2.3
Phy-24-72	RH 2370	56.4	55.8	1.0	59.7	49.0	17.8	58.7	53.7	8.5	79.1	76.9	2.8
Phy-24-73	BPM 11	55.9	50.3	9.9	68.4	53.7	21.4	59.2	56.6	4.3	81.7	75.5	7.7
Phy-24-74	DRMRDR 2141	53.5	52.3	2.2	71.3	63.4	11.1	78.3	71.9	8.1	81.9	75.3	8.1
Phy-24-75	PM 26	59.9	57.6	3.7	75.5	65.1	13.7	53.1	47.8	10.1	84.2	75.6	10.1
Phy-24-76	DRMR 2017-27	67.6	56.1	16.9	65.8	51.5	21.6	73.5	68.8	6.4	81.1	80.5	0.7
Phy-24-77	Pusa MH 218	57.7	54.0	6.4	55.8	46.8	16.2	52.5	46.0	12.4	81.7	78.2	4.3
Phy-24-78	PRL 2022-1	58.6	56.0	4.5	73.6	52.2	29.0	56.9	46.4	18.4	78.5	73.8	6.0
Phy-24-79	NPJ 277	62.6	59.0	5.7	67.8	57.2	15.6	61.5	60.4	1.9	77.7	73.5	5.5
Phy-24-80	SVJH-78	73.9	60.1	18.7	58.3	45.3	22.3	58.7	53.7	8.5	76.5	74.9	2.1
Phy-24-81	DRMRCI-212	63.8	57.8	9.4	69.7	49.2	29.4	68.4	55.4	19.0	79.6	78.6	1.2
Phy-24-82	NPJ 267	60.7	54.5	10.2	72.7	62.8	13.6	67.7	58.7	13.3	79.8	76.2	4.5
Phy-24-83	KMR(L) 24-6	58.6	53.6	8.6	64.2	52.8	17.8	67.7	58.7	13.3	82.0	78.1	4.7
Phy-24-84	PRL 2022-5	66.6	55.5	16.6	70.3	58.0	17.4	64.2	54.6	14.9	77.9	76.1	2.3
Phy-24-85	DRMRDR 2195	57.5	49.9	13.3	74.1	57.7	22.1	55.0	46.1	16.3	78.3	74.8	4.4
Phy-24-86	ORM 2019-30	55.1	52.8	4.0	57.7	45.3	21.6	69.6	58.7	15.6	79.9	78.6	1.6
Phy-24-87	DRMR 2022-16	62.7	56.4	10.1	71.4	59.7	16.4	69.5	55.3	20.4	83.0	77.9	6.2
Phy-24-88	KMR(L) 24-5	64.2	59.1	7.9	66.8	56.1	16.0	56.5	51.5	8.8	82.1	76.4	6.9
Phy-24-89	RGN 592	60.1	55.4	7.8	75.4	64.7	14.2	78.1	72.2	7.6	80.5	77.5	3.7
Phy-24-90	NPJ 276	66.2	55.4	16.3	61.1	47.4	22.5	73.2	68.8	6.0	81.1	78.3	3.5
Phy-24-91	RMWR 19-01	60.0	51.0	15.0	72.6	59.9	17.5	69.6	55.7	20.0	77.0	73.5	4.5
Phy-24-92	DRMR 2019-19	60.9	58.0	4.8	74.5	63.9	14.3	71.9	66.6	7.4	77.2	75.1	2.7
Phy-24-93	DRMR 2018-1	57.5	54.9	4.5	57.9	47.9	17.3	71.6	66.6	7.0	78.1	75.2	3.7
Phy-24-94	DRMR-150-35	53.0	36.2	31.6	69.0	51.6	25.2	53.1	47.8	10.1	79.8	78.8	1.3
Phy-24-95	TM 132-1	66.2	52.3	21.0	70.7	57.8	18.2	52.5	46.0	12.4	77.9	75.2	3.5
Phy-24-96	DRMRIJ 22-2	59.6	50.1	16.0	77.0	65.4	15.1	56.5	51.5	8.8	73.8	72.6	1.6
Phy-24-97	NRCHB-101	58.2	53.5	8.1	65.2	52.8	19.1	56.5	51.5	8.8	75.8	72.4	4.4
	Mean	61.0	53.3		67.6	55.3		63.9	56.9		79.8	76.3	
CD(p=0.05)	E	2.7			0.6			-			0.8		
	G	NS			2.2			-			3.0		
	E×G	NS			3.12			-			4.3		

NS- Normal Sown; LS- Late Sown

Table 6.3.2: Effect of terminal heat stress on canopy temperature (^0C) and canopy temperature depression (^0C)

Code	Entries	CT (°C)						CTD (°C)					
		BPR		HSR		LDH		BPR		HSR		LDH	
		NS	LS	NS	LS	NS	LS	NS	LS	NS	LS	NS	LS
Phy-24-67	RKM 599	14.9	16.1	31.5	30.4	15.7	19.6	-11.1	-9.9	-3.4	-1.7	-4.2	-5.3
Phy-24-68	NPJ 268	14.0	15.5	32.3	31.2	12.9	21.5	-12.0	-10.5	-2.3	-1.8	-7.0	-3.4
Phy-24-69	HUJM 23-4	14.6	16.7	33.1	30.9	14.4	20.9	-11.4	-9.3	-2.4	-2.3	-5.5	-3.9
Phy-24-70	Radhika	13.8	15.7	33.0	31.0	15.2	21.9	-12.2	-10.3	-2.5	-2.4	-4.7	-2.9
Phy-24-71	RH 2374	14.8	16.0	32.8	30.5	13.7	20.9	-11.2	-10.0	-2.7	-1.7	-6.2	-4.0
Phy-24-72	RH 2370	13.7	16.8	33.9	31.0	19.8	23.1	-12.3	-9.2	-2.0	-1.6	-3.5	-1.8
Phy-24-73	BPM 11	14.2	16.6	31.9	31.2	13.4	19.9	-11.8	-9.4	-3.5	-1.8	-6.4	-5.0
Phy-24-74	DRMRDR 2141	14.0	16.7	32.2	31.7	13.7	22.3	-12.0	-9.3	-2.9	-1.6	-6.1	-2.5
Phy-24-75	PM 26	13.0	16.1	32.3	31.6	12.8	22.5	-13.0	-9.9	-3.4	-1.7	-7.0	-2.3
Phy-24-76	DRMR 2017-27	14.3	16.1	33.0	31.0	19.4	21.2	-11.7	-9.9	-2.6	-2.0	-4.0	-3.7
Phy-24-77	Pusa MH 218	13.7	15.9	32.2	30.6	19.8	22.0	-12.3	-10.1	-2.9	-1.7	-3.5	-2.9
Phy-24-78	PRL 2022-1	13.7	16.3	32.0	31.1	20.9	22.7	-12.3	-9.7	-4.1	-1.8	-2.5	-2.1
Phy-24-79	NPJ 277	13.3	15.2	32.7	31.6	20.0	21.2	-12.7	-10.8	-3.1	-1.4	-3.4	-3.7
Phy-24-80	SVJH-78	15.5	16.3	32.6	31.4	19.0	20.9	-10.5	-9.7	-3.8	-1.7	-4.3	-4.0
Phy-24-81	DRMRCI-212	15.3	16.2	33.9	31.4	19.9	20.6	-10.7	-9.8	-3.7	-2.0	-3.4	-4.3
Phy-24-82	NPJ 267	14.6	15.6	32.5	31.8	21.4	20.7	-11.4	-10.4	-3.7	-1.9	-2.0	-4.1
Phy-24-83	KMR(L) 24-6	14.6	15.8	32.2	31.8	19.1	21.4	-11.4	-10.2	-4.5	-1.9	-4.3	-3.4
Phy-24-84	PRL 2022-5	14.8	15.8	32.6	31.5	18.4	21.8	-11.2	-10.2	-4.7	-1.9	-5.0	-3.0
Phy-24-85	DRMRDR 2195	14.5	15.8	32.4	31.9	19.3	18.8	-11.5	-10.2	-4.2	-1.8	-4.0	-6.0
Phy-24-86	ORM 2019-30	12.5	15.3	33.3	31.9	19.2	16.3	-13.5	-10.7	-3.2	-1.7	-4.1	-8.6
Phy-24-87	DRMR 2022-16	13.3	15.5	32.5	31.7	13.7	19.4	-12.7	-10.5	-4.1	-1.9	-6.1	-5.5
Phy-24-88	KMR(L) 24-5	12.6	16.5	32.0	31.5	14.0	16.7	-13.4	-9.5	-4.4	-2.3	-5.8	-8.2
Phy-24-89	RGN 592	13.7	15.9	31.8	30.0	11.3	20.2	-12.3	-10.1	-7.0	-2.3	-8.6	-4.6
Phy-24-90	NPJ 276	13.0	15.4	32.1	31.3	12.5	19.9	-13.0	-10.6	-5.8	-2.0	-7.3	-4.9
Phy-24-91	RMWR 19-01	12.8	16.2	32.1	31.3	15.6	20.5	-13.2	-9.8	-5.4	-2.5	-4.2	-4.4
Phy-24-92	DRMR 2019-19	12.6	15.8	31.8	30.9	13.3	20.0	-13.4	-10.2	-5.0	-1.9	-6.5	-4.9
Phy-24-93	DRMR 2018-1	13.3	15.5	32.1	31.1	17.7	20.4	-12.7	-10.5	-4.3	-2.3	-5.6	-4.5
Phy-24-94	DRMR-150-35	13.3	15.5	31.4	31.0	18.3	18.5	-12.7	-10.5	-3.9	-2.8	-5.0	-6.3
Phy-24-95	TM 132-1	12.7	15.5	31.6	31.2	14.3	19.4	-13.3	-10.5	-4.8	-2.6	-5.6	-5.4
Phy-24-96	DRMRIJ 22-2	13.7	15.4	31.9	31.6	11.2	19.4	-12.3	-10.6	-4.6	-2.6	-8.6	-5.5
Phy-24-97	NRCHB-101	13.5	14.3	31.6	31.1	14.8	20.3	-12.5	-11.7	-4.6	-2.6	-5.0	-4.6
	Mean	13.8	15.9	32.3	31.2	16.3	20.5						
CD(p=0.05)	E	0.4		1.057		0.8		-		0.395		0.57	
	G	NS		0.343		3.2		-		0.128		2.28	
	E×G	NS		1.495		4.6		-		0.559		NS	

NS- Normal Sown; LS- Late Sown

Table 6.3.3: Effect of terminal heat stress on seeds per siliqua

Code	Entries	Seeds/siliqua														
		BPR			DOL			HSR			MDR			LDH		
		NS	LS	Red (%)	NS	LS	Red (%)	NS	LS	Red (%)	NS	LS	Red (%)	NS	LS	Red (%)
Phy-24-67	RKM 599	16.7	15.1	9.6	12.2	10.9	10.7	13.3	12.2	8.3	14.3	13.5	5.9	12.0	11.7	2.5
Phy-24-68	NPJ 268	16.4	15.5	5.7	11.6	9.5	18.0	13.4	12.5	7.2	16.3	15.1	7.9	12.7	11.3	11.0
Phy-24-69	HUJM 23-4	16.1	15.1	6.2	10.4	8.9	14.3	12.0	10.1	15.6	14.3	13.5	5.9	11.7	10.8	7.7
Phy-24-70	Radhika	14.9	14.3	4.5	11.1	8.5	23.1	11.9	11.5	3.6	14.0	12.6	11.1	13.8	12.0	13.0
Phy-24-71	RH 2374	15.2	14.2	6.6	11.9	8.8	26.1	13.7	10.8	20.9	17.0	14.4	18.1	12.5	11.3	10.1
Phy-24-72	RH 2370	16.7	15.9	4.4	12.5	9.4	24.4	13.9	11.8	14.9	16.0	14.7	8.8	11.7	10.0	14.8
Phy-24-73	BPM 11	17.8	16.2	9.0	14.5	11.4	21.6	12.1	11.9	1.9	16.4	15.2	7.9	13.5	13.1	3.0
Phy-24-74	DRMRDR 2141	14.1	13.4	5.2	10.6	8.8	17.2	15.0	11.9	20.5	14.5	13.7	5.8	11.1	10.8	2.4
Phy-24-75	PM 26	15.1	14.2	5.8	11.2	7.5	32.9	13.4	12.1	9.2	15.0	13.7	9.5	13.0	11.3	13.3
Phy-24-76	DRMR 2017-27	18.0	15.6	13.3	11.1	10.4	7.0	13.7	11.4	16.5	17.9	17.3	3.5	12.5	11.6	7.0
Phy-24-77	Pusa MH 218	15.3	13.4	12.6	11.4	10.4	9.1	12.7	11.9	6.0	15.2	14.0	8.6	13.7	11.5	16.1
Phy-24-78	PRL 2022-1	15.6	14.7	5.6	14.2	10.5	25.7	11.7	11.7	0.6	17.0	16.0	6.3	12.7	12.2	3.7
Phy-24-79	NPJ 277	16.1	14.5	9.9	12.6	11.6	8.6	13.4	12.6	5.7	17.0	13.3	27.8	14.3	12.0	16.1
Phy-24-80	SVJH-78	15.4	13.6	11.7	12.4	10.3	17.3	12.2	11.9	2.5	17.3	13.8	25.4	12.7	12.5	2.1
Phy-24-81	DRMRCI-212	15.7	15.2	3.4	15.2	11.5	24.6	13.6	11.0	19.3	17.4	14.0	24.3	12.9	11.6	10.1
Phy-24-82	NPJ 267	18.7	17.7	5.4	12.1	9.6	21.1	15.1	12.9	14.4	16.7	13.9	20.1	13.0	12.3	5.6
Phy-24-83	KMR(L) 24-6	16.7	15.1	10.0	12.6	11.5	8.9	13.0	11.2	13.8	15.7	14.0	12.1	12.6	12.1	3.7
Phy-24-84	PRL 2022-5	16.9	14.3	15.4	12.5	10.3	17.2	13.0	12.5	3.6	18.7	15.3	22.2	13.5	13.2	2.0
Phy-24-85	DRMRDR 2195	15.1	14.5	4.0	11.0	8.5	22.8	15.5	11.1	28.8	13.0	12.3	5.7	13.8	12.3	10.6
Phy-24-86	ORM 2019-30	14.1	12.5	11.3	13.2	11.0	16.9	14.2	11.7	17.4	13.7	13.1	4.6	12.5	12.2	2.4
Phy-24-87	DRMR 2022-16	16.3	14.9	8.6	11.6	9.4	19.1	13.4	13.0	3.6	13.4	12.4	8.1	12.1	10.3	14.8
Phy-24-88	KMR(L) 24-5	14.9	14.1	4.9	11.4	9.6	16.4	13.3	11.0	17.3	14.4	11.6	24.1	12.9	12.2	5.2
Phy-24-89	RGN 592	16.9	14.2	16.1	12.7	9.8	22.8	14.7	11.9	18.6	15.1	14.3	5.6	13.2	12.7	4.0
Phy-24-90	NPJ 276	16.1	15.3	4.6	11.3	10.2	10.3	12.7	12.3	3.4	14.4	12.7	13.4	12.6	11.2	11.1
Phy-24-91	RMWR 19-01	16.3	14.5	11.1	12.6	11.6	7.6	13.9	13.1	6.0	13.6	12.8	6.2	12.3	11.5	6.5
Phy-24-92	DRMR 2019-19	16.2	15.4	4.9	12.6	11.3	10.3	12.3	11.8	3.8	16.0	15.7	1.9	13.1	12.5	4.6
Phy-24-93	DRMR 2018-1	14.5	13.3	7.8	11.3	9.9	11.8	13.4	13.0	3.2	15.1	14.8	2.0	12.0	11.3	5.6
Phy-24-94	DRMR-150-35	17.2	14.3	16.7	10.9	9.3	14.5	12.8	12.2	5.1	17.6	17.1	2.9	12.9	11.7	9.3
Phy-24-95	TM 132-1	14.2	13.9	2.3	13.2	12.1	7.9	12.6	11.7	7.7	14.4	12.5	15.2	11.8	10.5	11.0
Phy-24-96	DRMRIJ 22-2	15.2	14.9	2.2	11.3	10.2	9.8	13.8	13.4	3.0	16.1	14.9	8.1	13.3	12.6	5.3
Phy-24-97	NRCHB-101	16.7	15.7	5.6	11.7	10.3	11.8	12.6	12.0	4.8	15.1	14.7	2.7	12.7	12.3	3.2
	Mean	16.0	14.7		12.1	10.1		13.3	11.9		15.6	14.1		12.7	11.8	
CD(p=0.05)	E	0.5			0.2			NS			1.3			0.9		
	G	1.8			1.0			0.509			1.3			1.0		
	E×G	NS			1.37			NS			0.9			0.9		

NS- Normal Sown; LS- Late Sown

Table 6.3.4: Effect of terminal heat stress on 1000 seed weight (g)

Code	Entries	1000 Seed Weight (g)														
		BPR			DOL			HSR			MDR			LDH		
		NS	LS	Red (%)	NS	LS	Red (%)	NS	LS	Red (%)	NS	LS	Red (%)	NS	LS	Red (%)
Phy-24-67	RKM 599	5.3	5.2	2.3	4.3	3.6	15.7	5.7	5.7	0.3	5.7	4.4	29.5	5.9	3.9	33.9
Phy-24-68	NPJ 268	4.4	4.1	6.6	4.3	3.5	18.2	5.2	4.8	8.2	4.4	3.5	25.7	5.3	4.9	6.8
Phy-24-69	HUJM 23-4	4.6	4.4	5.3	3.9	3.5	11.3	5.3	4.6	14.7	4.9	4.3	14.0	5.0	3.5	29.2
Phy-24-70	Radhika	4.6	4.1	11.2	4.2	3.3	21.3	5.5	4.5	18.9	5.0	4.3	16.3	5.8	4.2	26.5
Phy-24-71	RH 2374	5.1	4.1	20.1	4.4	3.8	14.3	5.2	5.0	3.0	4.7	4.0	17.5	6.1	5.1	15.8
Phy-24-72	RH 2370	4.0	3.8	5.6	4.7	3.4	26.8	5.0	4.5	11.1	4.6	4.3	7.0	4.5	3.8	15.6
Phy-24-73	BPM 11	5.7	5.0	11.4	4.9	4.2	15.0	5.2	5.1	2.1	5.7	4.4	29.5	5.6	5.2	7.7
Phy-24-74	DRMRDR 2141	5.1	4.6	10.0	5.0	3.7	27.3	5.5	5.4	2.7	4.7	4.0	17.5	4.6	4.5	1.4
Phy-24-75	PM 26	3.8	3.3	13.1	4.6	3.8	16.3	4.7	4.7	0.6	4.1	3.2	28.1	4.4	4.3	2.1
Phy-24-76	DRMR 2017-27	4.5	4.0	9.8	6.0	5.0	16.7	5.6	4.5	20.7	5.7	4.9	16.3	5.2	4.7	9.5
Phy-24-77	Pusa MH 218	3.7	3.4	8.9	4.3	3.4	20.4	4.6	4.5	2.1	4.8	4.3	11.6	4.6	3.9	15.5
Phy-24-78	PRL 2022-1	4.6	4.3	7.5	4.2	3.1	26.3	4.5	4.3	4.3	4.7	4.0	17.5	5.6	5.2	6.3
Phy-24-79	NPJ 277	4.2	4.0	5.7	3.5	2.8	19.9	5.3	5.3	1.0	5.3	4.6	15.2	5.0	4.9	1.5
Phy-24-80	SVJH-78	3.8	3.6	4.2	4.5	2.8	39.1	5.1	4.8	6.3	4.9	4.3	14.0	6.2	5.1	18.1
Phy-24-81	DRMRCI-212	4.8	4.3	9.5	4.9	3.3	31.9	5.0	4.6	7.6	5.1	4.7	8.5	5.7	4.6	18.6
Phy-24-82	NPJ 267	4.5	3.9	13.5	4.6	3.8	17.2	5.1	4.8	6.5	5.0	4.4	13.6	5.1	4.3	15.7
Phy-24-83	KMR(L) 24-6	4.2	3.8	8.8	4.6	3.7	19.7	5.4	5.3	2.1	4.6	4.5	2.2	5.1	3.7	27.0
Phy-24-84	PRL 2022-5	4.3	4.2	2.2	5.3	4.0	25.2	4.9	4.5	9.9	5.6	4.4	27.3	5.1	4.2	16.9
Phy-24-85	DRMRDR 2195	4.4	4.1	5.9	5.2	4.5	14.1	5.6	4.3	22.0	5.1	4.1	24.4	4.9	4.7	4.6
Phy-24-86	ORM 2019-30	4.6	4.5	4.0	4.7	4.2	10.3	5.6	4.7	16.2	5.4	4.2	28.6	6.0	4.3	28.6
Phy-24-87	DRMR 2022-16	5.0	4.7	5.5	5.2	3.8	25.8	5.5	3.9	29.8	4.8	4.1	17.1	5.4	5.0	7.0
Phy-24-88	KMR(L) 24-5	4.4	3.9	9.4	4.3	3.8	10.8	4.9	4.6	4.6	5.0	3.9	28.2	5.3	5.0	6.0
Phy-24-89	RGN 592	3.7	3.5	5.4	4.8	3.8	22.4	4.4	4.2	3.6	4.0	3.3	21.2	5.0	4.5	9.3
Phy-24-90	NPJ 276	3.9	3.6	7.0	5.5	3.9	30.0	5.0	4.8	4.2	4.8	4.2	14.3	5.2	4.9	7.2
Phy-24-91	RMWR 19-01	4.6	4.0	12.4	4.2	3.3	21.6	4.9	4.0	17.7	4.6	4.6	0.0	4.7	4.0	14.0
Phy-24-92	DRMR 2019-19	4.9	4.4	9.7	4.9	3.8	23.8	5.3	5.1	2.4	5.0	4.4	13.6	6.0	5.7	5.0
Phy-24-93	DRMR 2018-1	4.8	4.3	10.2	4.3	3.7	13.5	5.4	5.2	3.4	5.3	4.1	29.3	6.2	4.8	22.3
Phy-24-94	DRMR-150-35	4.3	4.2	1.2	4.3	3.6	16.1	5.6	5.2	8.4	5.0	4.1	22.0	4.7	4.6	2.1
Phy-24-95	TM 132-1	5.4	5.3	1.9	4.8	3.7	23.5	5.9	4.5	23.6	5.8	4.5	28.9	5.2	4.3	18.3
Phy-24-96	DRMRIJ 22-2	4.5	3.9	12.1	4.5	3.8	15.5	4.8	4.6	3.6	5.4	4.2	28.6	5.4	4.1	23.6
Phy-24-97	NRCHB-101	5.1	4.8	5.0	4.7	3.6	22.8	6.0	4.6	23.4	5.9	4.7	25.5	5.4	5.3	1.9
	Mean	4.5	4.2		4.6	3.7		5.2	4.7		5.0	4.2		4.5	3.7	
CD(p=0.05)	E	0.14			0.11			NS			0.82			0.20		
	G	0.56			0.42			0.233			0.43			0.79		
	E×G	NS			NS			NS			0.47			1.11		

NS- Normal Sown; LS- Late Sown

Table 6.3.5: Effect of terminal heat stress on seed yield

Code	Entries	Seed yield (kg/ha)															Oil content (%)		
		BPR			DOL			HSR			MDR			LDH			BPR		
		NS	LS	Red (%)	NS	LS	Red (%)	NS	LS	Red (%)	NS	LS	Red (%)	NS	LS	Red (%)	NS	LS	Red (%)
Phy-24-67	RKM 599	1915	1797	6.2	1304	1045	19.9	14.8	9.4	36.5	2462	1078	128.4	1180	1068	9.5	37.2	37.4	-0.6
Phy-24-68	NPJ 268	1287	1073	16.6	1247	957	30.5	19.4	9.4	51.5	1249	971	28.6	1320	1216	7.9	38.0	37.4	1.6
Phy-24-69	HUJM 23-4	1882	1330	29.3	1581	1042	23.2	14.5	12.7	12.4	1732	1287	34.6	1359	1143	15.9	36.9	38.8	-5.1
Phy-24-70	Radhika	1854	1348	27.3	1580	1042	44.7	16.2	11.7	27.8	2034	1009	101.6	1568	1100	29.8	39.0	40.3	-3.3
Phy-24-71	RH 2374	2345	1838	21.6	1565	1061	35.5	18.7	8.7	53.5	2082	1496	39.2	1458	1120	23.2	40.1	40.7	-1.5
Phy-24-72	RH 2370	1809	1323	26.9	1653	1199	16.5	19.0	14.8	22.1	2102	1273	65.1	1307	1170	10.5	39.8	38.1	4.4
Phy-24-73	BPM 11	1814	1353	25.4	1640	1238	24.7	17.5	14.6	16.6	2208	1199	84.2	1198	1141	4.7	40.1	38.8	3.1
Phy-24-74	DRMRDR 2141	2006	1722	14.2	1330	1142	14.6	20.0	12.9	35.5	2150	977	120.1	1062	1030	3.0	39.8	38.2	4.1
Phy-24-75	PM 26	1227	901	26.6	1545	672	60.4	16.6	11.4	31.3	1063	730	45.6	999	821	17.8	38.7	39.2	-1.1
Phy-24-76	DRMR 2017-27	2415	2100	13.0	1564	1318	8.6	15.0	12.4	17.3	2366	1828	29.4	1061	1003	5.4	42.9	41.8	2.7
Phy-24-77	Pusa MH 218	1565	1243	20.6	1260	1030	24.1	17.3	12.4	28.3	1822	1213	50.2	1164	1028	11.7	40.7	37.0	9.1
Phy-24-78	PRL 2022-1	2083	1540	26.1	1572	1257	17.3	14.1	12.0	14.9	2400	1234	94.5	1236	980	20.7	40.0	38.2	4.4
Phy-24-79	NPJ 277	1444	1159	19.8	1369	800	48.2	11.1	9.9	10.8	1473	813	81.2	1017	956	6.0	41.0	40.3	1.8
Phy-24-80	SVJH-78	2443	1943	20.5	1740	1254	22.2	15.9	12.8	19.5	1861	1062	75.2	1022	841	17.7	38.9	39.0	-0.3
Phy-24-81	DRMRCI-212	1993	1517	23.9	1632	1269	12.3	19.0	9.2	51.6	1880	784	139.8	1497	1220	18.5	40.4	39.1	3.4
Phy-24-82	NPJ 267	1572	1449	7.8	1603	1234	10.7	13.4	11.0	17.9	1798	954	88.5	1508	1097	27.2	39.9	39.4	1.2
Phy-24-83	KMR(L) 24-6	1699	1493	12.1	1593	1290	9.7	18.4	11.2	39.1	1994	828	140.8	1192	1029	13.7	41.0	37.1	9.4
Phy-24-84	PRL 2022-5	1329	1213	8.7	1753	1228	18.0	18.4	12.9	29.9	1916	949	101.9	1236	1018	17.6	38.9	38.4	1.4
Phy-24-85	DRMRDR 2195	1821	1709	6.1	1641	991	42.3	17.7	13.1	26.3	1812	1191	52.1	1286	984	23.5	39.9	40.7	-2.0
Phy-24-86	ORM 2019-30	1546	1464	5.3	1475	1232	25.0	20.4	11.6	43.1	1796	1106	62.4	1027	919	10.5	40.1	39.2	2.1
Phy-24-87	DRMR 2022-16	1802	1511	16.1	1488	989	27.7	20.7	10.4	49.8	2173	1131	92.1	1181	926	21.6	40.8	37.4	8.3
Phy-24-88	KMR(L) 24-5	1687	1330	21.1	1693	1178	34.2	11.2	8.2	26.8	1918	920	108.5	1089	981	9.9	37.2	38.8	-4.5
Phy-24-89	RGN 592	1763	1330	24.6	1409	1054	35.3	14.5	7.1	51.0	2048	722	183.7	1191	1102	7.5	37.2	37.6	-1.0
Phy-24-90	NPJ 276	1339	1233	7.9	1579	968	40.0	17.3	14.4	16.8	1220	653	86.8	1064	1028	3.4	37.9	37.6	0.7
Phy-24-91	RMWR 19-01	2211	1814	17.9	1482	1211	8.3	17.7	9.9	44.1	2479	1066	132.6	1262	1147	9.2	39.0	39.7	-1.9
Phy-24-92	DRMR 2019-19	1684	1458	13.4	1550	1109	31.7	20.5	11.9	42.0	1679	956	75.6	1463	1103	24.6	39.8	38.3	3.8
Phy-24-93	DRMR 2018-1	1917	1573	17.9	1524	1187	19.3	11.8	11.0	6.8	2329	1026	127.0	1230	958	22.1	39.2	37.0	5.6
Phy-24-94	DRMR-150-35	1891	1668	11.8	1490	1313	22.6	12.7	9.9	22.0	1728	1077	60.4	1437	1062	26.1	37.5	41.8	-11.4
Phy-24-95	TM 132-1	1354	1062	21.6	1370	1189	6.4	16.0	10.1	36.9	1559	713	118.7	1337	1013	24.2	40.0	38.6	3.4
Phy-24-96	DRMRIJ 22-2	1972	1433	27.3	1439	1178	23.6	16.2	12.3	24.1	2142	1049	104.2	1371	1169	14.7	42.1	40.1	4.8
Phy-24-97	NRCHB-101	2138	1715	19.8	1724	1060	34.4	17.4	12.8	26.4	2053	1010	103.3	1359	1321	2.8	41.1	37.7	8.1
	Mean	1800	1472		1529	1121		16.6	11.4		1920	1042		1248	1055				
CD(p=0.05)	E	120.3			30.9			G= 1.961			329.10			42.30					
	G	473.6			121.7			NS			276.90			169.40					
	E×G	NS			172.11			NS			228.90			239.60					

NS- Normal Sown; LS- Late Sown

Table 6.3.6: Effect of terminal heat stress on heat and yield indices

Code	Entries	HSI					YSI				
		BPR	DOL	HSR	MDR	LDH	BPR	DOL	HSR	MDR	LDH
Phy-24-67	RKM 599	0.34	0.74	1.16	1.23	0.90	0.94	0.80	0.64	0.44	0.81
Phy-24-68	NPJ 268	0.91	0.87	1.64	0.49	0.92	0.83	0.77	0.48	0.78	1.03
Phy-24-69	HUJM 23-4	1.61	1.28	0.39	0.56	0.84	0.71	0.66	0.88	0.74	1.00
Phy-24-70	Radhika	1.50	1.28	0.88	1.10	0.70	0.73	0.66	0.72	0.50	1.11
Phy-24-71	RH 2374	1.19	1.21	1.70	0.62	0.77	0.78	0.68	0.47	0.72	1.05
Phy-24-72	RH 2370	1.48	1.03	0.70	0.86	0.90	0.73	0.73	0.78	0.61	0.98
Phy-24-73	BPM 11	1.40	0.92	0.53	1.00	0.95	0.75	0.76	0.83	0.54	0.88
Phy-24-74	DRMRDR 2141	0.78	0.53	1.13	1.19	0.97	0.86	0.86	0.65	0.45	0.70
Phy-24-75	PM 26	1.46	2.12	1.00	0.68	0.82	0.73	0.43	0.69	0.69	0.53
Phy-24-76	DRMR 2017-27	0.72	0.59	0.55	0.50	0.95	0.87	0.84	0.83	0.77	0.68
Phy-24-77	Pusa MH 218	1.13	0.68	0.90	0.73	0.88	0.79	0.82	0.72	0.67	0.77
Phy-24-78	PRL 2022-1	1.43	0.75	0.47	1.06	0.79	0.74	0.80	0.85	0.51	0.78
Phy-24-79	NPJ 277	1.09	1.56	0.34	0.98	0.94	0.80	0.58	0.89	0.55	0.62
Phy-24-80	SVJH-78	1.13	1.05	0.62	0.94	0.82	0.80	0.72	0.81	0.57	0.55
Phy-24-81	DRMRCI-212	1.31	0.83	1.64	1.27	0.82	0.76	0.78	0.48	0.42	1.17
Phy-24-82	NPJ 267	0.43	0.86	0.57	1.03	0.73	0.92	0.77	0.82	0.53	1.06
Phy-24-83	KMR(L) 24-6	0.67	0.71	1.25	1.28	0.86	0.88	0.81	0.61	0.42	0.79
Phy-24-84	PRL 2022-5	0.48	1.12	0.95	1.10	0.82	0.91	0.70	0.70	0.50	0.81
Phy-24-85	DRMRDR 2195	0.34	1.48	0.84	0.75	0.77	0.94	0.60	0.74	0.66	0.81
Phy-24-86	ORM 2019-30	0.29	0.62	1.37	0.84	0.90	0.95	0.84	0.57	0.62	0.61
Phy-24-87	DRMR 2022-16	0.89	1.26	1.58	1.05	0.78	0.84	0.66	0.50	0.52	0.70
Phy-24-88	KMR(L) 24-5	1.16	1.14	0.85	1.14	0.90	0.79	0.70	0.73	0.48	0.69
Phy-24-89	RGN 592	1.35	0.94	1.62	1.42	0.93	0.75	0.75	0.49	0.35	0.84
Phy-24-90	NPJ 276	0.43	1.45	0.53	1.02	0.97	0.92	0.61	0.83	0.54	0.70
Phy-24-91	RMWR 19-01	0.99	0.68	1.40	1.25	0.91	0.82	0.82	0.56	0.43	0.93
Phy-24-92	DRMR 2019-19	0.74	1.07	1.33	0.94	0.75	0.87	0.72	0.58	0.57	1.04
Phy-24-93	DRMR 2018-1	0.99	0.83	0.22	1.22	0.78	0.82	0.78	0.93	0.44	0.76
Phy-24-94	DRMR-150-35	0.65	0.44	0.70	0.82	0.74	0.88	0.88	0.78	0.62	0.98
Phy-24-95	TM 132-1	1.19	0.49	1.17	1.19	0.76	0.78	0.87	0.63	0.46	0.87
Phy-24-96	DRMRIJ 22-2	1.50	0.68	0.77	1.12	0.85	0.73	0.82	0.76	0.49	1.03
Phy-24-97	NRCHB-101	1.09	1.44	0.84	1.11	0.97	0.80	0.61	0.74	0.49	1.15
	Mean	0.99	0.99	0.96	0.98	0.85	0.82	0.74	0.70	0.55	0.85

HSI - Heat Susceptibility Index; YSI - Yield Stability Index

Table 6.4.1: Effect of biostimulants on relative water content, membrane stability, LWR and CSI

Treatments	RWC (%)					MS		LWR				CSI			
	BPR	DOL	HSR	MDR	LDH	BPR	DOL	BPR	DOL	MDR	LDH	BPR	DOL	HSR	LDH
Control (No Spray)	78.4	72.3	67.4	71.4	52.4	55.3	65.9	23.5	24.0	36.8	34.6	-	-	-	-
Water spray	80.1	73.3	69.7	73.8	57.8	58.7	66.0	26.3	24.9	32.6	35.3	96.0	98.4	93.3	98.6
Sodium thiosulphate@3mM	81.4	80.4	75.5	73.7	72.9	62.3	78.6	31.2	35.1	32.7	35.7	82.9	87.5	86.7	79.7
Sodium thiosulphate@5mM	82.6	83.2	75.4	74.7	72.8	70.2	78.3	31.9	36.7	31.0	40.7	83.9	84.2	83.7	86.0
Seaweed@3ml	82.7	77.9	71.5	76.5	72.1	67.5	76.8	32.9	31.6	28.2	36.8	78.3	94.3	88.9	87.8
Seaweed@5ml	80.8	78.7	77.2	74.7	65.9	61.4	77.8	32.8	33.6	31.1	35.9	86.2	92.8	94.1	72.8
Orthosilicic@3ml	80.9	-	75.8	80.0	68.9	60.2	-	29.5	-	23.0	46.9	71.0	-	91.1	86.9
Orthosilicic@5ml	84.2	-	78.3	77.8	72.3	65.1	-	29.7	-	26.1	47.0	83.1	-	90.4	79.8
CD(p=0.05)	NS	6.1	2.7	NS	3.3	8.7	0.8	NS	3.3	5.2	2.7	-	-	-	-

Table 6.4.2: Effect of biostimulants on photosynthetic pigments (mg/g FW)

Treatments	Chl a (mg/gFW)				Chl b (mg/gFW)				Total Chl (mg/gFW)				Carotenoid (mg/gFW)			
	BPR	DOL	HSR	LDH	BPR	DOL	HSR	LDH	BPR	DOL	HSR	LDH	BPR	DOL	HSR	LDH
Control (No Spray)	0.52	1.17	1.28	0.70	0.100	0.53	0.32	0.111	0.62	2.19	1.60	0.81	0.036	0.161	0.460	0.189
Water spray	0.54	1.23	1.38	0.71	0.111	0.65	0.33	0.112	0.65	2.23	1.71	0.83	0.039	0.168	0.470	0.212
Sodium thiosulphate@3mM	0.63	1.55	1.48	0.81	0.119	0.78	0.36	0.216	0.75	2.50	1.84	1.02	0.046	0.340	0.520	0.265
Sodium thiosulphate@5mM	0.62	1.57	1.52	0.82	0.118	0.81	0.39	0.131	0.74	2.60	1.91	0.95	0.046	0.342	0.540	0.215
Seaweed@3ml	0.68	1.45	1.46	0.78	0.118	0.67	0.34	0.144	0.79	2.32	1.80	0.93	0.051	0.259	0.510	0.217
Seaweed@5ml	0.58	1.46	1.35	0.94	0.139	0.74	0.35	0.179	0.72	2.36	1.70	1.12	0.042	0.283	0.500	0.270
Orthosilicic@3ml	0.73	-	1.40	0.74	0.143	-	0.35	0.196	0.88	-	1.75	0.94	0.057	-	0.470	0.243
Orthosilicic@5ml	0.58	-	1.45	0.84	0.166	-	0.32	0.181	0.75	-	1.77	1.02	0.043	-	0.500	0.241
CD(p=0.05)	0.12	0.05	0.41	0.05	NS	0.06	0.05	0.02	0.14	0.16	0.05	0.09	NS	0.06	0.55	0.02

Table 6.4.3: Effect of biostimulants on siliquae on main shoot (SMS), total siliquae/plant, no. of seeds per siliqua and oil content

Treatments	Siliqua on main shoot					Total siliquae/plant					No. of seeds/siliqua					Oil Content (%)		
	BPR	DOL	HSR	MDR	LDH	BPR	DOL	HSR	MDR	LDH	BPR	DOL	HSR	MDR	LDH	BPR	HSR	MDR
Control (No Spray)	47	40	45	37	37	285	145	264	262	140	13.0	10.2	12.5	12.4	10.1	37.4	35.7	40.5
Water spray	47	41	47	39	37	316	151	274	286	140	14.2	10.3	12.8	14.3	10.5	43.7	37.9	41.3
Sodium thiosulphate@3mM	52	48	55	41	38	323	171	316	321	147	14.6	11.8	13.4	14.7	10.7	42.9	38.4	39.0
Sodium thiosulphate@5mM	53	50	57	40	39	326	259	337	318	151	14.9	12.4	13.9	15.6	12.2	41.4	39.0	41.2
Seaweed@3ml	52	45	52	41	40	371	158	298	328	152	14.6	10.8	12.5	15.3	12.4	42.6	38.9	41.3
Seaweed@5ml	49	46	53	39	38	318	184	282	322	144	14.8	11.9	12.8	16.1	11.9	40.3	38.4	42.7
Orthosilicic@3ml	52	-	57	43	40	416	-	315	350	167	15.3	-	13.1	15.3	12.2	41.2	39.5	39.8
Orthosilicic@5ml	53	-	56	43	46	335	-	347	340	164	14.8	-	14.2	16.4	12.7	40.7	38.9	39.7
CD(p=0.05)	NS	6.4	0.014	NS	3.34	NS	42	0.47	NS	3.2	NS	1.5	0.13	NS	1.0	-	0.006	-

Table 6.4.4: Effect of biostimulants on 1000 seed weight, biological yield, seed yield and B:C ratio

Treatments	1000 seed weight (g)					Biological yield (kg/ha)					Seed yield (kg/ha)					B:C Ratio		
	BPR	DOL	HSR	MDR	LDH	BPR	DOL	HSR	MDR	LDH	BPR	DOL	HSR	MDR	LDH	BPR	HSR	MDR
Control (No Spray)	4.0	5.1	5.1	5.3	4.3	5985	4230	435	5057	3567	1289	1592	2028	1631	1087	2.21	5.22	1.91
Water spray	3.9	5.2	5.3	5.4	5.1	6637	4316	477	5370	4071	1570	1639	2090	1723	1092	2.63	5.20	2.07
Sodium thiosulphate@3mM	4.6	5.7	5.5	5.5	6.4	7956	5169	485	5855	5093	1941	1808	2362	1815	1291	3.13	6.08	2.19
Sodium thiosulphate@5mM	4.6	5.9	6.0	5.6	6.1	8444	5618	523	6087	4336	2326	1860	2408	1884	1437	3.65	6.20	2.27
Seaweed@3ml	4.3	5.3	5.6	5.7	6.5	7096	4782	603	5770	5080	1719	1683	2396	1908	1498	2.05	5.42	2.39
Seaweed@5ml	4.4	5.6	5.5	5.7	5.7	7037	4964	508	6088	4736	1770	1702	2349	1984	1260	1.78	5.52	2.50
Orthosilicic@3ml	4.4	-	5.7	5.9	5.3	7237	-	458	6024	4462	1696	-	2259	1956	1425	1.93	5.02	2.51
Orthosilicic@5ml	4.3	-	6.1	6.0	6.3	7163	-	542	5936	5347	1881	-	2461	2069	1327	1.77	5.71	2.89
CD(p=0.05)	NS	0.45	NS	NS	0.35	NS	405	NS	679	494	NS	32	NS	NS	68	-	-	-

Table 6.5.1: Effect of microbes on membrane stability and relative water content

Treatment	Varieties	Membrane stability (%)						RWC (%)					
		HSR			LDH			HSR			LDH		
		NS	LS	Avg	NS	LS	Avg	NS	LS	Avg	NS	LS	Avg
Control	BPM 1825	76.1	68.3	72.2	60.4	57.6	59.0	77.7	69.9	73.8	80.2	66.9	73.6
	PBR 357	76.4	69.7	73.1	78.1	66.5	72.3	81.1	71.5	76.3	78.4	68.5	73.5
	RH 1975	75.7	73.2	74.5	68.1	62.4	65.3	81.6	69.5	75.5	78.7	72.7	75.7
Mean		**76.1**	**70.4**		**68.9**	**62.2**		**80.1**	**70.3**		**79.1**	**69.4**	
MC-I	BPM 1825	78.0	69.1	73.5	71.3	64.5	67.9	85.0	79.7	82.3	82.4	76.6	79.5
	PBR 357	76.1	73.3	74.7	77.1	70.4	73.7	86.0	80.0	83.0	81.5	72.4	77.0
	RH 1975	76.2	72.8	74.5	78.0	66.0	72.0	78.7	68.0	73.4	83.4	74.0	78.7
Mean		**76.8**	**71.7**		**75.5**	**66.9**		**83.2**	**75.9**		**82.4**	**74.3**	
Overall Mean		76.4	71.1		72.2	64.6		81.7	73.1		80.8	71.9	
CD(p=0.05)	E	1.17			1.22			0.81			2.52		
	C	0.85			1.22			0.65			1.38		
	E×C	0.86			NS			0.67			NS		
	V	0.56			2.14			0.74			NS		
	E×V	0.53			3.03			0.86			2.16		
	C×V	0.79			2.12			0.73			2.39		
	E×C×V	1.41			3.00			0.87			3.39		

NS- Normal Sown; LS- Late Sown; MC-I Microbial Consortium

Table 6.5.2: Effect of microbes on canopy temperature (^{0}C) and CTD (^{0}C)

Treatment	Varieties	CT (°C)						CTD (°C)					
		HSR			LDH			HSR			LDH		
		NS	LS	Avg	NS	LS	Avg	NS	LS	Avg	NS	LS	Avg
Control	BPM 1825	24.8	29.8	27.3	17.8	24.0	20.9	-3.20	-3.38	-3.3	-5.8	-1.9	-3.9
	PBR 357	27.1	30.4	28.8	17.5	23.4	20.4	-1.53	-2.80	-2.2	-6.2	-2.5	-4.3
	RH 1975	26.1	29.0	27.6	17.8	23.7	20.8	-2.27	-2.78	-2.5	-5.8	-2.2	-4.0
Mean		**26.0**	**29.7**		**17.7**	**23.7**		**-2.41**	**-2.09**		**-5.92**	**-2.20**	
MC-I	BPM 1825	29.0	20.5	24.8	19.0	23.4	21.2	-2.00	-2.87	-2.4	-4.6	-2.5	-3.6
	PBR 357	21.1	30.2	25.6	17.4	22.8	20.1	-2.80	-3.18	-3.0	-6.2	-3.1	-4.7
	RH 1975	21.7	31.0	26.4	18.9	22.8	20.8	-1.83	-3.08	-2.5	-4.8	-3.1	-3.9
Mean		**23.9**	**30.4**		**18.4**	**23.0**		**-3.31**	**-2.73**		**-5.18**	**-2.90**	
Overall Mean		21.8	24.6		18.1	23.4		-3.63	-2.83		-5.6	-2.6	
CD(p=0.05)	E	0.91			2.11			0.09			0.16		
	C	0.24			NS			0.05			0.17		
	E×C	0.33			0.36			0.08			0.28		
	V	0.38			NS			0.04			0.29		
	E×V	0.54			NS			0.05			0.42		
	C×V	0.66			0.45			0.06			0.29		
	E×C×V	0.96			NS			0.08			0.40		

NS- Normal Sown; LS- Late Sown; MC-I Microbial Consortium

Table 6.5.3: Effect of microbes on photosynthetic pigments (mg/g FW) at Hisar

Treatment	Varieties	Photosynthetic pigments (mg/g FW)											
		Chl a			Chl b			Total Chl			Carotenoids		
		NS	LS	Avg	NS	LS	Avg	NS	LS	Avg	NS	LS	Avg
Control	BPM 1825	2.02	1.74	1.88	0.36	0.37	0.37	2.39	2.12	2.25	0.40	0.37	0.39
	PBR 357	1.98	1.83	1.90	0.34	0.35	0.34	2.32	2.18	2.25	0.38	0.35	0.36
	RH 1975	2.26	1.76	2.01	0.28	0.35	0.31	2.54	2.11	2.32	0.35	0.30	0.32
Mean		**2.09**	**1.78**		**0.33**	**0.35**		**2.41**	**2.13**		**0.38**	**0.34**	
MC-I	BPM 1825	2.40	2.18	2.29	0.62	0.54	0.58	3.02	2.71	2.87	0.67	0.64	0.65
	PBR 357	2.45	2.20	2.33	0.54	0.53	0.53	2.99	2.73	2.86	0.62	0.58	0.60
	RH 1975	2.45	2.19	2.32	0.52	0.44	0.48	2.96	2.64	2.80	0.57	0.51	0.54
Mean		**2.43**	**2.19**		**0.56**	**0.50**		**2.99**	**2.69**		**0.62**	**0.58**	

Overall Mean		2.26	1.99		0.44	0.43		2.70	2.41		0.50	0.46	
CD(p=0.05)	E	0.025			0.009			0.008			0.007		
	C	0.012			0.007			0.005			0.006		
	E×C	0.009			0.009			0.009			0.007		
	V	0.005			0.005			0.004			0.004		
	E×V	0.007			0.008			0.008			0.006		
	C×V	0.008			0.008			0.008			0.006		
	E×C×V	0.150			0.012			0.011			0.009		

NS- Normal Sown; LS- Late Sown; MC-I Microbial Consortium

Table 6.5.4: Effect of microbes on photosynthetic pigments (mg/g FW) at Ludhiana

Treatment	Varieties	Photosynthetic pigments (mg/gFW)											
		Chl a			Chl b			Total Chl			Carotenoids		
		NS	LS	Avg	NS	LS	Avg	NS	LS	Avg	NS	LS	Avg
Control	BPM 1825	1.34	1.22	1.28	0.69	0.42	0.55	2.03	1.64	1.83	0.478	0.428	0.453
	PBR 357	1.35	1.27	1.31	0.64	0.47	0.56	1.99	1.75	1.87	0.465	0.443	0.454
	RH 1975	1.24	1.21	1.23	0.50	0.42	0.46	1.74	1.65	1.70	0.464	0.422	0.443
Mean		**1.31**	**1.23**		**0.61**	**0.44**		**1.92**	**1.68**		**0.469**	**0.431**	
MC-I	BPM 1825	1.40	1.28	1.34	0.70	0.52	0.61	2.44	1.79	2.12	0.504	0.449	0.477
	PBR 357	1.39	1.28	1.33	0.68	0.49	0.59	2.07	1.77	1.92	0.492	0.455	0.474
	RH 1975	1.35	1.23	1.29	0.98	0.45	0.71	2.33	1.66	1.99	0.477	0.423	0.450
Mean		**1.38**	**1.26**		**0.79**	**0.49**		**2.28**	**1.74**		**0.491**	**0.442**	
Overall Mean		1.35	1.25		0.70	0.46		2.10	1.71		0.480	0.436	
CD(p=0.05)	E	0.064			0.082			0.262			0.019		
	V	NS			0.016			NS			NS		
	ExV	NS			0.022			NS			NS		
	C	0.012			0.041			0.096			0.078		
	ExC	0.017			0.025			0.135			NS		
	VxC	0.021			0.024			0.105			0.014		
	ExVXC	0.299			0.351			0.234			NS		

NS- Normal Sown; LS- Late Sown; MC-I Microbial Consortium

Table 6.5.5: Effect of microbes on total siliquae per plant and 1000 seed weight

Treatment	Varieties	Total siliquae/plant						1000 Seed weight(g)					
		HSR			LDH			HSR			LDH		
		NS	LS	Avg	NS	LS	Avg	NS	LS	Avg	NS	LS	Avg
Control	BPM 1825	330.0	292.3	311.2	202.0	133.0	167.5	5.5	5.0	5.2	5.80	5.50	5.7
	PBR 357	360.0	319.5	339.8	189.0	132.0	160.5	5.1	4.7	4.9	5.20	5.10	5.2
	RH 1975	512.0	471.7	491.8	182.1	131.0	156.6	5.5	5.1	5.3	6.60	5.00	5.8
Mean		**400.7**	**361.2**		**191.0**	**132.0**		**5.4**	**4.9**		**5.87**	**5.20**	
MC-I	BPM 1825	311.0	278.5	294.8	228.0	160.0	194.0	5.3	4.8	5.0	5.80	5.60	5.7
	PBR 357	336.0	298.8	317.4	242.0	147.0	194.5	5.7	5.0	5.4	5.80	5.60	5.7
	RH 1975	410.0	362.0	386.0	200.7	133.0	166.8	6.0	5.4	5.7	6.90	5.70	6.3
Mean		**352.3**	**313.1**		**223.6**	**146.7**		**5.7**	**5.1**		**6.00**	**5.63**	
Overall Mean		376.5	337.1		207.3	139.3		5.5	5.0		5.93	5.42	
CD(p=0.05)	E	4.97			1.37			0.03			0.55		
	C	0.70			2.10			0.01			0.26		
	E×C	**1.89**			**0.16**			**0.05**			**0.22**		
	V	4.15			0.99			0.03			0.33		
	E×V	0.88			1.17			0.07			0.46		
	C×V	0.84			0.76			0.07			0.45		
	E×C×V	1.81			1.07			0.07			0.64		

NS- Normal Sown; LS- Late Sown; MC-I Microbial Consortium

Table 6.5.6: Effect of microbes on biological and seed yield

Treatment	Varieties	Biological yield (kg/ha)						Seed yield (kg/ha)					
		HSR			LDH			HSR			LDH		
		NS	LS	Avg	NS	LS	Avg	NS	LS	Avg	NS	LS	Avg
Control	BPM 1825	3600	3272	3436	3311	2222	2767	3351	2725	3038	1492	1211	1352
	PBR 357	4687	4336	4512	5378	2089	3733	3181	2652	2916	1288	1173	1231
	RH 1975	6100	5672	5886	2141	2626	2384	3500	3088	3294	1305	1193	1249
Mean		**4796**	**4427**		**3610**	**2312**		**3344**	**2822**		**1362**	**1192**	
MC-I	BPM 1825	3810	3416	3613	3007	4400	3704	3372	2923	3148	1584	1485	1535
	PBR 357	5196	4792	4994	5526	2970	4248	3221	2730	2976	1433	1339	1386
	RH 1975	6200	5976	6088	3504	2807	3155	3754	3293	3524	1816	1256	1536
Mean		**5069**	**4728**		**4012**	**3392**		**3449**	**2982**		**1611**	**1360**	
Overall Mean		4932	4577		3811	2852		3397	2902		1486	1276	
CD(p=0.05)	E	78.8			21.9			31.2			27.8		
	C	79.9			117.5			14.3			63.9		
	E×C	145.9			135.9			19.7			NS		
	V	87.8			32.9			15.3			84.9		
	E×V	120.0			68.3			18.9			101.5		
	C×V	144.8			141.5			21.1			87.4		
	E×C×V	197.5			281.9			42.7			110.5		

NS- Normal Sown; LS- Late Sown; MC-I Microbial Consortium

Biochemistry

7. Biochemistry

7.1 Evaluation of important breeding materials for Nutritional Quality Index (NQI) of oil.

Parameters: Oil content, Fatty acid profiling (palmitic, stearic, oleic, linoleic, linolenic, eicosanoic and erucic acid), ω6: ω3 ratio, Oil stability index, SFA: MUFA: PUFA, Saturated and unsaturated fatty acid ratio.
Centres: Bharatpur (BPR), Ludhiana (LDH), Hisar (HSR), Pantnagar (PNT)

7.1.1. Oil Content

Oil content of twenty-eight genotypes was analyzed at four centres i.e. Bharatpur, Pantnagar, Hisar and Ludhiana. It ranged from 35.75 (DRMR CI (Q) 181) to 41.08 (LES 68) % (Table 1).

7.1.2. Oil Stability Index

The ratio of MUFA: PUFA was analyzed at four centres i.e. Bharatpur (BPR), Ludhiana (LDH), Hisar (HSR), and Pantnagar (PNT). It ranged from 0.70 (RGN73) to 1.71 (PMAS 1604) (Table 2).

7.1.3. Fatty Acid Profile

Entries of IVT/AVT quality trials were analyzed for fatty acid profile (Table 3 to 9) at Bharatpur (BPR), Ludhiana (LDH, Hisar (HSR), Pantnagar (PNT). Entries were:
Palmitic acid: 2.29% (RH 749 (ZC)) to 4.61% (PDZ 11)
Stearic acid: 0.82% (RH 749 (ZC)) to 2.36% (PM 30 (NC))
Oleic acid: 13.63% (RH 749 (ZC)) to 49.71% (PMAS 1604)
Linoleic acid: 15.86% ((RH 749 (ZC)) to 40.31% (PDZ 11 (DLC))
Linolenic acid: 9.83% (DRMRCI (Q) 179) to 20.73 % (RH (OE) 1704)
Eicosanoic acid: 0.97% (LES 70) to 2.09% (Varuna)
Erucic acid: 0.11% (PDZ 23#) to 48.18% (RH 749 (ZC)
ω6: ω3 ratio: 1.10 (RH 749 (ZC)) to 3.76 (DRMRCI (Q) 179)
Saturated Fatty Acid: 3.20 (RH 749 (ZC)) to 6.30 (PDZ 23#)
MUFA: 42.96 (DRMRCI (Q) 181) to 58.54 GED 2$)
PUFA: 30.94 (RH 749 (ZC)) to 52.71 (PDZ 11 (DLC))
Saturated to unsaturated fatty acid ratio: 0.03 to 0.07
SFA: MUFA: PUFA Ratio: 01:05:05 (BPMQ 47 (Fillar) 01:21:09 (RGN 73)

7.2. Screening seed meal of promising breeding materials for value addition.

Parameters: Protein content, total antioxidant activity, beta carotene content and total sinapine content.
Centres: Bharatpur (BPR), Ludhiana (LDH, Hisar (HSR), Pantnagar (PNT) and Varanasi (BHU)
Protein content: 30.84 (Varuna) to 33.96 (RGN 73) % (Table 16)
Total antioxidant activity: 14.50 (DRMRCI (Q) 179) to 19.69 (LES 70) mg/g AAE (Table 17)
Beta carotene content: 3.35 (DRMRCI (Q) 179) to 4.90 (Varuna) % (Table 18)
Total sinapine content: 1.90 (PMAS 8) to 2.45 (PDZ 11 (DLC)) % (Table 19)

7.3. Screening of antinutritional factors in quality breeding materials.

Parameters: Total glucosinolates and phytic acid
Centres: Bharatpur (BPR), Ludhiana (LDH, Hisar (HSR), Pantnagar (PNT) and Varanasi (BHU)
Entries of IVT/AVT quality trials were evaluated.
Total glucosinolates (Table 20) mean values for five centres were < 30 µmol/g in genotypes PMAS 7 (22.95), GED-1$ (13.73 µmol/g), GED 2$ (16.00 µmol/g), DH-2'00'7G (17.74 µmol/g), PDZ 11 (DLC) (21.16 µmol/g), PMAS 1604 (27.80 µmol/g). The range was from 13.73 µmol/g (GED-1$) to 81.79 µmol/g (LES 71).
Phytic acid content (Table 21) ranged from 2.12 (RH (OE) 1704) to 3.07 (PDZ 11 (DLC)) %.

Table 1. Oil Content (%)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	36.81	35.4	37.65	36.04	36.47	0.97	0.03
2	Biochem-2-24	PM 30 (NC)	38.11	36.85	37.53	36.85	37.33	0.61	0.02
3	Biochem-3-24	BPMQ 47 (Fillar)	37.95	39.13	39.59	38.46	38.78	0.72	0.02
4	Biochem-4-24	RH (OE) 1702	40.68	38.92	40.55	41.07	40.30	0.95	0.02
5	Biochem-5-24	LES 70	40.38	38.15	38.85	37.48	38.71	1.24	0.03
6	Biochem-6-24	PM 34 (LR)	38.09	39.71	39.89	39.32	39.25	0.81	0.02
7	Biochem-7-24	PMAS 1604	40.28	40.61	40.54	42.06	40.87	0.80	0.02
8	Biochem-8-24	PDZ 22#	37.1	37.11	36.97	35.77	36.74	0.65	0.02
9	Biochem-9-24	PDZ 11 (DLC)	39.77	41.66	40.5	40.97	40.73	0.80	0.02
10	Biochem-10-24	PMAS 1602	40.55	41.81	40.42	40.26	40.76	0.71	0.02
11	Biochem-11-24	DRMRCI (Q) 197	38.99	39.1	39.72	37.04	38.71	1.16	0.03
12	Biochem-12-24	RH (OE) 1704	38.85	40.18	41.2	40.08	40.08	0.96	0.02
13	Biochem-13-24	DH-2'00'7G	36.61	35.57	37.72	35.57	36.37	1.03	0.03
14	Biochem-14-24	LES 71	36.18	35.59	36.87	35.04	35.92	0.79	0.02
15	Biochem-15-24	PDZ 23#	38.63	37.9	39.22	38.14	38.47	0.58	0.02
16	Biochem-16-24	RH 749 (ZC)	38.51	40.45	38.93	38.41	39.08	0.94	0.02
17	Biochem-17-24	LES 68	41.22	40.65	40.59	41.86	41.08	0.59	0.01
18	Biochem-18-24	RGN 73	39.25	41.28	38.57	36.72	38.95	1.88	0.05
19	Biochem-19-24	Varuna	38.76	40.27	39.23	38.67	39.23	0.73	0.02
20	Biochem-20-24	DRMRCI (Q) 172	37.88	38.79	37.83	36.13	37.66	1.11	0.03
21	Biochem-21-24	RH (OE) 1710	38.91	38.41	38.37	37.30	38.25	0.68	0.02
22	Biochem-22-24	PM 32 (LR)	37.09	38.25	38.73	37.75	37.96	0.70	0.02
23	Biochem-23-24	GED 2$	38.43	40.4	38.55	36.58	38.49	1.56	0.04
24	Biochem-24-24	DRMRCI (Q) 181	36.39	34.81	36.47	35.34	35.75	0.81	0.02
25	Biochem-25-24	DRMRCI (Q) 179	39.89	40.61	39.72	38.03	39.56	1.09	0.03
26	Biochem-26-24	GED-1$	40.5	40.89	39.18	36.05	39.16	2.20	0.06
27	Biochem-27-24	PMAS 7	38.12	39.07	38.63	36.75	38.14	1.01	0.03
28	Biochem-28-24	PMAS 8	39.34	39.02	38.83	34.75	37.99	2.17	0.06

Table 2. Oil Stability Index (OSI)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	1.39	1.43	1.73	1.34	1.47	0.18	0.12
2	Biochem-2-24	PM 30 (NC)	1.54	1.65	1.50	1.43	1.53	0.09	0.06
3	Biochem-3-24	BPMQ 47 (Fillar)	1.29	1.27	1.32	1.41	1.32	0.06	0.05
4	Biochem-4-24	RH (OE) 1702	1.36	1.47	1.27	1.39	1.37	0.08	0.06
5	Biochem-5-24	LES 70	1.44	1.69	1.39	1.43	1.49	0.14	0.09
6	Biochem-6-24	PM 34 (LR)	1.31	1.45	1.31	1.46	1.38	0.08	0.06
7	Biochem-7-24	PMAS 1604	1.75	1.44	1.89	1.74	1.71	0.19	0.11
8	Biochem-8-24	PDZ 22#	1.41	1.24	1.52	1.50	1.42	0.13	0.09
9	Biochem-9-24	PDZ 11 (DLC)	1.11	1.09	1.08	0.87	1.04	0.11	0.11
10	Biochem-10-24	PMAS 1602	1.19	1.37	1.60	1.28	1.36	0.18	0.13
11	Biochem-11-24	DRMRCI (Q) 197	1.05	1.32	1.14	1.02	1.13	0.14	0.12
12	Biochem-12-24	RH (OE) 1704	1.39	1.48	1.36	1.32	1.39	0.07	0.05
13	Biochem-13-24	DH-2'00'7G	1.60	1.29	1.54	1.69	1.53	0.17	0.11
14	Biochem-14-24	LES 71	1.41	1.37	1.41	1.49	1.42	0.05	0.04
15	Biochem-15-24	PDZ 23#	1.31	1.62	1.43	1.29	1.41	0.15	0.11
16	Biochem-16-24	RH 749 (ZC)	0.71	1.34	0.76	0.65	0.87	0.32	0.37
17	Biochem-17-24	LES 68	1.16	1.49	1.33	1.07	1.26	0.19	0.15
18	Biochem-18-24	RGN 73	0.69	0.71	0.76	0.64	0.70	0.05	0.07
19	Biochem-19-24	Varuna	0.87	1.52	0.84	0.82	1.01	0.34	0.33
20	Biochem-20-24	DRMRCI (Q) 172	1.23	1.29	1.32	1.12	1.24	0.09	0.07
21	Biochem-21-24	RH (OE) 1710	1.18	1.38	1.47	1.23	1.32	0.13	0.10
22	Biochem-22-24	PM 32 (LR)	1.50	1.46	1.52	1.36	1.46	0.07	0.05
23	Biochem-23-24	GED 2$	0.70	1.42	0.72	0.68	0.88	0.36	0.41
24	Biochem-24-24	DRMRCI (Q) 181	1.14	1.29	1.34	1.04	1.20	0.14	0.11
25	Biochem-25-24	DRMRCI (Q) 179	1.18	1.64	1.33	1.10	1.31	0.24	0.18
26	Biochem-26-24	GED-1$	0.64	1.69	0.64	0.58	0.89	0.54	0.60
27	Biochem-27-24	PMAS 7	1.11	1.61	1.37	1.24	1.33	0.21	0.16
28	Biochem-28-24	PMAS 8	1.37	1.50	1.73	1.30	1.48	0.19	0.13

Table 3. Palmitic Acid (%)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	3.43	3.74	3.59	4.68	3.86	0.56	0.15
2	Biochem-2-24	PM 30 (NC)	4.41	3.25	3.65	4.89	4.05	0.74	0.18
3	Biochem-3-24	BPMQ 47 (Fillar)	3.85	3.29	4.17	6.30	4.40	1.32	0.30
4	Biochem-4-24	RH (OE) 1702	3.99	4.86	3.7	4.90	4.36	0.61	0.14
5	Biochem-5-24	LES 70	4.35	3.44	3.8	4.24	3.96	0.42	0.11
6	Biochem-6-24	PM 34 (LR)	4.45	2.78	4.15	4.96	4.09	0.93	0.23
7	Biochem-7-24	PMAS 1604	3.78	3.68	3.58	4.48	3.88	0.41	0.11
8	Biochem-8-24	PDZ 22#	4.01	3.11	3.6	4.19	3.73	0.48	0.13
9	Biochem-9-24	PDZ 11 (DLC)	4.92	3.37	4.54	5.61	4.61	0.94	0.20
10	Biochem-10-24	PMAS 1602	3.89	3.74	3.73	4.15	3.88	0.20	0.05
11	Biochem-11-24	DRMRCI (Q) 197	3.97	3.38	3.82	4.88	4.01	0.63	0.16
12	Biochem-12-24	RH (OE) 1704	4.46	2.16	4.18	4.69	3.87	1.16	0.30
13	Biochem-13-24	DH-2'00'7G	4.31	2.29	3.23	5.03	3.72	1.20	0.32
14	Biochem-14-24	LES 71	3.96	3.41	3.45	4.18	3.75	0.38	0.10
15	Biochem-15-24	PDZ 23#	4.32	3.97	4.1	4.93	4.33	0.43	0.10
16	Biochem-16-24	RH 749 (ZC)	2.41	2.12	1.81	2.82	2.29	0.43	0.19
17	Biochem-17-24	LES 68	3.55	2.87	3.7	4.41	3.63	0.63	0.17
18	Biochem-18-24	RGN 73	2.38	2.02	2.1	2.68	2.30	0.30	0.13
19	Biochem-19-24	Varuna	2.89	2.3	2.92	3.25	2.84	0.40	0.14
20	Biochem-20-24	DRMRCI (Q) 172	3.97	3.45	3.42	4.64	3.87	0.57	0.15
21	Biochem-21-24	RH (OE) 1710	4.59	3.73	3.58	4.91	4.20	0.65	0.15
22	Biochem-22-24	PM 32 (LR)	3.98	3.89	3.24	4.04	3.79	0.37	0.10
23	Biochem-23-24	GED 2$	2.26	2.01	1.9	3.30	2.37	0.64	0.27
24	Biochem-24-24	DRMRCI (Q) 181	3.41	3.29	3.68	5.00	3.85	0.79	0.20
25	Biochem-25-24	DRMRCI (Q) 179	3.59	3.24	3.92	4.05	3.70	0.36	0.10
26	Biochem-26-24	GED-1$	3.41	3.78	1.9	4.93	3.01	1.25	0.36
27	Biochem-27-24	PMAS 7	3.99	3.89	4	5.06	4.24	0.55	0.13
28	Biochem-28-24	PMAS 8	3.16	3.38	3.62	4.34	3.63	0.51	0.14

Table 4. Stearic Acid (%)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	1.35	1.19	1.94	1.46	1.49	0.32	0.22
2	Biochem-2-24	PM 30 (NC)	1.98	2.6	2.77	2.09	2.36	0.39	0.16
3	Biochem-3-24	BPMQ 47 (Fillar)	1.33	1.23	2.54	1.82	1.73	0.60	0.35
4	Biochem-4-24	RH (OE) 1702	1.46	1.48	2.2	1.50	1.66	0.36	0.22
5	Biochem-5-24	LES 70	2.07	2.51	1.72	1.65	1.99	0.40	0.20
6	Biochem-6-24	PM 34 (LR)	1.45	1.56	0.94	1.74	1.42	0.34	0.24
7	Biochem-7-24	PMAS 1604	1.35	2.13	1.97	1.44	1.72	0.39	0.22
8	Biochem-8-24	PDZ 22#	1.84	1.09	1.85	1.58	1.59	0.36	0.22
9	Biochem-9-24	PDZ 11 (DLC)	1.23	1.42	1.65	0.72	1.26	0.40	0.32
10	Biochem-10-24	PMAS 1602	1.41	1.11	1.67	0.70	1.22	0.42	0.34
11	Biochem-11-24	DRMRCI (Q) 197	1.35	1.61	2.14	1.27	1.59	0.39	0.25
12	Biochem-12-24	RH (OE) 1704	1.35	1.19	1.96	1.18	1.42	0.37	0.26
13	Biochem-13-24	DH-2'00'7G	1.45	1.52	2.24	1.57	1.69	0.37	0.22
14	Biochem-14-24	LES 71	1.35	1.71	2.51	1.60	1.79	0.50	0.28
15	Biochem-15-24	PDZ 23#	1.41	2.85	2.35	1.29	1.97	0.75	0.38
16	Biochem-16-24	RH 749 (ZC)	0.98	1.03	0.89	0.39	0.82	0.30	0.36
17	Biochem-17-24	LES 68	1.45	1.35	2.49	1.23	1.63	0.58	0.36
18	Biochem-18-24	RGN 73	1.26	1.13	1.10	0.42	0.98	0.38	0.39
19	Biochem-19-24	Varuna	1.41	1.12	1.95	0.77	1.31	0.50	0.38
20	Biochem-20-24	DRMRCI (Q) 172	1.81	1.08	2.23	1.28	1.60	0.52	0.33
21	Biochem-21-24	RH (OE) 1710	1.52	2.33	2.51	1.37	1.93	0.57	0.30
22	Biochem-22-24	PM 32 (LR)	0.35	2.74	2.11	1.135	1.58	1.05	0.67
23	Biochem-23-24	GED 2$	1.41	1.1	1.97	0.685	1.29	0.54	0.42
24	Biochem-24-24	DRMRCI (Q) 181	1.38	2.06	2.11	1.11	1.67	0.50	0.30
25	Biochem-25-24	DRMRCI (Q) 179	1.53	2.31	2.67	1.38	1.97	0.62	0.31
26	Biochem-26-24	GED-1$	1.16	1.06	0.97	0.895	1.02	0.11	0.11
27	Biochem-27-24	PMAS 7	2.35	1.41	2.39	1.445	1.90	0.54	0.29
28	Biochem-28-24	PMAS 8	1.63	1.96	2.12	1.14	1.71	0.43	0.25

Table 5. Oleic Acid (%)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	45.38	46.15	50.75	45.49	46.94	2.56	0.05
2	Biochem-2-24	PM 30 (NC)	49.78	48.01	44.71	45.29	46.95	2.37	0.05
3	Biochem-3-24	BPMQ 47 (Fillar)	47.55	43.3	46.21	47.36	46.11	1.96	0.04
4	Biochem-4-24	RH (OE) 1702	45.53	45.12	41.15	43.19	43.75	2.01	0.05
5	Biochem-5-24	LES 70	46.9	49.03	44.21	45.88	46.51	2.02	0.04
6	Biochem-6-24	PM 34 (LR)	44.35	46.32	43.79	45.94	45.10	1.22	0.03
7	Biochem-7-24	PMAS 1604	49.73	48.79	50.45	49.85	49.71	0.69	0.01
8	Biochem-8-24	PDZ 22#	44.93	43.53	47.43	46.97	45.72	1.82	0.04
9	Biochem-9-24	PDZ 11 (DLC)	45.6	41.89	41.1	38.08	41.67	3.09	0.07
10	Biochem-10-24	PMAS 1602	40.38	45.47	47.66	46.25	44.94	3.17	0.07
11	Biochem-11-24	DRMRCI (Q) 197	41.36	44.21	42.46	40.62	42.16	1.56	0.04
12	Biochem-12-24	RH (OE) 1704	42.43	46.52	40.56	40.72	42.56	2.77	0.07
13	Biochem-13-24	DH-2'00'7G	46.53	42.1	46.12	47.74	45.62	2.45	0.05
14	Biochem-14-24	LES 71	44.76	44.32	44.99	45.68	44.94	0.57	0.01
15	Biochem-15-24	PDZ 23#	47.32	48.42	48.37	47.01	47.78	0.72	0.02
16	Biochem-16-24	RH 749 (ZC)	11.82	20.03	12.57	10.08	13.63	4.40	0.32
17	Biochem-17-24	LES 68	41.99	47.34	43.21	41.58	43.53	2.63	0.06
18	Biochem-18-24	RGN 73	11.33	13.17	12.63	10.61	11.94	1.17	0.10
19	Biochem-19-24	Varuna	15.35	45.29	14.1	15.26	22.50	15.20	0.68
20	Biochem-20-24	DRMRCI (Q) 172	45.48	45.37	45.14	43.04	44.76	1.15	0.03
21	Biochem-21-24	RH (OE) 1710	39.22	40.36	45.48	43.88	42.24	2.93	0.07
22	Biochem-22-24	PM 32 (LR)	46.86	41.05	45.38	43.70	44.25	2.49	0.06
23	Biochem-23-24	GED 2$	12.35	42.67	11.88	13.09	20.00	15.12	0.76
24	Biochem-24-24	DRMRCI (Q) 181	40.11	43.12	43.87	39.28	41.60	2.24	0.05
25	Biochem-25-24	DRMRCI (Q) 179	45.26	50.4	46.81	45.05	46.88	2.47	0.05
26	Biochem-26-24	GED-1$	12.39	46.06	10.36	13.24	20.51	17.07	0.83
27	Biochem-27-24	PMAS 7	38.35	47.81	44.9	43.08	43.54	3.97	0.09
28	Biochem-28-24	PMAS 8	44.41	46.19	50.45	47.09	47.04	2.53	0.05

Table 6. Linoleic Acid (%)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	32.66	32.17	29.39	34.13	32.09	1.98	0.06
2	Biochem-2-24	PM 30 (NC)	32.38	28.18	29.86	32.01	30.61	1.96	0.06
3	Biochem-3-24	BPMQ 47 (Fillar)	36.95	33.99	34.93	34.42	35.07	1.31	0.04
4	Biochem-4-24	RH (OE) 1702	33.43	30.01	32.34	31.51	31.82	1.44	0.05
5	Biochem-5-24	LES 70	32.65	28.6	31.72	32.05	31.25	1.81	0.06
6	Biochem-6-24	PM 34 (LR)	33.76	30.87	33.44	31.73	32.45	1.38	0.04
7	Biochem-7-24	PMAS 1604	28.36	29.62	26.71	28.67	28.34	1.21	0.04
8	Biochem-8-24	PDZ 22#	31.84	34.24	31.21	31.46	32.19	1.39	0.04
9	Biochem-9-24	PDZ 11 (DLC)	41.04	38.43	38.11	43.67	40.31	2.59	0.06
10	Biochem-10-24	PMAS 1602	34.02	31.22	29.86	36.21	32.83	2.84	0.09
11	Biochem-11-24	DRMRCI (Q) 197	39.23	33.16	37.34	39.99	37.43	3.06	0.08
12	Biochem-12-24	RH (OE) 1704	30.43	30.36	29.92	30.78	30.37	0.35	0.01
13	Biochem-13-24	DH-2'00'7G	29.16	32.68	29.86	28.32	30.00	1.89	0.06
14	Biochem-14-24	LES 71	31.85	31.45	31.96	30.73	31.50	0.56	0.02
15	Biochem-15-24	PDZ 23#	36.09	29.23	33.78	36.48	33.89	3.33	0.10
16	Biochem-16-24	RH 749 (ZC)	16.61	14.88	16.56	15.38	15.86	0.86	0.05
17	Biochem-17-24	LES 68	36.08	30.86	32.41	38.97	34.58	3.65	0.11
18	Biochem-18-24	RGN 73	16.54	18.62	16.67	16.50	17.08	1.03	0.06
19	Biochem-19-24	Varuna	17.73	17.87	16.86	18.55	17.75	0.69	0.04
20	Biochem-20-24	DRMRCI (Q) 172	36.92	35.98	34.25	38.32	36.37	1.71	0.05
21	Biochem-21-24	RH (OE) 1710	33.32	31.19	30.95	35.76	32.80	2.24	0.07
22	Biochem-22-24	PM 32 (LR)	31.15	30.08	29.95	32.19	30.84	1.05	0.03
23	Biochem-23-24	GED 2$	17.62	20.1	16.44	19.155	18.33	1.62	0.09
24	Biochem-24-24	DRMRCI (Q) 181	35.34	33.19	32.76	37.745	34.76	2.29	0.07
25	Biochem-25-24	DRMRCI (Q) 179	38.24	30.77	35.14	41.025	36.29	4.40	0.12
26	Biochem-26-24	GED-1$	19.44	21.32	16.09	22.82	19.92	2.90	0.15
27	Biochem-27-24	PMAS 7	34.42	29.65	32.67	34.89	32.91	2.37	0.07
28	Biochem-28-24	PMAS 8	32.30	30.02	29.16	36.25	31.93	3.17	0.10

Table 7. Linolenic Acid (%)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	11.48	12.89	12.78	13.94	12.77	1.01	0.08
2	Biochem-2-24	PM 30 (NC)	15.7	14.06	15.59	15.59	15.24	0.79	0.05
3	Biochem-3-24	BPMQ 47 (Fillar)	10.11	14.55	10.38	9.69	11.18	2.26	0.20
4	Biochem-4-24	RH (OE) 1702	18.06	14.26	18.35	18.67	17.34	2.07	0.12
5	Biochem-5-24	LES 70	15.32	13.87	16.7	16.19	15.52	1.24	0.08
6	Biochem-6-24	PM 34 (LR)	15.31	14.73	15.49	15.61	15.29	0.39	0.03
7	Biochem-7-24	PMAS 1604	14.87	15.2	13.17	14.71	14.49	0.90	0.06
8	Biochem-8-24	PDZ 22#	14.63	15.18	13.56	14.83	14.55	0.70	0.05
9	Biochem-9-24	PDZ 11 (DLC)	11.38	12.94	13.35	11.93	12.40	0.90	0.07
10	Biochem-10-24	PMAS 1602	11.41	14.08	12.83	12.10	12.61	1.14	0.09
11	Biochem-11-24	DRMRCI (Q) 197	13.63	15.54	12.58	13.11	13.72	1.29	0.09
12	Biochem-12-24	RH (OE) 1704	21.35	18.26	20.69	22.63	20.73	1.83	0.09
13	Biochem-13-24	DH-2'00'7G	16.98	18.9	17.3	17.35	17.63	0.86	0.05
14	Biochem-14-24	LES 71	16.26	15.86	15.24	17.24	16.15	0.84	0.05
15	Biochem-15-24	PDZ 23#	10.44	11.51	9.93	10.32	10.55	0.68	0.06
16	Biochem-16-24	RH 749 (ZC)	15.35	10.69	14.35	19.93	15.08	3.80	0.25
17	Biochem-17-24	LES 68	13.37	14.79	15.72	13.82	14.43	1.05	0.07
18	Biochem-18-24	RGN 73	15.42	14.25	11.6	18.02	14.82	2.66	0.18
19	Biochem-19-24	Varuna	15.67	18.3	11.15	18.37	15.87	3.39	0.21
20	Biochem-20-24	DRMRCI (Q) 172	11.35	11.62	11.33	11.59	11.47	0.15	0.01
21	Biochem-21-24	RH (OE) 1710	12.92	14.24	13.27	13.09	13.38	0.59	0.04
22	Biochem-22-24	PM 32 (LR)	15.45	15.35	18.25	18.94	17.00	1.87	0.11
23	Biochem-23-24	GED 2$	14.48	20.07	14.06	14.64	15.81	2.85	0.18
24	Biochem-24-24	DRMRCI (Q) 181	14.35	15.3	15.6	16.88	15.53	1.04	0.07
25	Biochem-25-24	DRMRCI (Q) 179	10.01	10.92	9.97	8.42	9.83	1.04	0.11
26	Biochem-26-24	GED-1$	12.41	17.13	14.07	11.40	13.75	2.51	0.18
27	Biochem-27-24	PMAS 7	12.45	13.96	12.11	14.43	13.24	1.13	0.09
28	Biochem-28-24	PMAS 8	12.88	15.35	13.18	11.19	13.15	1.71	0.13

Table 8. Eicosanoic Acid (%)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	0.35	3.14	1.30	0.00	1.20	1.41	1.17
2	Biochem-2-24	PM 30 (NC)	0.41	2.16	1.81	0.00	1.10	1.05	0.96
3	Biochem-3-24	BPMQ 47 (Fillar)	0.63	2.88	1.39	0.00	1.23	1.24	1.01
4	Biochem-4-24	RH (OE) 1702	0.07	3.24	1.30	0.00	1.15	1.51	1.31
5	Biochem-5-24	LES 70	0.89	1.48	1.50	0.00	0.97	0.70	0.73
6	Biochem-6-24	PM 34 (LR)	0.38	1.81	1.61	0.00	0.95	0.89	0.94
7	Biochem-7-24	PMAS 1604	0.17	2.32	2.25	0.00	1.19	1.27	1.07
8	Biochem-8-24	PDZ 22#	0	1.76	1.74	0.00	0.88	1.01	1.15
9	Biochem-9-24	PDZ 11 (DLC)	0.35	1.62	1.25	0.00	0.81	0.76	0.94
10	Biochem-10-24	PMAS 1602	0.31	1.9	2.46	0.00	1.17	1.20	1.03
11	Biochem-11-24	DRMRCI (Q) 197	0.58	1.04	1.27	0.00	0.72	0.56	0.78
12	Biochem-12-24	RH (OE) 1704	0.35	2. 34	1.51	0.00	0.62	0.79	1.27
13	Biochem-13-24	DH-2'00'7G	0.41	1.43	1.25	0.00	0.77	0.68	0.88
14	Biochem-14-24	LES 71	0.81	1.68	1.34	0.00	0.96	0.73	0.76
15	Biochem-15-24	PDZ 23#	0.02	3.28	1.20	0.00	1.13	1.54	1.37
16	Biochem-16-24	RH 749 (ZC)	2.27	7.05	5.30	1.15	3.94	2.71	0.69
17	Biochem-17-24	LES 68	0.03	1.28	1.33	0.00	0.66	0.75	1.13
18	Biochem-18-24	RGN 73	4.4	5.49	6.38	1.19	4.37	2.27	0.52
19	Biochem-19-24	Varuna	0.35	2.06	5.76	0.20	2.09	2.59	1.24
20	Biochem-20-24	DRMRCI (Q) 172	0.3	2.48	1.98	0.00	1.19	1.22	1.03
21	Biochem-21-24	RH (OE) 1710	0.75	2.08	2.26	0.00	1.27	1.08	0.85
22	Biochem-22-24	PM 32 (LR)	1.69	2.27	1.07	0.00	1.26	0.97	0.77
23	Biochem-23-24	GED 2$	0.35	2.51	5.24	1.53	2.41	2.08	0.87
24	Biochem-24-24	DRMRCI (Q) 181	0.31	2.14	1.25	0.00	0.93	0.97	1.05
25	Biochem-25-24	DRMRCI (Q) 179	0.41	1.78	1.22	0.00	0.85	0.80	0.94
26	Biochem-26-24	GED-1$	0.82	2.17	5.02	1.32	2.33	1.88	0.80
27	Biochem-27-24	PMAS 7	0.41	2.84	2.16	0.00	1.35	1.36	1.01
28	Biochem-28-24	PMAS 8	0.11	1.29	1.22	0.00	0.66	0.69	1.06

Table 9. Erucic Acid (%)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	0.11	0.71	0.25	0.30	0.34	0.26	0.75
2	Biochem-2-24	PM 30 (NC)	0.52	0.64	1.61	0.15	0.73	0.62	0.85
3	Biochem-3-24	BPMQ 47 (Fillar)	0.43	0.76	0.38	0.40	0.49	0.18	0.36
4	Biochem-4-24	RH (OE) 1702	0.01	0.33	0.96	0.24	0.39	0.41	1.06
5	Biochem-5-24	LES 70	0.31	0.69	0.35	0.00	0.34	0.28	0.84
6	Biochem-6-24	PM 34 (LR)	0.58	0.92	0.58	0.05	0.53	0.36	0.67
7	Biochem-7-24	PMAS 1604	0.31	0.85	1.87	0.88	0.98	0.65	0.67
8	Biochem-8-24	PDZ 22#	0	0.08	0.61	0.99	0.42	0.47	1.11
9	Biochem-9-24	PDZ 11 (DLC)	0.31	0.33	0	0.00	0.16	0.18	1.16
10	Biochem-10-24	PMAS 1602	0.41	0.48	1.79	0.61	0.82	0.65	0.79
11	Biochem-11-24	DRMRCI (Q) 197	0.51	0.82	0.39	0.00	0.43	0.34	0.79
12	Biochem-12-24	RH (OE) 1704	0.38	0.49	1.18	0.00	0.51	0.49	0.96
13	Biochem-13-24	DH-2'00'7G	0.22	1.08	0	0.00	0.33	0.51	1.58
14	Biochem-14-24	LES 71	0.12	0.57	0.51	0.25	0.36	0.21	0.59
15	Biochem-15-24	PDZ 23#	0.02	0.14	0.27	0.00	0.11	0.12	1.16
16	Biochem-16-24	RH 749 (ZC)	49.74	44.18	48.52	50.27	48.18	2.76	0.06
17	Biochem-17-24	LES 68	0.05	0.51	1.14	0.00	0.43	0.53	1.24
18	Biochem-18-24	RGN 73	45.8	45.29	49.52	50.60	47.80	2.65	0.06
19	Biochem-19-24	Varuna	39.81	1.02	47.26	43.60	32.92	21.48	0.65
20	Biochem-20-24	DRMRCI (Q) 172	0.45	0.72	1.65	1.14	0.99	0.52	0.53
21	Biochem-21-24	RH (OE) 1710	1.54	8.06	1.95	0.99	3.14	3.31	1.05
22	Biochem-22-24	PM 32 (LR)	0.35	6.62	0	0.00	1.74	3.26	1.87
23	Biochem-23-24	GED 2$	46.88	41.5	48.51	47.60	36.13	23.07	0.64
24	Biochem-24-24	DRMRCI (Q) 181	0.35	0.69	0.73	0.00	0.44	0.34	0.77
25	Biochem-25-24	DRMRCI (Q) 179	0.32	0.58	0.27	0.07	0.31	0.21	0.68
26	Biochem-26-24	GED-1$	38.82	41.4	51.59	45.42	34.30	22.56	0.66
27	Biochem-27-24	PMAS 7	0.52	0.44	1.77	1.10	0.96	0.62	0.64
28	Biochem-28-24	PMAS 8	0.78	1.05	0.25	0.00	0.52	0.48	0.92

Table 10. ω6 to ω3 Ratio

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	2.84	2.49	2.30	2.46	2.52	0.23	0.09
2	Biochem-2-24	PM 30 (NC)	2.06	2.08	1.92	2.11	2.04	0.08	0.04
3	Biochem-3-24	BPMQ 47 (Fillar)	3.65	2.34	3.37	3.54	3.23	0.60	0.19
4	Biochem-4-24	RH (OE) 1702	1.85	2.15	1.76	1.69	1.86	0.20	0.11
5	Biochem-5-24	LES 70	2.13	2.09	1.90	1.99	2.03	0.10	0.05
6	Biochem-6-24	PM 34 (LR)	2.21	2.16	2.16	2.03	2.14	0.08	0.04
7	Biochem-7-24	PMAS 1604	1.91	2.04	2.03	1.95	1.98	0.06	0.03
8	Biochem-8-24	PDZ 22#	2.18	2.32	2.30	2.12	2.23	0.10	0.04
9	Biochem-9-24	PDZ 11 (DLC)	3.61	2.97	2.85	3.67	3.28	0.43	0.13
10	Biochem-10-24	PMAS 1602	2.98	2.36	2.33	3.03	2.68	0.38	0.14
11	Biochem-11-24	DRMRCI (Q) 197	2.88	2.15	2.97	3.06	2.77	0.42	0.15
12	Biochem-12-24	RH (OE) 1704	1.43	1.72	1.45	1.36	1.49	0.16	0.11
13	Biochem-13-24	DH-2'00'7G	1.72	1.73	1.73	1.63	1.70	0.05	0.03
14	Biochem-14-24	LES 71	1.96	2.05	2.10	1.79	1.98	0.14	0.07
15	Biochem-15-24	PDZ 23#	3.46	2.59	3.40	3.55	3.25	0.44	0.14
16	Biochem-16-24	RH 749 (ZC)	1.08	1.39	1.15	0.77	1.10	0.26	0.23
17	Biochem-17-24	LES 68	2.70	2.15	2.06	2.84	2.44	0.39	0.16
18	Biochem-18-24	RGN 73	1.07	1.31	1.44	0.92	1.19	0.23	0.20
19	Biochem-19-24	Varuna	1.13	1.63	1.51	1.01	1.32	0.30	0.22
20	Biochem-20-24	DRMRCI (Q) 172	3.25	3.04	3.02	3.32	3.16	0.15	0.05
21	Biochem-21-24	RH (OE) 1710	2.58	2.05	2.33	2.74	2.43	0.30	0.12
22	Biochem-22-24	PM 32 (LR)	2.02	1.83	1.64	1.70	1.80	0.17	0.09
23	Biochem-23-24	GED 2$	1.22	1.50	1.17	1.31	1.30	0.15	0.11
24	Biochem-24-24	DRMRCI (Q) 181	2.46	2.18	2.10	2.26	2.25	0.15	0.07
25	Biochem-25-24	DRMRCI (Q) 179	3.82	2.82	3.52	4.87	3.76	0.85	0.23
26	Biochem-26-24	GED-1$	1.57	1.59	1.14	2.00	1.58	0.35	0.22
27	Biochem-27-24	PMAS 7	2.76	2.12	2.70	2.42	2.50	0.29	0.12
28	Biochem-28-24	PMAS 8	2.51	2.01	2.21	3.32	2.51	0.58	0.23

Table 11. MUFA (%)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	45.84	50	52.30	45.79	48.48	3.22	0.07
2	Biochem-2-24	PM 30 (NC)	50.71	50.81	48.13	45.44	48.77	2.54	0.05
3	Biochem-3-24	BPMQ 47 (Fillar)	48.61	46.94	47.98	47.76	47.82	0.69	0.01
4	Biochem-4-24	RH (OE) 1702	45.61	48.69	43.41	43.43	45.29	2.49	0.06
5	Biochem-5-24	LES 70	48.1	51.2	46.06	45.88	47.81	2.47	0.05
6	Biochem-6-24	PM 34 (LR)	45.31	49.05	45.98	45.98	46.58	1.68	0.04
7	Biochem-7-24	PMAS 1604	50.21	47.96	54.57	50.72	50.87	2.75	0.05
8	Biochem-8-24	PDZ 22#	44.93	45.37	49.78	47.96	47.01	2.28	0.05
9	Biochem-9-24	PDZ 11 (DLC)	46.26	43.84	42.35	38.08	42.63	3.44	0.08
10	Biochem-10-24	PMAS 1602	41.1	47.85	51.91	46.86	46.93	4.46	0.10
11	Biochem-11-24	DRMRCI (Q) 197	42.45	46.07	44.12	40.62	43.32	2.33	0.05
12	Biochem-12-24	RH (OE) 1704	43.16	49.35	43.25	40.72	44.12	3.68	0.08
13	Biochem-13-24	DH-2'00'7G	47.16	44.61	47.37	47.74	46.72	1.43	0.03
14	Biochem-14-24	LES 71	45.69	46.57	46.84	45.93	46.26	0.54	0.01
15	Biochem-15-24	PDZ 23#	47.36	51.84	49.84	47.01	49.01	2.27	0.05
16	Biochem-16-24	RH 749 (ZC)	63.83	71.26	66.39	61.50	65.75	4.18	0.06
17	Biochem-17-24	LES 68	42.07	49.13	45.68	41.58	44.62	3.52	0.08
18	Biochem-18-24	RGN 73	61.53	63.95	68.53	62.39	64.10	3.12	0.05
19	Biochem-19-24	Varuna	55.51	48.37	67.12	59.05	57.51	7.79	0.14
20	Biochem-20-24	DRMRCI (Q) 172	46.23	48.57	48.77	44.18	46.94	2.17	0.05
21	Biochem-21-24	RH (OE) 1710	41.51	50.5	49.69	44.87	46.64	4.23	0.09
22	Biochem-22-24	PM 32 (LR)	48.9	49.94	46.45	43.70	47.25	2.78	0.06
23	Biochem-23-24	GED 2$	59.58	46.72	65.63	62.22	58.54	8.26	0.14
24	Biochem-24-24	DRMRCI (Q) 181	40.77	45.95	45.85	39.28	42.96	3.45	0.08
25	Biochem-25-24	DRMRCI (Q) 179	45.99	52.76	48.3	45.12	48.04	3.42	0.07
26	Biochem-26-24	GED-1$	52.03	49.61	66.97	59.97	57.15	7.90	0.14
27	Biochem-27-24	PMAS 7	39.28	51.09	48.83	44.18	45.85	5.24	0.11
28	Biochem-28-24	PMAS 8	45.3	48.53	51.92	47.09	48.21	2.80	0.06

Table 12. PUFA (%)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	44.14	45.06	42.17	48.07	44.86	2.46	0.05
2	Biochem-2-24	PM 30 (NC)	48.08	43.24	45.45	47.59	46.09	2.22	0.05
3	Biochem-3-24	BPMQ 47 (Fillar)	47.06	48.54	45.31	44.11	46.26	1.95	0.04
4	Biochem-4-24	RH (OE) 1702	51.49	44.97	50.69	50.18	49.33	2.96	0.06
5	Biochem-5-24	LES 70	47.97	42.83	48.42	48.24	46.87	2.70	0.06
6	Biochem-6-24	PM 34 (LR)	49.07	46.6	48.93	47.33	47.98	1.21	0.03
7	Biochem-7-24	PMAS 1604	43.23	46.22	39.88	43.37	43.18	2.59	0.06
8	Biochem-8-24	PDZ 22#	46.47	50.42	44.77	46.29	46.99	2.41	0.05
9	Biochem-9-24	PDZ 11 (DLC)	52.42	51.37	51.46	55.59	52.71	1.98	0.04
10	Biochem-10-24	PMAS 1602	45.43	47.3	42.69	48.31	45.93	2.47	0.05
11	Biochem-11-24	DRMRCI (Q) 197	52.86	48.94	49.92	53.10	51.21	2.09	0.04
12	Biochem-12-24	RH (OE) 1704	51.78	49.62	50.61	53.41	51.36	1.63	0.03
13	Biochem-13-24	DH-2'00'7G	46.14	51.58	47.16	45.67	47.64	2.70	0.06
14	Biochem-14-24	LES 71	48.11	48.31	47.20	47.97	47.90	0.49	0.01
15	Biochem-15-24	PDZ 23#	46.53	41.34	43.71	46.80	44.60	2.58	0.06
16	Biochem-16-24	RH 749 (ZC)	31.96	25.59	30.91	35.31	30.94	4.03	0.13
17	Biochem-17-24	LES 68	49.45	46.65	48.13	52.79	49.26	2.62	0.05
18	Biochem-18-24	RGN 73	31.96	32.87	28.27	34.52	31.91	2.64	0.08
19	Biochem-19-24	Varuna	33.40	48.17	28.01	36.91	36.62	8.52	0.23
20	Biochem-20-24	DRMRCI (Q) 172	48.27	46.9	45.58	49.91	47.67	1.86	0.04
21	Biochem-21-24	RH (OE) 1710	46.24	43.43	44.22	48.85	45.69	2.42	0.05
22	Biochem-22-24	PM 32 (LR)	46.60	43.43	48.2	51.13	47.34	3.21	0.07
23	Biochem-23-24	GED 2$	32.10	50.17	30.5	33.79	36.64	9.12	0.25
24	Biochem-24-24	DRMRCI (Q) 181	49.69	48.69	48.36	54.62	50.34	2.91	0.06
25	Biochem-25-24	DRMRCI (Q) 179	48.25	41.69	45.11	49.45	46.13	3.48	0.08
26	Biochem-26-24	GED-1$	31.85	44.45	30.16	34.22	35.17	6.41	0.18
27	Biochem-27-24	PMAS 7	46.87	43.61	44.78	49.32	46.15	2.51	0.05
28	Biochem-28-24	PMAS 8	45.18	46.13	42.34	47.44	45.27	2.16	0.05

Table 13. Saturated Fatty Acid (%)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	4.78	4.93	5.53	6.14	5.35	0.62	0.12
2	Biochem-2-24	PM 30 (NC)	4.75	5.85	6.42	6.98	6.00	0.95	0.16
3	Biochem-3-24	BPMQ 47 (Fillar)	4.12	4.52	6.71	8.12	5.87	1.88	0.32
4	Biochem-4-24	RH (OE) 1702	4.37	6.34	5.9	6.40	5.75	0.95	0.16
5	Biochem-5-24	LES 70	4.82	5.95	5.52	5.88	5.54	0.52	0.09
6	Biochem-6-24	PM 34 (LR)	5.9	4.34	5.09	6.70	5.51	1.02	0.18
7	Biochem-7-24	PMAS 1604	5.13	5.81	5.55	5.91	5.60	0.35	0.06
8	Biochem-8-24	PDZ 22#	5.85	4.2	5.45	5.77	5.32	0.76	0.14
9	Biochem-9-24	PDZ 11 (DLC)	5.86	4.79	6.19	6.33	5.79	0.70	0.12
10	Biochem-10-24	PMAS 1602	5.3	4.85	5.4	4.85	5.10	0.29	0.06
11	Biochem-11-24	DRMRCI (Q) 197	5.32	4.99	5.96	6.15	5.61	0.54	0.10
12	Biochem-12-24	RH (OE) 1704	5.81	3.35	6.14	5.87	5.29	1.30	0.25
13	Biochem-13-24	DH-2'00'7G	5.76	3.81	5.47	6.60	5.41	1.17	0.22
14	Biochem-14-24	LES 71	5.31	5.12	5.96	5.78	5.54	0.39	0.07
15	Biochem-15-24	PDZ 23#	5.73	6.82	6.45	6.21	6.30	0.46	0.07
16	Biochem-16-24	RH 749 (ZC)	3.76	3.15	2.7	3.20	3.20	0.43	0.14
17	Biochem-17-24	LES 68	5	4.22	6.19	5.64	5.26	0.85	0.16
18	Biochem-18-24	RGN 73	4.03	3.15	3.2	3.09	3.37	0.44	0.13
19	Biochem-19-24	Varuna	4.3	3.42	4.87	4.02	4.15	0.60	0.15
20	Biochem-20-24	DRMRCI (Q) 172	5.78	4.53	5.65	5.92	5.47	0.64	0.12
21	Biochem-21-24	RH (OE) 1710	5.04	6.06	6.09	6.28	5.87	0.56	0.10
22	Biochem-22-24	PM 32 (LR)	4.33	6.63	5.35	5.17	5.37	0.95	0.18
23	Biochem-23-24	GED 2$	3.67	3.11	3.87	3.99	3.66	0.39	0.11
24	Biochem-24-24	DRMRCI (Q) 181	4.3	5.35	5.79	6.11	5.39	0.79	0.15
25	Biochem-25-24	DRMRCI (Q) 179	3.94	5.55	6.59	5.43	5.38	1.09	0.20
26	Biochem-26-24	GED-1$	4.67	5.84	2.87	5.83	4.80	1.40	0.29
27	Biochem-27-24	PMAS 7	6.34	5.3	6.39	6.51	6.14	0.56	0.09
28	Biochem-28-24	PMAS 8	4.79	5.34	5.74	5.48	5.34	0.40	0.08

Table 14. Saturated Fatty Acid: Unsaturated Fatty Acid Ratio

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	0.05	0.05	0.06	0.07	0.06	0.01	0.17
2	Biochem-2-24	PM 30 (NC)	0.05	0.06	0.07	0.07	0.06	0.01	0.15
3	Biochem-3-24	BPMQ 47 (Fillar)	0.04	0.05	0.07	0.09	0.06	0.02	0.35
4	Biochem-4-24	RH (OE) 1702	0.05	0.07	0.06	0.07	0.06	0.01	0.15
5	Biochem-5-24	LES 70	0.05	0.06	0.06	0.06	0.06	0.01	0.09
6	Biochem-6-24	PM 34 (LR)	0.06	0.05	0.05	0.07	0.06	0.01	0.17
7	Biochem-7-24	PMAS 1604	0.05	0.06	0.06	0.06	0.06	0.01	0.09
8	Biochem-8-24	PDZ 22#	0.06	0.04	0.06	0.06	0.06	0.01	0.18
9	Biochem-9-24	PDZ 11 (DLC)	0.06	0.05	0.07	0.07	0.06	0.01	0.15
10	Biochem-10-24	PMAS 1602	0.06	0.05	0.06	0.05	0.06	0.01	0.10
11	Biochem-11-24	DRMRCI (Q) 197	0.06	0.05	0.06	0.07	0.06	0.01	0.14
12	Biochem-12-24	RH (OE) 1704	0.06	0.03	0.07	0.06	0.06	0.02	0.31
13	Biochem-13-24	DH-2'00'7G	0.06	0.04	0.06	0.07	0.06	0.01	0.22
14	Biochem-14-24	LES 71	0.06	0.05	0.06	0.06	0.06	0.01	0.09
15	Biochem-15-24	PDZ 23#	0.06	0.07	0.07	0.07	0.07	0.01	0.07
16	Biochem-16-24	RH 749 (ZC)	0.04	0.03	0.03	0.03	0.03	0.01	0.15
17	Biochem-17-24	LES 68	0.05	0.04	0.07	0.06	0.06	0.01	0.23
18	Biochem-18-24	RGN 73	0.04	0.03	0.03	0.03	0.03	0.01	0.15
19	Biochem-19-24	Varuna	0.05	0.04	0.05	0.04	0.05	0.01	0.13
20	Biochem-20-24	DRMRCI (Q) 172	0.06	0.05	0.06	0.06	0.06	0.01	0.09
21	Biochem-21-24	RH (OE) 1710	0.06	0.06	0.06	0.07	0.06	0.01	0.08
22	Biochem-22-24	PM 32 (LR)	0.05	0.07	0.06	0.05	0.06	0.01	0.17
23	Biochem-23-24	GED 2$	0.04	0.03	0.04	0.04	0.04	0.01	0.13
24	Biochem-24-24	DRMRCI (Q) 181	0.05	0.06	0.06	0.07	0.06	0.01	0.14
25	Biochem-25-24	DRMRCI (Q) 179	0.04	0.06	0.07	0.06	0.06	0.01	0.22
26	Biochem-26-24	GED-1$	0.06	0.06	0.03	0.06	0.05	0.02	0.29
27	Biochem-27-24	PMAS 7	0.07	0.06	0.07	0.07	0.07	0.01	0.07
28	Biochem-28-24	PMAS 8	0.05	0.06	0.06	0.06	0.06	0.01	0.09

Table 15. SFA: MUFA: PUFA Ratio

S.No.	Code	Genotype	BPR	PNT	HSR	LDH
1	Biochem-1-24	DRMRCI (Q) 198	01:10:09	01:10:09	01:09:08	01:07:08
2	Biochem-2-24	PM 30 (NC)	01:11:10	01:09:07	01:07:07	01:06:08
3	Biochem-3-24	BPMQ 47 (Fillar)	01:12:11	01:10:11	01:07:07	01:05:05
4	Biochem-4-24	RH (OE) 1702	01:10:12	01:08:07	01:07:09	01:06:07
5	Biochem-5-24	LES 70	01:10:10	01:09:07	01:08:09	01:07:08
6	Biochem-6-24	PM 34 (LR)	01:08:08	01:11:11	01:09:10	01:07:08
7	Biochem-7-24	PMAS 1604	01:10:08	01:08:08	01:09:07	01:08:07
8	Biochem-8-24	PDZ 22#	01:08:08	01:11:12	01:09:08	01:08:08
9	Biochem-9-24	PDZ 11 (DLC)	01:08:09	01:09:11	01:07:08	01:06:08
10	Biochem-10-24	PMAS 1602	01:08:09	01:10:10	01:09:08	01:09:09
11	Biochem-11-24	DRMRCI (Q) 197	01:08:10	01:09:10	01:07:08	01:06:08
12	Biochem-12-24	RH (OE) 1704	01:07:09	01:14:15	01:07:08	01:06:09
13	Biochem-13-24	DH-2'00'7G	01:08:08	01:12:14	01:09:09	01:07:06
14	Biochem-14-24	LES 71	01:09:09	01:09:09	01:08:08	01:07:08
15	Biochem-15-24	PDZ 23#	01:08:08	01:08:06	01:08:07	01:07:07
16	Biochem-16-24	RH 749 (ZC)	01:17:09	01:23:08	01:24:11	01:19:11
17	Biochem-17-24	LES 68	01:08:10	01:12:11	01:07:08	01:07:09
18	Biochem-18-24	RGN 73	01:15:08	01:20:10	01:21:09	01:20:11
19	Biochem-19-24	Varuna	01:13:08	01:14:14	01:14:06	01:14:09
20	Biochem-20-24	DRMRCI (Q) 172	01:08:08	01:11:10	01:08:08	01:07:08
21	Biochem-21-24	RH (OE) 1710	01:08:09	01:08:07	01:08:07	01:07:07
22	Biochem-22-24	PM 32 (LR)	01:11:11	01:08:07	01:09:09	01:08:09
23	Biochem-23-24	GED 2$	01:16:09	01:15:16	01:17:08	01:15:08
24	Biochem-24-24	DRMRCI (Q) 181	01:09:12	01:09:09	01:08:08	01:06:08
25	Biochem-25-24	DRMRCI (Q) 179	01:12:12	01:10:08	01:07:07	01:08:09
26	Biochem-26-24	GED-1$	01:11:07	01:09:08	01:23:11	01:10:05
27	Biochem-27-24	PMAS 7	01:06:07	01:10:08	01:08:07	01:06:07
28	Biochem-28-24	PMAS 8	01:09:09	01:09:09	01:09:07	01:08:08

Table 16. Protein Content (%)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	VAR	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	33.08	31.98	32.62	32.08	29.76	32.44	0.51	0.02
2	Biochem-2-24	PM 30 (NC)	34.57	32.48	34.80	33.83	31.25	33.92	1.05	0.03
3	Biochem-3-24	BPMQ 47 (Fillar)	32.6	30.70	35.89	34.42	30.20	33.40	2.25	0.07
4	Biochem-4-24	RH (OE) 1702	33.04	32.09	34.25	33.25	30.25	33.16	0.89	0.03
5	Biochem-5-24	LES 70	33.17	33.07	33.01	32.08	29.54	32.83	0.51	0.02
6	Biochem-6-24	PM 34 (LR)	31.14	29.94	31.78	31.50	28.74	31.09	0.81	0.03
7	Biochem-7-24	PMAS 1604	32.98	31.76	34.89	35.00	25.66	33.66	1.57	0.05
8	Biochem-8-24	PDZ 22#	30.22	29.06	32.57	32.08	25.41	30.98	1.63	0.05
9	Biochem-9-24	PDZ 11 (DLC)	33.54	32.43	33.55	32.67	26.33	33.05	0.58	0.02
10	Biochem-10-24	PMAS 1602	32.94	32.49	32.08	31.50	31.20	32.25	0.61	0.02
11	Biochem-11-24	DRMRCI (Q) 197	33.85	33.02	33.71	33.25	32.62	33.46	0.39	0.01
12	Biochem-12-24	RH (OE) 1704	33.16	33.72	30.94	32.08	29.48	32.48	1.23	0.04
13	Biochem-13-24	DH-2'00'7G	30.87	30.98	32.14	31.50	30.65	31.37	0.58	0.02
14	Biochem-14-24	LES 71	32.95	33.1	32.55	35.00	27.45	33.40	1.09	0.03
15	Biochem-15-24	PDZ 23#	34.28	32.10	34.66	33.83	27.56	33.72	1.13	0.03
16	Biochem-16-24	RH 749 (ZC)	33.77	33.02	33.75	33.25	27.45	33.45	0.37	0.01
17	Biochem-17-24	LES 68	32.47	31.75	31.83	32.08	25.69	32.03	0.32	0.01
18	Biochem-18-24	RGN 73	34.21	33.35	33.87	34.42	31.24	33.96	0.47	0.01
19	Biochem-19-24	Varuna	30.32	29.00	31.95	32.08	32.65	30.84	1.46	0.05
20	Biochem-20-24	DRMRCI (Q) 172	33.18	33.20	32.79	34.42	29.85	33.40	0.71	0.02
21	Biochem-21-24	RH (OE) 1710	33.28	33.42	31.77	32.67	29.65	32.79	0.75	0.02
22	Biochem-22-24	PM 32 (LR)	32.15	30.94	33.21	33.25	29.84	32.39	1.09	0.03
23	Biochem-23-24	GED 2$	33.67	30.85	33.24	33.25	27.45	32.75	1.28	0.04
24	Biochem-24-24	DRMRCI (Q) 181	31.89	30.16	31.18	31.50	27.89	31.18	0.74	0.02
25	Biochem-25-24	DRMRCI (Q) 179	33.56	31.01	32.27	32.08	28.51	32.23	1.05	0.03
26	Biochem-26-24	GED-1$	33.67	30.07	33.82	32.67	28.63	32.56	1.74	0.05
27	Biochem-27-24	PMAS 7	35.66	33	34.56	34.42	30.28	34.41	1.09	0.03
28	Biochem-28-24	PMAS 8	30.32	30.48	31.38	32.67	30.36	31.21	1.08	0.03

Table 17. Total Antioxidant Capacity (mg/g AAE)

S.No.	S.No.	Genotype	BPR	PNT	HSR	LDH	VAR	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	14.08	17.93	12.56	15.30	20.36	16.05	3.11	0.19
2	Biochem-2-24	PM 30 (NC)	18.91	18.43	18.31	18.79	18.51	18.59	0.25	0.01
3	Biochem-3-24	BPMQ 47 (Fillar)	14.44	16.97	13.52	14.20	17.45	15.32	1.77	0.12
4	Biochem-4-24	RH (OE) 1702	18.77	17.29	19.74	18.54	17.62	18.39	0.97	0.05
5	Biochem-5-24	LES 70	20.76	17.70	21.13	21.64	17.23	19.69	2.06	0.10
6	Biochem-6-24	PM 34 (LR)	20.76	18.07	20.33	19.02	17.85	19.21	1.31	0.07
7	Biochem-7-24	PMAS 1604	18.27	18.53	17.29	17.06	18.52	17.93	0.71	0.04
8	Biochem-8-24	PDZ 22#	15.06	16.44	14.61	21.46	18.59	17.23	2.83	0.16
9	Biochem-9-24	PDZ 11 (DLC)	15.84	17.95	14.18	14.09	18.63	16.14	2.10	0.13
10	Biochem-10-24	PMAS 1602	17.15	17.47	16.86	15.07	18.47	17.00	1.24	0.07
11	Biochem-11-24	DRMRCI (Q) 197	14.92	17.97	13.53	14.92	15.22	15.31	1.62	0.11
12	Biochem-12-24	RH (OE) 1704	18.34	17.74	18.14	17.29	20.75	18.45	1.35	0.07
13	Biochem-13-24	DH-2'00'7G	12.77	18.41	12.34	14.49	21.36	15.87	3.89	0.25
14	Biochem-14-24	LES 71	16.82	18.58	15.89	18.30	17.45	17.41	1.10	0.06
15	Biochem-15-24	PDZ 23#	13.45	15.43	12.11	13.21	18.96	14.63	2.70	0.18
16	Biochem-16-24	RH 749 (ZC)	15.26	14.81	16.07	15.57	19.63	16.27	1.93	0.12
17	Biochem-17-24	LES 68	13.84	14.42	12.74	16.55	20.56	15.62	3.09	0.20
18	Biochem-18-24	RGN 73	17.27	16.73	17.03	15.91	21.45	17.68	2.17	0.12
19	Biochem-19-24	Varuna	16.43	19.46	14.77	20.39	21.54	18.52	2.83	0.15
20	Biochem-20-24	DRMRCI (Q) 172	16.43	17.30	14.35	17.02	15.63	16.15	1.19	0.07
21	Biochem-21-24	RH (OE) 1710	19.87	19.62	19.53	16.19	16.63	18.37	1.80	0.10
22	Biochem-22-24	PM 32 (LR)	19.88	18.34	20.69	14.46	16.23	17.92	2.57	0.14
23	Biochem-23-24	GED 2$	16.87	13.85	11.93	21.43	15.41	15.90	3.60	0.23
24	Biochem-24-24	DRMRCI (Q) 181	17.46	17.22	14.54	18.64	18.65	17.30	1.68	0.10
25	Biochem-25-24	DRMRCI (Q) 179	14.26	13.95	14.43	14.61	15.27	14.50	0.49	0.03
26	Biochem-26-24	GED-1$	13.69	18.57	10.76	14.20	16.98	14.84	3.04	0.20
27	Biochem-27-24	PMAS 7	13.56	18.35	13.19	14.44	15.47	15.00	2.07	0.14
28	Biochem-28-24	PMAS 8	16.49	17.27	16.27	16.57	15.36	16.39	0.69	0.04

Table 18. Beta Carotene (ppm)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	VAR	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	4.32	4.99	4.42	4.34	3.38	4.29	0.58	0.13
2	Biochem-2-24	PM 30 (NC)	4.16	4.12	4.79	3.98	3.54	4.12	0.45	0.11
3	Biochem-3-24	BPMQ 47 (Fillar)	4.99	5.14	4.39	4.09	4.12	4.55	0.49	0.11
4	Biochem-4-24	RH (OE) 1702	4.05	4.11	4.42	4.13	3.78	4.10	0.23	0.06
5	Biochem-5-24	LES 70	4.27	5.21	4.55	4.88	4.15	4.61	0.44	0.09
6	Biochem-6-24	PM 34 (LR)	3.51	4.29	3.88	2.79	3.73	3.64	0.55	0.15
7	Biochem-7-24	PMAS 1604	4.29	5.21	4.26	3.39	4.35	4.30	0.64	0.15
8	Biochem-8-24	PDZ 22#	4.08	4.25	3.84	2.98	4.36	3.90	0.55	0.14
9	Biochem-9-24	PDZ 11 (DLC)	4.71	5.39	4.53	3.81	4.42	4.57	0.57	0.12
10	Biochem-10-24	PMAS 1602	4.68	4.04	4.12	3.87	4.48	4.24	0.33	0.08
11	Biochem-11-24	DRMRCI (Q) 197	4.92	5.16	4.66	3.87	3.93	4.51	0.58	0.13
12	Biochem-12-24	RH (OE) 1704	5.17	5.08	5.71	4.79	3.45	4.84	0.85	0.17
13	Biochem-13-24	DH-2'00'7G	3.97	5.23	4.35	3.53	4.21	4.26	0.63	0.15
14	Biochem-14-24	LES 71	4.12	4.22	3.59	3.37	3.88	3.84	0.36	0.09
15	Biochem-15-24	PDZ 23#	4.18	5.07	4.53	3.77	4.99	4.51	0.55	0.12
16	Biochem-16-24	RH 749 (ZC)	4.08	4.23	3.84	3.21	4.56	3.98	0.51	0.13
17	Biochem-17-24	LES 68	4.27	5.34	4.66	4.14	4.92	4.67	0.49	0.10
18	Biochem-18-24	RGN 73	3.85	4.31	3.74	3.28	3.96	3.83	0.37	0.10
19	Biochem-19-24	Varuna	5.21	5.59	4.94	4.81	3.97	4.90	0.60	0.12
20	Biochem-20-24	DRMRCI (Q) 172	3.51	3.85	3.29	3.45	3.17	3.45	0.26	0.07
21	Biochem-21-24	RH (OE) 1710	4.56	5.77	4.18	4.54	3.01	4.41	0.99	0.22
22	Biochem-22-24	PM 32 (LR)	3.14	5.29	3.33	3.17	4.48	3.88	0.96	0.25
23	Biochem-23-24	GED 2$	3.17	4.24	3.08	3.25	4.42	3.63	0.64	0.18
24	Biochem-24-24	DRMRCI (Q) 181	4.33	5.20	4.31	3.77	4.13	4.35	0.53	0.12
25	Biochem-25-24	DRMRCI (Q) 179	3.11	3.28	3.22	3.89	3.27	3.35	0.31	0.09
26	Biochem-26-24	GED-1$	4.87	5.21	4.72	4.32	3.29	4.48	0.74	0.16
27	Biochem-27-24	PMAS 7	3.79	5.42	3.86	3.94	3.53	4.11	0.75	0.18
28	Biochem-28-24	PMAS 8	3.04	4.21	3.16	3.26	3.75	3.48	0.49	0.14

Table 19. Total Sinapine Content (%)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	VAR	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	1.84	1.76	1.56	1.42	3.00	1.64	0.19	0.12
2	Biochem-2-24	PM 30 (NC)	2.18	2.17	1.74	1.76	4.54	1.96	0.24	0.12
3	Biochem-3-24	BPMQ 47 (Fillar)	1.71	1.69	1.88	1.82	3.10	1.77	0.09	0.05
4	Biochem-4-24	RH (OE) 1702	1.56	1.44	1.91	2.08	3.92	1.75	0.30	0.17
5	Biochem-5-24	LES 70	1.92	2.03	1.81	1.76	5.46	1.88	0.12	0.06
6	Biochem-6-24	PM 34 (LR)	1.93	1.57	2.29	2.25	6.39	2.01	0.33	0.17
7	Biochem-7-24	PMAS 1604	1.87	1.85	1.84	1.81	5.75	1.84	0.02	0.01
8	Biochem-8-24	PDZ 22#	2.01	1.95	2.57	2.21	6.64	2.19	0.28	0.13
9	Biochem-9-24	PDZ 11 (DLC)	2.68	2.14	2.81	2.15	6.18	2.45	0.35	0.14
10	Biochem-10-24	PMAS 1602	2.17	2.26	2.11	2.03	5.34	2.14	0.10	0.04
11	Biochem-11-24	DRMRCI (Q) 197	1.87	2.16	1.75	1.75	3.88	1.88	0.19	0.10
12	Biochem-12-24	RH (OE) 1704	1.76	1.86	1.87	1.71	6.35	1.80	0.08	0.04
13	Biochem-13-24	DH-2'00'7G	1.75	2.0	1.96	2.01	6.21	1.93	0.12	0.06
14	Biochem-14-24	LES 71	2.11	1.83	1.86	1.86	6.64	1.91	0.13	0.07
15	Biochem-15-24	PDZ 23#	1.61	1.88	1.82	1.99	6.44	1.82	0.16	0.09
16	Biochem-16-24	RH 749 (ZC)	2.03	2.01	2.31	2.23	7.09	2.15	0.15	0.07
17	Biochem-17-24	LES 68	2.33	2.43	2.37	2.65	6.19	2.45	0.14	0.06
18	Biochem-18-24	RGN 73	1.53	1.96	1.62	1.57	6.44	1.67	0.20	0.12
19	Biochem-19-24	Varuna	2.17	2.26	2.33	2.23	6.52	2.25	0.07	0.03
20	Biochem-20-24	DRMRCI (Q) 172	1.98	2.08	2.11	2.11	3.33	2.07	0.06	0.03
21	Biochem-21-24	RH (OE) 1710	2.03	1.85	2.12	2.02	4.47	2.01	0.11	0.06
22	Biochem-22-24	PM 32 (LR)	1.49	1.65	1.57	1.55	4.24	1.57	0.07	0.04
23	Biochem-23-24	GED 2$	1.87	2.39	1.77	1.72	4.57	1.94	0.31	0.16
24	Biochem-24-24	DRMRCI (Q) 181	1.97	1.85	2.06	2.02	5.92	1.98	0.09	0.05
25	Biochem-25-24	DRMRCI (Q) 179	1.94	1.90	1.84	1.97	5.11	1.91	0.06	0.03
26	Biochem-26-24	GED-1$	2.11	2.09	1.93	2.00	4.95	2.03	0.08	0.04
27	Biochem-27-24	PMAS 7	2.17	1.88	2.15	2.02	3.65	2.05	0.13	0.07
28	Biochem-28-24	PMAS 8	1.95	2.02	1.86	1.76	5.27	1.90	0.11	0.06

Table 20. Total Glucosinolates (µmol/g)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	VAR	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	44.31	85.65	49.96	40.01	30.46	54.98	18.05	0.33
2	Biochem-2-24	PM 30 (NC)	66.55	68.46	76.74	70.32	25.26	70.52	3.83	0.05
3	Biochem-3-24	BPMQ 47 (Fillar)	22.92	41.55	27.78	28.75	38.45	30.25	6.89	0.23
4	Biochem-4-24	RH (OE) 1702	58.80	57.84	45.55	63.48	28.45	56.42	6.63	0.12
5	Biochem-5-24	LES 70	64.44	68.15	72.24	69.24	49.55	68.52	2.79	0.04
6	Biochem-6-24	PM 34 (LR)	50.38	54.80	62.81	65.36	48.30	58.34	6.02	0.10
7	Biochem-7-24	PMAS 1604	30.55	18.15	32.79	29.70	41.47	27.80	5.68	0.20
8	Biochem-8-24	PDZ 22#	36.91	34.20	31.19	33.12	41.32	33.86	2.07	0.06
9	Biochem-9-24	PDZ 11 (DLC)	20.10	16.20	20.59	27.74	36.59	21.16	4.16	0.20
10	Biochem-10-24	PMAS 1602	29.58	35.16	30.13	29.34	38.42	31.05	2.39	0.08
11	Biochem-11-24	DRMRCI (Q) 197	41.87	46.47	38.71	42.56	31.56	42.40	2.76	0.07
12	Biochem-12-24	RH (OE) 1704	63.37	66.82	47.85	62.83	28.94	60.22	7.30	0.12
13	Biochem-13-24	DH-2'00'7G	17.15	20.55	14.71	18.53	45.66	17.74	2.12	0.12
14	Biochem-14-24	LES 71	77.11	90.18	81.97	77.90	41.74	81.79	5.18	0.06
15	Biochem-15-24	PDZ 23#	30.20	27.15	31.31	33.34	38.31	30.50	2.24	0.07
16	Biochem-16-24	RH 749 (ZC)	50.04	50.81	69.78	69.58	30.46	60.05	9.63	0.16
17	Biochem-17-24	LES 68	64.23	75.13	52.22	67.43	52.45	64.75	8.25	0.13
18	Biochem-18-24	RGN 73	53.54	74.33	63.25	60.78	47.22	62.98	7.46	0.12
19	Biochem-19-24	Varuna	70.23	89.43	80.12	78.26	42.40	79.51	6.83	0.09
20	Biochem-20-24	DRMRCI (Q) 172	29.11	35.87	34.76	30.06	41.48	32.45	2.91	0.09
21	Biochem-21-24	RH (OE) 1710	57.14	71.05	68.13	53.11	51.25	62.36	7.44	0.12
22	Biochem-22-24	PM 32 (LR)	64.72	73.81	81.62	61.06	40.54	70.30	8.02	0.11
23	Biochem-23-24	GED 2$	15.48	14.62	16.20	17.68	40.24	16.00	1.12	0.07
24	Biochem-24-24	DRMRCI (Q) 181	52.57	85.66	61.47	58.84	48.96	64.64	12.56	0.19
25	Biochem-25-24	DRMRCI (Q) 179	35.91	45.86	37.25	43.73	48.32	40.69	4.20	0.10
26	Biochem-26-24	GED-1$	11.71	12.13	19.44	11.62	44.59	13.73	3.31	0.24
27	Biochem-27-24	PMAS 7	22.77	26.17	24.14	18.73	52.12	22.95	2.72	0.12
28	Biochem-28-24	PMAS 8	30.82	32.96	31.51	27.03	29.36	30.58	2.19	0.07

Table 21. Phytic Acid (%)

S.No.	Code	Genotype	BPR	PNT	HSR	LDH	VAR	Mean	SD	CV
1	Biochem-1-24	DRMRCI (Q) 198	2.01	2.14	2.44	2.03	2.52	2.23	0.24	0.11
2	Biochem-2-24	PM 30 (NC)	2.47	2.24	3.12	2.41	2.33	2.51	0.35	0.14
3	Biochem-3-24	BPMQ 47 (Fillar)	2.18	2.17	2.69	2.43	1.89	2.27	0.30	0.13
4	Biochem-4-24	RH (OE) 1702	2.42	2.17	2.74	2.75	1.92	2.40	0.36	0.15
5	Biochem-5-24	LES 70	2.98	2.57	3.25	3.30	2.68	2.96	0.33	0.11
6	Biochem-6-24	PM 34 (LR)	2.55	2.41	3.13	2.47	1.85	2.48	0.46	0.18
7	Biochem-7-24	PMAS 1604	2.04	2.15	2.66	2.44	1.98	2.25	0.29	0.13
8	Biochem-8-24	PDZ 22#	2.51	2.19	3.05	2.46	2.47	2.54	0.31	0.12
9	Biochem-9-24	PDZ 11 (DLC)	3.12	3.20	3.72	3.00	2.32	3.07	0.50	0.16
10	Biochem-10-24	PMAS 1602	2.05	2.29	2.91	2.51	2.35	2.42	0.32	0.13
11	Biochem-11-24	DRMRCI (Q) 197	2.23	2.34	2.42	2.39	2.72	2.42	0.18	0.08
12	Biochem-12-24	RH (OE) 1704	1.97	1.9	2.64	1.87	2.24	2.12	0.32	0.15
13	Biochem-13-24	DH-2'00'7G	2.97	2.13	3.25	2.83	2.25	2.69	0.48	0.18
14	Biochem-14-24	LES 71	2.43	2.65	3.11	2.88	2.19	2.65	0.36	0.14
15	Biochem-15-24	PDZ 23#	2.31	2.08	2.51	2.59	1.95	2.29	0.27	0.12
16	Biochem-16-24	RH 749 (ZC)	3.11	2.38	3.16	2.97	1.99	2.72	0.51	0.19
17	Biochem-17-24	LES 68	2.57	2.31	2.85	2.40	2.24	2.47	0.24	0.10
18	Biochem-18-24	RGN 73	2.59	2.41	3.27	2.89	2.12	2.66	0.44	0.17
19	Biochem-19-24	Varuna	2.05	2.81	3.23	2.65	1.95	2.54	0.54	0.21
20	Biochem-20-24	DRMRCI (Q) 172	2.25	2.61	2.94	2.55	1.98	2.47	0.37	0.15
21	Biochem-21-24	RH (OE) 1710	2.57	2.21	2.96	2.36	2.11	2.44	0.34	0.14
22	Biochem-22-24	PM 32 (LR)	1.89	1.96	2.48	1.96	2.74	2.21	0.38	0.17
23	Biochem-23-24	GED 2$	2.67	2.16	3.28	2.81	2.36	2.66	0.43	0.16
24	Biochem-24-24	DRMRCI (Q) 181	2.57	1.84	2.18	2.05	2.59	2.25	0.33	0.15
25	Biochem-25-24	DRMRCI (Q) 179	2.30	2.11	2.74	2.27	1.78	2.24	0.35	0.16
26	Biochem-26-24	GED-1$	2.62	2.10	3.31	2.78	2.36	2.63	0.46	0.17
27	Biochem-27-24	PMAS 7	2.53	2.63	2.29	2.92	2.78	2.63	0.24	0.09
28	Biochem-28-24	PMAS 8	2.98	2.23	3.08	3.39	2.11	2.76	0.56	0.20

Front Line Demonstrations

8. Frontline demonstrations

8.1 Distribution of frontline demonstrations

Under the scheme "Frontline demonstrations and other related activities of Oilseeds" funded under the NFSM-Oilseed by DAC&FW, Ministry of Agriculture and Farmers' Welfare, Govt. of India, 56 cooperating centres of AICRPRM/ ICAR institutes/ Ag. Universities conducted 10571 frontline demonstrations (FLDs) against the allocation of 10000 FLDs under irrigated as well as rainfed conditions on rapeseed (Toria, Yellow Sarson, Brown Sarson, Gobhi Sarson and Taramira), mustard (Indian Mustard) in 168 districts across 20 states during 2024-25.

Uttar Pradesh had maximum FLDs (2110) followed by Rajasthan (2013), Assam (1691) and Madhya Pradesh (1441), Jammu & Kashmir (545). Out of 56 FLDs conducting centres, 11 were in Assam, 10 in Uttar Pradesh, 09 in Rajasthan, 04 in Madhya Pradesh, 03 in Jharkhand, 02 each in

Bihar, Haryana, J & K, Punjab and one each in rest of the 11 states. Maximum districts (43) were covered in Uttar Pradesh followed by 18 in Rajasthan, 13 each in Assam and Madhya Pradesh, 12 in Haryana, 10 in J & K, 07 each in Maharashtra, Punjab and Uttarakhand, 06 each in Manipur and Odisha, 04 each in Bihar, Gujarat, Jharkhand and Himachal Pradesh, 03 each in Arunachal Pradesh and Chhattisgarh, 02 in Meghalaya and 01 each in Tripura and West Bengal. (Table 8.1). The sowing time from Sept. 15, 2024 (Uttarakhand and Uttar Pradesh) for Toria to Dec 26, 2025 (Meghalaya) for Toria.

8.2 Types of demonstrations

The 2199 FLDs on rapeseed and 8372 on mustard were conducted. Maximum 8372 FLDs were conducted on Indian mustard followed by Toria (1708), Gobhi Sarson (172), Yellow Sarson (115), Brown Mustard (104) and Taramira (100). All the demonstrations were conducted under whole package and components demonstrations in two different situations *viz*., irrigated (7586) and rainfed (2985). Variety-wise analysis was also done to see the performance of demonstrated improved varieties. There were 19 varieties of Indian mustard followed by 4 each of Toria and Gobhi Sarson and 3 of Yellow Sarson under irrigated condition. The 6 each varieties of Indian Mustard followed by 05 of Toria, 03 each of Gobhi Sarson and Taramira and 01 each of Yellow Sarson and Brown Sarson under rainfed condition (Table 8.2). The results included the mean seed yield (kg/ha) for both the improved plot (IP) with improved technology and the farmers' plot (FP) with farmers' practice, besides yield superiority of improved technology (%), cost of cultivation (CoC), gross monetary return (GMR) and additional net monetary return (ANMR) in Rs/ha from the IP and benefit: cost (B:C) ratio for both the IP and FP.

8.3 Whole package FLDs of rapeseed-mustard under rainfed condition

DoR, AAU, Shillongani (SHL), Organic Golaghat FPC (OGP FPC), Jasingfa FPC, Jaymati FPC, Luitporia, Na-Suruj FPC, Pahumara FPC, PUB-Kamrup FPC, Shyamol FPC, Uttaran FPC centres in Assam; CAU centres in Manipur; Meghalaya; Arunachal Pradesh and Tripura; GNSU centre in Bihar; Jobner (JOB) and Manjari (MNZR) centre in Rajasthan; Bhubaneswar (BHU) in Odisha; Chatha (CHT) and Khudwani (KHD) in J&K; Kanke, MASS and SISU centres in Jharkhand; Kangra (KGN) in Himachal Pradesh; Pantnagar (PNT) in Uttarakhand conducted 2985 FLDs on WP of rapeseed-mustard under rainfed condition (Table 8.3).

The maximum demonstrations (1487) were conducted in Assam on Indian Mustard (376) and Toria (1111) under rainfed condition with mean seed yield of 974 kg/ha in IP and 731 kg/ha in FP. IP had a yield advantage of 33.24% and ANMR of Rs 9,760/ha under rainfed condition. 460 demonstrations were conducted in Jharkhand on Indian Mustard (460) which recorded maximum yield advantage of 47.61% and maximum ANMR of Rs. 22,286/ha. The maximum yield improvement of 58.13% was recorded in Tripura with 49 FLDs on Toria with 914 Kg/ha in IP and ANMR of Rs. 12,212 followed by Odisha that recorded 50.09 % yield improvement in 40 FLDs in Toria with 755 kg/ha average seed yield in IP and ANMR of Rs. 10,999/ha under rainfed condition**.**

In Rajasthan, the maximum demonstration (156) were conducted on Indian Mustard (56) and Taramira (100) under rainfed condition with mean seed yield of 1459 kg/ha in IP and 1145 kg/ha in FP. IP had yield advantage of 27.42% and ANMR of 20,079/ha under rainfed condition. In Bihar, GNSU centre with average mean seed yield of 1,347 kg/ha in 31 FLDs on Indian Mustard recorded yield advantage of 4.58 % from IP with maximum ANMR of Rs. 2,319/ha.

The cost of cultivation of IP ranged from Rs. 14,502 /ha in Rajasthan to Rs 36,302 /ha in Tripura under rainfed condition. In rainfed condition, the IP also had higher B:C ratio in all states than that of FP. The highest B:C ratio for IP (6.0) in Rajasthan and lowest (1.49) in Tripura were recorded.

8.4 Whole package FLDs of rapeseed-mustard under irrigated condition

The whole package technology demonstration included use of improved variety, balanced use of fertilizers, proper spacing, use of micronutrients and need based plant protection and scientific cultural practices in comparison to farmers' practices of crop cultivation. DCM, IIRMR, VMFPCL, Kota, Manzari, SGN, JDH, Bharatkhand centres in Rajasthan; Varanasi, Kanpur, Banda, Jhansi, Agrimitra, AMITY, MB Trust, Bharatkhand, Biozone, DCM in Uttar Pradesh; Dholi and GNSU in Bihar; ZRAS Morena, Jhansi, Bharatkhand and Sujagrati in Madhya Pradesh; Kangra in Himachal Pradesh; DoR, AAU, Luitporia FPC, Organic Golaghat FPC, Jaymati FPO in Assam; Ludhiana and Abohar in Punjab; Chatha in J&K; Pantnagar in Uttarakhand; Nagpur in Maharashtra; Kalyani in West Bengal; Bhubaneswar in Odishaa and Jagdalpur in Chhattisgarh conducted 7166 FLDs on whole package of rapeseed-mustard under irrigated condition (Table 8.5).

The maximum FLDs (2110) were conducted in Uttar Pradesh where improved plot recorded average yield of 1,916 kg/ha with yield superiority of 28.33% and ANMR of Rs 22,667/ha.

Under irrigated condition, mean seed yield from IP ranged from 750 in Assam to 3,120 kg/ha in Uttar Pradesh, whereas from FP ranged from 450 in Assam to 2,830 kg/ha in Uttar Pradesh. The yield increase due to IP ranged from 8.72 % in Punjab to 79 % in Maharashtra.

For IP, Bihar had the highest cost of cultivation (Rs 40,754. /ha), while Chhattisgarh had the lowest cost of cultivation (Rs 11,411/ha).

The maximum ANMR (Rs 27,520/ha) was reported due to the improved WP of Indian mustard in Madhya Pradesh, while minimum was in Punjab (Rs 11,416 /ha). All IP had positive ANMR. The higher B:C ratio for the improved WP under irrigated condition observed in all the states. The highest B:C ratio of IP (5.49) was realized in Punjab (Table 8.4).

8.5 Varietal performance in Whole package FLDs of rapeseed-mustard under irrigated condition

An effort was also made to see the performance of demonstrated varieties in whole package demonstrations in different states under irrigated and rainfed condition.

8.5.1 Indian mustard

A total of 19 improved varieties of Indian mustard namely DRMR 1165-40, RH 725, DRMR 150-35, RH 749, Surekha, Radhika, Brijraj, Azad Mahak, TAM 108-1, PDKV Kartik, RLC 3, PBR 157, Giriraj, RH-761, CS-60, RH-1975, PHR 127, PR 20 and PR 21 were used in WP covering 11 states under irrigated condition (Table 8.5). Improved variety PBR 357 demonstrated in 100 FLDs in Punjab recorded highest average yield of 2,775 kg/ha with a yield improvement of 12% over local (FP) practice and ANMR of Rs 17,546 /ha followed by RH-749 demonstrated in 30 FLDs in Uttar Pradesh with average seed yield of 2,576 kg/ha. The maximum yield improvement 80% was recorded in Maharashtra with TAM-108-1 variety. The negative minimum yield improvement of -0.33 % was reported from RLC-3 variety in Punjab, while minimum average seed yield of 1,036 kg/ha was reported from PDKV Kartik variety in Nagpur.

The DRMR 150-35 variety was demonstrated in 6 states which recorded highest mean seed yield of 2,097 kg/ha with 21.21% yield improvement in West Bengal (200 FLDs) followed by 1,646 kg/ha with 19.36 % yield improvement in Bihar (171 FLDs) over FP.

The DRMR 1165-40 variety was demonstrated in 3 states which recorded highest mean seed yield of 2,367 kg/ha with 23.21% yield improvement in Madhya Pradesh (1396 FLDs) followed by 2,232 kg/ha with 12.61% yield improvement in Rajasthan (1120 FLDs) over FP.

The Brijraj variety was demonstrated in 3 states which recorded highest mean seed yield of 2,412 kg/ha with 39.42% yield improvement in Uttar Pradesh (106 FLDs) followed by 1,928 kg/ha with 30.35% yield improvement in Rajasthan (21 FLDs) over FP.

The RH 725 variety was also demonstrated in 2 states which recorded highest yield improvement of 11.43% with mean seed yield of 2,114 kg/ha in Rajasthan (300 FLDs) followed by 17.58% with mean seed yield of 1,799 kg/ha in Uttar Pradesh (395 FLDs) over FP.

The improved variety Radhika was also demonstrated in 2 states which recorded highest yield improvement of 15.9% with mean seed yield of 2,007 kg/ha in Rajasthan (90 FLDs) followed by 27.79 % with mean seed yield of 1,329 kg/ha in Uttar Pradesh (156 FLDs) over FP.

In Uttar Pradesh, nine improved varieties viz. RH 749, RH 725, Giriraj, Radhika, Brijraj, DRMR 150-35, DRMR-1165-40, Azad Mahak and Surekha were demonstrated in 2013 FLDs by 10 centres under irrigated condition. Out of which, improved variety RH-749 demonstrated in 30 FLDs in Uttar Pradesh recorded highest yield of 2,576 kg/ha with yield improvement of 48.55% over FP. In Uttar Pradesh, the improved variety DRMR 1165-40 was used in maximum demonstrations (709 FLDs), which recorded average seed yield of 2,012 kg/ha with yield improvement of 20.91%. The improved variety RH 725 was demonstrated in 395 FLDs, which recorded average seed yield of 1,799 kg/ha with yield improvement of 17.58%. The improved variety DRMR 150-35 was demonstrated in 274 FLDs, which recorded average seed yield of 1,526 kg/ha with yield improvement of 34.33%. The improved variety Radhika was demonstrated in 156 FLDs, which recorded average seed yield of 1,329 kg/ha with yield improvement of 27.79%. The improved variety Azad Mahak was demonstrated in 154 FLDs, which recorded average seed yield of 2,225 kg/ha with yield improvement of 42.9%. The improved variety Surekha was demonstrated in 152 FLDs, which recorded average seed yield of 2,156 kg/ha with yield improvement of 45.77%. The improved variety Brijraj was demonstrated in 106 FLDs, which recorded average seed yield of 2,412 kg/ha with yield improvement of 39.42%. The improved variety Giriraj was demonstrated in 40 FLDs, which recorded average seed yield of 2,533 kg/ha with yield improvement of 43.26%.

The seven improved varieties *viz.* DRMR 1165-40, RH-725, RH-761, Radhika, RH-1975, Brijraj and CS-60 were demonstrated in 1857 FLDs by eight centres in Rajasthan under irrigated condition. Out of which, improved variety DRMR 1165-40 was demonstrated in maximum demonstrations (1120 FLDs) conducted in Rajasthan recorded highest average yield of 2,232 kg/ha with yield improvement of 12.61% followed by RH 725 (300 FLDs), which recorded average seed yield of 2,114 kg/ha with yield improvement of 11.43% over FP. The improved variety RH-761 demonstrated in 270 FLDs, recorded 1,664 kg/ha average seed yield under IP with yield improvement of 11.52%. The improved variety Radhika demonstrated in 90 FLDs, recorded 2,004 kg/ha average seed yield under IP with yield improvement of 15.9%. The improved variety RH-1975 demonstrated in 38 FLDs, recorded 2,424 kg/ha average seed yield under IP with yield improvement of 10.13%. The improved variety CS-60(18) and Brijraj (21) demonstrated in FLDs, recorded 2,346 kg/ha and 1,928 kg/ha average seed yield under IP with yield improvement of 17.77% and 30.35 respectively.

In Madhya Pradesh, the improved variety DRMR 1165-40 demonstrated in 1396 FLDs by ZARS, Morena, Bharatkhand FPC, Sujagrati centres recorded highest mean seed yield of 2,367 kg/ha with yield improvement of 23.21%, while DRMR 150-35 demonstrated in 45 FLDs by Jhansi centre in Madhya Pradesh recorded mean seed yield of 1,433 kg/ha with yield improvement of 20.62%.

The three Improved variety of PBR 357, RLC-3 and PHR-127 were demonstrated in 134 FLDs by Abohar (ABH) and Ludhiana (LDH) Centre in Punjab. Out of Which, improved variety PBR 357 was demonstrated in maximum demonstration (100 FLDs) recorded highest average seed yield of 2,775 kg/ha with yield improvement of 12% followed by improved variety PHR 127 (26 FLDs), which recorded average seed yield of 2142 kg/ha with yield improvement of 3.57% over FP.

In, Maharashtra, the two Improved variety of TAM-108-1 and PDKV Kartik were demonstrated in 400 FLDs by Nagpur Centre. Out of which, improved variety TAM-108-1 was demonstrated in maximum demonstration (200 FLDs) recorded highest average seed yield of 1,056 kg/ha with yield improvement of 80.2% followed by improved variety PDKV Kartik (200 FLDs), which recorded average seed yield of 1,036 kg/ha with yield improvement of 77.39% over FP.

The two Improved variety of PR-20 and PR-21 were demonstrated in 23 FLDs by Pantnagar Centre in Uttarakhand. Out of which, improved variety PR-20 was demonstrated in maximum demonstration (09 FLDs) recorded highest average seed yield of 2,258 kg/ha with yield improvement of 12.45% followed by improved variety PR-21 (14 FLDs), which recorded average seed yield of 2,032 kg/ha with yield improvement of 14.02% over FP.

The yield improvement of 60.46% with mean seed yield of 1,587 kg/ha from Brijraj (264 FLDs) by Chatha centre was recorded in Jammu & Kashmir. In West Bengal, By Kalyani (KLN) centre the improved varieties DRMR-150-35 (200 FLDs) recorded 2,097 kg/ha average seed yield with 21.21% yield improvement, over FP. The DRMR-150-35 variety demonstrated in 200 FLDs in Jagdalpur (CG) was recorded 1,314 kg/ha average seed yield under IP with yield improvement of 42.82%. The DRMR-150-35 variety also demonstrated in 171 FLDs in Dholi (Bihar) and GNSU recorded 1,646 kg/ha average seed yield under IP with yield improvement of 19.36% while DRMR 150-35 vvariety demonstrated in 113 FLDs in Assam recorded 1,339 kg/ha average seed yield under IP with yield improvement of 45.22%.

The maximum ANMR (Rs 45,569/ha) was reported from RH-749 variety in Uttar Pradesh, while minimum (Rs. 4,544/ha) was from PHR 127 variety in Punjab. All IP had positive ANMR. The B:C ratio for all improved varieties under irrigated condition was higher. However, highest B:C ratio of IP (6.85) was realized from DRMR 150-35 variety in Chhattisgarh. (Table 8.5).

8.5.2 Yellow sarson

Pantnagar conducted 20 FLDs with PPS-1, 09 FLDs with Pant Sweta varieties of yellow sarson. The IP with PPS-1 and Pant Sweta had the average yield of 1,494 kg/ha and 1,482 kg/ha, respectively with yield improvement of 20.09% and 20.29%, respectively. Kanpur centre conducted 68 FLDs with Pitambari variety which recorded average yield of 2,133 kg/ha with maximum yield improvement of 40% and maximum ANMR of Rs. 32,128/ha from IP in Uttar Pradesh (Table 8.5).

8.5.3 Gobhi sarson

Ludhiana (72) and Kangra (17) centres conducted 89 FLDs using PGHS-2155, HPGS 1, HPGS 2 and GSC 7 variety of gobhi sarson (Table 8.5). The IP with PGHS-2155 had the recorded maximum average yield of 2,321 kg/ha with a yield improvement of 3.8 % and an ANMR of Rs 5,581 /ha in Punjab, while average seed yield of 1,918 kg/ha with a yield improvement of 7.93% and an ANMR of Rs 7,622 /ha was recorded from GSC-7 in Punjab. The three Iimproved variety of GSC 7, HPGS 1 and HPGS 2 were demonstrated in 17 FLDs by Kangra Centre in Himachal Pradesh. Out of which, improved variety GSC-7 was demonstrated in maximum (07 FLDs) recorded highest average seed yield of 1,465 kg/ha with yield improvement of 33.22% over FP while HPGS 2 variety (04 FLDs), which recorded maximum average seed yield of 1680 kg/ha with yield improvement of 48.67% over FP.

8.5.4 Toria

A total of 5 improved varieties of Toria namely Uttara (05 FLDs), Sushree (40 FLDs), Tapeshwari (10 FLDs), Azad Chetna (16 FLDs) and TS-38 (90 FLDs) were demonstrated across 4 states (Uttarakhand, Odisha, Uttar Pradesh and Assam) under irrigated condition (Table 8.5). Among these, Organic Golaghat FPC centre conducted 47 FLDs with TS-38 variety which recorded average yield of 981 kg/ha with yield improvement of 25.76% and ANMR of Rs. 8,423/ha from IP in Assam. Tapeshwari variety under IP at Kanpur centre recorded maximum average yield of 1,370 kg/ha with a yield improvement of 71.25 % and an ANMR of Rs 29,745/ha in Uttar Pradesh. Bhubaneshwar centre conducted 40 FLDs with Sushree variety which recorded average yield of 857 kg/ha with yield improvement of 56.38% and ANMR of Rs. 12375/ha from IP in Odisha. All demonstrated varieties had higher B:C ratio than that of FP (Table 8.5).

8.6 Varietal performance in Whole package FLDs of rapeseed-mustard under rainfed condition

8.6.1 Indian mustard

A total of 6 improved varieties of Indian mustard namely BBM-1, NRCHB 101, DRMR-150-35, Brijraj, Radhika and PR-20 were used in WP covering 7 states under rainfed condition (Table 8.6).

Kanke in Jharkhand conducted 260 FLDs with BBM-1 variety of Indian mustard under rainfed condition which showed highest average seed yield of 1,361 kg/ha with yield improvement of 59.55% in Jharkhand.

The improved variety of Brijraj demonstrated (29 FLDs) in Manzari (Rajasthan), which recorded maximum average seed yield of 1,930 kg/ha with maximum yield improvement of 29.87%, while the improved variety of NRCHB-101 (25 FLDs) recorded average seed yield of 996 kg/ha with yield improvement of 21.76 % in Manipur over FP.

The maximum ANMR (Rs 32,969 /ha) was reported in Rajasthan from Brijraj variety, while minimum (Rs. 2,319 /ha) was in GNSU Centre in Bihar from DRMR-150-35 variety. All IP had positive ANMR. The higher B:C ratio for all improved varieties under rainfed condition in all the states under IP was realized. The highest B:C ratio of IP (5.43) was realized from Brijraj variety in Manjari (Rajasthan). (Table 8.6).

8.6.2 Yellow Sarson

The improved variety PNT of toria was demonstrated (18 FLDs) in Uttarakhand under rainfed situations, which recorded highest mean seed yield of 1153 kg/ha with highest yield improvement of 27.68% over FP.

8.6.2 Toria

The improved variety TS 38, Sushree, PHT-1, PT-508 and Uttra of toria was demonstrated (1547 FLDs) in 7 states under rainfed situations, which recorded highest mean seed yield of 1229 kg/ha with highest yield improvement of 25.53% of PT-508 (05 FLDs) variety followed by 1120 kg/ha mean seed yield with yield improvement of 28.73 % of Uttra variety (05 FLDs) in Uttarakhand over FP. The maximum ANMR (Rs 17,698 /ha) from TS 38 variety was reported in Arunachal Pradesh, while minimum (Rs. 7,016 /ha) from TS-38 variety was in Assam. All IP had positive ANMR. (Table 8.6).

8.6.3 Brown sarson

Khudwani centre used Shalimar Sarson-2 variety of Brown Sarson in 104 demonstrations conducted in J&K under rainfed condition (Table 8.6). The IP demonstrations with Shalimar Sarson-2 had an maximum mean seed yield of 1,066 kg/ha against 920 kg/ha in FP with a yield improvement of 15.86% and ANMR of Rs. 54,740 /ha.

8.6.3 Gobhi sarson

Kangra centre used HPGS-1 (30 FLDs), HPGS-2 (09 FLDs), GSC 7 (44 FLDs) of gobhi sarson in 83 demonstrations conducted in Himachal Pradesh under rainfed condition (Table 8.6). The IP demonstrations with HPGS 2 had an average seed yield of 1,423 kg/ha against 1061 kg/ha in FP with a yield improvement of 34.11% and ANMR of Rs. 18,112 /ha.

8.6.4 Taramira

Jobner centre conducted 100 FLDs using RTM 1624, RTM 1351 and RTM 1355 varieties of taramira under rainfed situation of Rajasthan (Table 8.6). The demonstrations with RTM 1351 (35 FLDs) recorded an average seed yield of 1,193 kg/ha with a yield improvement of 21.85 % and an ANMR of Rs 10,507 /ha, while demonstrations with RTM 1355 (34 FLDs) and RTM 1624 (31 FLDs) recorded an average seed yield of 1,206 kg/ha and 1,196 kg/ha with a yield improvement of 28.43 % and 23.42 % and an each ANMR of Rs 13,386 /ha. and 53,295/ha, respectively.

8.7 Other component technology FLDs

8.7.1 Indian mustard

In irrigated condition, a total of 420 FLDs with 06 component technologies for Indian mustard were carried out by Bawal and Hisar (Haryana), SK Nagar (Gujarat), Bhubaneswar (Odisha). (Table 8.7).

Improved Varieties: Bawal centre conducted 40 demonstrations on this component using the RH 1424 variety. The seed yield increase was up to 11.30% with additional cost of Rs (-1623/ha) and additional net return of Rs 15,605/ha. The B:C ratio was 2.88 (IP) and 2.51 (FP).

Sulphur application (Gypsum @100 kg/ha): Bawal centre conducted 30 demonstrations on this component. The average seed yield increase was up to 8.70% with additional cost of Rs 456/ha and additional net return of Rs 10492/ha. The B:C ratio was 2.85 (IP) and 2.65 (FP).

Sclerotinia rot disease management: Hisar centre conducted 30 demonstrations using Seed treatment with two spray of Bavistine (carbendazim) @ 1 % solution at 45 and 65 DAS using RH 725 variety. This component with RH 725 variety showed an increase of 8.66% in seed yield, additional net return of Rs 9677/ha with an additional cost of Rs 1450/ha. The B:C ratio for IP (2.93) was higher than that of the FP (2.78).

Seed Treatment and Foliar Spray (Carbendazim): Hisar conducted 100 demonstrations on Seed treatment with carbendazim @ 2 g/kg seed and two foliar sprays of 0.1% carbendazim at 45 and 60 DAS using RH 1706 (02 FLDs), RH-725 (03 FLDs), RH 1424 (19 FLDs) and RH 1975 (76 FLDs) variety. This component with RH 1706 variety showed an increase of 19.1% in seed yield, additional net return of Rs 23,313/ha with an additional cost of Rs 1,975/ha. The B:C ratio for IP (4.01) was higher than that of the FP (3.54). This component with RH 1975 variety which showed an increase of 18.62 in seed yield, additional net return of Rs 22,037/ha with an additional cost of Rs 2,060/ha. The B:C ratio for IP (3.87) was higher than that of the FP (3.44).

Sulphur application: The SK Nagar centre used one components namely application of 40kg sulphur/ ha, using GM-6 variety and conducted 100 FLDs in Gujarat with GM-6 variety of Indian mustard. Among the application of sulphur had the maximum average yield of 2,209 kg/ha and also the maximum increase of 11% over FP with ANMR of Rs. 9,726/ha in response to additional expenditure of Rs. 3,185/ha.

Sulphur with plant protection measures in late sown irrigated condition: The Bhubaneshwar centre had conducted 120 FLDs with three combinations (Thiamethoxam 12.6% + Lambda-Cyhalothrin 9.5%) ZC, Appliocation of Flonicamid 50 WG@150g/ha and (Indoxacarb + novaluron) @625ml/ha) of technological components of Indian mustard using Sampoorna variety in Orissa (Table 8.7). The centre conducted 120 FLDs on application of recommended dose of sulpher with plant protection measures in late sown irrigated condition. All three component had an average yield of 1277 kg/ha with yield improvement of 51.3%. However, the maximum ANMR of Rs. 20,260/ha was recorded from the combination of application of sulphur with plant protection measures. The IP observed with the higher B:C ratio than the FP.

8.7 Exploitable yield reservoir in rapeseed-mustard

It is evident from the productivity potentials and profitability of improved rapeseed-mustard production technologies that there exists vast potential to improve the rapeseed-mustard productivity under real farm situations. An attempt was made to estimate the extent of such yield reservoir available for exploitation (Table 8.8). Yield gap-I as a result of demonstration of improved technology over farmers practices was ranging from 8.72 % in Punjab to 79% in Maharashtra, whereas, the yield gap-II (between IP and state average productivity) was ranging from 19.73% in Gujarat, to 272.60% in Odisha.

Exploitable production-1 (EP-I is the sum of State average production and production increased over State average production by bridging yield gap-I) and exploitable production-II (EP-II is the sum of State average production and production increased over State average production by bridging gap-II) were also worked out as indicated in Table 8.8.

It can be understood from the Table 8.8 that rapeseed-mustard productivity at national level could be improved by 30.45 and 72.37% by bridging the yield gaps-I and II, respectively. Similarly, the national rapeseed-mustard production could be increased from 125.31 to 149.43 and 172.57 lakh ton by bridging yield gaps I and II, respectively. This indicates the presence of significant yield reservoir which can be exploited through spread of appropriate technology among the farmers. Therefore, there is an urgent need for effective transfer of improved rapeseed-mustard production technologies to the rapeseed-mustard growers in order to convince them to adopt such technologies so that yield gaps can be bridged and rapeseed-mustard production in the country can be stepped up.

8.8 Training of field level extension workers and farmers under the programme of FLDs and other related activities

For upgrading the knowledge and skills of grass root extension workers of States Department of Agriculture about research developments in the field of rapeseed-mustard, 13 training programmes for extension workers / farmers of a days each were organized by ICAR-DRMR and AICRPRM centres during 2024-25 under this scheme.

In these programmes, a total of 366 farmer/extension personnel from State Department of Agriculture of Assam, Uttar Pradesh, Madhya Pradesh, Gujarat, Jammu & Kashmir participated and they were made aware of the new technologies advances in rapeseed-mustard cultivation so that they communicate the same to the farmers in the field.

State of participants	Organizing AICRPRM Centre	Place of Training	Dates	No. of participants
Training of Extension Personnel				
Gujarat	SK Nagar	Extension personnel at SK Nagar	31 Jan 2025-Feb 2025	21
J & K	Chatha	Main Campus	03-04 Feb 2025	11
Maharashtra	Nagpur	CAO, Nagpur	11-12 Feb 2025	26
Madhya Pradesh	ZARS, Morena	ZARS, Morena	27-28 Feb 2025	29
Uttar Pradesh	Varanasi	BHU, Varanasi	01-02 March 2025	20
Uttar Pradesh	RLBCAU, Jhansi	Jhansi	03-04 March 2025	30
Training of Farmers				
Assam	ICAR-IIRMR	KVK, Kamrup	07-08 Nov 2024	30
Assam	AAU, Jorhat	Neulgaon, Dhekorgarahunder, Jorhat	04-05 Dec 2024	30
Gujarat	SK Nagar	Farmers Training at SK Nagar	27-28 March 2025	36
J & K	Chatha	Main Campus	05-06 Feb 2025	32
Madhya Pradesh	ZARS, Morena	ZARS, Morena	25-26 feb 2025	51
Uttar Pradesh	Varanasi	BHU, Varanasi	07-08 Feb 2025	20
Uttar Pradesh	RLBCAU, Jhansi	Jhansi	03-04 March 2025	30
	Total			**366**

Table 8.1 State wise FLDs on rapeseed-mustard conducted during 2024-25

State	Centre(s)	Total FLDs	Districts covered	Crops	Period of Sowing 2024
Assam (ASM)	DoR, (AAU)	291	Lakhimpur, Nagaon, Kokrajhar, Jorhat	Toria	Nov 05- Dec 05
	Shillongani (SHL)	200	Nagaon, Hojai, Karbi Analog, Kamrup Metro, Kamrup Rural and Nalbari	Toria	Nov 15 -Nov 25
	OGP FPC	130	Golaghat	Toria Indian Mustard	Nov 7- Nov 25
	Jasingfa FPC	130	Darrang	Toria Indian Mustard	Nov 10- Dec 20
	Jaymati FPC	130	Sonitpur	Toria Indian Mustard	Nov11- Nov 20
	Luitporia FPC	130	Barpeta	Toria Indian Mustard	Nov 7- Nov 20
	Na-Suruj FPC	130	Darrang	Toria Indian Mustard	Nov 8- Dec 12
	Pahumara FPC	130	Barpeta	Toria Indian Mustard	Nov 12- Dec 25
	PUB-Kamrup FPC	130	Kamrup	Toria Indian Mustard	Nov 8- Nov 18
	Shyamol FPC	160	Sonitpur	Toria Indian Mustard	Nov 7- Nov 20
	Uttaran FPC	130	Kamrup	Toria Indian Mustard	Nov12- Nov 20
Arunachal Pradesh	CAU (IMP)	91	Namsai, Changlang, East Siang	Toria	Oct 15- Nov15
Bihar	Dholi	102	Muzzafarpur, Samstipur, Darbhanga	Indian Mustard	Oct 24-Nov30
	GNSU-NIAS	100	Rohtas	Indian Mustard	Oct 26-Nov 12
Chhattisgarh (CG)	Jagdalpur (JGD)	200	Bastar, Kanker, Balod	Indian Mustard	Oct 20-Nov 11
Gujarat (GUJ)	SK Nagar (SKN)	100	Banaskanta, Mehsana, Patan, Ahemdabad	Indian mustard	Oct 05- Oct 30
Haryana (HAR)	Hisar (HSR)	100	Jind, Sirsa, Hisar ,Bhiwani, Fatehabad, Ambala, Jhajjar, Mahendergarh,Charkhi Dadri, Karnal	Indian mustard	Oct 08-30
	Bawal (BAW)	100	Rewari, Gurugram, Mahendragarh	Indian mustard	Oct 15- 27
Himachal Pradesh (HP)	Kangra (KNG)	100	Kangra, Una, Hamirpur, Chamba	Gobhi sarson	Oct 10- Nov 09
Jammu & Kashmir (J&K)	Chatha (CHT)	441	Jammu, Samba, Kathua, Rajouri	Indian Mustard	Oct 20 -Nov 25
	Khudwani (KHW)	104	Anantnag, Budgam, Pulwama, Ganderbal, Kulgam and Kupwara	Brown Mustard	Oct-10- Nov 15
Jharkhand (JH)	KANKE	260	Ranchi , Khunti, Gumla	Indian Mustard	Nov 10-Dec 10
	MASS	100	Godda	Indian Mustard	Oct 28- Nov 15
	SISU	100	Ranchi	Indian Mustard	Oct 28- Nov 11
Madhya Pradesh (MP)	ZARS (MOR)	500	Morena, Bhind, Datia and Shivpuri, Gwalior	Indian mustard	Oct 10-Nov 15
	Jhansi (JHI)	45	Niwari	Indian mustard	Oct 25-Nov 24
	Sujagrati FPC	50	Morena	Indian mustard	Oct 15-30
	BCFPCL	846	Agar Malwa, Neemuch, Mandsaur, Ratlam, Ujjain, Shajapur	Indian mustard	Oct 02-25
Maharashtra (MH)	Nagpur (NGP)	400	Bhandara, Gondia, Nagpur, Chandrapur, Akola, Washim, Buldana	Indian mustard	Oct 15-Nov 15
Manipur (MAN)	CAU (IMP)	200	Imphal West, Imphal East, Thoubal, Kakching, Bishnupur, kangpopki	Indian mustard Toria	Nov 20 -Dec 20
Meghalaya (ML)	CAU (IMP)	50	East Garo Hills, North Garo Hills	Toria	Nov 18-Dec 26
Odisha	Bhubaneswar (BHU)	200	Koraput, Keonjhar, Cuttack, Mayurbhanja, Bhadrak, Balasore	Indian mustard Toria	Nov 07- Dec 16

Punjab (PUN)	Ludhiana (LDH)	106	Barnala, Bathinda, Fazilka, Hoshiarpur, Jalandhar, Ludhiana, Sangrur	Gobhi sarson Indian mustard	Oct 14- Nov 15
	Abohar (ABH)	100	Fazilka	Gobhi sarson	Oct 25-Nov 25
Rajasthan (RAJ)	IIRMR	101	Bharatpur, Deeg	Indian mustard	Oct 10-Oct 25
	Jodhpur (JDH)	200	Jodhpur, Pali, Balotara, Nagaur	Indian mustard	Oct 15-Oct 30
	Kota(KOT)	300	Kota, Baran, Jhalawar	Indian mustard	Oct 16-Oct 28
	Jobner (JOB)	100	Jaipur, Ajmer, Pali, Jodhpur	Taramira	Oct 8-Oct 31
	BCFPCL	990	Baran, Bundi, Jhalawar, Kota, Tonk, Pratapgarh	Indian mustard	Oct 17- Nov 30
	Sri Ganganagr (SGN)	100	Sri Ganganagr, Hanumangarh	Indian mustard	Oct 10- Oct 28
	Manzari Foundation (MNZ)	100	Dholpur	Indian mustard	Oct 28-Nov 11
	DCM	22	Jaipur, Alwar	Indian mustard	Oct 15-Nov 15
	VMFPCL	100	Bharatpur	Indian mustard	Oct 15- Oct 30
Tripura	CAU (IMP)	49	Sepahijala	Toria	Oct 15- Nov15
Uttar Pradesh (UP)	Agrimitra	100	Mirzapur	Indian mustard	Oct 15-28
	Amity Uni.	100	Gautam Budh Nagar, Bulandshahar	Indian mustard	Oct 12- Oct 28
	Biozone	100	Gorakhpur, Deoria, Kushi Nagar and Basti	Indian mustard	Oct 25- Nov 15
	Banda (BND)	400	Banda	Indian mustard	Oct 25-Nov 05
	Jhansi (JHI)	354	Jhansi, Lalitpur	Indian mustard	Oct 25-Nov 24
	Kanpur (KPR)	400	Unnao, Fatehpur, Kanpur Dehat, Kanpur Nagar, Gonda, Amethi, Pratapgarh, Hamirpur, Kannauj, Hardoi, Azamgarh,Lalitpur, Jalaun, Kaushanbhi, Jhashi, Bahraich, Gautambudh Nagar, Raibareily, Bulandsher, Saharanpur, Sahjhanpur, Brabanki, Sultanpur, Bariely, Auriya, Banda, Lucknow, Sonbhadra, Basti, Varanashi and Prayagraj , Mathura,	Indian mustard, Yellow Mustard Toria,	Sep 15-Oct 30
	BCFPCL	350	Varanasi, Ayodhya	Indian Mustard	Oct 30-Nov 11
	DCM	06	Mainpuri	Indian Mustard	Oct 15-Nov 15
	MB Trsut	100	Sant kabeer Nagar	Indian mustard,	Oct 29-Nov 27
	Varanasi (VAR)	200	Varanasi, Mirzapur, Jaunpur, Azamgarh, Gazipur, Chaundauli	Indian mustard	Oct 10-Nov 06
Uttarakhand (UK)	Pantnagar (PNT)	114	U.S. Nagar, Nainital, Almora, Champawat, Haridwar, Rudraprayag, Pauri Garhwal	Toria, Yellow Mustard, Indian Mustard	Sept 15-Nov.15
West Bengal (WB)	Kalyani (KLN)	200	Nadia	Indian mustard	Oct 20-Nov 10
20	**56**	**10571**	**168**	**6**	**Sept 15-Dec 26**

***Jhansi centre conducted FLDs in two states, viz. Uttar Pradesh and Madhya Pradesh**

*** in Chatha centre (Jammu & Kashmir) 200 FLDs were conducted with 441 farmers due to small land holdings**

*** in Kanke centre (Jharkhand) 200 FLDs were conducted with 260 farmers due to small land holdings**

Table 8.2 Frontline demonstrations conducted on rapeseed-mustard during 2024-25

Crop	FLDs (No)	Distribution of FLDs					
		Whole package		Varietal distribution (Total No. of Varieties)		Component	
		Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed
Toria	1708	161	1547	04	05	-	-
Gobhi sarson	172	89	83	04	03	-	-
Yellow sarson	115	97	18	03	01	-	-
Taramira	100	-	100	-	03	-	-
Indian Mustard	8372	6819	1133	19	06	420	-
Brown Mustard	104	-	104	-	01	-	-
Total	**10571**	**7166**	**2985**	**30**	**19**	**420**	**-**

Abbreviations used in the text and table: WP: whole package; IR: Irrigated; RF: Rainfed; YIOFP: Yield increase over farmer's practice; CoC: Cost of cultivation; GMR: Gross monetary return; ANMR: Additional Net Monetary Return; IP: Improved practices; FP: Farmers' Practices; B:C: Benefit: Cost;

Table 8.3 Performance of whole package FLDs on rapeseed-mustard under rainfed condition during 2024-25

State	Centre	Crops	FLDs	Mean yield (kg /ha)		YIOFP (%)	COC (Rs/ha)		GMR (Rs/ha)		ANMR (Rs/ha)	B: C Ratio	
				IP	FP		IP	FP	IP	FP		IP	FP
ASM	DoR, AAU (272) SHL (200) OGP FPC (52) Jasingfa FPC (130) Jaymati FPC (86) Luitporia (68) Na-Suruj FPC (130) Pahumara FPC (130) PUB-Kamrup FPC (130) Shyamol FPC (160) Uttaran FPC (130)	Toria (1111) Indian Mustard (376)	1487	974 (315-1346)	731 (300-1050)	33.24	32842	28143	57953	43494	9760	1.76	1.54
MAN	CAU (200)	Indian mustard (25), Toria (175)	200	996 (905-1075)	818 (735-970)	21.76	35743	36540	56227	46410	10614	1.57	1.27
ML	CAU(50)	Toria (50)	50	961 (888-1120)	760 (702-803)	26.44	19500	16600	57179	45636	8643	2.93	2.74
AP	CAU (91)	Toria (91)	91	803 (810-816)	467 (440-486)	72	22114	19820	47778	27786	17698	2.16	1.4
Bihar	GNSU (31)	Indian Mustard (31)	31	1347 (1288-1581)	1288 (1184-1396)	4.58	32410	33601	80146	76636	2319	2.47	2.28
TR	CAU (49)	Toria (49)	49	914 (789-1020)	578 (477-704)	58.13	36302	28522	54383	34391	12212	1.49	1.2
RAJ	JOB (100) MNZR (56)	Taramira (100) Indian Mustard (56)	156	1459 (1100-1985)	1145 (858-1500)	27.42	14502	15898	86810	68127	20079	6.00	4.29
ODH	BHU (40)	Toria (40)	40	755 (641-892)	503 (419-567)	50.09	23275	19280	44922	29928	10999	1.93	1.55
J&K	Chatha (177) Khudwani (104)	Indian Mustard (177) Brown Mustard (104)	281	1221 (825-1650)	868 (700-1050)	40.66	28185	23761	72649	51646	16579	2.57	2.17
JH	KANKE (260) MASS (100) SISU (100)	Indian Mustard (460)	460	1330 (974-1555)	901 (751-1180)	47.61	28826	25586	79135	53609	22286	2.74	2.09

HP	Kangra(83)	Gobhi sarson (83)	83	1279 (1082-1570)	1000 (818-1310)	27.9	32905	29795	76100	59500	13490	2.31	2.00
UK	PNT(57)	Toria (31) Indian Mustard (8) Yellow Mustard (18)	57	1118 (787-1525)	868 (537-1275)	28.8	29820	28583	66521	51646	13638	2.23	1.8

Figure in parenthesis is the number of FLDs conducted by the centre

Table 8.4 Performance of whole package FLDs on rapeseed-mustard under irrigated condition during 2024-25

State	Centre	Crops	FLDs	Mean yield (kg /ha)		YIOFP (%)	COC (Rs/ha)		GMR (Rs/ha)		ANMR (Rs/ha)	B: C Ratio	
				IP	FP		IP	FP	IP	FP		IP	FP
RAJ	DCM (22) IIRMR (101) VMFPCL (100) Kota (300) Manzari (44) SGN (100) JDH (200) Bharatkhand (990)	Indian Mustard (1857)	1857	2121 (1240-2680)	1884 (1350-2320)	12.57	33404	31078	126199	112098	11775	3.77	3.60
UP	VAR (200) KPR (400) BND (400) JHI (354) Agrimitra (100) Amity (100) MB Trust (100) Bharatkhand (350) Biozone (100) DCM (06)	Indian Mustard (2016) Yellow sarson (68) Toria (26)	2110	1916 (900-3120)	1493 (860-2830)	28.33	32152	29650	114002	88833	22667	3.54	2.99
Bihar	DHOLI (102) GNSU (69)	Indian Mustard (171)	171	1646 (1351-2039)	1379 (1201-1605)	19.36	40754	37960	97937	82050	13093	2.4	2.16
MP	ZRAS (500) JHI (45) Bharatkhnad (846) Sujagrati (50)	Indian Mustard (1441)	1441	2338 (1300-2678)	1898 (1200-2260)	23.18	28344	29684	139111	112931	27520	4.9	3.8
HP	Kangra (17)	Gobhi Sarson (17)	17	1552 (1395-1878)	1112 (946-1245)	39.56	35201	30848	92344	66164	21827	2.62	2.14

ASM	DoR, AAU (19) Luitporia FPC (62) OGP FPC (78) Jaymati FPO (44)	Toria (90) Indian Mustard (113)	203	1210 (750-1524)	800 (450-1250)	51.25	31851	27053	71995	47600	19597	2.26	1.75
PUN	LDH (106) ABH (100)	Gobhi Sarson (72) Indian mustard (134)	206	2418 (1550-3000)	2224 (1400-2650)	8.72	26166	26039	143871	132328	11416	5.49	5.08
J&K	CHT (264)	Indian mustard (264)	264	1587 (1250-1760)	989 (780-1180)	60.46	20328	14100	94426	58845	29353	4.65	4.17
UK	PNT (57)	Indian Mustard (23) Yellow Sarson (29) Toria (5)	57	1732 (1015-2550)	1482 (765-2300)	16.86	31637	29896	103054	88179	13134	3.25	2.94
MH	NGP (400)	Indian mustard (400)	400	1046 (783-1273)	585 (375-728)	79.00	17500	12500	62237	34807	22430	3.5	2.7
WB	KLN (200)	Indian Mustard (200)	200	2097 (1760-2500)	1730 (1350-2010)	21.21	33900	32500	124771	102935	20436	3.68	3.16
ODH	BHU (40)	Toria (40)	40	857 (751-967)	548 (483-611)	56.38	27737	21767	50951	32606	12375	1.83	1.49
CG	JGDL (200)	Indian Mustard (200)	200	1314 (1070-1510)	920 (570-1070)	42.82	11411	9911	78183	54740	21943	6.85	5.52

Table 8.5 Variety-wise performance in whole package FLDs on rapeseed-mustard under Irrigated conditions during 2024-25

State	Centre	Varieties	FLDs	Mean yield (kg /ha)		YIOFP (%)	COC (Rs/ha)		GMR (Rs/ha)		ANMR (Rs/ha)	B: C Ratio	
				IP	FP		IP	FP	IP	FP		IP	FP
Indian mustard													
RAJ	DCM (22) IIRMR (58) VMFPCL (50) Bharatkhand (990)	DRMR 1165-40	1120	2232 (1790-2680)	1982 (1650-2320)	12.61	27993	31200	132804	117929	18082	4.74	3.78
RAJ	KOT (300)	RH-725	300	2114 (1800-2330)	1897 (1600-2000)	11.43	34200	33265	125783	112871	11977	3.67	3.39
RAJ	JDH (200) SGN (70)	RH-761	270	1664 (1240-2200)	1492 (1114-2000)	11.52	28043	26131	99008	88774	8322	3.53	3.39
RAJ	VMFPCL (50) Manzari (23) IIRMR (17)	Radhika	90	2004 (1840-2250)	1729 (1400-1950)	15.9	37278	37186	119238	102875	16271	3.19	2.76
RAJ	SGN (30) IIRMR (08)	RH-1975	38	2424 (2140-2580)	2201 (1800-2450)	10.13	28626	27201	144228	130959	11844	5.03	4.81
RAJ	Manzari (21)	Brijraj	21	1928 (1875-1975)	1479 (1400-1525)	30.35	23055	27704	114716	88000	31395	4.97	3.17
RAJ	IIRMR (18)	CS-60	18	2346 (2220-2410)	1992 (1840-2100)	17.77	44005	42738	139587	118524	19796	3.17	2.77
UP	JHI (142) BUAT (121) Agrimitra (100) Amity (100) Bharatkhand (100) MB trust (70) Biuozone (70) DCM (06)	DRMR 1165-40	709	2012 (1130-3120)	1664 (860-2830)	20.91	32539	31683	119714	99008	19850	3.67	3.12
UP	JHI (145) Bharatkhand (250)	RH-725	395	1799 (900-1950)	1530 (840-1610)	17.58	27532	27180	107040	91035	15653	3.88	3.34
UP	BUAT (153) JHI (67) VAR (54)	DRMR-150-35	274	1526 (1100-2800)	1136 (885-1826)	34.33	30514	25801	90797	67592	18492	2.97	2.61
UP	BUAT (126) Biozone (30)	Radhika	156	1329 (1170-2181)	1040 (880-1933)	27.79	30933	25316	79075	61880	11578	2.55	2.44

UP	VAR (76) MB Trust (30)	Brijraj	106	2412 (1790-2999)	1730 (1300-1974)	39.42	32562	28370	143514	102935	36387	4.4	3.62
UP	VAR (40)	Giriraj	40	2533 (2221-2801)	1768 (1525-1939)	43.26	30758	27813	150713	105196	42568	4.89	3.78
UP	VAR (30)	RH-749	30	2576 (2240-2810)	1734 (1509-1845)	48.55	31533	27003	153272	103173	45569	4.86	3.82
UP	KPR (152)	Surekha	152	2156 (1900-2500)	1479 (1290-1775)	45.77	37699	33530	128282	88000	36113	3.4	2.62
UP	KPR (154)	Azad Mahak	154	2225 (1980-2490)	1556 (1310-2380)	42.9	37721	33551	132387	92582	35635	3.5	2.75
MP	JHI (45)	DRMR 150-35	45	1433 (1100-1790)	1188 (1050-1350)	20.62	32420	28683	85263	70686	10840	2.62	2.46
MP	Bharatkhand (846) ZARS (500) Sujagrati (50)	DRMR-11-65-40	1396	2367 (1300-2678)	1921 (1200-2260)	23.21	28213	29716	140836	114299	28040	4.9	3.84
J&K	CHT (264)	Brijraj	264	1587 (1250-1760)	989 (780-1180)	60.46	20328	14100	94426	58845	29353	4.65	4.17
Bihar	DHOLI (102) GNSU (69)	DRMR-150-35	171	1646 (1351-2039)	1379 (1201-1605)	19.36	40754	37960	97937	82050	13093	2.4	2.16
CG	JGDL (200)	DRMR-150-35	200	1314 (1070-1510)	920 (570-1070)	42.82	11411	9911	78183	54740	21943	6.85	5.52
MH	NAG (200)	TAM-108-1	200	1056 (876-1273)	586 (375-755)	80.2	17500	12500	62832	34867	22965	3.59	2.78
MH	NAG (200)	PDKV Kartik	200	1036 (783-1279)	584 (462-728)	77.39	17500	12500	61642	34748	21894	3.52	2.77
WB	KLN (200)	DRMR-150-35	200	2097 (1760-2500)	1730 (1350-2010)	21.21	33900	32500	124771	102935	20436	3.68	3.16
PUN	ABH (100)	PBR 357	100	2775 (2500-3000)	2478 (2025-2775)	12	27563	27438	165112	147441	17546	5.99	5.37
PUN	LDH (8)	RLC-3	08	1791 (1700-1900)	1797 (1700-1950)	-0.33	25912	25912	106922	106921	0.45	4.12	4.12
PUN	LDH (26)	PHR 127	26	2142 (1950-2525)	2068 (1875-2450)	3.57	25759	25900	127449	123046	4544	4.94	4.75
UK	PNT (09)	PR-20	09	2258 (1950-2550)	2008 (1700-2250)	12.45	31614	29355	134351	119476	12616	4.24	4.07
UK	PNT (14)	PR-21	14	2032 (1550-2375)	1782 (1300-2125)	14.02	33903	31836	120904	106029	12808	3.56	3.33
ASM	Luitporia FPC (48) OGP FPC (31) Jaymati FPC (34)	DRMR-150-35	113	1339 (1024-1524)	922 (720-1250)	45.22	30827	27125	79670	54859	21109	2.58	2.02

Yellow sarson													
UP	KPR (68)	Pitambari	68	2133 (1870-2400)	1523 (1290-17000	40	37671	33504	126913	90618	32128	3.36	2.7
UK	PNT (09)	Pant Sweta	09	1482 (1015-1750)	1232 (765-1500)	20.29	31516	30034	88179	73304	13393	2.79	2.44
UK	PNT (20)	PPS-1	20	1494 (1275-1700)	1244 (1025-1450)	20.09	29679	28185	88893	74018	13381	2.99	2.62
Gobhi sarson													
PUN	LDH (41)	GSC-7	41	1918 (1550-2000)	1777 (1400-1875)	7.93	22780	22012	114121	105731	7622	5	4.80
PUN	LDH (31)	PGHS-2155	31	2321 (1760-3000)	2235 (1750-2650)	3.84	26544	27008	138099	132982	5581	5.2	4.92
HP	Kangra (07)	GSC-7	07	1465 (1378-1580)	1108 (945-1236)	32.22	35088	30941	87168	65926	17095	2.48	2.13
HP	Kangra (06)	HPGS 1	06	1569 (1372-1595)	1115 (946-1245)	40.71	35181	30803	93355	66342	22635	2.65	2.15
HP	Kangra (04)	HPGS 2	04	1680 (1635-1727)	1130 (986-1236)	48.67	35427	30752	99960	67235	28050	2.82	2.18
Toria													
UK	PNT (05)	Uttara	05	1350 (1157-1550)	1100 (907-1300)	22.72	33383	32032	80325	65450	13524	2.40	2.04
ODH	BHU (40)	Sushree	40	857 (751-967)	548 (483-611)	56.38	27737	21767	50951	32606	12375	1.83	1.49
UP	KPR (10)	Tapeshwari	10	1370 (1290-1590)	800 (680-910)	71.25	37721	33551	81515	47600	29745	2.16	1.41
UP	KPR (16)	Azad Chetna	16	1126 (870-1400)	708 (590-905)	59	37721	33551	66997	42126	20701	1.77	1.25
ASM	AAU (19)	TS-38	19	1552 (1395-1878)	1112 (946-1245)	39.56	35201	30848	92344	66164	21827	2.62	2.14
ASM	Luitporia FPC (14)	TS-38	14	1362 (1200-1500)	804 (770-850)	69.4	31207	27250	81039	47838	29244	2.59	1.75
ASM	OGP FPC (47)	TS-38	47	981 (890-1190)	780 (700-890)	25.76	31220	27684	58369	46410	8423	1.87	1.68
ASM	Jaymati FPC (10)	TS-38	10	1162 (1100-1200)	786 (724-824)	48.83	31143	27667	69139	46767	18896	2.22	1.69

Table 8.6 Varietal performance in Whole package FLDs of rapeseed-mustard under rain-fed condition during 2024-25

State	Centre	Varieties	FLDs	Mean yield (kg /ha)		YIOFP (%)	COC (Rs/ha)		GMR (Rs/ha)		ANMR (Rs/ha)	B: C Ratio	
				IP	FP		IP	FP	IP	FP		IP	FP
Indian Mustard													
JH	MASS (100)	BBM-1	100	1146 (974-1256)	829 (751-900)	38.23	15900	14800	68187	49325	17762	4.29	3.33
JH	SISU (100)	BBM-1	100	1435 (1300-1550)	1096 (900-1180)	30.93	34931	31789	85382	65212	17028	2.44	2.05
JH	KANKE (260)	BBM-1	260	1361 (1121-1555)	853 (755-922)	59.55	31450	27350	80979	50753	26126	2.57	1.85
MAN	CAU(25)	NRCHB-101	25	996 (905-1075)	818 (735-970)	21.76	35743	36540	56227	46410	10614	1.57	1.27
BIHAR	GNSU (31)	DRMR-150-35	31	1347 (1288-1581)	1288 (1184-1396)	4.58	32410	33601	80146	76636	2319	2.47	2.28
J&K	Chatha (177)	Brijraj	177	1312 (1140-1650)	837 (700-1000)	56.75	20328	14100	78064	49801	22035	3.84	3.53
RAJ	Manzari (29)	Brijraj	29	1930 (1875-1985)	1486 (1400-1550)	29.87	21153	27704	114835	88417	32969	5.43	3.19
RAJ	Manzari (27)	Radhika	27	1919 (1800-1985)	1491 (1450-1500)	28.70	21834	27704	114180	88714	31336	5.23	3.20
UK	PNT (08)	PR-20	08	1358 (1152-1525)	1108 (867-1275)	22.56	32650	30895	80801	65926	13120	2.47	2.13
ASM	Luitporia FPC (14)	DRMR-150-35	14	1101 (1004-1200)	757 (700-780)	45.44	31076	27684	65509	45041	17076	2.1	1.62
ASM	Jasingfa FPC (61)	DRMR-150-35	61	1058 (900-1110)	761 (700-834)	39.02	30829	27316	62951	45279	14159	2.04	1.6
ASM	NA-Suruj FPC (55)	DRMR-150-35	55	1031 (900-1148)	765 (700-834)	34.77	31032	27554	61344	45517	12349	1.97	1.65
ASM	Pahumara FPC (48)	DRMR-150-35	48	1013 (924-1056)	773 (756-830)	31.04	30778	27463	60273	45993	10965	1.95	1.67
ASM	Uttran FPC (48)	DRMR-150-35	48	1042 (980-1110)	757 (650-826)	37.64	31336	27544	61999	45041	13166	1.97	1.63
ASM	Joymati FPC (08)	DRMR-150-35	08	1055 (1004-1110)	889 (820-1000)	18.67	31086	27455	62772	52895	6246	2.02	1.93
ASM	Pub Kamrup FPC (47)	DRMR-150-35	47	1054 (980-1104)	844 (820-880)	24.88	31200	27393	62713	50218	8688	2.01	1.83
ASM	Shyamol FPC (95)	DRMR-150-35	95	1057 (998-1156)	864 (780-990)	22.33	30917	27320	62891	51408	7886	2.03	1.88

Yellow Mustard													
UK	PNT (18)	PPS-1	18	1153 (914-1320)	903 (800-1025)	27.68	32435	31148	68603	53728	13588	2.11	1.72
Toria													
ASM	DoR, AAU (272)	TS-38	272	889 (315-1346	613 (300-1780)	45.02	36148	28563	52895	36473	8837	1.46	1.27
ASM	SHL (200)	TS-38	200	917 (1000-1200)	681 (680-900)	34.65	37466	31184	54561	40519	7760	1.46	1.30
ASM	Luitporia FPC (54)	TS-38	54	1072 (972-1148)	775 (700-834)	38.32	31134	27523	63784	46112	14061	2.04	1.67
ASM	Jasingfa FPC (69)	TS-38	69	1056 (912-1346)	767 (700-830)	37.67	30761	27252	62832	45636	13687	2.04	1.67
ASM	NA-Suruj FPC (75)	TS-38	75	1048 (900-1148)	764 (700-800)	37.17	31085	27541	62356	45458	13354	2	1.65
ASM	OGP FPC (51)	TS-38	51	887 (750-972)	709 (650-850)	25.1	31166	27591	52776	42185	7016	1.69	1.53
ASM	Pahumara FPC (82)	TS-38	82	1009 (970-1056)	782 (734-834)	29.02	30735	27342	60035	46529	10113	1.95	1.7
ASM	Uttran FPC (82)	TS-38	82	947 (890-1000)	745 (650-820)	27.11	31380	27519	56346	44327	8158	1.79	1.61
ASM	Joymati FPC (78)	TS-38	78	894 (680-1050)	688 (580-820)	29.94	31078	27590	53193	40936	8769	1.71	1.48
ASM	PUB Kamrup (83)	TS-38	83	956 (900-1012)	778 (720-834)	22.87	31239	27332	56882	46291	6684	1.82	1.69
ASM	Shyamol FPC (65)	TS-38	65	983 (950-1050)	783 (700-820)	25.54	31074	27267	58488	46588	8093	1.88	1.7
MAN	CAU (175)	TS 38	175	994 (900-1175)	818 (770-900)	21.51	35718	36876	59143	48671	11630	1.65	1.31
ODH	BHU (40)	Sushree	40	755 (641-892)	503 (419-567)	50.09	23275	19280	44922	29928	10999	1.93	1.55
UK	PNT (21)	PHT-1	21	970 (939-1167)	721 (537-867)	34.53	25884	24913	57715	42899	13845	2.22	1.72
UK	PNT (05)	PT-508	05	1229 (1117-1325)	979 (867-1075)	25.53	33212	31883	73125	58250	13546	2.2	1.82
UK	PNT (05)	Uttra	05	1120 (1005-1269)	870 (755-1019)	28.73	29025	27765	66640	51765	13615	2.29	1.86
AP	CAU (91)	TS-38	91	803 (810-816)	467 (440-486)	72	22114	19820	47778	27786	17698	2.16	1.4

TR	CAU (49)	TS-38	49	914 (789-1020)	578 (477-704)	58.13	36302	28522	54383	34391	12212	1.49	1.2
ML	CAU (50)	TS-38	50	961 (888-1120)	760 (702-803)	26.44	19500	16600	57179	45636	8643	2.93	2.74
Brown Sarson													
J&K	KHD (104)	Shalimar Sarson-2	104	1066 (825-1430)	920 (700-1065)	15.86	41558	40203	63427	54740	7332	1.52	1.36
Gobhi sarson													
HP	Kangra (30)	HPGS 1	30	1256 (1142-1680)	987 (855-1423)	27.25	33000	29975	74732	58726	12981	2.64	1.95
HP	Kangra (09)	HPGS 2	09	1423 (1358-1570)	1061 (876-1310)	34.11	33200	29773	84668	63129	18112	2.55	2.12
HP	Kangra (44)	GSC 7	44	1265 (1025-1375)	997 (835-1147)	26.88	32780	29676	75267	59321	12842	2.29	1.99
Taramira													
RAJ	JOB (31)	RTM 1624	31	1196 (1100-1252)	969 (861-1039)	23.42	10622	9258	65780	53292	53295	6.19	5.75
RAJ	JOB (35)	RTM 1351	35	1193 (1102-1290)	979 (859-1034)	21.85	10592	9329	65615	53845	10507	6.19	5.77
RAJ	JOB (34)	RTM 1355	34	1206 (1104-1290)	939 (848-1048)	28.43	10570	9271	66330	51645	13386	6.27	5.57

Table 8.7 Component performance in FLDs of rapeseed-mustard condition during 2024-25

State	Name of centre	Component	FLDs	Situation Irrigated/ Rainfed	Varieties	Mean yield (kg /ha)		YIOFP (%)	COC (Rs/ha)		GMR (Rs/ha)		ANMR (Rs/ha)	B: C Ratio	
						IP	FP	(%)	IP	FP	IP	FP	(Rs./ha)	IP	FP
HAR	Bawal	Improved variety with Best Management practices	40	Irrigated	RH 1424	2313 (1960-2550)	2078 (1750-2220)	11.3	47712	49335	137623	123641	15605	2.88	2.51
HAR	Bawal	Sulphur application: Gypsum application @ 100 kg/acre	30	Irrigated	RH 1424	2286 (1980-2550)	2102 (1800-2340)	8.7	47712	47256	136017	125069	10492	2.85	2.65
HAR	Bawal	Sclerotinia Disease Management (Applied Two spray of Bavistine (Carbendazim) @ 1% solution at 45 and 65 DAS	30	Irrigated	RH 725	2346 (2060-2520)	2159 (1880-2300)	8.66	47712	46262	139587	128460	9677	2.93	2.78
HAR	HSR	Seed treatment with carbendazim @2 g/kg	02	Irrigated	RH 1706	2650	2225	19.1	39275	37300	157675	132387	23313	4.01	3.54
HAR	HSR		03	Irrigated	RH 725	2650	2240	18.3	39767	36933	157675	133280	21561	3.96	3.6

HAR	HSR	seed and two foliar sprays of 0.1% carbendazim at 45 and 60 DAS	19	Irrigated	RH 1424	2587 (2250-2650)	2179 (1820-2320)	18.72	39729	37610	153926	129650	22157	3.87	3.44
HAR	HSR		76	Irrigated	RH 1975	2579 (2200-2800)	2174 (1780-2380)	18.62	39615	37555	153450	129353	22037	3.87	3.44
GUJ	SKN	Sulphur Application @ 40 kg/ha.	100	Irrigated	GM-6	2209 (1992-2609)	1992 (1678-2346)	11	38197	35012	131435	118524	9726	3.44	3.39
ODH	BHU (120)	Seed treatment + Late Irrigated + PP + Sulpher	120	Irrigated	Sampoorna	1277 (1003-1622)	844 (654-1080)	51.3	30817	25314	75981	50218	20260	2.47	1.98

Table 8.8 Exploitable yield reservoir of rapeseed-mustard in major states during 2024-25

State	No. of FLDs	FLDs Mean yield (kg /ha)		Yield gap-I (%)	State level yield (Kg/ha) (2024-25)	Yield gap- II (%)	State wise production (000 tons) (2024-25)	Expected production (000 tons)	
		IP	FP					EP-I	EP-II
RJ	2013	2070	1826	13.36	1549	33.63	5410	6132.8	7229.6
UP	2110	1916	1493	28.33	1481	29.37	2035	2611.5	2632.7
MP	1441	2338	1898	23.18	1530	52.81	1666	2052.2	2545.8
HR	200	2449	2143	14.27	1947	25.78	1248	1426.1	1569.8
WB	200	2097	1730	21.21	1250	67.76	796	964.8	1335.4
JH	460	1330	901	47.61	801	66.04	361	532.9	599.4
ASM	1691	1002	739	35.58	788	27.16	244	330.8	310.3
GJ	100	2209	1992	11.00	1845	19.73	476	528.4	569.9
Bihar	202	1591	1365	16.55	1151	38.23	99	115.4	136.8
PB	206	2418	2224	8.72	1777	36.07	87	94.6	118.4
J&K*	545	1398	926	50.97	800	74.75	34	51.3	59.4
MAN*	200	996	818	21.76	748	33.16	23	28.0	30.6
CG	200	1314	920	42.82	499	163.33	16	22.9	42.1
MH	400	1046	585	79.00	402	160.20	10	17.9	26.0
UK	114	1425	1175	21.27	857	66.28	15	18.2	24.9
ODH	200	1088	716	51.95	292	272.60	4	6.1	14.9
HP	100	1325	1019	30.00	811	63.38	7	9.1	11.4
All India	**10382**	**1746**	**1389**	**30.45**	**1518**	**72.37**	**12531**	**14943**	**17257.4**

Figures about state wise yield and production for Manipur, Jammu & Kashmir taken from the averages during 2020-21 to 2024-25.

****A sum of 190 FLDs conducted in TR (49), ML (50), AP (91) has not been included in this table.**

Appendices

Achievements of AICRP-RM coordinating centres (2024-25)

Varieties Release by SVRC of respective states:

Centre	Crop	Variety	Year of notification	State	Condition
Kanpur	Mustard	Goverdhan (KMR(L)17-5)	To be notified	Uttar Pradesh	Late sown irrigated conditions
Varanasi	Mustard	Malviya Nidhi (HUJM-10-06)	2025	Uttar Pradesh	Timely sown irrigated conditions

Publications of AICRP-RM coordinating centres:

Research paper published:

Ludhiana

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Appendix-II

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BANDA UNIVERSITYOF AGRICULTUREL & TECHNOLOGY, BANDA (U.P)

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29. Dr. Dalip Kumar, (Jr. Entomologist), CCS HAU, Hisar 125 004
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31. Dr. Vinod Goyal (Jr. Plant Physiologist), CCS HAU, Hisar 125 004
32. Dr. Shweta, (Jr. Agronomist), CCS HAU, Hisar 125 004
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50. Dr. Chinmaya Kumar Das, Plant breeder, College of Agri. OUA&T, Bhubaneswar

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95. Dr. Najeeb ul Rehman, Assoc. Prof., Gen.& Pl. Breeding, MRCFC, Bilbehra, Khudwani 192124

BHABHA ATOMIC RESEARCH CENTER, MUMBAI

96. Dr. Archana N. Rai, scientist Officer, F, BARC, Mumbai 400 085

ICAR INSTITUTES

ICAR-INDIAN INSTITUTE OF RAPESEED-MUSTARD RESEARCH, BHARATPUR (RAJ.)

97. Dr. V.V. Singh, Director, Pr. Scientist, (Genetics & Pl. Breeding), IIRMR, Bharatpur 321 303
98. Dr. P.D. Meena, Pr. Scientist, (Pl. Pathology), IIRMR, Bharatpur 321 303
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102. Dr. R.S. Jat, Pr. Scientist, (Agronomy), IIRMR, Bharatpur, 321303
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104. Dr. Anubhuti Sharma, Pr. Scientist, (Biochemistry), IIRMR, Bharatpur 321 303
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106. Dr. H. K. Sharma, Senior Scientist, (Genetics & Pl. Breeding), IIRMR, Bharatpur 321 303
107. Dr. Mukesh Kumar Meena, Senior Scientist, (Soil Science), IIRMR, Bharatpur 321 303
108. Dr. M. L. Dotaniya, Senior Scientist, (Soil Science), IIRMR, Bharatpur 321 303
109. Dr. R.K. Yogi, Senior Scientist, (Ag. Economics), IIRMR, Bharatpur 321 303
110. Dr. Bhiru Lal Meena, Senior Scientist, (Genetics & Pl. Breeding), IIRMR, Bharatpur 321 303
111. Dr. Murlidhar Meena, Senior Scientist, (Soil Science), IIRMR, Bharatpur 321 303
112. Dr. R. L. Chaudhary, Senior Scientist, (Agronomy), IIRMR, Bharatpur 321 303
113. Dr. Vasudev Meena, Senior Scientist, (Soil Science), IIRMR, Bharatpur 321 303
114. Dr. Prashant Kumar, Senior Scientist, (Biotechnology), IIRMR, Bharatpur 321 303
115. Dr. Ibandalin Mawlong, Scientist, (Biochemistry), IIRMR, Bharatpur 321 303
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127. Dr. Navinder Saini, Pr. Scientist, Division of Genetics, IARI, New Delhi 110 012
128. Dr. (Mrs.) Sujata Vasudev, Pr. Scientist (Genetics & Pl. Breeding.), IARI, New Delhi 110 012
129. Dr. Laxman Prasad. Sr. Scientist, (Pl. Pathology.), IARI, New Delhi 110 012
130. Dr. Sneha Adhikari, Scientist, (Genetics & Pl. Breeding.), IARI, New Delhi 110 012
131. Dr. J. Nanjundan, Sr. Scientist, (Genetics & Pl. Breeding.), IARI, Wellington

ICAR- NATIONAL BUREAU OF PLANT GENETIC RESOURCES, NEW DELHI

132. Dr. Jameel Akhtar, Pr. Scientist, NBPGR, New Delhi 110 012
133. Dr. Rashmi Yadav, Sr. Scientist, NBPGR, New Delhi 110 012

ICAR - NATIONAL CENTRE FOR INTEGRATED PEST MANAGEMENT, NEW DELHI

134. Dr. M.S. Yadav, Pr. Scientist (Plant. Pathology.), NCIPM, New Delhi 110 012

ICAR- CENTRAL SOIL SALINITY RESEARCH INSTITUTE, KARNAL (HARYANA)

135. Dr. Jogendra Singh, Sr. Scientist, CSSRI, Karnal 132 001
136. Dr. Vijayata Singh, Sr. Scientist, CSSRI, Karnal 132 001

ICAR- INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, NEW DELHI

137. Dr. Rajendra Prasad, Director, IASRI, Library Avenue, Pusa, New Delhi-110 012

PRIVATE ORGANISATIONS

138. Dr. Bhupesh Vaid, Corteva, Gahlot Farm AJJ01 ning Sector -47 opp house No.525 Gurgaon
139. Dr. Mukesh Mohan, Corteva, Gahlot Farm AJJ01 ning Sector -47 opp house No.525 Gurgaon
140. Dr. E. Selvarani, Corteva, Gahlot Farm AJJ01 ning Sector -47 opp house No.525 Gurgaon
141. Dr. N. Ghosh Dastidar, Nath Bio-Gene (I). Ltd., 104, Ist Floor, Block 5, Erose Garden, Faridabad
142. Mr. S.U. Baig, Breeder, Nath Seeds Ltd., P B No.318, Nath House, Nath Road, Aurangabad
143. Dr. V. S. Patil, Res. Scientist, Namdhari Seeds Pvt. Ltd.

144. Dr. M. C. Gupta, Sr. Breeder (Mustard), Rasi Seeds (P) Ltd., Plot No. 126, Sector-8, IMT Manesar, Dist.Gurgaon-122 051 Haryana
145. Dr. R.K. Arora, Director, Mustard & Millet Research, Gourmet Popurnica LLP
146. Mr. C. H. Mruthunjaya, Pr. Scientist, Mustard Crop, Hytech Seed India Pvt. Ltd. Alwar (Raj.)
147. Dr. I. S. Halakude, R & D Head, Nirmal Seeds Pvt. Ltd, Pachora, Dist. Jalgaon 424201 (MS)
148. Dr. Shailesh Kumar, Breeder, Advanta Seeds Pvt. Ltd
149. Dr. S.K.Yadav, Mustard Breeder, Crystal crop Protection Ltd., F-1/104, South end Apartment, Charmood Village, Erose Garden, Faridabad-121001 (Harayana)
150. Dr. Sambhaji Y Shedage, Mustard Breeder, Crystal Crop Prodection Ltd., Khasra No 763-768, Maheshwas Kalan, Jalsu, Jaipur (Raj.) 303701
151. Dr. R. S. S. Gurjar, Res. Scientist, J.K. Seeds, Jaipur (Rajasthan)
152. Dr. Ved Prakash, M.D., Shakti Vardhak Hybrid Seeds Pvt. Ltd. Tilak Bazar, Hisar
153. Dr. Raj bahadur, Breeder, Shakti Vardhak Hybrid Seeds Pvt. Ltd. Tilak Bazar, Hisar
154. Dr. Bhojraj Singh, Breeder, Mustard, Kaveri Seeds, Alwar, Rajasthan
155. Dr. M. K. Singh, Res. Scientist (PB), Bioseed Research India Plot No. 234, B Blick, Kaveri Hills, Phase II, Hyderabad- 500 033
156. Dr. R.S. Mahala, Director, Mustard & Millet Research, Seed Works Pvt. Ltd. Shri Krishana house, 3rd Floor, Banjara Hills, Hyderabad -500 034 (Telangana)
157. Dr. Shankar Yadav, Sr. Breeder(Mustard) Seed Works International Pvt. Ltd.8-2-626/2, Road No 10 Shri Krishana house,3 rd Floor, Banjara Hills, Hyderabad -500 034 (Telangana)
158. Dr. Saurabh Goyal, Breeder, Co. Office Kamadgiri Crop Science Pvt. Ltd. B-66, Kamla Nagar, Agra-282005
159. Dr. Rajarshi Kundu, Managing Director, Mali Agri Tech Pvt Ltd, Subhas Avenue, Ranaghat-741201, Dist. Nadia, WB
160. Dr. Susanta Das, Asst. Breeder, Mali Agri Tech Pvt Ltd, Subhas Avenue, Ranaghat-741201, Dist. Nadia, WB
161. Dr. Avanesh Kumar Singh, Dept. Gen. Manager Dayal Seeds (P) Ltd. Delhi Road, Partapur, Meerut - 250103 (UP)
162. Dr. U.S. Singh, Breeder (Wheat & Mustard), Nuziveedu Seeds Limited, 905, 9th Floor, Kanchan Junga Bulding, Barakhambha Road, Connaught Place, New Delhi
163. Dr. Pramod Kumar, MR Seeds Pvt. Ltd. 82-A, Old Dhan Mandi, Sriganganagar- 335001, Rajasthan

Appendix-III

Zone-wise research centres for multi-location testing

Zone I

Himachal Pradesh	**:**	**Kangra, Dhaula Kuan*, Bajaura*, Una***
Jammu & Kashmir	**:**	**Chatha, Udhampur***
Uttarakhand	**:**	**Pantnagar, Kashipur*, Dhanauri***
Zone II		
Punjab	**:**	**Ludhiana, Abohar***
Haryana	**:**	**Hisar, Bawal, Karnal*,**
Uttar Pradesh	**:**	**Modipuram***
Rajasthan	**:**	**Sriganganagar, Alwar***
Delhi	**:**	**IARI New Delhi***
Zone III		
Uttar Pradesh	**:**	**Kanpur, Jhansi, Lucknow*, Agra*, Banda***
Madhya Pradesh	**:**	**Morena, Tikamgarh***
Rajasthan	**:**	**Kota, Bharatpur, Jaipur*, Bikaner*, Fatehpur Shekhawati***
Zone IV		
Rajasthan	**:**	**Mandor*, Sumerpur***
Gujarat	**:**	**S.K. Nagar, Junagarh***
Maharashtra	**:**	**Nagpur, Jalgaon***

Zone V

Uttar Pradesh	:	Varanasi
Jharkhand	:	Kanke
Bihar	:	Dholi , Sabour*
West Bengal	:	Kalyani*
Asom	:	Shillongani

Zone VI

Manipur	:	Imphal
Meghalaya	:	Umiam (Barapani)*
Arunachal Pradesh	:	Pasighat*
Tripura	:	Tripura (W.T.) *
Sikkim	:	Bermiok*

Zone VII

Chhattisgarh	:	Jagdalpur, Kanker*, Bilaspur*, Ambikapur*
Odisa	:	Ranital (Bhubaneshwar)

* Voluntary Centre

Abbreviations used in the report

Zone I		**Zone III**		**Zone V**	
KNG	Kangra	BPR	Bharatpur	VAR	Varanasi
DLK	Dhaula Kuan*	KOT	Kota	KNK	Kanke
UNA	Una*	KPR	Kanpur	DOL	Dholi
BJR	Bajaura*	BKR	Bikaner*	SBR	Sabour*
CHT	Chatha	TKM	Tikamgarh*	KLN	Kalyani*
PNT	Pantnagar	JHS	Jhansi	SHL	Shillongani
UDH	Udhampur*	LKW	Lucknow*		
KAS	Kashipur*	MOR	Morena		
DHN	Dhanauri*	BND	Banda*		
Zone II		AGR	Agra*	**Zone VI**	
		JAI	Jaipur*	IMP	Imphal
LDH	Ludhiana	FTP	Fatehpur Shekhawati*	BPN	Barapani*
ABR	Abohar*			PGT	Pasighat*
HSR	Hisar			TPR	Tripura*
MOD	Modipuram*	**Zone IV**		BMK	Bermiok*
BAW	Bawal	MDR	Mandor*	**Zone VII**	
KAR	Karnal	SMR	Sumerpur*	BHU	Bhubaneshwar
NDH	New Delhi*	NGP	Nagpur	JAG	Jagdalpur
SGN	Sriganganagar	SKN	S.K. Nagar	KNR	Kanker*
ALW	Alwar*	JUG	Junagarh*	BLR	Bilaspur*
		JAL	Jalgaon*	AKR	Ambikapur*