

# **All India Coordinated Research Project**

# on Rapeseed-Mustard



30th Annual Group Meeting

held

At

# **SKUAST, Chatha, Jammu**

(August 03-04, 2023)



All India Coordinated Research Project on Rapeseed - Mustard ICAR- Directorate of Rapeseed-Mustard Research (Indian Council of Agricultural Research) Sewar, Bharatpur-321 303 (Rajasthan), India



30<sup>th</sup>Annual Group Meeting All India Coordinated Research Project on Rapeseed-Mustard ICAR-Directorate of Rapeseed-Mustard Research, Bharatpur



# (AUGUST 03-04, 2023) Venue: Chatha, SKUAST-Jammu

# AGENDA

03 <sup>rd</sup> August 2023	(Thursday)				
08.00-09.30 hrs.	s. REGISTRATION				
09.30-10.35hrs.	INAUGURAL SESSION				
	Chief Guest	Dr. B.N. Tripathi, Vice-Chancellor, SKUAST-Jammu			
	Guest of Honour	Dr. San	jeev Gupta, ADG (O&P), ICAR, New Delhi		
09.30-09.35 hrs.	Lightning of lamp				
09.35-09.50 hrs.	Welcome address, Presentation of Research highlights and Action Taken Report	Dr. P.K	. Rai, Director, ICAR-DRMR, Bharatpur		
09.50.10.00 hrs.	Remarks	Dr. R.K	. Samnotra, Director Research, SKUAST-J		
10.00-10.10 hrs.	Remarks (Guest of honour)	Dr. San	jeev Gupta, ADG (O&P), ICAR		
10.10-10.20 hrs.	Release of publications	Guests	on the Dais		
10.20- 10.30 hrs.	Chief Guest's Remarks	Dr. B.N	I.Tripathi, Vice-Chancellor, SKUAST-Jammu		
10.30-10.35 hrs.	Vote of thanks	Dr. S.K	. Rai, Organizing Secretary, SKUAST-Jammu		
10.35-11.00 hrs.	Tea Break				
11.00-14.00 hrs.	<b>TECHNICAL SESSION-I: Crop Improvemen</b>	t and Ge	enetics Resources		
	Chairman	Dr. San	jeev Gupta		
	Subject Expert	Dr. R.K	. Mathur, Director, ICAR-IIOR		
	Rapporteurs	Drs. Bh	agirath Ram/H.K. Sharma, Plant Breeding,		
		ICAR-I	ORMR, Bharatpur		
		Dr. Kartikeva Srivastava, B.H.U., Varanasi			
11.00-11.30 hrs.	Presentation of results of crop improvement trials conducted in AICRP-RM during 2022-23		. Singh, PI Plant Breeding, AICRP-RM		
11.30-12.30 hrs.	Formulation of technical program for 2023-24				
12.30-12.45 hrs.	Tea Break				
12.45-13.00 hrs.	Invited lecture on "Development of low-seed, hi Genome Editing" by Dr. Naveen C. Bisht, Staff	gh-leaf g Scientis	plucosinolate oilseed mustard (Brassica juncea) by t-V, National Institute of Plant Genome Research		
	(NIPGR)				
13.00-13.15 hrs.	Session concluding remarks	Dr. R.H	X. Mathur		
		Dr. Sar	Sanjeev Gupta		
13.15-14.00 hrs.	Lunch Break				
14.00 - 17.15 hrs.	<b>TECHNICALSESSION-II: Plant Pathology an</b>	nd Entor	nology		
	Chairman		Dr. Sanjeev Gupta, ADG (O&P)		
	Subject Experts		Dr. R.P. Awasthi, Ex-Professor (Plant		
			Pathology), GBPUA&T, Pantnagar		
			Dr. R.K. Gupta, Professor & Head Div. of		
			Entomology, SKUAST-Jammu		
	Rapporteurs		Dr. Pankaj Sharma, Principal Scientist,		
			ICAR-DRMR, Bharatpur		
			Prof. S.S. Vaish, BHU, Varanasi		
			Prof. M.S. Khan, Dept. of Entomology,		
			GBPUA&T, Pantnagar		
			Dr. Akhtar Ali Khan, Prof. Entomology,		
14.00 14 151		1	SKUAST-Kashmir		
14.00-14.15 hrs.	Presentation of results of Plant Pathologic	al trials	Dr. P.D. Meena, PI, Plant Pathology,		
141514451	conducted in AICRP-RM during 2022-23		AICKP-RM		
14.15-14.45 hrs.	Formulation of technical program for 2023-24				
14.45-15.00 hrs.	Presentation of results of Entomological trials co	onducted	Dr. Sarwan Kumar, PI, Scientist, Entomology,		
	in AICRP-RM during 2022-23		AICRP-RM		

16.30 -17.00 hrs.	Formulation of technical program for 2023-24	
17.00-17.15 hrs.	Session concluding remarks	Dr. R.P. Awasthi
		Dr. Sanjeev Gupta
15.00-16.30 hrs.	Varietal Identification Committee Meeting	14.00-15.30hrs.
	Chairman: Dr. T.R. Sharma/Dr. Sanjeev Gupta	
	Members of VIC, Nominated by DDG (CS)	

04 August 2023 (Fr	iday)	
09.30-10.30 hrs.	Technical Session-III: Breeder Seed Production	
	Chairman & Experts	Dr. Sanjeev Gupta, ADG (O&P), ICAR, Krishi Bhawan, New Delhi
	Rapporteurs	Dr. Arun Kumar, Pr. Scientist, Plant Breeding, ICAR-DRMR, Bharatpur Dr. H.S. Meena, Pr. Scientist, Plant Breeding, ICAR-DRMR, Bharatpur
09.30-09.50 hrs.	Scenario of Breeder seed production in Rapeseed-Mustard during 2022-23	Dr. B.L. Meena, Nodal Officer Breeder seed production,
09.50-10.10 hrs.	Variety-wise breeder seed production program as per DAC indent	ICAR-DRMR, Bharatpur
10.10-10.30 hrs.	Session concluding remarks	Dr. Sanjeev Gupta
10.30-10.50 hrs.	Tea Break	
10.50- 13.30 hrs.	<b>TECHNICALSESSION-IV: Crop Production</b>	
	Chairman	Dr. Sanjeev Gupta, ADG (O&P)
	Subject Expert	Dr. N. Ravishankar, Incharge, IFS, ICAR- IIFSR, Modipuram Dr. S.S.Rathore, Head, Agronomy, ICAR-IARI, New Delhi
	Rapporteurs	Dr. R.L. Choudhary, Sr.Scientist, Agronomy, ICAR-DRMR, Bharatpur Dr. Rajiv Bharat, Jr. Scientist, Agronomy, SKUAS&T, Jammu
10.50-11.00 hrs	Talk on performance of mustard strains grown organically at various locations	Dr. Devendra Kumar, Pr. Scientist, IIFSR, Modipuram, Meerut
11.00 -11.20 hrs.	Presentation of results of Crop Production trials conducted during 2022-23	Dr. R.S. Jat, PI, Agronomy, AICRP-RM
11.20-12.00 hrs.	Formulation of technical program for 2023-24	
12.00-12.30 hrs.	Session concluding remarks	Dr. N. Ravishankar Dr. Sanjeev Gupta
12.30-13.30 hrs.	Technical Session-V:Transfer of Technology	
	Chairman	Dr. Parminder Sheoran, Director, ICAR-ATARI, Ludhiana
	Subject Experts	Dr. Parminder Sheoran, Director, ICAR-ATARI, Ludhiana
	Special Invitee	Dr. Sanjay Singh, DG Uttar Pradesh Council of Agricultural Research (UPCAR)
	Rapporteurs	Dr. R.K. Yogi, Senior Scientist, ICAR-DRMR, Bharatpur
12.30-13.00 hrs.	Presentation f results of FLDs conducted during 2022-23	Dr. Ashok Kumar Sharma, PI, FLDs, AICRP-RM
	Presentation on allocation of FLD for the year $2023-24$	All concerned centers
13.00-13.15 hrs.	Activities of Outreach programs	Dr. A.K. Sharma, Pr. Scientist, ICAR-DRMR, Bharatpur
13.15-13.30 hrs.	Session concluding remarks	Dr. Sanjay Singh Dr. Parminder Sheoran,
13.30-14.30 hrs.	Lunch	

14.30-15.45 hrs.	Technical Session-VI: Biochemistry and Plant		
	Chairman	Dr. Sanjeev Gupta, ADG (O&P), ICAR	
	Co- Chairman	Dr. Sanjay Guleria, Professor & Head, Div. of Biochemistry, SKUAST-Jammu	
	Rapporteurs	Dr. Anubhuti Sharma,Pr.Scientist, Biochemistry, ICAR-DRMR, Bharatpur Dr. Lalit Krishna Meena, Scientist, Plant Physiology, ICAR-DRMR, Bharatpur	
14.30-15.00 hrs.	Presentation of results of Biochemistry trials conducted during 2022-23 and formulation of technical program for 2023-24	Dr. Anubhuti Sharma, PI, Biochemistry, AICRP-RM	
15.00-15.30 hrs.	Presentation of results of Plant Physiology trials conducted during 2022-23 and Formulation of technical program for 2023-24	Dr. Pushp Sharma, PI, Plant Physiology, AICRP-RM	
15.30-15.45 hrs.	Session concluding remarks	Dr. Sanjay Guleria	
15.45-16.00 hrs.	Tea Break		
16.00-17.00 hrs.	Plenary Session		
	Chairman	Dr. R.K. Samnotra, Director Research, SKUAST-Jammu	
	Co-Chairman	Dr. Sanjeev Gupta, ADG (O&P), ICAR	
	Co-Chairman	Dr. R.K. Mathur, Director, ICAR-IIOR	
Convener D		Dr. P.K. Rai, Director, ICAR-DRMR, Bharatpur	
16.00-16.05 hrs.	Welcome and remarks	Dr. P.K.Rai, Director, ICAR-DRMR, Bharatpur	
	Presentation of best centre awards		
	Presentation Of VIC proceeding		
16.05-16.25 hrs.	Presentation of summary recommendations and highlights of deliberations	Rapporteurs of different sessions	
16.25-16.40 hrs.	Farewell of retiring personnel	Dr. Pankaj Sharma, Pr. Scientist, ICAR- DRMR, Bharatpur	
	Remarks	Dr. R.K. Mathur, Director, ICAR-IIOR	
Remarks		Dr. Sanjeev Gupta, ADG (O&P), ICAR	
	Remarks	Dr. R.K. Samnotra, Director Research, SKUAST-J	
	Vote of thanks	Dr. P.K.Rai, Director, ICAR-DRMR, Bharatpur	

#### XXX Annual Group Meeting of AICRP Rapeseed-Mustard August 3-4, 2023 at SKUAST, Chatha, Jammu

#### Session: Inaugural

Chief Guest	: Dr. B.N. Tripathi, Vice Chancellor, SKUAST-Jammu
<b>Guest of Honour</b>	: Dr. Sanjeev Gupta, ADG (O&P), ICAR, New Delhi
Convener	: Dr. P.K. RAI, Director, ICAR-DRMR, Bharatpur
Rapporteurs	: Dr. Bhagirath Ram, Principal Scientist, ICAR-DRMR, Bharatpur
	: Dr. H.K. Sharma, Sr. Scientist, ICAR-DRMR, Bharatpur

The inaugural session started with the welcome address and presentation by Dr. P. K. Rai, Director, ICAR-DRMR, Bharatpur. He welcomed Dr. B.N. Tripathi, Vice Chancellor, SKUAST-Jammu, Dr. Sanjeev Gupta, ADG (Oilseeds &Pulses), esteemed subject experts, all the delegates from different AICRP-RM centres. Dr. Rai presented the research highlights of AICRP-RM programme along with scenario of area, production and productivity of rapeseed-mustard in World, India and Jammu & Kashmir. He also presented the action taken report of recommendations of 29<sup>th</sup> AGM. He threw light on the ongoing programmes and apprised about the trials of different disciplines conducted under AICRP-RM at different centres across all 6 zones.

Dr. R.K. Samnotra, Directore Research (SKUAST-Jammu) apprised about the varietal development by SKUAST-Jammu. He told that with the efforts of SKUAST-Jammu, area under rapeseed-mustard has increased in J&K. He emphasised that there is a need to develop rapeseed-mustard varieties with early, dwarf, profuse branching, non-lodging, good quality (low erucic acid and glucosinolate, high oleic acid) and high oil content, resistant to biotic (white rust, aphid, alternaria blight) and abiotic stresses (heat, rainfed, cold).

Dr. Sanjeev Gupta, ADG (O&P), ICAR, New Delhi and chairman of the session praised the presentation of AICRP-RM programme by Dr. P.K. Rai, Director, ICAR-DRMR. In his address, he told that promotion of oilseeds is the top most agenda of the Govt. He apprised the house that oilseeds contributes about 5% to total GDP and about 10% to all agricultural produce GDP. We are still importing about 50% edible oil to meet our domestic demand. He further, told that in 2047 we will be largest population in the world and the biggest challenge for us will be to meet the demand of our population. He suggested that are under rapeseed-mustard crop could be increased further by including rice fellow, potato fellow area. He told that old varieties under seed chain need to be replaced by new high yielding varieties. He stressed to develop Indian mustard varieties with less isothiocynate, more number of hybrids in Indian mustard, yellow sarson and toria varieties with shorter duration. He advised to use genome editing to increase seeds/siliquae, no. of branches.

Dr. B.N. Tripathi, Vice Chancellor, SKUAST-Jammu praised the contribution of AICRP-RM in enhancing the oilseed production in country. He thanked peers and predecessors who have contributed to start AICRP platform in India. He told that in 2050 our population will be about 163 crore. We need technological interventions to feed our population with limited land, water and other resources. He further advised to develop varieties with climate resilience and tolerance to pest and diseases. He further suggested to look after the human health issue by research on precision farming, organic and natural farming. He stressed that SKUAST-Jammu should work to cater the needs of Jammu & Kashmir keeping in view the variation in topography and climate of the Union Territory.

The session ended with the vote of thanks given by Dr. S. K. Rai, Organising Secretary of  $30^{\text{th}}$  AGM.

#### XXX Annual Group Meeting of AICRP Rapeseed-Mustard August 3-4, 2023 at SKUAST-J, Chatha, Jammu

#### Session I: Planning and Technical Programme Formulation: Genetics & Plant Breeding

Chairman	: Dr. Sanjeev Gupta, ADG (O&P), ICAR, New Delhi	
Co- Chairman	: Dr Sanjay Kumar, Director, ICAR-IISS, Mau, UP	
Subject Expert	: Dr. R K Mathur, Director, ICAR-IIOR, Hyderabad	
<b>Rapporteurs</b> : Dr. Bhagirath Ram, Principal Scientist, ICAR-DRMR, Bh		
	: Dr. H.K.Sharma, Sr. Scientist, ICAR-DRMR, Bharatpur	
	: Prof. Kartikeya Srivastava, I. A. Sc., BHU, Varanasi	
Cassion	started with the energing remarks of Dr Senicey Curte	

Session started with the opening remarks of Dr Sanjeev Gupta, ADG (O&P), Chairman of the session. Dr V.V. Singh, PI (Plant Breeding) made a presentation on crop improvement programme. He informed the house that a total of 8315 accessions were maintained under AICRP-RM. A total of 116 strains of toria were tested at Kanpur, Bhubneshwar, Chatha-Jammu, Jagdalpur and Pantnagar for evaluation of advanced breeding lines. The yield superiority in Toria station trial was recorded up to 30.04 % over the check (PT-303) at Pantnagar. In yellow sarson, 55 strains were tested at Kanpur and Pantnagar. The yield superiority in station trial up to 24.77 % over the check YSH 401 was recorded at Pantnagar. In Indian mustard, 1270 strains were evaluated at 10 centres; Chatha, Imphal, Hisar, Kanpur, Ludhiana, Pantanagar, Dholi, SK Nagar and Varanasi in 37 trials. Seed yield superiority up to 35.15 % over the check Kranti was recorded at Pantnagar. Ten strains at Hisar, 237 strains at Ludhiana and 08 strains at Chattha of gobhi sarson were evaluated for seed yield and its component characters.

Performance of 180 strains including 06 toria, 11 of yellow sarson, 162 of Indian mustard and 01 of gobhi sarson was tested in nineteen performance evaluation trials consisting of toria (1), yellow sarson (1), gobhi sarson (1) and Indian mustard (16) at 49 locations across the 6 agro-climatic zones of the country. On the basis of superiority for seed/oil yield/earliness/quality/resistance over the best check 24 strains including yellow sarson (01), gobhi sarson (01) and Indian mustard (22) were promoted for advanced stage evaluation.

He raised certain issues for discussion in the house such as: Zonalization, strict monitoring at different crop stage, Precision in experimentation, modification in cut-off date of sowing of yellow sarson trials in different zone. He also showed concern of rejection of trials due to different reasons *i.e.* low CV (%), high CV (%), none compliance of trial layout as per technical programme, late submission of trial data, late/not submission of seed sample for oil content estimation. After presentation, chairman called upon the participants to give their suggestions on the numerous issues. Following decisions were taken.

- > The timely supply of seed of entries should be strictly followed for timely conductance of trials.
- It is decided that cut-off date of for sowing of yellow sarson trials should be 10<sup>th</sup> of October in zone II & III.
- Strict monitoring of breeding trials should be ensured at different growth stages of crop
- Re-zonalization proposed was discussed and finalized as: Zone I (Kangra, Chatha, Pantnagar), Zone II (New Delhi, Hisar, Bawal, Sriganagnagar, Ludhiana), Zone III (Bharatpur, Kota, Morena, Jhansi, Kanpur), Zone IV (Jobner, SK Nagar, Nagpur), Zone V (Kanke, Dholi, Varanasi, Shilongani, Berhampore), Zone VI (Imphal, North Eastern Hilly States), Zone VII (Jagdalpur, Bhubneshar). Voluntary centre may be taken as per need of the zone.
- > Only one entry should be included from each private company in IHT trial/ other trials.
- It has been decided that 45S46 hybrid of private sector should not be used as check in hybrid trials. Since, it has not been released/ notified from AICRP-RM testing system.
- Oil content of AVT I & II (TS irrigated/ Quality/WRR) Zone II trial may be re-analyzed from referral laboratory.
- Pedigree of the hybrid should include the cytoplasm used in the development of hybrid and method should be mentioned as two line/three line CMS system. Pedigree should be provided as follows: numerical name (A) x numerical name (R).

After in-depth deliberations, different crop wise trials were constituted and presented by Dr. V.V. Singh, PI, Plant Breeding.

#### 1. AVT-I Yellow Sarson

Zone-V Entries : PYS 2018-1, YSH-401(NC),Benoy (ZC), Pitambari (LR),Filler Locations: Shillongani, Imphal, Kanke, Kalyani, Bhubaneswar

#### 2. Mustard

#### 2.1. IVT Early Mustard

SN	Entry	Pedigree	Method of breeding	Centre
1	KMR (E) 23-1	Seeta X Varuna	Hybrid Breeding	CSAUA&T, Kanpur
2	RH 1999-16	RH 1370 X RH 1402A	Pedigree selection	CCS HAU, Hisar
3	PRE-2021-1	(PRE-2010-19 X EJ17)X	Bulk	GBPUA&T, Pantnagar
		Maya		
4	DRMRHT-17-3-3	NRCHB 101 X BT-15	Pedigree selection	DRMR, Bharatpur
5	DRMRHT-18-65	SEJ-9 X JBT-41/15	Pedigree selection	DRMR, Bharatpur
6	DRMRIJ 102	DRMRIJ 31 X MJR 17	Pedigree selection	DRMR, Bharatpur
7	NPJ 269	NRCHB- 101 X NPJ 173	Pedigree selection	IARI, New Delhi
8	NPJ 266	PM 25 X PusaAgrani	Pedigree selection	IARI, New Delhi
9	SVJH-74 (Hybrid)	SVJA-06 X SVJR-04	Hybrid Breeding	Shaktivardhak Hybrid Seeds, Pvt.
				Ltd.
10	KBH 5106	KB20SA002 X KB20SR009	Hybrid Breeding	Kaveri Seed Company Ltd.
11	Q90025	AFBN7228 X RFN 9001	Hybrid Breeding	Advanta Enterprises Ltd.
12	TM 309-2	TJD1 X PM 26	Pedigree selection	BARC, Mumbai
13	ACN-231	Vardan X Bio YSR	Pedigree selection	COA, Nagpur
14	HUJM (E)-22-1	Sej 2X Kranti	Pedigree selection	BHU, Varanashi
15	4205B296-01	4PHHW64A/4PFTV90R	Hybrid Breeding	Corteva Agriscience
16	Pusa MH- 135	Pusa Agrani (Mori) X NPJ	Hybrid Breeding	IARI, New Delhi
		113R		
17	Pusa Mustard 25			
18	JD 6 (ZC)			
19	LR			
20	Pro 5111 (hybrid check)			

#### Zonal check/Latest Release:

Zone IV : GDM 4 Zone VI: NRCHB 101 Zone

Zone V: NRCHB 101 Zone VII: NRCHB 101

# Locations:

Zone IV	:	S. K. Nagar,	Nagpur, Mandore	, Junagarh
---------	---	--------------	-----------------	------------

- Zone V : Kanke, Shillongani, Kalyani, Dholi, Varanashi
- Zone VI : Imphal, Pasighat, Tripura (COA), Umiam, Bermiok (Sikkim)
- Zone VII: Jagdalpur, Ranital, Kanker, Bilaspur, Ambikapur

#### 2.2 AVT I Early Indian mustard

# Zone II

Entries : DRMRHT 13-13-5-5#, PM 25 (NC), PM 28 (LR), JD 6 (ZC), Filler Locations: Chatha, Hisar, Ludhiana, New Delhi, Abohar # Repeat entry

#### 2.3 AVT I Early Indian mustard

Zone V	•
Entries :	KMR(E) 22-2, PM 25 (NC), NRCHB 101 (LR), JD 6 (ZC), Filler
Locations:	Kanke, Shillongani, Bhubaneshwar, Jagdalpur, Imphal, Kalyani

#### 2.4. IVT Timely Sown, Irrigated

(To be conducted in Alpha Lattice Design, layout is given in last section of plant breeding technical programme)

SN	Entry	Pedigree	Method of breeding	Centre
1	DRMRCI-175	RH 119 X Laxmi	Pedigree selection	ICAR-DRMR, Bharatpur
2	DRMR 2021-30	DRMR 2035 X NRCHB 101	Pedigree selection	ICAR-DRMR, Bharatpur
3	DRMRIJ 21-31	DRMRIJ 31 X LET-36	Pedigree selection	ICAR-DRMR, Bharatpur

4	SKM 2120	NRCHB 101 X PM 25	Pedigree selection	SDAU, SK Nagar
5	SKM 2104	NRCHB 101 X PM 28	Pedigree selection	SDAU, SK Nagar
6	RH 2220	RH 1134 X RH 8814	Pedigree selection	CCS HAU, Hisar
7	RH 2299-63	RH 749 X T-6342	Pedigree selection	CCS HAU, Hisar
8	KMR 23-3	Pusa bold X Urvashi	Pedigree selection	CSAUA&T, Kanpur
9	KMR 23-4	Rohini X CSR-1017	Pedigree selection	CSAUA&T, Kanpur
10	NPJ 270	P.Agrani/ Laxmi//P.Agrani///P. karishma/PAC 401/ /P.Jagannath	Pedigree selection	IARI, New Delhi
11	NPJ 271	PusaTarak/ TS 14-7038 (Varuna/EC-399301)	Pedigree selection	IARI, New Delhi
12	PR-2019-9	Urvashi X PRB-2006-5	Bulk	GBPUA&T, Pantnagar
13	PR-2021-4	RH0923 X Albeli	Bulk	GBPUA&T, Pantnagar
14	HUJM-22-13	NPJ-112 X HUJM-9964	Pedigree selection	BHU, Varanasi
15	AKMS-18-89-1	NDYR-32 X DRMR-11-10	Bulk	SAREC, Kangra
16	ACN 248	ACN-9 X TM 101	Pedigree selection	CoA, Nagpur
17	TM 182	TM 102 X IC 264133	Pedigree selection	BARC, Mumbai
18	RB-116	RH 116 X RH 345	Pedigree selection	RRS, Bawal
19	RGN 559	RL 1359 x RGN 73	Pedigree selection	SKRAU, Sriganganagar
20	PMAS A 2008	PBR 357/Donskaja//PBR 357	MABC	PAU, Ludhiana
21	PBR 788-1	PBR 357 X PDZ 1	Pedigree selection	PAU Ludhiana
22	JM-17-8	RSPR-69 X RH-406	Pedigree selection	SKUAST, Chatha
23	CS 22000-7-4	CS 7003-1-2-5-1 X CS 204-2-2	Pedigree selection	CSSRI, Karnal
24	RMM 19-07	JM-2 X Rohini	Pedigree selection	ZARS, Morena
25	RKM 544	PM 28 X Laxmi	Pedigree selection	ARS,AU,Kota
26	Kranti (NC)			
27	Zonal Check			
28	Latest Release			

Zonal Checks: Latest Release: Zone I: RCC 4 Zone- II- RH 749 Zone I- Giriraj Zone- II –Giriraj

Zone- III – Maya Zone- III: RGN 73 Zone- IV – Bio 902 Zone- IV-GDM-4

Locations :

Zone I: Kangra, Chatha, Pantnagar, Bajaura, Dhaulakuan, Una

Zone II: Abohar, Bawal, Ludhiana, Hisar, Sriganganagar, New Delhi, Modipuram, Navgaon

Zone III: Kanpur, Morena, Kota, Jhansi, Banda, Bharatpur, Jaipur (RARI), Tikamgarh

Zone IV: S.K. Nagar, Nagpur, Jalgaon, Mandore, ARS Washim(COA, Nagpur), Pali

#### 2.5. AVT-I + II (Timely Sown, Irrigated/Quality)

#### Zone II

Entries: RH 1934 @, DRMR 2018-25\*\*\*@, NPJ 261, NPJ 262, PBR 813-2, RGN 528, NPJ 253#, RH(OE) 1708\*\*, DRMRCI(Q) 158\*\*, DRMRCI(Q) 47\*\*#, Giriraj (LR), Basanti (WRR), RH 749(ZC), Kranti (NC), PM 32 (Quality LR), PM 30 (NC), PDZ-1 (DLC), PDZ 11(DLC LR)

Locations : Bawal, Chatha, Hisar, Ludhiana, New Delhi, Sriganganagar, Modipuram, Abohar

\*Timely sown irrigated, \*\*quality strain, \*\*\* white rust resistance strain, # AVT II strain, @ Repeat entry

#### 2.6. AVT-I+II (Timely Sown, Irrigated/Quality)

#### Zone III

Entries: RGN 528, NPJ 253#, DRMRCI (Q) 172\*\*, DRMRCI (Q) 158\*\*, DRMR 2018-25\*\*\*#, RGN 73 (LR), Maya (ZC), Kranti (NC), PM 30 (NC), PM 30 (Quality LR), Basanti (WRR C), PDZ 11 (DLC),

Locations: Pantnagar, Kanpur, Morena, Bharatpur, Varanasi, Dholi, Jhansi,

#AVT II strain, \*\*quality strain, \*\*\* White rust resistant strain,

#### 2.7 AVT I+II (Timely sown irrigated)

Zone IV Entries: NPJ 252#, NPJ 253@, PBR 939@, Kranti, BIO 902, GDM 4, Filler Locations: S.K. Nagar, Nagpur, Jalgaon, Mandore, Pali, ARS Washim(COA, Nagpur) # AVT-II entry, @ Repeat entry

#### 2.8. IVT Mustard, Timely sown (Rainfed)

SN	Entry	Pedigree	Method of breeding	Centre
1	DRMRCI-176	Laxmi X Giriraj	Pedigree selection	ICAR-DRMR, Bharatpur
2	DRMRIJ 20-197	Giriraj X Heera	Pedigree selection	ICAR-DRMR, Bharatpur
3	DRMR 2021-8	RH 749 X NPJ 112	Pedigree selection	ICAR-DRMR, Bharatpur
4	DRMRHT-17-23	DRMRIJ 31 X Urvashi	Pedigree selection	ICAR-DRMR, Bharatpur
5	NPJ 272	PusaAgrani X BCI-12	Pedigree selection	IARI, New Delhi
6	NPJ 273	PusaAgrani X BCI-12	Pedigree selection	IARI, New Delhi
7	RH 2217	RH 1134 X RH 8814	Pedigree selection	CCS HAU, Hisar
8	RH 2263	RH 1209 X RH 7846	Pedigree selection	CCS HAU, Hisar
9	RGN 563	SKM 518 X RGN 298	Pedigree selection	SKRAU, Sriganganagar
10	RB 114	RH 411 x RH 119	Pedigree selection	RRS, Bawal
11	RKM 597	PM 27 X(NPJ124XRB50)	Pedigree selection	ARS,AU,Kota
12	Kranti (NC)			
13	Zonal Check			
14	Latest Release			

Zonal Check - Zone II : RH 725 Zone V: NRCHB 101 Zone VI: NRCHB 101 Zone VII: NRCHB 101 Latest Release – Zone II : RH 761 Zone V : DRMR 150-35, Zone VI : DRMR 150-35, Zone VII : DRMR 150-35 Locations:

Zone II : Sriganganagar, Hisar, Bawal, Ludhiana, Abohar

Zone V : Kanke, Shillongini, Dholi, Varanashi, Kalyani

Zone VI : Imphal, Pasighat, Tripura (COA), Barapani, Bermiok (Sikkim)

Zone VII : Jagdalpur, Bhubneshwar, Kanker, Bilaspur, Ambikapur

#### 2.9. AVT I Mustard, Timely sown (Rainfed)

Zone V

**Entries:** RB 113, NRCHB 101 (ZC), DRMR 150-35(LR), Kranti (NC), Filler **Locations:** Kanke, Jagdalpur, Shillongini, Bhubaneshwar, Imphal

2.10. IVT- Mustard Late s	sown	
---------------------------	------	--

SN	Entry	Pedigree	Method of breeding	Centre
1	DRMRIJ 20-126	NRCHB 101 X MCB 1	Pedigree selection	DRMR, Bharatpur
2	DRMR 2018-1	NRCDR 2 X DRMR 2326	Pedigree selection	DRMR, Bharatpur
3	DRMRHT-17-4-5	BPR-543-2 X BPR-549-9	Pedigree selection	DRMR, Bharatpur
4	RH 2299-106	RH 1511 X RH 725	Pedigree selection	CCS HAU, Hisar
5	RH 2299-108	RH 1402 X RH 1401	Pedigree selection	CCS HAU, Hisar
6	KMR (L) 23-5	Vardan X Kranti	Pedigree selection	CSAUA&T, Kanpur
7	KMR (L) 23-6	Pusa Basant X NDR-8501	Pedigree selection	CSAUA&T, Kanpur
8	NPJ 267	NRCHB 101 X NPJ 173	Pedigree selection	IARI, New Delhi
9	NPJ 268	PM26/(NPJ102/P.Jagannath//NPJ 102	Pedigree selection	IARI, New Delhi
10	TM 305-1	TM 276 X TM 277	Pedigree selection	BARC, Mumbai
11	PRL-2020-20	PRL-2009-6 X Albeli	Bulk	GBPUA&T, Pantnagar
12	PRL-2020-6	KMRL-12-1 X Ashirwad	Bulk	GBPUA&T, Pantnagar
13	HUJM-22-1	(ORYJ(M)-14-2-1 X ABR-4(9511)	Pedigree selection	BHU, Varanasi
14	RGN 570	RGN 399 X RB 50	Pedigree selection	SKRAU, Sriganganagar
15	RGN 572	RGN 393X RH 406	Pedigree selection	SKRAU, Sriganganagar
16	PHR 5169	Ogu-CMS-DTM212XFR-M408	CMS Hybrid	PAU, Ludhiana
17	RKM 594	PM 27 X (NPJ 124xRB50)	Pedigree selection	ARS,AU, Kota
18	Kranti (NC)			
19	Zonal Check			
20	Latest Release			

Zonal check: Zone-II - Pusa Mustard 26 (NPJ 113)

Zone-III- NRCHB-101

Zone-III- CS 56

Zone-V- NRCHB-101 Zone-V- CS 56

Latest Release : Zone-II – Radhika (DRMR 2017-15)

Locations: Zone II : Sriganganagar, Hisar, New Delhi, Ludhiana, Abohar

Zone	III	:	Kar	npur	, I	Moren	a,	Kota,	Bl	haratpur,	, I	Ba	and	la		
	<b>-</b>		**		~ •					* *			**		~	

Zone V : Kanke, Shillongini, Dholi, Varanashi, Kalyani, Sabour

#### 2.11. AVT-II Mustard,Late Sown (Irrigated)

Zone – III Entries: DRMRHJ 430, Kranti (NC), CS 56 (LR), NRCHB 101(ZC), Filler Locations: Kanpur, Pantnagar, Varanasi, Morena, Dholi, Bharatpur, Sabour

#### 2.12. IHT,Hybrid Mustard

SN	Entry	Pedigree	CMS system used	Centre
1.	RHH 2301	RH 427-OA X OR 146	Ogura CMS	CCS HAU, Hisar
2.	RHH 2302	RH 247-OA X OR-504-1	Ogura CMS	CCS HAU, Hisar
3	PHR 1293	Ogu-CMS-DTM48XFR-M404	Ogura CMS	PAU Ludhiana
4	PHR 3278B	CMS-DTM38XFRM103	Ogura CMS	PAU Ludhiana
5	DRMRHJ 1517	MJA 15 X MJR 17	mori CMS	ICAR-DRMR, Bharatpur
6	DRMRHJ 25018	MJA 15 X EC 597309	mori CMS	ICAR-DRMR, Bharatpur
7	Pusa MH 145	P. Bahar(ber)/TN-3 R	Diplotaxis	IARI, New Delhi
			berthautii	
8	Pusa MH 150	Sej-8( <i>ber</i> )/ TN-3 R	Diplotaxis	IARI, New Delhi
			berthautii	
9	SKMH 1809	GMMo 2105A X GMMo 2110R	Mori CMS	SDAU, S.K. Nagar
10	SVJH-76	SVJA-04 X SVJR-06	Ogura CMS	Shakti Vardhak Hybrid
				Seeds Pvt. Ltd.
11	KGMH-9297	KA- 119 X KR-67	Ogura CMS	Kamadgiri Crop Science
				Pvt. Ltd.
12	DRMRHJ 1170	MJA 11 X MJR 17	mori CMS	ICAR-DRMR, Bharatpur
13	NAM-9204	NAMJA-2 X NAMJR-5	Ogura CMS	Namdhari Seeds Pvt. Ltd.
14	4205B284-01	733F/ 4PNVG79R	Ogura CMS	CortevaAgriscience
15	PA 5232	PA1IJ208 X PR1IJ668	Ogura CMS	Crystal Crop protection
				Ltd
16	KBH 5252	KB20SA003 X KB21SR013	Ogura CMS	Kaveri Seed Copmany Ltd
17	Q90033	AFG 0154 X RFN 9001	Ogura CMS	Advanta Enterprises Ltd.
18	NMH 90M03	GRU163A/GRU164BXGRU472/GRU483	Ogura CMS	Nuziveedu Seeds Ltd
19	PMH90V02	GRU269A/GRU270BXGRU509/GRU483	Ogura CMS	Prabhat Agribiotech Ltd
20	US 8787	SWJ05AX SWJ25R	Ogura CMS	Seed Works International
			-	Pvt. Ltd.
21	BMH 20011	BM0345M X BM7040	Ogura CMS	Bioseed Research India
22	HRH191290	HR0030 X HR007R	Ogura CMS	Hytech India Pvt. Ltd.
23	RHH 2318	RH222OA X Ogura 146	Ogura CMS	CCS HAU, Hisar
24	Kranti (NC)			
25	Zonal Check			
26	DMH-1 (Check)			

Observations on number of sterile/fertile plants are to be recorded on 30 plants per replication on boarder rows by covering main raceme at bud stage and recoding observation on seed set at maturity in hybrid trial.

Zonal check: Zone-II : RH 749 Zone-III : RGN 73 Zone IV : GDM 4

Locations:

Zone II : Hisar, Ludhiana, New Delhi, Palwal (Advanta), Mahendragarh (Shaktivardhak), Navgaon

Zone III : Kanpur, Morena, Kota, Bharatpur, Jhansi, Faizabad (Namdhari Seeds), Jaipur (Crystal)

Zone IV: SK Nagar, Mandore, Pali , Jalgaon, Nagpur

#### 2.13. AHT-I+II Mustard

Zone – II

**Entries:** JKJH 11, SVJH 73, Q90007,RHH 2101#, SVJH- 71#, IJ16R1168#, Kranti (NC), DMH- 1 (Hybrid Check), RH 0749 (ZC), 45S46 (Hybrid Check), Filler

Locations: Ludhiana, Hisar, New Delhi, Sriganganagar, Mahendragarh (Shaktivardhak) # AHT-II strain

2.14 AHT-I+IIMustard Zone – IV Entries: : JKJH 11, SVJH 73, SKMH 1901,18J408C#,Kranti (NC), DMH- 1 (Hybrid Check), GDM 4 (ZC), 45S46 (Hybrid Check), Filler Locations: SK Nagar, Mandore, Pali, Jalgaon, Nagpur # AHT-II strain

SN	Entry	Pedigree	Method of breeding	Centre
1	LES 68	LES 45 X EC-61	Pedigree selection	IARI, New Delhi
2	LES 69	Heera/PM30//Heera	Pedigree selection	IARI, New Delhi
3	PDZ 21#	LES 1-27 X PDZ-2	Pedigree selection	IARI, New Delhi
4	PMAS 7	PBR 357/ RLC 3// PBR 357	MABC	PAU Ludhiana
5	PMAS 8	PBR 357/ RLC 3// PBR 357	MABC	PAU Ludhiana
6	RH(OE) 1618	RH(HO) 0502 X Berry	Back Cross	CCS, HAU, Hisar
7	RH(OE) 1710	RH(HO) 0508 X RH 0401 B	Back Cross	CCS, HAU, Hisar
8	DRMRCI(Q) 179	NRCHB- 101 / Heera//NRCHB 101	MABC	DRMR, Bharatpur
9	DRMRCI(Q) 180	DRMR 150-35/ RLC- 3// DRMR	MABC	DRMR, Bharatpur
		150-35		
10	DRMRCI(Q) 181	DRMR 150-35/ RLC- 3// DRMR	MABC	DRMR, Bharatpur
		150-35		
11	LR			
12	Zonal Check			
13	PM 30 (NC quality)			
14	PDZ 11 (double low			
	check)			

#### 2.15. IVT, Quality Mustard

# - double low strains

#### Zonal check :- Zone II –RH 749; Zone III – RGN 73

Latest Release (Quality Check): Zone II- Pusa Mustard 32 (LES 54); Zone III- Pusa Mustard 30 Locations:

Zone II:	Bawal, New Delhi, Hisar, Ludhiana, Sriganganagar,
Zone III:	Kanpur, Morena, Bharatpur, Kota, Jhansi

#### 2.16. AVT-I Mustard Salinity

**Entries:** CS 2020-10@, CS 54 (Salinity check), CS 60 (LR), Kranti (NC), Filler **Locations:** Karnal, Lucknow, Agra, Hisar, Fatehpur, Bikaner @ Repeat entry

#### 3. IVT Gobhi Sarson

SN	Entry	Pedigree	Method of breeding	Centre
1	JGS-16-9	DGS-1 X GSC-6	Pedigree selection	SKUAST, Chatha
2	AKGS 2461	CNH-11-1 X EC 552608	Bulk	SAREC, Kangra
3	AKGS-20-9	Neelam X MHO 173	Bulk	SAREC, Kangra
4	GSC 64	Synthetic B. napus (B. juncea x B carinata)	Synthesized through hybridizing <i>B. juncea x B</i> <i>carinata</i> followed by derived ploidy	PAU, Ludhiana
5	PGSH 1711	Ogu-CMS-AG-14XFR-ZY005	Hybrid Breeding	PAU, Ludhiana
6	Kranti (NC)			
7	GSL-1 (NC)			
8	GSC 6 (QC)			
9	AKMS 8141 (LR)			

Locations :Kangra, Dhaulakuan, Bajaura, Pantnagar, Chatha, Ludhiana, Abohar, Khudwani

#### 3.1 AVT-II Gobhi Sarson

**Entries:** GSH 2155, Kranti (NC), GSL-1 (NC), GSC 6 (QC), AKMS 8141 (LR), Filler **Locations:** Kangra, Dhaulakuan, Bajaura, Chatha, Ludhiana, Abohar

#### LAYOUT OF EXPERIMENTS

Trials	IVT	AVT
Design	RBD/Alpha Lattice	RBD
Replication	Three (two blocks in each replication)	Four
Plot size Varieties- Zone II	Gross: 2.7 X 5 m; Net: 1.8 X 4.5 m	Gross: 4.5 X 5 m; Net: 3.6 X 4.5 m
Plot size Varieties-Zone I, III,	Gross: 1.8 X 5 m; Net: 1.2 X 4.5 m	Gross: 3.0 X 5 m; Net: 2.4 X 4.5 m
IV & V		
Plot size Hybrids	GrossAll Zones:2.7 X 5 m	Gross All Zones:4.5 X 5 m
	Net All Zones : 1.80 X 4.5 m	Net All Zones : 3.6 X 4.5 m
No. of Rows	Six, Data to be recorded from four rows	Ten, Data to be recorded from eight rows
Zone I, II, III, IV& V		
No. of Rows	Seven of 4 m length	Twelve of 4 m length
NEH region		
Spacing varietal trials	45 X15 cm Zone II (Except early & LS)	45 X15 cm Zone II(Except early & LS)
	30 X 10 cm Zone I, III, IV and V	30 X 10 cm Zone I, III, IV and V
Spacing hybrid trials	45 X 15 cm	45 X 15 cm

Note : In case of combined IVT + AVT 1 Trial, layout of AVT I Trial shall be followed

Fertilizer doses :	
--------------------	--

Toria	:	50 : 25 : 25 , N: P <sub>2</sub> O <sub>5</sub> : K <sub>2</sub> O kg/ha
Yellow sarson	:	50 : 30: 30, N : P <sub>2</sub> O <sub>5</sub> : K <sub>2</sub> O g/ha
Mustard, Karan	:	Irrigated-80 : 40 : 40, N : P2 O5 : K2O kg/ha
Rai,Gobhi Sarson		Rainfed- 40 : 20 : 20, N : P <sub>2</sub> O <sub>5</sub> : K <sub>2</sub> O kg/ha
Taramira	:	30 N kg/ha
Hybrids	:	125 % of RDF for the respective states

#### Seed Supply:

- Seed material of Toria and Mustard (Early sown) trials should be sent latest by 20th August
- Seed material of rest of the trials should be sent latest by 30<sup>th</sup> August
- In case of late receipt of seed material, it will not be included in the trials.
- 50 g seed for IVT and 100 g seed for AVT for each location should be sent.
- 200 g seed of IVT, AVT 1 and AVT 2 entries should be added for Entomological and Pathological experiments.
- 250 g seed / location of AVT-2 entries should be added for Agronomical experiments.
- 300 g seed of each quality strain should be added for biochemical analysis
- Entire quantity of seed of each entry is to be sent in one lot in proper packing to avoid mixing of seed with other entry seed. Do not make separate packets and seed should be without any treatment or any other identification mark.

#### Data reporting:-

- Data should be sent to Director, DRMR (<u>director.drmr@gmail.com</u>) on the prescribed data sheets latest by May 15, otherwise it will not be possible to include in the report
- Weather data with brief weather report should be supplied along with trial data.
- Yield data (kg/ha) should be sent after analysis. Unanalyzed data will not be included in Annual Report.
- Entries along with pedigree and method of breeding should be sent in the prescribed proforma available at DRMR website latest by 10<sup>th</sup> July for inclusion in concerned IVT trial. In case of hybrid entry, mention the name of CMS system used for hybrid development.

#### Note:

- In each case, preceding crop may be reported.
- Soil test for NPK may be got done and reported along with the results.
- No irrigation is to be given for rainfed experiments and 5m buffer spacing in all sides should be kept.
- If there is no rain before the sowing, pre-sowing irrigation is to be given.

• The centres, which have accepted the trials, must report data, otherwise their test entries will not be included in trials if the data are not supplied without any valid reason.

S.N.	Trial		Zone								
		I & II	III	IV	V	VI	VII				
1	Toria	30 <sup>th</sup> September	10 <sup>th</sup> October	10 <sup>th</sup> October	31 <sup>st</sup> October	15 <sup>th</sup> November	31 <sup>st</sup> October				
2	Yellow sarson	10 <sup>th</sup> October	10 <sup>th</sup> October		31 <sup>st</sup> October	15 <sup>th</sup> November	31 <sup>st</sup> October				
3	Early mustard	30 <sup>th</sup> September	10 <sup>th</sup> October	10 <sup>th</sup> October	15 <sup>th</sup> November	30 <sup>th</sup> November	15 <sup>th</sup> November				
4	Indian mustard, TS Irrigated/ Rainfed, (Hybrid, Quality, Salinity)	31 <sup>st</sup> October	31 <sup>st</sup> October	31 <sup>st</sup> October	30 <sup>th</sup> November	30 <sup>th</sup> November	30 <sup>th</sup> November				
5	Indian mustard Late Sown	November 15-30	November 15-30	November 15-30	30 <sup>th</sup> November						

#### Cut off sowing dates for different trials

#### **Criteria for promoting the strains**

- The strain (variety/hybrid) out yielding the best check by margin of at least 10 percent either for seed yield or for oil yield shall be promoted for advanced stage of testing, however an exemption upto 10 kg for seed yield may be considered.
- The qualifying strains for possessing any specific trait like quality, drought, and disease and pest resistance will be promoted even if its yield is at par with the best check.
- In single zero lines, promotion shall be on the basis of 10 % superiority for seed/oil yield over quality check as well as seed/oil yield at par/ better than the best non quality check
- In double zero lines, promotion shall be on the basis of 10% superiority for seed/oil yield over quality check as well as seed/oil yield at par/ better than the best non quality check
- The qualifying trials for computing the mean seed yield should have CV less than 15% for trials conducted under irrigated and less than 20% for trials conducted under rainfed and alkaline and saline conditions.
- If the differences in seed yield of same genotype being used as filler/check are equal or greater than CD value, the data of the centre shall not be considered.
- If the variation for seed yield among the strains of a trial is more than four times at one centre and not supported by similar trend at other centres of the zone, such data of that centre shall not be considered.
- Seed yield data of developing centres will be discarded if found two times higher than any entry of particular trial.
- The plant population should be at least 80% of the expected plant population.Plant Population -Minimum CriteriaIVT110AVT260
- The experimental mean seed yield should be equal to or greater than the state mean for the seed yield.
- 75% of state average yield during last 3 years shall be the criteria for inclusion of data on the basis of General Mean for late sown, Rainfed, Salinity. In taramira 50% of state average yield shall be the criteria for inclusion of data on the basis of grand mean of trial
- In Salinity trials EC levels should be 10 or > 10 dS/m for inclusion of the data.
- In toria/early mustard trial, promotion shall be based upon superiority over the earliest maturing check. A margin of 5 days over the best check's maturity duration shall be given in early maturity toria/mustard trial.
- Non significant data shall not be considered for computation of mean.

- Expts with <5% C.V. shall not be considered for computation of mean
- Entries developed through pure line selection from germplasm/variety shall not be evaluated.

# Criteria for Promotion of Indian Mustard hybrids to higher order of testing and identification

- 10% and 5% higher seed yield over the best performing variety checkand hybrid check, respectively and numerically at par oil yield or 10% and 5% higher oil yield over the best performing variety checkand hybrid check, respectively and numerically at par seed yield.
- Thousand seed weight should be more than 4.5g for promotion of hybrids in hybrid evaluation trials
- Numerically at par with best performing check variety/ hybrid for seed or oil yield for specialty types like low erucic acid (< 2%); glucosinolates (< 30 umole/g defatted seed meal) or any other character of Zonal/national importance.
- Moderately resistant or resistant reaction to major key diseases/ pest of the crop at several locations while comparing with check variety/ hybrid
- Stable performance in terms of consistency in yield and oil content across locations within a zone.
- Thermostability if indicated in physiological trials

#### Criteria for Promotion of Near Isogenic Lines (NILs) in AICRP- Rapeseed & Mustard

• Promotion of NILs shall be based on the consistency in the performance of target trait in the target environment and yield equivalence with recurrent parent.

# Proposed Alpha Lattice Design for IVT Timely Sown (Irrigated) v = 28, b = 12, r = 3, k = 7, AE = 0.9603, DE = 0.9812 $\alpha$ (0,1,2)

REPLICATION 1									
Block 1	20	16	8	12	28	4	24		
Block 2	25	5	9	13	17	21	1		
Block 3	7	15	19	11	23	3	27		
Block 4	6	26	2	18	22	10	14		

<b>REPLICATION 2</b>							
Block 1	13	22	7	26	4	17	11
Block 2	9	5	2	24	15	28	19
Block 3	18	8	12	14	1	23	27
Block 4	25	10	21	3	20	16	6

<b>REPLICATION 3</b>								
Block 1	25	7	23	13	2	12	20	
Block 2	16	1	11	6	22	19	28	
Block 3	17	24	26	14	9	3	8	
Block 4	18	5	15	4	10	21	27	

rep	block	treatment	Seed	rep	block	treatment	Seed	rep	block	treatment	Seed
			yield				yield				yield
1	1	20		2	1	13		3	1	25	
1	1	16		2	1	22		3	1	7	
1	1	8		2	1	7		3	1	23	
1	1	12		2	1	26		3	1	13	
1	1	28		2	1	4		3	1	2	
1	1	4		2	1	17		3	1	12	
1	1	24		2	1	11		3	1	20	
1	2	25		2	2	9		3	2	16	
1	2	5		2	2	5		3	2	1	
1	2	9		2	2	2		3	2	11	
1	2	13		2	2	24		3	2	6	
1	2	17		2	2	15		3	2	22	
1	2	21		2	2	28		3	2	19	
1	2	1		2	2	19		3	2	28	
1	3	7		2	3	18		3	3	17	
1	3	15		2	3	8		3	3	24	
1	3	19		2	3	12		3	3	26	
1	3	11		2	3	14		3	3	14	
1	3	23		2	3	1		3	3	9	
1	3	3		2	3	23		3	3	3	
1	3	27		2	3	27		3	3	8	
1	4	6		2	4	25		3	4	18	
1	4	26		2	4	10		3	4	5	
1	4	2		2	4	21		3	4	15	
1	4	18		2	4	3		3	4	4	
1	4	22		2	4	20		3	4	10	
1	4	10		2	4	16		3	4	21	
1	4	14		2	4	6		3	4	27	

Datasheet for recording the observations Timely Sown Irrigated

# XXIX Annual Group Meeting of AICRP Rapeseed-Mustard August 2-4, 2023

#### Venue: SKUAST-JAMMU

Session II	: Planning and Technical Programme Formulation: Plant Pathology
Chairman	: Dr. Sanjeev Gupta, Assistant Director General (O&P), ICAR, New Delhi
Co-Chairman	: Dr. P. K. Rai, ICAR-Director, ICAR-DRMR, Bharatpur
Subject Expert	: Dr. R. P. Awasthi, Ex-Profesoor, Dept. of Plant Pathology, GBPUAT, Pantnagar
Rapporteurs	: Dr. Pankaj Sharma, Principal Scientist, ICAR-DRMR, Bharatpur
	: Dr. S. S. Vaish, Professor, I.A. Sc., BHU, Varanasi

The presentation of results, planning and technical programme formulation session of Plant Pathology started with introductory remark by the Chairman, Dr. Sanjeev Gupta, Assistant Director General (O&P), ICAR, New Delhi, and subject expert Prof. R. P. Awasthi, Ex-Professor & Head, Dept. of Plant Pathology, GBPUAT, Pantnagar. Significant achievements of Plant Pathological trials conducted during the year 2022-23 at different locations were presented by Dr. P.D. Meena, PI, Plant Pathology. The results were reviewed critically and the technical programme for the year 2023-24 was finalized after through discussion. Dr. R. P. Awasthi, suggested that all coordinated centers should analyze the disease data uniformly to avoid variation in severity data at different locations. He also suggested that all trials must be conducted in a precise way for any uniform conclusion. Chairman Dr. Gupta suggested to make National Genetic Stock nursey at ICAR-DRMR and resistant/tolerant sources (>3 yrs) should be maintained. Disease reaction will be recorded as mean and ABL, ABP, SR, PM will be in mode. He advised to make a publication on standard screening protocol for rapeseedmustard diseases. Dr. P.K. Rai, Director, ICAR-DRMR call upon all plant pathologists to support breeders in evaluation of germplasm developed and data recording and compilation. Dr. R.K. Mathur, Director ICAR-IIOR suggested to identify the disease hot spots and utilize for different screening. Following recommendation emerged:

- 1. Indian mustard genotype RH 1700 and RH 1700-1 are recommended as white rust resistant sources for use in the breeding programme.
- 2. Trial on assessment of yield loss and management of AB in rice-fellow mustard cropping system concluded based on three-year data with a recommendation that foliar spray of Tebuconazole 50%+ trifloxistrobin 25% WG @ 0.5g/l at 40 and 70 days after sowing may be beneficial for the management of AB which causes 49.8 per cent yield losses under rice-fellow-mustard cropping system.
- 3. Efficacy of fungicides against major diseases of rapeseed-mustard trial concluded based on three year data with a recommendation that AB and WR disease can be reduced by foliar spray of Tebuconazole 50% + Trifloxostrobin 25% WG@0.1% over control.

#### **Technical Programme**

All centres should report observations on percent disease severity (AB, WR, PM) following 0-9 rating scale. Date of sowing and date of observation(s) should be indicated in data sheet itself. Data for disease severity/ incidence to be reported replication-wise as also after proper statistical analysis (angular transformation) in the same format as in the AICRP-RM Annual Progress Report 2013 with CD (P < 0.05) and CV (%) values for comparison of treatments. <u>Transformed value should be indicated in parenthesis</u>. Soft copy of data should be prepared only in **MS Excel sheets. Text** of report should be in **MS Word**. Both soft (by email file attachment only) and hard copy of data should reach the PI (Plant Pathology), ICAR-DRMR, Bharatpur latest by 15<sup>th</sup> May, 2024. Unanalyzed data will not be accepted. Data after due date will not be considered.

**Attention:** (i) Seeds from different trials labelled suitably and in separate packets should reach the PI, Plant Pathology, ICAR-DRMR, Bharatpur **latest by 30 August 2023**. (ii) Pathologist from respective centre should take action for supply of seed well in time. The national disease nursery (NDN) for different diseases should be conducted with artificial inoculation. Data for all other major diseases occurring on the test entries needs to be recorded and reported. Respective centres should take up detail work on sources of resistance, epidemiology, losses and control of diseases of local importance.

#### 4.1 Screening of Brassica germplasm and breeding material against major diseases

**Objective:** Disease response of elite accessions under different geographical conditions

S. No.	AVT-I+II (Entries)	S. No.	AVT-I+II (Entries)				
Hybrid	Indian mustard	TSI/Q/V	WRR mustard				
1.	JKJH 11	14.	RH 1934				
2.	SVJH 73	15.	RH(OE) 1708				
3.	Q90007	16.	NPJ 252				
4.	RHH 2101	17.	NPJ 253				
5.	SVJH- 71	18.	NPJ 261				
6.	IJ16R1168	19.	NPJ 262				
7.	SKMH 1901	20.	PBR 813-2				
8.	18J408C	21.	PBR 939				
Early n	nustard	22.	RGN 528				
9.	DRMRHT 13-13-5-5	23.	DRMR 2018-25				
10.	KMR(E) 22-2	24.	DRMRCI(Q) 47				
LSI mu	stard	25.	DRMRCI (Q) 172				
11.	DRMRHJ 430	26.	DRMRCI (Q) 158				
TSR m	ustard	Gobhi S	Sarson				
12.	RB 113	27.	GSH 2155				
Mustard salinity		Yellow	Sarson				
13. CS 2020-10		28.	PYS 2018-1				
Checks:	Checks: B. juncea: Rohini, NRCHB 101 (SC) & Local Check, BIOYSR, DRMRMJA-35 (RC-						
WR), Pl	HR 2 (TC-AB), DMH 1, PDZ 1; B. napp	us: GSL 1	l; B. carinata: DLSC 1, B. rapa ssp				
Yellow	Yellow Sarson: NRCYS-5-2: <i>B</i> rang var Toria: PT 303: RTM 314						

#### 4.1.1Screening of Brassica AVT-I & II strains against major diseases under natural condition

Location: Dholi, Pantnagar, Hisar, Ludhiana, S.K. Nagar, Shillongani, Jhansi

Layout: i. Single row: two replications of 3 m row length

ii. Susceptible checks will be used after every two test rows

#### 4.1.2Screening of *Brassica* AVT-I and AVT-II strains against major diseases using artificially inoculated under field condition

Disease	Location
Alternaria blight:	Dholi, Pantnagar, Ludhiana, Shillongoni, Hisar
White rust/ DM:	Pantnagar, Hisar, Ludhiana, Bharatpur
Sclerotinia rot:	Dholi, Ludhiana, Pantnagar, Hisar, Bharatpur
Methodology	

- i. Add oosporic material of local isolate only after grinding hypertrophied plant material collected from the previous year crop along with seed for white rust and downy mildew.
- ii. For secondary spread of the disease make repeated inoculations after collecting inoculum from the naturally infected plants for major diseases (AB, WR, DM, PM, SR).
- iii. Give frequent irrigation and higher doses of nitrogenous fertilizer to create epiphytotic.
- iv. The source of inoculum for creating epiphytotic conditions for PM screening needs to be implemented by collecting infected plant stubbles from previous crop season.

#### **Observations to be recorded**

- i. Date of first appearance of each disease including bacterial rot
- ii. Data as percent disease severity / percent disease incidence for WR (75 DAS/ at maximum disease pressure), AB / PM/ BR (90 DAS/ at maximum disease pressure) on leaves and pods and number of staghead (15 days before harvest) should be recorded on 10 randomly selected plants from each plot using 0-9 scale. Date of observation and date of sowing should be indicated in data sheet itself.
- iii. Cotyledonary infection due to downy mildew and pod infection due to Alternaria blight

should be recorded separately.

Staghead formation should be recorded as percent incidence and percent twigs infected.

Staghead (% twigs affected) = (number of twigs infected/ total number of twigs) x 100.

- iv. Data for all major diseases may be recorded as percent disease severity (AB, WR and PM) on leaves/ pods or as percent disease incidence (SR, DM, CR, BR).
- v. Date of each observation should be provided in the data sheet.
- vi. Data should be statistically analysed as per the design using ANOVA after arc sin transformation. Actual and transformed (in parenthesis) values along with mean, CD (P < 0.05) and CV (%) are to be submitted for report preparation.

Scale (0-9) for	<sup>r</sup> rating o	of entries	for	reaction	to	Alternaria	blight,	white	rust	and	powdery
mildew should	be used										

0 (Immune for WR)	=	No lesion
1 (HR)	=	Non-sporulating pinpoint size or small brown necrotic spots, less
		than 5% leaf area covered by lesion
3 (R)	=	Small roundish slightly sporulating larger brown necrotic spots,
		about 1-2 mm in diameter with a distinct margin or yellow halo, 5-
		10% leaf area covered by lesions
5 (MR)	=	Moderately sporulating, non-coalescing larger brown spots, about 2-
		4 mm in diam with a distinct margin or yellow halo, 11-25% leaf
		area covered by the spots
7 (S)	=	Moderately sporulating, coalescing larger brown spots about 4-5 mm
		in diam, 26-50% leaf area covered by the lesions
9 (HS)	=	Profusely sporulating, rapidly coalescing brown to black spots
		measuring more than 6mm diam without margins covering more
		than 50% leaf area

Average severity score= (N-1 X 0) + (N-2 X 1) + (N-3 X 3) + ((N-4 X 5) + (N-5 X 7) + (N-6 X 9))Number of leaf samples

Per cent Disease Intensity (PDI) = 
$$(N-1 X 0) + (N-2 X 1) + (N-3 X 3) + ((N-4 X 5) + (N-5 X 7)) + (N-6 X 9) X 100$$

No. of leaf samples X 9

Where N-1 to N-6 represents frequency of leaves in the respective score

#### Note:

- (1) The word spots can be read as pustules if the same scale is used for white rust rating
- (2) In case of white rust, brown spot can be read as creamy white pustule
- (3) This scale can also be used in management trials
- (4) For PM, the same rating scale will be followed ignoring the lesion/ pustule characteristics



Diseased leaf and pod area assessment key for for Alternaria blight of rapeseed-mustard (Conn et al. 1990) modified and adopted by AICRP-RM Plant Pathologist during 17<sup>th</sup> AICRP-RM Group meeting -2010 at Gwalior

Reaction	Rating	Lesion (cm)
Resistant	0	< 3
Moderately tolerant	1	3-5
Moderately susceptible	2	5-10
Susceptible	3	10-15
Highly susceptible	4	>15

Scale (0-4) for rating of entries for reaction to Sclerotinia rot

\*Stem diameter and % incidence must also be recorded

#### Method of artificial inoculation for white rust:

Test plants (including checks) should be inoculated twice i.e. at initiation of flowering and pod formation stage. Inoculum may be prepared by collecting fresh zoosporangia from naturally infected leaves with *Albugo candida*. Petri plates containing zoosporangia suspended in distilled water be kept at 4°C for 2 h to facilitate germination of zoosporangia. To assure germination of the sporangia, the plates may be examined under the low power microscope. Germinating zoosporangia would be emptied and zoospores will be visible in the suspension. Suspension containing zoospores be filtered through double layered muslin cloth and further diluted with distilled water for spraying on leaves of test plants. This may be done with the help of atomizer / small sprayer in the afternoon (after 1500 hrs). Data for disease severity may be recorded 75 DAS/ at maximum disease pressure on leaves and 15 days before harvest for staghead.

#### Method of artificial inoculation for Alternaria blight

Test plants (including checks) should be inoculated twice i.e. at initiation of flowering and pod formation in the afternoon (after 1500 hrs) with conidial suspension ( $10^5$  cfu / ml) of pure culture of *Alternaria brassicae*/ *A. brassicicola* using distilled water. Disease severity should be recorded 90 DAS/ at maximum disease pressure on leaves and 15 days before harvest on pods.

#### Method of artificial inoculation for Sclerotinia rot

Cut 5 mm discs of fungal mycelium along with medium from 7-days old pure culture *Sclerotinia sclerotiorum* grown on thick layer of PDA at 20°C. Place one disc on third internode of plant at flowering stage. Wrap the stem along with the fungal agar disc with a swab of cotton dipped in sterile distilled water. Record observation 3-weeks after inoculation for lesion size and per cent disease incidence.

#### Method of artificial inoculation for downy mildew

Freshly harvested conidia in distilled water from naturally/ artificially infected cotyledonary leaves of susceptible variety should be used for preparation of conidial suspension. Inoculum concentration should be adjusted to  $10^4$  conidia/ ml using distilled water. Prepared conidial suspension of *Hyaloperonospora parasitica* should be inoculated directly to test plants at 2/3 leaf stage in the afternoon (after 1500 hrs). Observations should be recorded after 7-10 days of inoculation.

#### 4.2 Uniform disease nursery (UDN) trial for major diseases of rapeseed-mustard

- **Objective:** Disease reaction of accessions under different geographical conditions (under natural conditions) for identification of lines for respective national disease nursery trials
- **Materials:** Concerned breeders/ scientists will supply the seed material to Director, DRMR indicating 'for Pathology 4.2 UDN trial'. PI, Plant Pathology, DRMR will in turn send the material to different centres. Pathologist of each centre, with the help of plant breeder, should be responsible for sending the seed of each entry (minimum 100 g) under proper cover labelling species and accession details. Entries must be arranged species-wise.

**Observations:** Should be recorded and reported as percent disease severity (AB, WR, PM) or percent disease incidence (Sclerotinia rot, Club root as per trial 4.1.

Centre	Entries to be sent
Bharatpur	Bj: DRMRDR 2116, DRMRDR 2119, DRMRDR 2133, DRMRDR 2135,
	DRMRDR 2140, DRMRDR 2141, DRMRDR 2151, DRMRDR 2152, DRMRDR
	2155, DRMRDR 2156, DRMRDR 2195, DRMRDR 2196, DRMRDR 2201,
	DRMRDR 2202, DRMRDR 2203, DRMRDR 2206, DRMRDR 2227, DRMRDR
	2235, DRMRDR 2236, DRMRDR 2241, DRMRDR 2242, DRMRDR 2203,
	DRMRCI (Q) 57, DRMRCI 153, DRMRCI 168, DRMRCI 169, DRMRCI 170,
	DRMRCI 171, DRMRCI 190, DRMRCI 191, DRMRCI 192, DRMRCI 182,
	DRMRSJ 9, DRMRSJ 12, DRMRSJ 22, DRMRSJ 14, DRMR 2018-26, DRMR
	2019-15, DRMR 2021-28, DRMR 2021-30, DRMR 2020-14, DRMR 2020-15,
	DRMR 2019-16, DRMR 2019-20, DRMRIJWR 20-12, DRMRIJWR 20-29,
	DRMRIJWR 20-30, DRMRDR 2301, DRMRDR 2304, DRMRDR 2305,
	DRMRDR 2315, DRMRDR 2317, DRMRDR 2318, DRMRDR 2319, DRMRDR
	2320, DRMRDR 2322, DRMRDR 2335, DRMRDR 2342, DRMRDR 2343,
	DRMRDR 2349, DRMRDR 2351, DRMRDR 2352
Pantnagar	<i>Bj:</i> PRD-2014-26, PRD-2014-21, PRD- 2014-7, PAB-2017-22, PAB-2017-25, PAB-2017-4, PAB-2017-1
Hisar	RH-1700-3
Check:	Brassica juncea: Rohini, NRCHB 101 (SC) & Local Check, BIOYSR,
	DRMRMJA 35 (RC-WR), PHR 2 (TC-AB); B. napus: GSL 1; B. carinata:
	DLSC 1, B. rapa ssp Yellow Sarson: NRCYS-5-2; B. rapa var Toria: PT 303
Locations:	Dholi, Pantnagar, Morena, Hisar, S.K. Nagar, Ludhiana, Shillongoni, Kanpur, New Delhi, Varanasi, Jhansi, Jagdalpur, Nagpur, Jobner, Jammu

<u>NOTE</u>: All concerned scientists should mention the name of the species of the entry while sending seeds.

#### 4.3 National disease nursery (NDN) for Alternaria blight

Objective:	To identify potential donors against Alternaria blight after screening under different geographical locations						
Centre	Entries to be sent						
Bharatpur	B <i>j</i> : DRMRSJ-349, DRMR-PMJ-17, DRMRSJ 22, DRMRIJWR 20-11, DRMRIJWR 20-15, DRMRIJWR 20-16, DRMRIJWR 20-19, DRMRHJ 3130,						
Pantnagar	<i>Bj</i> : PAB-2014-1, PAB-2014-4, PAB- 2014-7, PAB- 2014-8, PAB- 2014-18, PAB-2017-15, PAB-2017-18, PAB-2017-20						
Hisar	RH-1700-3						

Check:	B. juncea: Rohini, NRCHB 101 (SC) & Local Check, BIOYSR, DRMRMJA 35
	( $\mathbb{R}C_{-}W\mathbb{R}$ ) PHR 2 ( $\mathbb{T}C_{-}A\mathbb{R}$ ): <i>B</i> nanus: GSL 1: <i>B</i> carinata: DLSC 1: <i>B</i> ranges
	(RC-WR), THR 2 (TC-AD), D. napus. OSE 1, D. carinata. DESC 1, D. rapa ssp
	Yellow Sarson: NRCYS-5-2; B. rapa var Toria: PT 303
Locations:	Pantnagar, Dholi, Hisar, Ludhiana, Shillongani, Jagdalpur, Kanpur, Varanasi

**Layout:** Repl: 02: Each entry should be sown in paired row of 3 m length between susceptible local check with 30 x 10 cm spacing.

**Method of inoculation:** Test plants (including checks) should be inoculated at initiation of flowering and initiation of pod formation during afternoon (after 1500 hrs) with pure culture of *Alternaria brassicae/ A. brassicicola* using  $10^5$  conidial suspensions/ ml in distilled water. Data for disease severity may be recorded at 90 DAS/ at maximum disease pressure on leaves and 15 days before harvest on pods. <u>Screening is to be done strictly under artificial inoculation</u> condition. Data should be reported as percent disease severity as per 4.1.

**Observations**: Date of sowing, date of first appearance of Alternaria blight, its intensity on leaf and pod in each entry should be reported as per trial 4.1. In addition, seed infection should also be detected following standard procedure.

**Note:** Concerned breeder/ scientist will supply the seed material of each entry (minimum 50 g) to Director, DRMR indicating 'for Pathology 4.3 NDN / AB trial'. Director, ICAR-DRMR will in turn send the material to different centres. Pathologist of each centre should be responsible for sending the seed of his centre with help of concern breeder. No responsibility shall be taken in the absence of seed not reaching to the Incharge, Plant Pathology, ICAR-DRMR, Bharatpur.

#### 4.4 National disease nursery (NDN) for white rust under artificial conditions

Objective: To identify potential donors against white rust under different geographical locations

Centre	Entries to be sent
Bharatpur	<i>Bj</i> : DRMRCI-131, DRMRCI-132, DRMRCI-139, DRMR 2018-1, DRMR 2018-41,
	DRMRIJWR-20-11, DRMRIJWR-20-13, DRMRIJWR-20-14, DRMRIJWR-20-15,
	DRMRIJWR-20-17, DRMRIJWR 20-18, DRMRIJWR-20-19, DRMRIJWR-20-20,
	DRMRIJWR-20-21, DRMRIJWR-20-23, DRMRIJWR-20-24, DRMRIJWR-20-26,
	DRMRIJ-12-44, DRMRIJ 1-37, DRMR 2018-26, DRMR 2019-15, DRMR 2020-
	15, DRMRSJ-349, DRMRSJ 22, DRMRM 18-35-11, DRMRM 18-36-12, DRMRM
	18-37-13, DRMRM-163, DRMRSJ-271, DRMRSJ-206, DRMRDR 2116,
	DRMRDR 2135, DRMRDR 2141, DRMRDR 2143, DRMRDR 2151, DRMRDR
	2152, DRMRDR 2195, DRMRDR 2155, DRMRDR 2156, DRMRDR 2196,
	DRMRDR 2235, DRMRDR 2242,
New Delhi	<i>Bj</i> : PMW 18, PDZ 16, PDZ 17, NPJ 250
Hisar	<i>Bj</i> : RH 1400-1, RH- 1700, RH- 1700-1, RH- 1700-3, RH- 1700-4
Pantnagar	<i>Bj</i> : PAB 14-7, PAB 14-8, PAB 14-18
Ludhiana	<i>Bj:</i> JC 36, PMAS A 2010, PBR-813-2
Resistant /	B. juncea: Rohini, NRCHB 101 (SC) & Local Check, BIOYSR, DRMRMJA 35
Susceptibl	(RC-WR), PHR 2 (TC-AB); B. napus: GSL 1; B. carinata: DLSC 1, B. rapa ssp
e check	Yellow Sarson: NRCYS-5-2; B. rapa var Toria: PT 303
Locations:	Pantnagar, Hisar, Ludhiana, Dholi, Bharatpur, Shillongani, Jhansi

**Note:** Concerned breeders/ scientists will supply the seed material of each entry (minimum 100 g) to PI, Plant Pathology, DRMR indicating 'for Pathology 4.4 NDN / WR trial'. PI, Plant Pathology, ICAR-DRMR will in turn send the material to different centres. Pathologist of each centre should be responsible for sending the seed of his centre with the help of breeder.

**Observations**: Date of sowing, date of first appearance of white rust on each entry, its intensity should be reported as per trial 4.1. Screening is to be done under artificial inoculation condition.

**Layout:** Replications: 02; each entry should be sown in paired row of 3 m length between susceptible check of *B. juncea* (local check).

Method of artificial inoculation against white rust: Test plants (including checks) should be

inoculated at initiation of flowering and initiation of pod formation. Inoculum may be prepared and inoculated as per method described in 4.1. Data for WR disease severity may be recorded at 75 DAS at maximum disease pressure on leaves and 15-days before harvest for stagheads.

#### 4.5 National disease nursery (NDN) for Sclerotinia rot

**Objective:** To identify potential donors against Sclerotinia rot after screening under different geographical locations

**Layout:** Repln: 2; each entry should be sown in paired row of 3 m length between susceptible checks of *B. rapa* ssp. Yellow Sarson.

Centre	Entries to be sent
Materials:	Bj: DRMRSJ-25, DRMRSJ 361, DRMRIS 20-1, DRMRIS 20-4, DRMRIS
	20-5, DRMRIS 20-11, DRMRDR 2119, DRMRDR 2156, DRMRDR 2220,
	DRMRDR 2237, DRMRDR 2238, DRMRDR 2239, DRMRDR 2315,
	DRMRDR 2317, DRMRDR 2320, DRMRDR 2322, DRMRDR 2335,
	DRMRDR 2342, DRMRDR 2343, DRMRDR 2349, DRMRDR 2351,
	DRMRDR 2352
Susceptible check:	Bj: Rohini, NRCHB 101, BIOYSR, DRMRMJA 35, Br: NRCYS-5-2
Tolerant check:	<i>Bj</i> : RH 1222-28; <i>Bc</i> : NPC 16
Locations:	Dholi, Pantnagar, Hisar, Ludhiana, Bharatpur, Shillongani, Jhansi, Varanasi

Method of artificial inoculation for Sclerotinia rot: As described 4.1.

**Observations:** Date of sowing, date of first appearance of disease on each entry, percent disease incidence/ intensity of different diseases should be reported at 20 days before harvest as per trial 4.1. In addition, data on lesion length stem diameter and 1000-seed weight should also be recorded. **Screening is to be done strictly under artificial inoculation condition.** 

**Note**: Concerned breeders/ scientists will supply the seed material of each entry (minimum 100 g) to Director, DRMR indicating 'for Pathology 4.5 NDN / SR trial'. Director, DRMR will in turn send the material to different centres. Pathologist of each centre should be responsible for sending the seed of his centre with help of concern breeder(s). All centres must sow zonal check. Artificial inoculation should be done by stem inoculation. Monitoring team must visit the trial to observe uniform disease appearance, if it is not so than trial may be rejected on spot to avoid inconsistent data.

#### 4.6 Screening of IVT entries of *Brassica* against different diseases

<b>Objective:</b>	Disease response of accessions promoted to IVT under different geographical					
	conditions in natural conditions					
Location:	Dholi, Pantnagar, Hisar, Ludhiana, SK Nagar, Shillongoni, Nagpur, Jobner					

**Layout:** i. Single row: two replications of 3 m row length

ii. Susceptible checks will be used after every two test rows

**Observations:** Should be recorded and reported as percent disease severity (AB, WR, PM) or percent disease incidence (SR, DM, CR) as per trial 4.1.

S	Entries	Organization		Entries	Organization	
No		U				
Earl	y mustard		B. juncea (Timely sown, irrigated)			
1.	KMR (E) 23-1	CSAUA&T, Kanpur	61	DRMRCI-175	ICAR-DRMR, Bharatpur	
2.	RH 1999-16	CCS HAU, Hisar	62	DRMR 2021-30	ICAR-DRMR, Bharatpur	
3.	PRE-2021-1	GBPUA&T, Pantnagar	63	DRMRIJ 21-31	ICAR-DRMR, Bharatpur	
4.	DRMRHT-17-3-3	DRMR, Bharatpur	64	SKM 2120	SDAU, SK Nagar	
5.	DRMRHT-18-65	DRMR, Bharatpur	65	SKM 2104	SDAU, SK Nagar	
6.	DRMRIJ 102	DRMR, Bharatpur	66	RH 2220	CCS HAU, Hisar	
7.	NPJ 269	IARI, New Delhi	67	RH 2299-63	CCS HAU, Hisar	
8.	NPJ 266	IARI, New Delhi	68	KMR 23-3	CSAUA&T, Kanpur	
9.	SVJH-74 (Hybrid)	Shaktivardhak Hybrid	69	KMR 23-4	CSAUA&T, Kanpur	
		Seeds				

10.	KBH 5106	Kaveri Seed Company	70	NPJ 270	IARI, New Delhi
11.	Q90025	Advanta Enterprises	71	NPJ 271	IARI, New Delhi
12	TM 309-2	BARC Mumbai	72	PR-2019-9	GRPUA&T Pantnagar
13.	ACN 231	CoA Nagpur	73	PR-2021-4	GBPUA&T Pantnagar
14	HUIM (E)-22-1	BHU Varanashi	74	HUIM-22-13	BHU Varanasi
15	4205B296-01	Corteva Agriscience	75	AKMS-18-89-1	SARFC Kangra
16.	Pusa MH- 135	IARI New Delhi	76	ACN-248	COA Nagnur
101	1 454 10111 155		77	TM 182	BARC Mumbai
R in	ncea (Timely Sown	rainfed)	78	RB-116	RRS Bawal
17.	DRMRCI- 176	ICAR-DRMR	79		SKRAU Sriganganagar
	Diamon 170	Bharatpur	.,	RGN 559	Siliti ie, siigungunugu
18.	DRMRIJ 20-197	ICAR-DRMR.	80	PMAS A 2008	PAU. Ludhiana
	210,110, 20 17,	Bharatpur			
19.	DRMR 2021-8	ICAR-DRMR.	81	PBR 788-1	PAU Ludhiana
		Bharatpur			
20.	DRMRHT-17-23	ICAR-DRMR,	82	JM-17-8	SKUAST, Chatha
		Bharatpur			
21.	NPJ 272	IARI, New Delhi	83	CS 22000-7-4	CSSRI, Karnal
22.	NPJ 273	IARI, New Delhi	84	RMM 19-07	ZARS, Morena
23.	RH 2217	CCS HAU, Hisar	85	RKM 544	ARS, AU, Kota
24.	RH 2263	CCS HAU, Hisar	Hvb	rid B. iuncea	, ,
25.	RGN 563	SKRAU, Sriganganagar	86	RHH 2301	CCS HAU, Hisar
26.			87	RHH 2302	CCS HAU. Hisar
27.	RB 114	RRS. Bawal	88	PHR 1293	PAU Ludhiana
28.	RKM 597	ARS, AU, Kota	89	PHR 3278B	PAU Ludhiana
B. iu	ncea (Late Sown)		90	DRMRHJ 1517	ICAR-DRMR. Bharatpur
29	DRMRIJ 20-126	DRMR. Bharatpur	91	DRMRHJ 25018	ICAR-DRMR. Bharatpur
30	DRMR 2018-1	DRMR. Bharatpur	92	Pusa MH 145	IARI. New Delhi
31	DRMRHT-17-4-5	DRMR. Bharatpur	93	Pusa MH 150	IARI. New Delhi
32	RH 2299-106	CCS HAU. Hisar	94	SKMH 1809	SDAU. S.K. Nagar
33	RH 2299-108	CCS HAU. Hisar	95	SVJH-76	Shakti Vardhak Hybrid
					Seeds
34	KMR (L) 23-5	CSAUA&T, Kanpur	96	KGMH-9297	Kamadgiri Crop Science
35	KMR (L) 23-6	CSAUA&T, Kanpur	97	DRMRHJ 1170	ICAR-DRMR, Bharatpur
36	NPJ 267	IARI, New Delhi	98	NAM-9204	Namdhari Seeds Pvt. Ltd.
37	NPJ 268	IARI, New Delhi	99	4205B284-01	CortevaAgriscience
38	TM 305-1	BARC, Mumbai	100	PA 5232	Crystal Crop protection
		,			Ltd
39	PRL-2020-20	GBPUA&T, Pantnagar	101	KBH 5252	Kaveri Seed Copmany
40	DDI 2020 6	CPDUA&T Doptpogor	102	000033	Advanta Enterprises I td
41	HUM_22_1	BHU Varanasi	102	NMH 90M03	Nuziveedu Seeds I td
42	RGN 570	SKRAU Sriganganagar	103	DMH00V02	Problet Agribiotech I td
43	RGN 572	SKRAU, Sriganganagar	104	LIS 8787	Seed Works International
	PHR 5160	$P \Delta I \downarrow I$ udbiana	105	BMH 20011	Rioseed Research India
44	PKM 504	ARS ALL Kota	100	HRH1012001	Hytech India Pyt I td
4.3 KKIVI 394 AKS, AU, KOta				рии 7218	CCS HALL Hisse
46		SKUAST Chatha		px1111 2310	
47	AKGS 2/61	SAREC Kangra	100	R juncea	DMH-1 (Hybrid check)
4/	AKCS 2401	SAREC Kangra	107	р. јинсец	Pohini (SC)
40	$\frac{1}{20-3}$	DALL Ludbiana	110		NDCUD 101 (SC)
+2	ちしい	и ло, Luuillalla	111		

50	PGSH 1711	PAU, Ludhiana	112		BIOYSR (RC-WR)
B. ju	ncea (Quality)		113		DRMRMJA 35 (RC-WR)
51	LES 68	IARI, New Delhi	114		PHR 2 (TC-AB)
52	LES 69	IARI, New Delhi	115		PDZ 1 (Q)
53	PDZ 21	IARI, New Delhi	116		DMH-1
54	PMAS 8	PAU Ludhiana	117	<i>B. rapa</i> var.	PT 303
				Toria	
55	PMAS 7	PAU Ludhiana	118	B. napus	GSL 1
56	RH(OE) 1618	CCS, HAU, Hisar	119	B. carinata	DLSC 1
57	RH(OE) 1710	CCS, HAU, Hisar	120	Eruca sativa	RTM 314
58	DRMRCI(Q) 179	DRMR, Bharatpur	121	<i>B. rapa</i> var. YS	NRCYS-5-2
59	DRMRCI(Q) 180	DRMR, Bharatpur			
60	DRMRCI(Q) 181	DRMR, Bharatpur			

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

**Objective:** To assess the effect of some novel bio-formulation on major diseases of rapeseedmustard at different locations.

Locations: PNT, HSR, LDH, BPR, JHS, SKN, SHL

Layout: Variety: Giriraj; Plot size: 3x5 m: Replication: 3: Spacing 30x10 cm; sowing; 20-25 October

#### Treatment:

T1: ST with Th3 (5ml/kg seed) + FS Th3@1ml/lit (45DAS)

T2: ST with Th3 (10ml/kg seed) +Th3 incubated FYM (100 ml/ton FYM) incorporation before sowing (2.5 ton/ha)

T3: ST with Th3 20 ml/kg seed

T4: ST with green fungicide @ 10gram/kg seed

T5: ST with Bio-care @ 10gram/kg seed

T6: ST with Crop-care @ 10 gram/kg seed

T7: ST with Eco-pesticide @ 10 gram/kg seed

T8: ST with Bio-pulse @ 10 gram/kg seed

T9: control (without seed treatment)

Observations: ABL, ABP, WR, SH, PM severity and SR incidence

#### 4.8 Epidemiology of major rapeseed-mustard diseases

Objective: To develop models for forecasting of the major diseases at different locations

Locations: Pantnagar, Hisar, Shillongani, SK Nagar, Dholi, Jhansi, Morena, Jagdalpur

**Layout:** The experiment shall be laid out in split-plot design with one replication with varieties Varuna & Local (important variety of the locality) as main-plot treatments and dates of sowing (08) at weekly interval (01, 08, 15, 22, 29 Oct, 05, 12 and 19 Nov) as sub-plot treatments. Each plot shall be of 1.5 m x 5 m size with a spacing of 30 cm x 10 cm (the plot may have 5 rows at 30 cm spacing). Recommended doses of N and P fertilizers shall be applied with no application of K fertilizer; insect-pest protection practices to be undertaken (apply seed treatment with appropriate insecticide and spray 1 ml/ 1 at 15-day interval). No protection to be taken against any disease.

**Observations:** Data for initial date of appearance of disease in each plot shall be recorded on copies of data sheet with data for percent disease severity (PDS) in each treatment/ plot twice-a-week (on Tuesday morning and Friday evening) till harvest on leaf for Alternaria blight (powdery mildew in SK Nagar) and white rust and Alternaria blight PDS on pods – all following new rating scale adopted by the group (2010). Plot-wise observation for staghead percent and percent incidence of Sclerotinia rot shall also be recorded. Data may be recorded from 10-tagged plants randomly in experimental plot (tagged by stacking with stick). Seed yield per plot be recorded and

provided in kg/ha.

Maximum possible details of daily weather data for crop period (September to day of harvest of the last plot) for different parameters [Min & max. temp. (°C), rainfall (mm), max and min RH (%), solar intensity/ sunshine hours] may also be recorded and submitted to PI, Plant pathology, ICAR- DRMR, Bharatpur at end of every month. Wherever possible, data for leaf wetness and wind velocity (km/ h) may also be recorded and submitted. Data should be reported after correlation regression analysis along with disease severity of different diseases during the year accompanied by weather data for its finalization. Data for disease severity/ incidence may be recorded in excel of prescribed data sheets and they may be sent along with daily weather data to PI (Plant Pathology), ICAR-DRMR, Bharatpur at the end of every month for necessary analysis.

#### 4.9. Bio-management of rapeseed-mustard diseases

**Objective:** To assess effective bio-management of major diseases at different locations

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

Layout: Variety: DRMRIJ 31; Plot size: 3x5 m, Repln: 3; Spacing: 30x10 cm; D/s: 20-25 Oct

**Treatments:** T1= ST with *T. harzianum* @ 10g / kg T2= Soil incorporation of *Th* with mustard straw @ 2.5t / h T3= T1+ FS of *Th* at 60 and 75 d.a.s. @ 6gm/ ha T4= Soil incorporation with FYM of *Th* @ 1 kg/ q FYM T5= *Bacillus subtilis* 10<sup>6</sup> c.f.u. T6= Control

Observations: ABL, ABP, WR, SH, PM severity and SR incidence as above

#### 4.10 Farmers' field for disease outbreak

**Objective:** Survey of farmers' fields for occurrence of major/minor diseases **Observations at all centre:** 

- i. Initial appearance of the disease with intensity and cultivars affected
- ii. Fortnightly observations on the same field
- iii. Fortnightly weather parameters

## XXX Annual Group Meeting of AICRP Rapeseed-Mustard August 3-4, 2023, SKUAST, Jammu

#### Session II Planning & Technical Programme Formulation: Entomology

: Dr Sanjeev Gupta, Assistant Director General (O & P), ICAR, New Delhi					
: Dr PK Rai, Director, ICAR-DRMR, Bharatpur					
Subject Experts: Dr RK Gupta, Professor and Head, Division of Entomology, SKUAST-Jammu					
Dr RP Awasthi, Ex-Professor (Plant Pathology), GBPUA&T					
: Prof. MS Khan, Deptt. Of Entomology, GBPUA&T, Pantnagar					
: Dr Akhtar Ali Khan, Prof. Entomology, SKUAST-Kashmir					

The planning and technical programme formulation session of Entomology started with welcome address by Dr. P.K. Rai, Director, DRMR. He welcomed the Chairman, and the fellow entomologists. Dr. Sanjeev Gupta, ADG (O&P) suggested to record different natural enemies in experiment 5.4. Dr. R.K. Gupta, Professor and Head, Division of Entomology, SKUAST-Jammu also emphasized to study natural enemies of aphids. It was decided to continue experiment 5.4 with only one most effective intercrop treatment i.e. three row strip of coriander along the border and in the middle of the plot. A new trial on management of mustard aphid with exogenous application of salicylic acid was formulated.

It was emphasized by Dr. Sarwan Kumar, PI of AICRP-RM that the experiments must be conducted as per technical programme with proper statistical analysis and the report should be submitted latest by May 15<sup>th</sup> of the year. For data recording, a uniform format will be circulated to all the centers. Data should be submitted in the same format as circulated by PI. All entomologists should follow technical programme strictly. After thorough discussion following technical programme was finalized:

#### **Technical Programme (2023-24)**

# Project 5.1 A): Screening of germplasm and advanced genotypes for their reaction to mustard aphid infestation

Locations: Bharatpur, Ludhiana, Hisar, New Delhi, Morena, Kanpur, Pantnagar, S.K. Nagar, Dholi, Shillongani

**Methodology**: Grow entries in 3 m long paired rows in 3 replications. Delay the sowing by 20 to 25 days than the normal to ensure heavy aphid pressure under natural conditions.

**Observations:** Record observations on number of aphids per plant (10 cm top twig), per cent plants with aphids on 10 randomly selected plants per entry, and derive aphid population index (API), aphid damage index (ADI), and aphid resistance index (ARI) as described in the below given table. **Time of observation:** 1. At full flowering stage 2. At full siliqua formation stage.

**Note:** The material will be supplied by the PI, Entomology.

Record data separately for different Brassica spp.

Material for screening will be provided by the respective breeders.

Maximum grading either at full flowering stage or at pod formation stage should be considered to classify the genotypes.

Self at least two plants per entry for genetically pure seed.

# Aphid infestation index can be calculated as per the following table:

Table 1: Aphid population, damage and resistance indices to categorize rapeseed-mustard for resistance to *Lipaphis erysimi* 

S.N	Aphid population index (API)	Aphid damage index (ADI)	Aphid resistance index (ARI)	Resistance category
1	1 = No or less than 20 aphids on the inflorescences of test Plants	1 = Normal plant growth, no symptoms of injury, no curling or yellowing of leaves	0.1-1.0 (API+ADI/2)	0.0-1.0 = Resistant
2	2 = upto 25% inflorescences have 21- 100 aphids on the test plants	2 = Average plant growth, curling and yellowing of few leaves, flowering and fruiting	1.1-2.0 (API+ADI/2)	1.1-2.0 = Moderately resistant
3	3 = upto 50% of inflorescences have 101- 250 aphids across test plants	3 = Poor plant growth, curling and yellowing of leaves on some branches, drying of few flowers and poor pod setting	2.1-3.0 (API+ADI/2)	2.1-2.5 = Tolerant
4	4 = upto 75% inflorescences have 251- 500 aphids across test plants	4 = Stunted plant growth, heavy curling and yellowing of leaves all through the plant, drying and curling of almost half the inflorescence with poor flowering and rare pod setting	3.1-4.0 (API+ADI/2)	2.6-3.5 = Susceptible
5	5 = 100% of inflorescences have more than 500 aphids across test plants	5 = Severe stunting and ragged plant appearance, yellowing and curling of almost all the leaves, complete drying of inflorescence without any flower and immature drying of pods if any	4.1-5.0 (API+ADI/2)	3.6-5.0 = Highly susceptible

(Ref. Dhillon, 2018)

S No	IVT Early Mustard	S.No	IVT Mustard Late Sown
1	KMR (E) 23-1	1	DRMRIJ 20-126
2	RH 1999-16	2	DRMR 2018-1
3	PRE-2021-1	3	DRMRHT-17-4-5
4	DRMRHT-17-3-3	4	RH 2299-106
5	DRMRHT-18-65	5	RH 2299-108
6	DRMRIJ 102	6	KMR (L) 23-5
7	NPI 269	7	KMR (L) 23-6
8	NPI 266	8	NPI 267
9	SVIH-74 (Hybrid)	9	NPI 268
10	KBH 5106	10	TM 305-1
10	090025	10	PRI -2020-20
11	TM 309 2	12	PRI 2020-20
12	ACN 231	12	HUM 22 1
13	ACN-251	13	DCN 570
14	HUJMI (E)-22-1 4205D206 01	14	RON 570
15	4205B290-01	15	RGN 5/2
16	Pusa MH-135	10	PHR 5169
- 1	IVI Timely Sown Irrigated	1/	RKM 594
1	DRMRCI-1/5		
2	DRMR 2021-30		IHT (Hybrid Mustard)
3	DRMRIJ 21-31	1.	RHH 2301
4	SKM 2120	2.	RHH 2302
5	SKM 2104	3	PHR 1293
6	RH 2220	4	PHR 3278B
7	RH 2299-63	5	DRMRHJ 1517
8	KMR 23-3	6	DRMRHJ 25018
9	KMR 23-4	7	Pusa MH 145
10	NPJ 270	8	Pusa MH 150
11	NPJ 271	9	SKMH 1809
12	PR-2019-9	10	SVJH-76
13	PR-2021-4	11	KGMH-9297
14	HUJM-22-13	12	DRMRHJ 1170
15	AKMS-18-89-1	13	NAM-9204
16	ACN 248	14	4205B284-01
17	TM 182	15	PA 5232
18	RB-116	16	KBH 5252
19	RGN 559	17	090033
20	PMAS A 2008	18	NMH 90M03
20	PBR 788-1	10	PMH90V02
21	IM_17_8	20	LIS 8787
22	CS 22000 7 4	20	BMH 20011
23	DMM 10.07	21	UDU101200
24	DVM 544	22	DUU 2218
23	IVIT Timely Sour (Deinfed)	23	WT Quality Mustand
1	DDMDCL 17(	1	
2	DRIVIRUE- 1/0 DDMDH 20, 107	1	
2	DRIVIRIJ 20-19/	2	LEO 09 DD7 21#
5	DKIVIK 2021-8	5	
4	DRMRH1-17-23	4	PMAS /
5	NPJ 272	5	PMAS 8
6	NPJ 2/3	6	RH(OE) 1618
7	RH 2217	7	RH(OE) 1710
8	RH 2263	8	DRMRCI(Q) 179
9	RGN 563	9	DRMRCI(Q) 180
10	RB 114	10	DRMRCI(Q) 181
11	RKM 597		IVT Gobhi Sarson
		1	JGS-16-9
		2	AKGS 2461
		3	AKGS-20-9
		4	GSC 64
		5	PGSH 1711

Project 5.1: Screening of germplasm and advanced genotypes for their reaction to mustard aphid infestation

**Checks:** RH-725 (Conventional check), BSH-1 (Susceptible check), 45-S-46 (Hybrid check), LR-PDZM-31 (Quality check), Kranti (NC) and Radhika (LR) and *Brassica fruticulosa* introgressed *Brassica juncea* line (resistant check) will be the check entries for all screening programme.

# Project 5.1 (B): Screening of AVT I and AVT II entries of *Brassica* for their reaction to against mustard aphid infestation

Following are the AVT-I + II entries of Brassica to be screened for their reaction to mustard aphid

SN	Entry
1	AVT-I Yellow Sarson
	Entries: PYS 2018-1, YSH-401(NC), Benoy (ZC), Piambari (LR)
2	AVT- I Early Indian Mustard
	Entries: DRMRHT 13-13-5-5#, KMR(E) 22-2, PM 25 (NC), PM 28 (LR), JD 6 (ZC), NRCHB 101
	(LR)
3	AVT-I+II: (Timely Sown, Irrigated/Quality)
	Entries: RH 1934, DRMR 2018-25***@, NPJ 261, NPJ 262, PBR 813-2, RGN 528, NPJ 252#, NPJ
	253, PBR 939, RH(OE) 1708**, DRMRCI(Q) 158**, DRMRCI(Q) 172**, DRMRCI(Q) 47**#,
	Giriraj (LR), Basanti (WRR), RH 749 (ZC), Kranti (NC), PM 32 (Quality LR), PM 30 (NC), PDZ-1
	(DLC), PDZ 11(DLC LR), RGN 73, Maya,
4	AVT-I Mustard (Timely Sown, Rainfed)
	RB 113, NRCHB 101 (ZC), DRMR 150-35(LR)
5	AVT -II Mustard, Late Sown (Irrigated)
	DRMRHJ 430, Kranti (NC), CS 56 (LR), NRCHB 101(ZC)
6	AHT I+II Mustard
	JKJH 11, SVJH 73, Q90007, RHH 2101#, SVJH- 71#, IJ16R1168#, SKMH
	1901,18J408C#, Kranti (NC) DMH- 1 (Hybrid Check), RH 0749 (ZC), 45S46,
	GDM-4,
7	AVT I Mustard (Salinity)
	CS 2020-10@, CS 54 ( Salinity check), CS 60
8	AVT II Gobhi Sarson
	GSH 2155, Kranti (NC), GSL-1 (NC), GSC 6 (QC), AKMS 8141 (LR)
I	

**Checks:** RH-725 (Conventional check), BSH-1 (Susceptible check), 45-S-46 (Hybrid check), LR-PDZM-31 (Quality check), Kranti (NC) and Radhika (LR) and *Brassica fruticulosa* introgressed *Brassica juncea* line (resistant check) will be the check entries for all screening programme.

**Observations**: Record aphid infestations index (AII) on 0-5 scale, average aphid population per plant (10 cm top twig) and per cent plant infestation on the basis of 10 randomly selected plants per entry [Calculated as per the given methods in table:1, (Ref. Dhillon, 2018)]

#### Time of observation:

#### **1.** At full flowering stage

#### 2. At full siliqua formation stage.

### Note:

1. The material will be supplied by the PI, Entomology.

- 2. Record data separately for different Brassica sp.
- 3. Material for screening will be provided by the respective breeders.
- 4. Maximum grading either at full flowering stage or at pod formation stage should be considered to classify the genotypes.
- 5. Self at least two plants per entry for genetically pure seed.

#### ENTO 4

#### Project 5.2: Assessment of yield losses due to insect-pests in Brassica crops

Objective: To find out yield losses caused by various insect-pests

Locations: Bharatpur, Ludhiana, Hisar, New Delhi, Morena, Kanpur, Pantnagar, S.K. Nagar, Dholi and Shillongani

**Treatments** (2) (i) Protected (ii) Unprotected

The protected set to be sprayed with locally recommended insecticide against insectpests. Spray should be done when the pest population reaches economic threshold level or pest appearance where ETL is not available.

# Entries: The recent released/identified varieties for *Brassica juncea* were taken for yield losses trial: Radhika and Brijraj and locally high performing variety

Design - RBD, Plot size: 4.2 m x 3m, Replications 4

Sowing time: Second fortnight of November

**Observations:** 1. Observations of different insect pests to be recorded on randomly selected 10 plants per plot as per standard methodology given in 5.3. However, before every spray data on insect-pests population will be recorded and per cent reduction in pest population will be worked out.

2. Percent reduction in insect pest population in protected set over unprotected one of the same variety.

- 3. Yield data at harvest.
- 4. Yield loss to be worked out.

#### Format for data recording of project 5.2

Project 5.2: Assessment of yield losses due to insect pests in <i>Brassica</i> crops Date of Sowing: Date of Harvesting:								
Entries	Aphid population before treatment		Aphid population after treatment		% reduction in aphid population in protected set over unprotected	Yield kg/ha		Avoidable yield loss (%)
	Protected	Unprotected	Protected	Unprotected		Protected	Unprotected	
PM 31								
RH 725								
Local high yielding Variety								

Locations:	Bharatpur, Ludhiana, Hisar, Morena, Kanpur, Pantnagar, S.K. Nagar, Dholi and Shillongani					
Crops/Entries	(i) Brassica juncea (DRMRIJ 31) (ii) Eruca sativa (T 27) (iii) B. napus GSC 6 (iv) B. rapa BSH 1					
Plot size:	4.2 m x 3 m					
Replications:	3					
Crop sowing	(i) Timely sown		(ii) Late sown			
Observations: (Recorded at	1. Mustard aphid	:	Number of aphids/10 cm twig on 10 plants per			
weekly			genotype (See Project No. 5.1)			
intervals)	2. Mustard sawfly	:	Number of larvae/10 plants (sawfly larval			
			population to be recorded at 3 days interval)			
	3. Painted bug	:	Number of bugs (adult + nymph)/10 plants			
	4. Flea beetle	:	Number of beetles/10 plants			
	5. Cabbage caterpillar	:	Number of larvae/10 plants			
	6. Others	: a) N	Number of insects/10 plants			
			b) Pollinator diversity should be recorded			
			(Species diversity can be recorded through			
			taxonomic identification as well as image			
			verification from the experts)			
			c) Natural enemies (i.e. parasitoids, predators			
			and entomogenous pathogens diversity etc)			
			diversity should be recorded (Species diversity			
			can be recorded through taxonomic			
			identification as well as image verification			
			from the experts)			

# Project 5.3(A): Agro-ecological analysis of various insect-pests on *Brassica* crops

Format for data recording for Project 5.3(A): Agro-ecological analysis of various insect-pests

Date of Harvesting : Date of sowing :											
SM	Weather Parameters					1	Aphids /10ci	n top twig			
W	Temperature (°C)R.H. (%)		Sunshine	Wind	Rainfall	B. juncea	Eruca	<i>B</i> .	<i>B</i> .		
	Max	Min.	Max	Min.	(hrs)	speed	( <b>mm</b> )		sativa	napus	rapa
						Kmph					

Note- The same format can be used for other pests as well.

#### Project 5.3 (B): Monitoring of alate aphids on yellow sticky traps

Objective: All the centres will install yellow (chrome) painted smeared with transparent greasy material on 1 kg oil tin box (round) at 5 locations in the experimental farm at 1.5 m above ground from first week of October onwards. The height of trap should be adjusted so that it remains 1 foot above the crop canopy. The data on the winged trapped mustard aphid is to be recorded daily by taking care of cardinal directions throughout the year

Locations: Bharatpur, Ludhiana, Hisar, Morena, Kanpur, Pantnagar, S.K. Nagar, Dholi and Shillongani

- Observations: i) Temperature (maximum and minimum), RH (morning and evening), sunshine hours, rainfall and rainy days
  - Analysis: Data on the insect-pests infestation from different centres will be analyzed with respect to meteorological parameter

# 5.4 Effect of host plant diversity on abundance of mustard aphid and the associated specialist and generalist natural enemies

Locations:	Bharatpur, Ludhiana, Hisar, Morena, Kanpur, Pantnagar, S.K. Nagar, Dholi and Shillongani
Plot size:	8 m x 3 m
<b>Replications :</b>	6
Mustard variety:	Brassica juncea DRMR IJ 31
Sowing time	Sowing time: Mustard: second/third week of November
Treatments:	T <sub>1</sub> : Mustard alone
	$T_2$ : Mustard + coriander
	Note: Inter-cropping will be done with three row strip of coriander around mustard plot and one three row strip in the middle of the plot. Note: Seed rate for Coriander (10kg/acre). Spacing should be followed as 30x15 cm.
Observations:	<ol> <li>Weekly data on the population development of mustard aphid/ 10 plants selected at random</li> <li>Number of mummified aphids (Parasitized by specialist parasitoid: <i>Diaeretiella rapae</i>) and number of generalist predators such as lady bird beetles, syrphid fly larvae, <i>Chrysoperla</i> sp. etc.</li> <li>Yield data at harvest (Mustard + intercrop) and calculate mustard equivalent yield as done as per the following formula:</li> </ol>
	Price of Mustard (Rs/kg) Where MSP is available, it should be taken otherwise sale price may be taken.

#### 5.5 Management of mustard aphid with exogenous application of salicylic acid

Locations:	Bharatpur, Ludhiana, Hisar, Morena, Kanpur, Pantnagar, S.K. Nagar, Dholi and
	Shillongani
Plot size:	4.2 m x 3 m
<b>Replications:</b>	3
Mustard variety:	Brassica juncea: Giriraj
Sowing time	second/third week of November
Treatments:	T <sub>1</sub> : Salicylic acid 0.5 mM (69 ppm)
	T <sub>2</sub> : Salicylic acid 1.0 mM (138 ppm)
	T <sub>3</sub> : Salicylic acid 1.5 mM (207 ppm)
	<b>T4:</b> Aphid alarm pheromone (subject to availability)
	<b>T</b> <sub>4</sub> : Thiamethoxam 25 @ 0.1 g/1
	T <sub>5</sub> : Control

**Observations:** 1. Data on the population of mustard aphid will be recorded before, 1, 3, 7, 10 and 14 days after treatment from 10 plants selected at random in each replication.

- 2. Also record data for the other pests prevalent in the centre.
- 3. Yield data at harvest
- 4. Economics

### 5.6 Effect of aphid herbivory on changes in biochemical parameters of Brassica plants

Locations:	Bharatpur, Ludhiana, Hisar, Pantnagar
Plot size:	4 m x 3 m
<b>Replications</b> :	3
Mustard variety:	Conventional genotypes: B. juncea-DRMR IJ 31, B. napus: GSL 1
	Quality genotypes: B. juncea-PM 30, B. napus: GSC 6
Design:	RBD
Sowing time	Sowing time: Mustard: second/third week of November
Treatments:	T <sub>1</sub> Aphid infested
	T <sub>2</sub> Uninfested

**Methodology:** At flowering, in the infested plot release aphids @ 20 aphids/ plant on 5 randomly selected plants. After 48 hours, collect the top 10 cm twig of plants from both infested and uninfested plots for biochemical analysis. To avoid natural aphid infestation in uninfested plots, spray the plots with recommended insecticide of the state.

#### **Biochemical analysis:**

- 1 Peroxidase
- 2 Total glucosinolates
- 3 Total phenols
- 4 Ortho-dihydroxy phenols
- 5 Flavonols

### Data and Recording Analysis:

All centres will also record aphid population data at weekly intervals.

1 Analyze the data w.r.t. increase/decrease in biochemical constituent in infested treatment over uninfested.

2. Record the yield data at harvest.

### Data reporting:

- Data should be sent to Director, DRMR (<u>director.drmr@gmail.com</u>) on the prescribed data sheets latest by May 15, otherwise it will not be possible to include in the report
- Weather data with brief weather report should be supplied along with trial data.
- Yield data (kg/ha) should be sent after analysis. Unanalyzed data will not be included in the report

#### Note:

- 1 Report should be submitted on time
- 2 As suggested by DG, ICAR, Pictures of different stages of the crop, trial conducted, insect damage and operation performed to be submitted from all the centers.
- 3 Problem faced by center PI with respect to conducting the AICRP-RM trials can be communicated to DRMR through official mail as and when they come across so needful can be done.

#### XXX Annual Group Meeting of AICRP Rapeseed-Mustard August 3-4, 2023 at SKUAST, Chatha, Jammu

#### **Session III: Breeder Seed Production**

Chairman	: Dr.Sanjeev Gupta, ADG (OP), ICAR, Krishi Bhawan, New Delhi
Rapporteur	: Dr Arun Kumar, PS, ICAR-DRMR, Bharatpur
	: Dr. H S Meena, PS, ICAR-DRMR, Bharatpur

The session was started with the introductory remarks by the Chairman followed by presentation of the detailed report on breeder seed production for the year 2022-23 by Dr. B. L. Meena, Sr. Scientist, ICAR-DRMR. He informed that an indent of 106.09 quintals of breederseed of 82 varieties of rapeseedmustard was received from Department of Agriculture and Cooperation (DAC), Ministry of Agriculture and Farmers Welfare, Govt of India for the year 2022-23. Against the indent, 290.84 quintals breeder seed was produced, indicating a surplus of 184.75 quintals.Breeder seed of 02 varieties Pusa Saag-1 and PBR 378 ofIndian mustard and one variety T-9 of Toria was notproduced. Further, he informed theshortage in breeder seed production of RVM-1 (-6.06 q) and PDZM-31 (-0.19 q) of Indian mustard; Benoy (-0.80 q) of Yellow sarson andGluchin (-0.32 q) of Brown sarson.In addition, 35.40 q breeder seed of 24 varieties of Indian mustard was also reported from sevencentres. He presented an account of the percent contribution of recently notified (2011-2022) varieties in breeder seed production chain. Heconveyed the house that breeder seed indent (BSP-1) for 2023-24will be posted shortly by the DAC on its website andthe same will be communicated to different co-operating centres once the indent is finalized. It can also be downloaded from the website of DAC <u>www.seednet.com</u>.

Dr Sanjeev Gupta, ADG (Oilseeds & Pulses), ICAR, New Delhi suggested to prepare a scheme on EBSP (Enhancing Breeder Seed Production) for strengthening the seed hubs. The centre which do not have facility for Breeder Seed Production or which do not produce breeder seed, the information along with allotment (BSP-1) has to be sent to DAC.

The Chairman, in his concluding remarks, appreciated the status of breeder seed production in the country. The session ended with the vote of thanks to the Chair.

XXX Annual Group Meeting of AICRP Rapeseed-Mustard						
	August 3-4, 2023 at SKUAST, Chatha, Jammu					
Session IV: Formulation of Technical Programme: Agronomy						
Chairman	: Dr. Sanjeev Gupta, ADG (O&P), ICAR, New Delhi					
Subject Expert	: Dr. N. Ravishankar, In-charge, IFS, ICAR-IIFSR, Modipuram					
	: Dr. S.S. Rathore, Head, Division of Agronomy, IARI, New Delhi					
Rapporteurs	: Dr. R.L. Choudhary, Sr. Scientist, Agronomy, ICAR-DRMR,					
	Bharatpur					
	: Dr. Rajiv Bharat, Sr. Scientist, Agronomy, SKUAST, Jammu					

The session started with the opening remarks by the Chairman, Dr. Sanjeev Gupta, ADG (O&P), ICAR. Dr. R.S. Jat, PI and Principal scientist, ICAR-DRMR, Bharatpur presented the results of the experiments conducted during 2022-23 at various centre's under AICRP (R&M) on soil, water, nutrient and weed related aspects. ADG (O&P) insisted that there is need to look into new opportunities for better crop establishment techniques, mechanization and biofertilizers to enhance the crop productivity and profitability. Dr. Ravi Shankar, subject expert suggested to initiate work on futuristic research using crop models in the changing climatic scenario. He also opined to explore the new areas of mustard as intercrop with sugarcane. New experiments on rice-fallow and nano fertilizers were formulated in due consultation with subject expert and was approved by the house. The following action points emerged during the presentation:

- 1. The soil status of secondary and micronutrient should be looked into before start of new experiment.
- 2. Nano Gold (sulphur coated urea) should be evaluated at ICAR-DRMR, Bharatpur.
- 3. Adaptive trials on SMI should be initiated. It was decided that ICAR-IIFSR, Modipuram will conduct the trails at 3 locations and the trial protocol will be provided by ICAR-DRMR, Bharatpur. ICAR-CIAE, Bhopal should also be associated for mechanization of SMI experiment.

#### **Recommendations:**

The center-wise recommendations were made as follows:

- 1. Application of 150% NPK of the recommended levels at Dholi, Shillongani and SK Nagar, and 100% NPK + 2.5 t FYM/ha at Kota and Pantnagar is recommended to achieve the higher and long-term productivity, sustainability, profitability and soil health.
- 2. Drought alleviating microbial formulation CRIDA MI-I is recommended at Sriganganagar, Morena, Varanasi and SK Nagar, and CRIDA MI-II at Chatha, Dholi and Jobner to increase the productivity and soil health.

### Suggestions for proper conduct of agronomical trials

- 1. The treatments of any experiment should not be modified at their end.
- 2. The results should be presented in the report as per format given in the technical programme including two-way tables in the split plot experiments.
- 3. Report all the important observations as per experimental requirement.
- 4. The trials should be sown on time so that treatment effects could be identified properly and yield levels are optimized.
- 5. The reports should be submitted by 31<sup>st</sup> May, 2024 positively. No report will be accepted after the due date.
- 6. The centres should send the information pertaining to field trials along with date of sowing to Director, DRMR latest by 25<sup>th</sup> November.
- 7. The centres accepting the trial (whose names are given in the technical programme) must positively report the data. In case of any difficulty centre should report immediately to Director/PI, DRMR.
- 8. The fertility/Biofertilizer experiments should be conducted at the same location in the same field over the years.

- 9. The economics of each experiment should be calculated on the basis of MSP and state recommended cost of cultivation for respective crops. The IBCR should be reported instead of B:C ratio.
- 10. Data without statistics will not be considered.
- 11. All the ancillary data of component crops should be recorded and reported.
- 12. The initial and final soil analysis data of all the experiments should be done and reported every year.
- 13. If the yield level of recommended fertiliser dose is less than the state average, the trial will be rejected.
- 14. If any centre needs oil and nutrient analysis, depute concerned scientist along with samples to DRMR, Bharatpur latest by 30<sup>th</sup> April for analysis.
- 15. The plot size should not be less than  $21.6 \text{ m}^2$  in agronomic experiments and width of buffer channel should not be less than 1.5 m.
- 16. The field layout of all the agronomy trials should be provided to the Plant Pathologist/Entomologist of the AICRP-RM centres for recording of insect and disease infestation if any, and due credit will be shared with the agronomist.

#### **Technical programme for 2023-24**

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

Treatment	Season				
	Rabi (Rapeseed-mustard)	Kharif			
T1	Control	Control			
T2	100% PK	100% PK			
T3	100% NPK	100% NPK			
T4	150% NPK	150% NPK			
T5	100% NPK + S (recommended as per zone)	100% NPK			
T6	100% NPK + Zn @ 25 kg ZnSO <sub>4</sub> /ha	100% NPK			
T7	100% NPK + B @ 1 kg B/ha	100% NPK			
T8	100% NPK + FYM @ 2.5t/ha (dry weight basis)	100% NPK			
Т9	100% NP	100% NP			
T10	100% NK	100% NK			

# **Replication: 3**

### Design: RBD

Locations: Bharatpur (PM-Mustard), Ludhiana (Maize-Mustard), Hisar (PM-Mustard), Pantnagar (Maize-Mustard), Kota (Urdbean-Mustard)

Note: Kangra, Ludhiana, Hisar, Sriganganagar, Morena and Bhubneswar are requested to submit the final pooled data on seed yield, system productivity, sustainability yield index, economics and Soil fertility status before and after 10 years (organic carbon, available N, P, K, S, Zn, B) before next Group Meeting.

#### Observations to be recorded in all the crops every year

- 1. Growth, yield attributes, yield, system productivity, oil content and economics.
- 2. Disease and pest incidence, if any, is to be reported by the pathologist.
- 3. Soil samples every year from 0-15 cm and 15-30 cm depth to be taken after mustard harvest to assess build up/ depletion of soil fertility (Organic carbon, pH, N, P, K, S, Zn, B).
- 4. The experiment should be conducted on fixed plots.
- 5. Potassium is to be applied @ 20 kg K/ha in case of no recommendation for potassium application.
- 6. Observations on weed infestation needs to be recorded treatment wise.

# **3.2** Evaluation of herbicides for weed management in rapeseed - mustard. Treatment

- 1. Pendimethalin 1.0 kg a.i./ha (PE)
- 2. Fluazifop-p-butyl 0.125 kg a.i./ha at 25-30 DAS (PoE)
- 3. Quizalofop 0.050 kg a.i./ha at 15-20 DAS (PoE)
- 4. Pendimethalin 1.0 kg a.i./ha (PE)-Fluazifop-p-butyl 0.125 kg a.i./ha at 25-30 DAS (PoE)
- 5. Pendimethalin 1.0 kg a.i./ha (PE)-Quizalofop 0.050 kg a.i./ha at 15-20 DAS (PoE)
- 6. Weedy check
- 7. Weed free

# **Replication**: 3 **Design**: RBD **Locations**: Ludhiana, Hisar, Pantnagar, SK Nagar, Bhubhaneshwar, Imphal

# **Observations**:

- 1. Data on growth, yield attributes, yield, oil content and economics.
- 2. Data on weed dynamics, weed control efficiency and weed index should be reported at 45 and 80 DAS.
- 3. Information on plant and soil residue analysis should be reported or send the samples at ICAR-DRMR, Bharatpur.
- 4. Phytotoxicity effects if observed should be reported with photographs.

# 3.3 Agronomic evaluation of promising rapeseed-mustard entries

# Zone III- Late sown mustard (irrigated):

Entries: DRMRHJ 430, Kranti (NC), NRCHB 101(ZC), CS 56 (LR), Filler Locations: Kanpur, Pantnagar, Varanasi, Morena, Kota

# Zone II- Timely Sown, Irrigated/Quality:

NPJ 253, DRMRCI(Q) 47, Giriraj (LR), RH 749 (ZC), Kranti (NC), PM 32 (Quality LR), PM 30 (NC)

Locations : Bawal, Chatha, Hisar, Ludhiana, New Delhi

# Zone III- Timely Sown, Irrigated/Quality:

Entries: NPJ 253, DRMR 2018-25, RGN 73 (LR), Maya (ZC), Kranti (NC), Basanti (WRR C), Locations: Pantnagar, Jhansi, Morena, Bharatpur, Varanasi

# Zone IV- Timely sown irrigated:

Entries: NPJ 252, Kranti, BIO 902, GDM 4, Filler Locations: S.K. Nagar, Nagpur, Mandore, Pali (CAZRI), ARS Washim (COA, Nagpur)

# Zone II- AHT-II Mustard:

Entries: RHH 2101, SVJH- 71, IJ16R1168, Kranti (NC), DMH- 1 (Hybrid Check), RH 0749 (ZC), 45S46 (Hybrid Check)

Locations: Ludhiana, Hisar, New Delhi, Sriganganagar, Mahendragarh (Shaktivardhak)

# Zone IV- AHT-II Mustard:

Entries: 18J408C, Kranti (NC), DMH- 1 (Hybrid Check), GDM 4 (ZC), 45S46 (Hybrid Check) Locations: SK Nagar, Mandore, Pali (CAZRI), Jalgaon, Nagpur

# Gobhi Sarson

**GSH 2155,** Kranti (NC), GSL-1 (NC), GSC 6 (QC), AKMS 8141 (LR) **Locations :**Kangra, Dhaulakuan, Chatha, Ludhiana, Abohar

# Fertility levels (for all the locations)

- 1. Recommended fertility level
- 2. 125% of the recommended fertility level
- 3. 150% of the recommended fertility level

# **Replications**: 3

**Design**: Split-plot (Entries in main plots and fertility levels in sub- plots)

# **Observations**:

- 1. Yield and yield attributes (branches/plant, siliquae/plant, seeds/siliqua, 1000 seed weight and seed weight/plant and seed yield).
- 2. Oil content.
- 3. Initial fertility status of soil.
- 4. Uptake of nitrogen, phosphorus and potassium at pre-flowering and harvest stage.
- 5. Calculate N, P & K economy and use efficiency at different fertility levels.
- 6. Always report the data in two-way table with entries and fertility levels as given in the report.
- 7. Identified advanced strains promoted to AVT-II of rapeseed-mustard will be taken along with check varieties of national/zonal importance.

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

# Treatment details:

# Main plot treatments: Fertility level

- 1. 100% RDF
  - 2. 75% RDF
  - 3. Control

# Sub plot: Microbial consortia

- 1. Azotobactor
- 2. Phosphate Solubilising Micro Organism (PSMO)
- 3. Potassium Mobilizing Biofertiliser (KMB)
- 4. Zinc Solubilizing Biofertiliser (ZSB)
- 5. NPK consortia + ZSB
- 6. Control (No biofertilizer)

# **Replication:** 3

**Design:** Split plot design

Locations: Kangra, Ludhiana, Pantnagar, Morena, SK Nagar, Dholi, Kanke, Shillongani, Bhubhaneshwar, Kota, Varanasi, Chatha, Imphal, Bawal, Bharatpur

# **Observations**:

- 1. Growth parameters.
- 2. Yield and yield attributes (branches/plant, siliquae/plant, seeds/siliqua, 1000 seed weight and seed weight/plant and seed yield).
- 3. Oil content, oil yield and economics.
- 4. Availability of N, P, K, S and Zn before sowing and at harvest and their use efficiency should be given.
- 5. Analyse the microbial population at initial stage and at harvest stage.

- 6. Always report the data in two-way table with CV (%), LSD values (p = 0.05) of main-plot, sub-plot and interactions as given in the report.
- Note: All the biofertilizers are in liquid form and are manufactured and supplied from IFFCO. All the centres should analyse oil content, economics and soil OC and nutrients

# **3.5 Optimization of mineral nutrient management for higher productivity Treatment details:**

Main plot treatments: Major nutrients (NPK)

- 1. Control
- 2. 100% NPK
- 3. 125% NPK
- 4. 150% NPK

### Sub plot: Secondary & micro nutrients

- 1. 20 kg S + 2.5 kg Zn + 0.5 kg B/ha
- 2. 40 kg S + 5 kg Zn + 1 kg B/ha
- 3. 20 kg S + 2.5 kg Zn + 0.5 kg B/ha enriched with 500 kg FYM/ha
- 4. 40 kg S + 5 kg Zn + 1 kg B/ha enriched with 500 kg FYM/ha

# **Replication: 3**

### Design: Split Plot Design

Locations: Kangra, Ludhiana, Hisar, Pantnagar, Morena, SK Nagar, Dholi, Kanke, Shillongani, Bhubhaneshwar, Kota, Khudwani, Chatha, Imphal, Jobner, Jhansi, Kanpur, Nagpur

# **Observations:**

- 1. Growth and yield attributes, yield, oil content is to be reported every year.
- 2. System productivity, profitability and sustainability to be reported every year.
- 3. Initially measure soil physical and chemical properties from 0-15 cm and 15-30 cm depth.
- 4. Soil analysis (Organic carbon, pH, N, P, K, S, Zn, B) before and at harvest. Accordingly prepare balance sheet of all the nutrients and their use efficiency.
- 5. Always report the data in two-way table with CV (%), LSD values (p = 0.05) of main-plot, sub-plot and interactions as given in the report.

Note: All the centres should analyse oil content, economics and analyze soil OC and nutrient

# **3.6** Technological advancement for mustard production in rice-fallow areas Treatments for mustard:

- Main plot: 1. CT
  - 2. ZT+30% kharif rice residue

# Sub plot:

00% basal)

2. N+P+K+Zn (100% basal)

3.	N+P+K+Zn+B	(100% basal)
•••		(100/0 00000)

- 4. N+P+K+Zn+B (50% N basal & 50% N as top dressing)
- 5. N+P+K+Zn+B (50% N basal & 50% N as top dressing) + microbial consortia for residue decomposition

Locations: Imphal, Shillongani, Dholi

Design: SPD

**Replications: 3** 

Plot size: The sub plot should be minimum of  $25 \text{ m}^2$ 

Rice: Sowing method-DSR and short duration variety uniformly to all the centres

Mustard: Short duration mustard (DRMR 150-35)

RDF: as per location including seed treatment with microbes, biofertilizers & trichoderma Weed management: as per recommended herbicides in rice and mustard

# **Observations:**

- 1. Growth attributes: plant height, dry matter, chlorophyll content
- 2. Yield attributes: number of primary & secondary branches/plant, siliquae/plant, seeds/siliqua, main shoot length & test weight
- 3. System productivity, economics and sustainability yield index.
- 4. Soil analysis (Organic carbon, pH, N, P, K, S, Zn, B) before and at harvest.
- 5. Always report the data in two-way table with CV (%), LSD values (p = 0.05) of main-plot, subplot and interactions as given in the report.

# **3.7** Effect of nano-fertilizers on yield and quality of rapeseed-mustard Treatments

# Factor A: RD-NP levels

- 1. 100% RD-NP
- 2. 75% RD-NP
- 3. 50% RD-NP

# Factor B: Nano-fertilizers

- 1. 2 spray of nano-urea
- 2. 2 spray of nano-DAP
- 3. 2 spray of nano-urea & 2 spray of nano-DAP

# \*Absolute control

Total treatment:  $3 \times 3 + 1 = 10$ 

Design: FRBD

Replications: 3

Plot size: min. 25 sq.m.

Nano-fertilizers @ 4 ml/litre, water quantity- 300 litre/ha; RDF as per location.

Stage of pray: At 25-30 & 45-50 DAS

Locations: Kangra, Ludhiana, Hisar, Pantnagar, Morena, SK Nagar, Dholi, Kanke, Shillongani, Ranital, Kota, Chatha, Imphal, Jobner, Jhansi, Kanpur, Nagpur, Mandore, Khudwani

# **Observations:**

- 1. Growth attributes: plant height, dry matter, chlorophyll content & leaf area index
- 2. Yield attributes: number of primary & secondary branches/plant, siliquae/plant, seeds/siliqua, main shoot length & test weight
- 3. Seed yield, harvest index, oil content & economics.
- 4. Soil analysis (Organic carbon, N, P, K) before and at harvest.
- 5. Plant analysis: N, P & K content and uptake

#### XXX Annual Group Meeting of AICRP Rapeseed-Mustard August 3-4, 2023 at SKUAST, Chatha, Jammu

### **Technical Session V: Transfer of Technology**

Chairman	: Dr. Parminder Sheoran, Director, ICAR-ATARI, Ludhiana
Subject Expert	: Dr. Parminder Sheoran, Director, ICAR-ATARI, Ludhiana
Special Invitee	: Dr. Sanjay Singh, Director General, UPCAR
<b>Rapporteurs</b> : Dr. Ashok Kumar Sharma, Pr. Scientist, ICAR-DRMR,	
	: Dr. RK Yogi, Sr. Scientist, ICAR-DRMR, Bharatpur

After brief introductory remarks from chairman about the importance of frontline demonstrations in technology dissemination, Dr. Ashok Kumar Sharma, Pr. Scientist, (Ag Extension), ICAR-DRMR, Bharatpur presented the annual report of frontline demonstrations (FLDs) on rapeseed-mustard conducted during 2022-23. He informed the house 6462 frontline demonstrations (FLDs) were conducted in 172 districts across 20 states during 2022-23 through 46 cooperating centres of AICRPRM/ ICAR institutes/ Ag. Universities/NGOs/FPOs. The maximum FLDs were conducted in Rajasthan (1651) followed by Uttar Pradesh (1178), Assam (703) and Madhya Pradesh (550).

The maximum average yield of 2,200 kg/ha was observed from the IP under irrigated condition in Haryana followed by 2,197 kg/ha in Punjab; 2,055 kg/ha in Madhya Pradesh; 2,052 kg/ha in West Bengal; 2,012 kg/ha in Uttar Pradesh; 1,999 kg/ha in Bihar; 1,946 kg/ha in Rajasthan; 1,447 kg/ha in Uttrakhand; 1,418 kg/ha in J&K; 1,201 kg/ha in Assam; 1,132 kg/ha in Jharkhand; 1,052 kg/ha in Telengana; 993 kg/ha in Odisha and 989 kg/ha in Maharashtra. The maximum yield gap of 67.8% was recorded in Jammu & Kashmir followed by 58.8% in Odisha; 53.7% in Assam; 27.2% in Uttar Pradesh; 25.3% in Jharkhand; 24.2% in West Bengal; 18.44% in Maharashtra; 17.86% in Bihar;15.97% in Madhya Pradesh; 15.12% in Uttrakhand;15.09% in Telengana; 14.8% in Rajasthan; 9.73% in Haryana; and 4.76% in Punjab.The maximum ANMR/ha were Rs 25,001; Rs 20,226; Rs. 19,570; Rs. 19,507; Rs. 14,449; Rs. 13,937; Rs. 13,893; Rs. 12,877; Rs.12,726; Rs. 11,696; Rs. 8,888; Rs. 8,648, Rs.8,342; Rs. 7,045; in Jammu & Kashmir, Uttar Pradesh, West Bengal, Assam, Rajasthan, Odisha, Madhya Pradesh, Haryana, Jharkhand, Bihar, Telangana,Uttarakhand, Punjab, Maharashtra, respectively. The cost of cultivation ranged from Rs. 16,985/ha in Jharkhand to Rs. 39,005 /ha in Haryana in IP under irrigated Whole package demonstrations.

The maximum average yield of 1848 kg/ha from the IP of WP demonstrations under rainfed conditions was in Himachal Pradesh followed by 1,286 kg/ha in Jammu & Kashmir; 1,187 kg/ha in Rajasthan; 1,152 kg/ha in Jharkhand; 1,041 kg/ha in Tripura; 947 kg/ha in Assam; 859 kg/ha in Uttrakhand; 825 kg/ha Arunachal Pradesh; 719 kg/ha in Odisha; 684 kg/ha in Manipur; 635 kg/ha Meghalaya. The maximum yield gap of 74.95% was recorded in Tripura followed by 59.42% in Odisha; 51.84% in Himachal Pradesh; 48.45% in Jharkhand;46.30% in Jammu & Kashmir; 42.37% in Meghalaya; 34.32% in Assam; 33.3% in Manipur; 20.88% in Rajasthan; 18.32% in Uttrakhand; 14.74% in Arunachal Pradesh. The maximum ANMR/ha were Rs 30,959;Rs 18,901; Rs 17,726; Rs 17,432; Rs 10,703; Rs 8,671; Rs 8,249; Rs 7,686; Rs 7,606; Rs 6,010 and Rs. 4,238 in Himachal Pradesh, Tripura, Jharkhand, Jammu & Kashmir, Assam,Rajasthan, Meghalaya, Manipur, Odisha, Uttrakhand, and Arunachal Pradesh respectively. The cost of cultivation ranged from Rs. 10,309/ha in Rajasthan to Rs 33,500/ha in Himachal Pradesh in IP under rainfed Whole package demonstrations.

A total of 18 improved varieties of Indian mustard, 5 yellow sarson and 7 of toria and 2 of gobhi sarson were used in WP covering 14 states under irrigated condition. Under irrigated condition, improved variety RH 749 demonstrated in 99 FLDs in Uttar Pradesh, recorded highest average yield of 2,510 kg/ha with a yield improvement of 30.8% over local (FP) practice followed by Surekha (75 FLDs) with average seed yield of 2,442 kg/ha with yield improvement 54.5%. The minimum yield improvement of 2.1% was reported from PHR 126 variety from 27 FLDs in Punjab, while minimum average seed yield of 663 kg/ha was reported from DRMR 150-35 variety from 25

FLDs in Assam. However, the variety Brajraj in Jammu & Kashmir, under irrigated condition, recorded highest yield improvement of 68.5% with average seed yield of 1,336 kg/ha.

The maximum yield improvement of 27.8% from Pitambari variety of yellow sarson in Uttar Pradesh, 3.2 % from PGSH 1707 variety of gobhi sarson in Punjab, 66.2% from TS 38 variety of toria in Assam were recorded under irrigated condition.Under rainfed condition, the demonstrations with Radhika recorded the highest average seed yield of 1,429 kg/ha with yield improvement of 60.2% in Jammu& Kashmir under rainfed situation. In Manipur, 21 demonstrations with NRCHB-101 recorded lowest average seed yield of 749kg/ha with yield improvement of 26.7% over FP. However, the variety BBM-1 in Jharkhand under rainfed condition recorded highest yield improvement of 70.8% with average seed yield of 1093 kg/ha. The maximum yield improvement of 75.0% from TS 38 variety of toria in Tripura, 39.7% from NRCYS-05-02 variety of Yellow Mustard in Manipur, 53.3% from GSC 7 variety of Gobhi Sarson in Himachal Pradesh, 17.8% from Shalimar Sarson variety of brown Mustard in Jammu & Kashmir and 22.2% from RTM 1624 of taramira in Rajasthan were recorded under rainfed condition.

A total of 481 FLDs with 13 component technologies for Indian mustard, Toria and Yellow Mustard were carried out by different centres. Among the components, varietal and Sclerotinia stem rot demonstrated by Hisar centre had maximum average yield of 2,678 kg/ha. However, maximum yield increase of 59.5%, 58.9% and 58.0% was recorded with plant protection in timely sown irrigated, plant protection in late sown irrigated and Boron application and Plant protection in late sown irrigated demonstrated by Bhubaneswar centre followed by 24.7% and 22% yield increase with varietal and Sclerotinia stem rot management and varietal + micronutrient (SA of Sulphur 90% + Zinc sulphate + Borax) demonstrated by Bansur resulting maximum ANMR of Rs 20,772/ha. Weeding and thinning component demonstrated by Bawal centre gave 23.1 and 14.3% yield enhancement over FP, respectively.

The chairman and delegates appreciated the work done and presentation of results. After in depth discussion the following suggestions emerged.

- 1. Documentation with time series analysis of the FLD data with impact 1 (Yield Gap –I) and impact 2 (Yield Gap-2) need to be prepared.
- 2. Selected district wise pamphlets with transferable technology details may be prepared.
- 3. UC should be submitted by 15<sup>th</sup> March, so that the allotment and fund release can be processed timely.
- 4. Geo-tagging of all the FLDs should be done. A training programme may be conducted for the concerned personnel.
- 5. Emphasis should be given on demonstration of single component technology on the basis of adoption gap identified by the respective centers.
- 6. Chairman suggested for the zonal level interface with the focus on latest transferable technologies for the extension functionaries in the collaboration with the ICAR-ATARI.
- 7. New varieties less than of 5 years old may be preferred under FLDs and ensure that varieties more than 10 years old are not to be taken up in FLDs.
- 8. All the guidelines of FLDs should be followed strictly by all centres

The session ended with vote of thanks to chair.

#### Frontline Demonstrations on Rapeseed-Mustard 2023-24 Guidelines for conducting frontline demonstrations

- 1. Each implementing centre will conduct the FLDs as per the allotment list given along with the technical programme.
- 2. As per new guideline, all the demonstrations will be conducted in cluster approach. Emphasis should be given to component technology demonstrations including INP and IPM. For organizing FLDs, adopt adjoining villages of a panchayat (Cluster approach) preferably 2-3 village in one district only to show the impact and carry out PRA for identifying the critical factor for low productivity. A group of multidisciplinary scientists, instead of one scientist should be involved in FLDs programme
- 3. One FLD is for one acre plot only. Funds for conducting FLDs will be Rs. 2160.00 for an area of one acre (one FLD). No farmer should be allotted more than one FLD.
- 4. The binding of one acre area for one demonstration may not be observed, where holdings areas are too small. In these areas, one FLD (one acre area) can be divided in 2-3 farmers as per land holdings available.
- 5. Unspent balance of previous years may be utilized but subject to revalidation by ICAR-DRMR.
- 6. In the report, specifically mention the rainfed and irrigated situation and also the normal and late sown conditions under which FLDs are actually conducted.
- 7. Farmers having soil health card issued by Department of Agriculture/KVKs should only be selected for conducting FLDs in Oilseeds. Fertilizer inputs will be provided to farmers under FLDs on the basis of Soil health card. The chemical fertilizers/ pesticides under FLDs should only be given by identifying the gaps in adoption. Growth promoters, Micro nutrients, etc can also be given.
- 8. New varieties less than 5 year old may be preferred under FLDs and ensure that in any circumstances, varieties more than 10 years old shall not be allowed.
- 9. The improved varieties recommended for a particular zone should also be tested against the local variety. At least 50 per cent of recently released varieties of the zone must be included in FLDs by each centre other than its own centers.
- 10. The in-charge of the implementing centre should indent the requisite quantity of the varieties to the concerned centres/ breeders well before the start of the season.
- 11. The total cost of cultivation for improved plot (IP) and farmers' plot (FP) per ha should be reported including all input, labour and miscellaneous cost separately and ensure that they vary from each other only on the technology being tested (whole package, component, cropping system as the case may be).
- 12. The package of practices should be improved / recommended for the concerned zone. Technology used in FLDs should be clear and thoroughly described along with complete package in the report
- 13. Each centre must work out the economics of the FLDs and report the B:C ratio for the improved plot (IP) and farmer's plot (FP) for each demonstration instead of IBCR value.
- 14. Document farmers' practices and the prevailing ITK during PRA and send the same along with the preliminary report to the Director, DRMR within one month after the sowing.
- 15. The impact of new technology should be discussed during scientist-farmer interaction, training and field visit / kisan diwas / kisan mela, etc in the village. Photography of the FLD activities must be done and send good photographs to DRMR, Bharatpur for record.
- 16. The centres should send the preliminary report pertaining to the name of farmer, location along with date of sowing and technology demonstrated to the Director, ICAR-DRMR, Director Agriculture of the respective state/ICAR institutes/DAC&FW/ the district level extension agency and NGOs, for proper monitoring, strengthening the linkages and also extending learning experiences to relatively large population of farmers.
- 17. The final data book for individual farmer, as supplied by the ICAR-DRMR, must be sent to ICAR-DRMR, Bharatpur along with the summary sheet of results latest by April 30, 2024.
- 18. Every center should send the list of selected farmers for the FLDs for the release of 50% budget as an advance. After receiving the audit utilization certificate of the previous season, rest 50% budget would be released.
- 19. Reservation for SC and ST community must be followed in selecting beneficiary farmers for conducting FLDs as per norms.
- 20. Every centre will do the geo tagging of all FLDs as per the guideline of DAC&FW, Govt. of India

# Zone wise improved varieties recommended for FLDs on rapeseed-mustard (2023-24)

# Zone-I: Kangra and Khudwani

Brown sarson: Shalimar Sarson-1 Ghobhi Sarson: GSC-7, AKMS 8141, GSH 1699 (hybrid)

Zone -II: Chata, Hisar, Bewal, Ludhiana, Navgaon and Sriganganagar
Indian Mustard:
Irrigated Timely Sown RH 749, DRMRIJ 31, PBR 357
Rainfed: RH 406, GDM 5, PBR 378, RH 725, RH 761, DRMR 1165-40.
Late Sown irrigated: Brajraj, Radhika, RVM 2 (Raj Vijay Mustard 2), RGN 236.
Quality: Pusa mustard 30, RLC 3, Pusa mustard 31 (Double zero), PM 32, PM 33, RCH 1 (hybrid)
Early Sown: Pusa mustard 28, Pant Rai 19 (PR 2006-1)
Salinity/Alkalinity: CS 58, CS 60
Gobhi Sarson: GSC 7, RSPN 25, AKMS 8141, GSH 1699

# Zone-III: Morena, Bharatpur, Kota, Faizabad, Banda, Jhansi, Agra, Varanasi, Kanpur Pantnagar and Dholi,

Indian Mustard: Irrigated Timely Sown: RH 749, Griraj (DMRIJ 31), RGN 73 Quality: Pusa mustard 30 <u>Yellow Sarson:</u> Pitambari, YSH 401, Pant Pilli Sarson 1, Pant Sweta, <u>Toria:</u> Uttara, Tapeswari <u>Taramira</u>: RTM 1351, RTM 1355, RTM 1624

- Zone-IV: Junagarh, S.K. Nagar, Jobner, Mandore and Nagpur <u>Indian Mustard:</u> GDM 4, Taramira: RTM 1351, RTM 1355, RTM 1624
- Zone-V: Shillongani, Kanke, Jagdalpur, Imphal, Tripura, Bhubaneshwar and Berhempore Indian Mustard: DRMR 150-35 <u>Yellow Sarson:</u> Pitambari, YSH 401, Pant Sweta, <u>Toria:</u> TS 38

S.No	Zone/Centre	Allotment
	Zone I	
1	Kangra	24
	Sub total	24
	Zone II	
2	Jammu	24
3	Hisar	15
4	Bawal	15
5	Sriganganagar	20
6	Ludhiana	26
	Sub total	100
	Zone III	
7	RVSKVV, Morena	44
8	RLBCAU, Jhansi	25
9	BUAT, Banda (Uttar Pradesh)	25
10	Kota	50
11	Pantnagar	20
12	Kanpur	50
13	Varanasi	50
14	Dholi	26
	Sub total	290
	Zone IV	
15	Jobner	20
16	Jodhpur	50
17	Nagpur	42
18	S.K. Nagar	26
	Sub total	138
	Zone V	
19	Bhubaneshwar	24
20	Shillongai	25
21	Kalyani	29
22	Kanke	26
23	Chattisgargh	24
24	DEE, CAU, Imphal	40
25	DR, AAU, Assam	60
	Sub total	228
	Zone VI	
26	RARS, Jagtial, PJTSAU	20
	Sub total	20
	Grand total	800

Centre wise allotment of FLDs on rapeseed-mustard for 2023-24

# XXXAnnual Group Meeting of AICRP Rapeseed-Mustard August 3-4, 2023 at SKUAST, Chatha, Jammu

### Session VI : Planning and Technical Programme Formulation: Biochemistry

Chairman : Dr. Sanjeev Gupta, ADG (O&P), New Delhi

Subject expert : Dr. Sanjay Guleria, Professor & Head, Division of Biochemistry, SKUAST-Jammu

**Rapporteurs** : Dr. Anubhuti Sharma, Principal Scientist, ICAR-DRMR, Bharatpur

: Dr.Lalit Krishna Meena, Scientist, ICAR-DRMR, Bharatpur

The session started with the formal introduction of the chairman Dr. Sanjeev Gupta, subject expert Dr. Sanjay Guleria and scientists from different coordinating centers participated in the formulation of the programme. The highlights of the programme of Biochemistry were:

- IVT/AVT quality trials were evaluated at Bharatpur, Pantnagar, Hisar and Ludhiana. Among the 26 genotypes analyzed, Oil stability index which is the ratio of MUFA: PUFA, it ranged from 0.67 in NPJ 253 to 1.64 in PM-30. Entries were also analyzed for fatty acid profile and it has Palmitic acid ranged from 2.22% (Released Variety) to 4.77 % (LES 67). Stearic acid: 0.85% (Released Variety) to 2.60% (PDZ 1). Oleic acid ranged 11.74 % (NPJ 253) to 49.17 % (PDZ 1).. However one genotype i.e. PDZ 1 has oleic acid more than 45%. Linoleic acid: 14.93 % (RH 0749) to 40.48 % (LES 67). Linolenic acid: 7.98 % (PDZ 1) to 19.11 % (RH 0749). Eicosanoic acid: 0.34 % (DRMRC1Q 47) to 1.15 % (NPJ 253). Erucic acid: 0.37 % (PM-32) to 48.28 % (Released Variety). ω6: ω3 ratio ranged from 0.80 (RH 0749) to 4.54 (LES 67). SFA: MUFA: PUFA ratio ranged between 1:06:06 to 1:21:11. Unsaturated and saturated ratio ranged between 13.04 (LES 67) to 26.84 (NPJ252).
- Nutritional Profiling of entries of IVT/AVT quality trials observe total protein ranged from 29.43 (RH (OE) 1806) to 32.95% (PDZ 16). Total antioxidant capacity ranged from 14.21 (DRMRC1Q 47) to 20.87 (PM 30) mg/g. β- carotene ranged from 3.49% (PDZ 14) to 5.44% (RH (OE) 1806). Total sinapine content ranged from 1.55% (PMAS 7) to 2.40% (PM 32).
- Estimation of anti-nutritional factors in quality breeding materials includes total glucosinolate content and phytic acid analysis. Total Glucosinolatemean values for four centers (Bharatpur, Pantnagar, Ludhiana, Hisar) were <30 μmol/g in PMAS 11, PDZ 18, PMAS 7, PDZ 19, PDZ 11, DRMR C1Q158, PDZ 15, IJ19R5004, PDZ 16, PDZ 1, PDZ 14, DRMRCIQ 47 genotypes. It ranged from 19.11% (PDZ-16) to 73.45% (DRMRQ 29-20). Phytic acid content mean values were < 2.60% in PMAS 11, PDZ 18, RH (OE) 1708, PDZ 1, NPJ 252, PDZ 14 and Released variety. Aliphatic glucosinolates were identified as sinigrin, glucobrassicanapin, gluconapin, nasturtin and few unknown peaks were unidentified using UPLC. Data was statistically analysed using SPSS version 22 software.</p>

The session completed with vote of thanks.

# Technical Programme 2023-24 Biochemistry

# 7.1 Evaluation of important breeding materials for Nutritional Quality Index (NQI) of oil.

# Parameters:

- 1. Oil content analysis
- 2. Fatty acid profiling (palmitic acid, stearic acid, oleic acid, linoleic acid, linolenic acid, eicosenoic acid, erucic acid)
- 3.  $\omega 6/\omega 3$  ratio
- 4. Oil stability index

- 5. SFA: MUFA: PUFA
- 6. Saturated and unsaturated fatty acid ratio

Centers: Bharatpur, Ludhiana, Hisar, Pantnagar, Chatha(Jammu), BHU(Varanasi)

#### 7.2. Value addition screening in seed meal of promising breeding materials Parameters:

- 1. Crude protein analysis
- 2.  $\beta$ -carotene content
- 3. Total Antioxidant activity
- 4. Total sinapine content

Centers:Bharatpur, Pantnagar, Hisar, Ludhiana, Chatha(Jammu), BHU(Varanasi)

5. Glucosinolate profiling (By HPLC/UPLC) Centers: Bharatpur, Ludhiana

### 7.3. Screening of anti-nutritional factors in quality breeding material

Parameters:

- 1. Total Glucosinolates
- 2. Phytic acid

Centers: Bharatpur, Pantnagar, Hisar, Ludhiana, Chatha(Jammu), BHU(Varanasi)

### 7.4. Biochemical basis of resistance to be evaluated for entomology trials.

Parameters:

Total Phenolic content, orthodihydroxy phenol, Flavonol, Total Glucosinolates Centers: Bharatpur, Ludhiana, Hisar, Pantnagar, Chatha(Jammu), BHU(Varanasi)

#### **Entries for Biochemical analysis:**

Ouality Mustard

SN	Fntry	Padiaraa	Method of	Contro		
<b>BIN</b>	Entry	1 euigi ee	hunding	Centre		
			breeding			
IVT,	Quality Mustard					
1	LES 68	LES 45 X EC-61	Pedigree selection	IARI, New Delhi		
2	LES 69	Heera/PM30//Heera	Pedigree selection	IARI, New Delhi		
3	PDZ 21#	LES 1-27 X PDZ-2	Pedigree selection	IARI, New Delhi		
4	PMAS 7	PBR 357/ RLC 3// PBR 357	MABC	PAU Ludhiana		
5	PMAS 8	PBR 357/ RLC 3// PBR 357	MABC	PAU Ludhiana		
6	RH(OE) 1618	RH(HO) 0502 X Berry	Back Cross	CCS, HAU, Hisar		
7	RH(OE) 1710	RH(HO) 0508 X RH 0401 B	Back Cross	CCS, HAU, Hisar		
8	DRMRCI(Q) 179	NRCHB-101 / Heera//NRCHB 101	MABC	DRMR, Bharatpur		
9	DRMRCI(Q) 180	DRMR 150-35/ RLC- 3// DRMR 150-35	MABC	DRMR, Bharatpur		
10	DRMRCI(Q) 181	DRMR 150-35/ RLC- 3// DRMR 150-35	MABC	DRMR, Bharatpur		
11	LR					
12	ZC					
13	PM 30 (NC)					
14	PDZ 11 (DLC)					
AVT	AVT I+II (Quality entries)					
15.	RH(OE) 1708					

Biochem-2

16.	DRMRCI(Q) 158		
17.	DRMRCI (Q) 172		
18.	DRMRCI(Q) 47		
19.	PDZ 1		
20.	RGN 73		

## Recommendations

- > Quantification of ITC content should be carried out in selected entries.
- > Statistical analysis should be added in the presentation.
- Standard protocol reference should be added in the report.
- Standardization of myrosinase activity should be carried out during 2023-24.
- > Two volunteer center Chatha (Jammu) and BHU (Varanasi) should be added.

# XXX Annual Group Meeting of AICRP Rapeseed-Mustard August 3-4, 2023 at SKUAST, Chatha, Jammu

Session VI:	Planning and Technical Programme Formulation: Plant Physiology
Chairman	: Dr. Sanjeev Gupta, ADG (O&P), ICAR, New Delhi
Subject expe	rt : Dr. Sanjeev Guleria, Professor & Head Biochemistry, SKUAST, Jammu
Rapporteurs	: Dr. Anubhuti Sharma, Principal Scientist, ICAR-DRMR, Bharatpur
	: Dr. Lalit Krishan Meena, Scientist, ICAR-DRMR, Bharatpur

The technical session on Plant Physiology and Biochemistry was chaired by Dr. Sanjeev Gupta, ADG (O&P) andDr. Sanjeev Guleria, Professor & Head of Biochemistry, SKUAST, Jammu was the subject matter expert. Dr. Pushp Sharma, PI (Plant Physiology), PAU Ludhiana and Dr. Anubhuti Sharma, PI (Biochemistry) presented the salient findings of experiments conducted by different centres during *rabi* 2022-23 of their respective disciplines.The highlights of the programme of Plant Physiology in 2022-23 were

- Entries of AVT (early) along with promising strains of 2021-22 and check JD-6 and PM 25 were screened for high-temperature tolerance at the seedling stage for the trait's seedling mortality ≤20% and 10 seedlings dry weight ≥35 mg under controlled laband field condition. Results indicated only one genotype DRMRCI 125 registered seedling mortality ≤20% at Hisar while none of the genotypes at Ludhiana. All the test genotypes at Hisar had dry weight/10 seedlings ≥35 mg under laboratory conditions except JD6. The highest dry matter per 10 seedlings was 63.3 mg in Kranti and ORM 2019-25 followed by 58.4 mg in DRMRCI 145 and PM 25. Dry matter was ≥35 mg in all the genotypes at Ludhiana, maximum in Kranti (57.5 mg) trailed by PM 25 (57.2 mg) and DRMRCI 167 (55.4 mg). In field conditions, the dry matter of 10 plants was 41.1g in DRMR 20-33 at Ludhiana only.
- 2. Out of 23 breeding lines tested for drought tolerance along with check RH 0725 & RGN-229, seed yieldreduced by ≤20% only in one genotype DRMRSJ 276 at three locations (Bharatpur, Dholi and Ludhiana), DRMRCI 162 and RGN 229 at Hisar and Ludhiana, DRMRCI 163 at Bharatpur and Ludhiana while DRMR 2020-3 and DRMRCI 163 at Dholi and Ludhiana rating these genotypes highly tolerant to drought. Seed yield reduction was ≤20% in RH725 (check) at Dholi, Hisar and Ludhiana while RGN 229 only at Hisar and Ludhiana.
- 3. Out of 27 tested entries, DRMR 2019-19 and DRMR 2018-19 showed tolerance to terminal heat stress with seed yield reduction ≤20% at 3 locations (Bharatpur, Dholi and Ludhiana) and only two genotypes (JC32 and Radhika) at Bharatpur and Ludhiana. CS 56 at Hisar and Ludhiana; while DRMRCI 166 at Bharatpur and Hisar were also thermo tolerant with yield reduction ≤20% with heat and yield stability indices ≥0.5.Yield reduction was≤ 30% in DRMR 2017-27 at all 4 locations while PM26 (check) at Bharatpur, Dholi and Ludhiana and BPR543-2 (check) at Dholi and Ludhiana were rated as moderately tolerant to terminal heat stress.
- 4. Foliar application of Trehalose @10mM improved seed yield at Bharatpur and Ludhiana centres while potassium nitrate @2% at Hisar.
- 5. Physiological traits (Chlorophyll, SPAD and RWC) and osmoprotectants (Proline and total sugar) increased with the microbial treatments under moisture stress at Ludhiana centres. The maximum increase in Total Chlorophyll, Carotenoids and SPAD with Biophos and Biophos+ treatment; RWC with CRIDA MI; proline with CRIDA MI II and total sugar was recorded with MKS 6 at Ludhiana centre.

- 6. Variations existed for the physiological, yield attributes and seed yield in Giriraj, RH725 and PBR357 with microbial formulation (CSIR- Lucknow) and Pusa Sanjeevni (IARI-New Delhi) at Bharatpur, Dholi, Hisar and Ludhiana in normal and late plantings. Seed yield improved with both the inoculations under normal and late sown varieties at all 4 locations except for PBR 357 and RH725 inoculated with microbial formulation; PBR 357, Giriraj and RH725 with pusa sanjeevani under the late sown condition at Bharatpur centre and for Giriraj inoculated with microbial formulation under the normal sown condition as well as for Giriraj inoculated with microbial formulation under the late sown condition at Hisar centre over non-inoculated control.
- 130 germplasm/breeding lines were evaluated for remobilization efficiency and only six breeding lines (JA245, JT1, NR3350, PM67, DJ33 and IM46) reported efficient uptake or mobilization.

After the presentation of the report of AICRP-RM plant physiology 2022-23, the following recommendations were given by the chairman

1. Trial 6.7 "Evaluation of germplasm /breeding lines for remobilization efficiency" is discontinued from this cropping season.

#### Technical Programme 2023-24 Plant Physiology

6.1 Screening of genotypes from different agro climatic zones for high temperature tolerance at seedling stage.

Entries of AVT (early/germplasm) along with promising strains of 2022-23:

DRMRCI 125, Kranti, DRMRCI 145, DRMRCI 167, DRMR 1188, DRMR 2019-19, DRMRCI 133, DRMRCI 165, DRMRSJ 272, DRMRHT 13-13-5-5, KMR(E) 22-2, PM 28, NRCHB 101, DRMRCI 187, DRMRCI 188, DRMR 21-16, DRMR 19-35, DRMR 2021-8, DRMR 2019-7, DRMRHT-17-40, DRMRHT-1889, DRMRDR 2116, DRMRDR 2133, Checks: PM 25 and JD 6

#### Methodology:

#### **Controlled condition (Laboratory)**

- 1. Take 5 kg soil in plastic trays and add water to bring it to field capacity.
- 2. Sow the seeds in rows and place the tray in seed germinator at 25±1°C for germination.
- 3. After 4-5 days (when the seedlings have about 2.5 cm height), the seedling should be exposed to high temperature  $(45\pm 1^{\circ}C)$  with 30-40% relative humidity for 4 hours daily for 4 days.
- 4. Maintain uniform soil moisture level.

Observations: Seedling mortality, dry weight (10 seedlings) and TTC test

#### Field condition

- 1. Sowing should be done around 20-25 September.
- 2. Plot will be irrigated prior to the sowing (Only pre-sowing irrigation).
- 3. 100 count seeds will be sown in 2 m row length.
- 4. Experiment will be continued for 30 days.

**Observations**: Soil moisture at depth of 0-15cm (at the time of seeding, 10, 20 and 30 DAS), ambient temperature, daily soil temperature, seedling mortality, dry weight (10seedlings), canopy temperature, membrane stability, seedling thermo tolerance index (STI) and seed to seedling thermotolerance index (SSTI).

Design: CRD (Lab.)/RCBD (Field), Replication: 3

**Centers**: Bharatpur, Dholi, Hisar and Ludhiana.

#### 6.2 Screening of genotypes for drought tolerance

Entries of AVT (*rainfed*/germplasm) along with promising strains identified during 2022-23: DRMRSJ 276,NPJ 210, NPJ 214, DRMR 19-21, DRMR 2020-3, DRMRCI 148, DRMRCI 163, DRMRCI 162, DRMRCI 161, RB 113, DRMR 150-35, DRMRCI 183, DRMRCI 184, DRMR 21-16, DRMR 19-35, DRMR 2019-19, DRMR 2019-7, DRMRDR 2135, DRMRDR 2141, Checks: RH 725, Kranti, NRCHB 101 and RGN-229 **Methodology:** 

#### 1. Sowing will be done in 5 rows each of 2.5 m row length.

- 2. Surface irrigation (5-6 cm) will be done prior to the sowing.
- 3. In irrigated condition, two irrigations will be given, first at 35 and second at 65 DAS while rainfed set be grown without irrigation.

#### **Design**: RBD, **Replication**: 3

**Observations :**Soil moisture (0-30, 30-60 cm) at the time of seeding, before 2<sup>nd</sup> irrigation and maturity, field capacity, rainfall, SPAD value, chlorophyll content, RWC, CT, 1000 seed weight, siliquae on main shoot(SMS), seeds/siliqua, biological yield (kg/ha), seed yield (kg/ha), harvest index, yield stability index (YSI), drought susceptibility index (DSI) and oil content.

Centers: Bharatpur, Dholi, Hisar and Ludhiana.

#### 6.3 Screening of genotypes for high temperature tolerance at terminal stage

Entries of AVT (late sown/ germplasm) along with promising strains from 2022-23: DRMRCI 166, JC 32, DRMR 2019-19, DRMR 2017-27, Radhika, DRMR 2018-19, DRMRHJ 430, CS 56, DRMRCI 189, DRMR 21-16, DRMR 19-35, DRMR 2018-1, DRMR 2019-7, DRMRHT-17-1-4, DRMRHT-17-2-6, DRMRDR 2156, DRMRDR 2195, Check: PM 26, Kranti, NRCHB 101 and BPR 541-4

**Methodology:** Two rows of each genotype will be sown at optimum date of sowing and one month thereafter as late sown.

**Plot Size**: 5.0 x 0.6m, Spacing: 30 x 10 cm

#### **Design**: RBD, **Replication**: 3

**Observations**: Ambient temperature (from flowering to maturity), canopy temperature, canopy temperature depression (CTD), membrane stability index, number of seeds/siliqua, 1000 seed weight, seed yield (kg/ha), heat stability index (HSI) and yield stability index (YSI).

Centers: Bharatpur, Dholi, Hisar and Ludhiana

#### 6.4 Effect PGRs to mitigate drought stress

Latest released local variety for rain fed condition.

#### Methodology

- 1. Rainfed variety will be sown in 5 rows each of 5 m row length.
- 2. Treatments:Urea -1 and 2%

Trehalose -10 and 20mM Potassium nitrate – 1 and 2 % Water spray Control

Foliar sprays at Initiation of flowering and 50% flowering stage.

#### **Design**: RBD, **Replication**: 3

**Observations:**Photosynthetic pigments in 3<sup>rd</sup> or 4<sup>th</sup> leaf on main shoot (chla, chlb, total chl and carotenoids), CSI, RWC, LWR, siliquae on main shoot(SMS), total siliquae/plant, number of seeds/siliqua, 1000 seed weight, biomass (kg/ha),seed yield (kg/ha) and B:C ratio.

Centers: Bharatpur, Dholi, Hisar and Ludhiana

#### 6.5Microbes for mitigating temperature stress in mustard

**Methodology**: Sowing will be done in 5 rows each of 3m row length at optimum date of sowing and one month thereafter as late sown

#### **Treatments**:

- 1. Without culture,
- 2. Microbial formulation as bio stimulant (MFs)
- 3. Stress adaptive consortium (Pusa Sanjeevni)
- Microbial cultures will be applied as seed dressing before sowing

Varieties: PBR357, RH725 and Giriraj

#### **Design**: SPD, **Replication**: 3

**Observations**: Soil microbial counts before and after sowing, ambient temperature (from flowering to maturity), photosynthetic pigments(chla, chlb, total chl and carotenoids),canopy temperature, canopy temperature depression, membrane stability, RWC, total siliquae/plant, 1000 seed weight,biomass(kg/ha) and seed yield (kg/ha) **Centres:** Bharatpur, Dholi, Hisar and Ludhiana

#### Seed Supply:

 $\Rightarrow$  200 g seed for each location should be sent.Entire quantity of seed of each entry is to be sent in one lot in proper packing to avoid mixing of seed latest by 30<sup>th</sup> August.

#### Data reporting:

Data should be sent to Director, DRMR (director.drmr@gmail.com) on the prescribed data sheets latest by May 30, otherwise it will not be possible to include in the report.

# XXX Annual Group Meeting of AICRP Rapeseed-Mustard August 3-4, 2023 at SKUAST, Chatha, Jammu

Session VII	: Plenary Session
Chairman	: Dr. Sanjeev Gupta, Assistant Director General (O&P), ICAR, New Delhi
Co-Chairman	: Dr. R.K. Mathur, Director, ICAR-IIOR, Hyderabad
Chief Guest	: Dr. R.K. Samnotra, Director Reserch, SKUAST-Jammu
Convener	: Dr. P.K. RAI, Director, ICAR-DRMR, Bharatpur
Rapporteurs	: Dr. Bhagirath Ram, Principal Scientist, ICAR-DRMR, Bharatpur
	: Dr. H.K. Sharma, Sr. Scientist, ICAR-DRMR, Bharatpur

The session started with welcome and remark by Dr. P.K. Rai, Director, ICAR-DRMR, Bharatpur (Rajasthan). The recommendation of each technical session was presented by respective Principal Investigators. Dr. V.V. Singh, presented recommendations of Plant Breeding session. Dr. R.S. Jat presented the highlights of Agronomy session. Dr. P.D. Meena presented the highlights of Plant Pathology session and Dr. Srawan Kumar presented highlights of Entomology session. The highlights of Plant Biochemistry session were presented by Dr. Anubhuti Sharma, followed by highlights of Plant Physiology session by Dr. L.K. Meena.

Dr. P.K. Rai, Director, ICAR-DRMR presented the proceedings of VIC. He apprised that out of five proposals, four proposals of Indian mustard were considered and recommended by varietal identification committee. He announced the best performing main centre award to CCSHAU, Hisar and sub-centre award to SKUAST-Jammu. Dr. Rai, congratulated and appreciated the efforts of the centres, and scientists whose varieties were identified and the centres received best centre awards.

Dr. R.K. Mathur, Director, IIOR, Hyderabad suggested to use diverse parents in breeding programme. He advised to work on resource use efficiency, testing of biomolecules/ biopesticides for pest management and to develop varieties with tolerance to high temperature, cold and high water use efficiency. Dr. Sanjeev Gupta, congratulated the group for identification of 04 varieties of Indian mustard. He thanked ICAR, Vice Chancellor, Director Research SKUAST-Jammu and Dr. P.K. Rai, Director, DRMR for selecting the SKUAST-Jammu for hosting the AGM. Dr. R.K. Samnotra, Director Research SKUAST-Jammu congratulated developers of varieties and best performing award winning centres.

Later, Dr. Bikram Singh, Pr. Scientist & In-charge, RRS, Bawal (CCSHAU, Hisar); Dr. S.S. Patil, Pr. Scientist, Jalgaon (MPKV, Rahuri) and Mr. Dinesh Awasthi, Technical officer, ZARS, Morena (JNKVV, Jabalpur) were felicitated on the occasion of their superannuation. The session ended with the vote of thanks given by Dr. P.K. Rai, Director, ICAR-DRMR. He conveyed his regards to Dr. B.N. Triapthi, Vice Chancellor, SKUAST-Jammu and Dr. R.K. Samnotra, Director Research, SKUAST-Jammu for hosting the 30<sup>th</sup> AGM at SKUAST-Jammu, Jaipur. He expressed his sincere gratitude to Secretary, DARE, GoI & DG, ICAR, New Delhi, DDG (CS), ICAR, New Delhi, ADG (Oilseeds & Pulses), ADG (Seed), ICAR, New Delhi, for their constant encouragement, guidance and help to improve rapeseed-mustard research and development programme. He also thanked all the esteemed PIs, rapporteur, subject experts and all the delegates, press and electronic media and sponsoring agencies.