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Proceedings of
Centre wise presentations &
Pearl Millet Technical Program Planning Meeting 2023-24
of
ICAR-All India Coordinated Research Project on Pearl Millet

ICAR-All India Coordinated Research Project on Pearl Millet
Mandor, Jodhpur – 342 304
http://aicrp.icar.gov.in/pearl
www.aicpmip.res.in

Proceedings – Centre wise presentations (17.05.2023)

Time	**Review of Research Results of AICRP-PM Centres 2022-2023** **(Centre-wise presentation of significant results and progress report)** One consolidated presentation by centre-Incharge.	
Chairman	Dr. S.K. Pradhan, ADG (FFC), ICAR	
Co-Chairman	Dr. C. Tara Satyavathi, Director, IIMR, Hyderabad	
Rapporteurs	Dr. S.P. Singh, ICAR-IARI, New Delhi; Dr. Sanjana Reddy, ICAR-IIMR, Hyderabad	
09.00-12.00	**Zone A_1 & A**	
09:00-09:30	Bikaner	Dr. P.S. Shekhawat, Director Research & Professor (Agronomy), SK Rajasthan Agricultural University, Beechwal, Bikaner
09:30-10:00	Durgapura	Dr. L.D. Sharma, Professor (PB&G) & Incharge (Millet), RARI, Durgapura, Jaipur
10:00-10:30	Hisar	Dr. Anil Kumar, Principal Scientist & Head, Bajra Section, Department of Genetics & Plant Breeding, CCS Haryana Agricultural University, Hisar
10:30-11:00	Gwalior	Dr. R.K. Pandya, Principal Scientist (Pl Pathology), RVSKVV, College of Agriculture, Gwalior
11:00-11:30	Jamnagar	Dr. K.D. Mungra, Research Scientist (Pl. Breeding), Pearl Millet Research Station (JAU), Air Force Road, Jamnagar
11:30-12:00	Ludhiana	Dr. R.S. Sohu, Incharge, Forage & Millet Section (Acting), Punjab Agricultural University, Ludhiana Dr. Ruchika Bhardwaj, Asstt. Breeder, AICRP-PM, Dept. Of Plant Breeding, Punjab Agricultural University, Ludhiana
12:00-13:30	**LUNCH**	
13:30-16:30	**Zone B**	
13:30-14:00	Ananthapuramu	Dr. C.V. Chandra Mohan Reddy, Senior Scientist (Plant Breeding), AICRP on Pearl Millet, ARS, ANGRAU, DCMS Buildings, Kamalanagar, Ananthapuram
14:00-14:30	Aurangabad	Dr. S.B. Pawar, Associate Director Research, AICRP on Pearl Millet, National Agricultural Research Project, Paithan Road, Aurangabad
14:30-15:00	Coimbatore	Dr. K. Iyanar, Associate Professor (PBG), Department of Millets, Centre for Plant Breeding & Genetics, Tamil Nadu Agricultural University, Coimbatore
15:00-15:30	Dhule	Dr. K. K. Barhate , Associate Professor (Pearl Millet Breeding), AICRP on Pearl Millet, Bajra Research Scheme, College of Agriculture (MPKV), Dhule
15:30-16:00	Mysore	Dr. S. Chandra Nayak, Professor & Officer Incharge, ICAR-AICRP on Pearl millet (Mysore centre), Pearl millet Pathology Laboratory, DOS in Applied Botany and Biotechnology, University of Mysore, Manasagangotri
16:00-16:30	Vijayapur	Dr. B.K. Athoni, Jr. Breeder & Head, AICRP on Pearl Millet, Regional Research Station, College of Agriculture, Vijayapur-Karnataka

Review of Research results of ICAR-AICRP on Pearl Millet funded centers (2022-23)

An online meeting was held via zoom platform on 17th May, 2023 to evaluate the performance of different centers of ICAR-AICRP on Pearl millet. The session was chaired Dr. C Tara Satyavathi, Director, ICAR- Indian Institute of Millets Research & Project Coordinator for ICAR-AICRP on Millets. The progress made during 2022-2023 was presented by respective center PIs of different ICAR-AICRP on Pearl millet centers. The center wise observations and suggestions are briefly mentioned below:

SKRAU, Bikaner- Dr. P.C. Gupta presented the progress report and following observations were made:

- Twenty plant breeding trials, two ICAR-ICRISAT, 30 FLDs were conducted by the centre and 4 entries were contributed for AICRP trials. The centre has conducted seven agronomy trials.
- The productivity has not increased in zone 1C of Rajasthan from 2018-2020. The latest data needs to be presented.
- As Bikaner represents typical arid zone, efforts should be made to increase productivity in arid zone in early background as well as breeding for better water use efficiency should be targeted.
- Efforts for MoU with private sector should be made for enhancing the hybrid (BHB 1602) adoption by the farmers.
- Avenues for funding should be explored. Funds should be raised from MOUs made.
- Over all centre has made good progress.

RARI, Durgapura- Dr. L.D. Sharma presented the progress of the centre and the following observations were recorded:

- The centre has conducted 9 breeding, 5 ICAR-ICRISAT, 2 station, 7 agronomy, 7 pathology, 7 entomology and 1 physiology trials and contributed 3 hybrids for testing. Fifty-two germplasm lines were collected from Barmer and Jaisalmer.
- Centre to present the statistics of the zone in which it is placed rather than entire state.
- Good efforts are made for seed production. In lieu of IYOM, centre to address the seed demands.
- AICRP data for entomology trials should be submitted in time.

CCS HAU, Hisar- Dr. Anil Kumar presented the progress report and the different salient achievements and observations are given below:

- The centre has conducted 8 breeding, 3 ICAR-ICRISAT, 54 FLDs, 7 agronomy, 5 pathology trials.
- NEL/MOUs have been made with five seed companies for seed production of three hybrids.
- Pre-breeding for blast tolerance being taken up.
- Newly reported stem rot disease was found in all districts
- A new disease, Klebsiella leaf streak caused by *Klabsiella variicola* was identified on sorghum and pearl millet.
- Centre asked to obtain resistant sources from locally adapted material rather than PMiGAP.

- Seed production of HHB 67 improved-2 has to be strengthened.

RVSKVV, Gwalior- Dr. R.K. Pandya presented the progress of the centre and important achievements and suggestions are given below:

- The centre has conducted 6 breeding, 1 station, 3 ICAR-ICRISAT, 25 FLDs, 8 pathology trials and contributed 2 hybrids for testing.
- Yield advantage of 10-11% over checks is shown in station trial. Since the advantage is marginal, it may not perform well in coordinated trial. No hybrid has been identified from the centre for the past 7-8 years. Hence, more focus is needed on material development and identification of hybrids or varieties from the center.

JAU, Jamnagar- Dr. K.D. Mungra presented the progress report and the following observations were made:

- Pre-breeding activities on introgression of genes from landraces into elite lines taken up. About 12 lines were identified with flowering stage heat tolerance, 13 with profuse pollen producing ability, 11 with terminal drought tolerance, 7 with DM tolerance, 16 with blast resistance, 23 with rust resistance. Thirteen new A/B lines and seven restorers were designated. Five female parents and 12 restorer lines with tolerance to multiple diseases identified. Nine hybrids are under active seed chain, 12 hybrids contributed for testing and 2 hybrids are under advanced testing.
- Three accessions registered with NBPGR. Two non-exclusive MOUs were made for seed production and commercialization of three hybrids.
- Centre conducted 8 breeding trials, 8 agronomy trials, 10 pathology, 11 entomology, 5 physiology, 9 station trials, 75 FLDs.
- Centre to provide data on *kharif* and summer pearl millet area. Write up on scope of kharif and summer pearl millet.

ANGRAU, Ananthapuramu- The progress report was presented by Dr. C.V. Chandra Mohan Reddy and the following observations and suggestions were made:

- The center has conducted 5 breeding, 5 station, 2 ICAR-ICRISAT, 20 FLDs, and contributed 2 hybrids for testing.
- 520 germplasm lines were characterized for 33 traits
- Efforts on seed production is appreciated

NARP, Aurangabad- Dr. SB Pawar presented the progress report and following observations and suggestions were made:

- The center has conducted 6 breeding, 2 station, 7 agronomy, 8 pathology, 3 entomology trials, 25 FLDs, and contributed 2 hybrids for testing.
- Good efforts has been taken for seed production and promotion of hybrids.

TNAU, Coimbatore- Dr. K. Iyanar presented the progress report and the following observations and suggestions were given to the center:

- The center has conducted 6 breeding, 2 station, 6 agronomy and 8 pathology trials, 25 FLDs, and contributed 3 hybrids for testing.
- Sixteen lines were identified for DM tolerance and four lines for resistance to blast.
- Centre activities should be strengthened towards product development.

MPKV, Dhule- Dr. K.K. Barhate presented the progress report and the following observations and suggestions were given to the centre:

- The centre has conducted 6 breeding, 6 agronomy, 9 pathology trials, 12 station, and 4 ICAR-ICRISAT trials, 25 FLDs, and contributed 11 hybrids for testing.
- MOUs has been made with three seed companies for seed production of two hybrids
- Sources has been identified for resistance to downy mildew (28), blast (7), rust (5) and ergot (3), and high F and Zn (8), multiple disease resistance (4)
- Centre to constitute a nursery for blast screening for identification of highly esistant blast lines for B-zone

UAS, Vijayapur- Dr. R. Sadhana presented the progress report and the following observations and suggestions were made:

- The centre has conducted 5 breeding, 1 entomology, 6 agronomy, pathology trials, 15 station, and ICAR-ICRISAT trials, 10 FLDs, and contributed 4 hybrids for testing.
- Centre to involve the centre developed parental lines for hybrid generation and testing
- Restorer program for alternate CMS systems should also be strengthened parallelly
- Efforts should be made for commercialization of VPMH 7 through MOUs with private seed companies

PAU, Ludhiana- Dr. Ruchika presented the progress report and the presentation was appreciated. Salient achievements and suggestions are mentioned below:

- The center has conducted 6 breeding, 1 ICAR-ICRISAT, 10 FLDs, 5 station trials
- Centre should concentrate on disease resistance in the parental lines
- More efforts should be diverted for developing grain pearl millet products

UOM, Mysore- Dr. S. Chandra Nayaka presented the progress report. The work done at the center was appreciated and the following observations were made:

- Eight plant pathology trials were conducted.
- Highly blast resistant lines were not identified in any of the trials while most of them were resistant (<3 scale)
- Seed coated with silicon dioxide nano particles gave good protection against downy mildew
- A new disease spathe leaf blight/ leaf spot caused by *Bipolaris spicifera* is reported, pathogen sequenced and submitted to NCBI database
- High incidence of blast (>30% incidence) and rust (15%) was observed in farmers'field in Karnataka.
- Efforts to be made for identification of highly resistant sources for blast resistance and lines with multiple disease resistance

General comments

- Dr. S.P. Singh to compile information on seed production activities taken up public sector to look into share of public sector vis a vis private sector.
- The centres of Hisar, Durgapura, Bikaner, Ananthapur, Jamnagar and Aurangabad to provide 4-5 panicle samples of each released hybrid to ICAR-IIMR for display during G20 minister's visit.

- Mapping populations being developed at centers should involve highly resistant and highly susceptible parents (highly contrasting parents)

Proceedings of Pearl Millet Technical Program Planning Meeting 2023-24

Date: 19th May, 2023 (Friday)

09:00– 13:00	**Session I: Review of Research Results and Progress report 2022-23**
Chairman	Dr. S.K. Pradhan, ADG (FFC), ICAR, New Delhi
Co-chairs	Dr. C. Tara Satyavathi, Director, ICAR-IIMR, Hyderabad
Rapporteurs	Dr. S.P. Singh, ICAR-IARI, New Delhi Dr. Sanjana Reddy, ICAR-IIMR, Hyderabad

Discipline-wise Presentation and finalization of technical programs (PI Presentation- 20 minutes for each presentation)		
09:00-09:30	Plant Breeding	Dr. Vikas Khandelwal, ICAR-AICRP on Pearl millet, Jodhpur
09:30 -10:00	Agronomy	Dr. Anil Kumar, CCS HAU, Hisar
10:00-10:30	Plant Pathology	Dr. Chandra Nayak, UoM, Mysore
10:30-11:00	Entomology	Dr. R.K. Juneja, JAU, Jamnagar
11:00-11:30	Plant Physiology	Dr. R.C. Meena, ICAR-AICRP on Pearl millet, Jodhpur
11:30-12:00	Plant Biotechnology	Dr. Supriya, ICAR-AICRP on Pearl millet, Jodhpur
12:00-12:15	Progress reports on FLDs	Dr. Manoj Kumar, ICAR-AICRP on Pearl millet, Jodhpur
11:00-11:15	ICAR-ICRISAT Pearl millet Nurseries for 2023 & Marker assisted breeding trials	Dr. S.K. Gupta, Principal Scientist (Pearl millet breeding), ICRISAT Dr. Rakesh Srivastava, Principal Scientist (Pearl millet Molecular breeding), ICRISAT
11:15-11:30		Chairman/ Co-chairman's remarks

Discipline wise presentation of 2022-23 results and technical program for 2023-24 were made by Principal Investigators of different disciplines in virtual meeting on 19th May 2023. The session was chaired by Dr. S.K. Pradhan, ADG (FFC), ICAR, New Delhi and Dr. C. Tara Satyavathi, Director, ICAR-IIMR, Hyderabad. Scientists from public sector, private sector and ICRISAT attended this online meeting

Plant Breeding: The presentation was done by PI, Plant Breeding, Dr. Vikas Khandelwal, ICAR-AICRP on Pearl Millet, Jodhpur. He reported that a total of 187 trials were conducted with 95% success. Three entries were promoted from IHT (E) to APHT 1(E). No entry was promoted from PT A to APHT I (E) and from AHPT I (E) to AHPT II (E). Twelve entries were promoted from IHT (L) A to AHT I (L)A, two entries from AHTI (L) A to AHT II (L) A. No entry was promoted from IHT (M) A to AHT I (M)A and from AHT I (M)A to AHT II (M)A. No entry was promoted from promoted from PT A to PTI A and from PTIA to PT IIA. Two entries were promoted from IHT (M) B to AHT I (M) B and no entry was promoted from AHT I (M) B to AHT II (M) B. Three entries were promoted from IHT (L) B to AHT I (L) B and no entry was promoted from AHT I (L) B to AHT II (L) B. No entries were promoted in Summer Hybrid Trials and population trials in B-zone. Two hybrids were proposed for identification for Kharif - Zone A1 and three hybrids for summer.

All the centers and private partners are requested to contribute entries in early trial. More efforts need to put in developing material for medium maturity in A zone as none of the entries are promoted. Checks which are five years old need to be replaced. CV needs to be looked into promotion traits for very high yielding entries. For extra early maturity, if there are considerable nominations, a trial may be constituted.

Agronomy: PI, Agronomy, Dr. Anil Kumar, CCS HAU, Hisar presented the progress report of Agronomy discipline. He reported that a total of 63 trials (7 different trials) were undertaken under the crop production. Five recommendations were made based on three years of study, two for Zone A1, one for zone A, one for zone B and one for Zones A + B. In case of split application of fertilizer, nano urea should be included. Leaf colour chart has been developed at ICAR-IIMR and should be used for standardization in AVT trial. Average yield levels across locations in irrigated trials is less and need to be checked.

Pathology: PI, Pathology, Dr. Chandra Nayaka, UoM, Mysore presented the report on trials taken up during *kharif* 2022. A total of nine trials were conducted at 12 locations during the year 2022-23. In PMDMVN, 2 lines were resistant at all 10 locations and 7 lines were resistant at 9 of the 10 locations. A new disease spathe leaf blight and leaf spot of pearl millet is reported. In farmers fields, blast and rust were more severe among all the diseases. One recommendation was made. Many donors are identified for diseases. At institute level, genetic studies on allelic relationships among the resistant sources should be studied. Races of pathogens should be collected and species variation should be studied at molecular level. Residual effects of fungicides on fodder should be studied. While applying chemicals, B:C ratio should be calculated.

Entomology: PI, Entomology, Dr. R.K. Juneja, JAU, Jamnagar presented the progress report. A total of nine trials were conducted. The germplasm line IP 7915 was found resistant to shoot fly at vegetative stage. Among all pests, shoot fly incidence was highest, with Fatehpur Shekawati showing highest incidence of 22.5%. The resistant lines should be used in the breeding program. Common marker or ortholog sequences across crops should be explored for molecular breeding. More basic studies on fall army worm should be taken up for identification of biotypes. Jaipur centre is not submitting results timely.

Plant Physiology: The presentation was done by PI, Plant Physiology, Dr. R.C. Meena, ICAR-AICRP on Pearl Millet, Jodhpur. He reported that a total of 16 trials involving six experiments were conducted at Mandor, Jaipur and Jamnagar during summer and *kharif*, 2022 for heat and drought tolerance at different stages of crop. More inbred lines should be involved rather than hybrids for physiological studies.

Plant Biotechnology: The presentation was made by Dr. Supriya, PI, Plant Biotechnology, ICAR- AICRP on Pearl Millet, Jodhpur. She presented results of four experiments done with SSR markers. Duplication work should be avoided. GWAS should be planned with phenotyping at AICRP centers. Molecular breeding program involving donors identified using genome selection should be planned. In place of SSRs, SNPs will be more beneficial.

FLDs: The FLD results of 2022-23 were presented by Dr. Manoj Kumar, Assistant Professor (Agronomy), PC Unit, Jodhpur. He informed the house that FLDs were conducted on a total of 380 ha area under A1, A and B zones during *kharif* and summer with different technologies including, varietal component, biofortified varieties, improved practices and full package of practices. He proposed that during 2022-23, FLDs will be conducted on a total of 400 ha area covering A1, A and B zones in different seasons. During this year, the proportion of FLDs with biofortified hybrids will be also increased. Aurangabad centre is asked to send additional request for FLDs as asked for.

Review of Research Results of ICAR-ICRISAT Collaborative Project 2021-22 and Plan of Work 2022-23:

Dr. S.K.Gupta, Principal Scientist (Pearl Millet Breeding) ICRISAT, Hyderabad presented the research results of 2022 and proposed five trials viz., promising B-line nursery, promising R-line nursery, drought tolerant restorer nursery, blast resistant nursery and elite joint biofortification trial to be taken up during 2023 over different locations. ICRISAT asked to develop lines for multiple traits.

Dr. Rakesh Srivastava, Principal Scientist, ICRISAT presented work plan for 2023. He proposed that marker assisted breeding trials & nurseries namely blast resistance trial: GWAS (Entries: 350; Reps: 2 and Rows: 2) and blast resistance trial: bi-parental QTL mapping (Entries: 300; Reps: 2 and Rows: 2) can be conducted at Delhi, Jaipur and Dhule. ICRISAT asked to take a set of random donors and validate them, initiate haplotype based breeding and genomic selection. Also, ICRISAT is asked to make genomic resources freely available.

Breeder seed production indent for the year 2024 was presented by Dr. Vikas Khandelwal. In the concluding remarks, Dr. C. Tara Satyavathi thanked all the centers and PIs for presenting on a short notice. Dr. S.K. Pradhan pointed towards low productivity and need to enhance yield potential as it is an important nutricereal serving for food and nutritional security. He pointed towards the need to utilise molecular approaches to address the yield constraints.

PLAN OF WORK 2023-24

A. CROP IMPROVEMENT (PLANT BREEDING)

Chairman : Dr. S K Pradhan (ADG-FFC)

Co-Chairman : Dr. C. Tara Satyavathi
Director-ICAR-IIMR & PC,
AICRP-Pearl millet

Rapporteur : Dr S P Singh
Dr Sanjana Reddy

Date : 19.05.2023 **Time** : 09.00-9.30 am

FORMULATION OF TECHNICAL PROGRAMME FOR 2023-24
PLANT BREEDING

Organization of trials

Criteria for promotion of entries

- Grain yield = higher than best check or 10% higher over relevant check in early and Medium group and 5% over relevant check in Late group.
- Downy mildew (60 DAS) under sick plot equal to or less than 5% in hybrids and populations across all Zones.
- Blast (Score) equal to or less than 3 (by using 0-9 scale) in hybrids and populations across all Zones.
- Ergot (% severity) under artificial inoculation conditions equal or less than 20% across all Zones in hybrids and populations.
- Smut (% severity) under artificial inoculation conditions equal or less than 20% across all Zones in hybrids and populations.
- Rust (% leaf area) equal to or less than 20% in hybrids and populations across all Zones.
- Days to 50% flowering in IHT (Early) and AHPT (Early) equal to or less than 45 Days, in IHT (Medium) and AHT (Medium) equal to or less than 50 Days.
- A grace of one day in days to 50% flowering may be given to hybrids yielding grains 15% higher over HHB 67 Improved in early group hybrids and yielding grains 15% higher over relevant check in medium group hybrids.
- The total promoted entries should not be more than 33% of total test entries in medium and late maturity hybrid trials.
- Iron content ≥42 ppm and Zinc content ≥32ppm in all the trials.

Promotion Criteria for Summer Hybrid Trial: (From 2019 onward)

- Grain yield = higher than best check or 5% higher over relevant check.
- Downy mildew (60 DAS) under sick plot equal to or less than 5% in hybrids.
- Blast (Score) equal to or less than 3 (by using 0-9 scale) in hybrids.
- Ergot (% severity) under artificial inoculation conditions equal or less than 20% in hybrids.

- Smut (% severity) under artificial inoculation conditions equal or less than 20% in hybrids.
- Rust (% leaf area) equal to or less than 20% in hybrids.
- The total promoted entries should not be more than 33% of total test entries.
- Iron content ≥42 ppm and Zinc content ≥32 ppm.

The following entries were promoted to next higher stage in various trials on the basis of performance in trials for the characters:

Hybrid and Population Trials

Entries promoted to next higher stage of testing in kharif /summer 2023 Zone A_1 and A

S. No.	Advanced Hybrid & Population Trial (E) ZoneA_1	S. No.	Advanced Hybrid Trial (L) Zone A [AHT(L) A]		
	IHT (E) to AHPT I (E)		**IHT (L) A to AHT I (L) A**		
1	MH 2672	1	MH 2709	7	MH 2717
2	MH 2673	2	MH 2710	8	MH 2723
3	MH 2675	3	MH 2711	9	MH 2728 (Not submitted)
4	MH 2678	4	MH 2712	10	MH 2729
	PT A to AHPT I (E)	5	MH 2713	11	MH 2730
	Nil	6	MH 2715	12	MH 2733
	AHPT I (E) to AHPT II (E)		**AHT I (L) A to AHT II (L) A**		
	Nil	1	MH 2626		
	Checks	2	MH 2631		
1	HHB 67 (Imp.)		**Checks**		
2	RHB 223	1	86M86		
3	MPMH 21	2	KBH 108		
4	PB 1756	3	MP 7792*		
5	AHB 1200 (for Fe & Zn Comparison)	4	MP 7878		
		5	86M84		
		6	AHB 1200 (for Fe & Zn Comparison)		
S. No.	**Advanced Hybrid Trial (M) Zone A [AHT (M)A]**	**S. No.**	**Population Trial Zone A (PT A)**		
	IHT (M) A to AHT I (M) A		**PT A to PT I A**		
	Nil		Nil		
	AHT I (M)A to AHT II (M) A		**PT I A to PT II A**		
	Nil		Nil		
	Checks		**+ New entries of PT**		
1	DHBH 1397		**Checks**		
2	86M94	1	Raj 171		
3	PB 1852	2	Pusa Comp. 383		
4	AHB 1200 (for Fe & Zn Comparison)	3	JBV 2		
		4	Pusa Comp. 701		
		5	Dhanshakti		
		6	ICMV 221		
S. No.	**Essentially Derived Varietal Trial (EDV) A_1**				
	EDV to EDV I				
	Nil				
	Checks				
	Check of EDV				

* Seed not available

Entries promoted to next higher stage of testing in kharif /summer 2023 Zone B

S. No.	Advanced Hybrid Trial (M) Zone B [AHT (M) B]	S. No.	Advanced Hybrid Trial (L) Zone B [AHT (L) B]
	IHT (M) B to AHT I (M) B		**IHT (L) B to AHT I (L) B**
1	MH 2682	1	MH 2709
2	MH 2705	2	MH 2715
	AHT I (M) B to AHT II (M) B	3	MH 2717
	Nil		**AHT I (L) B to AHT II (L) B**
	Checks		Nil
1	Pratap		**Checks**
2	86M01	1	86M86
3	AHB 1269	2	Kaveri Super Boss
4	AHB 1200 (for Fe & Zn Comparison)	3	NBH 4903
		4	AHB 1200 (for Fe & Zn Comparison)
S. No.	**Summer Hybrid Trial (SHT)**	**S. No.**	**Population Trial Zone B (PT B)**
	SHT to SHT I		**PT B to I PT B**
	Nil		Nil
	SHT I to SHT II		**PT I B to PT II B**
	Nil		Nil
	+ New entries		**+ New entries of PT**
	Checks		**Checks**
1	86M64	1	Raj 171
2	Proagro 9444	2	ICMV 221
3	Nandi 75	3	Dhanshakti
4	MP 7366	4	Pusa Comp. 612
5	BLPMH-109	5	ABV 04
6	AHB 1200 (for Fe & Zn Comparison)	6	ICMV 155

Table I.1 Details of Centres and Trials Conducted During Kharif 2023/Summer 2024 in Zone A_1 and A

LOCATIONS	IHT (E)	IHT (M)	IHT (L)	AHPT (E)	AHT (M)	AHT (L)	PT	RHVT	SHT
ZONE A_1					No Entry				
RAJASTHAN									
Mandor (ICAR-AICRP on PM)	*	*		*					*
Mandor (ARS,AUJ)							*	*	
Jodhpur (ICAR-CAZRI)	*			*					
Bikaner (SKRAU)	*	*		*			*	*	
Fathehpur Shekhawati (SKNAU)	*			*					
Samdari (AUJ)	*			*					
ARS, Jalore (AUJ)	*			*					
Nagaur (AUJ)	*			*					
Jobner (COA,SKNAU)	*							*	
GUJARAT									
Kothara (SDAU)	*	*		*					
HARYANA									
Bawal (CCSHAU)	*	*		*					
Total Trials Zone A_1	**10**	**4**	**0**	**9**	**0**	**0**	**2**	**3**	**1**
ZONE A					No Entry				
RAJASTHAN									
Jaipur (SKNAU)		*	*			*	*	*	
Jaipur (Seed works)			*			*			
Jaipur (Corteva)		*							
Tabiji (SKNAU)		*							
Paota (Limagrain)			*						
Tijara (Rallis)			*						
Alwar (Corteva)			*			*			
Dausa (Rasi Seeds)		*	*						
GUJARAT									
Talaja (JAU)		*							
Anand (AAU)		*							*
Jamnagar (JAU)		*	*			*	*	*	*
Deesa (SDAU)	*	*		*					*
Visnagar (Apex Seedstech)									*
Ahmedabad (Nandi)			*						*
Dhanera (J K Seed)		*	*			*			
Dehgam (Rallis)									*
Dehgam (Kaveri Seeds)			*			*			
Palanpur (Corteva)									*
Deesa (J K Seed)									*
UTTAR PRADESH									
Jhansi (RLBCAU)		*					*	*	
Aligarh (Hytech)			*			*			
Hathras (Ganga Kaveri)			*						
Agra (Kartik Bio Seeds)		*	*						*
Agra (Mahindra)						*			
Bichpuri (Kaveri Seeds)						*			
Mathura (Kamadgiri)		*	*						
HARYANA									
Hisar (CCS HAU)	*	*	*	*		*	*	*	
MADHYA PRADESH									
Gwalior (RVSKVV)		*	*			*	*	*	
Morena (RVSKVV)							*		
PUNJAB									
Ludhiana (PAU)		*	*			*	*		*
DELHI									
New Delhi (ICAR-IARI)		*					*		
JHARKHAND									
Ranchi (BAU)								*	
Total Trials Zone A	**2**	**16**	**17**	**2**	**0**	**12**	**8**	**6**	**10**

Table I.1 Details of Centres and Trials Conducted During Kharif 2023/Summer 2024 in Zone B

LOCATIONS	IHT (M)	IHT (L)	AHT (M)	AHT (L)	PT	RHVT	SHT
MAHARASHTRA							
Auarangabad (NARP)	*	*	*	*	*	*	*
Auarangabad (Ajeet Seed)			*	*			
Auarangabad (Seed works)		*		*			*
Niphad (MPKV)			*	*	*		
Dhule (MPKV)	*	*	*	*	*	*	*
Jalna (Mahyco)		*					*
Jalna (Krishidhan Ghanewadi)		*					
Pachora (Nirmal Seed)	*	*					*
Gangapur (Ganga Kaveri)		*					
KARNATAKA							
Vijayapur (UAS Dharwad)	*	*	*	*	*	*	
Malnoor (UAS, Raichur)	*		*		*	*	
Dharwad (KSSC Ltd)	*						
ANDHRA PRADESH							
Ananthapuram (ANGRAU)	*	*	*	*	*	*	
Perumallapalle (ANGRAU)	*				*		*
Vizianagaram (ANGRAU)			*		*	*	
TELANGANA							
Palem (PJTSAU)	*		*		*	*	*
Hyderabad (Nuziveedu)		*					
Toopran, Medak (NU Genes)		*					
TAMIL NADU							
Coimbatore (TNAU)	*	*	*	*	*	*	*
ODISHA							
Semiliguda (OUAT)	*				*	*	
Total Trials Zone B	**11**	**12**	**10**	**8**	**11**	**9**	**8**

Observations to be recorded in initial and advanced trials:

1. Days to 50% Flowering –Rounded to 0 decimal
2. Plant Height (cm) –Rounded to 0 decimal
3. No. of productive tillers/plant -Rounded to one decimal
4. Panicle length (cm) -Rounded to one decimal
5. Panicle Diameter (cm) - Rounded to one decimal
6. Seed set under bagging (In hybrid trials only) –Rounded to 0 decimal
7. Grain yield (kg/plot) -Rounded to three decimals
8. Fodder yield (kg/plot)- Rounded to three decimals
9. Days to maturity- Rounded to 0 decimal
10. Plant population at harvest (No./Plot)
11. 1000-seed wt (g)
12. Diseases and pest incident (Under natural conditions)

New entries for testing in initial trial Kharif 2023/ Summer 2024

S. No.	Organization/Institution	Name of Entries				
		IHT (E)	IHT (M)	IHT (L)	PT	Summer
1	ICAR-CAZRI, Jodhpur	CZH 268				
		CZH 269				
		CZH 270				
		CZH 271				
2	ICAR-AICRP on PM, JAU, Jamnagar	GHB 1381	GHB 1354			GHB 1383
3	ICAR-AICRP, RARI, SKRAU, Bikaner	BHB 2301			BCB 2301	
		BHB 2302				
		BHB 2303				
		BHB 2304				
		BHB 2305				
4	ICAR-AICRP, CCSHAU, Hisar	HHB 347				
5	ICAR-AICRP on PM, Jodhpur	MPMH 45	MPMH 47			
		MPMH 46				
6	NARP, Aurangabad		AHB 1684			
			AHB 1687			
7	ICAR-IARI New Delhi	Pusa Hybrid Bajra 2301	Pusa Hybrid Bajra 2302		Pusa Comp 732	
					Pusa Comp 733	
					Pusa Comp 734	
8	ICAR-AICRP, TNAU, Coimbatore		TNBH 2022			TNBH 2022
9	ICAR-AICRP, RARI, SKNAU, Jaipur	RHB-276				
10	ICAR-AICRP on PM, RVSKVV, Gwalior	RVBH-2361				
		RVBH-2362				
11	ICAR-AICRP on PM,PAU Ludhiana			PHB 3778	GBL 9	
12	RARS, Vijyapura		VPMH-21	VPMH-20	VPMV-17	
			VPMH-22		VPMV-18	
					VPMV-19	
13	ICAR-IIMR, Hyderabad	HMHE2301	HMHM2301	HMHL2301	IIMR-1	
		HMHE2302	HMHM2302		IIMR-2	
		IIMRPH4	HMHM2303			
		IIMRPH5	IIMRPH6			
14	ICAR-AICRP on Pearl Millet, Dhule	DHBH-22117	DHBH-22115	DHBH-22122		DHBH-22115
		DHBH-22121	DHBH-22116	DHBH-22124		DHBH-22117
		DHBH-22123	DHBH-22119	DHBH-22126		DHBH-22119
			DHBH-22120	DHBH-22128		DHBH-22122
			DHBH-21002 ®			
15	ICAR-AICRP on Pearl Millet, Ananthapuramu		APHB-235			
16	Seed Works PVT. LTD. Hyderabad			US7722		
17	Nuziveedu Seed Pvt. Ltd., Secunderabad			NBH6019		
18	Kaveri Seed Com. Ltd., Secunderabad			KPH 6288		KPH 6311
19	Ajeet Seeds Pvt. Ltd., Hyderabad			APH-44		
20	Corteva Agriscience, Hyderabad	9049B734-01	9049B734-01			
21	Hytech Seed India Pvt. Ltd., Hyderabad			HT 423158		
22	JK Agri Genetics Ltd, Hyderabad			JKBH1968		
23	Shakti Vardhak Hybrid Seeds Pvt. Ltd., Hisar					SVPMH-130
24	Limagrain India Pvt. Ltd., Hyderabad			BLPMH 113		
25	Crystal Crop Protection Ltd., Aurangabad	PB2004	PB1937	PB1858 ®		PB2046
			PB1988	PB1987 ®		PB2064
				PB1991 ®		
26	VNR Seeds Pvt. Ltd., Hyderabad			VNR-108		
				VNR-109		
27	Rallis India Ltd., Hyderabad					DH7312
						DH7314
28	Sona Genetic Pvt. Ltd.		Shalimar (9818)			
29	Nirmal Seeds Pvt. Ltd., Pachora		NPH-6358			
30	Navbharat Seeds Pvt. Ltd.			NBMH 1016		
31	Trimurti Plant Science Pvt. Ltd.			TMBH 601		

Experimental details:

Initial Trials: No. of rows – 3 (net) Row length – 4m(net) Spacing- 60 cm x 15 cm (Zone A_1) 50 cm x 15 cm (Zone A & B) Plot size – 4m x 1.8 m (net) (Zone A_1) 4 m x 1.5 m (net) (Zone A & B) Fertilizer – As per recommendations	**Advanced Trials:** No. of rows – 6 (net) Row length – 4m (net) Spacing- 60 cm x 15 cm (Zone A_1) 50 cm x 15 cm (Zone A & B) Plot size – 4m x 3.6 m (net) (Zone A_1) 4m x 3.0 m (net) (Zone A & B) Fertilizer – As per recommendations
Population Trials: No. of rows – 6 (net) Spacing- 60 cm x 15 cm (Zone A_1) 50 cm x 15 cm (Zone A & B) Plot size – 4m x 3.6 m (net) (Zone A_1) 4m x 3.0 m (net) (Zone A & B) Fertilizer – As per recommendations	**EDV Trial:** No. of rows – 6 (net) Row length – 4m (net) Spacing- 60 cm x 15 cm Plot size – 4m x 3.6 m (net) Fertilizer – As per recommendations

Proposed entries for initial trials

IHT (E) A_1: 26	PT A & B Zone : 10
IHT (M) A & B Zone : 23	Summer 2024: 12
IHT (L) A & B Zone : 21	

Seed Requirement (per entry)

IHT E A_1 Zone : 1.5 Kg	AHT (M) A : 2.0 Kg	AHT (L) A : 2.0 Kg
IHT (M) A & B Zone : 2.0 Kg	AHT (M) B : 2.0 Kg	AHT (L) B : 2.0 Kg
IHT (L) A & B Zone : 2.250 Kg	RHVT A : 1.250 Kg	EDV Trials : 1.5 Kg
Initial Population Trial A & B Zone : 2.0 Kg	RHVT B : 1.250 Kg	
Population Trial A Zone : 1.5 Kg	Summer Hybrid Trial : 2.0 Kg	
Population Trial B Zone: 1.5 Kg		
AHPT (E) A_1 Zone: 1.5 Kg		

Additional seed requirement for entries of IIIrd year testing for agronomical trials (Separate pack)

AHT Zone A : 3.5 Kg	AHT Zone B : 3.5 Kg
PT Zone A: 2.5 Kg	AHPT Zone A_1: 2.5 Kg
PT Zone B: 2.5 Kg	Summer Hybrid Trial : 2.0 Kg

Seed requirement of checks:

Trial Checks:	86M94: 5.0 Kg (new)	86M80: 5.0 kg (new)	**Populations:**	**Summer:**
Early:	PB 1705: 4.0 Kg	86M84: 5.0 kg (new)	Raj 171: 7.0 Kg	86M64: 4.0 Kg
HHB 67 Imp.: 7.0 Kg	GHB 905: 5.0 Kg	Kaveri Super Boss: 6.0 Kg	Pusa Comp. 383: 5.0 Kg	Proagro 9444: 3.0 Kg
RHB 223: 5.0 Kg	RHB 173: 5.0 Kg	NBH 4903: 4.0 Kg	JBV 2: 4.0 Kg	Nandi 75: 3.0 Kg
MPMH 21: 5.0 Kg	86M01: 6.0 Kg	GHB 558: 4.0 Kg	Pusa Comp. 701: 3.0 Kg	MP 7366: 3.0 Kg
PB 1756: 5.0 Kg	Pratap: 5.0 Kg	NBH 5061: 5.0 Kg	Dhanshakti: 7.0 Kg	BLPMH-109: 3.0 Kg
HHB 272: 5.0 Kg	AHB 1269: 6.0 Kg		ICMV 221: 6.0 Kg	
RHB 177: 7.0 Kg	NBH 5767: 5.0 Kg	**Bio fortified:**	ICMV 155: 3.0 Kg	
Medium:	**Late:**	RHB 233: 5.0 kg	Pusa Comp. 612: 3.0 Kg	
MPMH 17: 8.0 Kg	86M86: 10.0 Kg	RHB 234: 5.0 kg	ABV 04: 4.0 Kg	
PB 1852: 4.0 Kg	KBH 108: 8.0 Kg	AHB 1200: 5.0 kg		
JKBH 1326: 4.0 Kg	MP-7792: 6.0 Kg	AHB 1269: 4.0 Kg	**RHVT:**	
DHBH 1397: 4.0 kg	MP-7878: 5.0 Kg	HHB 299: 5.0 kg	Released since 2006	

Seed requirement of Released Hybrids/varieties: 1.5 Kg seed of all national released hybrids/ varieties since 2006 should be sent for RHVT Trial positively (Separate pack).

The required quantity of seed material **(untreated)** of entries along with pedigree selected for organizing the trials as above with new entries should reach to the office of the Project Coordinator (Pearl Millet), ICAR-AICRP on Pearl Millet, ARS, Mandor, Jodhpur 342304 (Rajasthan) **latest by 25th May 2023 for kharif and by 15th January 2024 for summer trials** along with required testing fee of Rs. 75,000 + GST 18% /entry (Private Sector) in form of DD/cheque at par in favour of Project Coordinator (Pearl Millet), Mandor, payable at Jodhpur. **If the testing fee is increased by the council, upon the receipt of information from council, increased testing fee will be charged from this season**. **Entries without fee and pedigree of hybrids/varieties will not be accepted.** Seed of each entry should be packed in cloth bag separately for each zone and also for agronomic trials**.**

PLAN OF WORK 2023-24 FOR MOLECULAR BREEDING

PMMB 1: VALIDATION OF MARKERS IN PEARL MILLET

Experiment 1: Validation of drought tolerance markers in pearl millet drought/heat tolerant genotypes suitable for A_1 zone.

Background: Development of high yielding, dual purpose disease resistant cultivars for low rainfall areas i.e. A_1 zone is of utmost priority for increasing pearl millet productivity at national level and some new initiatives were taken last year to screen germplasm for A_1 zone and develop some hybrids for this specific zone. Keeping this in view, this experiment will be useful for screening and developing drought/heat tolerant hybrids for A_1 zone.

Objective: Validation of drought tolerance markers in drought tolerant lines suitable for A_1 zone using SSR markers

Plant material: Young leaf samples of 2-3 leaf stage of drought/heat tolerant genotypes.

Methodology

- Phenotyping will be done at PC Unit, Jodhpur
- DNA isolation and genotyping will be done at PC Unit, Jodhpur using SSR markers.
- Genotyping using SNP panel will be done in collaboration with IIMR, Hyderabad.
  - DNA isolation will be done using CTAB method.
  - Molecular characterization using SSR markers.

Experiment 2: Validation and molecular characterization of disease tolerant genotypes

Background: Downy mildew and blast are two major diseases affecting pearl millet. Hence, screening of pearl millet lines resistant to these diseases will be useful for developing disease resistant pearl millet hybrids.

Objective: Screening of disease resistant pearl millet genotypes using molecular markers.

Plant material: Young leaf samples of 2-3 leaf stage of disease tolerant genotypes tested under nursery trials at UoM, Mysore

Methodology

- Phenotyping will be done at UoM, Mysore
- Genotyping will be done at PC Unit, Jodhpur
  - DNA isolation will be done using CTAB method.
  - Screening and molecular characterization using markers identified for blast and downy mildew.

Experiment 3: Validation of already reported high Fe/Zn markers among pearl millet lines rich in Fe and Zn content

Background: Pearl millet is rich in Fe & Zn content and ICAR-AICRP on Pearl Millet has already included minimum standard for micronutrient (Fe = 42 ppm; Zn = 32 ppm) in the promotion criteria. Hence, screening of pearl millet lines rich in Fe and Zn content using molecular markers and their validation will be helpful for developing high Fe/Zn pearl millet hybrids.

Objective: Screening and validation of already reported high Fe/Zn markers in Fe/Zn rich lines.

Plant material: Young leaf samples of 2-3 leaf stage of high Fe/Zn genotypes.

Methodology

- DNA isolation will be done using CTAB method.
- Screening and validation of high Fe/Zn markers in Fe/Zn rich lines.

PMMB 2: MOLECULAR CHARACTERIZATION OF GERMPLASM OF PEARL MILLET

Experiment 1: DNA profiling of identified/advanced hybrid entries of third year testing

Background: The entries promoted for third year testing will be later identified for release and hence need DNA profile for submission of proposal. Thus, this experiment will be useful for authenticity of identification proposal and can meet the basic requirements of proposal submission.

Objective: DNA profiling of advanced hybrid entries of pearl millet using SSR markers.

Plant material: Young leaf samples of 2-3 leaf stage of identified/advanced hybrid entries.

Methodology

- DNA isolation will be done using CTAB method.
- DNA profiling using SSR markers.

Experiment 2: Molecular characterization of high/low rancidity genotypes (landraces) in pearl millet.

Background: Pearl millet has poor shelf life and rancidity is a major issue. To enhance its keeping quality there is a high need to address the issue of rancidity. Hence, screening of pearl millet landraces having low and high rancidity will be useful for developing superior genotypes.

Objective: Molecular characterization of high/low rancidity genotypes in pearl millet.

Plant material: Young leaf samples of 2-3 leaf stage of high/low rancidity genotypes.

Methodology

- DNA isolation will be done using CTAB method.
- Molecular characterization using SSR markers.

PLAN OF WORK 2023-24 FOR CROP PRODUCTION (AGRONOMY)

Chairman : Dr. S.K. Pradhan
ADG (FFC), ICAR, New Delhi
Dr. C. Tara Satyavathi
Director, ICAR-IIMR and Project Coordinator (Acting), ICAR-AICRP on PM

Rapporteur : Dr. S.P. Singh, Principal Scientist, Division of Genetics,
ICAR-IARI, New Delhi
: Dr. Sanjana Reddy, Principal Scientist
ICAR-IIMR, Hyderabad

Date : May 19, 2023

The details are given in the Plan of work for 2023-24.

Agronomy Experiments to be continued during 2023-24

- **PMAT 1 :** Response of pearl millet advance hybrids and/or populations to different levels of nitrogen.
- **PMAT 3 :** Enhancing biofortified/non- biofortified pearl millet hybrids productivity and quality through micronutrients under irrigated situation
- **PMAT 4 :** Contribution of production factors to the yield and economics of pearl millet.
- **PMAT 6 :** Response of pearl millet to split application of nitrogen at different growth stages under irrigated condition
- **PMAT 7 :** Productivity of Pearl millet-Mustard/Chickpea cropping sequence as influenced by organic and natural farming.

AGRONOMY - TECHNICAL PROGRAMME FOR 2023-24

PMAT 1 : Response of pearl millet advance hybrids and/or populations to different levels of nitrogen

Objective : To study the response of advance hybrid and population entries to nitrogen application.

b) Response of advance late hybrid entries to nitrogen levels

Nitrogen levels (4) : 0, 30, 60 & 90 kg N/ha
Hybrids (2+3 checks) : **MH 2626, MH 2631, 86M86 (c), KBH 108(c) & MP 7792 (c)**
Design : Split plot (Nitrogen in main plot and entries in sub-plots)
Replication : Three
Plot size
Gross : 5.00 m x 4.00 m

Net : 4.00 m x 3.60 m
Locations : Jaipur, Hisar, Jamnagar and New Delhi (Zone A)

Observations to be recorded

1. Plant population (final) in thousands/ha
2. Plant height (cm)
3. Days to 50% flowering
4. Total number of tillers/plant
5. Effective number of tillers/plant
6. Test weight (g)
7. Grain yield (q/ha)
8. Dry fodder yield (q/ha)

Note: *Chemical analysis of the properties of the soil (pH, EC, organic carbon and available NPK) before sowing of the crop.*

PMAT 3: Enhancing biofortified/non-biofortified pearl millet hybrids productivity and quality through micronutrients under irrigated situation

Objective : To find out the effect of micronutrients on the crop growth, productivity, quality and economics of biofortified pearl millet under irrigated condition.

Year of start : 2021

A. Main plot : Hybrids

V_1 : MPMH 17
V_2 : HHB 299

B. **Sub plot : Micronutrient Management**

T_1 : Control
T_2 : Soil application $ZnSO_4$ @ 25 kg/ha
T_3 : 0.5% $ZnSO_4$ Foliar spray at 20-25 DAS
T_4 : Soil application $FeSO_4$ @ 20 kg/ha
T_5 : 0.5% $FeSO_4$ Foliar spray at tillering stage (20-25 DAS)
T_6 : 0.5% $MnSO_4$ Foliar spray at tillering stage (20-25 DAS)
T_7 : 0.2% $CuSO_4$ Foliar spray at tillering stage (20-25 DAS)
T_8 : 0.2% Borax Foliar spray at tillering stage (20-25 DAS)
T_9 : $ZnSO_4$ (25 kg/ha) + $FeSO_4$ (20 kg/ha) + 0.2 % Borax

Note: RDF will be applied of the respective zones under irrigated situations to all the treatments.

Locations : Bikaner & Mandor (Zone A_1)
Jaipur, Hisar, Jamnagar and New Delhi (Zone A)
Aurangabad, Dhule, Vijayapur & Coimbatore (Zone B)
Entries : HHB 299
Design : SPD
Replication : Three
Treatment : Eighteen
Plot size :
Gross : 5.00 m x 4.00 m
Net : 4.00 m x 3.60 m

Observations to be recorded

1. Plant population (final) in thousands/ha
2. Plant height (cm)
3. Total number of tillers/plant
4. Effective number of tillers/plant
5. Test weight (g)
6. Grain yield (q/ha)
7. Dry fodder yield (q/ha)
8. Fe, Zn, Mn, Cu and B content in plant and grain at harvest
9. Economics of the treatments [Gross Returns (Rs/ha), Net returns (Rs/ha) & B:C ratio]

Note: *Chemical analysis of the properties of the soil (pH, EC, organic carbon and available NPK before sowing) and Fe, Zn, Mn, Cu and B content before sowing & after harvesting of the crop.*

PMAT 4: Contribution of production factors to the yield and economics of pearl millet

Objective: To study the quantification of individual production factors of management towards productivity and economics in the pearl millet crop.
Year of Start: *kharif* 2021

Treatment details:

T_1 : Full package & practices of the location [(RDF+ $ZnSO_4$ @ 25 kg/ha+ $FeSO_4$ @ 0.5-0.75% at 20-25 DAS + bioinoculant seed treatment (Azoteeka/as per availability) + thinning & gap filling + weeding & hoeing (3 & 5 Weeks after sowing)+ Irrigation]

T_2 : T_1- RDF

T_3 : T_1- $ZnSO_4$ @ 25 kg/ha

T_4 : T_1- $FeSO_4$ @ 0.5-0.75% at 20-25 DAS

T_5 : T_1- bioinoculant seed treatment (Azoteeka)

T_6 : T_1- thinning & gap filling

T_7 : T_1- weeding & hoeing (3 & 5 Weeks after sowing)

T_8 : T_1- Irrigation

Note: *RDF will be applied of respective state under irrigated condition. Full P&K as basal will be applied at sowing time*

Locations	:	Bikaner & Mandor (Zone A_1) Jaipur, Hisar, Jamnagar and New Delhi (Zone A) Aurangabad, Dhule, Vijayapur & Coimbatore (Zone B)
Hybrid	:	Popular high yielding hybrid of the location
Design	:	RBD
Replication	:	Three
Treatment	:	8
Plot size	:	
Gross	:	5.00 m x 4.00 m
Net	:	4.00 m x 3.60 m

Observations to be recorded

1. Plant population (final) in thousands/ha
2. Plant height (cm)
3. Total number of tillers/plant
4. Effective number of tillers/plant
5. Test weight (g)
6. Grain yield (q/ha)
7. Dry fodder yield (q/ha)
8. Economics of the treatments [Gross Returns (Rs/ha), Net returns (Rs/ha) & B:C ratio]

Note: *Chemical analysis of the properties of the soil (pH, EC, organic carbon and available NPK before sowing.*

PMAT 6: Response of pearl millet to split application of nitrogen at different growth stages under irrigated condition

Objectives:

1) To study crop growth and productivity in response to split application of urea at different stages
2) To find out optimum time of urea application for higher grain yield in pearl millet.
3) To work out the economics of different management practices.

Year of Start: *kharif* 2021

Treatment details:

A. Main plot:

Nutrient management

N_1 – 100 % RDN

N_2 – 112.5% RDN

N_3 – 125 % RDN

B. Sub plot:

Nitrogen split application

S_1: Entire dose of N at sowing

S_2: 50% N at sowing + 50% N at tillering (20-25 DAS)

S_3: 50% N at sowing + 50% N at boot stage (35-40 DAS)

S_4: N will be applied in three splits (25% basal), 50% at tillering (20-25 DAS) and 25% at boot stage (35-40 DAS);

Note: *RDN will be applied of respective state under irrigated condition. P&K as per zone recommendation under irrigated condition will be applied as basal.*

Locations	**:**	Bikaner & Mandor (Zone A_1) Jaipur, Hisar, Jamnagar and New Delhi (Zone A) Aurangabad, Dhule, Vijayapur & Coimbatore (Zone B)
Hybrid	**:**	HHB 299
Design	**:**	SPD
Replication	**:**	Four
Treatment	**:**	12
	:	

Plot size

Gross **:** 5.00 m x 4.00 m

Net **:** 4.00 m x 3.60 m

Observations to be recorded

1. Plant population (final) in thousands/ha
2. Plant height (cm)
3. Total number of tillers/plant
4. Effective number of tillers/plant
5. Test weight (g)
6. Grain yield (q/ha)
7. Dry fodder yield (q/ha)
8. Available N,P & K (kg/ha) in soil before sowing and after harvesting
9. N, P & K content (%) & their uptake (kg/ha) in plant and grain at harvest
10. Protein content (%) in grain
11. Economics of the treatments [Gross Returns (Rs/ha), Net returns (Rs/ha) & B:C]

Note: *Chemical analysis of the properties of the soil (pH, EC, organic carbon & available NPK before sowing of the experiment.*

PMAT-7 **Productivity of pearl millet [*Pennisetum glaucum* (L.) R.Br. Emend. Stuntz]-Mustard/ Chickpea cropping sequence as influenced by organic and natural farming.**

Objectives

1. To evaluate the effect of organic and natural farming on productivity and quality of pearl millet and mustard/chickpea crops.
2. To study the impact of organic and natural farming on soil properties and microbial counts.
3. To find out the relationship among yield and soil properties.

Treatment details:

T_1 Control

T_2 RDN* through Farm yard manure (FYM)

T_3 RDN through Vermicompost (VC)

T_4 RDN through Poultry manure(PM) for Zone A &B / *Sheep or Goat manure for Zone A_1

T_5 RDN through FYM+ Biofertilizer

T_6 RDN through Vermicompost+ Biofertilizer

T_7 RDN through Poultry manure + Biofertilizer

T_8 *** Cow based bio formulation

T_9 RDF**

**RDN or **RDF /ha for irrigated pearl millet & Mustard/ Chickpea crops of respective Zones* along with P, K & $ZnSO_4$/$FeSO_4$ in RDF treatment will be applied.

1. **Biofertilizer will be used as seed treatment for respective crops.**

***250 kg/ha **Cow Urine Based Solid Organic bio-Formulation (CUBSOF)**/ha before sowing along with sieved dry FYM @ 250 kg/ha will be applied into the soil before sowing and **Cow Urine Based Liquid Organic bio-Formulation (CUBLOF)** @ 500 litre/ha with irrigation water or foliar spray of 10 % will be applied two times at 15-20 & 35-40 DAS during the crop season.

2. **Analysis of FYM, VC and PM/Sheep or Goat manure for total N (%)**

Variety	Best performing Latest hybrid /varieties of Pearl millet, Mustard or Chickpea of the locations.
Design	RBD
Replications	Three
Plot size	4.0 m x 3.6m

Observations to be recorded

1. The moisture content in the Organic manure sources at the time of application should be compensated with higher dose in that proportion of moisture content.
2. Collection of soil samples (0-15 cm) for their analysis of soil pH, EC, SOC, available N, P, K, S and DTPA-extractable Zn & Fe (before sowing and after harvesting)
3. Analysis of bacterial count in soil samples (before sowing and after harvesting)
4. Pearl millet: Plant height (cm), Number of total and effective tillers/ plant, Ear head length (cm), Ear head girth (mm) and Test weight (g)
5. Mustard: Number of Primary & Secondary Branches, Number of siliquae/plant, No. of seeds/siliqua, test weight (g)
6. Chickpea: Number of Primary & Secondary Branches, Number of pods/plant, no. of grains/pod, test weight (g)
7. Grain and straw yield (q/ha) of both the crops
8. Protein content in pearl millet/ chickpea & Oil content (%) in mustard

Note : The experiment will have to be conducted on a permanent site for at least 3-4 years.

Composition of 250 kg/ha Cow Urine Based Solid Organic bio-Formulation (CUBSOF)/ha : Take 250 kg desi cow dung+2.5 kg Jaggery+ 5.0 kg Gram Flour (Arhar/Chickpea/Moong/Urd)+ Two handful of soil near to tree of that field + 5.0 litre cow urine. Mix all these components and dry it under shade. Make it into powder form by beating with stick. Mix it with sieved dry FYM @ 250 kg/ha and apply into the soil before sowing.

Composition of 500 litre/ha or @ 10 % as foliar spray of Cow Urine Based Liquid Organic bio-Formulation (CUBLOF): Take 25 kg desi cow dung+ 25 litre cow urine +5.0 kg/ha Jaggery+ 5.0 kg Gram Flour (Arhar/Chickpea/Moong/Urd)+ Two handful of soil near to tree of that field + 500 litre water. Mix all these components into a plastic drum and stir daily for 2 times in the morning & evening for 2-3 minutes for 2-3 days. Cover the plastic drum with some cover or cloth.

PLAN OF WORK 2023-24 FOR PLANT PHYSIOLOGY

Plant Physiology Experiments to be continued during 2023-24

PMPHY 2a : Characterization for heat tolerance to identify parental lines of pearl millet suitable for summer cultivation.

PMPHY 2b : Characterization for drought tolerance to identify parental lines of pearl millet suitable for kharif cultivation.

PMPHY 3 : Study the photosynthate partitioning and remobilization in pearl millet under rain-fed condition

PMPHY 4 : Identification of physiological traits for drought tolerance in pearl millet under rain-fed condition

PMPHY 5 : Agro-physiological management of the drought in Pearl millet genotypes

PMPHY 7 : Identification of heat stress tolerance in pearl millet genotype at seedling stage

The details are given in the Plan of work for 2023-24.

PMPHY 2 (a &b) : Characterization for drought tolerance to identify parental lines of pearl millet suitable for *kharif* and summer cultivation

Objectives : To identify heat tolerant donor parents for hybrid and population development in pearl millet

Year of Commencement : 2014
Modified as per suggestion of the expert Dr. D.C. Uprety, Ex. Principal Scientist, Division of Plant Physiology, ICAR-IARI, New Delhi during 55th online AGM on 29th April, 2021.

Locations : Summer : Jamnagar and Mandor
Kharif : Jamnagar, Jaipur and Mandor
Conditions Summer : Irrigated (PMPHYa)
Kharif : Rainfed (PMPHYb)
Treatment : 20 inbred (R lines and B lines)
Design : RBD
Replication : Three
Spacing : 50 cm X 10 cm (Summer) , 60 cm X 10 cm (*Kharif*)
Plot size : 4 Rows of 4 M length
Fertilizer : **As per PoP**

Observations:

1. Chlorophyll content at anthesis and 65 DAS
2. Relative water content (RWC) at anthesis and 65 DAS
3. Seed setting %
4. Panicle initiation
5. Days to 50% flowering
6. Grain yield (kg/ha)
7. Productive tillers/plant

8. Test weight (g) (1000 grains)
9. Threshing percentage (Panicle harvest Index)
10. Fodder yield (q/ha)
11. Harvest index (%)
12. Days to Maturity
13. Ear head weight (kg/ha)
14. Soil temperature (^{0}C)
15. Air Temperature (^{0}C)

PMPHY 3 : To study the photosynthate partitioning & remobilization in pearl millet under rain-fed condition

Year of Commencement: 2019, As per the QRT, suggestions and Dr. C. Viswanathan, HoD, Division of Plant Physiology, ICAR-IARI, New Delhi during 54th AGM.

Location : Jaipur, Jamnagar and Mandor
Season : Kharif
Treatment : Six genotypes, released hybrids and varieties (Pusa composite 443, MPMH 17, MPMH 21, RHB 177, AHB 1200 & Pusa composite 612)
Design : RBD
Replication : Three
Spacing : 60 X 10-15 cm
Plot size : 2 Rows of 5 M length
Fertilizer : **AS per PoP**

Methodology
Tag ten similar plants, Biomass sampling at anthesis (Record height of the plant; Record dry weight of stem, leaf & panicle separately of whole plant. 10 samples per treatment), Biomass sampling at physiological maturity (Record height of the plant; Record dry weight of stem, leaf, panicle, grains separately; HI use only main shoot, 10 samples per treatment)

Observations:
At Anthesis
1. Plant height (cm)
2. Dry weight of stem (g)
3. Leaf dry weght (g)
4. Ear head weight (g)

At Physiological maturity
1. Plant height (Main stem)
2. Dry weight of stem (g)
3. Leaf dry weight (g)
4. Ear head weight (g)
5. Grain yield (g)
6. Panicle harvest index (PNHI)
7. Harvest index (HI)

PMPHY 4: Identification of physiological traits for drought tolerance in pearl millet

Objectives : Find out drought tolerant traits in pearl millet

Year of Commencement : 2020
Modified as per suggestion of the expert Dr. D.C. Uprety, Ex. Principal Scientist, Division of Plant Physiology, ICAR-IARI, New Delhi during 55th online AGM on 29th April, 2020.

Location : Mandor, Jaipur and Jamnagar
Season : Field (*Kharif*)
Replication : Three
Design : RBD
Genotypes: (Released hybrids of A and A_1 zone of India)

Methodology:
Tag five similar plants, Biomass sampling at 30 DAS (Record Chlorophyll content, height of the plant, number of leaf, number of tillers, dry weight of stem, leaf & panicle separately of whole plant - five samples per treatment), Biomass sampling 45 DAS (Record Chlorophyll content, height of the plant, number of leaf, number of tillers, dry weight of stem, leaf & panicle separately of whole plant - five samples per treatment), 60 DAS (Record Chlorophyll content, height of the plant, number of leaf, number of tillers, dry weight of stem, leaf & panicle separately of whole plant - five samples per treatment) and at maturity (Record Chlorophyll content, height of the plant, number of leaf, number of tillers, dry weight of stem, leaf & panicle, Grain yield separately of whole plant - five samples per treatment).

At 30 DAS, 45 DAS and 60 DAS

1. Chlorophyll content (mg/g f.wt)
2. Height of the plant (cm)
3. Number of leaf
4. Number of tillers
5. Dry weight of stem (g)
6. Dry weight of leaf (g)
7. Dry weight of panicle (g)

At Physiological maturity

1. Chlorophyll content (mg/g f.wt)
2. Number of leaf
3. Number of tillers
4. Dry weight of stem (g)
5. Dry weight of leaf (g)
6. Dry weight of panicle (g)
7. Dry weight of era head weight (g)
8. Grain yield (g)
9. Panicle harvest index (PNHI %)
10. Harvest index (HI %)
11. Crop growth rate (CGR per unit land area per unit time)
12. Relative growth rate (RGR gg^{-1} day^{-1} or gg^{-1} week)

PMPHY 5: Agro-physiological management of the drought in Pearl millet genotypes
(Released hybrids and varieties of A_1 zone of India)

Year of Commencement : 2022
Location : Mandor, Durapura (Jaipur) and Jamnagar
(Dr. Seema Sharma , Associate Professor (Agronomy) will conduct this trial at Dugapura centre, Jaipur)
Season : *Kharif*
Replication : Three
Design : RBD
Treatment : A) Factor

1. Control
2. Seed priming with water with ratio1/2 for 6 hr
3. Seed priming with ABA 150 ppm for 6 hrs
4. Seed priming with KNO_3 0.5% for 6 hrs
5. Seed priming with KNO_3 0.5% for 6 hrs + Spray of KNO_3 @ 1% at panicle initiation
6. Seed priming with salicylic acids 200 mg/L SA for 6 hrs
7. Spray of thiourea @ 1000 ppm at tillering stage and panicle initiation
8. Spray of KNO_3 @ 1% at tillering and panicle initiation

B) factor- Genotypes
(Released hybrids / varieties of A_1 zone of India)
I. MPMH 21, II. BHB 1602,

Design : FRBD
Replication : Three
Spacing : 45 cm X 15 cm
Plot size : 6 Rows (Gross plot size 2.7X 4.5 M)
4 Rows (Net plot size 1.8 X 3.5 m)
Fertilizer : As per PoP
(Also required Soil nutrient status and moisture level)

Observations
A- Biomass partitioning at different stages
At 30 DAS, 45 DAS and 60 DAS and 75 DAS

1. Chlorophyll content (mg/g f.wt)
2. RWC
3. Number of leaf
4. Leaf area Index
5. Number of tillers
6. Dry weight of stem (g)
7. Dry weight of leaf (g)
8. Dry weight of panicle (g)
9. Dry weight of era head weight (g)

10. Grain yield (g)
11. Panicle harvest index (PNHI %)
12. Harvest index (HI %)
13. Crop growth rate (CGR per unit land area per unit time)
14. Relative growth rate (RGR gg^{-1} day^{-1} or gg^{-1} week)
15. NAR
16. Transpiration cooling

B- Yield Observations:

1. Seed setting %
2. Days to 50% flowering
3. Days to maturity
4. Grain yield (kg/ha)
5. Productive tillers/plant
6. Test weight (g)
7. Threshing percentage
8. Fodder yield (q/ha)
9. Harvest index (%)
10. Days to Maturity
11. Ear head weight (kg/ha)
12. Nutrient uptake Seed and straw

PMPHY 7 : Identification of heat stress tolerance in pearl millet genotype at seedling stage in pearl millet

Objectives :

i. To identify heat stress tolerance mechanism in pearl millet at seedling stage.
ii. To identify physiological parameters for identification of heat stress tolerance mechanism in pearl millet

Year of Commencement : 2017
Modified in 2019 during 54th AGM by Dr. C. Viswanathan, HoD, Division of Plant Physiology, ICAR-IARI, New Delhi

Location : Jaipur and Mandor
Season : Laboratory trial (*Kharif*)
In the Field also (kharif) Rain fed
Entries : Study material : Parental line(A and B lines) of pearl millet (15-20)
Replication : Three
Design : CRD
Temperature : Three temperature treatments 20 DAS (40 Ċ for 4 hours,44 Ċ for 4 hours and 46 Ċ for 2 hours

Observations:

Growth parameters – 22 DAS

1. Shoot length(cm)
2. Root length(cm)
3. Shoot dry weight(mg)

4. Root dry weight (mg))
5. Root -shoot ratio
6. seedling vigour index

Physiological parameters

1. RWC
2. Membrane stability index
3. Pigment content (chlorophyll content (mg/g f.wt)),

Field observation at 15, 22 and 30 DAS

1. RWC
2. Membrane stability index
3. Pigment content (chlorophyll content)

PLAN OF WORK OF PLANT PATHOLOGY (2022-23)

A. CROP PROTECTION

Chairman	:	Dr. S K Pradhan (ADG-FFC)	**Co-Chairman**	:	Dr. C. Tara Satyavathi Director-ICAR-IIMR & PC, AICRP-Pearl millet
			Rapporteur	:	Dr S P Singh Dr Sanjana Reddy
Date	:	19.05.2023	**Time**	:	09.00-9.30 am

FORMULATION OF TECHNICAL PROGRAMME FOR 2023-24

PATHOLOGY - TECHNICAL PROGRAMME FOR KHARIF / SUMMER

PMPT I: Disease screening trial of Initial Pearl Millet Hybrids and Varieties.
PMPT II: Disease screening trial of Advanced Pearl Millet Hybrids and Varieties.
PMPT III: Monitoring disease resistance stability of released popular hybrid/varieties.

Downy Mildew :

Location **Zone A& A_1**
Mandor, Jaipur, Hisar, Gwalior, Jamnagar and New Delhi
Zone B
Mysore, Aurangabad, Dhule, Coimbatore, Tiupati and Patancheru

Smut

Location : **Zone A& A_1**
Jaipur, Jamnagar, Hisar and Gwalior
Zone B
Dhule

Blast

Location : **Zone A& A_1**
Jaipur, Jamnagar, Mandore, Gwalior, Hisar and New Delhi (PMPT-II)
Zone B
Dhule, Aurangabad, Tirupati and Mysore

Rust

Location : **Zone A& A_1**
Jaipur, Jamnagar, Hisar and Gwalior
Zone B
Aurangabad, Dhule, Mysore and Coimbatore

Ergot

Location : **Zone A& A_1**
Jaipur
Zone B
Aurangabad, Dhule and Coimbatore

PMPT IV: Pearl millet downy mildew virulence nursery (PMDMVN).

1. Pathogenic diversity and resistance stability analysis by multi-location disease nursery

Location
Mandor, Jaipur, Hisar, Gwalior, Jamnagar
Zone B
Mysore, Aurangabad, Dhule, Coimbatore and Patancheru

PMPT V: Pearl millet blast variability nursery (PMBVN)

2. Pathogenic diversity and resistance stability analysis by multilocation diseasenursery

Location : **Zone A& A_1**
Gwalior, Anand, Mandor, Jamnagar, Hisar**,** New Delhi, and Jaipur
Zone B
Dhule, Aurangabad, Mysore, Patancheru and Tirupati

PMPT VI: Basic and strategic research: (Mysore and ICRISAT)

- Biochemical and molecular of host pathogen interaction of blast and downy mildew system

PMPT VII: Management of downy mildew and blast disease by using chemicals and bio-agents for the year 2023-2024.

PMPT VIII: Monitoring of Pearl Millet diseases at Farmers' fields: All AICRP on Pearl millet centres in their respective zones

PMPT IX: Disease screening trial of pearl millet hybrids in summer Locations: Jamnagar, Dhule, Aurangabad and Coimbatore

The criteria for the acceptability of new genotypes for diseases, the following criteria finalized for the year2023-2024.

- **Downy mildew**: **Up to 5%** downy mildew incidence under sick plot condition must be considered for varietalpromotion.
- **Blast**: group decided to submit the data using 0-9 scale.**Up to the Score 3**for blast be considered for promotion of genotypes i.e., varietal promotion under the category of blast resistant. The blast screening under artificial inoculationat seedling stage /infector row system (ICMB 95444).

- **Smut**: **Up to 20%** smut severity under artificial inoculation to the flower must be considered for varietal promotion.
- **Ergot**: **Up to 20%** ergot severity under artificial inoculation to the flowermust be considered for varietal promotion.
- **Rust**: Rust severity under artificial inoculation at flowering stage and during hard dough stage data should be recorded **(% leaf area of upper four leaves)**. Rust **up to the score 20%**can be considered for promotion.

Disease Screening Trials
Following procedures should be adopted to conduct the disease screening trials

I. Downy Mildew: Downy mildew sick plot using infector rows system (seed should not be treated with fungicide)
II. Smut and Ergot: to be inoculated artificially to the flower
III. Rust:artificial inoculation to flowering stage
IV. Blast: blast severity under natural infection.

**The group decided that all the Centres should record incidence of Downy mildew, blast, and rust in PMPT I, II, & III entries during 2023-2024. All the centres should be record Downy mildew and Blast disease for PMPT I, II, and III at 30, 45 and 60 days and Downy mildew should be recorded 30 & 60 days.

Smut: Jaipur, Jamnagar, Hisar and Gwalior (Zone A) and Dhule (Zone B)
Ergot: Jaipur (Zone A) and Aurangabad, Dhule and Coimbatore (Zone B)
Minimum plant population: 50 plants/rep of two rows of 4 m each

PMPT I: Disease screening trial of Initial Pearl Millet Hybrids and Varieties.
PMPT II: Disease screening trial of Advanced Pearl Millet Hybrids and Varieties.
PMPT III: Monitoring disease resistance stability of released popular hybrid/varieties.

Downy Mildew :

Location **Zone A& A_1**
Mandor, Jaipur, Hisar, Gwalior, and Jamnagar
Zone B
Mysore, Aurangabad, Dhule, Coimbatore and Patancheru (PMPT-II)

Smut

Location : **Zone A& A_1**
Jaipur, Jamnagar, Hisar and Gwalior
Zone B
Dhule

Blast

Location : **Zone A& A_1**
Jaipur, Jamnagar, Mandore, Gwalior, Hisar and New Delhi (PMPT-II)
Zone B
Dhule, Aurangabad and Mysore

Rust

Location **:** **Zone A& A_1**
Jaipur, Jamnagar, Hisar and Gwalior
Zone B
Aurangabad, Dhule and Coimbatore

Ergot

Location **:** **Zone A& A_1**
Jaipur
Zone B
Aurangabad, Dhule and Coimbatore

PMPT IV: Pearl millet downy mildew virulence nursery (PMDMVN).
Pathogenic diversity and resistance stability analysis by multi-location disease nursery

Location : **Zone A& A_1**
Mandor, Jaipur, Hisar, Gwalior, Jamnagar and Anand
: **Zone B**
Mysore, Aurangabad, Dhule, Coimbatore and Patancheru

PMPT V: Pearl millet blast variability nursery (PMBVN)
Pathogenic diversity and resistance stability analysis by multi-location disease nursery

Location **:** **Zone A& A_1**
Gwalior, Anand, Mandor, Jamnagar, Hisar**,** New Delhi, and Jaipur
Zone B
Mysore, Dhule, Aurangabad, Patancheru

PMPT VI: Basic and strategic research:

- Biochemical and molecular of host pathogen interaction of blast and downy mildew system

Location: Mysore

PMPT VII: Management of downy mildew and blast disease by using chemicals and bio-agents **(Experiment Started on 2022)**

a. DOWNY MILDEW

Treatments:

S. No	Treatments	Time and method of applications
T_1	Microbial Consortia (Combination of 3 microbes) Trichoderma/Bacillus/Pseudomonas	Seed Treatment @ 8.0 g/kg
T_2	Microb Consortia (Combination of 3 microbes) Trichoderma/Bacillus/Pseudomonas	Seed Treatment @ 8.0 g/kg + Soil amendment @ 8.0 g/lt
T_3	Microbial Cons. (Combination of 4 microbes) Mycorhhiza/PSB/Pseudomonas/ Trichoderma	Seed Treatment @ 8.0 g/kg
T_4	Microbial Cons. (Combination of 4 microbes) Mycorhhiza/PSB/Pseudomonas/ Trichoderma	Soil Treatment @ 8.0 g/lt
T_5	Microbial Cons. (Combination of 4 microbes) Mycorhhiza/PSB/Pseudomonas/ Trichoderma	Seed Treatment @ 8.0 g/kg + Soil amendment @ 8.0 g/lt
T_6	Pseudomonas + Biochar	Seed Treatment @ 8.0 g/kg + Soil amendment 1 %
T_7	Trichoderma + Biochar	Seed Treatment @ 8.0 g/kg+ Soil amendment 1 %
T_8	Seed Treatment Metalaxyl 35 SD (6 g/kg)	Seed treatment
T_9	Control (moderate resistance)	Water treatment

Replication: 3 (4 rows in 4 meter length)

Observation to be recorded:

a) Seedling emergence
b) Per cent Downy Mildew Incidence at 30 and 60DAS
c) Grain and Fodder Yield -Should be calculated per hectare

Minimum plant population: 30 plants/rep

Location **:** **Zone A& A_1**

Mandor, Jaipur, Hisar, Gwalior, Jamnagar

Zone B

Aurangabad, Dhule, Coimbatore, Mysore, Tirupati and Patancheru

b. BLAST DISEASE

(Experiment Started on 2023)

Treatments:

S. No	Treatments	Time and method of applications
T_1	Propiconazole + *Pseudomonas fluorescens*	Spray treatment with Propicanazole @ 1ml/lit on 20 DAS +1 spray of Pseudomonas fluorescens @ 10 g /lit on 35 DAS
T_2	Microb Cons. (Combination of 4 microbes) Mycorhhiza/PSB/ Pseudomonas/ Trichoderma + Tricyclazole 75% WP	Seed Treatment @ 8.0 g/kg + Spray treatment with Tricyclazole 75% WP on 35 DAS
T_3	Pseudomonas fluorescens +Trifloxystrobin + Tebuconazole	Seed treatment with Pseudomonas fluorescens @ 10g/lit and spray Trifloxystrobin + Tebuconazole @ 0.04 on 35DAS
T_4	Trifloxystrobin + Tebuconazole + Bacillus subtilis	Spray treatment with Trifloxystrobin + Tebuconazole @ 0.04 on 20DAS and Bacillus subtilis @ 10 g /lit on 35 DAS
T_5	Trifloxystrobin + Tebuconazole	@ 0.04%1 spray on 35DAS
T_6	Trifloxystrobin + Tebuconazole	@ 0.04%2 sprays on 20 DAS and 35DAS
T_7	Pseudomonas + Biochar	Seed Treatment @ 8.0 g/kg+ Soil amendment 1 % + Spray Pseudomonas @ 10 g /lit on 35 DAS
T_8	Trichoderma + Biochar	Seed Treatment @ 8.0 g/kg + Soil amendment 1 % + Spray Trichoderma @ 10 g /lit on 35 DAS
T_9	Control (moderate resistance)	Water treatment

Replication: 3 (4 rows in 4 meter length)

Observation to be recorded:

a) Seedling emergence

b) Per cent blast disease severity at 30, 45 & 60 DAS

c) Grain and Fodder Yield –Should be calculated per hectare

Minimum plant population: 30 plants/rep

Location : Zone A& A_1

Mandor, Jaipur, Hisar, Gwalior, Jamnagar

Zone B

Aurangabad, Dhule, Mysore and Patancheru, Tirupati

Note:

1. **Cultivar ICMB 95444 should be used as an indicator after each treatment**
2. **Observation of Blast disease should be recorded 30, 45 and 60 days and Downy mildew should be recorded 30 & 60 days, in each treatment.**
3. **For blast disease severity should be recorded 0-9 scale and PDI should be calculated**
4. **The soft copy (CD) of the disease incidence of different genotypes of the respective Centre should be recorded and as to submit along with annual report.**

PMPT VIII: Monitoring of Pearl Millet diseases at Farmers' fields: All AICRP on Pearl millet centres in their respective zones

Method: Record survey information by preparing chart listing farmers name, source of seed samples/field number, location, cultivar/area, crop stage (F and SDS), disease incidence/severity and Collect the infected leaves samples of highly susceptible cultivars of downy mildew and blast samples for pathogen characterization.

PMPT IX: Disease screening trial of pearl millet hybrids in summer Locations:

- Jamnagar
- Dhule
- Coimbatore
- Aurangabad

PLAN OF WORK 2023-24 FOR ENTOMOLOGY

Chairman : Dr. Dr. S. K. Pradhan ADG (FFC) ICAR, N. Delhi
Co-chairs : Dr. Dr. C. Tara Satyavathi, Director, ICAR-IIMR, Hyderabad
Rapporteur : Dr. S. P. singh, ICAR-IARI, New Delhi, Dr. Sanjana Reddy, ICAR-IIMR, Hyderabad
Co- Rapporteur : Prof. Rajkumar P. Juneja, PI Entomology, ICAR-AICRP-PM, JAU, Jamnagar

Recommendation:

The IPM module consisting of 10% higher seed rate, seed treatment of imidacloprid 600 FS @ 8.75 ml/kg and PSB ($1x10^8$ cfu/ml) @ 10 ml/kg seed, neem cake @ 500 kg/hactare furrow application at the time of sowing, removal of shoot fly dead hearts, fish meal trap @ 10/ha and two sprays of azadirachtin 1500 ppm (40 ml/10 litres of water) at 30 DAG and at ear head stage, recorded lowest shoot fly, stem borer, grass hopper, termite, white grub and *Helicoverpa* incidence. This module also recorded highest grain & fodder yield at Jamnagar, Mandor-Jodhpur and Jaipur.

Significant findings/Achievements:

1	Out of 115 **initial lines/populations** screened, 22 entries at vegetative stage and 58 entries at ear head stage were found free from shoot fly. Whereas, in case of stem borer, 18 entries at vegetative stage and 91 entries at ear head stage were found free.
2	Out of 34 **advance entries** screened, zero entry at vegetative stage and three entries at ear head stage were found free from shoot fly. Whereas, in case of stem borer, 2 entries at vegetative stage and 16 entries at ear head stage were found free.
3	Out of 235 **germplasm lines** screened, 52 entris at vegetative stage and 150 entries at ear head stage were found free from shoot fly. Whereas, in case of stem borer, 150 entries at vegetative stage and 229 entries at ear head stage were found free.
4	The results of mean of 2 years of **235 germplasm lines** screened, the accession number, IP 7915 (ICRISAT) was found to be free from shoot fly at vegetative stage of the crop.
5	Out of 42 **advance lines** screened against storage pest, US 7711, GHB 905, NBH 5980, US 7775, GHB 1294 and 86M01 were found to be promising against ***Tribolium* sp.**
6	Out of 42 advance lines screened against storage pest, NBH 5980, US-7775, 86M93, RHB 177, HHB 67 IMP., 86M98, JKBH 1792, US 7711, HBH 191294, NBH 5930, GHB 538 IMP-1, GHB 538 IMP-4, MP 609, HHB 272, Pratap and RAJ 171 were found to be promising against ***Rhyzopertha dominica*** at Anand.
7	**Shoot fly:** Temperature minimum and maximum along with rainfall has a significantly negative role for shoot fly incidence.
8	**Stem borer:** Temperature maximum has a significantly negative role for stem borer incidence.
9	***H. armigera*:** Temperature maximum has a significantly negative and bright sun shine hours has a significantly positive correlation for larval population.

Plan of work/Technical Programme for *Kharif* & summer 2023-24

No.	Expt.	Title of the experiment	Centres	No. of centres
1	PMET-1A	Screening of pearl millet lines against major insect-pest (Initial lines)	Jamnagar, Jaipur & Fatehpur-Shekhawati	3
2	PMET-1B	Screening of pearl millet lines against major insect-pest (Advance entries)	Jamnagar, Jaipur, Mandor-Jodhpur and Fatehpur-Shekhawati (New centre)	4
3	PMET-2	Monitoring of major insect-pest of pearl millet	Jamnagar , Anand, Jaipur, Mandor-Jodhpur, Fatehpur-Shekhawati, Aurangabad, Hisar (New centre) and	7
4	PMET-3	Survey of major insect pests of pearl millet	Jamnagar , Anand, Jaipur, Aurangabad, Fatehpur-Shekhawati (New centre), Hisar (New centre)	6
5	PMET-5 (New)	Management of ear head worm, *Helicoverpa armigera* in pearl millet through chemical insecticides	Jamnagar, Mandor-Jodhpur & Fatehpur-Shekhawati	3
6	PMET-7	Survey of insect- pests of summer pearl millet on farmers' field.	Jamnagar, Anand and Aurangabad (New centre)	3
7	PMET-8	Relative susceptibility of pearl millet advanced entries to storage insect pests.	Jamnagar , Anand, Jaipur , Mandor-Jodhpur & Anantapur	5
8	PMET-9	Monitoring of Fall Army worm (*Spodoptera furgiperda*) in *Kharif* pearl millet	Jamnagar, Anand , Jaipur, Fatehpur-Shekhawati, Mandor-Jodhpur & Aurangabad	6

Details of experiments to be conducted 2023-24

1. PMET-1A: Screening of pearl millet lines against major insect pests (Initial lines/populations)

Objective/Target: To find out resistant/promising pearl millet material against major insect pests.

Location: Jamnagar, Jaipur & Fatehpur-Shekhawati

Experimental details: Design: RBD, **No of replications:** 2, **No. of rows:** One

Row length: 4.0 m and **Spacing:** 50 x 15 cm. **No. of entries: Initial & population lines to be provided by PC unit.**

Methodology:
At vegetative stage (28 DAG), observations will be recorded from total plants of net plot plants by counting the dead hearts. Thus, shoot fly dead heart percent incidence will be worked out. For stem borer, plant showing parallel holes due to stem borer larvae in the leaves will be considered as damaged plant and percent damaged plant will be calculated. At ear head stage, number of ear heads showing shoot fly (deformed ear head) and stem borer (empty/white ear head) damage will be recorded separately and thus percent ear head damage will be worked out from ear heads of total plants of net plot. Whereas, for *Helicoverpa armigera*, the population of larvae will be counted from 5 ear heads of the randomly selected. Leaf roller damage score (0-10) will be worked out on 5 plant basis at ear head stage.

Observations to be recorded:

a. **Shoot fly** – Per cent infestation at 28 DAG (Vegetative stage) and ear head stage.
b. **Stem borer** – Per cent plant damage at 28 DAG (Vegetative stage) and at ear head stage.
c. ***Helicoverpa*** larvae – Number of larvae/ 5 ear heads.
d. **Leaf roller** – Damage score (0-10) at ear head stage.

2. PMET-1B: Screening of pearl millet lines against major insect pests (Advance lines)

Objective/Target: To find out resistant/promising pearl millet material against major insect pests.
Locations: Jamnagar, Jaipur, Mandor-Jodhpur and Fatehpur-Shekhawati (New centre)
Experimental details: Design: RBD, **No. of replications:** 3**, No. of rows:** One
Row length: 4.0 m and **Spacing:** 50 x 15 cm.
No. of entries: Advance Promising lines to be provided by PC unit.

Methodology: At vegetative stage (28 DAG), observations will be recorded from total plants of net plot plants by counting the dead hearts. Thus, shoot fly dead heart percent incidence will be worked out. For stem borer, plant showing parallel holes due to stem borer larvae in the leaves will be considered as damaged plant and percent damaged plant will be calculated. At ear head stage, number of ear heads showing shoot fly (deformed ear head) and stem borer (empty/white ear head) damage will be recorded separately and thus percent ear head damage will be worked out from ear heads of total plants of net plot. Whereas, for *Helicoverpa armigera*, the population of larvae will be counted from 5 ear heads of the randomly selected. Leaf roller damage score (0-10) will be worked out on 5 plant basis at ear head stage.

Observations to be recorded:

a. **Shoot fly** – Per cent infestation at 28 DAG (Vegetative stage) and ear head stage.
b. **Stem borer** – Per cent plant damage at 28 DAG (Vegetative stage) and at ear head stage.
c. ***Helicoverpa*** larvae – Number of larvae/ 5 ear heads.
d. **Leaf roller** – Damage score (0-10) at ear head stage.

N.B.: After the harvest of the seeds of different entries of this trial, the experiment number

PMET-8 (Storage trial) will be installed. Jamnagar, Jaipur, Fatehpur-Shekhawati & Jodhpur centres are instructed to collect and store the seeds of PMET-1B (Advance lines) as reserve for any of the centre if need arises. Do not mix or remove the seeds before prior permission from PI, Entomology, JAU, Jamnagar.

3. PMET-2: Monitoring of major insect pests of pearl millet (On Research Station)

Location: Jamnagar , Anand, Jaipur, Mandor-Jodhpur, Fatehpur-Shekhawati, Aurangabad and Hisar (New centre)

Objective/Target: To study the intensity & population fluctuation of key pests of pearl millet in context to weather parameters.

Experimental details:
Design: Nil (Observation plot)
Replications: Nil
Treatment: 2, Untreated plot/treated plot (Full package of practices to be followed)
Spacing: 50 x 15 cm.
Variety: Any released pearl millet hybrid of that zone

Methodology:

(A) Untreated plot: Sowing of released pearl millet variety will be done over an area of 100 m^2 which will be kept free from insecticidal application during crop season. The whole block will be divided into 10 quadrates of 1.0 X 1.0 m. The incidence (%) and population of various insect pests observed during the crop period will be recorded at weekly interval from 5 plants of each quadrate randomly selected, 7 days after germination (DAG) of the crop till maturity. Thus total 50 plants will be observed at weekly interval. The presence of bio agents will also be recorded simultaneously. Weather data may also be recorded on weekly basis (Meteorological Standard Weather Week) at least, Temperature Minimum & Maximum, RH Morning & Evening, Rainfall mm & Rainy days. If some other facility available than other parameters may be recorded for correlation.

(B) Treated plot: One treated plot of 100 m^2 may be maintained by taking recommended package of practices for insect pest management to get the information of yield purpose for losses.

The following treatments will be adopted for treated plot.

1. Shoot fly, stem borer, white grub & termite: Seed treatment imidacloprid 600 FS @ 8.75 ml/kg seed.
2. Shoot fly, stem borer foliar spray: Spray of imidacloprid 17.8 SL 0.009% at 35 DAG
3. *Helicoverpa armigera :* Spraying of novaluron 10 EC 0.01%, at ear head stage at pest appearance.
4. Fall Army Worm: *Beauveria bassiana* 5 g/ litre whorl application ($1X10^8$ cfu/g) at the initiation of pest appearance and repeat it after 10 days if required.
5. Leaf binder, grass hopper, grey weevil, hairy cater pillar and any other leaf feeding insects: Spraying of NSKE 5%.

Observations to be recorded:

1. From Un-treated plot, incidence (%) and population of various insect pests observed during the crop period will be recorded at weekly interval from 20 randomly selected plants 7 days after germination (DAG) of the crop till maturity. The presence of bio agents will also be recorded simultaneously.
2. Yield kg/plot converted into hactare from treated as well as Un-treated plot.

N.B.: The proforma for recording the observations will be sent by PI to the scientists concerned. The Scientists have to fill the same Excel sheet for the uniformity.

4. PMET-3: Survey of insect- pests of *Kharif* pearl millet crop on farmers' fields

Location: Jamnagar , Anand, Jaipur, Aurangabad, Fatehpur-Shekhawati (New centre), Hisar (New centre).

Objective/Target: To know the magnitude of insect-pests at farmer's field and to identify the hot spot of insect-pests in the region.

Methodology & observations to be recorded:

Survey of insect pests will be carried (minimum 25-50 fields) out at vegetative and at ear head stage of bajra crop during *Kharif* season at different locations. Percent incidence of various insect pests and population per 5 plants will be recorded infesting pearl millet. The presence of bio-agents will also be recorded simultaneously.

N.B.: The proforma for recording the observations will be sent by PI to the scientists concerned. All have to fill same Excel sheet sent by the PI.

5. PMET-5: Management of ear head worm, *Helicoverpa armigera* in pearl millet through chemical insecticides

Objective/Target: To find out effective and economical chemical for the management of *H. armigera*

Location: Jamnagar, Mandor-Jodhpur & Fatehpur-Shekhawati
Design: RBD
Replications: 3
Treatment: 10
Spacing: 50 x 15 cm.
Plot size: 4.0 X 2.5 m (Gross 5 rows) and 3.0 m X 1.5 m (Net 3 rows)
Variety: Any released pearl millet hybrid of that zone

Methodology:

The pearl millet crop will be sown followed by all the agronomical practices. If any major incidence of foliage pest (shoot fly, stem borer, grass hopper & FAW) is observed it will be protected with spray of Azadirachtin 1500 ppm (40 ml/10 litres) as a blanket spray. Rest of all the treatments will be given at ear head stage at the appearance of *H. armigera*.

Observations to be recorded:

1. *Helicoverpa armigera* larval population 24 hrs before spray, 24 hrs, 3 days and 7 days after spray from randomly selected 20 ear heads of net plot.
2. Grain and fodder yield will be recorded from the net plot.

Treatment details: 10

No.	Treatments	Concentration	Quantity of insecticides/ 10 litres of water
1	Profenophos 50 EC	0.05%	10.0 ml
2	Quinalphos 25 EC	0.05%	20.0 ml
3	Spinosad 45%	0.009%	2.0 ml
4	Indoxacarb 14.5 SC	0.006%	4.0 ml
5	Emamectin benzoate 5 SG	0.002%	4.0 g
6	Chlorantraniprole 18.5 SC	0.006%	3.0 ml
7	Lambda cyhalothrin 5 EC	0.003%	6.0 ml
8	Chlorfenapyre 10 SC	0.015%	15.0 ml
9	Malathion 50 EC	0.05%	10.0 ml
10	Un-treated control	--	

N.B.: The information regarding residues will be done at the time of recommendation.

6. PMET-7: Survey of insect- pests of summer pearl millet crop on farmers' fields

Location: Jamnagar, Anand and Aurangabad (New centre).
Objective/Target: To know the magnitude of insect-pests at farmer's field and to identify the hot spot of insect-pests in the region.

Methodology & observations to be recorded: Survey of insect pests will be carried (minimum 25-50 fields) out at vegetative and at ear head stage of bajra crop during summer season at different locations. Percent incidence of various insect pests and population per 5 plants will be recorded infesting pearl millet. The presence of bio-agents will also be recorded simultaneously.
N.B.: The proforma for recording the observations will be sent by PI to the scientists concerned.

7. PMET-8: Relative susceptibility of pearl millet varieties and hybrids to *Tribolium castaneum* Herbst, and *Rhizopertha dominica* Fab. in storage.

Objective/Target: To find out the resistant/tolerant/ susceptible variety/hybrid against storage insect pests.
Locations: Jamnagar, Anand, Jaipur, Mandor-Jodhpur and Anantapur.

Design: CRD**, Replications: 2**, **Treatment/varieties/hybrids:** Approximately 30-40 (Advanced entries)

Methodology & Observations to be recorded: The seeds of the trial number PMET-1B will be collected and will be utilized for this experiment. After the harvest dry the seeds properly and disinfect it properly. One hundred gram seeds of each variety of pearl millet will be taken in plastic container (250g capacity). Ten pairs of adults of ***Tribolium castaneum*** **Herbst (At Jamnagar)** and ***Rhizopertha dominica*** **Fab. (At Jaipur, Jodhpur, Anand & Anantapur)** will be released in each treatment/variety for egg laying, replicated twice. The plastic container will be covered with muslin cloth and will be fastened with rubber bands. The insects will be removed after 10 days of exposure. The set of experiment will be kept as such for recording the observations till 6 months at 27 ± 2^0 C and 60 to 70 per cent relative humidity. Observations on number of adults emerged per 100g seed, percentage of seed damage on 400 grain basis & percent weight loss on 100g will be recorded at 3 & 6 months after release of insects. Germination will be recorded at the end of the experiment (At 6 months storage period). The data recorded will be subjected to statistical analysis (CRD design).

Note:

1. **The pearl millet seeds will be used from experiment of PMET-1B (advanced entries) trial after harvesting of *kharif* trial.**
2. **For Anand and Anantapur centre, 200 gram seed of each entry will be arranged by PI Entomology, JAU, Jamnagar.**

8. PMET-9: Monitoring of Fall Army worm (*Spodoptera frugiperda*) in *Kharif* pearl millet.

Locations: Jamnagar, Anand , Jaipur, Fatehpur-Shekhawati, Mandor-Jodhpur & Aurangabad
Objective/Target: To know the presence of adults of fall army worm in pearl millet eco system and simultaneously damage in pearl millet
Treatment: Pheromone traps of fall army worm

Methodology & Observations to be recorded: The pheromone traps of ***fall army worm*** (Minimum 5 traps) will be installed in the general pearl millet crop field of the station. The mean catches per trap will be recorded at weekly interval as per standard weather week. The mean catches per week will be worked out to know the population fluctuations. The plant damage percentage will also be recorded weekly. The weather data will also be recorded to work out the correlation.

N.B.: The traps/lures will be supplied by PI (Entomology), Pearl millet Research Station, JAU, Jamnagar to the above locations.

N.B.: The data should be sent to PI in prescribed proforma, word and excel sheet latest by 15th December, 2023. The word and excel sheet will be sent by the PI in near short.

ICAR-ICRISAT COLLABORATIVE PROJECTS PLAN OF WORK 2022-23

S. No.	Name of the Trial/Breeding nursery	No of Entries	Plot Size	Locations (2023)
Trials/Nursery Rainy 2023				
1.	Promising B-line nursery	50	1 row x 2 reps	1. RARI, Durgapura 2. MPKV, Dhule 3. JAU, Jamnagar 4. ICAR-IIMR, Hyderabad 5. CCS HAU, Hisar
2.	Promising R-line nursery	50	1 row x 2 reps	1. RARI, Durgapura 2. MPKV, Dhule 3. JAU, Jamnagar 4. ICAR-IIMR, Hyderabad 5. CCS HAU, Hisar 6. IARI, New Delhi 7. PC Unit, Jodhpur
3.	Drought tolerant restorer parent nursery	40	1 row x 2 reps	1. AICRP, SKRAU, Bikaner 2. RARI, Durgapur 3. CAZRI, Jodhpur 4. CCA HAU, Hisar 5. PC Unit, Jodhpur
4.	Blast Resistant Nursery	26	1 row x 2 reps	1. RVSKVV, Gwalior 2. IARI, New Delhi 3. RARI, Durgapura 4. MPKV, Dhule 5. ARS, Ananthapur
5.	Elite Joint Bio-fortification Trial (coordinated by AICRP on Pearl Millet)	50	1 row x 3 reps	1. ARS, Malnoor, 2. RARI, Durgapur 3. PAU, Ludhiana 4. MPKV, Dhule 5. JAU, Jamnagar 6. IARI, New Delhi 7. PC Unit, Jodhpur

BREEDER SEED PRODUCTION (ACTION PLAN 2023-24)

Programme of production of Breeder Seed of Pearl Millet Varieties and Parental Lines (BSP I)

Crop: Pearl Millet Year of Production: 2023 Year of Supply: February 2024

S. No.	Name of Producing centre/State	Name of Parental Line/Variety	DAC Indent (q)	Actual Allocation as per BSP target (q)
A	**Varieties**			
1	ICRISAT, Patancheru	Dhanshakti (ICTP 8203 Fe 10-2)	2.54	2.54
2	ICAR-IARI, New Delhi	Pusa Composite 701 (MP 535)	1.99	1.99
3	ICAR-IARI, New Delhi	Pusa Composite 612 (MP 480)	0.36	0.36
4	NARP, Aurangabad	ABPC4-3 (MP 448)	0.06	0.06
5	RVSKVV, Gwalior	JBV-4 (MP 403)	2.00	2.00
6	RVSKVV, Gwalior	JBV-2 (GKKV-93191)	0.20	0.20
7	ANGRAU, Ananthapuram	ABV 04 (MP 552)	0.20	0.20
		Total (A)	**7.35**	**7.35**
B	**Parental Lines**			
8	ICRISAT, Patancheru	ICMA 94555 (A Line MPMH 35)	0.30	0.30
9	ICRISAT, Patancheru	ICMB 94555 (B Line MPMH 35)	0.10	0.10
10	ICRISAT, Patancheru	843-22 A (A Line HHB 67 Imp & HHB 67 Imp 2)	0.60	0.60
11	ICRISAT, Patancheru	843-22 B (B Line HHB 67 Imp & HHB 67 Imp 2)	0.20	0.20
12	ICRISAT, Patancheru	ICMA 02333 (A Line HHB 311 & RHB 234)	0.33	0.33
13	ICRISAT, Patancheru	ICMB 02333 (B Line HHB 311& RHB 234)	0.13	0.13
14	ICRISAT, Patancheru	ICMA 88004 (A Line BHB-1602)	0.01	0.01
15	ICRISAT, Patancheru	ICMB 88004 (B Line BHB-1602)	0.01	0.01
16	ICRISAT, Patancheru	ICMA 99222 (A Line Jam Shakti, GHB 1129 & GHB 1225)	0.02	0.02
17	ICRISAT, Patancheru	ICMB 99222 (B Line Jam Shakti, GHB 1129 & GHB 1225)	0.02	0.02
18	ICRISAT, Patancheru	ICMA 99444 (A Line RHB 233)	0.20	0.20
19	ICRISAT,	ICMB 99444 (B Line RHB 233)	0.08	0.08

S. No.	Name of Producing centre/State	Name of Parental Line/Variety	DAC Indent (q)	Actual Allocation as per BSP target (q)
	Patancheru			
20	ICRISAT, Patancheru	ICMA 98222 (A Line AHB 1200 & AHB 1269)	0.21	0.21
21	ICRISAT, Patancheru	ICMB 98222 (B Line AHB 1200 & AHB 1269)	0.06	0.06
22	ICRISAT, Patancheru	ICMA 96666 (A Line RHB 223)	0.03	0.03
23	ICRISAT, Patancheru	ICMB 96666 (B Line RHB 223)	0.01	0.01
24	ICRISAT, Patancheru	ICMA 04888 (A Line HHB 299)	0.03	0.03
25	ICRISAT, Patancheru	ICMB 04888 (B Line HHB 299)	0.01	0.01
26	ICRISAT, Patancheru	ICMA 04999 (A Line MPMH 17)	0.06	0.06
27	ICRISAT, Patancheru	ICMB 04999 (B Line MPMH 17)	0.02	0.02
28	ICRISAT, Patancheru	ICMA 93333 (A Line RHB 173)	0.03	0.03
29	ICRISAT, Patancheru	ICMB 93333 (B Line RHB 173)	0.01	0.01
30	ICRISAT, Patancheru	834A (A Line MH 180)	0.03	0.03
31	ICRISAT, Patancheru	834B (B Line MH 180)	0.01	0.01
32	ICRISAT, Patancheru	ICMP 501 (R Line MH 180)	0.01	0.01
33	ICRISAT, Patancheru	81A (A Line MH 179)	0.03	0.03
34	ICRISAT, Patancheru	81B (B Line MH 179)	0.01	0.01
35	ICRISAT, Patancheru	ICMP 451 (R Line MH 179)	0.01	0.01
36	MPKV, Dhule	RHRBH 1A (A Line RHRBH-8609 SHRADDHA)	0.03	0.03
37	MPKV, Dhule	RHRBH 1B (B Line RHRBH-8609 SHRADDHA)	0.03	0.03
38	MPKV, Dhule	RHRBI 138 (R Line RHRBH-8609 SHRADDHA)	0.03	0.03
39	MPKV, Dhule	DHLB-8A (A Line ADISHAKTI)	0.06	0.06
40	MPKV, Dhule	DHLB-8B (B Line ADISHAKTI)	0.02	0.02
41	MPKV, Dhule	DHLB-967 (R Line ADISHAKTI)	0.02	0.02

S. No.	Name of Producing centre/State	Name of Parental Line/Variety	DAC Indent (q)	Actual Allocation as per BSP target (q)
42	NARP, Aurangabad	AUBI 1105 (R Line AHB 1269)	0.04	0.04
43	NARP, Aurangabad	AUBI 1101 (R Line AHB 1200)	0.054	0.054
44	JAU, Jamnagar	J-2565 (R Line Jam Shakti & GHB 1129)	0.01	0.01
45	JAU, Jamnagar	J-2591 (R Line Moti Shakti & GHB 1225)	0.01	0.01
46	HAU, Hisar	H 77-833-2-202-6R (R Line HHB 67 Imp 2)	0.12	0.12
47	HAU, Hisar	H 14/003 (R Line HHB 311)	0.05	0.05
48	HAU, Hisar	H 13/0001 (R Line HHB 299)	0.01	0.01
49	HAU, Hisar	HMS 7A (A Line HHB 234)	0.03	0.03
50	HAU, Hisar	HMS 7B (B Line HHB 234)	0.01	0.01
51	HAU, Hisar	H77/833-2-202 (R Line HHB 234)	0.01	0.01
52	HAU, Hisar	H 77-833-2-202R (R Line HHB 67 Imp)	0.08	0.08
53	SKNAU, Jaipur	RIB 15176 (R Line RHB 233)	0.12	0.12
54	SKNAU, Jaipur	RIB 15177 (R Line RHB 234)	0.12	0.12
55	SKNAU, Jaipur	RIB 3135-18 (R Line RHB 223)	0.01	0.01
56	SKNAU, Jaipur	RIB 192 S/99 (R Line RHB-173)	0.01	0.01
57	AU, Jodhpur	MIR 1252 (R Line MPMH 35)	0.10	0.10
58	AU, Jodhpur	MIR 525-2 (R Line MPMH 17)	0.02	0.02
59	SKRAU, Bikaner	BIB-16810 (R Line BHB-1602)	0.01	0.01
60	PAU, Ludhiana	PB 111 A (A Line PHB-14)	0.03	0.03
61	PAU, Ludhiana	PB 111 B (B Line PHB-14)	0.01	0.01
62	PAU, Ludhiana	PIB 228 (R Line PHB-14)	0.01	0.01
		Total (B)	**3.624**	**3.624**
		Total (A+B)	**10.974**	**10.974**

ICAR-ICRISAT Partnership Project Trials *Kharif* -2023-24

Project title: Pearl millet hybrids for harshest drought prone environments and for new emerging markets.

Table 1: The summary table of breeding trials and nurseries is given below

S. No.	Nursery/Trial	Trial size	HYD	APR	MLR	DHL	JMR	MDR	JDR	BKR	JPR	HSR	BWL	NDL	GLR	LDN	Total
		Ent x reps x rows															
	Seed Parent Progeny Trial																
1	Potential B-line Nursery (PBLN)	50x2x1	*			*	*				*	*					**5**
	Restorer Parent Progeny Trials																
2	Potential R-Line Nursery (PRLN)	50x2x1	*			*	*	*			*	*		*			**7**
	Other Trials																
3	Drought Tolerant Restorer Parent Nursery (DTRPN)	40x2x1						*	*	*	*	*					**5**
4	Blast Resistant B and R Line Nursery (BRB&RLN)	26x2x1		*		*					*			*	*		**5**
5	Elite Joint Biofortification Nursery (EJBFN)	50x3x1			*	*	*	*			*			*		*	**7**
	Marker Assisted Breeding Trial and Nurseries																
6	Blast Resistance Trial : GWAS	350x2x2				*		*			*		*	*			**5**
7	Blast Resistance Trial : Mapping population	290x2x2				*					*			*			**3**
	Total Trials		**2**	**1**	**1**	**6**	**3**	**4**	**1**	**1**	**7**	**3**	**1**	**5**	**1**	**1**	**37**

Abbreviations * =Trial allotted

HYD=Hyderabad, APR= Ananthapuram, MLR= Malnoor, DHL=Dhule, JMR=Jamnagar, MDR=Mandor, JDR=Jodhpur, BKR=Bikaner, JPR=Jaipur, HSR=Hisar, BWL= Bawal, NDL=New Delhi, GLR=Gwalior and LDN=Ludhiana.

Proposal of FLD's on pearl millet for the year 2023-24 (*Kharif* & Summer)

Sr. No.	Name of the coordinating centre	(Area in ha)			Technology to be demonstrated
		Kharif	Summer	Total	
1	RARI, (SKNAU), Durgapura (Jaipur), Rajasthan	50	-	50	• Improved biofortified hybrid (RHB 233, RHB 234 and HHB 299) V/s Local variety • Full Package of practices • Weed management
2	Agricultural Research Station (SKRAU), Bikaner (Rajasthan)	50	-	50	• Improved biofortified hybrid (HHB 299, RHB 233, RHB 234 and BHB 1202) V/s Local variety
3	Millet Research Station, JAU, Jamnagar (Gujrat)	30	20	50	• Improved biofortified hybrid (GHB 1129, GHB 1231, HHB 299 and AHB 1200) V/s Local variety • Full package of practices in summer
4	Bajra Section, CCSHAU, Hisar (Haryana)	20	-	20	• Improved hybrids (HHB 299 and HHB 311) V/s Local variety • Weed management by Atrazine • Efficient nutrient management • Use of micro nutrient v/s Farmer's practices
5	KVK, Shikohpur (IARI, New Delhi), Gurgaon	20	-	20	• Improved hybrids (HHB 299 and HHB 311) V/s Local variety • Improved variety v/s local variety • Full package of practices • Weed management
6	AICRP-PM, COA (RVSKVV), Gwalior (MP)	20	-	20	• Improved biofortified hybrid (HHB 299, HHB 311 and AHB 1200) V/s Local variety • Full package of practices
7	AICRP on Pearl Millet, NARP, Aurangabad (MH)	20	-	20	• Improved biofortified (AHB 1200 and AHB 1269) v/s Local variety
8	Department of Millets, CPBG, TNAU, Coimbatore	20	-	20	• Improved biofortified (AHB 1200 and AHB 1269) v/s Local variety
9	AICRP on Pearl Millet, Regional Agricultural Research Station, Vijayapur (Karnataka)	20	-	20	• Improved biofortified (AHB 1200 and AHB 1269) v/s Local variety
10	College of Agriculture, (MPKV, Rahuri), Dhule (MH)	20	-	20	• Improved biofortified hybrid (HHB 299 and AHB 1200) V/s Local variety
11	Agricultural Research Station, (ANGRAU), Ananthapuram (AP)	20	-	20	• Improved biofortified (ABV 04, AHB 1200 and AHB 1269) v/s Local variety
12	DEE (AU, Jodhpur), Jodhpur (Rajasthan)	100	-	100	• Improved biofortified hybrid (HHB 299, HHB 233, HHB 234 and HHB 311) V/s Local variety • Full package of practices
13	KVK, CAZRI, Jodhpur (Rajasthan)	30	-	30	• Improved biofortified hybrid (HHB 299, RHB 233, RHB 234 and HHB 311) V/s Local variety • Full package of practices
14	Incharge Forage & Millet section, Department of Plant Breeding, PAU, Ludhiana (Punjab)	20	-	20	• Improved biofortified hybrid (HHB 299) V/s Local variety • Full package of practices
15	Agricultural Research Station, (ANGRAU), Vizianagaram (AP)	30	20	50	• Improved biofortified (ABV 04, AHB 1200 and AHB 1269) v/s Local variety

16	KVK Phalodi, Jodhpur (Rajasthan)	50	-	50	• Improved biofortified hybrid (HHB 299, RHB 233, RHB 234 and HHB 311) V/s Local variety • Full package of practices
17	KVK Gudamalani, Barmer (Rajasthan)	80	20	100	• Improved biofortified hybrid (HHB 299, RHB 233, RHB 234 and HHB 311) V/s Local variety • Full package of practices
18	KVK Athiyasan, Nagaur (Rajasthan)	50	-	50	• Improved biofortified hybrid (HHB 299, RHB 233, RHB 234 and HHB 311) V/s Local variety • Local variety • Full package of practices
19	KVK Molasar, Nagaur (Rajasthan)	50	-	50	• Improved biofortified hybrid (HHB 299, RHB 233, RHB 234 and HHB 311) V/s Local variety • Full package of practices
20	KVK Jalore (Rajasthan)	50	-	50	• Improved biofortified hybrid (HHB 299, RHB 233, RHB 234 and HHB 311) V/s Local variety • Full package of practices
21	KVK Chandgothi, Churu (Rajasthan)	50	-	50	• Improved biofortified hybrid (HHB 299, RHB 233, RHB 234 and HHB 311) V/s Local variety • Full package of practices
22	College of Agriculture Sumerpur, AU, Jodhpur (Rajasthan)	50	-	50	• Improved biofortified hybrid (HHB 299, RHB 233, RHB 234 and HHB 311) V/s Local variety • Full package of practices
23	Agricultural Research Station, (ANGRAU), Perumallapalli (AP)	0	20	20	• Improved biofortified (ABV 04, AHB 1200 and AHB 1269) v/s Local variety
24	KVK Pokaran, Jaisalmer (Rajasthan)	50	-	50	• Improved biofortified hybrid (HHB 299, RHB 233, RHB 234 and HHB 311) V/s Local variety
25	KVK Jaisalmer (Rajasthan)	20	-	20	• Improved biofortified hybrid (HHB 299, RHB 233, RHB 234 and HHB 311) V/s Local variety
	Total	**920**	**80**	**1000**	

Note: The monitoring team will be constituted after planting of the crop.

PROJECT COORDINATOR 25/6/25