(***For office use only: Internal Circulation***)

Proceedings of the 53rd Annual Group Meeting of ICAR - All India Coordinated Research Project on Pearl Millet

Held at

Agriculture University Jodhpur (Rajasthan)

22nd – 24th March, 2018

ICAR-All India Coordinated Research Project on Pearl Millet
Mandor, Jodhpur 342 304
www.aicpmip.res.in

53rd Annual Group Meeting of
ICAR-All India Coordinated Research Project on Pearl Millet
Agriculture University, Jodhpur

Date: 22nd – 24th March, 2018 **Venue: Agriculture University, Jodhpur**

AGENDA

1st Day

08:30 – 09:30	**Registration**	
Session I: Inaugural		
09:30 – 11:30	**Chairman**	Dr. Balraj Singh, Hon'ble Vice Chancellor, Agriculture University, Jodhpur
	Chief Guest	Dr. I.S. Solanki, ADG (FFC), ICAR, New Delhi
	Guests of Honour	Dr. P. Raghava Reddy, Chairman QRT
		Dr. O.P. Yadav, Director, ICAR-CAZRI, Jodhpur
	Research Highlights 2017-18	Dr. C. Tara Satyavathi, Project Coordinator, ICAR-AICRP on Pearl Millet, Jodhpur
	Remarks by Guest of Honour	Dr. P. Raghava Reddy, Chairman QRT
		Dr. O.P. Yadav, Director, ICAR-CAZRI, Jodhpur
	Inaugural address by Chief Guest	Dr. I.S. Solanki, ADG (FFC), ICAR, New Delhi
	Chairman Remarks	Dr. Balraj Singh, Hon'ble Vice Chancellor, Agriculture University, Jodhpur
	Vote of Thanks	Director Research, AU, Jodhpur
11:30 – 12:00	***High Tea***	
Session II: Review of Research Results and Progress Report of AICRP-PM 2017-18 (PI Presentation)		
12:00 – 13:30	**Chairperson**	Dr. I.S. Solanki, ADG (FFC), ICAR, New Delhi
	Co-Chairperson	Dr. P. Raghava Reddy, Chairman QRT
		Dr. C. Tara Satyavathi, Project Coordinator, ICAR-AICRP on Pearl Millet
	Special invitees	QRT Committee
	Rapporteur	Dr. Yash Pal Yadav, Principal Scientist, RRS, Bawal
		Dr. P.S. Shekhawat, ZDR & I/c AICRP on Pearl Millet, Bikaner
	Crop Improvement	Dr. B.S. Rajpurohit, Professor, AU, Jodhpur
	Crop Production	Dr. Anil Kumar, Pr. Scientist, CCS HAU Hisar
		Dr. R.C. Meena, Asstt. Prof. (Phy.), AICRP-PM, Jodhpur
	Crop Protection	Dr. H.R. Bishnoi, Pathologist, AICRP-PM, Jodhpur
		Dr. R.K. Juneja, Asstt. Res. Sci. (Ento.), JAU, Jamnagar
13:30 – 14:30	***Lunch Break***	
Session III: Review of Research Results of AICRP-PM Centres 2017-18 (Centre-wise presentation of significant results and progress report)		
14:30 – 17:00	**Chairperson**	Dr. P. Raghava Reddy, Chairman QRT
	Co-Chairperson	Dr. I.S. Solanki, ADG (FFC), ICAR, New Delhi
		Dr. C. Tara Satyavathi, Project Coordinator, ICAR-AICRP on Pearl Millet, Jodhpur
	Special Invitees	QRT Committee
	Centre-wise presentation	Jaipur, Hisar, Aurangabad, Jamnagar, Vijayapur, Mysore, Ananthapuram, Coimbatore, Gwalior, Ludhiana, Bikaner & Dhule

	Rapporteur	Dr. R.K. Kakani, Principal Scientist, ICAR-CAZRI, Jodhpur Dr. Babar Sadhana, Scientist (Agronomy), RRS, Vijayapur

Session IV: Review of Front line demonstrations for 2017-18 and Action Plan 2018-19, Review of BSP 2017-18 and Action Plan 2018-19		
17:00 – 17:45	**Chairperson**	Dr. Ishwar Singh, Director (DEE), AU, Jodhpur
	Co-Chairperson	Dr. S.R. Kumhar, ZDR & ADR (Seed), AU, Jodhpur
	Rapporteur	Dr. P.S. Shekhawat, Professor, SKRAU, Bikaner Dr. M.B. Arun Kumar, Principal Scientist, ICAR-IARI, New Delhi Dr. R.S. Bana, Scientist, ICAR- IARI, New Delhi
	Frontline Demonstrations	Mr. Manoj Kumar, Asstt.Prof. (Agronomy), ICAR-AICRP-PM, Jodhpur
	Breeder Seed Production	Dr. Vikas Khandelwal, Sr. Scientist (GPB), ICAR-AICRP on Pearl Millet, Jodhpur

Session V: Varietal Identification Committee Meeting		
18:00 – 19:30	**Chairperson**	Dr.I.S. Solanki, ADG (FFC), ICAR, New Delhi
	Member Secretary	Dr. C. Tara Satyavathi, Project Coordinator, ICAR-AICRP on Pearl Millet, Jodhpur
		Members and facilitators

2nd Day

Session VI : Plan of work 2018-19 (Concurrent discipline wise technical programme presentation)			
09:30 – 11:15		**Co-Chairpersons**	**Rapporteur**
	Crop Improvement	Dr. P. Raghava Reddy, Chairman QRT Dr. I.S. Solanki, ADG (FFC), ICAR Dr. O.P. Govila, QRT Member Dr. C. Tara Satyavathi, Project Coordinator, ICAR-AICRP on Pearl Millet, Jodhpur	Dr. Vikas Khandelwal, Sr.Scientist (GPB), ICAR-AICRP on Pearl Millet, Jodhpur Dr. L.D. Sharma, Professor, SKNAU, Jaipur
	Crop Production	Dr. R.K. Pannu, QRT Member (Agronomy) Dr. Ishwar Singh, Director (Extn. Edu.), AU, Jodhpur	Dr. Anil Kumar, Pr. Scientist, CCS HAU Hisar/ Dr. Minakshi Grover, Pr. Scientist, IARI, New Delhi/ Manoj Kumar, Asstt.Prof.(Agro.), ICAR-AICRP on Pearl Millet, Jodhpur Dr. Sunita Gupta,Professor (Physio.), RARI, Jaipur/ Dr. R.C. Meena, Asstt.Prof. (Pl.Physio.), ICAR-AICRP on Pearl Millet, Jodhpur
	Crop Protection	Prof. H. Shekhar Shetty, QRT Member (Pathology)	Dr. Pokhar Rawal, Assoc.Prof. (Pl.Patho.), ICAR-AICRP on Pearl Millet, Jodhpur Sh. R.K. Juneja, Asstt. Res. Scientist (Ento.), JAU, Jamnagar

11:15 – 11:30	***Tea Break***	

11:30 – 13:30	**Chairperson**	Dr. O.P. Yadav, Director, ICAR-CAZRI, Jodhpur
	Co-Chairperson	Dr. O.P. Govila, QRT Member
	Rapporteur	Dr. P. Sumathi, Professor, TNAU, Coimbatore
	Speakers	
	Progress report in DUS testing in Pearl millet	Dr. Vikas Khandelwal, Sr. Scientist (GPB), ICAR-AICRP on Pearl Millet, Jodhpur
	Revised DUS testing Guidelines in Pearl millet and Genetic gains in Pearl millet study 2011 and present day	Dr. C. Tara Satyavathi, Project Coordinator, ICAR-AICRP on Pearl Millet, Jodhpur

13:30 – 14:30	***Lunch Break***	

Session VIII: Present status of pearl millet research and new initiatives for pearl millet improvement		
14:30 – 17:30	**Chairperson**	Dr. Balraj Singh, VC, AU, Jodhpur
	Co-Chairperson	Dr. I.S. Solanki, ADG (FFC), ICAR, New Delhi
	Panellist/ Special Invitees	All QRT Members
	Rapporteur	Dr. S.P. Singh, Principal Scientist, ICAR-IARI, New Delhi Dr. Pokhar Rawal, Assoc.Prof. (Patho.), ICAR-AICRP on Pearl Millet, Jodhpur Dr. R.K. Solanki, Scientist, ICAR-CAZRI, Jodhpur
	Present status of Pearl millet research in the country since inception of AICRP on Pearl millet	Dr. C. Tara Satyavathi, Project Coordinator, ICAR-AICRP on Pearl Millet, Jodhpur
	Improvement of Shelf life in Pearl millet	Dr. Shelly Praveen, Head, Division of Bio-chemistry, ICAR-IARI, Pusa, New Delhi Dr. Bhaskarachary, Deputy Director, National Institute of Nutrition, Hyderabad Dr. Asha Kawatra, Professor (Food & Nutrition), IC College of Home, CCS HAU, Hisar
	Pearl millet blast and present status	Dr. Rajan Sharma, Principal Scientist, Cereal Pathology, ICRISAT
	Genomic assisted breeding activities in Pearl millet	Dr. Rakesh Srivastava, Principal Scientist, ICRISAT
	Business activities taken by NGOs for the production, marketing and promotion of value added products of pearl millet	Mr. Veera Shetty, Entrepreneur
	Maintenance breeding in Pearl millet through protected cultivation in off season	Dr. Balraj Singh, Vice Chancellor, Agricultural University, Jodhpur
	Cultural evening	

3rd Day

Session IX: Pearl millet genetic resources		
09:30 – 10:45	**Chairperson**	Dr. O.P. Govila, QRT Member
	Co-Chairperson	Dr. C. Tara Satyavathi, Project Coordinator (Pearl Millet), ICAR-AICRP on Pearl Millet, Jodhpur
	Rapporteur	Dr. Dev Vart Yadav, Asstt.Scientist, CCS HAU, Hisar Dr. Supriya, Asstt.Professor, ICAR-AICRP on Pearl Millet, Jodhpur
	Centrewise presentations	Respective breeder from AICRP centres
10:45 – 11:00	***Tea Break***	
Session X: Review of Research Results, Progress Report of CRP on Biofortification, ICAR-ICRISAT Collaborative Projects 2017-18 and Plan of Work 2018-19		
11:00 – 13:00	**Chairperson**	Dr. O.P. Govila, QRT Member
	Co-Chairpersons	Dr. C. Tara Satyavathi, Project Coordinator (Pearl Millet), ICAR-AICRP on Pearl Millet, Jodhpur Dr. C.N. Neerja, Principal Scientist, ICAR-IIRR, Hyderabad
	Rapporteur	Dr. K.D. Mungra, Assoc. Research Scientist, JAU, Jamnagar
	Centre-wise presentation of CRP Biofortification	Respective Breeder from CRP - Biofortification centres (Jaipur, Delhi, Jamnagar, Dhule, Hisar & Mandor)
	ICAR-ICRISAT Trials	Dr. B.R. Beniwal, STA, ICAR-AICRP on Pearl Millet, Jodhpur Dr. S.K. Gupta, Principal Scientist, ICRISAT Dr. Rakesh Srivastava, Principal Scientist, ICRISAT
13:00 – 14:00	***Lunch Break***	
Session XI: Plenary Session/ Session-wise Presentation and Recommendations		
14:00 – 18:00	**Chairperson**	Dr. Balraj Singh, Hon'ble Vice Chancellor, AU, Jodhpur
	Co-chairperson	Dr. C. Tara Satyavathi, Project Coordinator (Pearl Millet), ICAR-AICRP on Pearl Millet, Jodhpur
	Chief Guest	Dr. I.S. Solanki, ADG (FFC), ICAR, New Delhi
	Guest of Honor	Dr. R.K. Pannu, QRT Member
	Rapporteur	Dr. Vikas Khandelwal, Sr. Scientist (GPB), ICAR-AICRP on Pearl Millet, Jodhpur Dr. P. Sumathi, Professor, TNAU, Coimbatore
	Inaugural Session	Dr. S.P. Singh, Pr.Scientist, IARI, New Delhi
	Technical Session II	Dr. Yash Pal Yadav, Principal Scientist, RRS, Bawal Dr. P.S. Shekhawat, ZDR & I/c AICRP on Pearl Millet, Bikaner
	Technical Session III	Dr. R.K. Kakani, Principal Scientist, ICAR-CAZRI, Jodhpur Dr. Babar Sadhana, Scientist (Agronomy), RRS, Vijaypur
	Technical Session IV	Dr. P.S. Shekhawat, Professor, SKRAU, Bikaner Dr. R.S. Bana, Scientist, ICAR- IARI, New Delhi
	Technical Session V	Dr. Vikas Khandelwal, Sr. Scientist (GPB), ICAR-AICRP on Pearl Millet, Jodhpur
	Technical Session VI	
	Crop Improvement	Dr. Vikas Khandelwal, Sr. Scientist (GPB), ICAR-AICRP on Pearl Millet, Jodhpur/ Dr. L.D. Sharma, Professor (PBG), RARI, Durgapura, Jaipur
	Crop Production	Dr. Anil Kumar, Pr. Scientist, CCS HAU Hisar/ Dr. Minakshi Grover, Pr. Scientist, IARI, New Delhi/ Manoj Kumar, Asstt.Professor (Agro.),

	ICAR-AICRP on Pearl Millet, Jodhpur/ Dr. Sunita Gupta, Professor (Physio.), RARI, Jaipur/ Dr. R.C. Meena, Asstt.Prof. (Pl.Physio.), ICAR-AICRP on Pearl Millet, Jodhpur
Crop Protection	Dr. Pokhar Rawal, Assoc.Prof. (Pl.Patho.), ICAR-AICRP on Pearl Millet, Jodhpur
	Dr. R.K. Juneja, Asstt. Res. Scientist (Ento.), JAU, Jamnagar
Technical Session VII	Dr. P. Sumathi, Professor, TNAU, Coimbatore
Technical Session VIII	Dr. S.P. Singh, Principal Scientist, ICAR-IARI, New Delhi
	Dr. Pokhar Rawal, Assoc.Prof. (Patho.), ICAR-AICRP on Pearl Millet, Jodhpur
	Dr. R.K. Solanki, Scientist, ICAR-CAZRI, Jodhpur
Technical Session IX	Dr. Dev Vart Yadav, Asst. Professor, CCSHAU, Hisar
	Dr. Supriya, ICAR-AICRP on Pearl Millet, Jodhpur
Technical Session X	Dr. K.D. Mungra, Assoc. Research Scientist, JAU, Jamnagar
Technical Session XI	Dr. Vikas Khandelwal, Sr. Scientist (GPB), ICAR-AICRP on Pearl Millet, Jodhpur
Award distribution	
Felicitation	Dr. I.S. Solanki, ADG (FFC), ICAR, New Delhi
Vote of thanks	Dr. S.R. Kumhar, Organizing Secretary, AU, Jodhpur

SESSION – I

INAUGURATION OF 53rd ANNUAL GROUP MEETING OF ICAR-AICRP ON PEARL MILLET

Chairman	Dr. Balraj Singh, Hon'ble Vice Chancellor, Agriculture University, Jodhpur
Chief Guest	Dr. I.S. Solanki, ADG (FFC), ICAR, New Delhi
Guests of Honour	Dr. P. Raghava Reddy, Chairman QRT
	Dr. O.P. Yadav, Director, ICAR-CAZRI, Jodhpur
Research Highlights 2017-18	Dr. C. Tara Satyavathi, Project Coordinator, ICAR-AICRP on Pearl Millet, Jodhpur
Remarks by Guest of Honour	Dr. P. Raghava Reddy, Chairman QRT; Dr. O.P. Yadav, Director, ICAR-CAZRI, Jodhpur
Inaugural address by Chief Guest	Dr. I.S. Solanki, ADG (FFC), ICAR, New Delhi
Chairman Remarks	Dr. Balraj Singh, Hon'ble Vice Chancellor, Agriculture University, Jodhpur
Vote of Thanks	Director Research, AU, Jodhpur

In this session, Dr. Balraj Singh, Hon'ble Vice-Chancellor, Agriculture University, Jodhpur was the Chairman. Highly esteemed Dr P. Raghava Reddy, Chairman QRT, Ex-Vice Chancellor, ANGRAU and Dr. O.P. Yadav, Director, ICAR-CAZRI, Jodhpur were the guests of honor and Dr. I.S. Solanki, ADG (FFC) was the Chief Guest. The Welcome and introductory address was given by Dr. Balraj Singh, Vice Chancellor, Agriculture University, Jodhpur. Dr C. Tara Satyavathi, Project Coordinator, ICAR-AICRP on pearl millet, Jodhpur presented research highlights of work done in pearl millet during 2017-18. Important points emerged from her presentation are given below:

- Highest productivity *i.e.* 1305 kg per ha was obtained during 2016-17.
- During 2017-18, a total of 227 new experimental cultivars were evaluated in 14 trials conducted during kharif and summer 2017 at 69 test locations in the country. The hybrids evaluated during 2017-18 were based on 95 A lines and 120 R lines.
- During 2017-18, breeder seed production of 25 parental lines (A, B & R) of hybrids and 7 OPVs was undertaken.
- 41 varieties were tested for DUS characterization.
- In ICAR-ICRISAT partnership trials a total of 181 R lines and 91 B lines were assessed by breeders in 20 trials at 18 locations. CRP biofortification parental line trial was also conducted.
- Seven agronomy, 7 pathology, 7 entomology and 6 physiology trials were conducted during kharif and summer 2017.

Logo of ICAR-AICRP on Pearl millet was released. A number of publications were also released on this occasion viz. Summary of Experiments 2017-18, Pearl millet News Letter, Pearl millet Hybrids & Varieties, Magnaporthe Blast of Pearl millet in India, Ergot and Rust Diseases of Pearl millet.

Dr O.P. Yadav, Director ICAR-CAZRI, Jodhpur congratulated Project Coordinator and whole pearl millet group on various achievements made during 2017-18. He pointed out that drought resistance genes available in pearl millet can be utilized in other crops like wheat and rice. Dr P. Raghava Reddy QRT chairman highlighted the nutritional quality of pearl millet and its different uses.

The session ended with vote of thanks to the chair.

SESSION II

REVIEW OF RESEARCH RESULTS AND PROGRESS REPORT OF AICRP ON PEARL MILLET (2017-18)

Chairperson	**:**	Dr. I.S. Solanki, ADG (FFC), ICAR	**Co-Chairperson**	**:**	Dr. P. Ragahava Reddy Chairman QRT
				:	Dr. C. Tara Satyavathi Project Coordinator (Pearl Millet)
Special Invitees	**:**	QRT Committee	**Rapporteur**	**:**	Dr. Yash Pal Yadav, Principal Scientist (PB), CCS HAU RRS Bawal Dr. P.S. Shekhawat, ZDR & I/c AICRP on Pearl Millet, Bikaner
Date	**:**	March 22, 2018	**Time**	**:**	12:30 PM

Plant Breeding (Presented by: Dr. B.S. Rajpurohit)

This session was Chaired by Dr. I.S. Solanki, ADG (FFC), ICAR and Co-Chaired by Dr. P. Ragahava Reddy, Chairman QRT and Dr. C. Tara Satyavathi, Project Coordinator (Pearl millet) .

During *Kharif* 2017, in total 230 trials were allotted in A_1, A and B zones. Out of these, 218 trials were conducted with success rate of 95%. Chairman Dr. I.S. Solanki appreciated Dr. Rajpurohit for his excellent presentation and efforts of all the cooperators.

In IHT (E), out of 20 entries, three entries namely, MH 2294, MH 2304 & MH 2295 were found to be top yielders in zone A_1. In IHT (M) out of 39 entries, three entries MH 2340, MH 2307 & MH 2317 were top ranking hybrids in zone A. In AHT (M) out of 16 entries four hybrids namely; MH 2220, MH 2106, MH 2228 & MH 2223 gave higher yield over the best check in zone A. In addition to this, AHPT (E) (15 entries) in zone A_1; IHT (L) (32 entries), AHT (L) (2 entries) and Population trial (12 entries) in zone A were conducted. In zone B, five trials viz., IHT (M) (36 entries), IHT (L) (32 entries), AHT (M) (2 entries), AHT (L) (2 entries) and Population trials (8 entries) were conducted. One hybrid trial (Fe & Zn) was successfully conducted with 7 entries in zone A_1, A & B. In summer, one trial SHT (16 entries) was also successfully conducted. All the centers were complemented for the successful conduct of the experiments with a request to further intensify the efforts to identify the superior hybrids.

Agronomy (Presented by: Dr. Anil Kumar)

In Agronomy, of the 70 experiments allotted, 68 were conducted successfully. Seven different kinds of trials were conducted in zone A_1, A & B in respect of nutrient management (macro & micro nutrient), soil moisture conservation and irrigation management during summer and to evaluate the performance of different advance hybrid entries under staggered sowing. Three major recommendations were generated:

1. Field experiments carried out for three years (2015-2017) aimed to see the effect of $FeSO_4$ as foliar application on growth, yield and quality of different pearl millet hybrids

revealed that the grain yield was improved to the tune of 30.1, 16.3 and 28.1%, respectively by the best treatment of 0.50% $FeSO_4$ foliar spray at tillering stage (25-30 DAS) over no foliar spray in Zone A_1, Zone A and Zone B. Protein and Iron content also recorded maximum in the same treatment of 0.5% $FeSO_4$.

2. The study carried out for three years (2015-17) with an objective to standardize the irrigation requirement of the summer season grown crop revealed that the application of irrigation at 50 mm CPE recorded maximum grain and stover yield compared to CGS, and 100 mm CPE treatments. Whereas the water use efficiency was recorded maximum in 100 mm CPE treatment. Among different summer pearl millet hybrids 86M64 performed best in terms of yield and WUE as compared to ProAgro 9444 and Nandi 72.

3. Experiment on maximization in the pearl millet productivity under late sown situations (July 25-30 & August 10-15) conducted for three years (2015-2017) exhibited the superiority of the nutrient combination of RDF + FYM @ 5.0t/ha + NPK foliar spray @ 0.5% at 20-25 DAS by 35.6, 26.2 & 23.9% in terms of grain yield over RDF alone in Zones A_1, A & B, respectively .

Plant Pathology (Presented by: Dr. H.R. Bishnoi)

During *Kharif* 2017, eight pathological experiments were successfully conducted at 12 locations. Results on screening against different diseases and data on management of downy mildew and blast were also presented. In PMPT 1, 115 entries were tested where none of entry was free from downy mildew at 30 & 60 days after sowing. In general downy mildew incidence low as compare to the last year. In PMPT VII summer trial on downy mildew entries MSH 342, Proagro 9444 & MSH 347 were free from downy mildew incidence at 60 DAS. Application of trifloxystrobin+ Tebuconazole @ 0.05% at initial stage reduce blast incidence at all test locations.

Entomology (Presented by: Dr. R.K. Juneja)

Seven experiments were conducted at two locations namely; Jamnagar and Jaipur. None of the genotypes were found resistant to shoot fly and stem borer. Overall, grain losses caused by insect-pests were around 30% and fodder yield loss was reported upto 22%. Out of 62 entries only 86M86 at vegetative stage and Kaveri Super Boss, Pusa Composite 383 & JBV 2 at ear head emergence stage were tolerant against shoot fly.

Plant Physiology (Presented by: Dr. R.C. Meena)

Six physiological trials were conducted at Mandor, Jaipur and Jamnagar during summer and Kharif 2017. During the screening of advanced summer hybrids against terminal stress, low moisture and high temperature conditions, MSH 312 was found significantly superior reflecting its terminal stress tolerance. Identification of tolerance in genotypes at seedling stage in pearl millet, the genotypes BIB 240 and PPMI 1213 performed better.

The session ended with vote of thanks to the chair and co-chair.

SESSION – III

REIVEW OF RESEARCH RESULTS OF AICRP-PEARL MILLET CENTRES 2017-18 (CENTRE-WISE PRESETNATION OF SIGNIFICANT RESULTS AND PROGRESS REPORT)

Chairperson	**:**	Dr. P. Ragahava Reddy Chairman QRT	**Co-Chairperson**	**:** **:**	Dr. I.S. Solanki, ADG (FFC), ICAR Dr. C. Tara Satyavathi Project Coordinator (Pearl Millet)
Special Invitees	**:**	QRT Committee	**Rapporteur**	**:**	Dr. R. K. Kakani, Principal Scientist, ICAR-CAZRI, Jodhpur Dr. Babar Sadhna, Scientist (Agronomy), RRS, Vijayapur
Date	**:**	March 22, 2018	**Time**	**:**	14:30 PM

In this session, 11 out of 12 centres have presented their progress reports for the year 2017. Ananthapuram did not participate in the Group Meeting.

Dr. L. D. Sharma, Professor, RARI, Jaipur presented the report of Jaipur centre. Pearl millet hybrid RHB 223 is released and notified on 20.1.2018 by CVRC. Eleven hybrids and one population were contributed for coordinated testing. Nine coordinated trials, 11 ICAR-ICRISAT collaborative trials, four harvest plus trials and four station trials were successfully conducted. The progress of breeding programme was satisfactory. Seven trials of agronomy, nine experiments of pathology, six experiments of entomology and 4 experiments of plant physiology were successfully conducted. Nucleus, breeder, certified and TFL seed were produced as per indents.

Dr. Dev Vart Yadav, Assistant Scientist, CCS-HAU, Hisar presented the report of Hisar centre. Hybrid HHB 229 is released for A and B zone by CVRC on 20.1.2018. Seven hybrids and two composites were contributed for coordinated testing. Fifteen coordinated trials, 15 ICAR-ICRISAT collaborative trials, 06 Harvest plus trials and 13 station trials were successfully conducted. Total 2362 germplasm lines including A, B line progenies, R lines and other germplasm lines were maintained. Six trials of agronomy, five pathology trials and seven experiments on biochemistry were conducted successfully.

Dr. N Y Satpute, Associate Professor, presented report of Aurangabad centre. Pearl millet biofortified hybrid AHB1200 Fe is released for all zones. Five hybrids were contributed for coordinated testing. Eight coordinated trials, 03 State multi location trials, 3 harvest plus trials and other breeding material were successfully evaluated. Eight experiments of agronomy, 25

FLDs, nine pathological trials and breeder seed production were successfully taken during the year.

Dr. K D Mungra, Associate Research Scientist presented research report of Jamnagar. Eleven hybrids were contributed for coordinated testing. Eight coordinated trials, 03 station trials, 16 ICAR-ICRISAT collaborative trials, 05 state trials were successfully conducted. The progress of breeding programme was also reported. Eight coordinated and two station experiments of agronomy, eleven coordinated and six station experiments of pathology, ten experiments of entomology and five experiments of physiology were successfully conducted.

Dr. Babar Sadhna R, Scientist presented the research report of Vijayapura centre. Six experiments of agronomy, six coordinated and eight station trials of breeding were successfully conducted. The breeding programme of centre was also presented.

Dr. Chandra Nayaka, Professor from Mysore centre presented their report. Six pathological trials were successfully conducted and reported. He also presented the basic research done using OMICS approach for identification of pathogenicity factors of downy mildew and blast pathogen in pearl millet. First report of the *Sclerospora graminicola* draft genome based on 40 x coverage was also reported by the centre.

Coimbatore centre research report was presented by Dr. P. Sumathi, Senior Breeder. CUMBU Comp CO10 and CUMBU HYBRID CO-10 were released. Three hybrids, and different lines for various AICRP experiments were contributed for coordinated trials. The results of seven coordinated trials, 8 ICAR-ICRISAT collaborative trials, multilocation trials, station trials and breeding programme were presented. Twenty five FLDs, six agronomy trials, seven pathological trials and seed production activities were reported.

Dr. A. K. Singh, Professor, presented report of Gwalior centre. Six coordinated trials, four ICAR-ICRISAT collaborative trials and station trials were reported. Evaluation of germplasm and progress of breeding programme were presented besides 08 pathological experiments.

Dr. Ruchika Bhardwaj presented report of Ludhiana centre. Seven entries were submitted for coordinated testing. Nine coordinated trials, three ICAR-ICRISAT trials, six station trials were successfully conducted and progress of breeding programme was also presented.

Dr. P. C. Gupta, Professor presented report of Bikaner Centre. One hybrid BHB 1202 was released for Rajasthan state. Eight hybrids have been submitted for coordinated testing. Six coordinated trials, eleven ICAR-ICRISAT trials, 4 station trials were successfully conducted and progress of breeding programme was also presented. Seven agronomy trials and 40 FLDs were also been reported.

Dr. H. T. Patil, Associate Professor presented research report of Dhule centre. He presented salient features of Phule Aadishakti and Phule Mahashakti hybrids. The centre contributed seven hybrids for coordinated testing. Seven coordinated trials, 3 station trials were

conducted successfully. Progress of the breeding programme was also presented. Results of eight coordinated and one station experiment of pathology, three experiments of agronomy and seed production activities were also reported.

In the end, Chairman of the session gave the following comments - The research activities of all the centres are in accordance with the mandate of the All India Coordinated Research Project on Pearl millet. However, the breeding programmes must be intensified further keeping in view of the recently set criteria prescribed for the project group in terms of yield, iron and zinc and reaction to pests and diseases. While screening the breeding material or hybrids or varieties, the highest score recorded even at one centre/location should be considered as the actual reaction to that pest/disease.

The agronomic trials have to be conducted to solve the location specific problems and should come up with cost effective technologies to enhance the economic returns for the farmers. Further nutrient management technologies have to be developed for the organic cultivation of pearl millet in view of the increasing awareness among consumers for the organic products. In addition, due emphasis is to be given for the development of products duly depicting nutritional importance of the pearl millet.

The session ended with thanks to the Chairman and participant delegates.

SESSION – IV

REVIEW OF FRONTLINE DEMONSTRATIONS FOR 2017-18 AND ACTION PLAN 2018-19, REVIEW OF BSP 2017-18 AND ACTION PLAN 2018-19

Chairman	**:** Dr. Ishwar Singh, Director (DEE), AU, Jodhpur	**Co-Chairman**	**:**	Dr. S.R. Kumhar, ZDR, ARS, Mandor, Jodhpur
		Rapporteur	**:**	Dr. P.S. Shekhawat ZDR & Professor (Agro.) SKRAU, Bikaner
			:	Dr. R.S. Bana, Sr.Scientist, IARI, New Delhi
Date	**:** March 22, 2018	**Time**	**:**	5:00 PM

The progress report of Breeder Seed Production programme was presented by Dr. Vikas Khandelwal, Sr.Scientist (GPB), PC Unit, Jodhpur. The DAC indent received during 2017-18 was 6.9 qtls whereas actual production was 21.77 qtls. Out of this, only 6.93 qlts was lifted and 14.84 qtls is in surplus. Dr. Vikas also proposed the plan of breeder seed production for 2018-19, in which total DAC indent is 9.39 qtls and same is the target for the year 2018-19.

The progress report of FLD was presented by Sh. Manoj Kumar, Asstt. Professor (Agronomy), PC Unit, Jodhpur. As against the target of 350 ha, FLD's were organized over an area of 310 ha (including 30 ha area under summer) in the States of Gujarat, Haryana, Madhya Pradesh, Rajasthan Maharashtra, Andhra Pradesh, Uttar Pradesh, Delhi, Karnataka, Pusa (Bihar) and Tamil Nadu on five components *i.e.* improved practices, recommended nutrient application, weed management, improved cultivar and moisture conservation. The results revealed that overall yield advantage was in the range of 20.0 to 111% among these trials using various technologies. The Kalai centre of UP and IARI, Pusa, Samastipur (Bihar) did not conduct the kharif FLD which is objectionable. Many of the centres organized the Field Day/ Kisan Mela at Farmer's Field during the season.

1. The Chairman suggested that best hybrids and technology should be tested in the FLDs with prior permission of Project Coordinator.
2. Chairman and Co-Chairman suggested that FLD's should be laid out and spread in more districts to achieve above state average yield.
3. According to DMD, 350 FLDs were proposed for 2018-19. Out of that, 320 FLDs will be for *Kharif* and 30 FLDs will be for summer season during 2018-19.
4. The multi crop planter can be used for planting of FLD at Farmers field but before that it should be tested at Mandor, Jodhpur centre.
5. QRT Chairman suggested that reporting scientist of FLDs should pay attention to the deviation in yield. It was also suggested that the key factor for yield increase or decrease may be identified.

The meeting ended with thanks to the chair.

Programme of production of Breeder Seed of Pearl millet varieties and parental lines (BSP 1)

Crop: Pearl millet Year of Production: 2018 Year of supply: February 2019

S.No.	Name of Producing center/state	Name of parental line/ variety	DAC indent (q)	Actual allocation as per BSP-I Target (q)
A	**Varieties**			
1	ICRISAT, Patancheru	Dhanshakti	2.24	2.24
2	IARI, New Delhi	Pusa Composite-701 (MP- 535)	0.57	0.57
3	IARI, New Delhi	Pusa Composite- 612 (MP- 480)	0.12	0.12
4	IARI, New Delhi	Pusa Composite- 443	0.22	0.22
5	PAU, Ludhiana	FBC 16	0.55	0.55
6		ASG-3	0.35	0.35
7	NARP, Aurangabad	ABPC4-3 (MP 848)	0.79	0.79
8	RVSKVV, Gwalior	JBV-4 (MP-403)	0.50	0.50
9	RVSKVV, Gwalior	JBV-2 (GKKV-93191)	0.20	0.20
10	SKNAU, Jaipur	RAJ 171	0.10	0.10
11	AU, Jodhpur	Mandor Bajra Composite 2 (MBC 2)	0.12	0.12
	Total	**Total (A)**	**5.76**	**5.76**
B.	**Parental lines**			
12	MPKV, Dhule	DHLB-8A (A line Adishakti)	0.06	0.06
13	MPKV, Dhule	DHLB-8B (B line Adishakti)	0.03	0.03
14	MPKV, Dhule	DHLR-967 (R line Adishakti)	0.03	0.03
15	VNMKV, Parbhani	AUBI 1101 (R line AHB 1200)	0.07	0.07
16	ICRISAT, Patancheru	ICMA 98222 (A line AHB 1200)	0.14	0.14
17	ICRISAT, Patancheru	ICMB 98222 (B line AHB 1200)	0.07	0.07
18	ICRISAT, Patancheru	ICMA 04888 (A line HHB 299)	0.14	0.14
19	ICRISAT, Patancheru	ICMB 04888 (B line HHB 299)	0.07	0.07
20	ICRISAT, Patancheru	ICMA 94222 (A line HHB 256)	0.20	0.20
21	ICRISAT, Patancheru	ICMB 94222 (B line HHB 256)	0.10	0.10
22	ICRISAT, Patancheru	ICMA 04999 (A line GHB 905 & MPMH 17)	0.32	0.32
23	ICRISAT, Patancheru	ICMB 04999 (B line GHB 905 & MPMH 17)	0.14	0.14
24	ICRISAT, Patancheru	843-22A (A line HHB 67 Imp. , RHB 177 & HHB 226)	0.37	0.37
25	ICRISAT, Patancheru	843-22B (B line HHB 67 Imp., RHB 177 & HHB 226)	0.14	0.14
26	ICRISAT, Patancheru	ICMA 93333 (A line RHB 173)	0.10	0.10
27	ICRISAT, Patancheru	ICMB 93333 (B line RHB 173)	0.05	0.05
28	ICRISAT, Patancheru	ICMA 96666 (A line RHB 223)	0.20	0.20
29	ICRISAT, Patancheru	ICMB 96666 (B line RHB 223)	0.10	0.10
30	JAU, Jamnagar	J-2454 (R line GHB 905)	0.04	0.04
31	HAU, Hisar	HBL-11 (R line HHB 226)	0.02	0.02
32	HAU, Hisar	AC 04/13 (R line HHB 272)	0.10	0.10
33	HAU, Hisar	H 13/0001 (R line HHB 299)	0.07	0.07
34	HAU, Hisar	H 1305 (R line HHB 256)	0.10	0.10
35	HAU, Hisar	H 77/833-2-202 (R line HHB 67 Imp. & HHB 234)	0.07	0.07
36	HAU, Hisar	HMS 47A (A line HHB 272)	0.20	0.20
37	HAU, Hisar	HMS 47B (B line HHB 272)	0.10	0.10
38	HAU, Hisar	HMS 7A (A line HHB 234)	0.06	0.06
39	HAU, Hisar	HMS 7B (B line HHB 234)	0.02	0.02
40	SKNAU, Jaipur	RIB 192 S/99 (R line RHB 173)	0.05	0.05
41	SKNAU, Jaipur	RIB 494 (R line RHB 177)	0.07	0.07
42	SKNAU, Jaipur	RIB-3135-18 (R line RHB 223)	0.10	0.10
43	AU, Jodhpur	MIR 525-2(R line MPMH 17)	0.10	0.10
44	IARI, New Delhi	MS 411 A (A line Pusa 1201)	0.10	0.10
45	IARI, New Delhi	MS 411 B (B line Pusa 1201)	0.05	0.05
46	IARI, New Delhi	ICMR 07333 (R line Pusa 1201)	0.05	0.05
		Total (B)	**3.63**	**3.63**
		Total (A)+(B)	**9.39**	**9.39**

SESSION – V

VARIETAL IDENTITIFICATION COMMITTEE MEETING

Date: March 22, 2018 Time: 6.00 PM

Proceedings of Varietal Identification Committee Meeting held on 22.03.2018 at 6.00 pm at Meeting Hall, VC Secretariat, AU, Jodhpur.

Varietal Identification Committee Meeting of ICAR-AICRP on Pearl Millet was held on 22 March, 2018 6.00 pm at Meeting Hall, VC Secretariat, Agriculture University, Jodhpur under the Chairmanship of Dr. I.S. Solanki, Assistant Director General (FFC), ICAR, New Delhi. The following committee members were present:

1	Dr. I.S. Solanki, ADG (FFC), ICAR, New Delhi	-Chairman
2	Dr. O.P. Govila, QRT member- Breeding	-Member
3	Dr. B.R. Choudhary, Director Research, AU, Jodhpur	-Member
4	Dr. B.S. Rajpurohit, Dean & Director, AU, Jodhpur	-Member
5	Dr. R.K. Pannu, QRT member- Agronomy	-Member
6	Dr. H.S. Shekhar Shetty, QRT member- Pathology	-Member
7	Dr. B.K. Pareek, General Manager (R&D), Nandi Seeds Pvt. Ltd, Ahmedabad	-Member
8	Sh. Rajendra Singh Area Manager, NSC , Jodhpur	-Member
9	Sh. Punam Chand, Deupty State Seed Certification Officer, RSSCA, Jodhpur	-Member
10	Dr. C Tara Satyavathi, P C (Pearl Millet), ICAR-AICRP-PM, Jodhpur	-Member Secretary
Principal Investigator		
11	Dr. Vikas Khadelwal, Sr. Scientist, ICAR-AICRP-PM, Jodhpur	- Facilitator
12	Dr. Anil Kumar, Prof. (Agronomy), CCS, HAU, Hisar	- Facilitator
13	Dr. Pokhar Rawal, Assoc. Prof. (Pathology), ICAR-AICRP-PM, Mandor, Jodhpur	- Facilitator

I.S. Solanki 22.3.18

C. Tara Satyavathi 22/3/18

The proposals of 17 hybrids/varieties as per detail given below were discussed:

S. No.	Hybrid/ Variety	Identity	Zone/States/Maturity Group
1	MH 2098	RHB 228	Zone A_1 (Early Maturity)
2	MH 2082	PB 1756	Zone A_1 (Early Maturity)
3	MH 2087	JKBH 1288	Zone A_1 (Early Maturity)
4	MH 2101	BHB 1504	Zone A_1 (Early Maturity)
5	MH 2106	PB 1706	Zone A (Medium Maturity)
6	MH 2114	DHBH 1397	Zone A (Medium Maturity)
7	MH 2107	PB 1720	Zone A (Medium Maturity)
8	MH 2155	MP 7878	Zone A (Late Maturity)
9	MH 2155	MP 7878	Zone B (Late Maturity)
10	MH 2137	HT 415256	Zone B (Late Maturity)
11	MP 570	Pusa Co. 709	Zone A (Population)
12	MH 2179	HHB 311	Zone A_1, A & B (High Fe & Zn) of Rajasthan, Gujarat, Haryana, Punjab, Delhi, Maharashtra, Tamil Nadu
13	MH 2174	RHB 234	Zone A_1, A & B (High Fe & Zn) of Rajasthan, Gujarat, Haryana, Punjab, Delhi, Maharashtra, Tamil Nadu
14	MH 2185	AHB 1269	Zone A_1, A & B (High Fe & Zn) of Rajasthan, Gujarat, Haryana, Punjab, Delhi, Maharashtra, Tamil Nadu
15	MH 2173	RHB 233	Zone A_1, A & B (High Fe & Zn) of Rajasthan, Gujarat, Haryana, Punjab, Delhi, Maharashtra, Tamil Nadu
16	MSH 312	PB 1728	Summer growing Areas of Rajasthan, Gujarat, Punjab, UP, Maharashtra, Tamil Nadu
17	MSH 315	JKBH 1486	Summer growing Areas of Rajasthan, Gujarat, Punjab, UP, Maharashtra, Tamil Nadu

The Committee took the following decision:

Zone A_1 (Early maturity) (Drier part of Rajasthan, Gujarat and Haryana)

The hybrid MH 2082 (PB 1756) recorded 11 to 26.7 percent higher grain yield and superiority in dry fodder yield over the checks and was also found resistant to downy mildew, blast, smut and ergot. Hence, it was identified for release.

Zone A (Medium maturity) (Rajasthan, Gujarat, Haryana, UP, MP, Punjab and Delhi)

The two hybrids MH 2114 (DHBH 1397) and MH 2107 (PB 1720) were identified for release. Both of them recorded superiority in grain yield and dry fodder yield as compared to all checks and found resistant to downy mildew, blast, rust, smut and ergot.

Zone A (Late maturity) (Rajasthan, Gujarat, Haryana, UP, MP, Punjab and Delhi)

The hybrid MH 2155 (MP 7878) was identified for release in this zone. It recorded 4.9 to 17.6 percent higher grain yield over the checks. In addition, it was also found resistant to downy mildew, blast, smut, rust and ergot.

J. S. Sandhu
22.3.18

C. Tara Satyavathi
22/3/18

High Iron and Zinc hybrids for the state of Rajasthan, Gujarat, Haryana, Punjab, Delhi, Maharashtra, Tamil Nadu of Zone A_1, A & B

Four hybrids, viz., MH 2179 (HHB 311), MH 2174 (RHB 234), MH 2185 (AHB 1269) and MH 2173 (RHB 233) were found superior in Iron and Zinc content along with grain yield and also found resistant to diseases. Hence, these were identified for release.

The list of identified hybrids/varieties is as per detail given below:

1	MH 2082	PB 1756	Zone A_1 (Early Maturity)
2	MH 2114	DHBH 1397	Zone A (Medium Maturity)
3	MH 2107	PB 1720	Zone A (Medium Maturity)
4	MH 2155	MP 7878	Zone A (Late Maturity)
5	MH 2179	HHB 311	Zone A_1, A & B (High Fe & Zn) of Rajasthan, Gujarat, Haryana, Punjab, Delhi, Maharashtra, Tamil Nadu
6	MH 2174	RHB 234	Zone A_1, A & B (High Fe & Zn) of Rajasthan, Gujarat, Haryana, Punjab, Delhi, Maharashtra, Tamil Nadu
7	MH 2185	AHB 1269	Zone A_1, A & B (High Fe & Zn) of Rajasthan, Gujarat, Haryana, Punjab, Delhi, Maharashtra, Tamil Nadu
8	MH 2173	RHB 233	Zone A_1, A & B (High Fe & Zn) of Rajasthan, Gujarat, Haryana, Punjab, Delhi, Maharashtra, Tamil Nadu

Dr. I.S. Solanki 22.3.18

Chairman

Dr. C. Tara Satyavathi 22/3/18

Member Secretary

SESSION – VI

PLAN OF WORK 2018-19

A. CROP IMPROVEMENT (PLANT BREEDING)

Chairman	:	Dr. P. Raghava Reddy Chairman QRT	**Co-Chairman**	: Dr. I.S. Solanki, ADG (FFC), ICAR Dr. O.P. Govila, QRT Member Dr. C Tara Satyavathi Project Coordinator, ICAR-AICRP on Pearl Millet, Jodhpur
			Rapporteur	: Dr. Vikas Khadelwal, Sr. Scientist, ICAR-AICRP-PM, Jodhpur Dr. L.D. Sharma, Professor, ICAR-AICRP-PM, RARI, Jaipur
Date	:	23 March, 2018	**Time**	: 9.30 AM

FORMULATION OF TECHNICAL PROGRAMME FOR 2018-19
PLANT BREEDING

Organization of trials

Note: The HT (Fe & Zn) trial is discontinued from kharif 2018.

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 ≥32 ppm 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 2018 Zone A_1 and A

S. No.	**Advanced Hybrid & Population Trial (E) Zone** A1	**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**
	Nil	1	MH 2354
		2	MH 2359
			AHT I (L) A to AHT II (L) A
		3	MH 2267
	PT A to AHPT I (E)		**Checks**
	Nil	4	86M86
		5	KBH 108
	AHPT I (E) to AHPT II (E)	6	MP-7792
1	MH 2192 + 20 EDV		
	Checks		
2	HHB 67 (Imp.)		
3	RHB 177		
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
			PT I A to PT II A
		1	MP 577
		2	MP 579
	AHT I (M)A to AHT II (M) A		**+ New entries of PT**
1	MH 2224		**Checks**
2	MH 2228	3	Raj 171
	Checks	4	Pusa Comp. 383
3	MPMH 17	5	JBV 2
4	GHB 905	6	Pusa Comp. 701
5	86M01	7	Dhanshakti
		8	ICMV 221

Entries promoted to next higher stage of testing in kharif/ summer 2018 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**
	Nil		Nil
			AHT I (L) B to AHT II (L) B
	AHT I (M) B to AHT II (M) B		Nil
	Nil		
			Checks
	Checks	1	86M86
1	Pratap	2	Kaveri Super Boss
2	PAC 909	3	86M64
3	NBH 5767	4	NBH 5061
4	86M01		
S. No.	**Summer Hybrid Trial (SHT)**	**S. No.**	**Population Trial Zone B (PT B)**
	SHT to SHT I		**PT B to I PT B**
1	MSH 339		Nil
2	MSH 346		**PT I B to PT II B**
	SHT I to SHT II		Nil
	Nil		**+ New entries of PT**
	+ New entries		**Checks**
	Checks	1	Raj 171
3	86M64	2	ICMV 221
4	Proagro 9444	3	Dhanshakti
5	Nandi 72	4	ICMV 155
		5	Pusa Comp. 612

Table I.1 Details of Centres and Trials to be Conducted During Kharif 2018/Summer 2019 in Zone A_1 and A

LOCATIONS	IHT (E)	IHT (M)	IHT (L)	AHPT (E) & EDV	AHT (M)	AHT (L)	PT	RHVT	SHT
ZONE A_1									
RAJASTHAN									
Mandor (ICAR-AICRP)	*	*	*	*	*	*	*	*	*
Jodhpur (ICAR-CAZRI)	*			*					
Bikaner (SKRAU)	*	*		*	*		*	*	
Fathehpur Shekhawati (SKNAU)	*			*					
Samdari (AUJ)	*			*					
Molasar (Bayer)	*			*					
ARS, Jalore (AUJ)	*			*					
GUJARAT									
Kothara (SDAU)	*	*		*	*				
HARYANA									
Bawal (CCSHAU)	*	*		*	*				
Total Trials Zone A_1	**9**	**4**	**1**	**9**	**4**	**1**	**2**	**2**	**1**
ZONE A									
RAJASTHAN									
Jaipur (SKNAU)		*	*		*	*	*	*	
Tabiji (SKNAU)		*			*				
Alwar (Pioneer)			*		*	*			
Behrod (Bayer)		*	*		*				
GUJARAT									
Talaja (JAU)		*			*				
Anand (AAU)		*	*		*	*			*
Jamnagar (JAU)		*	*		*	*	*	*	*
S.K.Nagar (SDAU)		*	*		*	*			*
Ahmedabad (Nandi)		*	*						*
Dehgam (Metahelix)		*				*			*
Deodar (Bayer)									*
Dhanera (J K Seed)					*	*			
Kheda (Shakti Vardhak)									*
UTTAR PRADESH									
Eglas (Bioseeds)			*						
Agra (Krishna)			*						*
Aligarh (Hytech)		*	*						
Hathras (Ganga Kaveri)			*		*				
HARYANA									
Hisar (CCS,HAU)		*	*		*	*	*	*	
Shikohpur (ICAR-IARI-KVK)					*				
MADHYA PRADESH									
Gwalior (RVSKVV)		*	*		*	*	*	*	
Morena (RVSKVV)					*		*		
PUNJAB									
Ludhiana (PAU)		*	*		*	*	*		*
DELHI									
New Delhi (ICAR-IARI)		*			*		*		
Assam									
Jhorhat (AAU)								*	
Gossaingaon (AAU)								*	
Total Trials Zone A		**14**	**14**	**-**	**16**	**10**	**7**	**6**	**9**

Table I.1 Details of Centres and Trials to be Conducted During Kharif2018 /Summer 2019 in Zone B

LOCATIONS	IHT (M)	IHT (L)	AHT (M)	AHT (L)	PT	RHVT	SHT
MAHARASHTRA							
Auarangabad (NARP)	*	*	*	*	*	*	*
Auarangabad (Ajeet Seed)			*	*			
Niphad (MPKV)			*	*	*		
Dhule (MPKV)	*	*	*	*	*	*	*
Jalna (Mahyco)	*		*				
Pachora (Nirmal Seed)	*	*					*
Buldana (Dr. PDKV)	*	*	*	*			
Malkapur (Ankur Seed)		*					
KARNATAKA							
Vijayapur (UAS Dharwad)	*	*	*	*	*	*	
Malnoor (UAS, Raichur)	*		*		*	*	
Dharwad (KSSC Ltd)	*						
ANDHRA PRADESH							
Ananthapuram (ANGRAU)	*	*	*	*	*	*	
Palem (PJTSAU)	*		*		*	*	
Hyderabad (Nuziveedu)		*		*			
Wargal (Kaveri Seed)		*					
Medchal (Ganga Kaveri)		*		*			
Perumallapalle (ANGRAU)	*						
Vizianagaram (ANGRAU)			*	*			
TAMIL NADU							
Coimbatore	*	*	*	*	*	*	*
Total Trials Zone B	**12**	**11**	**12**	**11**	**8**	**7**	**4**

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 approved for testing in initial trial kharif 2018 /summer 2019

S. No.	Organization/Institution	Name of Entries				
		IHT (E)	IHT (M)	IHT (L)	PT	Summer
1	ICAR-AICRP-PM, RARI, SKNAU, Jaipur	RHB-256	RHB-259	RHB-262	RCB-30	
		RHB-257	RHB-260	RHB-263		
		RHB-258	RHB-261			
2	ICAR-AICRP-PM, MPKV, Dhule		DHBH 16152	DHBH 1711		DHBH 1389
			DHBH 1760	DHBH 1712		
				DHBH 1713		
3	ICAR-AICRP-PM, SKRAU, Bikaner	BHB 1801	BHB 1806			
		BHB 1802	BHB 1807			
		BHB 1803				
		BHB 1804				
		BHB 1805				
4	ICAR-AICRP-PM, JAU, Jamnagar	GHB 1257	GHB 1260	GHB 1214		GHB 1260
		GHB 1258	GHB 1261	GHB 1225		GHB 1263
		GHB 1259	GHB 1262	GHB 1255		
				GHB 1256		
5	ICAR-AICRP-PM, CCS HAU, Hisar	HHB 330	HHB 336	HHB 333		
		HHB 331	HHB 337	HHB 334		
		HHB 332	HHB 338	HHB 335		
6	ICAR-AICRP-PM, PAU, Ludhiana			PHB 3381	GBL 1	
7	ICAR-IARI, New Delhi		Pusa 1801		Pusa Composite 718	
			Pusa 1802		Pusa Composite 719	
			Pusa 1803			
8	ICAR-AICRP-PM, TNAU, Coimbatore		TNBH 1618	TNBH 1605		TNBH 1514
			TNBH 16335	TNBH 16307		TNBH 1525
9	ICAR-AICRP-PM, RVSKVV, Gwalior		RVBH 15-35			
10	ICAR-CAZRI, Jodhpur	CZH-246	CZH-249			
		CZH-247	CZH-250			
		CZH-248	CZH-251			
11	Centre for Crop Improvement ,SDAU, SK Nagar		GDHB-1			
12	NARP, Aurangabad		AHB-1521	AHB-1520		
			AHB-1398	AHB-1397		
13	ICAR-AICRP-PM , RARS, Vijayapur		VPMH-7	VPMH-8	VPMV-9	
					VPMV-10	
14	Agri. Research station, Buldana		BBH-15-4			
15	Maharashtra State Seeds Corporation, Akola		Mahabeej-160	Mahabeej-1008		
16	Regional Research Station, AAU, Anand					GABH 1612
						GABH 1633
17	Devgen Seeds & Crop Technology (Syngenta)			DB 80198		
				DB 80332		
18	MAHINDRA AGRISOLUTIONS LTD., HYDERABAD			MB-1030		
19	Metahelix Life Sciences Pvt. Ltd., Ahmedabad		MP 7779	MP 7111		
				MP 7288		
20	Nuziveedu Seeds Pvt. Ltd., Secunderabad		NBH 5836	NBH 5929		
			NBH 5837	NBH 5936		
21	Kaveri Seed Co. Ltd., Secundrabad		KBH 105	KBH 103		
22	HI-YIELD AGRI GENETICS Pvt., Ltd., Hyderabad			HYMH 4001		HYMH 4002
				HYMH 4006		
23	Nu Genes Pvt. Ltd., Hyderabad		NU-429	NU-427		NU-431
24	Bayer Bio Science Pvt. Ltd., Hyderabad		PB 1628	PB 1846		PB 1869
			PB 1813	BPM 912		PB 1878
25	Pioneer Overseas Corporation, Hyderabad			86M80		
26	Nirmal Seeds Pvt. Ltd., Pachora (MS)	NPH-4828	NPH-5541			
27	Bisco Bio Sciences Pvt. Ltd., Hyderabad		BLPMH 107			BLPMH 109
			BLPMH 108			
28	Spriha Biosciences Pvt. Ltd., Telangana			S1248		
29	J K Agri Genetics Ltd., Hyderabad		JKBH 1500			
30	Shakti Vardhak Hybrid Seeds Pvt. Ltd., Arya Nagar		SVPMH-80	SVPMH-81		SVPMH-101
31	Hytech Seed India Pvt. Ltd.		HTH 132942	HTH 170510		HTH 170162
			HTH 170712	HTH 170824		
32	Ganga Kaveri Seeds Pvt. Ltd., Hyderabad			GK 1275		
33	Krishna Seed Pvt. Ltd., Agra					KH-207
34	Eco Agriseeds Pvt. Ltd., Hyderabad		Eco-1051	Eco-1908		
35	RASI SEEDS, Pvt. Ltd., Medak			RBX 1845		
				RBX 1854		
36	Karnataka State Seeds Corporation Ltd., Bengaluru		BRBH-16620			
37	Nath Bio-Genes (I) Ltd., Aurangabad			NBBH-27		
	Total	**18**	**44**	**42**	**6**	**15**

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	

Proposed entries for initial trials

IHT (E) A_1: 18	PT A & B Zone : 6
IHT (M) A & B Zone : 44	Summer 2019: 15
IHT (L) A & B Zone : 42	

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 : 3.0 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: 3.500 Kg		AHT Zone B : 3.500 Kg
	PT Zone A: 2.500 Kg		AHPT Zone A_1: 2.500 Kg
	PT Zone B: 2.500 Kg		Summer Hybrid Trial : 2.0 Kg
	HT Fe & Zn: 2.250 Kg		

Seed requirement of checks:

86M86: 10.0 Kg	Kaveri Super Boss: 6 Kg	PAC 909: 10.0 Kg	Raj 171: 7.0 Kg
ICMH 356: 3.0 Kg	RHB 173: 8.0 Kg	GHB 905: 5.0 Kg	Pusa Comp. 383: 5.0 Kg
86M64: 4.0 Kg	MP-7792: 6.0 Kg	86M01: 6.0 Kg	Pusa Comp. 701: 2.0 Kg
GHB 558: 6.0 Kg	NBH 5061: 8.0 Kg	HHB 272: 2.0 Kg	Dhanshakti: 7.0 Kg
HHB 67 Imp.: 4.0 Kg	HHB 223: 2.0 Kg	NBH 5767: 8.0 Kg	Nandi 72 : 2.0 Kg
RHB 177: 7.0 Kg	Pratap: 6.0 Kg	ICMV 155: 3.0 Kg	Proagro 9444: 2.0 kg
GHB 538: 2.0 Kg	MPMH 17: 8.0 Kg	ICMV 221: 6.0 Kg	
KBH 108: 8.0 Kg	MPMH 21: 2.0 Kg	JBV 2: 4.0 Kg	

Seed requirement of Released Hybrids/varieties: 1.5 Kg seed of all national released hybrids/ varieties since 2005 should be sent for RHVT Trial positively

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 2018 for kharif and by 15th January 2019 for summer trials** along with required testing fee of Rs. 60,000 /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**.**

Session ended with vote of thanks to the chair.

PLAN OF WORK 2018-19 FOR CROP PRODUCTION (AGRONOMY AND PLANT PHYSIOLOGY)

Chairman : Dr. R. K. Pannu
Ex. Dean& Emeritus Professor COA
CCSHAU, Hisar and QRT Member

Co-chairman : Dr. Ishwar Singh
Director Extension Education
DEE, AU, Jodhpur

Rapporteur : Dr. Anil Kumar
Principal Scientist (Agronomy)
Bajra Section, CCS HAU, Hisar
Dr. Minakshi Grover, Principal Scientist (Microbiology), ICAR-IARI, New Delhi
Sh. Manoj Kumar
Asstt. Professor (Agronomy)
ICAR- AICRP on PM, Mandor (Jodhpur)
Dr. R.C. Meena
Asstt. Professor (Pl. Physiology)
ICAR-AICRP on PM, Mandor
Dr. Sunita Gupta
Professor (Pl. Physiology)
RARI, Durgapura (Jaipur)

Date : March23, 2018

Time : 12.30 PM

AGRONOMY

Dr. Anil Kumar welcomed the chairman and co- chairman of the session. He apprised them about different agronomical trials being conducted on the aspects of nutrient management, soil conservation, irrigation management and to see the effect of dates of sowing at various centre's during *kharif* and summer seasons of 2017. At the outset, the chairman welcomed the participants in the workshop. The chairman initiated the discussion by describing the importance of bajra as food and feed crop besides as nutricereal in the national scenario. He emphasized that before execution of the new experiment proper planning is of utmost importance. He also shared his experience on the importance of cultivating the pearl millet as organic crop. The Co-chairman suggested that the economics of experiment is very important from farmers point of view. A Total of 70 trials were allotted to different centers and results of 68 trials were reported by the centres with a success rate of 97 per cent. During the deliberations, the following three recommendations were emerged out:

Recommendations Generated:

1. Field experiments carried out for three years (2015-2017) aimed to see the effect of $FeSO_4$ as foliar application on growth, yield and quality of different pearl millet hybrids revealed that the grain yield was improved to the tune of 30.1, 16.3 and 28.1%, respectively by the best treatment of 0.50% $FeSO_4$ foliar spray at tillering stage (25-30 DAS) over no foliar spray in Zone A_1, Zone A and Zone B.

2. The study carried out for three years (2015-17) with an objective to standardize the irrigation requirement of the summer season grown crop revealed that the application of irrigation at 50 mm CPE recorded maximum grain and stover yield compared to critical growth stages (CGS) and 100 mm CPE treatments whereas the water use efficiency was recorded maximum in 100 mm CPE treatment. Among different summer pearl millet hybrid 86M64 in terms of yield and WUE was best performing as compared to ProAgro 9444 and Nandi 72.
3. Experiment on maximization in the pearl millet productivity under late sown situations (July 25-30 & August 10-15) conducted for three years (2015-2017) exhibited the superiority of the nutrient combination of RDF (RDF of respective zone) + FYM @ 5.0t/ha + NPK (19:19:19) foliar spray @ 0.5% at 20-25 DAS by 35.6, 26.2 & 23.9% in terms of grain yield over RDF alone in Zones A_1, A & B, respectively .

Trials to be continued during 2018-19

- **PMAT 1:** Response of pearl millet advance hybrids and/or populations to different levels of nitrogen.
- **PMAT 2:** Effect of mulching and hydrogel on the productivity of pearl millet under rainfed conditions.
- **PMAT 5:** Performance of pearl millet advance hybrids and/or populations under different sowing dates.

New trial formulated during 2017-18

- **PMAT 3:** Performance of different weed management practices on pearl millet productivity
- **PMAT 4:** Nutrient management through organic sources in rainfed pearl millet

Plant Physiology

As per suggestion of the chairman of the technical programme formulation meeting the trial of PMPHY-4 will be conducted under trench method instead of PVC tubes and if experiment is planted in PVC tubes there should be need to measure bulk density of soil.

Trials to be continued during 2018-19 in Plant Physiology

- PMPHY 1: Screening of advance summer hybrids against moisture stress
- PMPHY 2: Characterization for drought tolerance in pearl millet genotypes
- PMPHY-4: Varietal characterizations in pearl millet on the basis of root shoot traits

- PMPHY-5: Physiological mechanism of drought tolerance in pearl millet at early seedling stage
- PMPHY: 6 Manipulation of source- sink relationship in pearl millet through growth retardants
- PMPHY 7: Identification of heat stress tolerance in pearl millet genotypes at seedling stage in pearl millet

TECHNICAL PROGRAMME FOR 2018-19

PMAT 1: Response of pearl millet advance hybrid entries to N Levels

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

a) Performance of advance hybrids or populations to nitrogen levels in Zone A_1

Year of Start	: 2018
Nitrogen levels (4)	: 0, 20, 40 & 60 kg N/ha
Hybrids (1+3 check)	: MH 2192, MPMH 21, HHB 272 & RHB 177 (c)
Design	: Split plot (Nitrogen in main plot and entries in sub-plots)
Replications	: Three
Plot size	
Gross	: 5.00 m x 4.00 m
Net	: 4.00 m x 3.60 m
Locations	: Bikaner and Mandor

b) Performance of advance medium and late maturing hybrids or populations to nitrogen levels in Zone A

Nitrogen levels (4)	: 0, 30, 60 & 90 kg N/ha
Hybrids (3+3 check)	: MH 2267, MP 577, MP 579, MPMH 17 (c), KBH 108 (c) & Pusa Composite 383 (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, New Delhi, Hisar and Jamnagar

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: The following soil properties of the field will be recorded before layout of the experiment: Soil texture, pH, EC, available nitrogen, available phosphorus and available potash.

PMAT 2: Effect of mulching and hydrogel on the productivity of pearl millet under rainfed conditions

Objective: To find out the effect of mulching and hydrogel on the productivity and water use efficiency of pearl millet

*To find out the effect of different treatments on microbial activity in the soil (at Mandor and New Delhi)

Year of Start	:	2017
Treatment		T_1 : Control T_2 : Crop residue mulch @ 5.0 t/ha T_3 : Hydrogel @ 2.5 kg/ha T_4 : Hydrogel @ 5.0 kg/ha T_5 : Hydrogel @ 7.5 kg/ha T_6 : T_2 + Hydrogel @ 2.5 kg/ha T_7 : T_2 + Hydrogel @ 5.0 kg/ha T_8 : T_2 + Hydrogel @ 7.5 kg/ha
Locations	:	Bikaner and Mandor (Zone A_1) Jaipur, Hisar, Jamnagar, and New Delhi (Zone A) Aurangabad, Dhule, Vijayapur & Coimbatore (Zone B)
Entries	:	Zone A_1: MPMH 17, Zone A: RHB 173 and Zone B: GHB 558
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. Water use efficiency (kg/ha-cm)
9. Economics
10. *Soil Microbial biomass C
11. *Soil enzymes (Urease, Dehydrogenase, Acid Phosphatase and Alkaline Phosphatase)
12. *Fungal, Bacterial and Actinomycetes counts
13. Economics

* (at Mandor, Hisar and New Delhi only)

PMAT 3: Performance of different weed management practices on pearl millet productivity

Objective: To find the optimum dose of Tembotrione (Post emergence herbicide) on yield, weed flora and their economics

Year of Start : 2018

Treatment

T_1 : Weedy check
T_2 : Weed free
T_3 : Two hand weeding 3 and 5 weeks after sowing
T_4 : Pre emergence application of Atrazine @ 400g. a.i./ha. followed by one weeding at 3-4 weeks after sowing
T_5 : Tembotrione 42% SC @ 90g. a.i./ha at 3-4 leaf stage of weeds
T_6 : Tembotrione 42% SC @ 100g. a.i./ha at 3-4 leaf stage of weeds
T_7 : Tembotrione 42% SC @ 110g. a.i./ha at 3-4 leaf stage of weeds
T_8 : Tembotrione 42% SC @ 120g. a.i./ha at 3-4 leaf stage of weeds

Locations : Bikaner and Mandor (Zone A_1)
Jaipur, Hisar, Jamnagar and New Delhi (Zone A)
Aurangabad, Dhule, Vijayapur & Coimbatore (Zone B)

Entries : Zone A_1: MPMH 17, Zone A: RHB 173 and Zone B: GHB 558

Design : RBD

Replication : Three

Treatment : Eight

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. Weed intensity at 30 DAS and at harvest
9. Weed dry matter at 30 DAS and at harvest
10. Weed control efficiency at 30 DAS and at harvest
11. Economics of the treatments

Note: Initial physico-chemical properties of the soil (pH, EC, organic carbon and available NPK)

PMAT 4: Nutrient management through organic sources in rainfed pearl millet

Objective: To develop the appropriate technology to realize maximum production

Year of Start : 2018

Treatment
T_1 : Recommended dose of fertilizer
T_2 : Recommended dose of Nitrogen (RDN) through FYM
T_3 : 75 % RDN through FYM
T_4 : Recommended dose of Nitrogen (RDN) through Vermicompost
T_5 : 75 % RDN through Vermicompost
T_6 : T_2 + Biomix (*Azospirillum* + PSB + Mycorrhizae)
T_7 : T_3 + Biomix (*Azospirillum* + PSB + Mycorrhizae)
T_8 : T_4 + Biomix (*Azospirillum* + PSB + Mycorrhizae)
T_9 : T_5 + Biomix (*Azospirillum* + PSB + Mycorrhizae)
RDF : (40 kg N/ha + 20 Kg P_2O_5) for Zone A1 & A
(60 kg N/ha + 30 Kg P_2O_5) for Zone B

Locations : Bikaner and Mandor (Zone A_1)
Jaipur, Hisar, Jamnagar and New Delhi (Zone A)
Aurangabad, Dhule, Vijayapur & Coimbatore (Zone B)

Note :The experiment has to be conducted on the same site for at least 3-4 years

Entries : Zone A_1: MPMH 17, Zone A: RHB 173 and Zone B: GHB 558

Design : RBD

Replication : Three

Treatment : Eight

Plot size :

Gross : 4.00 m x 3.60 m

Net : 4.00 m x 2.70 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. Ear head length (cm)
6. Ear head girth (mm)

7. Test weight (g)
8. Grain yield (q/ha)
9. Dry Fodder yield (q/ha)
10. Protein content (%) in grain

Note: Initial analysis of soil for physico-chemical properties of the soil (pH, EC, organic carbon and available NPK).

PMAT 5: Evaluation of pearl millet advance hybrids under different sowing dates

Objectives: To find out the comparative performance of advance pearl millet entries under staggered sowings.

Year of Start : 2017

a) Performance of advance hybrids under different sowing dates in zone A_1

Sowing dates (3)	: July 5-10, July 20-25 and August 5-10
Hybrids (1+3 check)	: MH 2192, MPMH 21, HHB 272 & RHB 177 (c)
Design	: Split plot (Date of sowing in main plot and entries in sub-plots)
Replications	: Four
Plot size	
Gross	: 5.00 m x 4.00 m
Net	: 4.00 m x 3.60 m
Locations	: Bikaner and Mandor

b) Performance of advance medium and late maturing hybrids under different sowing dates in zone A

Sowing dates (3)	: July 5-10, July 20-25 and August 5-10
Hybrids (3+3 check)	: MH 2267, MP 577, MP 579, MPMH 17 (c), KBH 108 (c) & Pusa Composite 383 (c)
Design	: Split plot (Date of sowing in main plot and entries in sub-plots)
Replications	: Four
Plot size	
Gross	: 5.00 m x 4.00 m
Net	: 4.00 m x 3.60 m
Locations	: Jaipur, Hisar and Jamnagar

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: Recommended dose of N and P under rainfed situation in respective zones will be applied and similarly the soil properties as in PMAT 1 will be analyzed.

TECHNICAL PROGRAMME 2018-19 PLANT PHYSIOLOGY

PMPHY 1: Screening of advanced summer hybrids against moisture stress

Objectives: Screening of advance summer hybrids to terminal stress
Year of Commencement **:** 2014
Location **:** Jamnagar and Mandor
Season **:** Summer
Treatment:

a. Irrigated control
b. Terminal stress (Flowering to maturity) after boot leaf stage

Design: Factorial RBD **Replication** **:** Three
Spacing **:** 50 X 10 cm **Plot size** **:** 2 Rows of 4 M length
Fertilizer **: : AS per PoP**
Observations:

1. Chlorophyll content at flowering stage (on 3rd leaf)
2. Relative water content (%) at flowering stage
3. Leaf area (cm) at maturity
4. Seed setting %
5. Days to 50% flowering
6. Grain yield (kg/ha)
7. Productive tillers/plant
8. Test weight (g) (1000 grains)
9. Threshing percentage
10. Fodder yield (q/ha)
11. Harvest index (%)
12. Days to Maturity
13. Ear head weight (kg/ha)

PMPHY 2: Characterization for drought tolerance in pearl millet genotypes

Objectives: To identify donor parents for crossing programme

Year of Commencement **:** 2014
Location **:** Jamnagar and Mandor (summer)
Treatment **:** 20 inbred (R lines and B lines)
Design: RBD **Replication** **:** Three
Spacing **:** 50 cm X 10 cm **Plot size** **:** 4 Rows of 2 M length
Fertilizer **: AS per PoP**

Observations:

1. Chlorophyll content at flowering stage (on 3rd leaf)
2. Relative water content (%) at flowering stage
3. Leaf area (cm) at maturity
4. Seed setting %
5. Days to 50% flowering
6. Grain yield (kg/ha)
7. Productive tillers/plant
8. Test weight (g) (1000 grains)
9. Threshing percentage
10. Fodder yield (q/ha)
11. Harvest index (%)
12. Days to Maturity
13. Ear head weight (kg/ha)

PMPHY-4: Characterizations in pearl millet hybrids on the basis of root shoot traits

Location **:** Mandor, Jaipur and Jamnagar
Year of Commencement **:** Kharif-2014
Replication **:** four **Design :** CRD in pipes and RBD in field
Treatments **:** HHB 67 Improved, RHB 177, RHB 173, GHB 558 and GHB 538 (Released hybrids of A and A_1 zone of India)

Five selected genotypes will be grown in PVC tubes (approx 4 inch diameter and 1.0 m Height), each containing one plant. PVC tubes will be filled up with soil/vermiculite (1:2) ratio and will be irrigated before sowing the seed. All PVC tubes will be kept inside a trench filled with cereal straw. After 60-65 days each tube will be kept out and cut longitudinally to expose the soil without disturbing the plant. Soil mixture will be removed from root surface by flow of water till all intact roots will appear. Photographs will be taken for each genotype before taking observations.
In order to maintain the natural bulk density of soil, the plants will be raised in trenches and the roots will be dug out from trenches after 60 days of sowing.

Observations:

1. Shoot length (cm)
2. Root length (cm)
3. Shoot fresh Weight (g)
4. Root fresh Weight (g)
5. Shoot dry matter (g)
6. Root dry matter (g)
7. Root - shoot Ratio
8. Bulk density of soil samples

Field Trial Observations
Observations:

1. Days to 50% flowering
2. Grain yield (kg/ha)

3. Grain yield (kg/ha)
4. Productive tillers/plant (no)
5. Test weight (g) (1000 grains)
6. Fodder yield (q/ha)
7. Harvest index (%)
8. Days to Maturity
9. Bulk density

PMPHY-5: Physiological mechanism of drought tolerance in pearl millet at early seedling stage

Objectives: To identify drought tolerant genotypes of pearl millet at seedling stage

Location **:** Jaipur, Mandor and Jamnagar
Season **:** Laboratory trial (*Kharif*)
Year of commencement **:** 2014
Replication **:** Three **Design:** CRD
Genotypes **:** (Advance hybrids of A and A_1 zone of India)
Treatment **:** Control, PEG 5% and PEG 10%
Observation time **:** 15 day after sowing.
Observations:

1. Root length (cm)
2. Shoot length (cm)
3. Seedling dry weight (g)
4. Membrane stability index (%)
5. Relative water content (%)
6. Chlorophyll content (mg/g f. wt.)
7. Antioxidants- catalase ($min^{-1}g\text{-}^{1}f.$ wt)
8. Germination percentage 15 DAS
9. Seedling vigour

PMPHY: 6 Manipulation of source- sink relationship in pearl millet through growth retardants

Objectives: To enhance the partitioning efficiency for increasing yield in pearl millet.

Location **:** Jaipur, Mandor and Jamnagar
Season **:** *Kharif*
Year of commencement **:** 2015 Modified 2017
Fertilizer **:** As per PoP
Treatment:

(a) Foliar spray (20-25 DAS) at tillering and pre-anthesis (40-45) stages.

T1- Untreated control
T2- CCC (chloromequet chloride) – 250 ppm
T3- CCC (chloromequet chloride) – 500 ppm
T4- CCC (chloromequet chloride) – 750 ppm
T5- Mapiquet chloride (MC) – 250 ppm
T6- Mapiquet chloride (MC) – 500 ppm
T7- Mapiquet chloride (MC) – 750 ppm

(b) Entry **:** RHB 173 **Replication** **:** Four
Design **:** RBD **Spacing** **:** 50 X 10 cm
Plot size Gross : 4 Rows of 5 M length
Net : 2 Rows of 5 M length

Observations:

1. Chlorophyll content at flowering stage (mg/g f. wt.)
2. Relative water content (RWC) at flowering stage (%)
3. Specific leaf weight at flowering stage (g)
4. Seed setting %
5. Grain yield (kg/ha)
6. Days to 50% flowering
7. Productive tillers/plant (no)
8. Test weight (g) (1000 grains)
9. Fodder yield (q/ha)
10. Harvest index (%)
11. Days to Maturity
12. Plant height

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

Objectives

i) To identify heat stress tolerance mechanism in pearl millet at seedling stage.
ii) To identify physio-biochmecal parameters for identification of heat stress tolerance mechanism in pearl millet

Location **:** Jaipur and Mandor
Season **:** Laboratory trial (*Kharif*)
Year of commencement **:** 2017
Entries: Study material : Parental line(A and B lines) of pearl millet (15-20) **Replication** **:** Four **Design** **:** CRD

(a) Temperature - 20 DAS
T1 40 ^{o}C
T2 44 ^{o}C
T3 46 ^{o}C

Observations:

Growth parameters – 25 DAS

1. Seedling length,
2. Seedling dry weight, root;
3. shoot ratio,
4. seedling vigour index

Physiological parameters

1. Relative Water Content
2. Membrane stability index
3. Chlorophyll content

Anti-oxidants

1. Superoxide dismutase
2. Catalase,
3. Malondialdehyde content

The following scientists attended the meeting and actively participated in the discussions:

1. Dr. R. K. Pannu, Ex. Dean & Emeritus Professor cum QRT Member, Department Agronomy, CCS HAU, Hisar (Haryana)
2. Dr. Ishwar Singh, Director Extension Education, DEE, Agriculture University, Jodhpur
3. Dr. P.S. Shekhawat, ZDR & Professor (Agronomy), ARS, SKRAU, Bikaner
4. Dr. Anil Kumar, Principal Scientist (Agronomy), Bajra Section, CCS HAU, Hisar
5. Dr. Minakshi Grover, Principal Scientist (Microbiology),ICAR-IARI, New Delhi
6. Dr. R.S. Bana, Scientist (Agronomy), IARI, New Delhi
7. Dr. Babar Sadhana Ramchandra, Scientist (Agronomy), RARS, Bijapur, UAS, Dharwad
8. Dr. P.P. Girase, Asstt. Professor, (Agronomy), AICRP-PM, Dhule
9. Dr. Dinesh M. Lomte, Agronomist, NARP, Aurangabad
10. Dr. R.C. Meena, Asstt. Prof. (Plant Physiology), AICRP-PM, Mandor, Jodhpur
11. Dr. G. Guru, Assistant Professor (Agronomy), TNAU, Coimbatore
12. Dr. H. M. Bhuva, Associate Research Scientist, JAU, Jamnagar
13. Mr. Manoj Kumar, Assistant Professor (Agronomy), ICAR-AICRP on Pearl Millet, Agriculture University, Jodhpur
14. Dr. Krishna Saharan, Assistant Professor (Microbiology), Agriculture University, Jodhpur
15. Dr. Sunita Gupta, Professor (Plant Physiology), RARI (SKNAU), Jaipur (Raj.)
16. Dr. N.K. Gupta, Professor (Plant Physiology), RARI (SKNAU), Jaipur (Raj.)

The session ended with vote of thanks to the Chairman and Co-chairman.

PLAN OF WORK 2018-19 FOR CROP PROTECTION

Chairman	: Prof H. Shekhar Shetty, QRT member (Plant Pathology)	**Co-Chairman**	:	Dr. C. Tara Satyavathi, PC, ICAR-AICRP ON Pearl Millet, Mandor Jodhpur
	: Dr I. S. Solanki, ADG, (FFC), ICAR- New Delhi			
		Rapporteur	:	Dr. P. Rawal Associate Professor (Plant Pathology)AICRP- PM, Mandor Dr. R.K. Juneja, Asstt. Res. Sci.), JAU, Jamnagar
Date	: March 23, 2018	**Time**	:	12.15 PM

At the outset Dr. P. Rawal welcomed the Chairperson & QRT member (Plant Pathology) Prof. H. S. Shetty, Dr. I. S. Solanki, ADG (FFC), ICAR, New Delhi and Co-Chairperson Dr. C. Tara Satyavathi, PC, ICAR-AICRP on Pearl Millet, Mandor Jodhpur (Rajasthan). The Chairperson discussed various technical aspects on pathological and entomological trials and emphasized to create the facilities for artificial screening of diseases at each locations.

Pathology group concluded two experiments and made recommendations:

1. **Evaluation of Integrated Disease Management (IDM) Module:** Application of different bioagents *i.e, Pseudomonas fluorescens, Bacillus subtilis, Trichoderma viride, Trichoderma harzianum* @ 8g/kg seeds and a new chemical Ametoctradin + Dimethomorph @ 0.4ml/500ml water managed the downy mildew disease to some extent.

2. **Management of Pearl millet blast (*Pyricularia grisea*) using fungicides:** Spray application of Trifloxystrobin + Tebuconazole-75WG @ 0.05% first at initiation of disease and 2nd spray at 15 days interval significantly reduced the blast incidence in grain and fodder pearl millet.

TECHNICAL PROGRAMME FOR KHARIF / SUMMER – 2018-19

PATHOLOGY

The group discussed regarding the acceptability of new genotypes for diseases, the following criteria finalized during 52nd group meeting were discussed and continued for the year 2018-19.

Downy mildew: Up to 5% downy mildew incidence under sick plot condition must be considered for varietal promotion.

Smut: Up to 20% smut severity under artificial inoculation must be considered for varietal promotion.

Ergot: Up to 20% ergot severity under artificial inoculation must be considered for varietal promotion.

Blast: It was opined by the group to submit the data using 0-9 scale. Up to the Scale 3 for blast be considered for promotion of genotypes: Considered for varietal promotion under the category of resistance in case of natural infection.

Rust: The group concluded to have the observations of rust disease during hard dough stage and genotypes having rust up to 20% must be considered for promotion.

Chairperson also discussed about various trials to be conducted at different AICRP/Co-operating centres and emphasized on creation of facilities for artificial inoculation or sick plot techniques for screening of blast disease at each location.

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
II. Smut and Ergot: to be inoculated artificially
III. Rust and Blast: Natural disease incidence till facilities for artificial screening or sick plot are created.

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.

PMPT IV A: Characterization of pathogen diversity in downy mildew of pearl Millet.

1. Pathogenic diversity analysis by virulence nursery

Downy Mildew :

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

Smut

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

Blast

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

Rust

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

Ergot

Location : Zone A
Jaipur
Zone B
Aurangabad, Dhule and Coimbatore

PMPT IV B: Basic research: Molecular characterization of R and AVR gene in Pearl Millet Downy Mildew system and develop markers for utilization in breeding for DM resistance.

Location : Mysore

PMPT IV C: Characterization of pathogenic variability in Pearl Millet blast pathogen

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

PMPT V: Management of downy mildew by using organic practices

Treatments:

1. *Trichoderma harzianum* formulation (JAU @ 8g/kg) (Jamnagar centre will supply)
2. PSB formulation (PSB @8g/kg) (Mysore centre will supply)
3. Neem oil (3%) (Mandor centre will supply)
4. Metalaxyl 35SD (6g/Kg) (Mandor centre will supply)
5. Control

Replication: 4 (4 rows in 5 meter length)

Observation to be recorded:

a) Seedling emergence
b) Per cent Downy Mildew Incidence at 30 and 60 DAS
c) Grain and Fodder Yield

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

PMPT VI: Monitoring of Pearl Millet diseases at Farmer's field

Locations: All AICPMIP centres in their respective zones

Method: Record survey information by preparing chart listing field number, location, cultivar/area, crop stage (F and SDS), disease incidence and remarks.

Collect the infected leaves samples of highly susceptible cultivars of downy mildew and blast samples for pathogen characterization. The samples should to be sent to the project coordinator, Mandor, Jodhpur.

NOTE: - Observations to be recorded on all prevalent diseases in the area with rainfall, relative humidity (%), temperature using standard meteorological weeks and GPS data.

PMPT VII: Disease screening trial of pearl millet hybrids in summer

Locations: Anand, Jamnagar and Coimbatore

ENTOMOLOGY

Recommendation-Information:

On the basis of 4 years study regarding yield losses in pearl millet due to insect-pest complex it is revealed that there is a loss of 27.59% in grains and 21.75% in fodder. Hence, it is suggested to take appropriate recommended management measures in pearl millet to avoid considerable losses.

Technical Programme for *Kharif*-2018

1. PMET-1a: Screening of pearl millet lines against major insect pest (Advanced entries)

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

Location: Jamnagar & Jaipur

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

Row length: 3.0 m and **Spacing:** 50 x 15 cm. **No. of entries: Pearl millet lines to be provided by Project Coordinator.**

Observations to be recorded:

1. **Shoot fly** – Per cent infestation at 28 DAG (Vegetative stage) and ear head stage.
2. **Stem borer** – Per cent plant damage at 28 DAG (Vegetative stage) and at ear head stage.
3. ***Helicoverpa*** larvae – Number of larvae/ 5 ear heads.
4. **Grey weevil** – Damage score (0-10) and number of grey weevil adults/ 5 plants.
5. **Leaf roller** – Damage score (0-10) and number of larvae/ 5 plants.
6. **Chafer beetle** – Damage score (0-10) and number of beetles/ 5 ear heads

2. PMET-1b: Screening of pearl millet lines against major insect pest (IHT/Population entries), New trial.

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

Location: Jamnagar & Jaipur

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

Row length: 3.0 m and **Spacing:** 50 x 15 cm. **No. of entries: Promising lines to be provided by Project Coordinator.**

Observations to be recorded:

1. **Shoot fly** – Per cent infestation at 28 DAG (Vegetative stage) and ear head stage.
2. **Stem borer** – Per cent plant damage at 28 DAG (Vegetative stage) and at ear head stage.
3. ***Helicoverpa*** larvae – Number of larvae/ 5 ear heads.

4. **Grey weevil** – Damage score (0-10) and number of grey weevil adults/ 5 plants.
5. **Leaf roller** – Damage score (0-10) and number of larvae/ 5 plants.
6. **Chafer beetle** – Damage score (0-10) and number of beetles/ 5 ear heads

3. PMET-2: Monitoring of major insect pests of pearl millet

Location: Jamnagar, Anand & Jaipur

Objective: To study the population fluctuation of key pests of pearl millet.

Experimental details:

Design: Nil (Observation plot)

Replications: Nil

Spacing: 50 x 15 cm.

Variety: Any released pearl millet hybrid of that zone

Methodology:

- Sowing of released pearl millet variety will be done over an area of 200 m^2 which will be kept free from insecticidal application during crop season.
- 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.
- **Correlation will be worked out between major pest & weather parameters for at least 4-5 years to get clear role of abiotic factors.**

4. PMET-3: Survey of insect- pests of the pearl millet crop on farmers' field.

Location: Jamnagar & Jaipur

Objective: To examine pest status in pearl millet of the region.

Observations to be recorded:

- Survey of insect pests will be carried (minimum 25-50 fields) out at vegetative and ear head stage of bajra crop during *Kharif* season at different locations.
- Incidence of various insect pests infesting pearl millet will be recorded.
- The pest status (major and minor) and magnitude of damage will be worked out.
- The presence of bio-agents will also be recorded.

5. PMET-4: Testing of efficacy of different insecticides against shoot fly and stem borer in pearl millet

Objective: To assess the effectiveness of newer insecticides against shoot fly and stem borer infesting pearl millet.

Location: Jamnagar and Jaipur

Experimental details: Design: RBD, **No. of Replications:** 3, **Treatments:** 9

Gross plot size: 5.0 x 3.6 m, **Net plot size:** 4.0 x 2.4 m and **Spacing:** 50 x 15 cm.

Treatment details:

1) Seed treatment of clothianidin 50 WDG @ 7.5 g/kg seed followed by spray of clothianidin 50 WDG @ 0.025% (5 g / 10 lit.) at 35 DAG.
2) Seed treatment of clothianidin 50 WDG @ 7.5 g/kg seed followed by spray of fipronil 40%+ imidacloprid 40% WG @ 0.04% (5 g/10 lit.) at 35 DAG.

3) Seed treatment of clothianidin 50 WDG @ 7.5 g/kg seed followed by spray of fipronil 5 SC @ 0.01% (20 ml/10 lit.) at 35 DAG.
4) Seed treatment of clothianidin 50 WDG @ 7.5 g/kg seed followed by spray of clorantraniprole 20 SC @ 0.006% (3 ml/10 lit.) at 35 DAG.
5) Seed treatment fipronil 40% + imidacloprid 40% WG @ 2.5g /kg seed followed by spray of clothianidin 50 WDG @ 0.025% (5 g / 10 lit.) at 35 DAG.
6) Seed treatment fipronil 40% + imidacloprid 40% WG @ 2.5g /kg seed followed by spray of fipronil 40%+ imidacloprid 40% WG @ 0.04% (5 g/10 lit.) at 35 DAG
7) Seed treatment fipronil 40% + imidacloprid 40% WG @ 2.5g /kg seed followed by spray of fipronil 5 SC @ 0.01% (20 ml/10 lit.) at 35 DAG.
8) Seed treatment fipronil 40% + imidacloprid 40% WG @ 2.5g /kg seed followed by spray of clorantraniprole 20 SC @ 0.006% (3 ml/10 lit.) at 35 DAG.
9) Untreated control

Methodology and observation to be recorded

1) Per cent shoot fly infestation at 28 DAG (vegetative stage) and ear head stage.
2) Per cent stem borer infestation at 28 DAG (vegetative stage) and ear head stage.
3) Yield and economics of the treatments.
4) N.B.: This experiment will be concluded with the recommendation with residue data without fail.

6. PMET-5: Testing of IPM modules with farmers practice against pest complex of pearl millet.

Objective: To test the effectiveness of IPM modules against major insect pest of pearl millet.

Location: Jamnagar and Jaipur

Experimental details: Design: RBD, **No. of Replications:** 4

Gross plot size: 5.0 x 3.6 m, **Net plot size:** 4.0 x 2.4 m and **Spacing:** 50 x 15 cm.

Treatment details: 6

1. IPM module-I (Seed treatment of imidacloprid 600 FS @ 8.75 ml/kg + removal of shoot fly dead hearts + fish meal trap @ 10/ha + spraying of NSKE 5% at 35 DAG).
2. IPM module-II (Seed treatment of imidacloprid 600 FS @ 8.75 ml/kg + removal of shoot fly dead hearts + fish meal trap @ 10/ha + Spraying of Novaluron 10 EC 0.01% (10 ml/10 litres of water) at 35 DAG) .
3. IPM module-III (Seed treatment of imidacloprid 600 FS @ 8.75 ml/kg + removal of shoot fly dead hearts + fish meal trap @ 10/ha + spraying of *Beauveria bassiana* (2 X 10^6 cfu/g) , 40 g/10 litres of water at 35 DAG).
4. IPM module-IV (Seed treatment of imidacloprid 600 FS @ 8.75 ml/kg + removal of shoot fly dead hearts + fish meal trap @ 10/ha + spraying of Dimethoate 30 EC 0.03 % (10 ml/10 litres of water) at 35 DAG).
5. IPM module-V (Seed treatment of imidacloprid 600 FS @ 8.75 ml/kg + removal of shoot fly dead hearts + fish meal trap @ 10/ha + spraying of *Bt* (15 g/10 litres of water at 35 DAG).
6. Untreated-Control (This plot will be kept 30 m far from this experiment to avoid the effect of fish meal trap)

Methodology and observation to be recorded

1. Per cent infestations of shoot fly at 28 DAG (vegetative stage) and at ear head stage.
2. Per cent infestation of stem borer at 28 DAG (vegetative stage) and at ear head stage.
3. Per cent infestation of grey weevil, termite and white grub at 28 DAG (vegetative stage) and at ear head stage.
4. Larval population of *Helicoverpa* to be recorded on 5 ear heads in each replication.
5. Yield and economics of the treatments.

7. PMET-6: Evaluation of different insecticides as a soil drenching for the management of soil pests (white grub and termite) in pearl millet, Jaipur.

Design: RBD**, Replications:** 3, **Treatment:** 9

***Treatment details:**

1. Imidacloprid 17.8 SL, 60 g a.i./ha.
2. Thaimethoxam 70 WS, 150 g a.i./ha.
3. Fipronil 5 SC, 150 g a.i./h.a
4. Clothianidin 50 WDG, 150 g a.i./ha.
5. Imidacloprid 600 FS, 750 g a.i./ha.
6. Acephate 50% + Imidacloprid 1.8% SP, 1.25 kg/ha.
7. Fipronil 40% + Imidacloprid 40% WG 300 g a.i./ha.
8. Chlorantrainiprole 18.5 SC @ 60 g a.i./ha
9. Untreated- control.

Observations to be recorded: -

- Per cent termite and white grub damage at harvest.
- Yield and economics of the treatments.

8. PMET 7: Survey of insect- pests of summer pearl millet on farmers' field.

Location: Jamnagar (Gujarat)

Objective: To examine pest status in summer pearl millet of the region.

Observations to be recorded:

- At least 25-50 fields will be observed in bajra growing area of Gujarat twice *i.e.* vegetative stage & ear head stage.
- From each field 20 plants will be observed for insect-pests and per cent incidence of shoot fly & stem borer will be worked out.
- Whereas, for other insects, population per 5 plants will be recorded.

9. PMET-8: Relative susceptibility of pearl millet advanced entries to storage insect pests (New trial).

Objective: To find out the resistant/tolerant/ susceptible line against storage insect pests.

Design: CRD**, Replications: 2**, **Treatment/entries:** Approximately 60(Advanced entries)

Methodology & Observations to be recorded:

Two hundred fifty gram seeds of each entry of pearl millet will be taken in plastic container (500 g capacity). Five pairs of adults of ***Tribolium castaneum*** **Herbst (At Jamnagar)** and ***Rhizopertha dominica*** **Fab. (At Jaipur)** will be released in each treatment/entry 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 at the interval of 3 months and total up to 12 months. Observations on average number of adults emerged and average percentage of seeds damaged will be recorded. The data recorded will be subjected to statistical analysis.

Note: The pearl millet seeds will be used from experiment number PMET-1a (Advanced entries) after harvesting of *kharif* trial.

The following scientist attended the session:

1 Dr. H.S. Shetty, QRT Member (Plant Pathology)

2 Dr. P. Rawal, Associate Professor, AICRP-PM, Mandor, Jodhpur

3 Dr. H.R. Bishnoi, Associate Professor, AICRP-PM, Mandor, Jodhpur

4 Dr. Rajan Sharma, Sr. Scientist, ICRISAT, Patancheru

5 Dr.G.P. Jagtap, Plant Pathologist, AICRP-PM (NARP), Aurangabad

6 Dr. S. Chandra Nayak, Prof. University of Mysore, Mysore

7 Dr. Kushal Raj, Asstt. Scientist (Plant Pathology), CCS HAU, Hisar

8 Dr. D.L. Kadavani, Res. Scientist, JAU, Jamnagar

9 Dr. R.P. Juneja, Asstt. Research Scientist, JAU, Jamnagar

10 Dr. V.K. Chaudhari, RRS, AAU, Anand

11 Dr. I. Johnson, Assistant Prof. (Pathology), TNAU, Coimbatore.

12 Dr. R. K. Pandya, Principal Scientist (Pathology),RVSKVV, Gwalior

13 Dr. C.S. Thakare, Asst. Prof (Plant Pathology) MPKV, Dhule, Maharashtra

14 Dr. R.S. Bajiya, STA, RARI, Durgapura, Jaipur

15 Dr. A.C. Mathur, Professor (Plant Pathology), RARI, Durgapura, Jaipur

The session ended with vote of thanks to the Chair and Co-chair.

SESSION VII

REVIEW OF DUS TESTING PROJECT, PROGRESS REPORT 2017-18 AND GENETIC GAINS IN PEARL MILLET

Chairman	**:**	Dr. O.P. Yadav ICAR-CAZRI Jodhpur	**Co-Chairman**	**:**	Dr. O.P. Govila QRT Member
Speakers	**:**	Dr. Vikas Khandelwal Sr.Scientist (GPB), ICAR-AICRP on Pearl Millet, Jodhpur Dr. C. Tara Satyavathi Project Coordinator, ICAR-AICRP on Pearl Millet, Jodhpur	**Rapporteur**	**:**	Dr. P. Sumathi Professor, TNAU, Coimbatore
Date	**:**	March 23, 2018	**Time**	**:**	12:30 PM onward

Dr. Vikas Khandelwal presented report on DUS testing and characterization taken up during 2017-18 at Mandor and Rahuri centres. He mentioned that a total of 199 varieties were tested in these two centres. He also mentioned about the one day training programme organized by AICRP on pearl millet at Jodhpur and the revision of new guidelines for DUS characters in pearl millet. Co-chairman emphasized on farmer's varieties which are very important and could be a very good germplasm accession.

Project Coordinator, Dr. C. Tara Satyavathi, ICAR-AICRP on Pearl millet presented the revised DUS testing guidelines as per review meeting conducted under the chairmanship of Dr. C.L. Gowda. She presented the existing DUS characters and the revised characters with photographs. At the time of interaction, Dr. S.K. Gupta, Principal Scientist, ICRISAT, Hyderabad expressed that the IP lines may not be mentioned in the reference varieties and the example varieties for all the DUS characters are available in the ICRISAT website and that may be included for the purpose. There was an interaction about tip sterility character and it was suggested that it may be considered in different way since there is no floret at the end so it may not be sterile or fertile.

Chairman of the session requested the Project Coordinating Unit to take special efforts to register farmer's varieties under PPV&FRA. He also requested that all the released private and public varieties should be registered under PPV&FRA. Chairman also gave a presentation on "Estimation of Genetic gain in crops". He mentioned that the productivity increased from 240 kg/ha to 1305 kg/ha and the reason could be analyzed whether it may be due to genetics and this was a very good point of discussion at the end of the presentation.

Project Coordinator, Dr. C. Tara Satyavathi and Dr. S.K. Gupta, presented the list of hybrids which are going to be used for the genetic gain studies.

The session ended with the conclusion of the Chairman that additional efforts should be taken to register released varieties/ hybrids under PPV&FRA. To study the genetic gains, less number of hybrids and less number of locations will be considered to get a quality data.

SESSION VIII

PRESENT STATUS OF PEARL MILLET RESEARCH AND NEW INITIATIVE FOR PEARL MILET IMPROVEMENT

Chairperson	**:**	Dr. Balraj Singh Vice Chancellor, AU, Jodhpur	**Co-Chairperson**	**:**	Dr. I.S. Solanki, ADG (FFC), ICAR, New Delhi
			Rapporteur	**:**	Dr. S.P. Singh, Principal Scientist, ICAR-IARI, New Delhi Dr. Pokhar Rawal, Assoc.Prof. (Patho.), ICAR-AICRP on Pearl Millet, Jodhpur Dr. R.K. Solanki, Scientist, ICAR-CAZRI, Jodhpur
Date	**:**	March 23, 2018	**Time**	**:**	2:30 PM onward

This session was chaired and co-chaired by Dr Balraj Singh Hon'ble Vice chancellor Agriculture University, Jodhpur and Hon'ble ADG (FFC) Dr I.S. Solanki, respectively. A total of nine presentations were made in this session. Details of these presentations are given below:

- Dr C. Tara Satyavathi, Project Coordinator, ICAR-AICRP on pearl millet, Jodhpur presented present status of pearl millet research in the country since inception of AICRP on pearl millet. She described global and national distribution of pearl millet, mandates of AICRP on pearl millet, challenges in pearl millet production due to different biotic and abiotic stresses. Project coordinator also emphasized on the use of mechanization in pearl millet. She elaborated about nutritional superiority and constraints in promoting pearl millet as a health food.

- Dr Shelly Praveen, Head Division of Biochemistry, ICAR-IARI, New Delhi elaborated improvement of shelf life in pearl millet. She discussed the nutritional superiority of pearl millet especially about the presence of resistant starch content and chromium in the grain. She also advocated pearl millet value as gluten free cereal having high fibre, Fe, Zn, Vitamin B, folic acid; and about its health benefits for diabetic patients and as baby food. Dr Shelly also described the role of different fatty acids and enzyme causing rancidity in flour and strategies for rancidity management in pearl millet flour.

- Dr Bhaskarachary, Deputy Director, NIN, Hyderabad advocated diversity and use of pearl millet for health benefits. Pearl millet being a nutri-cereal has immense nutritional value and research pertaining to bio-availability of nutrients from various food sources and all this has shown pearl millet as a wonder cereal. The future prospective of research in the direction of breeding pearl millet can be strengthened by having collaboration of NARS with NIN in developing better varieties with high nutritive value which will be better for the consumer's health; which in-turn will increase the crop production and ultimately benefit to the farmers.

- Dr Asha Kawatra, Professor and Dean PG Studies, CCSHAU, Hisar presented the product range of pearl millet developed by the Centre of Excellence on Pearl millet in CCSHAU, Hisar. She explained about the various value additions process and about the activities taken up by the centre for skill development and capacity building for development of pearl millet products.
- Sh Veera Shetty an entrepreneur from Telagana State presented business activities taken up by the NGO 'Swayam Shakti Foundation' and company 'SS Bhavani Foods Pvt Ltd' for the production, marketing and promotion of value added products of pearl millet. The technology for development of the product is provided by IIMR, Hyderabad. He is also working in collaboration with ICRISAT, Hyderabad. They are selling the produce in the country and are also exporting it.
- Dr Rajan Sharma, Pearl Millet Pathologist from ICRISAT briefed about the recent activities taken up by the CG institute on pearl millet blast caused by *Magnaprothe grisea*, this disease has become of high importance in the recent years due to vast occurrence in nearly all pearl millet growing areas of the country. Pathogenic diversity studies have shown the presence of various racial forms of the pathogen. In addition, differential response for resistance has also been observed in pearl millet. The studies on genetic resistance are going on and potential resistance sources are available in the genetic stocks for developing better varieties/hybrids.
- Dr Rakesh Srivastava, Molecular Breeder from ICRISAT highlighted the genomic assisted breeding activities in pearl millet. He gave information on the whole genome sequence published recently, adding on he also provided information on the marker assisted breeding taken up for improvement of popular varieties like HHB 214 and GHB 538 for improvement in disease resistance by introgression of durable genes. He also elaborated about the tagging of QTLs for blast resistance and traits of quality value i.e., Fe/Zn in pearl millet genome. Recent advances were also shared about the development of heterotic gene pools in pearl millet. The genomic information generated is available in NCBI database for reference and future use.
- Dr Balraj Singh, Chairman of the session and Hon'ble Vice Chancellor AU, Jodhpur presented an innovative idea of generation advancement and maintenance breeding in pearl millet by use of protected structures especially in the northern plain. He suggested that naturally ventilated polyhouses can be effectively used in northern plain zones for taking a crop in winter months due to high day temperature and high radiation. Moreover, shade net houses can also be used effectively in summer and kharif season. Protected structures can help in solving the problem of isolation distance in pearl millet genetic advancement strategies. The concept is new and needs to be experimented for up-scaling.

The session ended with the thanks to the Chairman and Co-Chairman.

SESSION – IX

PEARL MILLET GENETIC RESOURCES

Chairman	:	Dr. O.P. Govila, QRT Member	**Co-Chairman**	:	Dr. C. Tara Satyavathi, PC, AICRP on Pearl Millet
			Rapporteur	:	Dr. Dev Vart Yadav, Asstt. Scientist, CCS HAU, Hisar Dr. Supriya, Asst. Prof., ICAR-AICRP-PM, AU,Jodhpur
Date	:	March 24, 2018	**Time**	:	09.30 A.M.

Following presentations were made by respective in charges of the centre as under:

Jaipur	:	Dr. L.D. Sharma
Hisar	:	Dr. Dev Vart Yadav
Aurangabad	:	Dr. N.Y. Satpute
Jamnagar	:	Dr. K.D. Mungra
Vijayapur	:	Dr. Babar Sadhna R.
Coimbatore	:	Dr. P. Sumathi
Gwalior	:	Dr. A.K. Singh
Ludhiana	:	Dr. Ruchika Bhardwaj
Bikaner	:	Dr. P.C. Gupta
Dhule	:	Dr. H.T. Patil

Recommendation made after discussion are as under:

- All the centres should make efforts to collect local landraces and Farmer's varieties, characterize them and submit proposals for PPV&FRA through PC Unit.
- All stations should maintain separate germplasm blocks of inbred lines, CMS lines, restorer lines, etc. during the coming *Kharif* 2018 season.
- Breeders should involve A_4 & A_5 cytoplasm in breeding programme
- The centres having small germplasm should try to enhance their germplasm stock by collection from different sources.
- All the centres are advised to get their trait-specific germplasm characterized and get it registered at NBPGR, New Delhi.
- All the centres should strengthen their own in house breeding programme and develop hybrids based on their own material also.
- Vijayapur centre is advised to send the concerned Plant Breeder to attend Annual Group Meeting.
- The centres should work specifically according to their state/ zone needs. For example, Ludhiana centre should concentrate on germplasm for forage purposes and Bikaner centre should collect more local germplasm related to drought tolerance.

The session ended with thanks to the Chairperson and participant delegates.

SESSION X

REVIEW OF RESEARCH RESULTS, PROGRESS REPORT OF CRP ON BIEFORTIFICATION, ICAR-ICRISAT COLLABORATIVE PROJECTS 2017-18 AND PLAN OF WORK 2018-19

Chairman	**:**	Dr. O.P. Govila QRT Member	**Co-Chairman**	**:**	Dr. C.N. Neerja, Principal Scientist, ICAR-IIRR, Hyderabad
				:	Dr. C. Tara Satyavathi Project Coordinator (Pearl Millet)
			Rapporteur	**:**	Dr. K.D. Mungra, Assoc. Res.Sci., JAU, Jamnagar
Date	**:**	March 24, 2018	**Time**	**:**	12:30 PM onward

In CRP-Biofortification project, the research results, progress made in the year 2017-18 and new technical programme for 2018-19 were presented by following station:

Jaipur	: Presented by Dr. L.D. Sharma
New Delhi	: Dr. S.P. Singh
Jamnagar	: Dr. K.D. Mungra
Hisar	: Dev Vart Yadav
Mandor	: Dr. C. Tara Satyavathi
Dhule	: Dr. H.T. Patil

The discussion were held in details centre-wise and Dr. Neerja has requested to all partners to submit the grain samples for further analysis in NIN lab. The Chairman express his satisfaction over work is being carried out by different station under the project.

The results of ICAR-ICRISAT trials conducted during 2017-18 was presented by Dr. B.R. Beniwal, Senior Technical Assistant, ICAR-AICRP on Pearl millet, Mandor, Jodhpur. He informed that a total of 20 trials were conducted successfully in 17 locations. Based on the results compiled best entries which performed superior of the check entries were also presented for all the trials.

Dr. S.K. Gupta, Principal Scientist, ICRISAT presented 218-19, ICAR-ICRISAT platform work plan for "Pearl millet hybrids for harshest drought prone environments and for new emerging markets". He has also presented the trials to be taken up during 2018-19. He has also presented in details the information about seed parent progeny trials, restorer parent progeny trials, Biofortification trials and other trials to be implemented in the next year. Dr. Rakesh Srivastava, Principal Scientist, ICRISAT presented 2018-19 work plan for Marker assisted breeding trials and nurseries. The session ended with vote of thanks by Chairman.

The finalized list of ICAR-ICRISAT partnership trials to be taken during Kharif 2018 and Summer 2019 are as follows:

Name of the Trial	Entries	Reps	Rows	Locations
Seed Parent Progeny Trials				
1. Promising Seed Parent Trial	60	2	1	New Delhi, Aurangabad, Bikaner, ICAR-CAZRI Jodhpur, Dhule, Hisar, Jamnagar, ICAR-IIMR Hyderabad, Buldana
2. Dwarf, Thick and Compact Panicle B-line Composite			40 rows of 4m	Dhule, Jamnagar
Restorer Parent Progeny Trials				
3. Promising Restorer Parent Trial	60	2	1	New Delhi, Buldana, Aurangabad, Bikaner, ICAR-CAZRI Jodhpur, Hisar, Coimbatore, Ludhiana, Jamnagar, ICAR-IIMR Hyderabad, Dhule, Mandor,
4. Blast Resistant Restorer Composite			40 rows of 4m	Aurangabad, ICAR-CAZRI Jodhpur, Dhule, Gwalior, Ludhiana, Jamnagar, Mandor,
Biofortification Trials				
5. Elite Inbred Joint Biofortification Trial (Consisting of elite inbred lines from AICPMIP partners + ICRISAT)	40-50	2	1	New Delhi, Buldana, Bikaner, CAZRI Jodhpur, Dhule, Hisar, Mandor
6. High-Fe Inbred trials	35-40	2	1	New Delhi, Bikaner, ICAR-CAZRI Jodhpur, Coimbatore, Jamnagar, Mandor
Marker Assisted Breeding Trials				
7. Genomic Selection Trial	300	2	2	Patancheru, Bikaner, Jamnagar, New Delhi, Mandor
8. Downy mildew resistance QTL mapping trial	192	2	2	Jamnagar, Mandor, Mysore
Summer 2019 Trial				
9. New Forage OPVs trial	20	3	6	Buldana, Ludhiana, Hisar

PLENARY SESSION

Chairperson	:	Dr. Balraj Singh, Hon'ble Vice Chancellor, AU, Jodhpur	**Co-Chairperson**	:	Dr. C. Tara Satyavathi, Project Coordinator (Pearl Millet), ICAR-AICRP on Pearl Millet, Jodhpur
Chief Guest	:	Dr. I.S. Solanki, ADG (FFC), ICAR	**Rapporteur**	:	Dr. Vikas Khandelwal, Sr. Scientist (GPB), ICAR-AICRP on Pearl Millet, Jodhpur
Guest of Honour		Dr. R.K. Pannu QRT Member			Dr. P. Sumathi, Professor, TNAU, Coimbatore
Date	:	24th March 2018	**Time**	:	2:00 PM

The recommendations of different sessions were presented by respective rapporteurs of the session. All the observations and recommendations of each session were approved after discussions.

Certificates of appreciation were awarded to various scientists and different ICAR-AICRP (PM) centres, voluntary centres and private organizations for their significant contributions in pearl millet improvement programs as mentioned below:

- Best ICAR-AICRP on Pearl millet Centre (2013-2018) – CCS HAU Hisar
- Best ICAR-AICRP on Pearl millet Centre for 2017-18 – NARP, Aurangabad
- Best Multi Disciplinary Research in Pearl millet (2015-2018) – ICAR-IARI, New Delhi
- Best Private Company involved in Pearl millet Improvement (2013-2018) - DuPont Pioneer
- Best Scientist Award (2017-18) – Dr. K.D. Mungra, JAU, Jamnagar

Dr. I.S. Solanki, ADG (FFC), ICAR was felicitated for his significant contribution and kind support to the various crop improvement programmes.

Chairman expressed his satisfaction for very good scientific presentations and discussions during the workshop.

The session ended with vote of thank to the Chair.