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**Proceedings of the  
46<sup>th</sup> Annual Pearl Millet Workshop**

**of the**

**All India Coordinated Pearl Millet  
Improvement Project**

**Held at**

**CCS Haryana Agricultural University, Hisar  
March 12-14, 2011**



**All India Coordinated Pearl Millet Improvement Project  
(Indian Council of Agricultural Research)  
Jodhpur 342 304**

**[www.aicpmip.res.in](http://www.aicpmip.res.in)**



**46<sup>th</sup> Annual Pearl Millet Workshop**  
**All India Coordinated Pearl Millet Improvement Project**  
**(Indian Council of Agricultural Research)**

**Date: March 12-14, 2011**

**Venue: CCS HAU, Hisar**

**AGENDA**

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**Day 1: March 12, 2011 (Saturday)**

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08.30 – 10.00      **Registration**

10.00 – 11.45    **Inaugural session**  
**Chief Guest**

**Dr. K.S. Khokhar, Vice-Chancellor, CCS HAU, Hisar**

Guests of Honour

Dr. R.P. Narwal, Director Research, CCS HAU, Hisar

Dr. R.P. Dua, Assistant Director General (FFC), ICAR

Welcome Address

Dr. R.P. Narwal, Director Research, CCS HAU, Hisar

Highlights of Research  
Progress 2010-11

Dr. O.P. Yadav, Project Coordinator (Pearl Millet)  
AICPMIP Jodhpur

Remarks by ADG (FFC)

Dr. R.P. Dua

Address by Chief Guest

Dr. K.S. Khokhar, Vice Chancellor, CCS HAU, Hisar

Vote of Thanks

Dr. (Mrs.) S. Khokhar, Dean, College of Agriculture

11.45 – 12.00    Tea Break

12.00-13.00    Special lectures

- Primary processing of pearl millet by Dr. S. Balasubramanian
- Prospects of value-added products of pearl millet with health attributes by Dr. A.K. Singh

13.00-14.00    Lunch Break

14.00-15.00    **Lead lectures**

**Chairman:** Dr. R.P. Dua; **Rapporteur:** Dr. L.K. Chugh

- Disease management in pearl millet by Dr. R.P.Thakur
- Progress in developing pearl millet with high iron and zinc by Dr. K.N.Rai
- Value addition of pearl millet through processing by Dr. Salil Sehgal

15.00-15.15    Tea Break

**Session – I: Review of Research Results of AICPMIP Centres 2010-11 and Plan of Work 2011-12 (Concurrent discipline-wise, centre-wise presentation of significant results and progress report)**

15.15 – 18.00

**Chairperson**

**Co-Chairperson**

**Rapporteur**

Breeding

Dr. R.P. Dua

Dr. K.N. Rai

*Dr. B.S. Rajpurohit*

Agronomy

Dr. A.S. Dhindwal

*Dr. M.S. Rathore*

Pathology

Dr. H.S. Shetty

Dr. S.K. Gandhi

*Dr. H.R. Bishnoi*

Physiology

Dr. Ashok Kumar

*Dr. B.S. Afria*

Entomology

Dr. (Mrs.) S. Khokhar

Dr. R.K. Saini

*Dr. B.L. Tandi*

18.00-19.00	<b>Session: Varietal Identification Committee meeting</b>	
	<b>Chairperson</b>	<b>Dr. R.P. Dua ADG (FFC)</b>
	<b>Member Secretary</b>	<b>Dr. O.P. Yadav, Project Coordinator</b>
		Members and facilitators

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**Day 2: March 13, 2011 (Sunday)**

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**Session – II:**

**Review of Research Results and Progress Report of AICPMIP 2010-11**

09.00- 11.30	<b>Chairperson</b>	<b>Dr. R.P. Dua, ADG (FFC)</b>
	<b><i>Rapporteur</i></b>	<b><i>Dr. H.T. Patil, Dr. Virender Singh Malik</i></b>
	Breeding	Dr. B.S. Rajpurohit
	Agronomy	Dr. M.S. Rathore
	Pathology	Dr. H.R. Bishnoi
	Physiology	Dr. B.S. Afria
	Entomology	Dr. K.L. Raghvani

11.30 – 11.45 **Tea Break**

**Session – III: Review of BSP and DUS Testing Project & Progress Report 2010-11 and Plan of Work 2011-12**

11.45 – 13.00	<b>Chairperson</b>	<b>Dr. J.S. Sandhu, ADG (Seeds)</b>
	<b><i>Rapporteur</i></b>	<b><i>Dr. Y.P. Yadav</i></b>
	Breeder Seed Production	Dr. B.S. Rajpurohit
	Review and Programme	
	DUS Testing Project	Dr. O.P. Yadav

13.00-14.00 Lunch Break

**Session – IV: Review of Research Results & Progress Report of ICAR-ICRISAT Collaborative Projects 2010-11 and Plan of Work 2011-12**

	<b>Chairperson</b>	<b>Dr. R.P. Dua</b>
	<b>Co-Chairperson</b>	<b>Dr. H.P. Yadav</b>
	<b><i>Rapporteur</i></b>	<b><i>Dr. C. Tara Satyavathi</i></b>
	ICAR-ICRISAT Collaborative Projects	Dr. O.P. Yadav, Dr. K.N. Rai, C.T. Hash, S.K. Gupta

15.15 – 15.30 Tea Break

**Session – V: Review of Front Line Demonstrations 2010-11 and Plan of Work 2011-12**

	<b>Chairperson</b>	<b>Dr. J.P. Singh, Director, DMD</b>
	<b><i>Rapporteur</i></b>	<b><i>Dr. Anil Kumar</i></b>
	Frontline Demonstrations	Dr. M.S. Rathore

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**Day 3: March 14, 2011 (Monday)**

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09.00 - 11.00	<b>Session VI: General Issues (Joint Session)</b>	
	<b>Chairperson</b>	<b>Dr. O.P. Yadav</b>
	<b>Rapporteur</b>	<b>Dr. S.K. Gupta</b>
11.00 - 11.15	Tea Break	
11.15 - 14.00	<b>Plenary Session</b>	
	<b>Session-wise Presentation of the Recommendations 2010-11 and Technical Programme of Work 2011-12</b>	
	<b>Chairperson</b>	<b>Dr. R.P. Narwal</b> (Director Research, CCS HAU, Hisar)
	<b>Co-Chairperson</b>	<b>Dr. O.P. Yadav</b> (Project Coordinator, AICPMIP)
	<b>Rapporteur</b>	<b>Dr. B.S. Rajpurohit</b>
	Technical Session I	
	Breeding	Dr. B.S. Rajpurohit
	Agronomy	Dr. M.S. Rathore
	Pathology	Dr. H.R. Bishnoi
	Physiology	Dr. B.S. Afria
	Entomology	Dr. B.L. Tandri
	Technical Session II	Dr. H.T. Patil
	Technical Session III	Dr. Y.P. Yadav
	Technical Session IV	Dr. C.Tara Satyavathi
	Technical Session V	Dr. Anil Kumar
	Technical Session VI	Dr. B.S. Rajpurohit
	Vote of thanks	Dr. H.P. Yadav
14.00 – 15.00	<b>Lunch Break</b>	
15.00 – 17.00	Visits: Fields/ Labs	

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## INAUGURAL SESSION

**March 12, 2011**

Chief Guest	Dr. K.S. Khokhar, Vice-Chancellor, CCS HAU, Hisar
Guests of Honour	Dr. R.P. Narwal, Director Research, CCS HAU, Hisar Dr. R.P. Dua, Assistant Director General (FFC), ICAR
Welcome Address	Dr. R.P. Narwal, Director Research, CCS HAU, Hisar
Highlights of Research Progress 2010-11	Dr. O.P. Yadav, Project Coordinator (Pearl Millet) AICPMIP Jodhpur
Remarks by ADG (FFC)	Dr. R.P. Dua
Remarks by ADG (Seeds)	Dr. J.S. Sandhu
Address by Chief Guest	Dr. K.S. Khokhar, Vice Chancellor, CCS HAU, Hisar
Vote of Thanks	Dr. (Mrs.) S. Khokhar, Dean, College of Agriculture, CCS HAU, Hisar

### Highlights of inaugural session:

- Addressing scientific gathering in inaugural function of the meeting, Dr. K.S. Khokhar, Vice-Chancellor, CCS HAU, Hisar highlighted the importance of pearl millet cultivation in changed climatic conditions.
- Dr. R.P. Dua, Assistant Director General (FFC) underlined the importance of pearl millet improved cultivars in different agro-climatic zones of crop. He further stressed that role of pearl millet is very critical in providing nutritional security and crop diversification in country.
- Dr. J.S. Sandhu ADG (Seeds) mentioned two unique advantages of pearl millet: a low (4-5 kg/ha) seed requirement and high multiplication rate of pearl millet seed production. These should be fully utilized to enhance seed replacement rate.
- The highlights of research done during 2010 were presented by Dr. O.P. Yadav, Project Coordinator. He mentioned that very impressive improvement has been made in pearl millet yield using technological interventions.
- Website of the All India Coordinated Pearl Millet Improvement Project was launched as [www.aicpmip.res.in](http://www.aicpmip.res.in).

- A fully digitalized Annual Report 2010-11 of the All India Coordinated Pearl Millet Improvement Project was also released for the first time.
- The research bulletin entitled 'Breeding pearl millet for arid zone of north-western India: constraints, opportunities and approaches' authored by OP Yadav, KN Rai, IS Khairwal, BS Rajpurohit and RS Mahala was released.
- The AICPMIP project centres of CCS HAU Hisar and JAU Jamnagar were felicitated for their contribution in pearl millet improvement.
- Dr. R.P. Thakur was felicitated by the Society of Millets Research for his life-long contribution in pearl millet pathology and crop improvement.
- Five new hybrids and one composite variety were identified for release. These included hybrid MH 1561 and composite MBC 2 for drought prone areas of Rajasthan, Gujarat and Haryana. Other hybrids included MH 1578 for cultivation in the states of Maharashtra, Tamil Nadu, Karnataka and Andhra Pradesh; and MH 1617, MH 1610 and MH 1609 for cultivation in Rajasthan, Gujarat, Uttar Pradesh, Haryana, Punjab, Madhya Pradesh.
- More than 30 food products and dishes of pearl millet were served to the participants in the meeting.

During inaugural session four special lectures on pearl millet processing, value addition on biofortification were delivered by the invited scientists.

First special lecture was on **Primary Processing of Pearl Millet** by S. Balasubramanian of Central Institute of Post Harvest Engineering and Technology (CIPHET), Ludhiana. Introducing the concept of primary processing of millets i.e. removal of outer layer of grain Dr. Balasubramanian outlined its importance in developing food products. The process of dehulling/decortication improves the biological availability of nutrients and consumer acceptability. Thus, development of primary processing technology is gaining importance since the focus on millets has shifted from merely an energy grains to a good source of phytochemicals. Due to the small grain size, pearling and milling are often more complex. Key raw material characters viz., size, form and structure of seed, including its development on its outer (bran) layer and endosperm hardness are the major hurdles in primary processing. Dr. Balasubramanian presented data and discussed performance of two primary processing machines produced by CIPHET. Multicrop Pearler and Collet Extruder are very effective for pearling of pearl millet and for making extruded pearl millet products. He stressed on creation of agro processing centres in dry regions to revive the local millet farming. At the end the video clip showing a news item (CNBC Awaz, 3:00 PM, 2.1.2011) on technology developed by CIPHET for producing pearl millet

extruded products which could compete with similar fast foods made from fine cereals available in the market was screened.

Another special lecture was delivered on **Value Added Products of Pearl Millet with Enhanced Health Attributes: Technology and Issues** by Dr. Ashish Kumar Singh, Senior Scientist, Dairy Technology Division, National Dairy Research Institute, Karnal. In his opening remarks Dr. Singh reviewing the therapeutic functions of coarse cereals and millets highlighted possible beneficial role of millets as antioxidants, excellent bulking agents and cholesterol-lowering agents in combating many diseases like esophageal cancer, hormone-dependent cancers and Type 2 diabetes mellitus. Although, milk is considered as "Nature's Perfect Food" but it too lacks certain key nutrients, however, combining milk and cereals/millets in the form of a "Composite Foods" has opened new vistas for health conscious people and food processors alike. Dr. Singh discussed application of whey proteins in composite dairy foods. Whey proteins may be utilized in development of novel composite foods meant for sports, diabetic and chronically ill patients. As a successful example of composite foods he presented before the audience technology for producing bajra lassi and iron enriched bajra biscuits. Bajra lassi contains nutrients in easily assimilable form and has a shelf-life of 21 days at refrigeration temperature. Biscuits of highly acceptable quality are made from a formulation of composite dairy-cereal mix consisting of whey protein concentrate, pearl millet flour and refined wheat flour. Optimized biscuits provide 15% of calorie, 20% protein, 7.6% iron; 9% of calcium and 35% of dairy iron requirement of RDA per 100 g of product. Discussing suitability of millets in formulation of probiotic dairy products he expressed his views on how millet components perform number of functions in probiotic foods. Presenting comparative data on market available fine cereal extruded products and on pearl millet based products he showed that pearl millet based extruded products are better. Dr. Singh also highlighted the efforts being made to bring the pearl millet based composite food to the market through associating companies, self help groups and entrepreneurs. Further he said, validation of nutritional and therapeutic potential of developed products and preparation of business plans for commercialization of the products are under way. Speaking on documentation and dissemination efforts he explained about the meetings conducted with farmers for popularization of pearl millet based consumption and utilization, participation in exhibition of products at metropolitan cities, development of brochures related to nutritional and therapeutic role of whey and pearl millet and on developing of linkages with Project Directorate, AICPMIP at Jodhpur for evaluation of varieties.

Dr. K N Rai, Principal Scientist (Breeding) & Director, Harvest Plus-India Biofortification, ICRISAT, Hyderabad apprised the audience about the progress made so far on **Breeding Biofortified Pearl Millet**. Dr. Rai informed that 5 agricultural universities and 9 private seed companies are participating in Harvest Plus programme for Fe and Zn biofortification of pearl millet. Discussing generation of variability in Fe and Zn content in germplasm accessions, population progenies and

advanced breeding lines Dr. Rai showed that sufficient breeding material with high Fe (80-100 ppm) and Zn content (60-80 ppm) is now available. High Fe versions of ICTP 8203, an open pollinated variety of pearl millet has been tested across 5 locations during rainy season 2010. It has good yield also. Work is under way on high iron hybrid KH 302 and high Zn hybrid 86M52. Dr. Rai said of the targeted iron content (71 ppm) of biofortified pearl millet under the harvest plus project has been achieved. High Fe version of ICTP 8203 might be released shortly. Concluding his talk he stressed that for achieving the targeted content of Fe and Zn continuous breeding efforts are needed for 5-6 years and for sustaining the targeted values of Fe and Zn another 3-4 years would be required.

Dr. (Mrs.) Salil Sehgal of Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar delivering her lead lecture spoke on **Value addition of Pearl Millet through Processing and Product Development**. She presented work conducted on two aspects. First, processing of pearl millet for increasing shelf life and reducing antinutrients and second on development of value added products (High fibre food products having low Glycaemic index for Diabetics). Presenting data, Dr. Sehgal discussed effectiveness of malting, blanching, acid treatment and dry heat treatment in improving the nutritional value and shelf life of flour. She further said blanching treatment is the most effective and using this technique shelf life of flour could be increased up to 6 months. Dr. Sehgal also presented technology developed for preparing pearl millet based traditional, baked, extruded, health and Weaning/Supplementary products. All the pearl millet based products generally have strong flavour and aroma, have more nutritional value and health benefits. Cost of the shelf stable products is also low. Amongst the tested recipes, those based on pearl millet have lowest glycaemic index. She stressed that the technology of acceptable pearl millet based products can be taken up by housewives at household level as the raw ingredients are already available in their homes for setting up small scale production unit.

The lead lecture on **Disease Management Strategies in Pearl Millet** was delivered by Dr. R P Thakur, Principal Scientist (Pathology) (Retd.), ICRISAT, Patancheru. At the start of his talk Dr. Thakur ranked diseases based on severity of the damage caused by these diseases. The decreasing order of severity of these diseases is as: Downy mildew, blast, rust, smut and ergot. Dr. Thakur explained boom & bust cycle of downy mildew in India. Dr Thakur also briefed about the pathogenic variability and the factors causing variability along with the management strategies thereof. Various factors contributing to the evolution of virulence of plant pathogens were also highlighted by him by describing the risk factor. The inoculum source, survival, parasitism, infection, spore cycle and dispersal thereof were summarized in tabulated form. On the disease management issues he said resistance breeding would remain the single major disease management option. He felt strong need to define resistance genes in order to track their performance/breakdown. Virulence monitoring is critical to develop



resistance breeding and cultivar deployment strategy. Open pollinated varieties could provide better resistance stability/durability than hybrids. Development and deployment of F<sub>1</sub> hybrids has led to evolution of new virulence in downy mildew pathogen. While speaking on use of fungicides Dr. Thakur opined that seed treatment with metalaxyl/new molecules will remain effective and economical for downy mildew management whereas spray to control blast and rust may not be effective and economical. Biocontrol has potential for induced resistance to downy mildew, blast and rust, however, this need to be investigated. Pathogen cultural studies are always important to reduce inoculum load and disease spread if followed properly and feasible. Exclusion is important to limit the spread of new races/pathotype between states, if inter-state quarantine regulations implemented. As an integrated approach moderate level of resistance + half the dosage of metalaxyl seed treatment would be effective for downy mildew. Speaking on management of blast he stressed that the disease could become a major threat due to changing rainfall pattern and needs proper monitoring and virulence analysis. Rust could also become more severe due to changing temperature patterns. Smut and ergot look dormant for the present, but could become severe due to changing climate – monitoring should continue.

At the end of the session the chairman thanked all the speakers for delivering their nice presentations. Dr. R P Narwal, commented that more efforts should be made to popularize millet based products among the urban population. There is need to make the farming community aware about the importance of pearl millet, technical know-how of the processing and product development. Millet based value added products will help to upgrade not only the health status but also the economic status of growers. There is scope for commercialization of various products from health and cost point of view. Industrial linkages for development and commercialization of these food products will secure market for pearl millet.

Dr. R P Dua appreciated the recent efforts being made by the speakers in not only redefining the role of pearl millet from that of a staple coarse cereal crop in subsistence agriculture to nutritive and therapeutic item but also for providing novel cost effective end use pearl millet based product technology. He further suggested to the participating scientists to develop hybrids/varieties possessing desired grain characters as per the need of products being developed.

## **SESSION – I REVIEW OF RESEARCH RESULTS**

### **PLANT BREEDING**

**Chairman** : Dr. R.P. Dua,  
ADG (FFC),  
ICAR, New Delhi

**Co-Chairman** : Dr. K.N. Rai,  
Principal Scientist,  
ICRISAT, Hyderabad

**Rapporteur** : Dr. B.S. Rajpurohit,  
Asst. Prof. PBG,  
AICPMIP, Mandor

**Date** : March 12, 2011      **Time** : 4.00 PM

#### **Review of Research Results – Centre-Wise Presentation of Significant Results and Progress Report (2010-11)**

The meeting of pearl millet breeding group was held under the Chairmanship of Dr. R.P. Dua, ADG (FFC), ICAR, New Delhi and Co-Chairmanship of Dr. K.N. Rai, Principal Scientist, ICRISAT, Hyderabad at 4:00 PM in the Auditorium of College of Agriculture, CCSHAU, Hisar to discuss the centre-wise research results of kharif /summer 2010-11 and to formulate the technical programme of kharif /summer 2011-12.

- Chairman Dr. R.P. Dua, ICAR, New Delhi welcomed all scientists and requested to present the results of their station as per guidelines provided by the Project Coordinator
- The results presented by respective scientist of the station were as under:

Bikaner	:	Dr. P.C. Gupta
Jaipur	:	Dr. Shrikant
Jamnagar	:	Sh. S.D. Atara
Kalai	:	Dr. S.P. Singh
Hisar	:	Dr. H.P. Yadav
Gwalior	:	Dr. A.K. Singh
Ludhiana	:	Dr. Rahul Kapoor
Aurangabad	:	Dr. N.B. Katare
Dhule	:	Dr. H.T. Patil
Bijapur	:	Dr. Gouri M. Sajjanar
Anantapur	:	Dr. M. Vijaya Sai Reddy
Coimbatore	:	Dr. P. Sumathi
- Chairman Dr. Dua suggested to club together two Sessions i.e. Session I and Session II and the incharges of the stations should present the progress report of all discipline to the full house.
- Dr. Dua expressed his satisfaction for breeding work being done at Hisar, Jaipur, Jamnagar, Ludhiana, Aurangabad, Dhule and Coimbatore.

- While breeding work done at Bikaner, Kalai, Bijapur, Gwalior and Anantapur during last many years was not found satisfactory in terms of developing new breeding material and varieties. Chairman suggested that Project Coordinator should review critically the work being done at these centres and the Vice Chancellors of these universities would be informed about status of work and output from these centres. These centres may be given contingency for conduct of trial only and breeding post may be shifted in 12<sup>th</sup> plan to other centres doing good work.
- AICPMIP Jaipur needs to undertake germplasm collection from Rajasthan
- Coimbatore centre should conduct all breeding, agronomical, pathological trials during kharif season only as some trials are being conducted in summer.
- Dr. K.N. Rai suggested that there is need to generate district-wise data on different uses of Pearl Millet grain in various regions.

## FORMULATION OF TECHNICAL PROGRAMME FOR 2011-12

### Organization of trials

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

- Grain yield = 10 % higher than mean grain yield of checks,
- Downy mildew (60 DAS) = less than 5.4% in hybrids; less than or equal to 10% in populations,
- Days to 50% flowering = + 4 days of flowering over HHB 67 Improved in IHT (Early) and AHPT (Early), + 3 days of flowering over average of checks in IHT (Medium) and AHT (Medium).
- The total promoted entries should not be more than 33% of total test entries in medium and late maturity hybrid trials.

### Hybrid and Population Trials

Entries promoted to next higher stage of testing in kharif/summer 2011 Zone A<sub>1</sub> and A

S. No.	Advance Hybrid & Population Trial (E) Zone A <sub>1</sub>	S.No.	Advance Hybrid Trial (L) Zone A [AHT(L) A]
	<b>IHT (E) to AHPT (E) (IInd Year)</b>		<b>IHT (L) A to AHT (L) A (IInd Year)</b>
1	MH 1695	1	MH 1747
2	MH 1696	2	MH 1737
3	MH 1697	3	MH 1741
4	MH 1700	4	MH 1743
5	MH 1703	5	MH 1740
	<b>IPT A to AHPT (E) (IInd Year)</b>	6	MH 1749
6	MP 508	7	MH 1759
	<b>AHPT (E) to AHPT (E) (IIIrd Year)</b>	8	MH 1746
7	MH 1632	9	MH 1748
	<b>Checks</b>		<b>AHT (L) A to AHT (L) A (IIIrd year)</b>
8	HHB 67 (Imp.)	10	MH 1684
9	ICMH 356	11	MH 1674
10	ICTP 8203	12	MH 1671
11	PUSA 266	13	MH 1673
12	CZP 9802	14	MH 1676
			<b>Checks</b>
		15	Pusa 23
		16	PB 106
		17	GHB 558

S. No.	Advance Hybrid Trial (M) Zone A [AHT (M) A]	S. No.	Population Trial Zone A (PT A)
	<b>IHT (M) A to AHT (M) A (IInd Year)</b>		<b>IPT A to PT A (IInd Year)</b>
1	MH 1720	1	MP 508
2	MH 1723	2	MP 510
3	MH 1712	3	MP 509
4	MH 1734	4	MP 514
	<b>AHT(M)A to AHT(M) A (IIIrd Year)</b>	5	MP 511
5	MH 1663	6	MP 506
6	MH 1655		<b>APT A to PT A (IIIrd Year)</b>
	<b>Checks</b>		Nil
7	PUSA 23		<b>+ New entries of PT</b>
8	ICMH 356		<b>Checks</b>
9	RHB 121		Raj 171
10	GHB 744		Pusa 383
			JBV 2
			ICMV 221

**Entries promoted to next higher stage of testing in kharif/summer 2011 Zone B**

S. No.	Advance Hybrid Trial (M) Zone B [AHT (M) B]	S. No.	Advance Hybrid Trial (L) Zone B [AHT (L) B]
	<b>IHT (M) B to AHT (M) B (IInd Year)</b>		<b>IHT (L) B to AHT (L) B (IInd Year)</b>
1	MH 1719	1	MH 1743
2	MH 1720	2	MH 1751
3	MH 1718	3	MH 1747
4	MH 1723	4	MH 1754
5	MH 1713	5	MH 1737
6	MH 1712	6	MH 1745
7	MH 1710	7	MH 1759
8	MH 1708	8	MH 1748
9	MH 1711	9	MH 1755
10	MH 1732	10	<b>AHT (L) B to AHT (L) B (IIIrd year)</b>
	<b>AHT (M) B to AHT (M) B (IIIrd year)</b>	11	MH 1684
11	MH 1659	12	MH 1671
12	MH 1642		<b>Checks</b>
	<b>Checks</b>	13	Saburi
13	ICMH 356	14	GHB 558
14	Shradha	15	B 2301
15	Pusa 23		
S. No.	Summer Hybrid Trial (SHT)	S. No.	Population Trial Zone B (PT B)
	<b>SHT (Ist Year) to SHT (IInd Year)</b>		<b>IPT B to PT B (IInd Year)</b>
1	MSH 239	1	MP 511
2	MSH 240		<b>APT B to PT B (IIIrd Year)</b>
3	MSH 238		Nil
	<b>SHT (IInd Year) to SHT (IIIrd Year)</b>		<b>+ New entries of PT</b>
4	MSH 224		<b>Checks</b>
5	MSH 226		Raj 171
	<b>+ New entries</b>		ICMV 221
	<b>Checks</b>		ICTP 8203
	GHB 526		ICMV 155
	GHB 558		
	Proagro 9444		

New entries approved for testing in initial trial kharif 2011/Summer 2012

S.No.	Organization/Institution	Name of Trial/Entries				
		IHT (E)	IHT (M)	IHT (L)	PT	Summer
1	AICPMIP, Jodhpur	MPMH 21	MPMH 23			
		MPMH 22	MPMH 24			
2	AICPMIP, SKRAU, Jaipur	RHB 201	RHB 203		RCB 21	
		RHB 202	RHB 204			
3	AICPMIP, PAU, Ludhiana			PHB-3058		
4	AICPMIP, Dhule			PHB-3081		
			DHBH 9074	DHBH 9073		
5	AICPMIP, SKRAU, Bikaner		DHBH 9076	DHBH 9075		
		BHB 1101			BCB 11	
6	AICPMIP, JAU, Jamnagar, Gujarat	BHB 1102				
		GHB-947	GHB-941	GHB-910	JPP-3	GHB-943
7	AICPMIP, RSKVV, Gwalior	GHB-953	GHB-961	GHB-939		GHB-952
			RVSKVV 21			
8	AICPMIP, CCS HAU, Hisar	HHB 263	HHB 266	HHB 268	HC 38	
		HHB 264	HHB 267	HHB 269		
		HHB 265		HHB 270		
9	AICPMIP, Kalai, Aligarh				SPK-21	
					SPK-30	
10	AICPMIP, TNAU Coimbatore			TNBH 08584	UCC 30	TNBH 09718
				TNBH 08804	UCC 32	TNBH 09655
11	IARI New Delhi		Pusa 11-01			
12	AICPMIP, NARP, Aurangabad		AHB-1051		ABPC-157	
			AHB-1052			
13	CAZRI, Jodhpur	CZH 221	CZH 218			
		CZH 222	CZH 223			
		CZH 225	CZH 224			
14	Atash Seed Pvt. Ltd, Hyderabad		ABH-68	ABH-999		
15	Vibha Agrotech Ltd., Hyderabad	VBBH 3125		VBBH-3146		
16	Shakti Vardhak Hyb. Seed Pvt. Lrd., Hisar			SVPMH 1164		
17	Kirtiman Agro Gen. Ltd., Aurangabad			KBH-11		KBH-261
				KBH-26		KBH-1007
18	Zuari Seeds Ltd., Hyderabad		B 2097	ICMH 356		
19	Devgen Seeds & Cor., Tech. Pvt. Ltd., Hyd.		DB-2093	DB-2052		DB 65512
20	Bioseed Res. India Pvt. Ltd., Hyderabad			Bio 1365		
21	JK Agri. Genetics Ltd, Hyderabad			JKBH 1097		
				JKBH 1100		
22	Metahelix Life Sci. Pvt. Ltd., Ahmedabad			MP 7878		
				MP 7886		
23	Biostadl MH Seeds Ltd., Hyderabad			Hipearl 130		
24	Nuziveedu Seed Pvt. Ltd., Secunderabad		NBH 5767	NBH 5061		
25	Kaveri Seed Com. Ltd. Hyderabad			KBH 1922		
				KBH 2360		
26	Ajeet Seeds Ltd., Aurangabad		APH-37			
27	Krishidhan Seeds Pvt. Ltd., Jalna			SOLID 78		
28	NU Genes Pvt. Ltd., Hyderabad		NU-308			NU-309
29	ECO Agri Seed Pvt. Ltd., Hyd.		ECO-22	ECO-10		
30	Mahodaya Hy. Seed Pvt. Ltd., Jalna		Mahodaya 331			
31	New Nandi Seeds Corp., Ahmedabad		NMH-79			
32	Bayer Bio Science Pvt. Ltd. Hyderabad	PB 1358		Proagro 9450		
33	Pioneer Overseas Corp., Hyderabad		86M35	86M85		86M13
			86M01	86M88		86M78
34	Super Agri Seeds Pvt. Ltd		SBH 144			
35	Western Agri Seeds Ltd.		WESTERN M 46			
36	Krishna Agri Res. & Dev. Centre Agra			KBH 504		KBH 513
37	ANGRAU, Palem (AP)		PHB-11			
38	Agri. Res. Station, Buldana (M.S.)		BBH-0-12			BBH-0-13
39	ICRISAT, Patancheru				ICTP 8203 Fe 1	
					ICTP 8203 Fe 2	
					ICTP 8203 Fe 3	
					ICTP 8203 Fe 4	
					ICTP 8203 Fe 5	
					ICTP 8203 Fe 6	
					ICTP 8203 Fe 7	
					ICMV 221 Fe 1	
			ICMV 221 Fe 2			
<b>Total</b>		<b>16</b>	<b>32</b>	<b>33</b>	<b>18</b>	<b>12</b>

**Locations for Conduct of Trials During Kharif 2011/Summer 2012 in Zone A<sub>1</sub> and A**

LOCATIONS	IHT (E)	IHT (M)	IHT (L)	AHPT (E)	AHT (M)	AHT (L)	PT	RHVT	SHT
<b>RAJASTHAN</b>									
Mandor	*	*	*	*	*	*	*	*	
Jodhpur (CAZRI)	*			*					
Bikaner (RAU)	*	*	*	*	*	*	*	*	
Bikaner (CAZRI)				*					
Jaipur	*	*	*	*	*	*	*	*	
Fatehpur Shekhawati	*			*			*		
Tabiji					*		*		
Alwar (Pioneer)			*			*			
Alwar (Vibha)					*	*			
Alwar (Devegene)			*						
Samdari	*			*			*		
Raniwara (Bayer)	*			*					*
Kota (MPUAT)		*			*				
Khiwasar (Bioseed)	*			*					
Jaisalmer (CAZRI)	*			*					
<b>GUJARAT</b>									
Kothara	*	*		*	*				
Kutch (CAZRI)	*			*					
S.K.Nagar	*	*	*	*	*	*			*
Mahuva		*	*		*	*			
Anand		*	*		*	*			*
Jamnagar		*	*		*	*	*	*	*
Ahmedabad (New Nandi)		*			*		*		*
Narsanda (Navbharat)		*	*			*			*
Palanpur (Pioneer)									*
Vadodara (GSFC)		*	*		*	*			
Baroda (JK Seed)			*			*			*
Gandhi Nagar (Western Seed)		*							
<b>UTTAR PRADESH</b>									
Kalai		*	*		*	*	*	*	
Agra (Ganga Kaveri)						*			
Eglas (Bioseeds)		*							
Agra (Krishna)			*			*			*
<b>HARYANA</b>									
Hisar	*	*	*	*	*	*	*	*	
Bawal	*	*		*	*		*		
KVK, Shikohpur		*	*		*				
Raipur (Super Seed)		*	*		*				
<b>MADHYA PRADESH</b>									
Gwalior		*	*		*	*	*	*	
Morena					*		*		
<b>PUNJAB</b>									
Ludhiana		*	*		*	*	*	*	
<b>DELHI</b>									
New Delhi		*			*		*	*	
Nazab garh (Bayer)					*	*			
<b>Total Trials</b>	<b>14</b>	<b>22</b>	<b>19</b>	<b>15</b>	<b>23</b>	<b>19</b>	<b>15</b>	<b>9</b>	<b>9</b>

Contd.

\*=Trial allotted

**Locations for Conduct of Trials During Kharif 2011/Summer 2012 in Zone B**

LOCATIONS	IHT (M)	IHT (L)	AHT (M)	AHT (L)	PT	RHVT	SHT
<b>MAHARASTRA</b>							
Aurangabad (NARP)	*	*	*	*	*	*	*
Aurangabad (Ajeet Seed)	*		*		*		
Aurangabad (Nath Seed)			*				
Aurangabad (Devgene)		*		*	*		
Aurangabad (Metahelix)					*		
Aurangabad (Biostd)					*		
Paithan (Ganga Kaveri)					*		
Harsul (Kirtiman)		*		*			
Niphad			*	*	*		
Dhule	*	*	*	*	*	*	*
Jalna (Vijay Seed)		*		*			
Jalna (Mahodaya)		*	*	*			
Pachora (Nirmal Seed)	*	*		*	*		*
Buldana	*	*	*	*	*		
Vaijapur			*	*			
Ganewadi (Krishidhan)				*	*		
Malkapur (Ankur Seed)	*		*	*	*		
Akola (Basant Agro)		*					
Ahmednagar (Pioneer)		*		*	*		
Medchal (Proline)					*		
<b>KARNATAKA</b>							
Bijapur	*	*	*	*	*	*	
Bagalkot (Kaveri Seeds)					*		
<b>ANDHRA PRADESH</b>							
Anantapur	*	*	*	*	*	*	
Palem	*		*		*	*	
Manoharabad (Zuari seeds)		*	*	*			
Hyderabad (Nuziveedu)		*		*	*		
Hyderabad (Vibha)			*		*		
Hyderabad (Atash)				*	*		
Hyderabad (Biostd)				*			
Hyderabad (Nu Gene)		*					
Hyderabad (Bioseed)					*		
Hyderabad (JK Seeds)					*		
Hyderabad (HP Seeds)					*		
ICRISAT, Patancheru					*		
<b>TAMIL NADU</b>							
Coimbatore	*	*	*	*	*	*	*
<b>Total Trials</b>	<b>10</b>	<b>16</b>	<b>15</b>	<b>20</b>	<b>26</b>	<b>6</b>	<b>4</b>

\*=Trial allotted

- Dr. Dua has suggested to withdraw the check Pusa 23 from medium group trials as it very old check.
- Check B 2301 should also be deleted from medium maturity group as it is flowering late.
- Looking to the less number of entries in Advance Population Trial for the last few year, it was decided to combine Initial Population Trial and Advance Population Trial to form Population Trial from Kharif 2011.
- Dr. J.S. Sandhu suggested to include recently identified top grain yielding hybrid as a check in respective maturity group after its notification.
- The testing fee charged from Private companies for testing their hybrids in AICPMIP trial is raised to Rs. 60,000/entry/season from kharif 2011.
- The change of location without intimating to the Project Coordinator will not be allowed. The data of any changed location will not be included in the report.
- Any treated seed supplied will not be included in the trial for evaluation.

**Observations to be recorded in initial and advance trials:**

1. Days to 50% Flowering –Rounded to 0 decimals
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 (Advance Trials only)
5. Panicle Diameter (cm) - Rounded to one decimal (Advance Trials only)
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) (Advance Trials only)
12. Diseases and pest incident (Under natural conditions)

**Experimental details:**

<b>Initial Trials:</b> No. of rows – 3 (net) Row length – 5m(net) Spacing- 50 cm x 15 cm Plot size – 5m x 1.5m (net) Fertilizer – As per recommendations	<b>Advance Trials:</b> No. of rows – 6 (net) Row length – 5m(net) Spacing- 50 cm x 15 cm Plot size – 5m x 3m (net) Fertilizer – As per recommendations
<b>Population Trials:</b> No. of rows – 6 (net) Row length – 5m(net) Spacing- 50 cm x 15 cm Plot size – 5m x 3m (net) Fertilizer – As per recommendations	

**Seed Requirement (per entry)**

IHT (E) A1 Zone : 1.25 Kg	AHT (M) A : 2.50 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 : 2.0 Kg	RHVT A : 2.0 kg	
Population Trial A & B Zone: 3.0	RHVT B : 2.0 kg	
AHPT (E) A1 Zone: 1.5 Kg	Summer Hybrid Trial : 2.0 kg	



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

AHT Zone A: 1.5 kg	AHT Zone B : 1.5kg
APT Zone A: 1.5 kg	AHPT Zone A1: 1.5 kg
APT Zone B: 1.5 kg	Summer Hybrid Trial : 1.5 kg

The required quantity of seed material of test entries and checks along with pedigree of new entries for organizing the trials as above should reach the office of the Project Coordinator, AICPMIP, A.R.S., Mandor, Jodhpur 342304 (Raj.) **latest by 25<sup>th</sup> May 2011 for kharif and by 15<sup>th</sup> January 2012 for summer trials** along with required testing fee of Rs. 60,000/entry (Private Sector) in form of DD in favor of Project Coordinator (Pearl Millet), Mandor, payable at Jodhpur. **Entries without fee and pedigree of hybrid/ varieties will not be accepted.** Seed of each entry should be packed in cloth bag.

**Seed requirement of checks:**

Pusa 23: 6 kg	Saburi: 6 Kg	RHB 121: 10 kg	JBV 2: 6kg
ICMH 356: 10 kg	Shradha: 6 kg	Raj 171: 8 kg	Pusa 266: 6 kg
PB 106: 6 kg	HHB 67: 5.0 kg	ICMV 221: 5 kg	ICTP 8203: 4.0 kg
GHB 558: 10 kg	GHB 538: 6 kg	ICMV 155: 7 kg	CZP 9802: 5 kg
HHB 67 Improved: 5.0 kg	Pusa 383:6 kg	GHB 744 : 5 kg	B 2301 : 5 kg
GHB 732: 5.0 kg	RHB 177: 3 kg	86 M 64: 5 kg	RHB 173: 5 kg
Nandi 65: 5 kg			

The meeting ended with vote of thank to the chairman.

Following scientists attended the session:

**S.No. Name with designation**

1. Dr. R.P. Dua, ADG (FFC), ICAR, New Delhi
2. Dr. J.S. Sandhu, ADG (Seed), ICAR, New Delhi
3. Dr. O.P. Yadav, Project Coordinator (Pearl Millet), ARS, Mandor, Jodhpur.
4. Dr. I.S. Khairwal, Country Crop Manager (Pearl Millet) India, Harvest Plus, Hyderabad
5. Dr. P. Veerabadhiran, Professor & Head Deptt. of Millets, TNAU, Coimbatore.
6. Dr. V.K. Manga, Principal Scientist (Plant Breeding), CAZRI, Jodhpur.
7. Dr. P.C. Gupta, Asstt.Prof., ARS, SKRAU, Bikaner.
8. Dr. B.S. Rajpurohit, Asstt. Breeder, AICPMIP, ARS, Mandor, Jodhpur.
9. Dr. C. Tara Satyavathi, Principal Scientist, IARI, New Delhi.
10. Dr. H.T. Patil, Assoc. Professor (Botany), Bajra Research Scheme, COA, Dhule.
11. Dr. N. B. Katare, Pearl Millet Breeder, NARP, Aurangabad.
12. Dr. P. Sumathi, Assoc. Professor (PB & G), TNAU, Coimbatore.
13. Dr. M. Vijaya Sai Reddy, Sr. Scientist (Plant Breeding), A. R. S. Anantapur.
14. Dr. Gauri M Sajjanar, Assoc. Professor (Plant Breeding), Regional Agri. Research Station, Bijapur.
15. Dr. H.P. Yadav, Chief Scientist & Head, Bajra Section, CCS HAU, Hisar.
16. Dr. Virendra Malik, Bajra Breeder, Deptt. of PB & Genetics, CCS HAU, Hisar.
17. Dr. V.S. Mor, Asstt. Scientist, Deptt. of PB & G, CCS HAU, Hisar.
18. Dr. Yash Pal Yadav, Sr. Scientist (Plant Breeding), RRS, CCS HAU, Bawal.
19. Mr. Satish Pareek, Res. Sci., Pioneer Over. Corporation, Hyderabad.

20. Mr. A.K. Goyal, Res. Co-ordinator, Krishna Agri., R & D Centre, Agra.
21. Mr. S.M. Rafiq, Sr. Plant Breeder, Nuzeevidu Seeds, Hyderabad.
22. Dr. M.P. Kulkarni, Senior Scientist (Cereals), Nirmal Seeds Pvt. Ltd., Pachora, Jalgon.
23. Dr. Rameshwar Singh, Chief (R & D millets), Krishidhan Seed, Jalna.
24. Mr. Narendera Sawarkar, Plant Breeder (Millets), Ankur Seeds, Nagpur.
25. Dr. S. K. Yadav, Junior Breeder, Bayer Bio Science, Hyderabad.
26. Dr. S.L. Indoria, Sr. Res. Officer, Vijay Seeds Co. Ltd, Jalna.
27. Mr. P.N. Gelda, Research Coordinator, Biosatds MH Seeds Ltd., Hyderabad.
28. Dr. Y.S. Verma, Research Coordinator, Metahelix Life Sciences, Bangalore.
29. Mr. Manoj Kumar, Breeder (Pearl Millet), Krishidhan Seeds, Jalna.
30. Mr. Shankar Honyal, Manager Bajra, Kaveri Seeds, Secunderabad.
31. Dr. B.R. Beniwal, Sr.TA (PBG), AICPMIP, Mandor.
32. Dr. A.K. Singh, Principal Scientist, RVSKVV, College of Agriculture, Gwalior.
33. Mr. R.S. Mahala, Res. Coordinator Pioneer Over. Corporation, Hyderabad.
34. Dr. S.K. Gupta, Scientist, ICRISAT, Hyderabad.
35. Mr. Sachin Vidhale, Pearl Millet Breeder, Bioseed Research India Pvt. Ltd., Hyderabad.
36. Mr. Dinesh G. Kanawade, Pearl Millet Breeder, A.R.S. Buldana.
37. Mr. M.T. Pawar, Plant Breeder (Pearl Millet), Atash Seeds Pvt. Ltd., Hyderabad
38. Mr. C. Ramakrishna, Vice President (R&D), Nuziveedu Seeds Pvt. Ltd.
39. Mr. P.A. Pacharne, Breeder (Pearl Millet), Mahodaya Hybrid Seeds Pvt. Ltd., Jalna.
40. Ms. A.K. Jayalekha, Lead Breeder (Millets and Sorghum), Bayer Bioscience Pvt. Ltd., Hyderabad
41. Dr. S.K. Ghosh, Sr. General Manager, Vibha Agrotech Ltd, Hyderabad.
42. Dr. M.L. Swami, Breeder, J K Agrigenetics Ltd. Hyderabad.
43. Dr. L. K. Dubey, Reasonal Manager, Devgen Seeds and Crop Tech. secunderabad.
44. Dr. V.L. Ameta, Breeder, Devgen Seeds.
45. Dr. L.K. Chugh, Scientist, Biochemistry, CCS, HAU, Hisar.
46. Mr. Bal Chandra, Breeder (Pearl Millet), Shaktivardhak Hybrid Seeds Pvt. Ltd., Hisar.
47. Dr. D.P. Goswami, Res. Scientist. (PB), Western Agri seeds
48. Dr. Nimesh B. Lad, Assoc. Res. Scientist, Maharastra Hybrid Seeds Co. Ltd.
49. Mr. A. Ansari, Statistical Investigator, Dir. of Millets Dev. Mini. of Agril. Jaipur
50. Dr. Shrikant, Millet Breeder, ARS Durgapura, Jaipur
51. Dr. Yogendra Singh, Asst. Millet Breeder, ARS Durgapura, Jaipur
52. Dr. L.D. Sharma, Asst. Millet Breeder, ARS Durgapura, Jaipur,
53. Dr. Gopal Bele, Sr. Millet Breeder, Zuari Seeds Ltd.
54. Dr. Rakesh K. Shrivastava, Scientist. P. Millet Moleculer Breeding, ICRISAT
55. Dr. C.P. Jaybhaye, Asso. Professor (Agro), NARP ARS Budana, Maharastra
56. Dr. S.P. Singh, Scientist (Plant Breeding), ARS, Kalai Kanpur
57. Dr. S.P. Singh, Senior Scientist (Plant Breeding), IARI, New Delhi
58. Dr. Dev Vart Yadav, Asst. Scientist (Plant Breeding), Deptt. Genetics & PB, CCS HAU, Hisar
59. Dr. Krishan Kumar, Asst. Scientist (Plant Breeding), Deptt. Genetics & PB, CCS HAU, Hisar

60. Dr. Ramesh Kumar, Asst. Scientist (Plant Breeding), Deptt. Genetics & PB, CCS HAU, Hisar
61. Dr. B.L. Sharma, P. D. M., Vibha Agrotech Ltd. Hydrabad
62. Dr. S.K. Chandel, G. M., Vibha Agrotech Ltd. Hydrabad
63. Sh. Ved Prakash Arya, M. D., Shakti Vradhak Hybrid Seed, Hisar
64. Sh. Rajbir Singh, Manager, HSDC, Hisar
65. Sh. R.P. Singh, Area Manager, NSC Ltd., Hisar
66. Sh. S.K. Nayak, Asst. Breeder, Bisco Bio Science Pvt. Secendrabad
67. Sh. A.V. Saraswat, Product development, Super Agri Seeds Pvt. Hydrabad
68. Dr. B.K. Pareek, Plant Breeder, New Nandi Seeds Co. Ahamdabad
69. Dr. Harpal Singh, Asst. Pro. Agro., ARS Fatehpur-Sekhawati, Sikar
70. Dr. R.C Singh, Millet Breeder, ARS Fatehpur-Sekhawati, Sikar
71. Dr. D. Shashi Bhushan, Scientist (Plant Breeding), Reg. ARS, Palem (AP)
72. Dr. K.S. Yadav, SMS (Agro.), KVK, IARI, Shikohpur, Gurgaon
73. Dr. J.P. Singh, Director, Directorate of Millets, Jaipur
74. Dr. C.T. Hash, Principal Scientist (Breeding), ICRISAT
75. Sh. Om Prakash Patil, Manager (Crop Dev.), Bayer BioScience Hyderabad
76. Dr. F.B. Patil, Director Research, Kirtiman Agro Genetics Ltd. Aurangabad
77. Dr. A.K. Verma, Breeder, Kirtiman Agro Genetics Ltd. Aurngabad
78. Sh. B.G. Ravindra, Sr. Breeder (P. Millet), BiostdsMH Seeds Ltd.
79. Dr. Arvind Kumar, Crop Develop., Bayer Bio Science Hydrabad
80. Dr. B.R. Anarase, Scientist, Ajeet Seeds Ltd. Aurgabad MS
81. Sh. S.V. Bemalgi, Director Research, Ecoagriseeds, Hydrabad
82. Dr. Aditya Shrama, Sr. Breeder, Devegen seeds, Secunderabad (AP)
83. Sh. V.T. Pawar, Sr. Research Asstt. (Breeding), Bajra Research Scheme, COA, Dhule
84. DR. K.R. Reddy, Director Research, Nugenes, Secunderabad

## **SESSION -I REVIEW OF RESEARCH RESULTS AGRONOMY**

Chairman : Professor. A.S. Dhindwal  
Head, CCS HAU, Hisar

Rapporteur : Dr. M.S. Rathore  
AICPMIP, Jodhpur

Dated : 12.03.2011

Pearl millet agronomy group met under the chairmanship of Professor. A.S. Dhindwal, Head, CCS HAU, Hisar at 04.00 PM in the Seminar Hall of Department of Agronomy. The following scientists attended the meeting and actively participated in the discussions-

1. Dr. H.R. Khafi, Research Scientist (Agronomy) MRS (JAU) Jamnagar
2. Dr. Harphool Singh, ARS (SKRAU), Fatehpur Shekhawati (Rajasthan)
3. Dr. B.K. Patil, Senior Agronomist, NARP, Aurangabad (Maharashtra)
4. Dr. G L Yadav, Agronomist, ARS(SKRAU), Jaipur, (Rajasthan)
5. Dr. A. K. Guggari, Sr.Scientist (Agronomy), RARS.Bijapur, UAS, Dharwad.
6. N. Meyyazhagan, Professor (Agronomy), TNAU, Coimbatore.
7. Dr. Anil Kumar, Agronomist, HAU, Hisar, Haryana
8. Dr. Suryawanshi R.T., BRS, MPKV, Dhule
9. Dr. C.P.Jaybhaye, Associate Professor (Agronomy), ARS Buldana
10. Dr. Bikram Singh, Scientist (Agronomy), CCS HAU, RRS, Bawal
11. Dr. K.S. Yadav, SMS (Agronomy), KVK (IARI), Shikohpur, Gurgaon (Haryana)
12. Dr. Devi Singh Bhati, Agronomist, PC Unit, Mandor, Jodhpur
13. Dr. G. Ram Kherwa, Associate Professor, PC Unit, Jodhpur
14. Dr. A. Ansari, Statistical Investigator, DMD, Jaipur
15. Dr. M.S. Rathore, Agronomist, PC Unit, Mandor, Jodhpur
16. Dr. M.F. Hussain, Agronomist, ARS, Kalai, Aligarh

In the beginning, Dr. Anil Kumar welcomed the chairman and rapporteur of the session. Center wise results of the agronomical trials conducted during last year (2010) were presented by the respective scientists. The Chairman suggested that as the pearl millet is very input responsive crop, some experiment should be planned on correlation between weather conditions and management practices. He also advised to take experiment on potassium fertilization and irrigation management. He also requested the scientists to conduct experiments as per the technical

programme and should not make any change in the approved technical programme. He also suggested to quantify the amount of water applied in summer pearl millet, rather than giving simply the number of irrigations. Scientists from Coimbatore requested that since pearl millet is mainly grown during Rabi season in Tamil Nadu, therefore he may be allowed to conduct experiments during Rabi season which was not accepted as trials of all disciplines are to be conducted in the same season.

Results from all the centers were presented except from New Delhi and Bikaner center because of non participation of scientists from these centers.

During kharif 2010, 60 trials were allotted to the different centers, out of which results of 57 trials were reported.

### **Recommendations**

1. The study conducted for three years to determine the performance of recently developed drought resistant hybrids to sustain pearl millet productivity under different row spacing revealed that hybrid GHB 538 performed better than hybrid GHB 558 in all the zones. The crop should be sown at 60 cm row spacing in zone A1 and A and at 45 cm in zone B
2. Pearl millet hybrids performed better than the populations. In zone A1 RHB 121 performed better while in zone A and B hybrid GHB 558 proved superior.
3. In summer pearl millet 20 Kg ZnSO<sub>4</sub>/ha should be applied along with the recommended dose of N, P & K in respective zones.
4. Nitrogen should be applied @ 120 Kg/ha in three equal splits i.e. 1/3<sup>rd</sup> at sowing, 1/3<sup>rd</sup> at tillering and 1/3<sup>rd</sup> at boot leaf stage during summer.
5. To obtain sustainable high productivity from pearl millet – oilseed crop sequence and higher net returns along with higher B:C ratio and improved physico-chemical properties of soil and crop quality, the recommended quantity of inorganic fertilizers for pearl millet and oil seed crop in different zones should be applied along with FYM @ 5 ton/ha to pearl millet crop. In succeeding oilseed crop 20 kg K<sub>2</sub>O + 200 Kg/ha gypsum be applied in zone A 1 and 30 Kg K<sub>2</sub>O +200 Kg gypsum + 10 Kg ZnSO<sub>4</sub>/ha should be applied in zone A and zone B.
6. At Bijapur, application of FYM @ 5 ton/ha improved pearl millet yield equivalent (PMYE) of pearl millet- oilseed crop rotation. Application of 30 Kg K<sub>2</sub>O/ha along with the recommended dose of N and P caused significant improvement in PMYE, net return and B:C ratio of the Pearl millet oilseed crop rotation.

### **A) Trials to be continued during 2011-12**

PMAT 1: Response of Pearl Millet Advance Hybrid (Early) to nitrogen levels

PMAT 2: Study of organic farming in pearl millet based cropping sequence

PMAT 5: Effect of sowing time on productivity of pearl millet hybrids and varieties

PMAT 1d: Suitability of hybrids under varying times of sowing during summer.

### **B) Trials concluded:**

PMAT 3: Studies on organic and balanced use of fertilisers in pearl millet –oilseed cropping sequence

PMAT 4: Performance of pearl millet hybrids and populations under different management practices

PMAT 6: Performance of recently developed drought resistant pearl millet hybrids under different row spacing

PMAT 8: Nitrogen management in summer pearl millet

### **C) New trial formulated:**

- Optimization of nutrients for pearl millet production under assured moisture conditions. In this trial four levels of nitrogen (0, 75% of the recommended N, 100% of recommended and 125% of the recommended N of the respective zones) and four levels of phosphorus (0, 15, 30, 45 kg/ha) are kept and the newly high yielding hybrid of the respective zone will be taken. The experiment shall be taken under assured moisture availability.
- In addition to the coordinated programme, each center may undertake one or two trials based on location specific problem to cater to the need of the state/agro-climatic zone. The results of these trials should be presented in the group meeting.

## **TECHNICAL PROGRAMME FOR 2011-12**

PMAT – 1: Response of N Levels to Pearl Millet Advance hybrid and/or Population entries

Objectives: To study the response of advanced hybrids and populations to nitrogen.

a) Performance of advance hybrid and population entries for zone A1

Nitrogen (3)	:	20, 40 & 60 kg N/ha
Hybrid (1 + 2)	:	MH 1632, check GHB 538 and HHB 67 (Imp)
Design	:	FRBD
Replication	:	4
Plot size	:	Gross: 5.00 m x 3.60 m Net: 5.00 m x 2.70 m
Locations	:	Mandore, ARSS, Samdari and Bikaner

b) Performance of advance medium and late hybrids for Zone A

Nitrogen (3)	:	30, 60 & 90 kg N/ha
Hybrids (7 + 2)	:	MH 1684, MH1674, MH1671, MH 1673, MH 1676, MH1663 and MH 1665, checks RHB 121 and GHB 732
Design	:	Split plot (Nitrogen in main plot and entries in sub-plot)
Replication	:	Three
Plot size	:	Gross: 5.00 m x 3.60 m Net: 5.00 m x 2.70 m
Locations	:	Jaipur, New Delhi, Hisar, Jamnagar and Kalai

c) Performance of medium and late advance hybrids for Zone B

Nitrogen (3)	:	30, 60 & 90 kg N/ha
Hybrids (4 + 2)	:	MH 1659, MH 1642, MH 1684 and MH1671, check GHB 558 and 86M 64
Design	:	Split Plot Design, keeping N in main plots and hybrids in Sub-plots
Replication	:	Three
Plot size	:	Gross: 5.00 m x 3.60 m Net: 5.00 m x 2.70 m
Locations	:	Aurangabad, Dhule, Bijapur and Coimbatore

d) Performance of advance summer hybrids

Nitrogen (3)	:	60, 90 & 120 kg N/ha
Hybrids (2 + 2)	:	MSH 224, MSH 226, check Pro agro 9444
Design	:	FRBD
Replications	:	Three
Plot size	:	Gross: 5.00 m x 3.60 m Net : 5.00 m x 2.70 m
Locations	:	Jamnagar, SK Nagar, Dhule & Aurangabad

**Note: Recommended dose of P<sub>2</sub>O<sub>5</sub> is to be added to all treatments.**

Observations to be recorded:

1. Plant population (Initial and final) in thousands / ha
2. Plant height (cm)
3. Days to 50% flowering.
4. Grain yield (Kg/ha)
5. Dry Fodder yield (Kg/ha)

**PMAT – 2: Studies on organic farming in pearl millet**

Objectives: To compare different organic sources of nutrients for growth, yield and quality of pearl millet.

Treatments:

T<sub>1</sub> = Control

T<sub>2</sub> = 2.5 ton FYM/ha  
T<sub>3</sub> = 5 ton FYM/ha  
T<sub>4</sub> = 7.5 ton FYM/ha  
T<sub>5</sub> = 1.00 ton/ha vermi compost  
T<sub>6</sub> = 2.00 ton/ha vermi compost  
T<sub>7</sub> = 3.00 ton/ha vermi compost  
T<sub>8</sub> = 1.00 ton/ha vermi compost+2.5 ton FYM/ha.

Total number of treatments: 8

Design : RBD  
Hybrid-Zone A1 : GHB 538  
Zone A : RHB 121  
Zone B : GHB 558

Number of replications: 3

Locations:

Zone A1 : Mandor and Bikaner  
Zone A : Jaipur, Jamnagar, Hisar and Kalai  
Zone B : Aurangabad, Coimbatore, Bijapur and Dhule

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

1. Grain (kg/ha) and dry fodder yield of pearl millet (q/ha)
2. Grain (kg/ha) and dry fodder yield of succeeding crop (q/ha)
3. Net returns in rupees per ha of crop sequence
4. B:C ratio of crop sequence
5. Pearl millet yield equivalent (kg/ha) of crop sequence

### **Soil analysis**

1. Initial soil analysis for pH, EC (1:2), organic carbon (%), total N(%), available P (ppm) with Olson method, available K (ppm), Soil analysis for all the above fertility parameters is to be done after three-crop sequence.

### **Note:**

1. Experiment should be conducted on permanent site at least for three years.
2. Chickpea should be taken as a succeeding crop at all the locations except at Coimbatore center where black gram will be taken as the succeeding crop as main pearl millet crop is taken as early rabi in the area. At Bijapur, mono crop of pearl millet shall be taken.

## **PMAT – 5: Effect of sowing time on productivity of different hybrids and varieties**

**Back ground:** For preparing the contingent plan and to ensure sustainable pearl millet production under abnormal crop season, this trial has been formulated

### **Treatment:**

1. Sowing Time (3)-last week of June, 15<sup>th</sup> of July and 1<sup>st</sup> of August (+/-5days).
2. Hybrid and population (6) – Hybrids-3, Population -3  
Zone A1 Hybrids-HHB 67 Improved, GHB 538 and RHB 121



Populations-CZP 9802, Pusa 266 and MP 443  
Zone A Hybrids – RHB 121, GHB 558 and HHB 197  
Populations-Pusa 383, Raj 171 and ICMV 221  
Zone B Hybrids-Shradha, Saburi and GHB 558  
Population-ICMV 155,ICTP 8203 and Raj171

Total No. of treatment : 3 x 6 = 18  
Design : FRBD  
Replication : Three  
Plot size Gross : 5.00 m x 3.60 m  
Net : 5.00 m x 2.70 m

**Locations:**

Zone A1 = Mondor, Bikaner  
Zone A – Jaipur, Hisar, Kalai  
Zone B – Aurangabad, Coimbatore, Bijapur, Dhule

Note: Trial has to be conducted completely as rainfed except sowing on the specific day which may be planted with optimum irrigation.

**Observations:**

1. Grain yield (kg/ha)
2. Dry fodder yield (q/ha)
3. Sustainability index

**Optimization of nutrients for pearl millet production under assured moisture availability conditions.**

**Background:** several newly developed hybrids have shown significant response to applied nitrogen to the maximum level in the different zones, considering their responsiveness it becomes pertinent to re determine the appropriate dose of nitrogen and phosphorus to realize their maximum production potentiality.

**Objective:** Determine N and P requirement of newly developed hybrids and work out the economic optimum dose of the nutrients.

Treatments:

- (A) Nitrogen level (4):  
(i) 0  
(ii) 75% of the recommended dose of respective zone  
(iii) Recommended dose  
(iv) 125% Recommended dose
- (B) Phosphorous level (4)  
0, 15, 30, 45 kg/ha.

Hybrids: new high yielding hybrid of the respective zone (A= Nandi 61/ HHB 223; A1= GHB 538, B= 86 M 64)

No. of treatments: 4 x 4 = 16. Design : FRBD Replication: Three.

Plot size gross: 5m x 3.6m Net: 5m x 2.7m

**Locations :**

A<sub>1</sub> : Mandor, Bikaner.  
A : Jaipur, Hisar, Kalai, Jamnagar  
B : Aurangabad, Bijapur, Dhule & Coimbatore

**Observations :**

1.Yield and yield attributes 2.Economic optimum dose of nutrients 3.  
Nutrient use efficiency.

Meeting ended with the vote of thanks to the chair.

## **SESSION - I REVIEW OF RESEARCH RESULTS**

### **PLANT PATHOLOGY**

<b>Chairman</b>	:	Prof. H. Shekar Shetty University of Mysore, Mysore
<b>Co-chairman</b>	:	Dr. S. K. Gandhi Professor and Head, Dept. of Plant Pathology, CCSHAU, Hisar
<b>Rapporteur</b>	:	Dr. H.R. Bishnoi Asst. Plant Pathologist, Jodhpur
<b>Dated</b>	:	March 12, 2011
<b>Time</b>	:	4.15 pm

Scientists of pathology group from different AICPMIP centres and ICRISAT reviewed the research results of Kharif 2010 trials conducted at different locations. The following scientists attended the session:

1. Dr. H. Shekhar Shetty, Professor, University of Mysore, Mysore.
2. Dr. R.P. Thakur, Principal Scientist, ICRISAT, Patancheru
3. Dr. S.K. Gandhi, Prof.& Head, Dept. of Plant Pathology, CCS HAU, Hisar
4. Dr. Rajan Sharma, Sr. Scientist, ICRISAT, Patancheru
5. Dr. S.S. Ghuge, Plant Pathologist, AICPMIP (NARP), Aurangabad
6. Dr. R. K. Pandya, Pr.Scientist, RVSKVV, College of Agriculture, Gwalior
7. Dr. Niranjan Raj, Asstt.Prof. University of Mysore, Mysore
8. Dr. Sudisha J, Scientist, University of Mysore, Mysore
9. Dr. Kushal Raj, Asstt.Prof. (Plant Pathology) CCS HAU, Hisar
10. Dr. Asha Shivpuri, Assoc.Prof., ARS (SK RAU), Durgapura, Jaipur
11. Dr. Mahaveer Singh, Asstt.Prof. (Pathology), ARS, Fatehpur Shekhawati
12. Dr. H.R. Bishnoi, Asstt.Pathologist, AICPMIP, Mandor, Jodhpur
13. Dr. C.S. Thakare, Pearl Millet Pathologist, College of Agriculture, Dhule
14. Dr. D. L. Kadvani, Assoc.Research Scientist, MRS (JAU), Jamnagar
15. Dr. G. Karthikeyan, Assoc.Prof. (Pathology), TNAU, Coimbatore

Centre-wise experimental results were presented by the respective scientists.

## **Significant Findings**

**PMPT I:** Out of 101 entries, 86 entries were found highly resistance to downy mildew disease across the country and 7 entries viz., MH 1747, MH 1709, MH 1754, MH 1717, MH 1743, GHB 744 and GHB 558 recorded multiple pearl millet disease resistance.

**PMPT II:** Out of 71 entries, 56 entries were found highly resistance to downy mildew disease across the country and 9 entries viz., MH 1580, MH 1605, MH 1656, MH 1617, MH 1616, MH1609, MH1661, MH 1628, and MH 1663 recorded multiple pearl millet disease resistance except ergot at Aurangabad and rust at Hisar.

**PMPT III:** Out of 24 entries, 20 entries showed resistance to downy mildew across the country and four entries, Nandi 62, PB 106, GHB 744 and ICTP 8203 exhibited multiple disease resistance except ergot at Aurangabad and rust at Hisar.

### **PMPT IV A (i): PMDMVN**

The variation in the pathogen population was evident from the mean downy mildew (DM) incidence levels at different locations. Eight lines (HHB 67-2 Improved, H 77/ 833-2-202, HHB 67-1 Improved, IP 18293, P 7-3, IP 18298 ,IP 18294 and P 310-17) were DM free across the country and 9 entries recorded <10% incidence. Pathogen population at Patancheru appeared more virulent (25%) and Dhule recorded least virulent (4.25%).

### **PMPT IV A (ii): Genetic analysis through DNA markers**

Candidate SCAR primers were designed and developed to detect *S. graminicola* isolates belonging to pathotype I and II existing across the country.

### **PMPT IV B: Basic Research**

Full length gene sequence for RGA RGPM 213 (AF213969) was obtained by RACE-PCR. This R gene codes for a 55 kDa protein which has 58% identity with serine/threonine protein kinase which is a disease resistance gene marker.

### **PMPT-IVC:**

All the 25 entries screened for blast at Anand recorded  $\geq 5.0$  score. The pathogen population at Anand appeared to be most virulent and the least virulent population was at Patancheru.

### **PMPT V: On farm biological control using IDM module**

*Bacillus pumilus* (INR-7) plus half dose of Chitosan seed treatment were found to be very efficient in reducing the DM incidence, increased emergence, grain and fodder yield throughout all the testing centers.

## **PMPT VI: Downy mildew disease monitoring trials at farmer's field**

Most of the hybrid seeds produced by the private seed companies were treated with fungicides. Downy mildew disease is increasing despite of fungicide treatments. The range of downy mildew in the farmers field across all fields surveyed was from 0-80%. In addition to DM, smut, ergot and rust were recorded. Severe DM was recorded in Maharashtra. Madhya Pradesh, Tamil Nadu and Karnataka were relatively free from DM. It was observed that blast is becoming more severe in Maharashtra.

### **Recommendations**

1. The pathology group recommended that seed producing agencies test their material under Greenhouse/Sick plot conditions against DM before marketing and for this purpose appropriate greenhouse facilities should be provided to the Plant Pathology centres.
2. Pathology group feels that breeders sending seed for evaluation may ensure that seeds should not be treated with fungicides or bioagents.
3. From the blast variability nursery there is an indication of pathogenic variability and further studies needs to be conducted.
4. Repeated monitoring and survey of the same locations of farmer's fields at least for 2 years to get information regarding changing status of the downy mildew and other diseases and hybrids in that area is essentially required.

## **TECHNICAL PROGRAMME FOR KHARIF - 2011**

Pearl millet pathological trials to be conducted at various coordinating/cooperating centres during Kharif 2011

### **Disease Screening Trials**

Following procedures should to be adopted in conduct of disease screening trials

- I. Downy Mildew : Screening should be conducted in downy mildew sick plot using infector rows system
- II. Smut and Ergot : to be inoculated artificially
- III. Rust and Blast : natural disease incidence

**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 and A, B and R lines

## **Downy Mildew**

**Location** : **Zone A**  
Mandor, Jaipur, Hisar, Gwalior, Fatehpur Shekhawati, Jamnagar, Anand (PMPT I, II and Summer trials) and Morena (PMPT-III)  
**Zone B**  
Mysore, Aurangabad, Dhule, Coimbatore and Patancheru (PMPT-III)

## **Smut**

**Location** : **Zone A**  
Jaipur, Jamnagar, Hisar, Gwalior and Morena (PMPT-III)  
**Zone B**  
Dhule

## **Blast**

**Location** : **Zone A**  
Jaipur, Jamnagar, Gwalior and Morena (PMPT-III)  
: **Zone B**  
Dhule and Aurangabad

## **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 A: Characterization of pathogen diversity in downy mildew of pearl millet**

### **1. Pathogenic diversity analysis by virulence nursery**

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

### **2. Genetic analysis through DNA markers**

**Location** : Mysore and Patancheru

**PMPT IVB:** 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 Pearl Millet blast pathogen**

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

**PMPT V:** Evaluation of Integrated Disease Management Module (IDM) using host plant resistance, bioagent and Chitosan formulation

**Treatments:**

1. Chitosan (2.5g/kg)
2. *Bacillus pumilus* (INR-7) (8g/kg seed)
3. *Bacillus pumilus* (INR-7) + Chitosan
4. *Pseudomonas fluorescens* (Pf -1) (8g/kg seed)
5. Apron (6g/kg)
6. Untreated control

**Mode of treatment:** seed treatment (moderately resistant hybrid B 2301)

**Replicates:** 4 (4 rows in 5 meter length)

**Observation to be recorded:**

- a) Field 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 and Fatehpur Shekhawati  
**Zone B**  
Aurangabad, Dhule, Coimbatore, Mysore and Patancheru

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

**Locations:** All AICPMIP centers in their respective zones

**Method:** Record survey information by preparing chart listing field number, location, cultivar/area, crop stage (PT, F and SD), disease incidence (at least at 5 random subplots) and remarks. Monitor at least minimum 5 fields for each cultivar. Also collect infected leaf samples from highly susceptible cultivars for pathogen characterization. The samples should to be sent to the project coordinator

**NOTE:** - observations to be recorded on all prevalent disease in the area.

## SESSION-1

### REVIEW OF RESEARCH RESULTS PLANT PHYSIOLOGY

<b>Chairman</b>	:	Dr. Ashok Kumar Prof. of Agronomy, CCS HAU, Hisar
Rapporteur	:	Dr. B.S. Afria Assoc. Prof. (Physiology) ARS, SKRAU, Durgapura, Jaipur
Date	:	March 12, 2011

The group meeting of Physiology discipline was held on 12.3.2011 in Crop Physiology Laboratory, College of Agriculture, CCS HAU, Hisar. The Chairman, Dr. Ashok Kumar welcomed the participants of the Physiology Group. It was emphasized by the chairman that there is greater need of involvement of physiological research with agronomy and plant breeding in the changing climatic scenario. The role of physiology becomes more important with trait-based breeding and spread of environmental fragility. A summary of highlights of the results is given below:

1. Entries ICMH 356, RHB 121 and ICTP 8203 performed better under drought conditions at Jamnagar in the summer.
2. At Jaipur in Kharif trial hybrids MH 1609, RHB 121 and MH 1617 performed better under irrigated as well as drought conditions.
3. In trial on testing on maintainer B lines and inbred lines against drought, high yielding B lines were 97111B and 97444B, 93333B, inbred were J 2405 and HBL 11 and among A lines 21A/S-10 and 85A/S-10.
4. In the trial on foliar spray of PGRs on pearl millet hybrid GHB 558, potassium chloride (1.50%) and thiourea (1000ppm) were found effective with regard to grain yield and physiological parameters.
5. In the trial on seedling establishment entries 98444B, 97111A, RMS 6A and RIB 31-40/S 10 performed better.
6. In the laboratory experiment for assessment of salinity tolerance in pearl millet, entries 96222B, GHB 757, GHB 744, 105/S10, 135/S10 and 145/S 10 performed better.

The Chairman thanked the speakers for excellent presentation. However, it was suggested that due to lack of sufficient scientific manpower, the physiologists may be associated with the crop production group. Physiological parameters related to drought tolerance such as plant water status, assimilate partitioning, chlorophyll stability index, gas exchange and canopy temperature depression may added in the trials of crop production group so that identification of drought tolerant entries



may be carried out at the initial stages of evaluation. This will also help in developing simple tools of screening for drought tolerance in pearl millet.

Two experiments (PMPHY 3 and PMPHY 5) were slightly modified.

### **TECHNICAL PROGRAMME FOR 2011**

**PHPHY 1 : Evaluation of entries from initial trials for their response to terminal drought stress**

Location : Jaipur and Jamnagar

Objective : To identify entries performing better under terminal moisture stress conditions for A Zone

Plan of work : Based on the data of Initial Hybrid/Varietal Trial, a set of the high yielding entries will be tested for terminal drought conditions to identify the drought tolerant lines for their use in the breeding programme and supplement the information on their response to drought stress.

Season : Rain free summer

Treatments : 1. Main plot treatments  
a) Irrigated control/natural rainfed condition  
b) Terminal stress (flowering to maturity) to irrigate up to boot leaf stage.  
2. Sub-plot treatment : Entries from initial trials MH 1695, MH 1696, MH 1697, MH 1692, MH 1706, MH 1724, MH 1711, MH 1719, MP 508, MP 510, HHB 67, RHB 121, GHB 744, ICMH 356 and Raj 171

Design : Split plot

Replication : 3

Plot size : 2 rows of 5m length for each entry

Spacing : 50 cm x 15 cm.

Observation : 1. Soil moisture status at 10 days interval  
2. Phenology  
3. Specific Leaf Area at 50-60 DAS  
4. Relative water content at 55-60 DAS during stress.  
5. Canopy temperature/leaf temperature at stress.  
6. Yield and yield components:  
Grain yield per plot, productive tillers/plant, 100 grain weight, Threshing percentage, fodder yield.  
7. Harvest index  
8. Drought susceptibility index

**PMPHY 2 : Testing of maintainer B lines and inbred lines against drought.**

Location : Jaipur and Jamnagar

Objective : 1. To assess and identify drought tolerance in B lines and inbred lines.  
2. To use drought tolerant parental lines for building of hybrids resistant to drought.

Season : Summer season

Treatments : Entries – 10-15 MS lines and inbred lines in terminal stress (irrigated up to boot leaf if required).

Design : RBD /Split plot

Plot size : Single row of 5m length/entry

Spacing : 50 cm x 15 cm

Observations : 1. Membrane stability index.  
2. RWC at appropriate intervals after onset of stress.  
3. Phenology  
4. Grain yield  
5. Productive tiller/plant  
6. Ear weight and number/plant  
7. Test weight  
8. Threshing percentage  
9. Harvest index  
10 DSI

**PMPHY 3 : Efficacy of foliar spray of growth substances under rainfed conditions on yield potential of pearl millet.**

Location : Jaipur, Jamnagar

Objective : 1. To increase the yield potential by foliar spray treatments  
2. To mitigate the drought stress under rainfed condition

Season : Kharif

Treatments : A. Foliar spray at tillering & post – anthesis stages.  
1. Untreated control  
2. Water spray  
3. Thiourea 1000 ppm  
4. Benzyl adenine 25 ppm  
5. Benzyl adenine 50 ppm  
6. Potassium chloride 0.75 %  
7. Potassium chloride 1.50 %  
B. Entry – GHB - 558

Design : RBD

Plot size : Gross-4 rows of 5m length for each treatment  
Net-2 rows of 5m length for each treatment

Spacing : 50 cm x 15 cm

Observations : Phenology  
Specific leaf area  
Fodder and grain yield  
Panicle weight

Threshing percentage  
Harvest index  
RWC at drought stress  
Soil Moisture status at 15 days interval

**PMPHY 4                      Evaluation for seedling establishment in pearl millet under adverse conditions**

Location                    : Jaipur, Jamnagar  
Objective                 : 1. To screen parental material and newly developed hybrids for their establishment at germination stage under hostile conditions of receding soil moisture, crust formation and high temperature  
                                      2. To identify better performing parental material and hybrids for seedling establishment under adverse conditions  
Plan of work              : 1. Only one irrigation will be given at the time of sowing in the month of May and June (two dates of sowings) when the temperatures are high to allow crust formation.  
                                      2. Observations on germination and emergence will be recorded from the specified number of seeds sown under moisture receding conditions.  
Season                     : Summer in the month of May and June.  
Treatments               : Hybrids and their parental lines  
Design                    : RBD  
Replication              : Three  
Plot size                 : Single row of 1m length  
Spacing                  : 50 cm x 15 cm  
Observations            : 1. Germination percentage in petridishes  
                                      2. Days to emergence  
                                      3. Emergence percentage after one week  
                                      4. Root length  
                                      5. Shoot length  
                                      6. Seedling length  
                                      7. Seedling dry weight  
                                      8. Root dry weight  
                                      9. Shoot dry weight  
                                      10. Root/shoot ratio  
                                      11. Vigour index

**PMPHY 5                    : Assessment of salinity tolerance in pearl millet (the experiment have not been approved in Plenary Session)**

Location                    : Jaipur, Jamnagar  
Objectives                : 1. To assess and identify salinity tolerance in pearl millet.  
                                      2. To screen pearl millet hybrids, MS lines and pollinators for salinity tolerance

Season : Laboratory trial  
Treatments : A. Salinity level : 0, 3 and 6 dsm<sup>-1</sup> prepared from sodium, calcium and magnesium salts.  
B. 10 to 15 entries (Hybrids, MS lines and pollinators)  
Design : CRD  
Replication : Two  
Plot size : Petridish trial  
Observations : To be recorded after 10 days of sowing  
Germination percentage  
Root length  
Shoot length  
Root dry weight  
Shoot dry weight  
Root/shoot ratio  
MSI/CSI  
Vigour indices (VI<sub>1</sub> and VI<sub>2</sub>)  
EC of leachets

Significant Achievements:

- MH 1609, RHB-121, MH 1617, ICTP-8203, 97444B, 93333B, J 2405 and HBL 11 were found to be high yielding and drought tolerant.
- Spray of potassium chloride (1.50%) and thiourea (1000 ppm) were efficacious in increasing the grain yield in pearl millet.

The meeting ended with thanks to the Chair.

**SESSION –I**  
**REVIEW OF RESEARCH RESULTS**

**ENTOMOLOGY**

<b>Chairperson</b>	:	Dr. (Mrs.) S. Khokhar
<b>Co- Chairperson</b>	:	Dr. R. K. Saini
<b>Rapporteur</b>	:	Dr. B. L. Tandil
<b>Date</b>	:	March 12, 2011
<b>Time</b>	:	5:30 pm

Center wise experimental results were presented by respective scientists. Dr. K. L. Raghwani, Research Scientist (Entomology) JAU, Jamnagar reported the experimental results conducted during the season. He reported higher incidence of shoot fly and stem borer at Jamnagar, while incidence of *Helicoverpa armigera* was low to moderate. He emphasized that seed treatment with imidacloprid 70 WS @ 7.5 g/kg seed or thiamethoxam 70 WS @ 4.5 g/kg seed followed by dusting of 0.4 % fenvalerate @ 20 kg/ha at 35 DAG proved the most effective treatment for the management of shoot fly and stem borer in pearl millet. Dr. B. L. Tandil, Entomologist, ARS, Durgapura, Jaipur presented the results of the experiments conducted at Jaipur Centre. He highlighted that low to moderate infestation of shoot fly, stem borer, white grub, grey weevil and termite was observed at Jaipur, Sikar, Ajmer and Daussa districts of Rajasthan, however 20% damage by shoot fly at Village Rajawas (Amer) and Nangal Kalan (Chomu), 30 % damage by Grass hopper at Hadota (Chomu) and Labana (Amer) and 20% damage by white grub at Gudliya (Chomu) of Jaipur Distt. was observed. He further reported that for the management of shoot fly and stem borer seed treatment with imidacloprid 70 WS@ 7.5 g/kg seed or thiamethoxam 70 WS @ 4.5 g/kg seed followed by dusting of 0.4% fenvalerate @ 20 kg/ha at 35 DAG found effective. Dr. Chokha Ram, Entomologist, ARS, Fatehpur-Shekhawati reported low infestation of grey weevil in areas of Sikar districts and heavy damage (40%) of earhead worm on some fields at Didwana of Nagour district.

Co-chairperson suggested to Dr. K. L. Raghwani that the treatments found at par with each other must be highlighted in the same group of effectiveness against the pest in their presentation table.

Chairperson suggested to Dr. Chokha Ram to confirm the species of ear head worm infesting Bajra crop at Nagour.

While testing different IPM modules it was suggested by the co-chairperson that module involving fishmeal trap may be tested at least 30m away from the other modules so that the shoot fly incidence is not affected in other treatments due to shoot fly catches in fishmeal traps.

## Technical Programme

**PMET1 : Screening of pearl millet lines against major insect pest**

Objectives : To find out resistant promising material against major insect pests

Location : Jamnagar, Jaipur and Fatehpur-Shekhawati

Experimental details : Design : RBD

No of replications : 3

No of rows : Two

Row Length : 3m and Spacing; 50 X 15 cm. No of entry: 60 to 70 promising lines to be provided by Project Coordinator

**Observations to be recorded**

1. Shoot fly – Percent infestation at 28 DAG and ear head stage
2. Stem borer – Per cent plant damage at vegetative stage and per cent white ear heads
3. Helicoverpa – Number of larva per ten ear heads
4. Grey weevil Damage score and number of grey weevil adults per ten plants at vegetative and ear head stages
5. Leaf roller- Damage score and number of larvae per ten plants at vegetative stage
6. Chafer beetle – Damage score and number of beetles per ten ear heads

**PMET 2 : Monitoring of major insect pests of pearl millet**

Location : Jamnagar, Jaipur and Fatehpur-Shekhawati

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

Methodology : Sowing of released variety/hybrid will be done over an area of 200 sqm, which will be kept free from insecticidal application during crop season. Incidence of various insect pests will be recorded at weekly interval from 30 randomly selected plants. Meteorological data such as temperature, rainfall, relative humidity and sunshine hours will be correlated with pest incidence.

**PMET 3 : Mapping of key pests of the bajra crop on farmer's field**

Location : Jamnagar, Jaipur and Fatehpur-Shekhawati

Objectives : To examine pest status in bajra growing areas

Observations : Survey of major insect pests will be carried out at

vegetative and ear head stage of bajra crop during kharif season. Incidence of various insect pests infesting bajra will be recorded from 25 randomly selected plants/field. The pest status (major and minor) and magnitude of damage will be worked out. Observation on alternate host plants of shoot fly, grey weevil, *Helicoverpa*, grass hoppers and chafer beetle will be recorded.

**PMET 4 : Chemical control of shoot fly and stem borer in pearl millet**

Objective : To assess the combined effect of seed treatment and some insecticidal treatments on the incidence of shoot fly and stem borer infesting pearl millet

Location : Jamnagar and Jaipur

Experimental details : Design: RBD, No. of Replications: Four, Gross plot size: 5.0x3.6m, Net plot size: 4.0x2.4m and Spacing 50x15cm

Treatments: Seven treatments including control

1. Imidacloprid 70 WS seed treatment @ 7.5 g/kg seed followed by Fenvalerate 0.4% dust @ 20 kg/ha at 35 DAG.
2. Thiamethoxam 70 WS seed treatment @ 4.5 g/kg seed followed by Fenvalerate 0.4% dust @ 20 kg/ha at 35 DAG.
3. Imidacloprid 70 WS seed treatment @ 7.5 g/kg seed followed by NSKE 5% spray at 35 DAG.
4. Thiamethoxam 70 WS seed treatment @ 4.5 g/kg seed followed by NSKE 5% spray at 35 DAG
5. Imidacloprid 70 WS seed treatment @ 7.5g/kg seed followed by *Beauveria bassiana* @ 4kg/ha whorl application at 35 DAG.
6. Thiamethoxam 70 WS seed treatment @ 4.5 g/kg seed followed by *Beauveria bassiana* @ 4 kg/ha whorl application at 35 DAG.
7. Untreated control

Methodology and observation to be recorded

- 1) Percent shoot fly infestation at 28 DAG and ear head stage.
- 2) Percent stem borer infestation at vegetative stage and ear head stage
- 3) Yield and economics of the treatments

**PMET 5 : Testing of IPM modules with farmers practice against pest complex of pearl millet**

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

Location : Jamnagar and Jaipur

Experimental : Design: RBD,

- details No of Replication: 4,  
Plot size gross: 5.0X3.6m,  
Net 4.0 x 2.4m and Spacing: 50x 15 cm.
- Treatments : Five
1. IPM module –I
    - a) Seed treatment with imidacloprid 600 FS @ 8.75ml/kg seed
    - b) Higher seed rate (10%)
    - c) Removal of shoot fly dead heart
  2. IPM module –II
    - a) Seed treatment with imidacloprid 600 FS @ 8.75 ml/kg seed
    - b) Spraying of endosulfan 0.07% at 30 DAG
    - c) Dusting of malathion 5% dust @ 20 kg/ha at milky grain stage
  3. IPM module-III
    - a) Seed treatment with imidacloprid 600 FS @ 8.75 ml/kg seed
    - b) Spraying of Bt. @ 1.0 kg/ha at 30 DAG
    - c) NSKE 5% spray at ear head stage
  4. IPM module –IV
    - a) Seed treatment with imidacloprid 600 FS@ 8.75 ml/kg seed
    - b) Fishmeal trap @ 10/ha
    - c) NSKE 5% spray at ear head stage

This module will be tested 30m away from the other modules to avoid shoot fly catches from other modules
  5. Farmers practice

Methodology and observation to be recorded

1. Pre cent infestations of shoot fly at 28 DAG and at ear head stage.
2. Per cent infestation of stem borer at vegetative stage and at ear head stage
3. Per cent infestation of grey weevil, termite and white grub.
4. Yield and economics of the treatments

**PMET 6 : Eco-friendly management of stored grain pests of bajra seed**

- Objective : To study the effectiveness of seed protectant against storage pest of pearl millet
- Location : Jamnagar and Jaipur
- Experimental details : Design: CRD. Replciations:3, Sample size: 500 g bajra seed
- Treatment : 11
1. Neem leaves powder @ 5 g/kg seed
  2. Neem leaves powder @ 10 g/kg seed



3. Mint leaves powder @ 5 g/kg seed
4. Mint leaves powder @ 10 g/kg seed
5. Tulsi leaves powder @ 5 g/kg seed
6. Tulsi leaves powder @ 10g/kg seed
7. Karanj leaves powder @ 5 g/kg seed
8. Karanj leaves powder @ 10 g/kg seed
9. Dhatura leaves powder @ 5 g/kg seed
10. Dhatura leaves powder @ 10 g/kg seed
11. Untreated control

Methodology and observation to be recorded:

- Release of 10 pairs of *Rhizopertha dominica* /*Tribolium castaneum* for egg laying for 10 days in a jar containing 500 g of bajra seed.
- Record moisture content of the seed before release of test insects
- Take one gram of seed from each treatment and count the number of healthy and damaged seed to assess the per cent damage and weight loss after 3 and 6 months of storage.
- Record the germination percentage after 6 months.

**PMET 7(new) : Evaluation of different insecticides as seed dresser for the management of soil pests (white grub and termite) in pearl millet**

Objective : To assess cost effective management of white grub and termite by using insecticides as seed treatment in pearl millet

Location : Jaipur

Expt. Details :

Design	: RBD
No. of Replications	: Three
Gross plot size	: 5.0X3.6 m
Net plot size	: 4.0x2.4 m
Spacing	: 50x15 cm

Treatments :

1. Imidacloprid 600 FS seed treatment @ 5 ml/kg seed
2. Imidacloprid 600 FS seed treatment @ 8.75 ml/kg seed
3. Clothianidin 50 WDG seed treatment @ 5 g/kg seed
4. Clothianidin 50 WDG seed treatment @ 7.5 g/kg seed
5. Thiamethoxam 70 WS seed treatment @ 5 g/kg seed
6. Thiamethoxam 70 WS seed treatment @ 7.5 g /kg seed
7. Fipronil 5 SC seed treatment @ 15 g/kg seed
8. Fipronil 5 SC seed treatment @ 25 g/kg seed
9. Quinalphos 25 EC seed treatment@ 15 ml/kg seed
10. Quinalphos 25 EC seed treatment @ 25 ml/kg seed
11. Endosulfan 35 EC seed treatment @ 15 ml/kg seed
12. Endosulfan 35 EC seed treatment @ 25 ml/kg seed
13. Untreated control

Methodology and observation to be recorded:

- Germination of treated seeds will be tested before sowing.
- Remove the died plants due to white grub and termites at each observation
- Per cent termite and white grub damage.
- Yield and economics of the treatments.

## **Proceedings of Varietal Identification Committee Meeting held on 12.3.2010 at CCS HAU, Hisar**

The Varietal Identification Committee Meeting was held on March 12, 2011 at 8.30 PM in the Committee Room of Faculty House, CCSHAU, Hisar under the Chairmanship of Dr. R.P. Dua, ADG (FFC), ICAR, New Delhi. The following committee members were present:

1	Dr. R.P. Dua, ADG (FFC), ICAR, New Delhi	-Chairman
2	Dr. R.P. Narwal, Director Research, CCS HAU, Hisar	-Member
3	Dr. J.S. Sandhu, ADG (Seeds), ICAR, New Delhi	-Member
4	Dr. K.N. Rai, Principal Scientist, ICRISAT, Hyderabad	-Member
5	Dr. J.P. Singh, Joint Director (DMD), Jaipur	-Member
6	Dr. H. Shekar Shetty, Professor, University of Mysore, Mysore	-Member
7	Dr. H.T. Patil, Pearl Millet Breeder, MPKV, Dhule (MS)	-Member
8	Dr. C. Ramakrishana, Vice President (R &D), Nuziveedu Seeds Pvt. Ltd., Hyderabad (AP)	-Member
9	Dr. (Mrs.) A.K. Jayalekha, Lead Breeder, Bayer BioScience Pvt. Ltd., Hyderabad (AP)	-Member
10	Dr. O.P. Yadav, Project Coordinator (Pearl Millet), AICPMIP, Jodhpur	-Member Secretary
<b>Principal Investigator</b>		
11	Dr. B.S. Rajpurohit, Asstt. Breeder, AICPMIP, Mandor, Jodhpur	- Facilitator
12	Dr. H.R. Bishnoi, Asstt. Pathologist, AICPMIP, Mandor, Jodhpur	- Facilitator

The proposals submitted for varietal identification were:

<b>S.No.</b>	<b>Hybrid/ Variety</b>	<b>Identity</b>	<b>Zone</b>
1	MH 1560	RHB 185	Zone A1 (Early Maturity)
2	MH 1561	HHB 234	Zone A1 (Early Maturity)
3	MP 495	Pusa Com. 621	Zone A1 (Early Maturity)
4	MP 489	MBC 2	Zone A1 (Early Maturity)
5	MH 1578	VBBH 3040	Zone A (Medium Maturity)
6	MH 1578	VBBH 3040	Zone B (Medium Maturity)
7	MH 1570	MRB 2240	Zone B (Medium Maturity)
8	MH 1617	86 M 66	Zone A (Late Maturity)
9	MH 1610	MP 7872	Zone A (Late Maturity)
10	MH 1609	MP 7792	Zone A (Late Maturity)
11	MH 1616	86 M 33	Zone A (Late Maturity)
12	MH 1600	JKBH 768	Zone A (Late Maturity)
13	MH 1617	86 M 66	Zone B (Late Maturity)
14	MH 1616	86 M 33	Zone B (Late Maturity)
15	MH 1610	MP 7872	Zone B (Late Maturity)
16	MH 1600	JKBH 768	Zone B (Late Maturity)
17	MSH 219	MRB 2240	Summer

The performance of each variety of submitted proposals was discussed in detail. The following decisions were taken after detailed deliberations:

**(Drier part of Rajasthan, Gujarat and Haryana) Zone A<sub>1</sub>**

The proposals of two hybrids viz., MH 1560 (RHB 185) and MH 1561 (HHB 234) were considered for drier parts of Rajasthan, Gujarat and Haryana. Hybrid MH 1560 was not approved because of its high downy mildew disease. The hybrid MH 1561 (HHB 234) was recommended for release in zone A1 (Drier part of Rajasthan, Gujarat and Haryana) as it has shown superiority in grain and fodder yield over the popular check HHB 67 (Improved)

Proposals of two composite varieties MP 495 (Pusa Composite 621) and MP 489 (MBC 2) were discussed by the committee. Variety MP 495 was not recommended for release as it showed high downy mildew incidence. Population MP 489 showed superiority in grain and fodder yield over the normal comparative checks CZP 9802 and ICTP 8203. Hence the population MP 489 (MBC 2) was recommended for release in zone A<sub>1</sub> (Drier part of Rajasthan, Gujarat and Haryana).

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

The hybrid MH 1578 (VBBH 3040) was not recommended for release as it has no superiority in grain yield over the best checks GHB 744 and RHB 121.

**Zone B (Medium maturity) (Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu).**

The proposal of the hybrid MH 1578 (VBBH 3040) and MH 1570 (MRB 2240) were considered for Zone B under medium maturity group. The hybrid MH 1570 (MRB 2240) was not recommended for release due to its lateness under medium maturity group. The hybrid MH 1578 was recommended for cultivation in zone B (Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu) due to its superiority over ICMH 356, Shradha and Pusa 23 with respect to grain yield.

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

Five proposals of hybrids namely MH 1617 (86 M 66), MH 1610 (MP 7872), MH 1609 (MP 7792, MH 1616 (86 M 33) and MH 1600 (JKBH 768) were discussed together by the committee. Three hybrids MH 1617 (86 M 66), MH 1610 (MP 7872) and MH 1609 (MP 7792) were identified for release in Rajasthan, Gujarat, Haryana, UP, MP, Punjab and Delhi under late maturity group as they have shown superiority in grain yield by more than 15% over checks PB 106, GHB 558 and Pusa 23. Hybrids MH 1616 and MH 1600 were not recommended as they had lower grain yield over the other three aforesaid qualifying hybrids.

**Zone B (Late maturity) (Maharashtra, Tamil Nadu, Karnataka and A.P.)**

Four hybrids MH 1617 (86 M 66), MH 1616 (86 M 33), MH 1610 (MP 7872) and MH 1600 (JKBH 768) were considered for this group. None of the hybrids has shown superiority in grain yield over the check B 2301, hence these were not recommended for release.

**Summer**

Proposal of hybrid MSH 219 (MRB 2240) was considered for summer cultivation and it was not approved for release as it has not shown superiority over check Proagro 9444 in grain as well as dry fodder yield.

Sd/-  
**Dr. O.P. Yadav**  
**Member Secretary**

Sd/-  
**Dr. R.P. Dua**  
**Chairman**

## **SESSION II**

### **Review of Research Results and Progress Report of 2010-11**

**Chairman** : Dr. R.P. Dua  
**Rapporteur** : Dr. H.T. Patil and Dr. Virendra Malik

#### **Plant Breeding**

**Presented by : Dr. B.S. Rajpurohit**

For Kharif 2010, there were 241 trials allotted in zone A1, A and B zones. Out of 241, 221 trials were conducted with success rate of 92%.

#### **Agronomy**

**Presented by: Dr. M.S. Rathore**

In agronomy, 8 trials were conducted by allotted centers in different zones.

Dr. Dua raised question about the problem with the centre at Fatehpur Shekhawati.

As per Dr. Rajpurohit, "No funds were given to this centre as Director Research denied to conducted this trial at their centre.

Dr. Dua raised question of economics of applying FYM 7.5 t/ha treatment. It was informed that with B:C ratio of 4.13 suggested that it was economical to use this treatment in Bajra -chickpea cropping sequence.

All hybrids performed better in D1 (last week of June) sowing and decrease in yield was observed in D2 (15<sup>th</sup> July) and D3 (Ist week of August).

Dr. R.P. Thakur suggested to incorporate disease incidence data with all the agronomy experiments going on under AICMIP. This is added to study the interaction of disease incidence with different cultural practices.

#### **Plant Pathology**

**Presented by: Dr. H.R. Bishnoi**

All the centres have submitted the results of all the allotted trials. Looking to the severity of pearl millet blast disease Dr. R.P. Dua asked that farmers can go for chemical spray to manage the blast. Dr. R.P. Thakur replied that seed treatment and resistant genotypes are best alternative to manage the blast disease and we can not recommend the

chemical spray because both fodder and grain are consumed by the animals directly.

### **Plant Physiology**

#### **Presented by: Dr. B.S. Afria**

Dr. Dua proposed that the Plant Physiology session should be clubbed with Session of Agronomy.

He also suggested that screening of breeding material for salinity in petri dishes have no relevance. The experiment should be either in field or pot.

### **Entomology**

#### **Presented by: Dr. K.L. Raghvani**

Dr. Dua emphasized to pool the data of all experiments of last five years on shootfly and stem borer data for presentation in the next AICMPIP meeting and also asked PI (Entomology) to assess the percent of insect damage during storage.

Dr. O.P. Yadav suggested to combine the data of entomology trials conducted at Jamnagar and other stations from next workshop onwards.

The session ended with thanks to the Chairman and Project Coordinator.

### **Session III**

## **Review of Breeder Seed Production and DUS Testing Project and Progress Report of 2010-11 and Plan of Work of 2011-12.**

Chairman : Dr. J. S. Sandhu, ADG (Seeds)  
Rapporteur : Dr. Yash Pal Yadav

Dr. B.S. Rajpurohit, Breeder, AICPMIP, Mandor informed that against a DAC indent of 10.22 q, actual production was 28.36q (including carry-over). Chairman suggested that registration of novel germplasm with NBPGR, New Delhi should be taken on priority. He also emphasised for submission of proposal of notification and release of newly identified hybrids/composites within one month of its identification along with its certificate of registration issued from NBPGR, New Delhi. Dr. C.T. Hash from ICRISAT, explained that BSP of HHB 67 parental lines; and 81A & 81B were not taken up due to their susceptibility to downy mildew. The chairman also advised that in future the year of release of hybrids/varieties should invariably be mentioned in the indent table and denotification process of susceptible hybrids should be started. If indented seed is not lifted by indenters, this information should be sent to ADG (Seeds) and Project Coordinator (Pearl Millet) giving full details. Last five years information should be provided to ADG (Seeds) by Project Coordinator (Pearl Millet) giving details of DAC indent, actual production and non-lifting of seeds. Chairman expressed concern that only six hybrids got DAC indent this year which is too low. He also pointed out that SAU's should not directly entertain the various agencies to supply seed. This information must be supplied to PC (Pearl Millet) and ADG (Seeds) and should be presented on a separate slide in the next workshop. Dr. C.T. Hash informed the house that at present nearly 3.00 lakh ha area is under HHB 67 Improved but until 2010 there was no indent from DAC yet. Dr. B.S. Rajpurohit informed that allocation of breeder seed for the year 2011-12 has been received. However, indent for 2011-12 is yet to be obtained from DAC and as soon as this information is received from DAC same will be communicated to the breeders by the PC (Pearl Millet). Dr. O.P. Yadav presented the progress report of DUS project in pearl millet.

He informed the house that at present AICPMIP, Mandor and MPKV, Rahuri are two test centres for DUS testing through PPV & FRA and 26 traits are identified for DUS testing. During last three years, 29 hybrids/varieties have been tested for DUS testing and these all are from private sector. He emphasized that public sector should also come forward for testing. Dr. I.S. Khairwal told the house that any inbred, hybrid/varieties may be registered with PPV&FRA. Chairman emphasized that before commercializing any hybrid, registration with PPV&FRA should be done within one year. The entry should differ for at least one character out of 26 listed traits for registration.

The meeting ended with vote of thanks to the chair.



**Program of production of Breeder Seed of Pearl millet varieties and parental lines**

**(BSP 1)**

Crop: Pearl millet

Year of Production: 2011

**Year of supply: February 2012**

<b>S.No</b>	<b>Name of Producing center/state</b>	<b>Name of parental line/ variety</b>	<b>DAC indent (q)</b>	<b>Target set (q)</b>
<b>A.</b>	<b>Varieties</b>			
1	PAU, Ludhiana	FBC 16	4.00	4.00
2	PAU, Ludhiana	PCB 164	1.05	1.05
3	CCS HAU, Hisar	HC 20	0.90	0.90
4	CCS HAU, Hisar	HC 10	0.02	0.02
5	RVSKVV, Gwalior	JBV 2	1.60	1.60
6	IARI, New Delhi	Pusa Composite 334	0.50	0.50
7	ICRISAT, Patancheru	ICMV-221	1.10	1.10
8	ICRISAT, Patancheru	ICMV-155	0.10	0.10
9	ICRISAT, Patancheru	WCC 75	0.03	0.03
10	ICRISAT, Patancheru	ICTP 8203	1.77	1.77
11	SKRAU, Jaipur	RAJ BAJRA CHARI 2	0.50	0.50
		<b>Total (A)</b>	<b>11.57</b>	<b>11.57</b>
<b>B.</b>	<b>Parental lines</b>			
12	IARI, New Delhi	576 A	0.26	0.26
13	IARI, New Delhi	576 B	0.07	0.07
14	IARI, New Delhi	PPMI 85	0.07	0.07
15	IARI, New Delhi	841 A	0.46	0.46
16	IARI, New Delhi	841 B	0.17	0.17
17	IARI, New Delhi	PPMI 69	0.07	0.07
18	IARI, New Delhi	D 23	0.20	0.20
19	CCS HAU, Hisar	H 77/833-2-202	0.38	0.38
20	ICRISAT, Patancheru	843-22 A	0.85	0.85
21	ICRISAT, Patancheru	843-22 B	0.43	0.43
22	ICRISAT, Patancheru	81 A	0.15	0.15
23	ICRISAT, Patancheru	81 A	0.05	0.05
24	MPKV, Rahuri	RHRBI 138	0.10	0.10
25	MPKV, Rahuri	RHRBH 1 A	0.20	0.20
26	MPKV, Rahuri	RHRBH 1 B	0.10	0.10
		<b>Total (B)</b>	<b>3.56</b>	<b>3.56</b>
		<b>Total (A) +(B)</b>	<b>15.13</b>	<b>15.13</b>

**Monitoring team for breeder seed production:**

1. Project Coordinator AICRIP-Pearl Millet/ Representative
2. Breeder Concerned
3. Representative of NSC
4. Representative of concerned SSC
5. Representative of concerned SSSA

DAC Indent of Pearl Millet Breeder Seed for Kharif 2012-13 (QUANTITY IN QUINTALS)															
S. No.	Variety Name	YEAR	AP	DAD H	HR	KK	MP	MH	NDD B	NSC	DAH (Pun)	SAI	TN	UP	Total
A	Varieties														
1	FBC 16	2007									2.00	2.00			4.00
2	PCB 164	2007							1.05						1.05
3	HC 20 (HMP 9102)	2002		0.50								0.40			0.90
4	HARYANA COMPOSITE-10	2000			0.02										0.02
5	JBV 2 (GKKV-93191)	1999					1.00							0.60	1.60
6	PUSA COMPOSITE-334 (MP-334)	1999					0.50								0.50
7	ICMV 221	1993											1.00	0.10	1.10
8	ICMV 155	1991												0.10	0.10
9	RAJ BAJRA CHARI 2	1990								0.50					0.50
10	MP 124 (ICTP 8203)	1988				0.62		0.50		0.05				0.60	1.77
11	WCC 75	1982								0.03					0.03
B	Parental Lines														
12	PUSA 415 (MH 739) 576 A	1999										0.26			0.26
13	PUSA 415 (MH 739) 576 B	1999										0.07			0.07
14	PUSA 415 (MH 739) PPMI 85 R	1999										0.07			0.07

DAC Indent of Pearl Millet Breeder Seed for Kharif 2012-13 (QUANTITY IN QUINTALS)															
S. No.	Variety Name	YEAR	AP	DAD H	HR	KK	MP	MH	NDD B	NSC	DAH (Pun)	SAI	TN	UP	Total
15	PUSA 605 (MH 564) 841 A	1999										0.26			0.26
16	PUSA 605 (MH 564) 841 B	1999										0.07			0.07
17	PUSA 605 (MH 564) PPMI 69 R	1999										0.07			0.07
18	HHB 67 Improved (MS 843-22 A)	2005	0.40							0.30		0.15			0.85
19	HHB 67 Improved (843-22 B)	2005	0.20							0.10		0.13			0.43
20	HHB 67 Improved (H 77-833-2-202 R)	2005	0.20							0.10		0.08			0.38
21	HHB 60 MS 81 A	1988								0.15					0.15
22	HHB 60 MS 81 B	1988								0.05					0.05
23	MH 169 (Pusa 23) D 23 R	1987										0.20			0.20
24	MH 169 (Pusa 23) MS 841 A	1987										0.20			0.20
25	MH 169 (Pusa 23) MS 841 B	1987										0.10			0.10
26	Shardha RHRBH 138 R	1994						0.10							0.10

DAC Indent of Pearl Millet Breeder Seed for Kharif 2012-13 (QUANTITY IN QUINTALS)															
S. No.	Variety Name	YEAR	AP	DAD H	HR	KK	MP	MH	NDD B	NSC	DAH (Pun)	SAI	TN	UP	Total
27	Shardha RHRBH 1 A	1994						0.20							0.20
28	Shardha RHRBH 1 B	1994						0.10							0.10
	TOTAL		0.80	0.50	0.02	0.62	1.50	0.90	1.05	1.28	2.00	4.06	1.00	1.40	15.13

**Session – IV**  
**Review of Research Results and Progress Report of**  
**ICAR-ICRISAT Collaborative Projects 2010-11 and**  
**Plan of Work 2011-12**

**Chairperson** : **Dr. R. P. Dua**

**Co-chairperson** : **Dr. H. P. Yadav**

**Rapporteur** : **Dr. C. Tara Satyavathi**

Dr. O. P. Yadav, Project Coordinator, AICPMIP presented the overview of the ICAR-ICRISAT partnership trials taken during Kharif, 2010. In the ICAR-ICRISAT partnership trials, the improved genetic material and genetic stocks developed at ICRISAT are being evaluated at various locations of the All India Coordinated Pearl millet improvement Programme and selections were made by respective breeders at various locations for use in their respective breeding programmes. These trials aim at providing breeding material to the breeders for development of restorers, seed parents and trait-specific material to different locations and base populations for use in local breeding programmes. During Kharif, 2010, number of trials and nurseries belonging to seed parent development, restorer development and marker assisted breeding nurseries were taken at the specific locations decided in the last year workshop. He concluded that

- Lines were selected by individual centres
- Inbreeding was initiated in the selected lines
- Genetic material was evaluated at selected locations
- Data of the respective trials from respective centres has been presented in the AICPMIP report

Dr. S.K. Gupta, Scientist (Pearl Millet Breeding) of ICRISAT presented the information about the various trials provided by ICRISAT under seed parent development, restorer development and other specific trials for specific traits and locations. These include -

- For the seed parent – trials and nurseries of maintainer lines with thick panicle, long panicle, thick panicle with dwarf plant height, earliness and compact panicle.
- For the restorer development – restorers derived from diverse sources of earliness, long panicle, thick panicle and A5 restorer lines

- Disease resistant B- line and R-line composite material with multiple resistances against different isolates of downy mildew and blast.
- Other trials on salinity tolerant inbreds and populations, high forage populations, high Fe inbreds and flowering stage heat tolerance

Dr. C. Tom Hash, Principal Scientist at ICRISAT presented information about various trials under marker assisted breeding trials and nurseries to be provided by ICRISAT at different locations. In the marker assisted breeding trials and nurseries trials on introgression of QTL's for yield, downy mildew, blast, high iron and zinc from different linkage groups in different backgrounds are also provided for specific locations.

A note was made about the activities of pathology to be taken up and which have to be decided during the plan meetings for Pearl millet downy mildew virulence nursery, pearl millet blast virulence nursery and survey of farmer's fields for collection of different isolates of downy mildew and blast.

In the end, the Chairman concluded that these trials are very effective in sharing material, information and experience among the breeders. These trials help the breeders in formulating new programmes and provide the base material for locations where much progress in breeding has not been done.

The technical programme for Kharif 2011/Summer 2012 was also finalized.

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

**ICAR-ICRISAT Collaborative Trials (2011-12)**

<b>Trial</b>	<b>Entries</b>	<b>Reps</b>	<b>Rows</b>	<b>Locations</b>
<b>Seed Parent Progeny Trials</b>				
Thick panicle B-line trial	25-30	2	1	Dhule, Hisar, Jamnagar, Jaipur, Aurangabad, IARI, Coimbatore, Bijapur
Long-panicle B-line trial	25-30	2	1	Dhule, Hisar, Jamnagar, Jaipur, Aurangabad, IARI, Coimbatore, Bijapur
Dwarf plant height B- line trial	30-40	2	1	Dhule, Hisar, Jamnagar, Jaipur, Aurangabad, IARI, Coimbatore
Early B-line trial	50-60	2	1	Hisar, Jaipur, Jamnagar, CAZRI, Mandore, SK Nagar, Bikaner
Compact-panicle B-line trial	15-20	2	1	Dhule, Hisar, Jamnagar, Jaipur, Aurangabad, IARI, Coimbatore, CAZRI, Mandore
Multiple DM Resistant B- Composite	25 rows of 4m			Dhule, Hisar, Jamnagar, Jaipur, Aurangabad, IARI, Coimbatore, Bijapur
Blast and DM Resistant B- Composite	25 rows of 4m			Dhule, Hisar, Jamnagar, Jaipur, Aurangabad, IARI, Coimbatore, Bijapur
<b>Restorer Parent Progeny Trials</b>				
Early Maturing Restorer trial	50-60	2	1	Hisar, Jaipur, Jamnagar, CAZRI, Mandore, SK Nagar, Bikaner
Long-panicle Restorers trial	25-30	2	1	Dhule, , Jamnagar, Jaipur, Aurangabad, IARI, Coimbatore
Thick-panicle Restorers Trial	25-30	2	1	Dhule, Hisar, Jamnagar, Jaipur, Aurangabad, IARI, Coimbatore, Bijapur
A5 Restorer trial	25-30	2	1	Dhule, Hisar, Jamnagar, Jaipur, Aurangabad, IARI, Coimbatore, CAZRI, Mandore, Bijapur

<b>Trial</b>	<b>Entries</b>	<b>Reps</b>	<b>Rows</b>	<b>Locations</b>
<b>Blast and DM Resistant Restorer- Composite</b>	<b>25 rows of 4m</b>			<b>Dhule, Hisar, Jamnagar, Jaipur, Aurangabad, IARI, Coimbatore, CAZRI, Mandore, Bijapur</b>
<b>OTHER TRIALS</b>				
<b>Salinity-tolerant inbred trial ( in saline soils)</b>	<b>15-20</b>	<b>3</b>	<b>2</b>	<b>Ludhiana, Mahua, Jamnagar</b>
<b>Salinity-tolerant population trial ( in saline soils)</b>	<b>15-20</b>	<b>3</b>	<b>4</b>	<b>Ludhiana, Mahua, Jamnagar</b>
<b>High-forage population trial ( Summer season- 2012)</b>	<b>15-20</b>	<b>3</b>	<b>4</b>	<b>Ludhiana, Hisar, Durgapura, Mandor</b>
<b>High-Fe inbred trial Set-1</b>	<b>40-50</b>	<b>2</b>	<b>1</b>	<b>Dhule, Hisar, Jamnagar, Jaipur,</b>
<b>High-Fe inbred trial Set-2</b>	<b>40-50</b>	<b>2</b>	<b>1</b>	<b>Aurangabad, IARI, Coimbatore, CAZRI</b>
<b>High-Fe inbred trial Set-3</b>	<b>40-50</b>	<b>2</b>	<b>1</b>	<b>Dhule, Hisar, Jamnagar, Jaipur</b>
<b>High-Fe inbred trial Set-4</b>	<b>40-50</b>	<b>2</b>	<b>1</b>	<b>Aurangabad, IARI, Coimbatore, Mandore</b>
<b>Flowering-stage heat tolerance trial ( Summer season-2012)</b>	<b>40-50</b>	<b>3 sowings</b>	<b>1</b>	<b>SK Nagar, Anand</b>
<b>Marker-Assisted Breeding Trials and Nurseries</b>				
<b>841B-background LG1 Yield QTL Introgression Line x Tester Trial:841B, ICML 71080, ICML 71085, &amp; ICML 71134 (4 lines) &amp; H 77/833-2, ICMR 01004, PPMI 301, &amp; RIB 3135-18 (4 testers)</b>	<b>16</b>	<b>3</b>	<b>2</b>	<b>IARI, Mandor</b>
<b>841B-background LG1 Yield QTL Introgression Line Trial: 841B, ICML 71080, ICML 71085, &amp; ICML 71134 (4 lines)</b>	<b>4</b>	<b>3</b>	<b>1</b>	<b>IARI, Mandor</b>
<b>GHB 358-background DMR QTL Introgression Line x Tester Trial: J 2340 + 23 Introgression Lines (24 lines) testcrossed on to 843-22A &amp; ICMA 95444 (2 testers)</b>	<b>48</b>	<b>3</b>	<b>2</b>	<b>Jamnagar, Jaipur</b>
<b>J 2340-background DMR QTL Introgression Line Trial: J 2340 + 23 Introgression Lines (24 lines)</b>	<b>24</b>	<b>3</b>	<b>1</b>	<b>Jamnagar, Mandor</b>



<b>Trial</b>	<b>Entries</b>	<b>Reps</b>	<b>Rows</b>	<b>Locations</b>
RHB 127-background DMR QTL Introgression Hybrid Trial: ICMB 93333 and 7 Introgression Lines (8 lines) testcrossed with RIB 3135-18	8	3	2	Durgapura, CAZRI, Mandor
ICMB 93333-background DMR QTL Introgression Lines Trial: ICMB 93333 and 7 Introgression Lines (8 lines)	8	3	1	Durgapura, CAZRI
HHB 67-background Testcross Trial of Lines with Pyramided DT and DMR QTLs	10	3	2	Hisar, Bawal, Mandore
H 77/833-2-background Trial of Inbred Lines with Pyramided DT and DMR QTLs	10	3	2	Hisar, Bawal
HHB 67-background DMR QTL Introgression Hybrid Observation Nursery: H 77/833-2, H 77/833-2-202, and 34 Introgression Lines (36 lines) testcrossed on to 843-22A	36	2	2	Hisar, Bawal
H 77/833-2-background DMR QTL Introgression Lines Observation Nursery: H 77/833-2, H 77/833-2-202, and 34 Introgression Lines (36 lines)	36	2	1	Hisar, Bawal
841B- and ICMB 95222-background 863B-LG4 Blast Resistance QTL Introgression Line Observation Nursery	15	2	1	IARI, Hisar
841B-background Grain Fe and Zn QTL Introgression Lines Observation Nursery	15	2	1	IARI, Hisar, Jaipur
[(Jakhrana S8 35-2)-P2 x (RIB 335/74-P1)-P1] RIL Population Testcross Trial	180	3	2	Mandor

## Session V

### **Review of Frontline Demonstrations 2010-11 and Action Plan for 2011-12.**

Chairperson : Dr. J.P. Singh, Director, DMD

Rapporteur : Dr. Anil Kumar

The Chairman in his introductory remarks made a mention about the genetic potential of pearl millet and impact of FLD programme conducted during last 10 years. He also complemented the support of PC Unit and SAUs provided in development of new initiatives for promotion of millets. He also informed that Action Plan received from PC Unit for 2011-12 was placed before the Committee headed by the Agriculture Commissioner, GOI in its meeting held on 25<sup>th</sup> February, 2011 and requested for finalization of centre-wise action plan with specific technologies to be demonstrated with a focus on intercropping of pearl millet with pulses as desired by the Chairman of the Committee.

2. The progress report of FLD organized during 2010-11 was presented by Dr. M.S. Rathore, Agronomist, PC Unit, Mandor. As against the target of 500 ha, FLDs were organized over an area of 342 ha in the States of Gujarat, Haryana, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu. Overall yield advantage of 30% was reported with improved production technology over the farmers' practice. However, in case of Hisar centre the mean yield of 2330 Kg/ha ha was recorded under FLDs as against the 2400 Kg/ha with farmers' practice. It was clarified that this year the State received very good monsoon which favoured long duration hybrids to fully realize their potentiality and the farmers' used the long duration private hybrids like Proagro-9444 while the FLDs were organized with medium maturity hybrids HHB-197. Moreover, average productivity of the State during *Kharif*-2010 was also high (1778 kg/ha).

3. The PC (PM) while supplementing the presentation, sought the specific reasons for non-submission of report by the centres namely; Ludhiana, Coimbatore, Aurangabad and Anantapur. It was informed by Coimbatore and Aurangabad centres that they have already submitted the report, whereas, FLDs were not organized at Anantapur and Ludhiana. The PC (PM) also reiterated about the delay in release of funds from GOI. He suggested that at least 75% approved allocations should be released to the PC Unit so that funds are placed with the centres for arrangement of inputs in advance. The implementing centres which are under the control of SAUs did not have any other source of funding for procurement of inputs.

- 4 While summing the deliberations, the following observations were made:-
- 4.1 Advance planning for laying of demonstrations i.e. identification of technologies, input kits as per requirement of technologies, selection of beneficiaries with involvement of State Department of Agriculture.
  - 4.2 Possibilities for uploading of list of beneficiaries on the website of the centres.
  - 4.3 Settlement of previous accounts i.e. submission of audited accounts of previous years, timely progress report to expedite the release of funds from GOI.
  - 4.4 Organizing field days on the selected sites and documentation of success stories for replication of technologies through the State Department of Agriculture.

**5. The centre-wise action plan finalized for 2011-12 is given as under:-**

Sl. No.	Centre	Proposed FLDs (ha)			Technology to be demonstrated
		Kharif	Summer	Total	
1	Bikaner	60	0	60	Improved varieties, weed control, intercropping with moth/cluster bean.
2	CAZRI, KVK, Jodhpur	40	0	40	Improved practices.
3	Kalai	25	10	35	Improved practices and weed control.
4	Jamnagar	15	50	65	Improved varieties, INM.
5	Hisar	50	0	50	Improved practices, weed control and bio-fertilizers.
6	Jaipur	25	0	25	Improved practices and Thio-urea application.
7	Gwalior	25	0	25	Improved practices.
8	Bijapur	20	0	20	Intercropping with pigeon pea and moisture conservation.
9	Dhule	20	0	20	Improved varieties and weed control.
10	Aurangabad	40	0	40	Intercropping with pulses and weed control.
11	Coimbatore	20	0	20	Improved practices and INM.
12	Anantpur	25	0	25	Improved practices and intercropping with <i>Urdbean</i> .
13	Ludhiana	15	0	15	Improved practices.
14	KVK Gurgaon (ICAR)	25	0	25	Improved practices.
TOTAL		405	60	465	-

## Session on General Discussion

Chairman : Dr. O. P. Yadav  
Rapporteur : Dr. S.K. Gupta

Following points emanated from the group discussion that followed in this session:

- The group decided that there should be a demonstration of commercial / pre-commercial cultivars at national level to demonstrate the cultivar diversity in the pearl millet program. This trial should be simultaneously planted at representative locations: Jodhpur and Hisar for zone A1 and zone A, and at Patancheru (ICRISAT) for zone B. At each location trial should be evaluated in 2 sets planted side by side, one set in best management practices and the second set with marginal management practices. Farmers and researchers seed companies will be invited for participatory evaluation of these entries.
- It was informed that PPV&FRA has approved registration of 13 extant varieties, and centers were requested to provide seed from the fresh stocks for this purpose to avoid germination problems.
- It was decided that a template of one of the best varietal release proposals will be put on AICPMIP's website for future use.
- It was decided that in future variety release proposals should be submitted to PC at least 15 days prior to workshop.
- The data of entries submitted for evaluation in summer trials should be asked for after the end of summer season in a particular year and not during the workshop. The details of entries need to be mentioned during the workshop in view of recent ICAR circular which requires approval of all test entries in coordinated trials by the workshop.
- The centers were requested to use respective performas for varietal identification and varietal release proposals. Template for each of these performas will be put on AICPMIP's website for future use.
- The group was of the strong view that information should be generated on the quantification of breeding efforts which have gone into pearl millet improvement in India in the last

about 50 years. It was suggested that an experiment be planned where 6-7 entries should be randomly drawn from a phase of 10 years starting 1950, and should be evaluated over locations and years under best management and epiphytotic conditions to generate such information. The Project Coordinator might explore the possibility of retrieving the seed of parental lines of old hybrids from AICPMIP centres/ ICRISAT/ other sources.

- The group discussed the need for molecular characterization of all the hybrids available in the market to evaluate the cultivar diversity, and also discussed the option of outsourcing this work to achieve timely and reliable results.

In the end, OP Yadav thanked the group for their active participation in the discussions.

## Plenary Session

<b>Chairman</b>	:	Dr. R.P. Narwal, Director Research, CCS HAU, Hisar
<b>Co-Chairman</b>	:	Dr. O.P. Yadav, Project Coordinator (Pearl Millet)
<b>Rapporteur</b>	:	Dr. B.S. Rajpurohit, Asst. Prof. PBG, AICPMIP, Mandor, Jodhpur
<b>Date</b>	:	March 14, 2011
<b>Time</b>	:	11.00 AM

The following recommendations were finalized.

### **Breeding:**

All recommendations were accepted as such.

### **Agronomy:**

1. The recommendation of conducting trials in rabi at Coimbatore centre is not accepted. All trial should be conducted during kharif only at Coimbatore to ensure similarity.
2. In recommendation no. 4, the first split of recommended dose of nitrogen (120 kg/ha) in summer pearl millet should be mentioned as basal/ sowing instead of at planting.

### **Pathology:**

1. In recommendation no. 2, the development of green house facilities for testing of marketed hybrid by private sector for downy mildew may be planned in next five-year plan.

### **Physiology:**

1. In all experiments row to row spacing should be 50 cm instead of 50-60cm and plant-to-plant distance of 15 cm.
2. Experiment PMPHY 1 and PMPHY 2 should be conducted in summer only and entries should be same and decided before formulation.
3. Experiment no. PMPHY 5 should be discontinued.
4. Physiological trial may be conducted by agronomist in

absence of physiologist.

**Entomology:**

In experiment PMET 7(New) the word some before insecticide should be deleted

**Concluding Remarks:**

Dr. R.P. Narwal thanked ICAR for choosing CCS HAU, Hisar as venue of AICPMIP workshop. He remarked that pearl millet should become food security for many people in coming time.

The session ended with vote of thank to the chair.