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**Proceedings of the
47th Annual Pearl Millet Workshop of the All India Coordinated
Pearl Millet Improvement Project
Held at
SK Rajasthan Agricultural University
Agricultural Research Station, Jaipur
March 17-19, 2012**



**All India Coordinated Pearl Millet Improvement Project
(Indian Council of Agricultural Research)
Mandor, Jodhpur 342 304
www.aicpmip.res.in**



47th Annual Pearl Millet Workshop All India Coordinated Pearl Millet Improvement Project (Indian Council of Agricultural Research)

Date: March 17-19, 2012

**Venue: SKRAU, ARS,
Durgapura, Jaipur**

PROGRAMME

Day 1: March 17th, 2012 (Saturday)

0830 – **Registration**
0930

Session – I: Review of Research Results of AICPMIP Centres for 2011-12 and Plan of Work for 2012-13 (Concurrent discipline-wise, centre-wise presentation of significant results and progress report)

0930 – 1330		Chairperson	Co-Chairperson	Rapporteur
	Crop Improvement	Dr. R.P. Dua	Dr. K.N. Rai	<i>Dr. B.S. Rajpurohit</i>
	Crop Production	Dr. R.C. Gautam	Dr. R.P. Jangir	<i>Dr. M.S. Rathore</i>
	Crop Protection	Dr. B.L. Jalali	Dr. H.S. Shetty	<i>Dr. H.R. Bishnoi & Dr. K.L. Raghvani</i>

Session – II: Review of Research Results and Progress Report of AICPMIP 2011-12

1430 – 1700	Chairperson	Dr. S.K. Datta, DDG (CS)
	Co-Chairperson	Dr. R.P. Dua, ADG (FFC)
	Rapporteur	Dr. C. Tarasatyavathi & Dr. L.D. Sharma
	Pearl Millet Improvement through Coordinated Approach – Dr. O.P. Yadav	
	Crop Improvement	Dr. B.S. Rajpurohit
	Crop Production	Dr. M.S. Rathore
	Crop Protection	Dr. H.R. Bishnoi and Dr. K.L. Raghvani

Session III: Variety Identification Committee Meeting

1830– 1930	Chairperson	DDG (CS)
	Co-chairperson	ADG (FFC)
	Member Secretary	Project Coordinator
	Varietal Identification Committee	Members and facilitators

Day 2: March 18th, 2012 (Sunday)

Inaugural Session IV

1000 – 1145	Chief Guest	Hon'ble Shri Harji Ram Burdak, Minister for Agriculture & Animal Husbandry, Govt. of Rajasthan
	Guests of Honour	Dr. Swapan K. Datta, DDG (CS), ICAR
	Special Guest	Dr. R.P. Dua, ADG (FFC), ICAR
	Chairperson	Prof. A.K. Dahama, Vice-Chancellor, SKRAU, Bikaner
	Welcome	Dr. R.P. Jangir, Director Research, SK RAU, Bikaner
	Highlights of Research Progress 2011-12	Dr. O.P. Yadav, Project Coordinator (Pearl Millet), AICPMIP Jodhpur
	Remarks by ADG (FFC)	Dr. R.P. Dua
	Remarks by DDG (CS)	Dr. S.K. Datta
	Release of publications and awards	
	Remarks by Chairperson	Dr. A.K. Dahama
	Inaugural Address	Hon'ble Shri Harji Ram Burdak
	Vote of Thanks	Dr. Shrikant
1145 – 1215	High Tea	

Session – V: Review of BSP and DUS Testing Project & Progress Report for 2011-12 and Plan of Work for 2012-13

1215 – 1345	Chairperson	Dr. H.P. Yadav
	Rapporteur	Dr. B.S. Rajpurohit
	Breeder Seed Production Review and Programme	Dr. B.S. Rajpurohit
	DUS Testing Project	Dr. B.S. Rajpurohit
1345 – 1445	Lunch Break	

Session – VI: Review of Research Results & Progress Report of ICAR-ICRISAT Collaborative Projects for 2011-12 and Plan of Work for 2012-13

1445 – 1615	Chairperson	Dr. S.K. Gupta
	Co-Chairperson	Dr. H.P. Yadav
	Rapporteur	Dr. P. Sumathi
	ICAR-ICRISAT Collaborative Projects	
	Progress Report 2011-12	Dr. O.P. Yadav
	Plan of Work 2012-13	Dr. S.K. Gupta

1615-1630 Tea Break

Session – VII: Review of Crop Production Strategies and Value Chain for 2011-12 and Plan of Work for 2012-13

1630 - 1800	Chairperson	Dr. J.P. Singh, Director, DMD
	Rapporteur	Dr. Anil Kumar
	INSIMP	Dr. J.P. Singh
	Frontline Demonstrations	Dr. M.S. Rathore

Day 3: March 19th, 2012 (Monday)

Session - VIII: Presentation of Lead Lecture(s)

0900 – 1100	Chairperson	Dr. B.L. Jalali, Ex-Director Research, CCS HAU Hisar	
	Rapporteur	Dr. P. Sumathi	
	Lead Lectures	Shelf-life of Pearl Millet	Dr. L.K. Chugh, HAU Hisar
		Knowledge Management in Pearl Millet	Dr. N.T. Yaduraju, ICRISAT
		Pearl Millet Variety Registration with PPV&FRA –	Dr. Dipal Roy Choudhury, PPV&FRA
		Public-private partnership to develop pearl millet hybrids for A1 zone	Dr. S.K. Gupta, JK Agri Genetics Ltd., Hyderabad
1100 – 1115	Tea Break		

Session IX: Plenary Session**Session-wise Presentation of the Recommendations for 2011-12 and Technical Programme Work for 2012-13**

1115 – 1400	Chairperson	Dr. K.N. Rai
	Co-chairperson	Dr. O.P. Yadav
	Rapporteur	Dr. B.S. Rajpurohit
	Technical Session I - Review of Research Results of AICPMIP Centres for 2011-12 and Plan of Work for 2012-13	
	Crop Improvement	Dr. B.S. Rajpurohit
	Crop Production	Dr. M.S. Rathore
	Crop Protection	Dr. H.R. Bishnoi and Dr. K.L. Raghvani
	Technical Session II - Review of Research Results and Progress Report of AICPMIP for 2011-12	Dr. C. Tarasatyavathi
	Technical Session III - Variety Identification Committee Meeting	Dr. O.P. Yadav
	Technical Session IV - Inaugural Session	Dr. L.D. Sharma
	Technical Session V - Review of BSP and DUS Testing Project & Progress Report for 2011-12 and Plan of Work for 2012-13	Dr. B.S. Rajpurohit
	Technical Session VI - Review of Research Results & Progress Report of ICAR-ICRISAT Collaborative Projects 2011-12 and Plan of Work for 2012-13	Dr. P. Sumathi
	Technical Session VII - Review and Crop Production Strategies and Value Chain 2011-12 and Plan of Work for 2012-13	Dr. Anil Kumar
	Technical Session VIII - Presentation of Lead Lecture(s)	Dr. P. Sumathi
	Vote of thanks	Dr. Shrikant
1400 – 1500	Lunch Break	
1500 – 1700	Visits : Fields/ Labs	

SESSION – I

REVIEW OF RESEARCH RESULTS AND PLANNING

A. CROP IMPROVEMENT (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,
Assoc. Prof. PBG,
AICPMIP, Mandor

Date : March 17, 2012

Time : 9:30 AM

The meeting of pearl millet breeding group was held at 9.30 AM in the Conference Hall of STR, A.R.S., SKRAU, Durgapura – Jaipur to undertake the centre-wise discussion of research results of *kharif*/summer 2011-12 and formulation of technical programme of *kharif*/summer 2012-13.

Review of Research Results – Centre-Wise Presentation of Significant Results and Progress Report (2011-12)

The results were presented by respective scientist of the AICPMIP centre as under:

Hisar	:	Dr. H.P. Yadav
Jaipur	:	Dr. L.D. Sharma
Bikaner	:	Dr. P.C. Gupta
Gwalior	:	Dr. A.K. Singh
Dhule	:	Dr. H.T. Patil
Jamnagar	:	Dr. K.D. Mungra
Aurangabad	:	Dr. N.B. Katare
Anantapur	:	Dr. P. Santhi
Kalai	:	Dr. S.P. Singh
Coimbatore	:	Dr. P. Sumathi
Bijapur	:	Dr. Gouri M. Sajjanar
Ludhiana	:	Dr. Johar Singh

Following issues emerged during discussion:

- It was suggested to add CCS HAU, Bawal location as a regular AICPMIP centre.
- Dr. O.P. Yadav inquired about germplasm collection from Rajasthan at Jaipur and told that there was no germplasm collection after 1997 and it was agreed that it should be done during 2012 by ARS, Jaipur.
- Dr. Dua expressed his strong recommendation for public-private partnership (PPP) for seed production of public bred hybrids. He suggested that all universities take initiatives in this matter. It was agreed that Project Coordinator should write to Vice-Chancellors of SAUs to take initiatives for providing seed of their hybrids to farmers under Public-Private Partnership (PPP), if the hybrid seed is not produced in enough quantity through established public sector seed chain.

- Chairman expressed his serious concern regarding unauthenticated presentation of AICPMIP trial data of Kalai centre and suggested that Vice Chancellor of the university should be informed. He also suggested to Kalai centre to prioritize work on hybrid breeding.
- Bijapur centre was suggested to deposit collected germplasm to NBPGR with passport data with intimation to the Project Coordinator.

FORMULATION OF TECHNICAL PROGRAMME FOR 2012-13

Organisation of trials

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

- Grain yield = higher than best check,
- Downy mildew (60 DAS) equal to or less than 5.4% in hybrids; less than or equal to 10% in populations,
- Days to 50% flowering at par with appropriate check in IHT (Early), AHPT (Early), 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* 2012 in Zone A₁ and A

S. No.	Advance Hybrid & Population Trial(E)	S. No.	Advance Hybrid Trial(L) Zone A
	IHT(E) to AHPT(E) I		IHT(L)A to AHT(L)A I
1	MH 1771		Nil
2	MH 1777		AHT(L)A I to AHT(L)A II
3	MH 1766	1	MH 1737
4	MH 1765	2	MH 1747
5	MH 1768	3	MH 1743
	PTA to AHPT(E) I	4	MH 1746
	Nil	5	MH 1759
	AHPT(E) I to AHPT(E) II		Checks
6	MH 1700	6	Pusa 23
	Checks	7	GHB 558
7	HHB 67 (Imp.)	8	GHB 732
8	ICMH 356	9	Nandi 61
9	RHB 177		
S. No.	Advance Hybrid Trial(M) Zone A [AHT(M)]	S. No.	Population Trial Zone A (PTA)
	IHT(M)A to AHT(M)A I		PTA to PTA I
1	MH 1790	1	MP 515
	AHT(M)A I to AHT(M)A II	2	MP 520
2	MH 1712	3	MP 519
3	MH 1723		PTA I to PTA II
4	MH 1720	4	MP 508
5	MH 1734	5	MP 509
	Checks		+ New entries of PT
6	PUSA 23		Checks
7	ICMH 356		Raj 171
8	RHB 121		Pusa 383
9	GHB 744		JBV 2
10	RHB 173		ICMV 221
			CZP9802

Entries promoted to next higher stage of testing in *kharif*/summer 2012 in Zone B

S. No.	Advance Hybrid Trial(M) Zone B [AHT(M)B]	S. No.	Advance Hybrid Trial(L) Zone B [AHT(L)B]
	IHT(M)B to AHT(M)B I		IHT(L)B to AHT(L)B I
1	MH 1790	1	MH 1816
2	MH 1802	2	MH 1815
3	MH 1785	3	MH 1812
4	MH 1796		AHT(L)B I to AHT(L)B II
5	MH 1792	4	MH 1743
6	MH 1798	5	MH 1751
7	MH 1797	6	MH 1754
8	MH 1795		Checks
	AHT(M)B I to AHT(M)B II	7	Saburi
9	MH 1719	8	GHB 558
10	MH 1720	9	B 2301
11	MH 1723	10	86M64
12	MH 1711		
	Checks		
13	GHB 558		
14	ICMH 356		
15	Shradha		
16	Pusa 23		
S. No.	Summer Hybrid Trial(SHT)	S. No.	Population Trial Zone B (PTB)
	SHT to SHT I		PTB to PTB I
1	MSH 254	1	MP 521
2	MSH 259	2	MP 519
3	MSH 257		PTB I to PTB II
4	MSH 253	3	MP 511
	SHT I to SHT II		+ New entries of PT
5	MSH 238		Checks
	+ New entries		Raj 171
	Checks		ICMV 221
	86M64		ICTP 8203
	GHB 558		ICMV 155
	Proagro 9444		

New entries approved for testing in initial trial *kharif* 2012/Summer 2013

S No.	Organization/Institution	Name of Entries				
		IHT (E)	IHT (M)	IHT (L)	PT	Summer
1	AICPMIP, Jodhpur	MPMH 23	MPMH 25			
		MPMH 24	MPMH 26			
2	AICPMIP, Jaipur	RHB-205	RHB-208		RCB-22	
		RHB-206	RHB-209			
		RHB-207				
3	AICPMIP, Dhule		DHBH 9075	DHBH 1113		DHBH 9076
			DHBH 9076	DHBH 1114		
4	AICPMIP, SKRAU, Bikaner	BHB 1201			BCB 1201	
		BHB 1202				
5	AICPMIP, JAU, Jamnagar	GHB-935	GHB-964	GHB-941		GHB-941
		GHB-978	GHB-993	GHB-966		GHB-965
			GHB-1000	GHB-984		
6	AICPMIP, CCS HAU, Hisar	HHB 272	HHB 274	HHB 276	HC 39	
		HHB 273	HHB 275	HHB 277	HC 40	
		HHB 281		HHB 278	HC 41	
				HHB 279		
				HHB 280		
7	AICPMIP, Kalai Aligarh				SPK-50	
					SPK-55	
8	IARI New Delhi		Pusa 1201		Pusa com. 701	
			Pusa 1202		Pusa com. 702	
9	AICPMIP, NARP, Aurangabad		AHB-1142		PPC-2-1	
			AHB-1138			
10	CAZRI, Jodhpur	CZH 225			CZP2K-9	
		CZH 226				
		CZH 227				
11	AICPMIP, TNAU, Coimbatore		TNBH 10923	TNBH 10889	UCC 33	TNBH 10923
12	AICPMIP, RVSKVV, Gwalior	RVSBH-22				
13	Atash Seed Pvt. Ltd, Hyderabad		ATPMH-11152	ATPMH-11005		
14	Vibha Agrotech Ltd., Hyderabad			VBBH 3145		
15	Kirtiman Agro Genetics Ltd., Aurangabad		KBH-1006			
16	Devgen Seeds & Crop Tech. Pvt. Ltd., Hyderabad			DB-66760		DB-65490
17	Bioseed Res. India Pvt. Ltd., Hyderabad			Bio-8142		Bio 8437
18	JK Agri Genetics Ltd, Hyderabad	JKBH 1008		JKBH 1009		JKBH 1100
				JKBH 1010		JKBH 1101
				JKBH 1011		
19	Metahetix Life Science Pvt. Ltd., Ahmedabad			MP 7888		
20	Nuziveedu Seed Pvt. Ltd., Secunderabad		NBH 5808	NBH 5807		
				NBH 5809		
21	Kaveri Seed Com. Ltd., Secunderabad		KBH 2655	KBH 2611		KBH 3026
			KBH 3043	KBH 3490		KBH 3484
22	Krishidhan Seeds Pvt. Ltd., Jalna		KDBH-1081	KDBH-1045		
				KDBH-1072		
23	Nu Genes Pvt. Ltd., Hyderabad		Nu-3355	Nu-3214		Nu-3204
				Nu-3277		
24	Mahodaya Hy. Seed Pvt. Ltd., Jalna		Mahodaya 332			
25	New Nandi Seeds Corporation, Ahmedabad		NMH 81			NMH 82
						NMH 83
26	Bayer Bio Science Pvt. Ltd., Hyderabad		PB 1497	9330+		9460
27	Pioneer Overseas Corporation, Hyderabad	86M76		86M84		86M14
				86M35		86M78
				86M82		86M75
				86M83		86M15
28	Western Agri Seeds Ltd., Ahmedabad			WESTERN M 46		WESTERN M 46
29	Ganga Kaveri Seeds Pvt. Ltd Hyderabad		GK-1116			GK-1116
			GK-1129			GK-1129
			GK-1135			GK-1135
30	Nirmal Seeds Pvt. Ltd Pachora (MS)		NPH-4506	NPH-4915		
31	Bisco Bio Sciences Pvt. Ltd. Secunderabad			Bisco-740		
32	Proline Seeds company (I) Pvt. Ltd Hyderabad		PROLINE-786			
33	Rasi seeds Pvt. Ltd		RBH-9	TH10-003		
34	Navbharat seeds Pvt. Ltd, Ahmedabad			NBBH-908		NBBH-668
						NBBH-908
35	VNR seeds Pvt. Ltd., Hyderabad			VNR-3232		
36	Maharashtra state seeds corp. Ltd, Akola		Mahabeej-1005			Manik
37	Nath Biogenes (I) Ltd., Aurangabad		NBH-1717	NBH-1188		NBH-4303
		18	34	39	12	26

Table 1. Details of Centres and Trials to be Conducted During Kharif 2012/Summer 2013 in Zone A₁ and A

LOCATIONS	IHT(E)	IHT(M)	IHT(L)	AHPT(E)	AHT(M)	AHT(L)	PT	RHVT	SHT
RAJASTHAN									
Mandor	*	*	*	*	*	*	*	*	
Jodhpur (CAZRI)	*			*					
Bikaner (RAU)	*	*	*	*	*	*	*	*	
Bikaner (CAZRI)				*					
Jaipur	*	*	*	*	*	*	*	*	
Fatehpur Shekhawati	*			*			*		
Tabiji					*		*		
Alwar (Pioneer)			*		*	*			
Alwar (Vibha)					*	*			
Alwar (DevGen)			*						
Samdari	*			*			*		
Raniwara (Bayer)	*			*					*
Khiwasar (Bioseed)	*			*					
Jaisalmer (CAZRI)	*			*					
GUJARAT									
Kothara	*	*		*	*				
Kutch (CAZRI)	*			*					
S.K.Nagar	*	*	*	*	*	*			*
Mahuva		*	*		*	*			
Anand		*	*		*	*			*
Jamnagar		*	*		*	*	*	*	*
Ahmedabad (New Nandi)		*			*				*
Narsanda (Navbharat)			*			*			*
Palanpur (Pioneer)									*
Baroda (JK Seed)			*			*			*
Gandhi Nagar (Western Seed)			*						*
UTTAR PRADESH									
Kalai		*	*		*	*	*	*	
Eglas (Bioseeds)		*							
Agra (Krishna)						*			*
HARYANA									
Hisar	*	*	*	*	*	*	*	*	
Bawal	*	*		*	*		*		
KVK, Shikohpur		*	*		*				
Rewari (Bayer)					*	*			
Suhana (Nuziveedu)						*			
MADHYA PRADESH									
Gwalior		*	*		*	*	*	*	
Morena					*		*		
PUNJAB									
Ludhiana		*	*		*	*	*	*	
DELHI									
New Delhi		*			*		*	*	
JAMMU AND KASHMIR									
Rakh Dhiansar					*			*	
Total Trials	14	17	17	15	22	18	14	10	10

Contd.

*=Trial allotted

Table 1. Details of Centres and Trials to be Conducted During Kharif 2012/Summer 2013 in Zone B

LOCATIONS	IHT (M)	IHT (L)	AHT (M)	AHT (L)	PT	RHVT	SHT
MAHARASTRA							
Aurangabad (NARP)	*	*	*	*	*	*	*
Aurangabad (Ajeet Seed)			*	*			
Aurangabad (Nath Seed)			*				
Aurangabad (DevGen)		*		*			
Harsul (Kirtiman)	*						
Niphad			*	*	*		
Dhule	*	*	*	*	*	*	*
Jalna (Vijay Seed)		*		*			
Jalna (Mahodaya)		*	*	*			
Pachora (Nirmal Seed)	*	*					*
Buldana	*	*	*	*	*		
Vaijapur			*	*			
Ganewadi (Krishidhan)				*			
Malkapur (Ankur Seed)	*	*					
Ahmednagar (Pioneer)		*	*	*			
KARNATAKA							
Bijapur	*	*	*	*	*	*	
Gulbarga	*		*				
ANDHRA PRADESH							
Anantapur	*	*	*	*	*	*	
Palem	*		*		*	*	
Manoharabad (Zuari seeds)		*	*	*			
Hyderabad (Nuziveedu)		*		*			
Hyderabad (Vibha)			*				
Hyderabad (Atash)				*			
Hyderabad (Biostd)				*			
Hyderabad (Nu Gene)		*					
ICRISAT, Patancheru					*		
Medchal (Ganga Kaveri)	*						
TAMIL NADU							
Coimbatore	*	*	*	*	*	*	*
Total Trials	12	15	16	18	9	6	4

*=Trial allotted

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) - Rounded to one decimal
12. Diseases and pest incidence (Under natural conditions)

Experimental details:

Initial Trials: No. of rows – 3 (net) Row length – 5m(net) Spacing- 50 cm x 15 cm (A and B zones) -60 cm x 15 cm (A ₁ zone) Plot size – 5m x 1.5m (net) Fertilizer – As per recommendations	Advance Trials: No. of rows – 6 (net) Row length – 5m(net) Spacing - 50 cm x 15 cm (A and B zones) - 60 cm x 15 cm (A ₁ zone) Plot size – 5m x 3m (net) Fertilizer – As per recommendations
Population Trial: No. of rows – 6 (net) Row length – 5m(net) Spacing- 50 cm x 15 cm (A and B zones) - 60 cm x 15 cm (A ₁ zone) Plot size – 5m x 3m (net) Fertilizer – As per recommendations	

Proposed entries for initial trials

IHT(E) Zone A1: 18	PT Zone A & B: 12
IHT(M) Zone A & B: 34	Summer 2013: 26
IHT(L) Zone A & B: 39	

Seed Requirement (per entry)

IHT(E) Zone A1 : 1.25 Kg	AHT(M)A : 2.50 kg	AHT(L)A : 2.0 kg
IHT(M) Zone A & B : 2.0 Kg	AHT(M)B : 2.0 Kg	AHT(L) B : 2.0 Kg
IHT(L) Zone A & B : 2.0 Kg	RHVTA : 2.0 kg	
Population Trial Zone A & B: 2.5 kg	RHVTB : 2.0 kg	
AHPT(E) Zone A1: 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 : 1.5 kg
PT Zone A: 1.5 kg	AHPT Zone A1: 1.5 kg
PT Zone B: 1.5 kg	Summer Hybrid Trial : 1.5 kg

The required quantity of seed material of entries along with pedigree selected for organizing the trials as above with new entries should reach the office of the Project Coordinator, AICPMIP, A.R.S., Mandor, Jodhpur 342304 (Raj.) **latest by 25th May 2012 for *kharif* and by 15th January 2013 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 separately in cloth bag.

Seed requirement of checks:

Pusa 23: 6 kg	Saburi: 3 Kg	RHB 121: 10 kg	JBV 2: 5kg
ICMH 356: 8 kg	Shradha: 5 kg	Raj 171: 5 kg	MBC 2: 2kg
86M64: 7 kg	Nandi 61: 8 Kg	ICMV 221: 5 kg	ICTP 8203: 3.0 kg
GHB 558: 10 kg	GHB 538: 3 kg	ICMV 155: 5 kg	CZP 9802: 4 kg
HGB 67 Imp.: 5.0 kg	Pusa 383:5 kg	GHB 744: 7 kg	B 2301 : 5 kg
RHB 177: 5 Kg	GHB 732: 7 kg	RHB 173: 7 kg	VBBH 3040: 2 kg

The meeting ended with thanks to the chairman and all participants.

Following scientists were present:-

S.No. Name with designation

1. Dr. R.P. Dua, ADG (FFC), ICAR, New Delhi
2. Dr. O.P. Yadav, Project Coordinator (Pearl Millet), AICPMIP, Mandor, Jodhpur
3. Dr. K.N. Rai, Principal Scientist, ICRISAT, Patancheru, Hyderabad
4. Dr. S.N. Shukla, Ex ADG, FFC-ICAR
5. Dr. G. Harinarayana, Ex Project Coordinator (Pearl Millet)
6. Dr. S.K. Bhatnagar, Ex Project Coordinator (Pearl Millet)
7. Dr. I.S. Khairwal, Senior Adviser Harvest Plus, ICRISAT, Hyderabad
8. Dr. P. Veerabadhiran, Professor & Head Deptt. of Millets, TNAU, Coimbatore.
9. Dr. V.K. Manga, Principal Scientist (Plant Breeding), CAZRI, Jodhpur.
10. Dr. B.S. Rajpurohit, Assoc. Prof. (PB & G), AICPMIP, Mandor, Jodhpur.
11. Dr. P.C. Gupta, Assoc. Prof. (PB & G), ARS, SKRAU, Bikaner.
12. Dr. C. Tara Satyavathi, Principal Scientist, IARI, New Delhi.
13. Dr. H.T. Patil, Pearl millet Breeder, AICPMIP, COA, Dhule.
14. Dr. N. B. Katare, Pearl Millet Breeder, NARP, Aurangabad.
15. Dr. P. Sumathi, Assoc. Professor (PB & G), TNAU, Coimbatore.
16. Dr. Gauri M Sajjanar, Assoc. Prof. (PB), Regional Agri. Res. Station, Bijapur.
17. Dr. H.P. Yadav, Chief Scientist & Head, Pearl millet Section, CCS HAU, Hisar.
18. Dr. Virendra Malik, Pearl millet Breeder, Deptt. Of PB &G, CCS HAU, Hisar.
19. Dr. P. Shanthi, Scientist (PB), AICPMIP, ARS, Anantpur
20. Dr. G. Girish, Jr. Breeder (Pearl millet & Sorghum), ARS, Gulbarga, UAS Raichur
21. Dr. Sita Ram Kumhar Associate Prof. (PB & G), ARS, SKRAU, Mandor
22. Sh. Satish Pareek, Res. Sci., Pioneer Over. Corporation, Hyderabad
23. Sh. S.M. Rafiq, Principal Breeder, Nuzevidu Seeds, Hyderabad.
24. Dr. M.P. Kulkarni, Senior Sci. (Cereals), Nirmal Seeds Pvt. Ltd., Pachora, Jalgon.
25. Dr. Iqbal Hussan, Regional Research Director, Vibha Seeds
26. Sh. Ravindra BG, DGM- Pearl Millet , Vibha Seeds
27. Sh. Narendera Sawarkar, Plant Breeder (Millets), Ankur Seeds, Nagpur.
28. Dr. S. K. Yadav, Breeder Millet, Bayer Bio Science, Hyderabad
29. Dr. S.L. Indoria, Sr. Res. Officer, Vijay Seeds Co. Ltd, Jalna.
30. Dr. Y.S. Verma, Research Coordinator, Metahelix Life Sciences, Bangalore
31. Sh. Shankar Honyal, Pearl millet Breeder, Kaveri Seeds Co. Ltd., Secunderabad.
32. Dr. B.R. Beniwal, Sr.TA (PBG), AICPMIP, Mandor.
33. Dr. A.K. Singh, Professor & Head , RVSKVV, College of Agriculture, Gwalior.
34. Dr. R.S. Mahala, Res. Director (Cotton & Millet) Pioneer Over. Cor., Hyderabad.
35. Dr. V.S. Deora, Research Scientist, Pioneer Over. Corporation, Hyderabad.
36. Sh. B.S. Yadav, R A, Pioneer Over. Corporation, Alwar
37. Dr. Indra Singh, SRA, Pioneer Over. Corporation, Palanpur
38. Sh. K.L. Koshta, Deputy Director Agriculture (MP), Dept. of Agriculture. MP
39. Dr. S.K. Gupta, Sr. Scientist, ICRISAT, Hyderabad.
40. Sh. Sachin Vidhale, Pearl Millet Breeder, Bioseed Research India Pvt. Ltd.,
41. Sh. Brijendra Pal , Dy. Director R&D, Bioseed Research India Pvt. Ltd
42. Sh. M.T. Pawar, Plant Breeder (Pearl Millet), Atash Seeds Pvt. Ltd., Hyderabad
43. Sh. P.A. Pacharne, Breeder (Pearl Millet), Mahodaya Hybrid Seeds Pvt. Ltd., Jalna.

44. Dr. M.L. Swami, Breeder, J K Agrigenetics Ltd. Hyderabad.
45. Dr. L. K. Dubey, Reasonal Manager, Devgen Seeds and Crop Tech. secunderabad.
46. Dr. V.L. Ameta, Breeder, Devgen Seeds.
47. Dr. Yogendra Sharma, Plant Breeder, Vibha Seeds, Gandhinagar, Gujarat
48. Sh. S.Y. Shedage, Breeder, Bayer Biosciences Pvt. Ltd.
49. Dr. Subhash Chandra, Asstt. Director, Directorate of Millets, GOI
50. Sh. Mohd. Abdullah, Principal Breeder, Rassi Seeds Pvt. Ltd.
51. Sh. Nitesh Patel, Dirtector, Dantiwada Seed Pvt. Ltd., Ahmedabad
52. Sh. Yashpal Singh, Manager (Pro), State Farms Corp. Of India, CSF Jalna
53. Dr. Yogendra Singh, Millet Breeder, ARS Durgapura, Jaipur
54. Sh. Arvind Kumar, Manager (CO), Bayer Biosciences Pvt. Ltd.
55. Sh. Praveen Kumar, RA, Pioneer Over. Corporation, Jaipur
56. Dr. Rakesh K. Shrivastava, Scientist. P. Millet Moleculer Breeding, ICRISAT
57. Dr. D.P. Yadav, Sr. Breeder Bajara, Nath Biogenes (I) Ltd.
58. Dr. Sandeep Kaushish, Plant Breeder, Vibha Seeds Agrotech. Ltd.
59. Dr. S.P. Singh, Senior Scientist (Plant Breeding), IARI, New Delhi
60. Dr. Dev Vart Yadav, Asst. Sci. (Plant Breeding), Deptt. PB & G, CCS HAU, Hisar
61. Dr. Y. Kumar, Assitt. Botanist (Barley), , CCS HAU, Bawal
62. Dr. Ramesh Kumar, Asstt. Sci. (Plant Breeding), Deptt. PB & G, CCS HAU, Hisar
63. Dr. G. Ram Kherwa, Associate Prof, (Stat.), AICPMIP, Jodhpur
64. Sh. Cherian Mathens, Plant Breeder, Vibha Seeds Agrotech. Ltd.
65. Sh. R.K. Dwivedi, Plant Breeder, Proline Seeds Company (I) Pvt Ltd., Hyderabad
66. Sh. Akhilesh Kumar Singh, Jr. Breeder Pearl Millet, VNR Seeds Pvt Ltd, Raipur
67. Sh. S.K. Nayak, Asst. Breeder, Bisco Bio Sciance Pvt. Secunderabad
68. Sh. R.P. Yadav, S.O., Western Agri Seeds
69. Dr. B.K. Pareek, Plant Breeder, New Nandi Seeds Co. Ahamdabad
70. Dr. S.I. Kapadia, Research Scientist, Navbharat Seeds
71. Sh. B.C. Patel, Asstt. Research Scientist, AAU, Anand, Gujarat
72. Sh. S.D. Atara , Assoc. Research Scientist, JAU, Jamnagar
73. Dr. K.D. Mungra, , Asst. Research Scientist, JAU, Jamnagar
74. Sh. G.P. Dahale, Jr. Breeder, MSSCL, Akola
75. Dr. Johar Singh, Plant Breeder (Wheat), PAU, Ludhiana
76. Dr. A.K. Deshmukh, Director R&D, Safed Seeds & Biotech Ltd, Hyderabad
77. Dr. F.B. Patil, Director Research, Kirtiman Agro Genetics Ltd. Aurangabad
78. Sh. S.D. Kamble, Jr. Breeder, Spriha Biosciences
79. Sh. V.A. Deshmukh, Plant Breeder, Mahodaya Seeds, Jalana
80. Dr. K.R. Reddy, Director Research, Nugenes, Secunderabad
81. Sh. Shankar Lal Yadav, S.R.F., AICPMIP Mandor Jodhpur
82. Sh. Nanda Ram, S.R.F., AICPMIP Mandor Jodhpur
83. Sh. Kanti Lal, S.R.F., AICPMIP Mandor Jodhpur
84. Sh. Shripal Singh, S.R.F., AICPMIP Mandor Jodhpur

B. CROP PRODUCTION (AGRONOMY AND PHYSIOLOGY)

Chairman : Prof. R.C. Gautam,
Ex Dean, IARI, New
Delhi

Co-Chairman : Dr R.P. Jangir,
Director, Research,
SKRAU, Bikaner

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

Date : March 17, 2012

Time 09.30 AM

In the beginning, Dr. M.S. Rathore welcomed the chairman and Co-chairman of the session. Center wise results of the agronomical trials conducted during *kharif* 2011 were presented by the scientists of various AICPMIP centres. The Chairman in his opening remarks said that there is no alternative to the pearl millet crop so the scientists should be prepared for all sort of measures in the form of contingent planning to save the crop. He suggested that in organic farming experiments the quality parameters of the produce should also be analyzed and given in the report and organic farming experiment should be conducted under irrigated situation. He advised to take experiment on integrated weed management, in situ moisture harvesting and intensive cropping where ever the irrigation facilities are available. He suggested for developing cultivation practices separately for late sown crop. Results from all the centers were presented except from Samdari. During *kharif* 2011, 48 Agronomy trials were allotted to different centers, three trials failed due to heavy showers and results of 45 trials were reported. Dr B.K. Davada presented the results of plant physiology trials conducted at M.R.S. Jamnagar center. The chairman suggested for formulating trials on physiology aspects in consultation with the persons from ICRISAT or ICAR.

AGRONOMY

Recommendations

On the basis of the study conducted for three years at different centers to determine suitable date of sowing of hybrid/population to sustain higher pearl millet productivity under aberrant monsoon situation it is recommended that crops should be sown:

- Up to mid July in zone A1
- During last week of June to 1st week of July in Zone A
- During last week of June to mid-July in zone B.
- Hybrids were found better in productivity over the populations in all the zones.

In pearl millet pigeon pea (2:1) inter cropping system, pearl millet hybrid inter cropped with medium duration pigeon pea variety (160-165 days) gave higher pearl millet equivalent yield, net return and B:C ratio in Karnataka.

A) Trials to be continued during 2012-13

PMAT1: Response of pearl millet advance hybrids and/or populations to three levels of nitrogen

PMAT 3: Optimization of nutrients for pearl millet production under assured moisture conditions

PMAT 7: Suitability of hybrids under varying times of sowing during summer.

B) Trials concluded

PMAT 2: Study of organic farming in pearl millet based cropping sequence (The recommendation of the trial shall be presented in next group meeting as the sequence will be completed after harvesting of the chickpea crop).

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

C) New trials formulated

- Weed management in rainfed pearl millet crop
- Nutrient management through organic and inorganic source for major and trace elements in rainfed pearl millet

TECHNICAL PROGRAMME FOR 2012-13

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

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 checks) : MH 1700, Check GHB 538 and HHB 67 (Imp)
Design : Factorial RBD
Replication : Four
Plot size : Gross: 5.00 m x 3.60 m
Net: 5.00 m x 2.70 m
Locations : Mandor, ARSS Samdari and Bikaner

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

Nitrogen (3) : 30, 60 & 90 kg N/ha
Hybrids (9 + 2 checks) : MH 1712, MH 1723, MH 1720, MH 1734, MH 1737, MH 1747, MH 1743, MH 1746, MH 1759 checks RHB 121 and GHB 732
Populations (2+1 check) : MP 508, MP 509 check Pusa 383
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 and populations to nitrogen levels in Zone B

Nitrogen (3) : 30, 60 & 90 kg N/ha
Hybrids (7 + 2 checks) : MH 1719, MH 1720, MH 1723, MH 1711, MH 1743, MH 1751, MH 1754, checks GHB 558 and 86 M 64
Population (1 + 1 check) : MP 511 and check Raj 171
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 (1 + 1 check) : MSH 238, 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_2O_5 is to be added to all treatments.

Observations to be recorded

1. Plant population (final) in thousands/ha
2. Plant height (cm)
3. Days to 50% flowering.
4. Total tillers/plant
5. Effective tillers/plant
6. Test weight (1000-seed weight)
7. Grain yield (kg/ha)
8. Dry Fodder yield (q/ha)

PMAT 3: Optimization of nutrients for pearl millet production under assured moisture availability conditions

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)

- (i) 0, 15, 30, 45 kg/ha.

Hybrids: New high-yielding hybrid of the respective zone

No. of treatments: $4 \times 4 = 16$. Design : FRBD Replication: Three.

Plot size gross: 5m x 3.6m

Net: 5m x 2.7m

Locations

Zone A₁ : Mandor, Bikaner

Zone A : Jaipur, Hisar, Kalai, Jamnagar

Zone B : Aurangabad, Bijapur, Dhule & Coimbatore

Observations

1. Plant population (final) in thousands/ha
2. Plant height (cm)
3. Days to 50% flowering.
4. Total tillers/plant
5. Effective tillers/plant
6. Test weight (1000-seed weight)
7. Grain yield (kg/ha)
8. Dry Fodder yield (q/ha)
9. Economic optimum dose of nutrients
10. Nutrient use efficiency

PMAT 9: Integrated weed management in rainfed pearl millet

Due to change in the behavior of monsoon (late and prolonged rains) and scarcity of human labour, weed management becomes very difficult in pearl millet. Further, to update/fine tune the prevailing recommendations of weed management in pearl millet (i.e. application of atrazine followed by one hand weeding), the granule formulation of atrazine have developed and are easy to apply.

Treatment

1. Control (Weedy check)
2. Weed free
3. Pre emergence application of Atrazine @ 0.5 kg a.i./ha + one hand weeding at 35 DAS
4. Atrazine granules @ 0.75 Kg /ha at 15 Days after sowing (DAS)
5. Atrazine granule @ 1.0 kg ai/ha at 15 DAS
6. T₄ + one hand weeding/hoeing at 35 DAS
7. T₅ + one hand weeding at 35 DAS
8. Two HW/hoeing at 20 and 40 DAS

Location : A₁: Mandor, Bikaner
A: Jaipur, Hisar, Kalai, Jamnagar
B: Aurangabad, Bijapur, Dhule & Coimbatore
Design : RBD
Replication : Four
Plot size : Gross: 5.00 m x 3.60 m
Net: 5.00 m x 2.70 m

Observations :

1. Plant population (final) in thousands/ha
2. Plant height (cm)
3. Days to 50% flowering.
4. Total tillers/plant
5. Effective tillers/plant
6. Test weight (1000-seed weight)
7. Grain yield (kg/ha)
8. Dry Fodder yield (q/ha)
9. Weed intensity
10. Weed control efficiency
11. Economics of the treatment

PMAT 10: Nutrient management through organic and inorganic source for major and trace elements in rainfed pearl millet

Due to intensive cultivation the soils of the Country became deficient in macro and micro-nutrients and the yield of pearl millet is almost stagnated. Looking to the low yield levels of pearl millet, an experiment is framed for enhancement of pearl millet productivity and quality under rainfed conditions.

Treatment

A. Levels of organic manure

1. FYM 5 t/ha
2. Without FYM

B. Levels of inorganic fertilizers

1. Recommended dose of fertilizer (N:P:K)
2. RDF + Zinc @ 20 kg/ha
3. RDF + Fe @ 20 kg/ha
4. RDF + Boron @ 10 kg/ha
5. RDF + Gypsum @ 250 kg/ha
6. Control (Absolute control)

Design: Factorial RBD, Rep: 3

Observations

1. Plant population (final) in thousands/ha
2. Plant height (cm)
3. Days to 50% flowering.
4. Total tillers/plant
5. Effective tillers/plant
6. Test weight (1000-seed weight)
7. Grain yield (kg/ha)
8. Dry Fodder yield (q/ha)
9. Chemical analysis of soil prior to experimentation
10. Quality (Zn and Fe content) of grain

PHYSIOLOGY

Experiments concluded:

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

PMPHY-5: Assessment of salinity tolerance in pearl millet

Experiments to continue:

PMPHY-1: modified: Evaluation of entries from initial trials for their response to terminal drought stress.

PMPHY-2: Testing of pearl millet restorers and maintainers against drought.

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

PMPHY-7: Screening for stay-green character in pearl millet

(PMPHY-1 and 2 shall be taken during summer at Jamnagar and *kharif* at Jaipur)

TECHNICAL PROGRAMME FOR 2012-13

PMPHY-1: Evaluation of entries from initial trials for their response to terminal drought stress.

Objectives :- (i) To identify entries performing better under terminal moisture stress conditions for A and A1 (scanty rainfall) zone of India.

ii) To supplement the information on their response to terminal stress.

*Year of Commencement-2012

Location Summer: Jamnagar, *Kharif* - Jaipur

Treatment: 12 Entries (Entries selected from initial trial)

Note: (1) Terminal stress (Stress will be given from flowering to maturity)

(2) Block of irrigated control will be sown near experimental block for calculating Drought Susceptible Index (DSI).

Design: - RBD **Replication:** - Three

Spacing: - 60 X 10 cm **Plot size:** - 1.2 X 5.0 M (2 Rows of 5 M length)

Fertilizer : 120:60:00 kg/ha (N:P:K)

Observations:

1. Days to 50% flowering
2. Relative water content at 55 to 60 days after sowing during stress.
3. Productive tillers
4. Grain yield Kg/plot
5. Fodder yield Kg/plot
6. Earhead weight Kg/plot
7. Total dry matter Kg/plot
8. Threshing percent
9. Harvest Index (HI %)
10. 1000 grain weight (Test Weight)
11. Plant population at harvest
12. Drought Susceptible Index (DSI)
13. Days to Maturity
14. Soil moisture status at 10 days interval

PMPHY-2: Testing of pearl millet restorers (R) and maintainers (B) against drought

Objectives: - (i) To assess and identify drought tolerance restorers.

(ii) To use drought tolerant parental lines for breeding of drought resistant hybrids.

Year of Commencement-2012; Location: Jamnagar, Jaipur

Treatment: Six Entries each from B and R lines (Entries from AICRP centre)

Note: (1) Terminal stress (Stress will be given from flowering to maturity)

(2) Block of irrigated control will be sown near experimental block to get data for calculating Drought Susceptible Index (DSI).

Design: - RBD **Replication:** - Three

Spacing: - 60 X 10 cm **Plot size:** - 0.6 X 5.0 M (Single Rows of 5 M length)

Fertilizer : 120:60:00 kg/ha (N:P:K)

Observations:

1. Days to 50% flowering
2. Relative water content at 55 to 60 days after sowing during stress.
3. Productive tillers
4. Grain yield Kg/plot
5. Fodder yield Kg/plot
6. Earhead weight Kg/plot
7. Total dry matter Kg/plot
8. Threshing percent
9. Harvest Index (HI%)
10. 1000 grain weight (Test Weight)
11. Plant population at harvest
12. Drought Susceptible Index (DSI)
13. Days to Maturity
14. Soil moisture status at 10 days interval

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

Objectives: -

(i) To increase the yield potential by foliar spray treatments.

(ii) To mitigate the drought stress under rainfed conditions.

Year of Commencement: *Kharif*-2011

Location: Jamnagar, Jaipur

Treatment:

(A) Foliar spray at tillering and post-anthesis stages.

- T1- Untreated control
- T2- Distilled water
- T3- Thiourea 1000 ppm
- T4- Benzyl adenine 25 ppm
- T5- Benzyl adenine 50 ppm
- T6- Potassium chloride 0.75 %
- T7- Potassium chloride 1.50 %

(B) Entry: GHB-558

Design :- RBD **Réplication :-** Four

Spacing: - 60 X 10 cm

Plot size: - **Gross:** - 2.4 X 5.0 M (4 Rows of 5 M length)

Net: - 1.2 X 5.0 M (2 Rows of 5 M length)

Observations:

1. Days to 50% flowering
2. Relative water content at 55 to 60 days after sowing during stress.
3. Productive tillers
4. Grain yield Kg/plot
5. Fodder yield Kg/plot

6. Earhead weight Kg/plot
7. Total dry matter Kg/plot
8. Threshing percent
9. Harvest Index (HI%)
10. 1000 grain weight (Test Weight)
11. Plant population at harvest

PMPHY-7: Screening for stay-green characters in pearl millet

Objectives: - (1) Rapid screening of entries for drought resistance on the basis of Stay- Green character.

(2) Utilization of entries in breeding programme for drought tolerance.

Year of Commencement: *Kharif-2012*

Location: Jamnagar

Treatment: 100 to 120 entries (Hybrids and Parental lines from AICPMIP centre)

Design :- Augmented design

Plot size: - 5.0 m X 0.6 m

Observation: Visual observation for stay green character at: Flowering and Grain filling.

a) Stay green index: 1= Green 2 = Pale yellow 3 = Yellow

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

1. Dr. H.S. Khafi, Research Scientist (Agronomy) MRS (JAU) Jamnagar
2. Dr.P.S. Shekhawat, Agronomist, A.R.S. Bikaner
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. K.S. Rana, Principal scientist, I.A.R.I., New Delhi
9. Dr. C.P. Jaybhaye, Associate Professor (Agronomy), ARS Buldana
10. Dr. B.K.Davada, Assoc.Res. Scientist(Pl. Physiology) M.R.S. Jamnagar
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
17. Dr P.P. Girase, Asstt professor, (Agron) AICPMIP, Dhule
18. Dr. Hoshiyar Singh, Assoc Professor, PB &G ARS, Durgapura

Session ended with thanks to the Chairman.

C. CROP PROTECTION (PATHOLOGY AND ENTOMOLOGY)

Chairman : Dr. B.L. Jalali,
Ex-Director Research
CCS HAU, Hisar

Co-Chairman : Prof. H. S. Shetty
University of Mysore,
Mysore

Rapporteur : Dr. H.R. Bishnoi
Dr. K.L. Raghvani

Date: March 17, 2012

Time : 9.30 AM

Scientists of Plant Protection group from different AICPMIP centres and ICRISAT reviewed the research results of *Kharif* 2011 trials conducted at different locations.

At the outset, Dr. Asha Shivpuri welcomed the chairman Dr B.L. Jalali. The Chairman requested all the scientists to present their achievements. He appreciated for conductance of all the trials allotted during *Kharif* 2011 by all centres. The centrewise results of experiments were presented by the respective scientist.

Pathology

Dr. Asha Shivpuri presented the results of Pathological experiments conducted at Durgapura. She also observed that during survey most of the cultivars grown by the farmers were resistant to downy mildew. Blast is becoming an important disease of pearl millet.

Dr Y. M. Rojasara presented the results of Jamnagar and Anand centres. During the presentation the chairman pointed out the titles of the tables should match with the data and trials. The Chairman also stressed to give more emphasis for the AICPMIP trials. Low incidence of downy mildew and high incidence of rust and blast was observed during survey in their zone.

Dr Kushal Raj presented the results of Hisar centre and Chairman appreciated the presentation. None of the entry was free from rust incidence. In a survey at farmers' fields downy mildew incidence to the tune of 80 – 90 per cent was observed on cultivar Badshah grown in Rewari district. It is a matter of concern. The centre should look into this matter on priority.

Dr Mahaveer Singh presented the data for Fatehpur Shekhawati centre. The Chairman observed that the information generated by the centre is not appropriate.

The house observed that there was inconsistency in presentation of data by different scientist. Accordingly the Chairman emphasized that there should be uniformity in presentation of data by adopting a common template, as presented by Dr. Kushal Raj.

Dr. S.S. Ghuge presented the results of Aurangabad centre. The Chairman suggested for refinement in conducting trials so as to ensure proper seed germination in IDM experiment.

The Chairman suggested the group that every centre should identify multiple resistant entries in each trial. He also emphasised that every scientist should carry out analysis and evaluation of the research data generated at the centre before submitting it to the Project Co-ordinator.

Dr. C.S. Thakare presented the results of Dhule centre and presentation was upto the mark.

Dr Niranjana presented the data for the Mysore centre. The Chairman sought clarifications on the pathotypes and basic research aspects. Different pathotypes should get registered at ICAR – NBAIM, in view of an IPR and PPV&FR regime.

Dr Rajan Sharma, from ICRISAT presented the results of ICAR – ICRISAT collaborative research trials.

Dr. G. Karthikeyan presented the results of Coimbatore centre. It was observed that the rust disease is becoming serious in Tamil Nadu. The Chairman pointed out that while reporting data on multiple resistance, it should be noted that the screening has to be conducted artificially for each disease.

Dr H.R. Bishnoi presented the results of Mandor centre and the results were up to the mark.

Dr R. K. Pandya presented the data for Gwalior centre. Most of the fields were free from downy mildew while rust and ergot incidence was not observed.

The important research achievements were listed. Based on the observations, the recommendations were made by the group. The group also discussed and formulated the technical programme for *kharif* 2012.

Significant Findings

PMPT I: Disease screening trial of Initial Pearl Millet Hybrids and Varieties-

Out of 101 entries, 70 entries were highly resistant to downy mildew across the locations. Out of these five entries viz., MH 1815, MH 1816, MH 1790, MH 1814 and MH 1812 exhibited multiple disease resistance.

PMPT II: Disease screening trial of Advanced Pearl Millet Hybrids and Varieties-

Out of 57 entries, 42 were highly resistant to downy mildew across the locations. Out of these, one entry namely MH 1747 exhibited multiple disease resistance except for blast. PB 106 and MH 1749 exhibited multiple disease resistance except for blast and rust. MH 1671 and MH 1751 exhibited multiple disease resistance except for rust and ergot.

PMPT III: Monitoring disease resistance stability of released/popular hybrid/varieties-

Out of 25 entries, 17 entries showed downy mildew resistance across the country. Only one entry Nandi 61 exhibited multiple disease resistance except for rust and ergot. The entries viz., PB 106, HHB 67 Imp., ICMH 356, 86 M 86, ICTP 8203, ICMV 221, HHB 197, Raj 171 and CZP 9802 were resistant against downy mildew and smut across the locations.

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

1. Pathogenic diversity analysis by virulence nursery (PMDMVN)

The downy mildew virulence nursery trial was conducted at 12 centers and the results demonstrated that high level of variation in virulence pattern of *Sclerospora graminicola* pathotypes across the locations.

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, II and III existing across the country.

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

Using the cDNA of Resistant Gene Candidate (RGC) UOM 209 isolated from IP18292, a partial R gene RGPM 209 was isolated, cloned and characterized by 3'RTPCR and the protein was expressed in bacterial system. Further, the functional analysis of this gene revealed that it codes for a NBS-LRR kinase which is known to be involved in plant defense against pathogens. It was also found that RGPM 209 cDNA shared more than 60% identity with R-proteins having NBS-LRR region containing protein kinases in the GenBank from *Saccharum officinarum*, *Elusine coracana*, *Oryza sativa* and *Aegilops ventricosa* indicating that NBS-LRR region is highly conserved.

PMPT IV C: Characterization of pathogenic variability in pearl millet blast pathogen (PMBVN)

The pathogen (*Magnaporthe grisea*) population at Dhule appeared to be most virulent. On the other hand, the least virulent population was at Mandor, Jodhpur.

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

The mean disease incidence at all India level stated that at soft dough stage Chitosan + *Bacillus pumulis* INR7 treatment reduced downy mildew followed by *Pseudomonas fluorescens*, *Bacillus pumulis* INR7 and Chitosan individual treatments.

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

During field surveys it was observed that downy mildew still remained to be the major disease of pearl millet. In general, downy mildew incidence was low as compared to previous year's field survey. The range of downy mildew in the farmers field across all fields surveyed was from 0 – 90%.

RECOMMENDATION

1. The house discussed at length about the requirement of minimum and maximum number of plants for each entry per row/replication. It was unanimously resolved to have a minimum of 30 and maximum of 50 plants per row/replication.
2. The House recommended that pathologists should visit Mysore centre for a hands-on exposure to disease screening and basic research. An interactive session may be arranged at Mysore centre during crop season of 2012 for the benefit of all pearl millet pathologists for upscaling their skills.
3. Looking in to the magnitude of the diseases, the group strongly recommend for the appropriate green house facility for sustainable artificial disease screening at each centre particularly for blast.

Entomology

Dr. K.L. Raghvani, Research Scientist, Entomology, JAU, Jamnagar reported the experimental results conducted during the season. He reported higher incidence of stem borer at Jamnagar, while incidence of shoot fly was moderate. He emphasised that seed treatment with imidacloprid 600 FS @ 8.75 ml/kg seed or thiamethoxam 35 FS @ 9 ml/kg seed followed by dusting of 0.4% fenvelerate @ 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. Tandi, Entomologist, ARS, Durgapura, Jaipur presented the results of the experiments conducted at Durgapura Centre. He highlighted that comparatively high infestation of shoot fly, grass hopper and white grub was observed at Jaipur, Sikar and Dausa districts of Rajasthan. Forty five per cent damage by shoot fly at village Belken (Udaipuria Mod) of Govindgarh tehsil, 60% damage by grass hopper at Bansko of Bassi tehsil and 70% damage by white grub at Aloda (Meelon Ki Dhani), Danta Ramgarh tehsil was observed. He further reported that imidacloprid 600 FS @ 8.75 ml/kg seed or thiamethoxam 35 FS @ 9 ml/kg seed followed by dusting of 0.4% fenvelerate @ 20 kg/ha at 35 DAG were found most effective followed by seed treatment of imidacloprid 600 FS @ 8.75 ml/kg seed followed by NSKE 5% spray at 35 DAG for the management of shoot fly.

Dr. Chokha Ram, Entomologist, ARS, Fatehpur-Shekhawati reported low infestation of grey weevil in Sikar district and 25% damage of white grub in Sikar and Nagaur districts.

Chairman suggested that since last for the several years, good deal of information on insect pest incidence has been generated. Now this data should get converted for mapping purpose. The resultant map should be presented in next Workshop. He also suggested to drop Module-II of trial PMET-4 since it is purely chemical module and modify the trial accordingly.

RECOMMENDATION

On the basis of three years' data from Durgapura and Jamnagar centres (PMET-4), it was concluded that seed treatment with imidacloprid 600 FS @ 8.75 ml/kg seed followed by dusting of fenvelerate 0.4% @ 20 kg/ha at 35 days after germination was found most economically viable and effective for the management of shoot fly and stem borer in pearl millet.

Or

Seed treatment of imidacloprid 600 FS @ 8.75 ml/kg seed followed by NSKE 5% spray at 35 DAG was also found effective and economically viable.

TECHNICAL PROGRAMME FOR KHARIF – 2012

Pathology

Pearl millet pathological trials to be conducted at various coordinating/cooperating centres during *Kharif* 2012

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 till facilities for artificial screening are created

PMPT I: Disease screening trial of Initial Pearl Millet Hybrids and Varieties

Downy Mildew

Location

Zone A

Mandor, Jaipur, Hisar, Gwalior, Fatehpur Shekhawati, Jamnagar and Anand

	Zone B Mysore, Aurangabad, Dhule and Coimbatore
Smut Location	: Zone A Jaipur, Jamnagar, Hisar and Gwalior Zone B Dhule
Blast Location	: Zone A Jaipur, Jamnagar and Gwalior : Zone B Dhule and Aurangabad
Rust Location	: Zone A Jaipur, Jamnagar, Hisar and Gwalior Zone B Aurangabad, Dhule and Coimbatore
Location	: Zone A Jaipur Zone B
Ergot Location	: Zone A Jaipur Zone B Aurangabad, Dhule and Coimbatore

PMPT II: Disease screening trial of Advanced Pearl Millet Hybrids and Varieties

Downy Mildew Location	Zone A Mandor, Jaipur, Hisar, Gwalior, Fatehpur Shekhawati, Jamnagar and Anand Zone B Mysore, Aurangabad, Dhule and Coimbatore
Smut Location	: Zone A Jaipur, Jamnagar, Hisar and Gwalior Zone B Dhule
Blast Location	: Zone A Jaipur, Jamnagar and Gwalior : 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

PMPT III: Monitoring disease resistance stability of released popular hybrid/varieties

Downy Mildew

Location

Zone A

Mandor, Jaipur, Hisar, Gwalior, Fatehpur Shekhawati and Jamnagar

Zone B

Mysore, Aurangabad, Dhule, Coimbatore and Patancheru

Smut

Location

: Zone A

Jaipur, Jamnagar, Hisar and Gwalior

Zone B

Dhule

Blast

Location

: Zone A

Jaipur, Jamnagar and Gwalior

: 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 in pearl millet blast pathogen

Location : **Zone A**
Gwalior, Anand , Mandor, Jamnagar, Hisar 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) @ 8g / kg of seeds + Chitosan @ 2.5g/kg of seeds
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)

The seed and apron will be supplied by the PC unit and the other treatment materials will be supplied by the Mysore centre.

Replicates: 4 (4 rows in 5 meter length)

Observation to be recorded:

- a) Seedling emergence
- b) 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 diseases 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 (Pre-tillering, flowering and soft dough stage), 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 diseases in the area.

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

Locations: Anand and Coimbatore

Entomology

PMET 1: Screening of pearl millet lines against major insect pest

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

Location: Jamnagar, Jaipur and Fatehpur-Shekhawati

Experimental details: Design: RBD, No of replications: 3, No. of rows: Two,

Row length: 3 m and Spacing: 50 x 15 cm. No. of entry: Advance trials entries

Observations to be recorded

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

PMET 2: Survey 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 m², which will be kept free from insecticidal application during crop season. Incidence and population 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 recorded and will be correlated with pest incidence.

Survey of major insect pests will be carried out at vegetative and ear head stage of pearl millet crop during *Kharif* season. Incidence of various insect pests infesting pearl millet will be recorded from 25 randomly selected plants/ field. The pest status (major and minor) and magnitude of damage will be worked out.

PMET 3 (New): Testing of efficacy of different newer insecticides against shoot fly and stem borer in pearl millet

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

Location: Jamnagar and Jaipur

Experimental details: Design: RBD, No. of Replications: Three, Gross plot size: 5.0x3.6 m, Net plot size: 4.0 x 2.4 m. and Spacing: 50 x 15 cm.

Treatments: 8 treatments including control

1. Seed treatment of Imidacloprid 600 FS @ 8.75 ml/kg seed followed by spraying of Imidacloprid 17.8 SL 0.009% at 35 DAG
2. Seed treatment of Imidacloprid 600 FS @ 8.75 ml/kg seed followed by spraying of Thiamethoxam 25 WG @ 0.005% at 35 DAG
3. Seed treatment of Imidacloprid 600 FS @ 8.75 ml/kg seed followed by spraying of Spinosad 45 SC @ 0.009% at 35 DAG
4. Seed treatment of Thiamethoxam 35 FS @ 9.00 ml/kg seed followed by spraying of Imidacloprid 17.8 SL 0.009% at 35 DAG
5. Seed treatment of Thiamethoxam 35 FS @ 9.00 ml/kg seed followed by spraying of Thiamethoxam 25 WG @ 0.005% at 35 DAG
6. Seed treatment of Thiamethoxam 35 FS @ 9.00 ml/kg seed followed by spraying of Spinosad 45 SC @ 0.009% at 35 DAG
7. Seed treatment with Imidacloprid 600 FS @ 8.75 ml/kg seed followed by dusting of Fenvelerate 0.4% @ 20 kg/ha at 35 DAG
8. 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 28 DAG and ear head stage
- 3) Yield and economics of the treatments

PMET-4: 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 details: Design: RBD, No. of Replications: 5, Plot size gross: 5.0 x 3.6 m, Net: 4.0 x 2.4 m and Spacing: 50 x 15 cm.

Treatments: Four

1. IPM module-I

- a) Seed treatment with imidacloprid 600 FS @ 8.75 ml/kg seed
- b) Higher seed rate (10 %)
- c) Removal of shoot fly damaged plants

2. IPM module-II

- 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

3. IPM module-III

- 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

4. Untreated check

***Module-II dropped since it is a purely chemical module.**

Methodology and observation to be recorded

- 1. Per 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. Larval population of *Helicoverpa* to be recorded at ear head.
- 5. Yield and economics of the treatments.

PMET 5: Eco-friendly management of stored-grain pests of pearl millet seed

Objective: To study the effectiveness of seed protectants against storage pest of pearl millet.

Location: Jamnagar and Jaipur.

Experimental details: Design: CRD (Laboratory trial), Replications: 3, Sample size: 500 g pearl millet seed

Treatments: 7

- 1. Neem leaves powder @ 5 g/kg seed
- 2. Neem leaves powder @ 10 g/kg seed
- 3. Karanj leaves powder @ 5g/kg seed
- 4. Karanj leaves powder @ 10 g/kg seed
- 5. Dhatura leaves powder @ 5g/kg seed
- 6. Dhatura leaves powder @ 10 g/kg seed
- 7. Untreated control

Since the treatment of mint leaves powder and tulsi leaves powder were found ineffective at both the centres, both the treatments each of two doses is deleted.

Methodology and observation to be recorded:

- 1. Release of 10 pairs of *Rhizopertha dominica*/*Tribolium castaneum* for egg laying for 10 days in a jar containing 500 g of pearl millet seed.
- 2. Record moisture content of the seed before release of test insects.

3. Take 1 g 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.
4. Record the germination percentage at the end of experiment i.e. after 6 month

PMET-6: Evaluation of different insecticides as seed dresser for the management of soil pests (white grub and termite) in pearl millet

Location: Jaipur **Design:** RBD **Replications:** 3

Gross plot size: 5.0 X 3.6 m **Net plot size:** 4.0 X 2.4 m

Spacing : 50 X 15 cm **Treatments :** 11

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 35 FS seed treatment @ 7.5 g/kg seed
6. Thiamethoxam 35 FS seed treatment @ 10 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. Untreated control

Note: As the use of Endosulfan 35 EC has been banned, both the treatment of Endosulfan is deleted.

Observations to be recorded:

1. Remove the died plants due to white grub and termites at each observation
2. Per cent termite and white grub damage will be recorded
3. Yield and economics of the treatments.

The following scientists attended the session:

1. Dr. B.L. Jalali, Ex-Director Research CCS HAU, Hisar
2. Prof. H. Shekar Shetty, University of Mysore, Mysore
3. Dr. H.R. Bishnoi, Associate Professor, AICPMIP, Mandor, Jodhpur
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. Niranjana Raj, Asstt. Prof. University of Mysore, Mysore
8. Dr. G. Karthikeyan, Assoc.Prof. (Pathology), TNAU, Coimbatore
9. Dr. Kushal Raj, Asstt. Scientist . (Plant Pathology) CCS HAU, Hisar
10. Dr. Asha Shivpuri, Assoc.Prof., ARS (SK RAU), Durgapura, Jaipur
11. Dr. Mahaveer Singh, Associate Prof. (Pathology), ARS, Fatehpur Shekhawati
12. Shri Y.M. Rojasara, Asst. Res. Scientist, RRS, AAU, Anand
13. Dr. C.S. Thakare, Pearl Millet Pathologist, College of Agriculture, Dhule
14. Dr. R. L. Meena, STA, ARS, Durgapura
15. Dr. B.L. Tandi, Entomologist, ARS, Durgapura
16. Dr. K. L. Raghvani, Research Scientist, JAU, Jamnagar
17. Dr. Chokha Ram, Assoc. Prof., ARS, Fatehpur Shekhawati
18. Dr. S.R. Dhaka, Associate. Prof. SKRAU, Bikaner
19. Sh. Shripal Singh, SRF, AICPMIP, Jodhpur
20. Dr. M.M. Jha, Chief Scientist, Bisco Bio Science Pvt Ltd, Secundrabad

Session ended with thanks to the chairman and participants.

SESSION - II

REVIEW OF RESEARCH RESULTS AND PROGRESS REPORT OF 2011-12

Chairman	: Dr. S.K. Datta, DDG (CS), ICAR	Co-Chairman	: Dr. R.P. Dua, ADG (FFC), ICAR
		Rapporteur	: Dr. C. Tara Satyavathi and Dr. L.D. Sharma
Date	: March 17, 2012	Time	: 4:00 to 5.30 pm

The session started with welcome of the chairman and co-chairman by the Project Coordinator.

Dr. O.P. Yadav, Project coordinator, AICPMIP, made a brief presentation on "Pearl millet improvement enroute coordinated approach". He mentioned about the progress made in the past 25 years on various aspects of pearl millet research undertaken by the coordinated centres. He mentioned that-

- The average number of hybrid entries tested per year increased from 77 in (1986-90) to 130 in 2006-10, while the entries of OPVs decreased from 32 to 17 during the same period.
- During the last 5 years, 25 hybrids and 4 OPVs were released.
- The research under AICPMIP is a perfect example of public private partnership with contribution of equal number of test entries in the coordinated trials by both public and private sectors.
- The major share in marketing of improved pearl millet cultivars comes from hybrids due to involvement of private sector with well organized seed production mechanisms like seed village concept as is being observed in Andhra Pradesh.
- The pearl millet productivity has increased from 539 kg/ha during 1986-90 to 932 kg/ha during 2006-10 registering a 73% improvement, which is highest among all food crops.
- The rate of improvement in pearl millet productivity during 1986-2010 has been 20 kg/ha/year as compared to 6.3 kg/ha/year during 1960-85.
- This extent of improvement in pearl millet productivity has resulted in more than 45% improvement in its grain production, from 5.83 million tons during 1986-90 to 8.48 million tons during 2006-10.
- Several processing technologies have been fine-tuned to enhance shelf life of pearl millet-based traditional and health-food products.

The chairman congratulated Dr. Yadav on his excellent presentation of the progress of pearl millet improvement in the past 25 years. He also emphasized about the value of low glycemic index of pearl millet and its products for a healthy and long life.

During the interactions, Dr. K.N. Rai from ICRISAT suggested that-

- More research efforts need to be directed towards improving the productivity of pearl millet for the arid regions of western Rajasthan or A1 zone through more of public-funded research along with involvement of private sector.

- While breeding for this zone the genetic plasticity available in the local landraces also need to be considered.

Dr. Harinarayana, EX- Project coordinator suggested the need for dual purpose pearl millet with fodder quality equivalent to that of sorghum.

Dr. S.K. Gupta (JK seeds), expressed the need of more cooperation among public and private in a consortium mode to take up pearl millet improvement and ensure seed supply.

In the end Dr. O.P. Yadav, suggested the need for policy interventions as the demand for pearl millet as food, poultry feed, animal feed and use in breweries is going to increase due to its adaptability to the changing climate scenario and increasing awareness as a health food crop.

In the review of research and progress report of 2011-12, presentations were made for the disciplines of plant breeding, agronomy and plant pathology.

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

For *Kharif* 2011, there were 242 trials allotted in zone A1, A and B zones. Out of 242, 203 trials were conducted with success rate of 84%.

The Chairman suggested that the presentations should include the pictures of the entries promoted along with the data for better comparison. Dr. Patil (Private sector) urged that the testing fee of ` 60,000 per entry should be charged only once in the beginning of coordinated testing rather than every year. This was not agreed as present guidelines don't permit it.

Dr. O.P. Yadav, urged the private sector to increase the number of entries and testing centres in A and A1 zones.

Agronomy (Presented by: Dr. M.S. Rathore)

In agronomy, 5 trials were conducted in different zones.

The chairman, Dr. Datta inquired about any experiments being conducted on crop intensification involving pearl millet, use of slow release fertilizers, nutrient estimation through image sensing etc. Dr. Rathore informed that recommendations exist from over a long term for crop intensification involving pearl millet.

The project coordinator responded to the query by stating that –

- No work is carried out on microdosing of fertilizers in the AICRP centres but work on drip irrigation and mulching are being carried out.
- The summer cultivation of pearl millet in Gujarat is a perfect example of increasing crop intensification;
- In western Rajasthan growing pearl millet followed by mustard is a common practice and in some areas farmers are taking two crops of pearl millet in the same season by taking up early maturing hybrids early in the season.

To the question of DDG regarding the possibility of increasing farmer income with intensification and intercropping with pearl millet, Dr. Harinarayana responded that-

- HHB 67 Improved is a classic example where, by growing this hybrid farmers get assured grain yield compared to the growing of local cultivars and pulses like mung – leading to crop diversification. Also due to early maturity, the next *rabi* crop of wheat/ chick pea/ mustard is taken allowing crop intensification.

- He also shared his experience of application of little quantities of fertilizer immediately after rainfall resulting in increased yield in pearl millet.

Dr. R.S. Mahala from Pioneer suggested that –

- high density planting responds to better fertilization after potato cultivation for all the hybrids bred by public and private sectors.
- Also emphasis needs to be given for use of drip irrigation.

The Co-Chairman Dr. R.P. Dua suggested that studies on comparing performance of different hybrids and OPVs for nutrient use efficiency to be taken up.

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

All the centres have submitted the results of all the allotted trials. Blast emerges to be a serious problem.

Dr.B.L.Jalali complimented the efforts carried out by the coordinating centres. He mentioned that

- There exists a rich gene pool for downy mildew resistance across the locations and that it should be exploited effectively.
- Ideal screening infrastructure needs to be developed at different centres and work needs to be initiated on new priority areas like blast.

In the end, the chairman suggested the group-

- To look and explore pearl millet from a basic and strategic research perspective like bioprospecting for new genes.
- The type of research carried out in agronomy, pathology and other disciplines needs to be revisited.
- Mechanization of harvesting of millets also should be considered and this can be made possible by little architectural changes in plant ideotype.
- He also concluded **that pearl millet is no longer an orphan crop and is fascinating as it has the potential for providing better nutrition, fodder and climate resilience essential for future agriculture.**

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

SESSION - III

PROCEEDINGS OF VARIETAL IDENTIFICATION COMMITTEE MEETING HELD ON 17.03.2012 AT ARS, SKRAU, DURGAPURA, JAIPUR

Varietal Identification Committee Meeting of AICPMIP held on March 17, 2012 at 7.30 pm at STR Seminar Hall, A.R.S. SKRAU, Durgapura – Jaipur in Chairmanship of Dr. S.K. Datta, DDG (CS), ICAR, New Delhi. The following committee members were present:

1	Dr. S.K. Datta, DDG (CS), ICAR, New Delhi	-Chairman
2	Dr. R.P. Dua, ADG (FFC), ICAR, New Delhi	-Co-Chairman
3	Dr. R.P. Jangir, Director Research, SKRAU, Bikaner (Raj.)	-Member
4	Dr. H.P. Yadav, Chief Scientist, CCS HAU, Hisar	-Member
5	Dr. K.N. Rai, Principal Scientist, ICRISAT, Hyderabad	-Member
6	Dr Subhash Chandra Asstt. Director, DMD, Jaipur	-Member
7	Dr. H. Shekar Shetty, Professor, University of Mysore, Mysore	-Member
8	Dr. S.K. Gupta, Vice President (R &D), J.K. Agri Genetics Ltd., Hyderabad (AP)	-Member
9	Dr. Yogendra S. Verma Sr. Breeder, Metahelics life Science Ltd., Hyderabad (AP)	-Member
10	Dr. O.P. Yadav, Project Coordinator (Pearl Millet), AICPMIP, Jodhpur	-Member Secretary
Principal Investigator		
11	Dr. M.S. Rathore, Assoc. Prof. (Agronomy), AICPMIP, Mandor	- Facilitator
12	Dr. B.S. Rajpurohit, Assoc. Prof. (PB & G), AICPMIP, Mandor, Jodhpur	- Facilitator
13	Dr. H.R. Bishnoi, Assoc. Prof. (Pathology), AICPMIP, Mandor, Jodhpur	- Facilitator

The proposals submitted for varietal identified are:

S.No.	Hybrid/ Variety	Identity	Zone
1	MH 1632	Bio 70	Zone A1 (Early Maturity)
2	MH 1663	MPMH 17	Zone A (Medium Maturity)
3	MH 1655	GHB 905	Zone A (Medium Maturity)
4	MH 1642	NBH 77	Zone B (Medium Maturity)
5	MH 1684	86 M 86	Zone A (Late Maturity)
6	MH 1671	Bio 448	Zone A (Late Maturity)
7	MH 1676	NBBH 668	Zone A (Late Maturity)
8	MH 1684	86 M 86	Zone B (Late Maturity)
9	MH 1671	Bio 448	Zone B (Late Maturity)
10	MSH 224	NMH 73	Summer
11	MSH 226	86 M 66	Summer

The Committee took following decisions:

Zone A1 (Drier part of Rajasthan, Gujarat and Haryana)

The proposal of the hybrid MH 1632 (Bio 70) was considered for drier part drier part of Rajasthan, Gujarat and Haryana. The hybrid MH 1632 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 checks ICMH 356 and HHB 67 (Improved)

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

The hybrid MH 1663 (MPMH 17) and MH 1655 (GHB 905) were considered for Rajasthan, Gujarat, Haryana, UP, MP, Punjab and Delhi and recommended for release as these hybrids have shown superiority with respect to grain yield over checks RHB 121, GHB 744, ICMH 356 and Pusa 23.

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

The proposal of the hybrid MH 1642 (NBH 77) was considered for Zone B under medium maturity group. The hybrid MH 1642 (NBH 77) was recommended for cultivation in zone B (Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu) due to its superiority over checks ICMH 356 Shradha and Pusa 23 with respect to grain and dry fodder yield .

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

Three proposals of hybrids namely MH 1684 (86 M 86), MH 1671 (Bio 448) and MH 1676) (NBBH 668) were discussed together by the committee. Two hybrids MH 1684 (86 M 86) and MH 1671 (Bio 448) were identified for release in Rajasthan, Gujarat, Haryana, UP, MP, Punjab and Delhi as they have shown superiority in grain yield at least by 10 % or more over checks PB 106, GHB 558 and Pusa 23 and also shown less downy mildew incidence. Hybrid MH 1676 (NBBH 668) was not recommended.

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

Two proposals of hybrids namely MH 1684 (86 M 86) and MH 1671 (Bio 448) were considered for this group. Both the hybrids has shown superiority in grain yield over the check GHB 558 hence recommended for release in Maharashtra, Tamil Nadu, Karnataka and A.P.

Summer (Rajasthan, Gujarat, Maharashtra, A.P and Tamil Nadu.)

Proposal of hybrids MSH 224 (NMH 73) and MSH 226 (86 M 66) were considered for summer cultivation and these hybrids were found superior over check Proagro 9444 in grain. Hence both the hybrids MSH 224 (NMH 73) and MSH 226 (86 M 66) were recommended for release in summer areas of Rajasthan, Gujarat, Maharashtra, A.P and Tamil Nadu.

Sd/-

Dr. S.K. Datta
Chairman

Sd/-

Dr. R.P. Dua
Co- Chairman

Sd/-

Dr. O.P. Yadav
Member Secretary

SESSION - IV

INAUGURAL SESSION

March 18, 2012

Time: 10:00 to 12:00

Chief Guest	Hon'ble shri. Harji Ram Burdak, Minister for Agriculture &Animal Husbandry, Govtt. Of Rajasthan
Guests of Honour	Dr. S. K. Datta, Deputy Director General (CS), ICAR
Special Guest	Dr. R.P. Dua, Assistant Director General (FFC), ICAR
Chairman	Prof. A.K. Dahama, Vice Chancellor, Swami Kesavanand Rajasthan Agricultural University
Welcome Address	Dr. R.P.Jangir, Director Research, SKRAU, Jaipur
Highlights of Research Progress 2011-12	Dr. O.P. Yadav, Project Coordinator (Pearl Millet) AICPMIP Jodhpur
Remarks by ADG (FFC)	Dr. R.P. Dua
Remarks by DDG (CS)	Dr. S.K. Datta
Remarks by Chairman	Prof. A. K. Dahama
Address by Chief Guest	Hon'ble Shri. Harji Ram Burdak, Minister for Agriculture & Animal Husbandry, Govt. of Rajasthan Dr. K.S. Khokhar, Vice Chancellor, CCS HAU, Hisar
Vote of Thanks	Dr. Shrikant, Pearl Millet Breeder, ARS, Durgapura

Highlights of inaugural session:

Addressing scientific gathering in inaugural function of the meeting, Hon'ble minister highlighted the importance of pearl millet for the dry land agriculture. Sh. Burdak underlined the need of producing seed according to the requirement of different pearl millet growing zones. He suggested that characteristics of traditional local grass species like *Lasiurus indicus*, widely grown in water-scarcity regions of western Rajasthan, should be studied to understand the mechanism of its tolerance to extreme water stress to help develop drought tolerance in other crops including pearl millet. He mentioned that the pearl millet varieties requiring less water should be developed for drought-prone areas of Rajasthan so that the farmers who depend upon scanty rains get a good crop harvest.

Dr. S.K. Datta, Deputy Director General (Crop Science) of the Indian Council of Agricultural Research, while appreciating the excellent work done in pearl millet improvement, emphasized that this crop can be an excellent genomic resource for isolation of candidate genes with respect to tolerance to environmental stresses. There is an urgent need for sequencing of pearl millet genome in order to facilitate next stage of pearl millet improvement. He further mentioned that genes controlling tolerance to various biotic and abiotic stresses need to be pyramided in order to develop pearl millet cultivars that are adapted to multiple stresses. Synergy between public and private sectors needs to be exploited in order to further speed up improvement in pearl millet productivity. He also mentioned that the Pearl millet genome sequencing should be taken up by ICAR with the involvement of PC unit, IARI and ICRISAT if they wish to.

Vice-Chancellor, Prof. A.K. Dahama highlighted immense role of pearl millet in Rajasthan where agriculture is primarily rainfed. Anticipating acute shortage of water in future, he mentioned that there is a need to promote higher water use efficiency under drought conditions. He showed concern that pearl millet which occupies maximum (more than 50% of total area in country) area in Rajasthan, has minimum adoption of high-yielding varieties. This situation calls for a close interaction between University, State Seeds Corporation and Department of Agriculture.

Dr. R.P. Dua, Assistant Director General (FFC) of the Indian Council of Agricultural Research emphasized that pearl millet is an important nutri-cereal and it will continue to have niche role in drought-prone environments to provide food, fodder and nutritional security. He advocated that a strong partnership between public and private sector should be developed in supplying the seed of improved hybrids which would be very critical to further enhance the crop yields.

While presenting the highlights of pearl millet research, Dr. O.P. Yadav, Project Coordinator (Pearl Millet) mentioned that 115 improved cultivars were released during last 25 years which provided a wide range of choice to farmers for their cultivation in various agro-ecological regions and currently. Around 65% of pearl millet area is under high-yielding cultivars (mostly hybrids) which is highest among crops in which hybrids are targeted cultivar type. Improvement in pearl millet productivity has resulted in 45% improvement in its grain production from 5.83 million tons in 1980-85 to 9 million tons in 2006-10. Crop productivity has gone up from 539 kg/ha to 932 kg/ha registering a 73% improvement, which is highest among all food crops. During 1960-85, the crop productivity increased @ 6.3 kg/ha/year which was further enhanced to 20 kg/ha/year during 1986-2010.

Project Coordinator also informed the gathering that the crop season during 2011 was relatively favourable from crop growth point of view. This is the second consecutive year in which pearl millet productivity at national level has gone beyond 1,000 kg/ha. He further mentioned that nine cultivars including seven pearl millet hybrids and two OPVs were released and notified in 2011. The domain area of these cultivars included states of Rajasthan, Gujarat, Uttar Pradesh, Haryana, Punjab, Madhya Pradesh, Delhi, Maharashtra, Tamil Nadu, Karnataka and Andhra Pradesh. The cultivars are RHB 173, RHB 177, HHB 226, 86M64, PAC 909, Mandor Bajra Composite 2, 86M66, Pusa Composite 612 and 86M53.

The Pearl Millet News was launched, both in printed and in electronic version.

The book on 'Twenty Five Years of Pearl Millet Improvement in India' was also released.

During the workshop different centres were recognized for their contribution in pearl millet improvement. The best AICRP centre award was presented to the pearl millet improvement team of the CCS Haryana Agricultural University, Hisar. SKRAU Agricultural Research Station, Durgapura, Jaipur and Pioneer Overseas Corporation, Hyderabad were recognized for their outstanding contribution in pearl millet improvement during 2011.

SESSION - V

REVIEW OF BREEDER SEED PRODUCTION AND DUS TESTING PROJECT AND PROGRESS REPORT OF 2011-12 AND PLAN OF WORK OF 2012-13

Chairman : Dr. H.P. Yadav,
Chief Scientist
CCS HAU, Hisar

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

Date : March 17, 2012

Dr. B.S. Rajpurohit, Breeder, AICPMIP, Mandor reported that breeder seed production programme of 22 varieties/ Parental lines was organised successfully in 2011-12 and against DAC indent of 15.13 q a total of 17.93 q breeder seed was produced along with 3.03 q carry over stock.

He also informed house about supply of breeder seed during year 2005 to 2011 from AICPMIP centres and informed that a total of 191.67 q breeder seed was supplied directly to indenting agencies.

BSP I for production of breeder seed in *kharif* 2012 was presented. Total DAC indent for year 2013 is 16.95 q and this quantity of breeder seed is allotted to respective centre for production and supply

DUS progress report was presented. Dr. Rajpurohit informed that 12 genotypes were characterized along with 11 reference varieties for DUS traits at AICPMIP, Jodhpur and MPKV Rahuri in *kharif* 2011.

Monitoring team in the chairmanship of Dr, Sai Dass visited both the station on 22.09.2011 and 8.10.2011.

Registration of four pearl millet hybrids/varieties was completed during 2011 with PPV and FRA.

The centre AICPMIP, Jodhpur was awarded for its outstanding contribution in variety registration by the PPV&FRA centre of excellence during 2011 by PPV and FRA with respect to registration.

The session 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: 2012 Year of supply: February 2013

S.No.	Name of Producing center/state	Name of parental line/ variety	DAC indent (q)	Target set (q)
A.	Varieties			
1	PAU, Ludhiana	FBC 16	2.60	2.60
2	PAU, Ludhiana	PCB 164	1.25	1.25
3	CCS HAU, Hisar	HC 20 (HMP 9102)	2.76	2.76
4	RVSKVV, Gwalior	JBV 2 (GICKV-93191)	1.60	1.60
5	RVSKVV, Gwalior	JBV3 (MP 363) GICKV 96752	0.10	0.10
6	IARI, New Delhi	PUSA COM.383 (MP-383)	0.20	0.20
7	IARI, New Delhi	PUSA COM.334 (MP-334)	0.15	0.15
8	IARI, New Delhi	PUSA COM.621 (MP 480)	0.03	0.03
9	ICRISAT, Patancheru	ICMV 221	0.09	0.09
10	ICRISAT, Patancheru	ICMV 155	0.01	0.01
11	ICRISAT, Patancheru	MP 124 (ICTP 8203)	3.17	3.17
12	SKRAU, Jaipur	RAJ BAJRA CHARI 2	0.20	0.20
13	TNAU, Coimbatore	Co 9	0.90	0.90
		Total (A)	13.06	13.06
B.	Parental lines			
14	IARI, New Delhi	576 A	0.18	0.18
15	IARI, New Delhi	576 B	0.06	0.06
16	IARI, New Delhi	PPMI 85	0.06	0.06
17	IARI, New Delhi	841 A	0.38	0.38
18	IARI, New Delhi	841 B	0.16	0.16
19	IARI, New Delhi	PPMI 69	0.06	0.06
20	IARI, New Delhi	D 23	0.20	0.20
21	CCS HAU, Hisar	H 77/833-2-202	0.27	0.27
22	ICRISAT, Patancheru	843-22 A	1.14	1.14
23	ICRISAT, Patancheru	843-22 B	0.47	0.47
24	ICRISAT, Patancheru	ICMA 93333	0.15	0.15
25	ICRISAT, Patancheru	ICMB 93333	0.05	0.05
26	ICRISAT, Patancheru	ICMA 95444	0.06	0.06
27	ICRISAT, Patancheru	ICMB 95444	0.02	0.02
28	MPKV, Rahuri	RHRBI 138	0.12	0.12
29	MPKV, Rahuri	RHRBH 1 A	0.25	0.25
30	MPKV, Rahuri	RHRBH 1 B	0.12	0.12
31	SKRAU, Jaipur	RIB 192	0.05	0.05
32	SKRAU, Jaipur	RIB 494	0.07	0.07
33	JAU, Jamnagar	J 2340	0.02	0.02
		Total (B)	3.89	3.89
		Total (A) +(B)	16.95	16.95

Indents of Parental Lines of Hybrids PUSA 415 and PUSA 605 have been made instead of hybrids

Indent of Avika Bajra Chari (AVKS-19) has not been made as it is expected to be undertaken by Project Coordinator (Forage Crops), IGFR, Jhansi (UP)

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 SSCA

SESSION - VI

REVIEW OF RESEARCH RESULTS AND PROGRESS REPORT OF ICAR– ICRISAT COLLABORATIVE PROJECTS 2011 – 2012 AND PLAN OF WORK 2012 -13

Chairperson : Dr. S.K. Gupta Co-Chairperson : Dr. H.P. Yadav, Chief
Scientist Scientist CCS HAU,
ICRISAT Hisar
Rapporteur : Dr. P. Sumathi

Date : March 17, 2012 Time : 9.30 am to 5.00 pm

The chairman in his introductory remarks made a mention about the importance of this session. The session was started with the presentation of Dr. O.P. Yadav, Project Coordinator, AICPMIP. He briefed the overview of the ICAR – ICRISAT partnership trials taken during 2011-12. The improved genetic materials and genetic stocks developed at ICRISAT were evaluated at various locations of the All India Coordinated Pearl Millet Improvement Programme. The breeders selected good materials from ICRISAT genetic stocks to utilize in their respective crop improvement programme.

These trials were aimed at to provide good breeding materials to the breeders for A/B line development, 'R' line development and trait specific populations programmes for inbreeding to different locations. During *kharif* 2011 number of trials on A/B line development, 'R' line development, high 'Fe' inbred lines, salinity trials and marker assisted breeding trials were conducted at the specific locations and the data of the respective trials from respective centres has been included in the AICPMIP report.

Dr. S.K. Gupta, Scientist, (Pearl Millet breeding) of ICRISAT presented the work plan for 2012-13 *kharif* and *summer* seasons. He presented the information about the following trials.

- Seed parent progeny trials
- Restorer parent progeny trials
- High 'Fe' inbred lines – He informed that high 'Fe' entries available at the AICPMIP centres may also be contributed to test under 'Elite inbred joint biofortification trials.
- High forage population trials
- Disease resistant B-line and R-line composite materials with multiple resistant against different isolates of downy mildew and blast.
- Other trials are heat tolerance trials, salinity tolerant inbreds and population trials.

The scientist Dr. Rakesh Srivastava, ICRISAT, presented the information about marker assisted breeding trials and nurseries to be provided by ICRISAT to different locations. In the marker assisted breeding trials and nursery trials on introgression of QTLs for yield, downy mildew, blast high 'Fe' and zinc from different linkage group in different background are also provided for specific locations. There are four marker assisted breeding trials will be provided by ICRISAT to test in different AICPMIP centres.

At the end of the programme, the chairman congratulated the speakers of this session for providing good information and good breeding materials to test in the ensuing year 2012-2013. He concluded with a note that the Jamnagar location may be included in compact 'B' line trials. He also informed that these trials are very effective in sharing materials, information and experience of the breeders in different locations.

The technical programme for *kharif* 2012 and *summer* 2013 was also finalised. The session was ended with vote of thanks to the chairman and co chairman by the Project Coordinator.

ICAR-ICRISAT Collaborative Trials (2012-2013)					
S.No	Trial	Entries	Reps	Rows	Locations
<u>Seed Parent Progeny Trials</u>					
1	Thick panicle B-line trial	25-30	2	1	Dhule, Ludhiana, Aurangabad, Gwalior, Coimbatore, Jamnagar, Bijapur , Kalai
2	Stay-green B-line trial	20-25	2	1	Dhule, Ludhiana, Jaipur, Aurangabad, Gwalior, Coimbatore, Delhi
3	Large seed B-line trial	25-30	2	1	Hisar, Jaipur, Delhi, Mandor, CAZRI-Jodhpur, Coimbatore
4	Bristled panicle B-line trial	20-25	2	1	Jaipur, Delhi, Mandor
5	Early B-line trial	50-60	2	1	Hisar, Jaipur, Delhi, Mandor, CAZRI-Jodhpur, Jamnagar, Bijapur
6	Compact-panicle B-line trial	15-20	2	1	Hisar, Jaipur, Delhi, Mandor, Jamnagar, Coimbatore, Kalai
7	Blast and DM Resistant B-Composite	25 rows of 4m			Hisar, Jaipur, Delhi, Mandor, Jodhpur, Ludhiana, Bikaner, Jamnagar
<u>Restorer Parent Progeny Trials</u>					
1	Early Maturing R- line trial	50-60	2	1	Bikaner, Hisar, Jaipur, Delhi, Mandor, CAZRI-Jodhpur, Jamnagar
2	Stay Green R-line trial	15-20	2	1	Bikaner, Hisar, Jaipur, Delhi, Mandor, CAZRI-Jodhpur
3	Thick-panicle R- line trial	25-30	2	1	Hisar, Jaipur, Dhule, Jamnagar, Delhi, Gwalior, Aurangabad, Coimbatore, Anantapur, Bijapur, Kalai
4	Compact-panicle R-line trial	15-20	2	1	Bikaner, Hisar, Jaipur, Delhi, Mandor, CAZRI-Jodhpur, Anantapur, Jamnagar, Bijapur, Coimbatore
5	Blast and DM Resistant Restorer- Composite	25 rows of 4m			Hisar, Jaipur, Dhule, Jamnagar, Delhi, CAZRI-Jodhpur, Gwalior, Ludhiana, Kalai
<u>OTHER TRIALS</u>					
1	Salinity-tolerant population trial (in saline soils)	15-20	3	4	Faridkot/Bhatinda (PAU Ludhiana), Karnal (CSSRI), Mahua (JAU Jamnagar)
2	High-forage population trial (Summer season- 2013)	15-20	3	4	Hisar, Jaipur, Dhule, Jamnagar, Ludhiana
3	High-Fe inbred trial Set-1	40-50	2	1	Jaipur, Dhule, Jamnagar, Delhi
4	High-Fe inbred trial Set-2	40-50	2	1	Jaipur, Dhule, Jamnagar, Delhi
5	High-Fe inbred trial Set-3	40-50	2	1	Jaipur, Jamnagar, Delhi
6	High-Fe inbred trial Set-4	40-50	2	1	Jaipur, Jamnagar, Delhi
7	Elite Inbreds Joint Biofortification trial (consisting of elite inbred lines from AICPMIP partners)	70-80 (or two trials of 30-40 entries each)	2	1	Hisar, Jaipur, Dhule, Jamnagar, Delhi
8	Flowering-stage heat tolerance trial (Summer season- 2013)	40-50	3 sowings	1	Mandor, SK Nagar
9	Flowering-stage heat tolerant composite (Summer season- 2013)				Mandor, SK Nagar
10	Forage-type B-composite (Summer season- 2013)				Hisar, Jaipur, Dhule, Jamnagar, Ludhiana
<u>Marker-Assisted Breeding Trials and Nurseries</u>					
1	HHB 67-background DMR QTL Introgression Hybrid Observation Trial	40	2	2	3 locations (Hisar, Bawal and Patancheru)
2	H 77/833-2-background DMR QTL Introgression Lines Observation Nursery	40	2	1	3 locations (Hisar, Bawal and Patancheru)
3	GHB 538-background DMR QTL Introgression Line x Tester Trial	48	3	2	4 locations (Jamnagar, Jaipur, Patancheru and Mandor)
4	J 2340-background DMR QTL Introgression Line Trial	24	3	1	3 locations (Jamnagar, Mandor and Patancheru)

SESSION - VII

CROP PRODUCTION STRATEGIES AND VALUE CHAIN

Chairman : Dr. J.P. Singh, Director,
DMD, Jaipur

Rapporteur : Dr. Anil Kumar

Presentation : (i) INSIMP - Dr. J.P. Singh

(ii) FLDs – Dr. M.S. Rathore

A brief presentation was made by Dr. Singh covering aim and objectives, criteria and provisions, progress of implementation with yield gains of 20% over normal yield under pearl millet component of "Initiatives for Nutritional Security through Intensive Millets Promotion (INSIMP)". He also suggested for active involvement of net-work of Scientists working on pearl millet in capacity building of selected farmers, field staff, seed production and transfer of processing technologies on value chain from the National Centre of Excellence on Pearl millet set up at CCS HAU, Hisar to their concerned States.

A brief presentation was made by Dr. Rathore indicating centre-wise progress for 312 ha FLDs organized during 2011-12. He mentioned that the action plan developed during the last workshop was conveyed to the various centres for timely implementation of FLDs. However, administrative approval from DAC, Govt. of India was received by PC Unit only for 50 ha in the end of July, 2011, by that time programme was already implemented by the Centres. Average yield gains of 13.4% have been recorded under these FLDs.

The centres, who have implemented FLDs have raised question about the release of payment to them. Their request was supported by PC (Pearl millet) requesting for early release of payment of 2011-12 to PC Unit for onward transfer to the centres. He further made a mention that approval for this year should also be conveyed well before the start of sowing season.

Dr. Singh stated that a proposal for considering the liability of 2011-12 and an action plan for 400 ha FLDs for 2012-13 has already been submitted by Directorate of Millets Development to Department of Agriculture & Cooperation. However, implementation of action plan for current year may be taken up on receipt of approval from the Department & Cooperation.

The centre-wise action for 2012-13 was decided as under:-

Sl.No.	Name of the Centre	Area (in ha)		
		<i>Kharif</i>	<i>Summer</i>	<i>Total</i>
1	Jaipur	25	0	25
2	Bikaner	60	0	60
3	Kalai	25	0	25
4	Jamnagar	15	50	65
5	Hisar	50	0	50
6	Gurgaon	25	0	25
7	Gwalior	25	0	25
8	Aurangabad	30	0	30
9	Coimbatore	20	0	20
10	Bijapur	20	0	20
11	Dhule	30	0	30
12	Anantpur	25	0	25
TOTAL		350	50	400

SESSION – VIII

PRESENTATION OF LEAD LECTURE(S)

Chairman : Dr. B.L. Jalali, Ex-Director Research CCS HAU, Hisar	Rapporteur : Dr. P. Sumathi TNAU, Coimabto
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In this session four special lectures were presented which included on Shelf-life of Pearl Millet, Knowledge Management in Pearl Millet, Pearl Millet Variety Registration with PPV&FRA and Public-Private Partnership (PPP) to develop pearl millet hybrids for A1 Zone were delivered by the eminent and experienced scientists in pearl millet.

First special lecture was on “Shelf-life of Pearl Millet” by Dr. L.K. Chugh, Professor, Bio-Chemistry, CCS HAU, Hisar. 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 the diseases like cancer and diabetes. He also presented before the audience about NATP and NAIP programme for popularization of pearl millet and also value addition in developing health food. He also mentioned some points about rancidity determinant and rancidity indicators and storage life of pearl millet flour.

Another special lecture was delivered on “Knowledge sharing and Innovation”. This lecture was presented by two scientists, viz., Dr. N.T. Yaduraju and Dr. Kiran Yadav, ICRISAT, Hyderabad. A web site Agropedia-2008 was introduced to the audience. They also explained about the pearl millet knowledge repository system, Pearl millet knowledge model and knowledge model component and sponsored contents and critical contents etc. This will be helpful for the pearl millet scientists like a digital library and they can also utilize these model to store their information.

The third lecture was delivered by Dr. Dipal Roy Choudhury, on “Pearl Millet Variety Registration with PPV&FRA”. He apprised the audience about UPOV systems, TRIPS, Notification for different crops Extent variety, EDV, DUS testing and its different parameters, process of registration and National gene bank, pearl millet data base.

Dr. Suresh Kumar Gupta, Vice President R&D, JK Agri genetics, Limited, Hyderabad presented a special lecture on “Public-Private Partnership (PPP) to develop pearl millet hybrids for A1 Zone”. He highlighted the private and public sector working for A1 zone, problem faced by the A1 Zone. He also introduced the challenges of A1 zone. He suggested utilization of existing resources in PPP mode, collaborative hybrid development and consortium approach

At the end of the session the chairman thanked all the speakers for delivering their nice presentations.

General Issues

Chairman : Dr. O.P. Yadav,
Project Coordinator

Rapporteur : Dr. B.S. Rajpurohit

Several issues related to conduct of trials, quality of check seeds, registration of hybrid and parental lines, etc. were discussed in detail and the following points emerged on consensus:

- The source material used in the development of parental lines of hybrids and OPVs should invariably be mentioned in the variety identification proposal. The mere mention of plot numbers and numeric numbers is not acceptable.
- The progress on registration of cultivars released during last 5 years by different AICPMIP centres was noted to be slow. It was emphasized that registration needs to be done on a priority basis. Hence, it was agreed that all AICPMIP centres would submit their application, through Project Coordinator (Pearl Millet), for registration of their hybrids with PPV&FRA. Project Coordinator indicated that all the centres were advised earlier to develop data on required traits during *kharif* 2011. Project Coordinator may write to the Vice-Chancellor of all universities regarding this. The AICPMIP Incharges should submit the duly filled-in application, in prescribed format for registration, alongwith seed, data and other documents to the Project Coordinator latest by 20th August, 2012.
- Several cases of registration of pearl millet cultivars with PPV&FRA were still pending for the want of seed of extant cultivars. Many AICPMIP centres are deferring the submission of seed because one or another reason. It was decided that seeds of all such hybrids/ cultivars would be immediately deposited with Project Coordinator for their onward transmission to PPV&FRA. The hybrids/ cultivars are Pusa 605, GHB 577, HHB 94, RHB 90 and Pusa 415.
- QRT would be visiting different centres during *kharif* 2012. Hence it was suggested that all the centres should put up the released/ pipeline material in one compact and well-managed block for display during *kharif* 2012. At the same time, the breeding material developed at each centre should also be grown in compact block so that QRT can assess the programme on the development of new genetic materials including male-sterile lines, maintainer lines and restorer lines.
- The concise note on the major achievements and other aspects, as per prescribed performa circulated to AICPMIP centres already by the Project Coordinator, should be submitted immediately to the Project Coordinator so that it can be included in the QRT report.
- The exercise on holding of National Demonstration of Pearl Millet Hybrids was highly successful during *kharif* 2011. It was decided to continue with this activity during *kharif* 2012 also. In this regard, it was agreed that all AICPMIP centres/ private companies should submit 500 gms of all of their released and commercial hybrids to the Project Coordinator. It was also suggested that each centre/ private sector should mention the maturity of hybrid as early, medium and late. The seed should be sent to the Project Coordinator latest by May 20, 2012.

- The pedigree of the hybrids evaluated in the AICPMIP trials have been observed to be inconsistent in some cases. The use of coma(,) space, bracket, underline, small or capital alphabets are to be used very consistently. The pedigree given in the first year of testing should remain same and will not be subject to change. It was also agreed that the pedigree should be short enough to be included in the pedigree details in AICPMIP Report. Each centre should develop and maintain the definite pattern of nomenclature of hybrids and parental lines of hybrids.
- It has been observed that seed supplied by the different centres with respect to check used in AICPMIP trials was occasionally found spurious. Hence, each centre should submit the seed of checks duly verified by them by growing and verifying check-seed one season ahead before its submission to the Project Coordinator.
- Downy mildew data at 30 days after sowing of AICPMIP Pathology trials should be submitted to the Project Coordinator within one week of data recording. The data should also be produced before the monitoring team.
- In view of increased incidence of blast disease during last few years, it was suggested that blast nursery should be developed at AICPMIP centres. It was also agreed that the Pathologists of AICPMIP centres who would be participating in Pearl Millet Field Day to be held during September 2012 at ICRISAT Patancheru should arrive one day advance at ICRISAT. They would be given training on the screening techniques and other aspects of blast disease.
- The issue of submission of names of entries for initial trial of summer season in AICPMIP trials was discussed in detail. It was pointed out that performance data of entries becomes available only in the month of May i.e. after workshop. Hence, it was agreed that the name of the entries to be evaluated in the initial trial of summer season can be submitted to the Project Coordinator after workshop. Also the promotion of entries to advance trials has to be decided at the level of Project Coordinator as the composition of trial is decided in the month of December i.e. before the workshop.
- The National Bureau of Plant Genetic Resources has been identified as Nodal Agency to develop molecular marker data of pearl millet cultivars and parental lines of hybrids. This data is usually required along with proposal for notification of varieties. The centres may deposit the seed of cultivars/ hybrids and hybrid parental lines with NBPGR as soon as their variety is identified in the workshop with intimation to the Project Coordinator.

Plenary Session

Chairman : Dr. K.N. Rai,
ICRISAT

Co-chairman : Dr. O.P. Yadav
AICPMIP Jodhpur

Rapporteur : Dr. B.S. Rajpurohit

The recommendations of different session were presented by the respective rapporteurs of the session. All the observations and recommendations of each session were approved as such.

Chairman complemented Project Coordinator for excellent scientific deliberations that were held during the workshop. At the same time he also complemented the organizers for making good arrangements during three days workshop.

The meeting ended with vote of thanks to the chair.



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

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