

## **PROCEEDINGS OF AICCIP ANNUAL GROUP MEETING: 2007-08**

### **AGRONOMY, PHYSIOLOGY & BIOCHEMISTRY PANEL**

The Agronomy Panel Meeting of AICCIP was held in the afternoon session on 09-04-2008 and on the following day (10-04-2008) for presentation of ANNUAL REPORT and finalization of the technical programme on Agronomy, Physiology and Biochemistry trials to be conducted during 2008-09. The session was chaired by Dr. P.R. Bharambe, Head, Crop Production Division, CICR, Nagpur and co-chaired by Dr. P.L. Nehra, Professor and PI (Agronomy), ARS, Sriganaganagar and Dr. G.S.Butter, Director, Regional Station, Bathinda and Dr. C.S.Praharaj, Senior Scientist (Agronomy), CICR, RS, Coimbatore and Dr. Kulvir Singh, Asstt. Agronomist, Regional Station, Faridkot acted as rapporteurs for all the sessions under the panel.

Research experiments have to be carried out in Agronomy, Physiology and Biochemistry on the coming season (2008-09) on the following important thematic areas:

- Agronomic requirements of promising pre-release/recently released Hirsutum/ arboreum genotypes/hybrids of cotton
- Agronomic evaluation of Bt hybrids
- Integrated weed management
- Integrated nutrient management
- Crop canopy modification for higher productivity
- Drip irrigation and fertigation
- Cropping system research
- Physiological and biochemical aspects in cotton production

#### **TECHNICAL PROGRAMME FOR 2008-09**

##### **AGRONOMY AND SOILS**

- Agronomy I: Agronomic requirements of promising pre-release/ recently released hirsutum / arboreum genotypes/ hybrids of Cotton
- Agronomy IIa. Agronomic evaluation of Bt cotton hybrids under varied crop geometries and NPK levels
- Agronomy IIb: Optimization of nutrient requirement and plant geometry for Bt cotton
- Agronomy III: Integrated weed Management in Cotton
- Agronomy IVa: Foliar application of micronutrients on growth and yield of Cotton.
- IVb: Effect of Foliar application of KNO<sub>3</sub> on yield and quality of Cotton.
- IVc. Effect of organic manures and bio-pesticides on production of cotton
- Agronomy V Studies on Planting Technique on yield and quality of Bt cotton under drip Irrigation
- Agronomy VI: Cotton based cropping systems
- Effect of Macro & micronutrients on fibre productivity and quality in cotton under cotton-wheat system in North zone
- Organic residue management in cotton based cropping systems

##### **PHYSIOLOGY**

- Phy. 1: Screening of Cotton genotypes for abiotic stress tolerance
- 1a: Screening genotypes for water stress tolerance under irrigated & rainfed condition
- 1b: Screening genotypes for salinity stress tolerance

- Phy. 2: Investigations on physiological efficiency in Bt cotton hybrids  
Phy. 3: Studies on defoliants on physiological parameters and seed cotton yield  
Phy. 4: Control of Parawilt in cotton

### **BIOCHEMISTRY**

- Biochem.1: Studies on biochemical parameters for tolerance to drought and salinity stress.  
Biochem 2: Biochemical evaluation of cotton genotypes for tolerance to bollworms and sap sucking pests.  
Biochem.3: Evaluation of cotton genotypes for seed oil, gossypol and protein.  
Biochem.4: Biochemical evaluation of Bt cotton hybrids vis-à-vis productivity

## **DETAILS OF TECHNICAL PROGRAMME FOR 2008-09**

### **COTTON AGRONOMY**

The details of Technical Program formulated under Agronomy are presented as under:

#### **Agronomy I: Agronomic requirements of promising pre-release/ recently released hirsutum / arboreum genotypes/ hybrids of Cotton**

Under this project, the pre-released varieties/hybrids developed and suggested by the breeding panel under irrigated/rainfed conditions shall be tested at respective centers in the zone for their response to optimum fertilizer levels and crop geometry requirements (applicable to both public & private sector varieties/hybrids).

Zone/Centres	Hirsutum Varieties	Hybrids	Arboreum Varieties
<b>NORTH</b>			
Ludhiana/ Faridkot		KR 64 (Arboreum) with LC	CISA 614 with LC
Hisar		KR 64 (Arboreum) with LC	CISA 614 with LC
Sriganganagar		KR 64 (Arboreum) with LC	CISA 614 with LC
<b>CENTRAL</b>			
Surat	GSHV 01/1338, HAG 1055, CNHO 12 (with LC)		
Baruch			GAM 141 and AKA 9703 with Check
Junagarh	GSHV 01/1338, HAG 1055, TCH 1608 (with LC)		
Khandwa	KH 151, CNHO 12 with LC		GAM 141 and AKA 9703 with Check
Banswara	KH 151, TCH 1608 with LC	USHB 25, PSCHB 901 with Check DCH 32	
Akola		MLCH 318, VBCH 2231 with LC	GAM 141 and AKA 9703 with Check
Nanded		MLCH 318, VBCH 2231 with LC	GAM 141 and AKA 9703 with Check
Indore		MLCH 318, VBCH 2231 with LC	
Rahuri		USHB 25, PSCHB 901 with Check DCH 32	
<b>SOUTH</b>			
Nandyal			KWA 23 with LC
Dharwad			KWA 23 with LC
Coimbatore		USHB 25, DHB 915 and PSCHB 901 with LC	
Siruguppa		USHB 25, DHB 915 and PSCHB 901 with LC	

All the coordinating participating centers shall invariably conduct these trials incorporating the new genotypes /hybrids against the local check for determining the optimum spacing and fertilizer requirements. In addition, centers can take up agronomic requirements of any promising entry as per local requirements/needs after obtaining prior approval from the Project Coordinator, CICR, Coimbatore.

**Action to be taken:**

1. These varieties/hybrids have been recommended by the Breeding panel after ascertaining their performance only.
2. Concerned Breeders shall send the required Seeds directly to the Agronomists of respective Centres without delay for taking up experiments.
3. Data supply from centers through monthly reports.

## **Agronomy IIa. Agronomic evaluation of Bt cotton hybrids under varied crop geometries and NPK levels**

Bt hybrids (3): RCH 134 for North zone; RCH 2 Bt for Central zone; Bunny Bt for South zone.

Spacing (3): 90 x 90 cm; 90 x 60 cm & 90 x 45 cm (Central and South zone) and 100 x 60 cm; 100 x 45 cm & 67.5 x 60 cm for North zone  
120 x 45, 120 x 60 and 120 x 75 cm for Surat

NPK levels (3): 75% RDF, RDF & 125 %RDF

Design: split plot (main- Plant spacing , sub- NPK levels)

The crop is to be sprayed with  $\text{KNO}_3$  @ 2% at flower & boll development stages only.

Centres: All AICCIP centres except Kanpur.

## **Agronomy IIb : Optimization of nutrient requirement and plant geometry for Bt cotton**

Treatments: Main (2): Bt hybrid (Recommended for the Zone)  
Non Bt hybrid (of the same hybrid)

Sub: Plant Geometry (2): Normal spacing for the location  
Higher spacing (25 %)

Sub-sub: Nutrient levels (3) : RD-NPK, 125% RD-NPK and 150% RD-NPK

Design: Split-split

Replication: three

### **Observations:**

- Yield and yield traits
- Nutrient availability including micronutrients at planting and harvest
- Nutrient removal at 50 % boll opening stage
- Nutrient use efficiency, water use efficiency and water productivity
- Fibre quality and oil yield
- Analysis of Bt toxin at 60, 90 & 120 DAS as influenced by agronomic treatments
- The crop is to be sprayed with  $\text{KNO}_3$  @ 2% at flower & boll development stages only.
- Centres: All AICCIP centres.

## **Agronomy III: Integrated Weed Management in cotton**

The experimental details of IWM are given as follows.

- T1 Unweeded Control
- T2 Farmers practices (Hand weeding at 20, 40 & 60 DAS )
- T3 Pendimethalin @ 0.75 kg a.i./ha pre-emergence + HW at 30 & 60 DAS
- T4 Fluchloralin @ 0.75 kg a.i./ha pre-emergence + HW at 30 & 60 DAS
- T5 Pendimethalin @ 1.00 kg a.i./ha pre-emergence + HW at 30 & 60 DAS
- T6 Fluchloralin @ 1.00 kg a.i./ha pre-emergence + HW at 30 & 60 DAS
- T7 Pendimethalin @ 0.75 kg a.i./ha pre-emergence + Quizalofop-ethyl @ 0.04 kg a.i./ha at 30 & 60 DAS

- T8 Fluchloralin @ 0.75 kg a.i./ha pre-emergence + Quizalofop-ethyl @ 0.04 kg a.i./ha at 30 & 60 DAS
- T9 Pendimethalin @ 1.00 kg a.i./ha pre-emergence + Quizalofop-ethyl @ 0.05 kg a.i./ha at 30 & 60 DAS
- T10 Fluchloralin @ 1.00 kg a.i./ha pre-emergence + Quizalofop-ethyl @ 0.05 kg a.i./ha at 30 & 60 DAS

The centers include Surat, Rahuri, Lam and Dharwad.

**Agronomy IVa: Foliar application of nutrients on growth and yield of Bt Cotton.**

The following nutrients and their combination will be tried at different centers.

**Treatments**

Control
Boron-0.1%
ZnSO <sub>4</sub> -0.5%
MnSO <sub>4</sub> -1.0%
MgSO <sub>4</sub> -1.0%
MgSO <sub>4</sub> -1.0%+ZnSO <sub>4</sub> -0.5%
FeSO <sub>4</sub> -0.5%
FeSO <sub>4</sub> -0.5% + ZnSO <sub>4</sub> -0.5%
Urea 2% at flowering and DAP 2% at boll development stage

Kanpur, Akola, Banswara, Nanded, Bhawanipatna, Dharwad, Siruguppa, and Coimbatore centers shall continue the experiments.

All the nutrients have to be applied at flowering and boll development stages.

New centre may start with **Bt hybrid** earmarked for their zone.

Action to be taken up: Data supply through monthly report-Centers mentioned above.

**Agronomy IVb: Effect of Foliar application of KNO<sub>3</sub> on yield and quality of Cotton.**

The treatments include only KNO<sub>3</sub> & its different combination, and are as under :

**Treatments**

Control
Two sprays of 2% KNO <sub>3</sub>
Three sprays of 2% KNO <sub>3</sub>
Four sprays of 2% KNO <sub>3</sub>
Two sprays of 3% KNO <sub>3</sub>
Three sprays of 3% KNO <sub>3</sub>
Four sprays of 3% KNO <sub>3</sub>
MOP in four splits (soil application) RD-K
Full dose of MOP at sowing

Abohar, Kanpur, Ludhiana, Sriganaganar, Surat, Junagarh, Nanded, Akola, Indore, Banswara, Dharwad, Siruguppa and Srivilliputtur centers shall continue the experiments as per treatments details listed here.

Action to be taken up: Data supply through monthly report-Centers mentioned above.

**Agronomy : IVc Effect of organic manures and bio-pesticides on crop production**

The treatments include plant protection measures and organic manures.

<b>Treatments</b>
A) Plant protection (PP)
RPP (Recommended)
PP with Biopesticides
B) Organic manures
FYM @ 10 t/ha
VC @ 2.5 t/ha
CR @ 5.0 t/ha
FYM @ 5 t/ha + VC @ 1.25 t/ha
FYM @ 5 t/ha + CR @ 2.5 t/ha
VC @ 1.25 t/ha + CR @ 2.5 t/ha
FYM @ 3.3 t/ha + VC @ 0.8 t/ha + CR @ 1.6 t/ha
RDF
Control

Rahuri and Nandyal centers shall continue the experiment as per treatment details.

Action to be taken up: Data supply through monthly report-Centers mentioned above.  
All the organic component must be analyzed for its nutrient content before addition.

**Agronomy V: Studies on Planting Technique on yield and quality of Bt cotton under drip irrigation**

The treatment combination includes irrigation scheduling and Fertilization.

I1 : Single row 40 % AWC
I2 : Single row 60 % AWC
I3 : Single row 80 % AWC
I4 : Paired Row 40 % AWC
I5 : Paired Row 60 % AWC
I6 : Paired Row 80 % AWC
I7 : Single Row surface irrigation
I8 : Paired row surface irrigation

Nanded, Lam (Guntur) will take up this experiment this year with using Bunny Bt.

**Agronomy VI : Cotton based cropping systems**

## **Effect of Macro & micronutrients on fibre productivity and quality in cotton under cotton-wheat system in North zone**

Faridkot center shall continue the experiments as per previous year plan.

### **Organic residue management in cotton based cropping systems**

Srivilliputtur shall continue the experiment as per earlier plan.

## **COTTON PHYSIOLOGY**

### **Phy. 1: Screening of Cotton genotypes for abiotic stress tolerance**

#### **1a: Screening genotypes for water stress tolerance**

Centres: Surat, Khandwa, Nanded, Lam and Dharwad

Genotypes=18+2 checks with new entries.

Action: Data supply through monthly report-Centres

Observations:

1. Seed cotton yield and ancillary data
2. Phenology
3. RWC, Chlorophyll stability index, Proline content, SLW, nutrient uptake
4. Stress indices (PHSI, DMSI, YSI and S etc.)
5. Monitoring of Periodic soil moisture profile.

#### **1b: Screening genotypes for salinity stress tolerance**

Continuing experiment as per last year's protocol.

Centres: Hisar, Lam and Dharwad (Pot/Microplot experiment)

Genotypes=10+2 checks with new entries.

**Observations:**

1. Seed cotton yield and ancillary data
2. Phenology
3. RWC, Chlorophyll stability index, Proline content, SLW, nutrient uptake
4. Stress indices (PHSI, DMSI, YSI and S etc.)
5. Monitoring of soil salinity at initial and final stages.
6. Leaf Na and K content at peak flowering stage.

Action: Data supply through monthly report-Centres

### **Phy. 2: Investigations on physiological efficiency in Bt cotton hybrids**

Treatments (Design split plot)

Main: (2) Date of sowing – Normal sowing/15 days delayed sowing

Sub : (5) Genotypes and Replications: (5)

2 Bt + 2 Non Bt + 1 Zonal check

RCH 134 Bt and MRC 6301 Bt for North zone and

RCH 2 Bt and Bunny Bt for Central and South Zone.

Centres: Hisar, Khandwa, Surat, Nanded, Lam and Dharwad

Action: Data supply through monthly report-Centres

1. Seed cotton yield and ancillary data
2. Phenology
3. Growth analysis at periodical intervals 50, 80, 110 and 140 DAS
4. Nutrient uptake at 50 % boll bursting stage
5. Consumptive use and WUE
6. Observations of leaf reddening and parawilt, if any.

### **Phy. 3 Effect of defoliants on physiological parameters and seed cotton yield.**

#### **Treatments**

1. Ethrel 1500 ppm at 145 DAS
2. Ethrel 2000 ppm at 145 DAS
3. Ethrel 2500 ppm at 145 DAS
4. Ethrel 1500 ppm at 160 DAS
5. Ethrel 2000 ppm at 160 DAS
6. Ethrel 2500 ppm at 160 DAS
7. Control

Centre: Ludhiana, Bathinda, Surat and CICR, Sirsa with RCH 134 Bt.  
Lam, Khandwa and Dharwad with Bunny Bt

Action: Data supply through monthly report-Centre

### **Phy 4: Control of Parawilt in cotton**

#### **Experimental details:**

1. Foliar spray of cobalt chloride @ 10 ppm before irrigation
2. Foliar spray of cobalt chloride @ 10 ppm at initial stage of Parawilt
3. Foliar spray of cobalt chloride @ 10 ppm at 50% wilting stage
4. Foliar spray of Sodium benzoate @ 1mM before irrigation
5. Foliar spray of Sodium benzoate @ 1mM at initial stage of Parawilt
6. Foliar spray of Sodium benzoate @ 1mM at 50% wilting stage
7. Control

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

1. Morphological characters, yield contributing parameters and Seed cotton yield.
2. Fibre quality parameters.

Centre: Ludhiana

#### **Note:**

Seed for different physiology experiment is to be organized by Dr. Ratna Kumari, RRS, Lam. All concerned scientists shall cooperate by sending required seed material in time.

## **COTTON BIOCHEMISTRY**

### **Biochem.1: Studies on biochemical parameters for tolerance to drought and salinity stress.**

Centre: Dharwad and Surat shall continue this experiment as per modified technical programme including evaluation of enzymes and metabolic intermediates.



Action: Data supply through monthly report-Centre

**Biochem. 2: Biochemical evaluation of cotton genotypes for tolerance to bollworms and sap sucking pests.**

Centre: Dharwad centre shall continue this experiment as per modified technical programme-  
Observation:

1. Peroxidase and nitrate reductase activity
2. Plant secondary metabolites

Action: Data supply through monthly report-Centre

**Biochem. 3: Evaluation of cotton genotypes for seed oil, oil profile, gossypol and protein.**

Centre: Dharwad and Surat centres shall continue this experiment as per previous technical programme.

Promising genotypes will be taken up for this trial.

Action: Data supply through monthly report-Centre

Source of materials: Br04a for irrigated centre (Surat) ; Br04b for rainfed centre (Dharwad)

**Biochem.4: Biochemical evaluation of Bt cotton hybrids vis-à-vis productivity**

Centre: Surat, and Dharwad centers shall conduct the experiment.

Biochemical evaluation like oil content, nitrate reductase, peroxidase, temporal distribution of secondary metabolites needs to be done during critical crop phenological stages.

Action: Data supply through monthly report-Centre

**SCHEDULE OF OBSERVATIONS TO BE TAKEN UP**

1. Soil type (Depth of soil/soil texture)
2. Irrigated/rainfed condition)
3. Soil fertility status (initial)
4. Periodic determination of soil moisture profile (0-15, 15-30, 30-60 cm) up to harvest
5. Dry matter production at 50 % boll bursting stage
6. Nutrient uptake at 50 % boll bursting stage
7. Water productivity (based on yield & consumptive use of water)
8. Nutrient/Fertilizer use efficiency (based on total uptake and yield)
9. Seed cotton yield, boll no., boll weight, seed yield and oil content
10. Fibre quality
11. Economics analysis

**SUBMISSION OF DATA ON THE TRIALS**

Zone	Date of submission of report
North	31 <sup>st</sup> January, 2009
Central	15 <sup>th</sup> February, 2009
South	1 <sup>st</sup> March, 2009

The following personnel of various coordinating centers participated in the deliberations and finalization of technical programme in the coming season (2008-09).

Sl No.	Name	Designation and Address
1.	Dr.Y.R.Aladakatti	Senior scientist, ARS, Dharwad
2.	Dr. B.C. Patil	Principal Scientist (Physiology), ARS, Dharwad
3.	Dr.H.M.Vamadevaiah	Sr. Scientist(Biochem), ARS, Dharwad
4.	Dr. Satyanarayan	Agronomist, RARS, Raichur
5.	Dr.K.L.Chhabra	Sr.Agronomist, CCS HAU, CRS,Sirsa
6.	Dr. S.S. Hallikeri	Sr. Agronomist, ARS, Dharwad
7.	Dr. K.M. Patel	Asstt. Research Scientist (Biochemist), MCRS, Surat
8.	Dr. K.N. Pawar	Physiologist, ARS, Dharwad
9.	Dr. A. N. Gitte	Asstt. Cotton Specialist, MAU, Parbhani
10.	Dr.V. Kumar	Research Scientist (Physiology),NAU, Surat
11.	Dr. Basavanneppa, M.A.	Sci (Agronomy), ARS, Siruguppa,
12.	Dr. R.K. Tripathy	Agronomist, RRTTS, Bhawanipatna
13.	Dr.B.Gururajan	Prof. of Agronomy, CRS, TNAU, Sriwilliputtur
14.	Dr.S.Ratnakumari	Sr.Sci.(Plant Physiology),RARS, ANGRAU, Guntur
15.	Dr.E.Narayana	Principal Scientist(Agronomy),RARS, Lam,Guntur
16.	Mr.A.D. Pandagale	Asst. Agronomist, CRS, Nanded
17.	Dr. Parminder Kaur	Asst. Agronomist, PAU Ludhiana
18.	Mr. Manpreet Singh	AES (Cotton), RS, Abohar
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20.	Dr.E.Aruna	Scientist (Agron),Nandyal
21.	Dr.R.K.Patel	Asstt. Agronomist,ARS,JAU,Junagarh
22.	Dr.R.S.Sarlach	Assoc. Prof. (Botany),PAU, Ludhiana
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24.	Dr.Thokale, J.G.	Cotton Agronomist, MPKV, Rahuri
25.	Dr.P.D.Bhalerao	Cotton Agronomist,CRU, Dr.PDKV,Akola
26.	Dr.S.K.Khamparia	Principal Scientist, JNKVV, Khandwa
27.	Mr. Harphool Meena	Asstt. Agronomist, ARS, Bonswara (Raj)
28.	Dr. Nitin Ahire	Cotton Breeder, Bayer Crop Science, Bathinda
29.	Dr. Jagdish Kumar	Asstt. Agronomist, CSA University, Kanpur
30.	Dr.R.S.S.Tomar	Cotton Agronomist, COA,JNKVV,Indore
31.	Dr. J.G.Patel	Asstt. Res.Sci.(Agronomy)
32.	Dr. R.A.Meena	Senior Scientist (Agronomy), CICR, RS, Sirsa
33.	Dr. M.S. Bhattoo	Cotton Agronomist, CRS, HAU Sirsa.

## **RECOMMENDATIONS**

Agronomic assessment of promising pre-release/ recently released *Hirsutum/ arboreum* genotypes/ hybrids of cotton were made during the current year along with those of Bt cotton hybrids.

### **AKOLA**

Application of FYM @ 5 t/ha + Cotton stalk residue @ 2.5 t/ha is recommended to *hisrutum* cotton variety (PKV Rajat) for organic cotton production and higher monetary returns under rainfed condition.

### **INDORE**

75% Nitrogen (60Kg N/ha) and 40 kg S/ha along with 1.25% V.C + Azospirillu + PSB (Seed treatment) was found most suitable for sustainable cotton production under rainfed condition under Malwa tract.

Plant protection with bio-pesticide and RDF (80:40:20 kg NPK/ha) was found more remunerative for higher production under rainfed condition of Western M.P.

### **SIRUGUPPA**

Four split application of MOP (25% each at sowing, thinning, flowering and boll development stage) gave highest net returns and B:C ratio at Siruguppa.

Application of 150:75:75 Kg NPK/ha + 5% FYM produced highest yield and net returns at Siruguppa.

### **ARS DHARWAD**

Application of 80:40:40 kg NPK/ha + Foliar sprays of 3% KNO<sub>3</sub> at flowering (70 DAS) and boll development (110 DAS) stages to non-Bt cotton (DHH-11) was economical to obtain higher kapas yield.

### **JNKVV KHANDWA**

Application of 30% RD-NPK + FYM 10 tons/ha with normal plant protection practices is recommended for *hirsutum* varieties under rainfed conditions.

Foliar application of Calcium chloride @ 0.25% + Potassium Nitrate @ 0.5% at 60 and 90 DAS is recommended under rainfed conditions.