AICCIP ANNUAL GROUP MEETING: 2014-15 PAU, Ludhiana
Proceedings of Agronomy, Physiology & Biochemistry Panel

Chairman:	Dr C.D. Mayee, Ex-Chairman ASRB
Co-Chairman:	Dr G.S. Buttar, Head, Agronomy, PAU, Ludhiana
Convener:	Dr. P.L. Nehra, Principal Investigator (Agronomy), AICCIP,
Rapporteurs:	Dr J.S Deol, Scientist (Agronomy), PAU, Bhatinda
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The Agronomy Panel Meeting of AICCIP was held in the afternoon session on 08.04.2014 and on the following day (9.04.2014) for presentation of results of 2013-14 and finalization of the technical programme on Agronomy, Physiology and Biochemistry trials to be conducted during 2014-15. Research experiments to be carried out in Agronomy, Physiology and Biochemistry in the coming season (2014-15) on the following important thematic areas:

- Agronomic requirements of promising pre-release/recently released hirsutum/ arboreum genotypes/ hybrids of cotton
- Developing suitable Agronomy for ruling *Bt* hybrids of the region.
- Weed management
- Improving use efficiency of inputs (water and nutrient)
- Technology for organic Cotton Production
- Physiological and biochemical aspects in cotton production

TECHNICAL PROGRAMME FOR 2014-15

AGRONOMY

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

Agronomy II: Developing suitable Agronomy for ruling *Bt* hybrids of the region

Agronomy III: Weed Management in cotton

Agronomy IV: Improving use efficiency of inputs (water and nutrient)

IVa: Drip irrigation in *Bt* cotton

IVb : Moisture conservation technique for ET based drip irrigation in *Bt* cotton

Agronomy V: Technology for organic cotton Production.

PHYSIOLOGY and BIOCHEMISTRY

1: Screening of cotton genotypes for abiotic stress tolerance
    1a: Screening genotypes for water stress tolerance
    1b: Screening genotypes for salinity stress tolerance
2: Studies on defoliants in cotton
3: Preparing for Climate Change: Effect of environment on crop phenology development, yield and fiber development
4: Manipulation of source sink relationship through growth regulators for enhancing production in cotton
5: Evaluation of cotton genotypes for seed oil, gossypol and protein.
6: Testing of swell (CCPU) Forchlorfenuron bio-efficacy on cotton crop (Paid trial)
7: Evaluation of Double for bio efficacy on *Bt* cotton (Paid trial)

Details of Technical Programme for 2014-15

COTTON AGRONOMY

The details of Technical Programme 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). 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.

NORTH ZONE

- Hirsutum variety – F 2276, LH 2256

CENTRAL ZONE

Irrigated Trials

- Hirsutum variety – GISV 272, BS 39
- Hirsutum hybrids- RHH 0707
- G. barbadance variety- GSB 21, DB 16
- *Hir x Barb* hybrid - RHB 0711, RHB 0713

Rainfed Trials

- Hirsutum variety – GBHV 170, SCS 793
- Intra-hirsutum Hybrid – GSHH 2646

SOUTH ZONE

Irrigated Trials

- Hirsutum variety – GISV 272
- Hirsutum hybrid- TSHH0629, RHH 0707, PHCH 270
- Barbadance variety- GSB 21, DB 16

Rainfed Trials

- Hirsutum hybrid- RAHH 455, RAHH 1001

Zone/Centers	Hirsutum vars.	Hirsutum hybrids	Arbor. vars	Arbor. hybrids
North Zone				
Faridkot	F 2276, LH 2256			
Bathinda	F 2276, LH 2256			
Sirsa (CCSHAU)	F 2276, LH 2256			
Sriganganagar	F 2276, LH 2256			

Central Zone				
Zone/Centers	**Hirsutum vars.**	**Hirsutum hybrids**	**Barbedanse. vars**	**Hir x barb**
Akola	GBHV 170, SCS 793	GSHH 2646		
Nanded	GBHV 170, SCS 793	GSHH 2646		
Rahuri		RHH 0707	GSB-21 DB 16	RHB0711, RHB 0713
Surat	GISV 272, BS 39		GSB-21 DB 16	
Junagarh		RHH 0707		RHB0711, RHB 0713
Bhwanipatna	GISV 272, BS 39			
Banswara			GSB-21 DB 16	RHB0711, RHB 0713

Southern Zone					
Zone/Centers	**Hirsutum vars.**	**Hirsutum hybrids**	**Barbedanse. vars**	**Arbor. Hyb**	**HxB**
Nandyal		RAHH 455, RAHH 1001			
Dharwad		RAHH 455, RAHH 1001	GSB 21, DB 16		
Coimbatore	GISV 272		GSB 21, DB 16		
Lam	GISV 272	TSHH 0629, RHH 0707, PHCH 270			
Raichur	GISV 272	TSHH 0629, RHH 0707, PHCH 270			

All the breeders of the above varieties / hybrids are requested to submit 1.0 kg (variety)/0.5 kg (hybrid) of **seeds directly to the concerned agronomists (and not to Project Coordinator)** and to keep track with the agronomists for getting the data on agronomy trial and to submit the lint samples to CIRCOT from concerned location. The agronomists are requested to submit the 5 kg lint samples directly for micro-spinning to Director, CIRCOT, Mumbai. Further, agronomists are requested to send the agronomic trials data to the concerned breeder in addition to the Principal Investigator (Agronomy) in time to facilitate the breeder to submit the release proposals before due date.

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 Centers without delay for taking up experiments.
3. One or two centers may send lint samples for full scale spinning.

IIA: Developing suitable Agronomy for ruling *Bt* hybrids of the region

Treatments: **Main (3):** *Bt* hybrids

1. *Bt* hybrid (three popular at farmer field)

Sub: Plant Geometry (2): Normal spacing for the location
Higher/Closer 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 at planting and harvest
- Nutrient use efficiency, water use efficiency and water productivity

All AICCIP centers except Bhawanipatna and Kanpur will conduct the trial by using hirsutum varieties

Agronomy III:Weed Management in *Bt* Cotton
Objectives : To find out the suitable weed management strategies for *Bt* cotton.
Treatments:
T_1: Pendimethalin @ 0.75 to 1.0 kg a.i/ha as Pre emr or PPI + one hoeing
T_2: Quizalofopethyl 50 g a.i/ha, at 2-4 weed leaf stage + one hoeing.
T_3: Pendimethalin 1.0kg a.i/ha followed by PE Quizalofopethyl 50g a.i/ha at 2-4 weed leaf stage + one hoeing
T_4: Pyrithiobac Sodium @ 62.5g a.i/ha 20-30 DAS + one hoeing
T_5: Pyrithiobac Sodium @ 62.5g a.i/ha + Quizalofopethyl 50g a.i/ha 20-30 DAS or 2-4 weed leaf stage +one hoeing
T_6: Glyphosate @ 1.0kg a.i/ha as directed spray at 45 DAS
T_7: Weed Free check
T_8: Weedy check
Note: one hoeing depending upon field situation at 40-60 DAS
Design: RBD
Replication: Three

Observations:
- Yield and yield traits &Economics
- Weed count species wise
- Weed dry weight
- Weed control efficiency

All AICCIP centers except Kanpur Bhavanipatna with Non *Bt*

Agronomy IV : Improving use efficiency of inputs (water and nutrient)

Drip irrigation in *Bt* cotton

Objectives:	To find out the suitable drip irrigation regimes To find out optimum Nitrogen dose for cotton. To study the interaction effect between irrigation and Nitrogen.

Treatments:
Main plot -irrigation regimes

I_1 = 0.6 ET

I_2 = 0.8 ET

I_3 = 1.0 ET

Sub Plot: Nitrogen level

F_1= RDN &K

F_2= 75 % RDN &K

F_3= 50 % RDN &K

Control: Surface method with RDN &K

Observation:

- Yield and yield attributing characters
- Consumptive use
- Water use efficiency
- Nitrogen use efficiency
- N content and uptake
- Economics

Crop and Variety: *Bt*.Cotton
Design : SPD
Replication : Three
Fertilizer : As per recommendation
Centers : Junagarh, Banswara, Rahuri, Dharwad, Lam and Indore

Moisture conservation techniques of ET based Drip Irrigation in *Bt* Cotton

T_1 : Control
T_2: Polymulching
T_3: 0.4 ETc drip
T_4 : 0.4 ETc drip + poly mulch
T_5: 0.6 ETc drip
T_6 : 0.6 ETc drip + poly mulch
T_7 : 0.8 ETc drip
T_8 : 0.8 ETc drip + poly mulch

Design: RBD
Replication : 3 (Three)
Note: 30 micron thickness with silver colour top layer

Observations:

- Yield and yield attributing characters
- Consumptive use
- Water use efficiency
- Economics

Centers: Junagarh, Banswara, Lam, Akola, and Indore

Agronomy V: Technology for organic cotton (*Arboreum*/ *herbaceum* varieties) Production

T_1: 5 t/ha FYM /Compost + seed treatment with Azotobactor + PSB @25 g each /kg seed

T_2: 2.5 t/ha Vermicompost+ seed treatment with Azotobactor + PSB @25 g each /kg seed

T_3: 10t/ha FYM /Compost + seed treatment with Azotobactor + PSB @25 g each /kg seed

T_4: 5 t/ha Vermicompost+ seed treatment with Azotobactor + PSB @25 g each /kg seed

T_5: Insitu Green manuring of sesbania/sunhemp+ seed treatment with Azotobactor + PSB @25 g each /kg seed

T_6: Castor Cake @ 500 Kg/ha+ seed treatment with Azotobactor + PSB @25 g each /kg seed

T_7: RD of Nutrient through organic based on P equivalent basis+ green manuring with sesbania/sunhemp 50kg seed /ha and it should be incorporated at 30 -45 DAS.

T_8: Control

Note: This project is to be conducted on the fixed site and during 1st year start with treatment no.7 only. Initial Soil Analysis of the field is essential. Plant protection by organic pesticides.

Centers: Kanpur**,** Central and South Zone centers

New Experiment

Proposed new experiment: Exploiting the potential of sub soiling in *Bt* cotton cultivation

Objectives: To find out the suitable sub soiling treatment for better cotton productivity

Treatments: 6

T_1 :Control/No sub soiling
T_2: Sub soiling at 1.0 m distance
T_3: Sub soiling at 1.5 m distance
T_4 : Cross sub soiling at 1.0m x1.0 m distance
T_5: Cross sub soiling at 1.5m x1.5 m distance
Design: RBD **Replications: 4**
Observations:
1. Yield and yield attributing characters
2. Effect on soil properties
a) Bulk density (g/m^3) at 0-15 cm and at 15-30 cm
b) Infiltration rate (mm/hour)
c) Initial and final soil status
3. Compaction depth measurements with sensors (If available)
4. Economics
5. Root length and root length density at 90-110 DAS
Centers: Faridkot, Bathinda, Kanpur and Surat

Cotton Physiology and Biochemistry

1: Screening of Cotton genotypes for abiotic stress tolerance
1a: Screening genotypes for water stress tolerance
Centres: Surat, Akola, Khandwa, Nanded, Lam, Dharwad and Hisar
Genotypes=18+NC (LRA 5166) +LC.
Action: Data supply through monthly report -Centres
Seed requirement: 100gX8 = 800g (delinted seeds)
Observations:

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

1b: Screening genotypes for salinity stress tolerance
Centres: Lam and Dharwad (Pot/Microplot experiment)
Genotypes: 8 + 1
Action: Data supply through monthly report-Centres
Seed requirement: 150x2 =300g (delinted seeds)

Observations:

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

Action: Data supply through monthly report-Centres

2. Effect of defoliants on cotton

Treatments:

Thidiazuron + Diuron

Main treatments: Three genotypes

- F-1861
- MRC 7361/ MRC 7017

Sub: Three doses of Thiadiuron (36%SC+ Diuron 18% SC)

- Control
- 200 ml/ha
- 225 ml/ha
- Ethrel 2000 ppm

Sub sub: Time of application

- 140-145DAS
- 150-155DAS

Experimental design: Split- Split plot

Replication: 3

Observations:

- Opened and unopened bolls at harvest
- Percent defoliation at 5 and 10 days after spray (50 leaves in five plants, each will be marked before spray and monitored)

Earliness index

Centres: CICR Sirsa and Akola

Action: Data supply through monthly report-Centre

3. Preparing for Climate Change :Effect of environment on crop phenology development, yield and fiber development

Treatments:

Main Plots: Date of Sowing
Early Sowing (3 weeks)
Normal Sowing
Late sowing (3 weeks)

Sub Plots: Genotypes: 5 popular *Bt* hybrids of the zone

Observations:

- Crop Phenology with GDD and heat units
- Flowering pattern
- Biomass and its partitioning at 50,80,110 and 140 DAS
- Diseases and pest situations
- All yield and yield components
- Biochemical Observation (Dharwad and Surat)
- Fiber development starting at 7 Days After Pollination till 21 days and 10 days interval till boll open

Replication: Three
Centers: Lam, Dharwad, Surat and Nanded

4: 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: Br02a for irrigated Centre (Surat, Hissar) ;
Br02b for rainfed Centre: Dharwad

5: Manipulation of source sink relationship through growth regulators for enhancing productivity in cotton

Objectives: To study the effect of ethylene and maleic hydrazide on source sink relationship in cotton

Main treatments: 2 cotton entries (one *Bt* entry and the other is non *Bt* entry)

Sub Treatments: 9

T_1 : Control

T_2 : Ethrel @8.5µmoles (45 ppm) at square initiation(40 DAS)

T_3 : MH@500 ppm at 80DAS

T_4 : Ethrel @8.5µ moles at square initiation followed by MH@500 ppm at 80DAS

T_5 : Ethrel @8.5µ moles at square initiation followed by MH@500 ppm at 95DAS

T_6 : Ethrel @8.5µ moles at square initiation followed by MH@750 ppm at 80DAS

T_7 : Ethrel @8.5µ moles at square initiation followed by MH@750 ppm at 95DAS

T_8 : Ethrel @8.5µ moles at square initiation followed by MH@1000 ppm at 80DAS

T_9 : Ethrel @8.5µ moles at square initiation followed by MH@1000 ppm at 95DAS

Experimental Design: FRBD

Replications : 3
Genotype: Popular *Bt* Hybrid of the zone with the recommended POP
Duration :2 years
Year of start : 2013-14

Observations :

- Plant height at 30 days interval from square initiation
- TDM at 30 days interval
- No. Of sympodia at 100 DAS and at Harvest
- LAI at 100DAS
- Yield and yield components
- Fibre quality parameters

Centres : Surat, Khandwa, Lam, Dharwad, Faridkot Nanded and Sriganganagar

6: Testing of swell (CPPU) Forchlorfenuron bio-efficacy on cotton Crop

(Paid trial)

Objective: To study the performance of swell(CPPU) increase in yield and better quality of cotton crop

Design: RBD

Replication: 3 (Three)

Genotypes: Popular Bt Hybrid of the zone with the recommended POP

Treatments:

T_1: Swell 0.1% (1ml) at flowering
T_2: Swell 0.1% (2ml) at flowering
T_3: Swell 0.1% (3ml) at flowering
T_4:Swell 0.1% (1ml) at flowering and boll development stage
T_5: Swell 0.1% (2ml) at flowering and boll development stage
T_6: Swell 0.1% (3ml) at flowering and boll development stage
T_7: Planofix @10 ppm at flowering stage
T_8: Planofix @10 ppm at flowering and boll development stage
T_9: Control

Centres: Lam, Dharwad, Rahuri, Surat, Nanded, Akola Faridkot and Sriganganagar

Information to M/S Omega Fine Chemicals W-231/D MIDC, Phase- II, Opp Sonapada Temple Stand, Dombivali(East) Dist Thane – 421 204 with a request to supply the chemical to all the physiologists of Lam, Dharwad, Rahuri, Surat, Nanded, Akola Faridkot and Sriganganagar.

7. Evaluation of Godrej Double for Bio-efficacy on Bt cotton (Paid trial)

Objective: To evaluate Godrej Double (Homobrassinolide 0.04% EC) a plant growth regulator for bio-efficacy, phyto-toxicity in Cotton and to study its residual effect on succeeding crops.

Product: Double developed by Godrej (Technical details enclosed)

Treatments:

T1: Control
T2: Double @ 75 ml per acre
T3: Double @ 100 ml per acre
T4: Double @ 125 ml per acre
T5: Planofix @10 ppm
T6: Nutrient consortia (CICR,Coimbatore)
T7*: Double @ 200 ml per acre

Time of Application

1. 1st Spray 35 – 40 days after sowing
2. 2nd Spray 15 days after 1st spray.

Water Volume: 200 litres per acre
Replications: 4 (Four)
Design: RBD

Observations to be recorded:

• No. of bolls per plant
• Average boll weight
• Seed weight per boll
• 100 seed weight
• Lint weight per boll
• Seed: Lint ratio
• Seed cotton yield/hectare
• Economics of these treatments

B. Sample for residue estimation from Treatments T1, T3 and T7 will be sent to IIBAT,

Chennai (TN) at the time of picking and logistics support will be provided by the organization.

C. Phyto-toxicity

Visual observation on vein cleaning, epinasty, hyponasty, wilting, leaf yellowing, leaf tip burning, leaf injury etc. if any to be recorded at 0, 1, 3, 5, 10 and 15 days after application. It will be recorded on 0 – 10 scale.

*** Treatment T7 will not be reported in the bio-efficacy, it is only for phyto-**

toxicity.

D. Quality parameters
Note: Seed cotton samples will be provided to the company for quality analysis

F. Effect on succeeding crops;
In each plot 3 different crop species (normally grown after cotton) are to be sown and evaluated for the following parameters:

a) Per cent germination and plant population after completion of plant emergence
b) Phyto-toxicity Rating (0-10 scale, 0 = no phytotoxicity, 10 = 100 % damage) 15 and 30 days after planting
c) Crop Growth parameters such as number of branches and plant height
d) Final Yield and Yield Components
e) Meteorological data (Sowing till harvest)

Centres: Sriganganagar, Hisar, Lam, Dharwad, and Nanded

SCHEDULE OF OBSERVATIONS TO BE TAKEN UP

- Soil type (Depth of soil/soil texture)
- Irrigated/rainfed condition)
- Soil fertility status (initial)
- Periodic determination of soil moisture profile (0-15, 15-30, 30-60 cm) up to harvest in drip irrigation experiment
- Nutrient uptake at 50 % boll bursting stage
- Water productivity (based on yield & consumptive use of water)
- Nutrient/Fertilizer use efficiency (based on total uptake and yield)
- Seed cotton yield, boll no., boll weight, plant population /ha, seed yield.
- Fiber quality
- Economics analysis

SUBMISSION OF DATA ON THE TRIALS

Zone Date of submission of report
North 25th January
Central 15th February
South 25th February

The following personnel of various coordinating centers participated in the deliberations and finalization of technical programme in the coming season (2014-15).

S.No.	Name, Designation and Centre	Mobile No.
1.	Dr. P.L. Nehra, P.I., Agronomy, Sriganganagar	09413714828
2.	Dr Kulvir Singh Agronomist Regional Station Faridkot	09417783052
3.	Dr. M.V. Venugopalan, Pr. Scientist, CICR, Nagpur	09970361057
4.	DR. C.K. Patel, Assoc. Res. Sci., AICCIP, Surat	09998983591
5.	Dr V.Kumar Sr.Physiologist NAU, Surat	09825782666
6.	Dr. Y.R. Aladakatti, Sr. Sci. (Agro.), ARS, Dharwad	09448861040
7.	Dr. H.M. Vamadevaiah, Pri. Scientist (Biochemist) ARS, UAS, Dharwad	09449792098
8.	Dr. B.S. Nayak, Asstt. Agron., AICCIP, Bhawaipatra	09437321675
9.	Dr Ajaya Kumar M.Y UAS Raichur	09880398690
10.	Prof. Arvind D. Pandagale, Asstt. Agronomist, CRS, Nanded	07588581713
11.	Dr Subodh Bishnoi, Physiologist, Sriganganagar	08058626129
12.	Dr. Shiwani Mandhania, Asstt. Biochemist, HAU, Hissar	09466812467
13.	Dr. M.S. Bhattoo, Sr. Agron., CRS, HAU, Sirssa	09416193867
14.	Dr V.K Vekariya, Asst. Biochemist MCRS NAU, Surat	09712913345
15.	V.L.Kikani, ARS, CRS, JAU	09898590750
16.	Dr D.G.Dalvi , Asst. Physiologist, CRS Nanded	07588082160
17.	Dr. K. Rajendran, Prof., TNAU, Coimbatore	09865560307
18.	Dr. R. Veeraputhiram, Asst. Prof. (Agron.), CRS,TNAU,	09003520822
19.	Dr. B.C. Patil, Pri. Scientist (Phy.), ARS, UAS, Dharwad	09448680287
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21.	Dr. S. Bharathi, Sr. Scientist (Agro) RARS, Lam, ANGRAU	09490723412
22.	Dr S.P.Shevde MD Omega fine	09821055290
23.	Dr. R.S. Sarlach, Botanist, PAU, Ludhiana	09465866535
24.	Dr. Sudeep Malik, Agronomist, PAU, RS, Bathinda	09417732999
25.	Ms Shelly Nayyar, Asst Agronomist, Regional Station Bathinda	09464879346
26.	Dr. Jagdish Kumar, CSA, University Kanpur	09450131189
27.	Dr S.K.Kamble, Cotton Agronomist, MPKV, Rahuri	09423578493

Recommendation

- Plant Geometry of 67.5×75 cm. with100% RDF has been found to be optimum for *Bt* cotton hybrid RCH 650 at Bathinda and Faridkot.
- Chemical defoliation with single spray of Ethrel @ 5.0 ml/litre of water has been recommended at 70% boll opening stage at PAU, Ludhiana and Faridkot.
- For high yield and management of leaf reddening in *Bt* cotton give two sprays of 1% of magnesium sulphate (1kg magnesium sulphate in 100 liter of water /acre) at 15 days interval during full bloom and boll development stage has been recommended at Bathinda, Faridkot and Ludhiana.
- Thiadizuron 36% SC + Diuron 18% SC @ 200 ml/ha at 70% boll opening has been recommended for getting higher seed cotton yield in Punjab.
- *Bt* cotton hybrid Ajeet 155 is recommended in medium deep black soil at 90cm x 45 cm spacing with 150% RDF (90: 45:45 NPK kg /ha) at Akola.
- Genotype GSHV-162 and H1454/12 were found to be tolerant as well high yielding under stress condition whereas genotype CSH - 111, ARBH-2004 and BGDS-802 were found promising for trait value at Surat.