

Proceeding of the All India Coordinated Research Project on Cotton-2018-19



North Zone Annual Group Meeting 2019

Venue: CCSHAU, Hisar

Dates: March 11, 2019



Organized by
Indian Council of Agricultural Research, New Delhi
&
Chaudhary Charan Singh Haryana Agricultural University,
HISAR



PROCEEDINGS OF THE AICRP ON COTTON – NORTH ZONE

The Annual Group Meeting for the North Zone was held on 11th March, 2019. The function started with the Inauguration of the Meet. The Respected Director of Research, CCSHAU, Hisar welcomed the Guests. He presented the cotton scenario in the state. This was followed by Lighting the Lamps.

Dr Prakash, Project Coordinator (Cotton Improvement) presented the programmes conducted during 2018-19 in the North zone centres. He also presented the salient findings during the period in Crop Improvement, Production and Protection. He also presented the report on Bt trials of both Varietal and Hybrid trials.

Dr V.N. Waghmare, Director, ICAR-CICR, Nagpur in his **Special Address** informed the house about the cotton situation across India. He informed that the north zone states of Punjab, Harayana and Rajasthan had a bumper crop with less incidence of Leaf curl virus and Whitefly. In Central and South Zone the cotton crop was exposed to terminal stress and the yields were effected drastically and the Production figure has been reduced to 340 lakh bales as against expected production of 380 lakh bales. He also highlighted the Extension activities coordinated by ICAR-CICR though its Regional stations and support of SAU's and State Government. He extended his appreciation to all the ACIRP Scientists associated in timely publishing of the Weekly Advisory for Cotton Farmers.

The Hon'ble Vice Chancellor, CCSHAU, Hisar in his **Presidential Address** congratulated the Cotton Scientists for overcoming the Whitefly menace and helping the farmers to reap good yield. He also informed the Scientists to think out of the box and come out with technologies which are practical and feasible. He informed that a Foreign Company had put up a proposal for extracting cellulose from Fibre and other source and from that synthesis uniform fibres suited for textile industry.

The Vote of Thanks was delivered by Dr Sangwan, Head Cotton Section, CCSHAU.

This was followed by **Review of results of AICRP trials during 2018-19**

Chairman	:	Dr V.N. Waghmare, Director, ICAR-CICR, Nagpur
Convener	:	Dr. A.H. Prakash, PC (Cotton Improvement)
Breeding Trials	:	Dr. S. Manickam, PI (Breeding)
Agronomy Trials	:	Dr. K. Sankaranarayanan, PI (Agronomy)
Entomology Trials	:	Dr. (Mrs) B. Dharajothi, PI (Entomology)
Pathology Trials	:	Dr. SK Sain, Senior Scientist (Plant Pathology), ICAR-CICR Regional Station, Sirsa
Fiber Quality Evaluation	:	Dr.Pradeep Kumar Mandhyan, PI (Quality Evaluation), CIRCOT, Mumbai

The Concurrent session was held after Lunch break.

This was followed by Plenary Session under the Chairmanship of Dr V.N.Waghmare, Director, ICAR-CICR, Nagpur and Co-Chaired by Dr Pankaj Rathore, Director, PAU, Faridkot. The technical programmes were thoroughly discussed and the technical programme for 2019-20 was formally approved for North zone.

The technical programmes are as follows

PROCEEDINGS OF THE BREEDING PANEL

Date: 11th March, 2019.

Chairman: Dr. V. N. Waghmare, Director, ICAR - CICR, Nagpur

Co-Chairman: Dr. Pankaj Rathore, Director, PAU, RRS, Faridkot

Convener: Dr. S. Manickam, Principal Investigator, AICCIP (Plant Breeding),

Last date for submission of seeds at CICR, Sirsa: 04/04/2019 before 4.00 PM

Issue of coded seeds: 06/04/2019 after 3.00 PM

The house was informed that the initial evaluation trial of both varieties and hybrids will be conducted at Zonal level for north zone, since the entries from Central and South zone were not performing well because of susceptibility to CLCuD and photoperiod which has been accepted by all the concerned. Further, the scientists unanimously felt that the trials on Naturally coloured cotton (both hirsutum and arboreum) as well as long linted arboreum are to be dropped in North zone locations, since the performance of entries in these trials were not promising. Accordingly, the trials were not formulated in north zone locations.

Private R & D – Please pay the testing fee (@ Rs. 60,000 + 10,800/- Service Tax per entry at national level; Of this amount 7080/- may be deducted as TDS and remaining **Rs. 63,720/-** may be paid) through NEFT State Bank of India Current A/c no. 10663183268, IFSC code no. SBIN0002274 in favour of the Project Coordinator (Cotton Improvement), Coimbatore. No entry shall be entertained without the submission of testing fee and R & D recognition by DST. The companies which have not updated the R & D recognition shall update and submit a copy at the time of submitting the seed without which the entry shall not be included in the trial.

GENERAL POINTS TO BE NOTED

- ❖ The seed sponsored for breeding trials should be acid delinted and without any seed treatment and seed quantity to be packed individually as indicated in the concerned trials. Fuzzy seeds and seeds treated with any coloured chemicals will be out rightly rejected during coding.
- ❖ **Each packet of seed must be securely packed and have name of the entry, trial name, quantity of seeds etc.**
- ❖ The senior scientists of the concerned state are requested to send the local check varieties / hybrids of those trials being conducted in the state / zone (including private R & D trials) without fail. **All the check varieties / hybrids should be packed separately and legibly labeled**

mentioning the name of the trial. The check seeds should not be mixed with the entry seeds.

- ❖ The trials should be conducted strictly as per the technical programme **and no other entry should be included** in the trial (including the check varieties).
- ❖ All the trials should have at least one border row.
- ❖ All the data sheets should have Name of the agency conducting trial, location of the trial (and not the location of the company) and the name of the trial.
- ❖ All those who are conducting the breeding trials are requested to furnish both the mean data as well as the replicated data analyzed statistically. The mean data is to be submitted as per the template (model data sheet) given below as **Excel sheet and not as Word file**.

S. No.	Code#	SCY (kg/ha)	LY (kg/ha)	GOT (%)	Boll No	Boll Wt (g)	Upper Half Mean Length (mm)	Mic	BS (g/tex)	Seed Oil (%)
1	101									
2	102									
N	10n									
	CD@5%									
	CV %									

#Code numbers in ascending order; n=number of coded entries

- ❖ The data should be submitted separately in different Excel sheets for each trial, and the data of different trials are not to be combined in a single sheet.
- ❖ The incomplete and insufficient data will not be included in report preparation, and shall be reported to the higher officials for non compliance.
- ❖ The **lint samples pooled over replications should be prepared for all the entries from the first picked kapas**, cleaned neatly and labeled properly (mentioning the name of the agency conducting the trial, location of the trial, and AICRP code number in each packet of the lint sample) and sent to concerned CIRCOT centre (**North Zone Trials – CIRCOT unit at Sirsa**) for fibre quality evaluation in time (**on or before 30-12-2019**). Kindly send the lint samples with AICRP Breeding trial code only to CIRCOT, or else the sample will not be evaluated. **The centres should ensure door delivery of lint to above mentioned CIRCOT units.**
- ❖ **Kindly send the data on or before 30-12-2019 (for north zone locations).**
- ❖ All are requested to visit the website of CICR / AICCIP at www.cicr.org.in for any information, announcement etc. No communication in any respect will be sent individually.
- ❖ **All the breeders are requested to part 40g seed of varieties and 20 g of hybrids for Pathology / entomology observations and no separate packets will be given to pathologists / entomologists.**
- ❖ Seeds received in less quantity than the prescribed quantity will not be included in the trial.
- ❖ All the breeders of the varieties / hybrids recommended for agronomic trials are requested to submit the required quantity 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 for micro-spinning to CIRCOT, Mumbai.

Br. 02a – Initial Evaluation Trial of *G. hirsutum* (IRRIGATED)

Design: RBD; Rows: 2 (6 m length); Reps: 3; Seed Qty: 120 g X 6 +2

S. No	Name of Entry	Sponsor	Locations	LC (2 pkts)
1.	F 2685	PAU, Faridkot	SGNR	RS 2013
2.	F 2720	PAU, Faridkot	Hisar	H 1098i
3.	PBH 56	PAU, Bathinda	Faridkot	LH 2108
4.	PBH 86	PAU, Bathinda	Bathinda	LH 2108
5.	H 1520	CCS HAU, Hisar	Sirsa [CICR]	CSH 3129
6.	H 1528	CCS HAU, Hisar	Kanpur	CSH 3129
7.	HS 304	CCS HAU, Sirsa		
8.	CSH 1715	CICR, Sirsa		
9.	CSH 1725	CICR, Sirsa		
10.	RS 2915	ARS, Sriganaganagar		
11.	RS 2920	ARS, Sriganaganagar		
12.	ZC (F 2228)			
13.	Quality Check (CSH 3129)			
14.	LC			

Br. 06 a – Initial Evaluation Trial of Compact genotypes under irrigated condition

Design: R.B.D.

Reps: 3

Rows: 3

Row Length: 6.0 m

Spacing: **67.5 X 20 cm (NZ)**

Seed quantity: 300 g X 4 +1

S. No.	Genotype	Sponsor	Location	Local Check (2)
1.	F 2757	PAU, Faridkot	Faridkot	F 2383
2.	F 2560	PAU, Faridkot	Hisar	H 1098-I
3.	PBH 78	PAU, Bathinda	Sriganaganagar	RS 875
4.	H 1563	CCS HAU, Hisar	Bathinda	F 2383
5.	CSH 100	CICR, Sirsa		
6.	RS 2921	ARS, Sriganaganagar		
7.	RS 2928	ARS, Sriganaganagar		
8.	Local Check			
9.	ZC (CSH 3075)			

Br. 22 a/b Initial Evaluation Trial -*G. arboreum*

Design: RBD; Rows: 2 (6 m length); Reps: 3; Seed Qty: 120 g X 6 + 2

S. No	Entry	Sponsored by	Locations	LC (2)
1.	FDK 298	PAU, Faridkot	SGNR	RG 542
2.	FDK 304	PAU, Faridkot	Faridkot	LD 949
3.	PBD 88	PAU, Bathinda	Bathinda	LD 949
4.	PBD 92	PAU, Bathinda	Hisar	HD 432
5.	HD 535	CCS HAU, Hisar	Sirsa (C)	CISA 310
6.	HD 544	CCS HAU, Hisar	Kanpur	RG 8
7.	CISA 17	CICR, Sirsa		
8.	CISA 41-1	CICR, Sirsa		
9.	RG 868	ARS, Sriganaganagar		
10.	RG 870	ARS, Sriganaganagar		
11.	ZC (FDK 124)			
12.	LC			

Br. 25 a/b Preliminary Hybrid Trial - Desi Hybrid

Design: RBD; Rows: 2 (6 m length); Reps: 3; Seed Qty: 100 g X 5

S. No	Name of Entry	Sponsor	Locations	LC
1.	AAH 42	CCS HAU, Hisar	Sriganaganagar	RAJ DH. 9
2.	KR 144	Shakti Vardhak	Bhatinda	FMDH 9
3.	KR 147	Shakti Vardhak	Hisar	AAH 1
4.	KR 155	Shakti Vardhak	Arya Nagar (Shakti Vardhak)	AAH 1
5.	CISAA 18-3	CICR, Sirsa	Sirsa (C)	CICR-2
6.	CISAA 18-4	CICR, Sirsa		
7.	AJAH 103	Ajeet Seeds		
8.	LC			
9.	ZC (KR 64-NZ)			

ZONAL TRIAL

Br-04 a – Coordinated Variety trial of *G. hirsutum*

Design: RBD; Reps: 4; Rows: 8 (6 m length); Seed qty: 500 g X 6

Entries promoted	Location	Local Check
PBH 116	Sriganganagar	RS 2013
F 2662	Faridkot	LH 2108
F 2596	Bathinda	LH 2108
ZC (F 2228)	Hisar	H 1236
Quality Check (CSH 3129)	Sirsa – HAU	H 1236
LC	Abohar	LH 2108

Br-06a - Coordinated Variety trial of compact *G. hirsutum*

Design: RBD; Reps: 3; Rows: 8 (6 m length); Seed qty: 700 g X 5
Spacing: 67.5 X 20 cm (NZ)

Entries promoted	Entries retained	Location	Local Check
RS 2913	PBH 115	Sriganganagar	RS 875
PBH 174		Faridkot	F 2383
RS 2914		Hisar	H 1098-i
H 1530	Zonal Check (CSH 3075)	Bathinda	F 2383
CSH 3158	Local Check	Sirsa (CICR)	H 1098-i

(Data to be recorded – same as per National Trial)

Br-24 a - Coordinated Variety trial of *G. arboreum*

Design: RBD; Reps: 4; Rows: 4 (6 m length); Seed qty: 250 g X 5

Entries promoted	Entries retained	Location	Local Check
PBD 36	PBD 22	Sriganganagar	RG 8
PBD 35	FDK 281	Hisar	HD 432
CISA 10	FDK 124 (ZC)	Faridkot	LD 949
	Local Check	Bathinda	LD 949
		Sirsa (CICR)	CISA 310

Br-25 a Coordinated Desi Hybrid trial

Design: RBD; Reps: 4; Rows: 4 (6 m length); Seed qty: 250 g X 7

Entries promoted	Location	Local Check
KR 136	Sriganganagar	RAJ DH 9
KR 133	Hisar	AAH 1
CISAA 18-1	Faridkot	FMDH 9
KR 139	Bhatinda	FMDH 9
Zonal Check (KR 64)	Sirsa (CICR)	CISAA 2
Local Check	Sriganganagar (Mahyco)	RAJDH 9
	Aryanagar (Shaktivardhak)	CISAA 2

ENTRIES PROPOSED FOR AGRONOMY TRIAL

Zone	Species	Variety / Hybrid	Irrigated / Rainfed	Entries
North Zone	<i>G. hirsutum</i>	Compact variety	Irrigated	RS 2818, RS 2827

All the breeders of the above varieties are requested to submit 1.0 kg (variety) of **seeds directly to the concerned agronomists** 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 **6 kg of lint samples for full scale spinning directly to Director, CIRCOT, Mumbai (Door Delivery only)**. 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.

TECHNICAL PROGRAMME OF ICAR-Bt COTTON TRIALS: 2019-20

Chairman: Dr. V. N. Waghmare, Director, ICAR - CICR, Nagpur

Co-Chairman: Dr. Pankaj Rathore, Director, PAU, RRS, Faridkot

Convener: Dr. S. Manickam, Principal Investigator, AICCIP (Plant Breeding),

Last date for submission of seeds at CICR, Sirsa: 04/04/2019 before 4.00 PM

Issue of coded seeds: 06/04/2019 after 3.00 PM

Private R & D – Please pay the prescribed testing fee (as detailed below) through online in State Bank of India Current A/c no. 10663183268, IFSC code no. SBIN0002274 in favour of the Project Coordinator (Cotton Improvement), Coimbatore. No entry shall be entertained without the submission of testing fee and hard copy of all the documents as per the ICAR Test Guidelines (available in official website).

S. No.	Particulars	Total per entry for all the 5 locations
1	Testing fee	Rs. 5,00,000
2	GST @ 18%	Rs. 90,000
3	Total	Rs. 5,90,000
4	TDS @ 10% (-)	Rs. 59,000
5	Total amount payable	Rs. 5,31,000

GENERAL POINTS TO BE NOTED

- ❖ The seeds sponsored for the trials should be acid delinted without any seed treatment and 200 g seeds to be packed individually and **each packet of seed must be labelled with the name of the sponsoring company, name of the entry, trial name, etc.**
- ❖ No seeds shall be accepted after the due date as mentioned above for coding.
- ❖ The list of entry as per the trial given below is final, and no addition / modification will be entertained.
- ❖ M/s. Rasi Seeds and M/s. Seed works are requested to send requisite seeds of check hybrids as indicated in each trial.

NORTH ZONE TRIAL

Initial Evaluation Trial of Intra-Hirsutum Hybrids (New Entries)

S. No.	Entries	Sponsored by	Location
1.	ACH 911-2 BG II	Ajeet Seeds	Sriganganagar
2.	ACH 999-2 BG II	Ajeet Seeds	Faridkot
3.	ARCH 1901 BG II	Ankur Seeds	Bathinda
4.	ARCH 1902 BG II	Ankur Seeds	Hisar
5.	SP 7678 BG II	Bayer Biosciences	CICR, Sirsa
6.	Tejas BG II	Crystal	
7.	Josh BG II	Crystal	
8.	KCH 9323 BG II	Kaveri Seeds	
9.	KCH 9333 BG II	Kaveri Seeds	
10.	C 9314 BG II	Mahyco	
11.	MC 5414 BG II	Metahelix	
12.	NBC 1911 BG II	Nath Biogenes	
13.	NBC 1912 BG II	Nath Biogenes	
14.	G COT HY 8 BG II	NAU, Surat	
15.	RCH 959 BG II	Rasi Seeds	
16.	RCH 960 BG II	Rasi Seeds	
17.	US 701 BG II	Seed Works	
18.	US 702 BG II	Seed Works	
19.	Solar 109 BG II	Solar Agro Tech	
20.	C 356 BG II	Sungro	
21.	Zonal BGII Check – 1	RCH 773 BG II	
22.	Zonal BGII Check – 2	US 51 BG II	

Advanced Evaluation Trial of Intra-Hirsutum Hybrids (Promoted Entries)

S. No.	Entries	Sponsored by	Location
1.	ACH 945-2 BGII	Ajeet Seeds	Sriganganagar
2.	ACH 955-2 BGII	Ajeet Seeds	Faridkot
3.	ARCH 1808 BGII	Ankur Seeds	Bathinda
4.	ARCH 1805 BGII	Ankur Seeds	Hisar
5.	SP7674 BGII	Bayer Biosciences	CICR, Sirsa
6.	Bio 6515 BGII	Bioseed	
7.	Bio 6468 BGII	Bioseed	
8.	CCH 666 BGII	Crystal Crop Protection Ltd	
9.	CCH 333 BGII	Crystal Crop Protection Ltd	
10.	JKCH 15409 BGII	JK Agri Genetics	
11.	KCH 307 BGII	Kaveri Seed Company Ltd.	
12.	C 9312 BGII	Mahyco	
13.	C 9313 BGII	Mahyco	
14.	MC5408 BGII	Metahelix Life Sciences Ltd	
15.	MC5403 BGII	Metahelix Life Sciences Ltd	
16.	NCS 3444 Bt2	Nuziveedu Seeds Pvt. Ltd.	
17.	NCS 3494 Bt2	Nuziveedu Seeds Pvt. Ltd.	
18.	RCH 951 BGII	Rasi Seeds	
19.	RCH 938 BGII	Rasi Seeds	
20.	SWCH 7716 BGII	Seed Works	
21.	C 352 BGII	Sungro Seeds Pvt. Ltd.	
22.	C 354 BGII	Sungro Seeds Pvt. Ltd.	
23.	Zonal BGII Check – 1	RCH 773 BG II	
24.	Zonal BGII Check – 2	US 51 BG II	

Initial Evaluation Trial of Bt Cotton Varieties (New Entries)

S. No.	Entries	Sponsored by	Location	Local Check
1.	CICR Bt 19-35	CICR, Nagpur	Sriganganagar	RS 2013
2.	CICR 902 Bt	CICR, Nagpur	Faridkot	LH 2108
3.	CICR 86 Bt	CICR, Nagpur	Bathinda	LH 2108
4.	CICRS 25 Bt	CICR, Sirsa	Sirsa (CICR)	CSH 3129
5.	CICRS 26 Bt	CICR, Sirsa	Hisar	H 1098i
6.	PBH Bt 21	PAU, Bathinda		
7.	F 2228 (Non-Bt ZC)			
8.	PAU Bt 1 (Bt ZC)			
9.	Local Check Non-Bt			

Initial Evaluation Trial of Bt Cotton Varieties (Promoted Entries)

Trial to be conducted in two spacing with 4 rows each

1. Normal recommended spacing for varieties
2. Closer spacing (67.5 cm x 20 cm)

S. No.	Entries	Sponsored by	Location	Local Check
1.	CICR 17 Bt	CICR, Nagpur	Sriganganagar	RS 2013
2.	CICRS Bt 23	CICR, Sirsa	Faridkot	LH 2108
3.	CICRS Bt 28	CICR, Sirsa	Bathinda	LH 2108
4.	CICRS Bt 27	CICR, Sirsa	Sirsa (CICR)	CSH 3129
5.	PBH Bt 11	PAU, Bathinda	Hisar	H 1098i
6.	F 2228 (Non-Bt ZC)			
7.	PAU Bt 1 (ZC)			
8.	Local Check Non-Bt			

Vote of thanks was proposed by Dr A.H. Prakash, Project Coordinator (Cotton Improvement)

PROCEEDINGS OF THE CROP PRODUCTION PANEL

AGRONOMY PANEL

- Chairman : Dr. Samunder Singh, HOD (Agronomy), CCS HAU, Hisar
- Convener : Dr. K. Sankaranarayanan, PI (Agronomy)
- Rapporteurs : Dr. Amarpreet Singh, Scientist, CICR, Sirsa
Dr. Karmal Singh, Asst Agronomist, CCS HAU, Hisar

The Agronomy Panel Meeting of AICRP on Cotton was held at CCCHAU, Hisar on 11/03/2019. The agenda of the meeting is to discuss the results of 2018-19 in detail and also finalization of the technical programme of Agronomy, Physiology and Biochemistry trials to be conducted during 2019-20.

The research experiments were formulated based on the following thematic areas:

AGRONOMY

- Evaluation of compact culture under HDPS with different nutrient levels
- Enhancing Nitrogen use efficiency in Bt cotton
- Technology for Organic Cotton Production
- Input use pattern & cost of cultivation
- Strategies to mitigate/minimize soil crust formation in cotton in North zone

PHYSIOLOGY and BIOCHEMISTRY

- Canopy management in HDPS cotton
- Stress management through use of different Osmo-protectants
- Screening of Cotton genotypes for abiotic stress tolerance and estimation of seed oil gossypol and protein
- Effect of PGRs on insect resistance in cotton

The following Experiments were undertaken during *Kharif*-2018 at North Zone centers of AICRP on Cotton.

AGRONOMY

Agronomy 1B	Evaluation of compact culture under HDPS with different nutrient levels
Agronomy IIIB	Enhancing Nitrogen use efficiency in Bt cotton
Agronomy IV	Technology for Organic Cotton Production
Agronomy VII	Input use pattern & cost of cultivation
Agronomy VIII	Strategies to mitigate/minimize soil crust formation in cotton in North zone

PHYSIOLOGY and BIOCHEMISTRY

PHY1	Canopy management in HDPS cotton
PHY 3	Stress management through use of different Osmo-protectants
BIO CHEM1	Screening of Cotton genotypes for abiotic stress tolerance and estimation of seed oil
BIO CHEM1A	Screening of Cotton genotypes for drought tolerance and estimation of seed oil for gossypol and protein
BIO CHEM1B	Screening of Cotton genotypes for salinity stress tolerance and estimation of seed oil for gossypol and protein
BIO CHEM.2	Effect of PGRs on insect resistance in cotton

The trials conducted centrewise were as follows:

North zone	Faridkot, Bathinda, Hisar and Sriganaganagar
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The project-wise findings and salient highlights of the research pertaining to North zones are summarized below.

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

Agronomy 1B: Evaluation of compact culture under HDPS with different nutrient levels

	North zone	
Environment	Irrigated	Irrigated
Locations	Faridkot	Hisar
Entries	RS 2818	RS 2827
Spacing (cm)	67.5 x 10cm, 67.5X15 cm, 67.5X20 cm & 67.5x60cm	67.5 x 10cm, 67.5X15 cm, 67.5X20 cm & 67.5X60 cm
Fertilizer levels (RDF)	State Recommendation; 125% and 150%	State Recommendation; 125% and 150%
Design	Split plot/FRBD	Split plot/FRBD

Please Note: Conventional spacing (Fourth spacing) of respective region will be included for evaluation to assess the architectural changes (LAI, Plant height, No of monopodia and its length, No of sympodia and its length) due to spacing should be mentioned in the results.

All the breeders of the above varieties are requested to submit 2.0 kg for variety HDPS and 1.0 kg for hybrids HDPS of seeds **directly to the concerned Agronomists (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 6 kg lint samples directly for micro-spinning to Director, CIRCOT, Mumbai (**Door Delivery only and not by Railway Parcel**). Further, agronomists are requested to send the agronomic trials data (interaction tables) to the concerned breeder in addition to the Principal Investigator (Agronomy) in time to facilitate the submit the release proposals before due date.

Action to be taken:

- These varieties/hybrids have been recommended by the Breeding panel after ascertaining their performance.
- Concerned Breeders shall send the required Seeds directly to the Agronomists of respective Centers without delay for taking up experiments.
- The center, where experiment is conducted, send lint samples for full scale spinning
- Entomology & Pathology data will be collected from the concerned Principal Investigator.

Observation to be recorded (Replication wise data to be reported)

- 1) Plant height (cm) at harvest
- 2) No. of monopodia at harvest
- 3) No. of sympodia at harvest
- 4) Sympodial length (cm)
- 5) No. of Bolls/squaremetre
- 6) Boll weight (g)
- 7) Final Plant population (no /net plot)
- 8) Seed cotton Yield (kg/ha)
- 9) Architectural changes due to spacing (LAI, Plant height, No of monopodia and its length, No of sympodia and its length at 120 DAS)

Statistical Analysis:

1. Standard Deviation
2. Critical Difference
3. Coefficient variation

Please Note: Data should be reported in interaction tables with above said parameters to find out optimum spacing and fertilizer level requirement of each entry and also to submit release proposal

Agronomy IIIB: Enhancing Nitrogen use efficiency in Bt cotton

Implementing Centres North Zone(Faridkot(I), Bathinda(I), Hisar(I)& Sriganaganar (I))

Treatments (Design: RBD); (Replications: 3) (FYM and P & K is 100% recommended dose to all treatments)

T1	N ₀ Control
T2	100 % of RDN(Band application in 2 splits at Basal & Flowering)
T3	75 % of RDN(Band application in 2 splits at Basal & Flowering)
T4	75 % of RDN +Placement (Spot application in 2 splits at Basal & Flowering)
T5	75 % of RDN + Placement (Spot application in 4 Split: Basal, Squaring, Flowering, Boll development)
T6	T5+Foliar application of 1 % urea (3 times: Squaring, Flowering, Boll development)
T7	T6+raising of Sunnhemp / fodder cowpea between rows incorporated before flowering

Method of imposing treatments

Treatments	Details	Dose of N	Method	Split	Foliar 1% urea	Sunnhemp/fodder cowpea
T1	No Control	-	-	-	-	-
T2	100 % of RDN(Band application in 2 splits at Basal & Flowering)	100%	Band	2	-	-
T3	75 % of RDN(Band application in 2 splits at Basal & Flowering)	75	Band	2	-	-
T4	75 % of RDN +Placement(Spot application in 2 splits at Basal & Flowering)	75	placement	2	-	-
T5	75 % of RDN + Placement (Spot application in 4 Split: Basal, Squaring, Flowering, Boll development)	75	placement	4	-	-
T6	T5+Foliar application of 1 % urea (3 times: Squaring, Flowering, Boll development)	75	placement	4	y	-
T7	T6+raising of Sunnhemp / fodder cowpea between rows incorporated before flowering	75	placement	4	y	y

Centres may add one or two treatments as per requirement in addition to T1 to T7.

Observation to be recorded (Replication wise data to be reported)

- 1) Plant height (cm) at harvest
- 2) No. of monopodia at harvest
- 3) No. of sympodia at harvest
- 4) No. of Bolls/squaremetre
- 5) Boll weight (g)
- 6) Final Plant population (no. /net plot)
- 7) Seed cotton Yield (kg/ha)
- 8) Rainfall data and other weather parameters
- 9) Pest and natural enemies

Statistical Analysis:

- 1) Standard Deviation; 2) Critical Difference; 3)Coefficient variation

Economics Parameters:

- 1) Cost of cultivation; 2) Gross return
- 3) Net return

Analysis: Nutrient availability at planting and harvest & uptake; N budget, N use efficiency
Pest observation will be taken by entomologist of AICRP

**Agronomy IV: Technology for Organic Cotton Production
Implementing Centres Sriganganagar**

Treatments (Design: RBD); (Replications: 3)

T ₁	Absolute control (No organic& inorganic)
T ₂	Control (RDN through inorganic)
T ₃	RD of Nutrient through organic based on P equivalent basis
T ₄	Seed treatment and soil application of recommended bio fertilisers and foliar application of PPFM
T ₅	Neem cake 250 kg/ha
T ₆	Raising of Sun hemp / fodder cowpea between rows incorporated before flowering
T ₇	Intercropping with green gram/black gram/ ground nut/soybean
T ₈	T ₄ +T ₅
T ₉	T ₄ +T ₆
T ₁₀	T ₄ +T ₅ +T ₆
T ₁₁	T ₄ + T ₅ + T ₇

Important Note:

1. Long Linted *arboreum* or *hirsutum* resistant to sucking pests should be selected.
2. This project is to be conducted on the fixed site and plant protection management should be done with organic pesticides.
3. PPFM culture will be supplied by TNAU, Coimbatore.
4. Observations to be taken by Entomologists & Pathologists of AICRP (Cotton).

Observation to be recorded (Replication wise data to be reported)

- | | |
|---------------------------------|---|
| 1) Plant height (cm) at harvest | 2) No. of monopodia at harvest |
| 3) No. of sympodia at harvest | 4) No. of Bolls/squaremetre |
| 5) Boll weight (g) | 6) Final Plant population (no. /net plot) |
| 7) Seed cotton Yield (kg/ha) | |

Statistical Analysis:	Economics Parameters:
1) Standard Deviation	1) Cost of cultivation
2) Critical Difference	2) Gross return
3) Coefficient variation	3) Net return
	4)Benefit Cost Ratio
	5)Cost of treatments &MBCR

Analysis: Nutrient availability at planting and harvest & uptake; Organic carbon content (before sowing and after harvest)

Agronomy VII: Input use pattern & cost of cultivation

Implementing centres

Sl.No	State		Species	Type
1	Punjab	Faridkot	Hirsutum	HxH
			Arboreum	Variety
2	Haryana	Hisar	Hirsutum	HxH
			Arboreum	Variety
3	Rajasthan	S.nagar	Hirsutum	HxH
			Arboreum	Variety

Methodology: Farm survey will be conducted with minimum of 30 samples for each case and the relevant questionnaire will be provided from PC & Head, Coimbatore. The survey concentrated on major environment of the domain

Agronomy VIII: Strategies to mitigate/minimize soil crust formation in cotton in North zone

Implementing Centres	Hisar, Faridkot, Bathinda, Sriganagar & Sirsa
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Treatments (Design: RBD); (Replications:3)

Treatments : 13

- T1 : Absolute control (without soil crust)
- T2 : Control (with soil crust)
- T3 : Super Absorbent Polymer @ 100 kg/ha⁻¹
- T4 : Gypsum @ 2.5 t/ha in seed rows
- T5 : Farm yard manure @ 3 t/ ha in seed rows
- T6 : Chopped crop residue/wheat bhusa 3 t/ha
- T7 : Spraying of phosphoric acid@ 100 l/ha in seed rows(Before making Soil crust)
- T8: Spraying of polyvinyl alcohol @0.5%(Before making Soil crust)
- T9 : Spraying of phosphoric acid@100 l/ha in seed rows(After making Soil crust)
- T10: Spraying of polyvinyl alcohol @0.5%(After making Soil crust)
- T11 : Running of peg/spike tooth weeder (two days after crust))
- T12: Water spraying 2-4 days by power sprayer
- T13:Gaund Kathira@12.5 Kg/ha
- T14:Gaund Kathira@25 Kg/ha

Methodology

- The treatments (T3, T4, T5, T6, T7, T8, T13 & T14) imposed after sowing before making soil crust. The treatments (T9, T10, T11, T12) to be imposed after formation of soil crust.

- Sowing will be taken by following weather forecast to create soil crust naturally/ water spray equivalent to 10-15 mm rainfall 3-4 DAS to simulate soil crust/Rainfall simulator- Simulated rainfall of 15 mm in 3 minutes after two days after sowing
- A narrow drench will be dug out around the each plot and plastic sheet is kept vertically to prevent lateral flow of water from one plot to another
- Buffer channel will be followed to avoid irrigation drift
- Using of Moveable shelter to prevent against the anticipated rainfall / simulation of soil crust in absolute control plot
- Seed rows after spraying with 0.5% PVA solution will be allowed for drying for 6 h before subjecting to the simulated soil crust
- Polyvinylalcohol (PVA: $[-CH_2CH(OH)-]_n$) as hydrophilic polymers is to be weighted in doses of 5 g, then dissolved in 1000 mL of pure water at 65°C in a sand oven
- Gaund Kathira mixed with DAP for application

Observation to be recorded (Replication wise data to be reported)

- | | |
|---|---|
| 1) Plant height (cm) at harvest | 2) No. of monopodia at harvest |
| 3) No. of sympodia at harvest | 4) No. of Bolls/square meter |
| 5) Boll weight (g) | 6) Final Plant population (no. /net plot) |
| 7) Seed cotton Yield (kg/ha) | 8) Germination per centage, shoot length and seedling vigor |
| 9) Quantity of water (mm/ha) used for simulation of soil crust, and treatment T12 and T13 | 10) Bulk density & porosity/penetrometer |
| 11) Soil moisture at germination, crust formation stage and after treatment | 12) Soil texture |

Statistical Analysis:

- 1) Standard Deviation
- 2) Critical Difference
- 3) Coefficient variation

Economics Parameters:

- 1) Cost of cultivation
- 2) Gross return
- 3) Net return

PHYSIOLOGY AND BIOCHEMISTRY PANEL

PHY1	Canopy management in HDPS cotton
PHY 3	Stress management through use of different Osmo-protectants
BIO CHEM1	Screening of Cotton genotypes for abiotic stress tolerance and estimation of seed oil
BIO CHEM1A	Screening of Cotton genotypes for drought tolerance and estimation of seed oil for gossypol and protein
BIO CHEM1B	Screening of Cotton genotypes for salinity stress tolerance and estimation of seed oil for gossypol and protein
BIO CHEM.2	Effect of PGRs on insect resistance in cotton

COTTON PHYSIOLOGY AND BIOCHEMISTRY

PHY I: Canopy management in HDPS cotton under high fertility condition

Implementing Centres Sriganganagar (North Zone);

Treatments (Design: FRBD); (Replications: 3)

N. Nutrient Dose	
N ₁	100 % RDF
N ₂	125 % RDF
N ₃	150 % RDF
Growth retardant application	
G ₁	Control
G ₂	Mepiquat chloride application 20 g a.i./ha. at 60 DAS
G ₃	Mepiquat chloride application 20 g a.i./ha. at 60 and 75 DAS

Genotype: Released compact genotype

Observation to be recorded (Replication wise data to be reported)

- | | |
|---|---|
| 1) Plant height (cm) at harvest | 2) No. of monopodia and its mean length at harvest |
| 3) No. of sympodia and its mean length at harvest | 4) Largest sympodial length (cm) |
| 5) No. of Bolls/squaremetre | 6) Boll weight (g) |
| 7) Final Plant population (no. /net plot) | 8)Seed cotton Yield (kg/ha) |
| 9)LAI | 10)Architectural changes due to spacing(LAI, Plant height, No of monopodia and its length, No of sympodia and its length) |

Statistical Analysis:

- 1) Standard Deviation; 2) Critical Difference; 3) Coefficient variation

PHY 3. Stress management through use of different Osmo-protectants

Implementing Centers	Faridkot (I), Bathinda(I), Hisar(I), Sriganaganagar(I), & Sirsa(I) (Agronomy)
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Design: Split Plot **Replications:** 3 **Treatments:** 24

Main plots:3

1. No water stress / Control/Recommended cultivation
2. No water after first irrigation
3. Limited water supply (just enough to keep crop plants alive)

Sub plots:8 (60-80 DAS for North Zone , 75% depletion of soil moisture- treatments imposed for rainfed trial of other Zones)

1. Control (water spray)
2. Foliar application of 2 % urea-4 sprays at weekly intervals
3. Foliar application of 2 % KNO₃- 4 sprays at weekly intervals
4. Foliar application of 500 ppm Thio urea –Single spray
5. Foliar application of Salicylic acid @50 ppm-Single spray
6. Foliar application of Glycine Betaine @100 ppm-Single spray
7. Foliar application of Salicylic acid @ @ 100 ppm-Single spray
8. Foliar application of PPFM@1 % -3 spray at 10 days interval

Methodology

- A narrow drench will be dug out around the each plot and plastic sheet is kept vertically to prevent lateral flow of water from one plot to another
- Buffer channel will be followed to avoid irrigation drift
- Quantity of irrigation water used(mm) and effective rainfall (mm) is to be provided

Observation to be recorded (Replication wise data to be reported)

- 1) Plant height (cm) at harvest; 2) No. of monopodia at harvest; 3) No. of sympodia at harvest
- 4) No. of Bolls/squaremetre; 5) Boll weight (g); 6) Final Plant population (no. /net plot)
- 7) Seed cotton Yield (kg/ha); 8) Man days/ha

Statistical Analysis:

- 1) Standard Deviation
- 2) Critical Difference
- 3) Coefficient variation

Economics Parameters:

- 1) Cost of cultivation
- 2) Gross return
- 3) Net return
- 4)Benefit Cost Ratio

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

Note: Subplot treatments only imposed under rainfed condition. TNAU, CBE will supply PPFM culture

Bio Chem1. Screening of Cotton genotypes for abiotic stress tolerance and estimation of for seed oil, gossypol and protein

Bio Chem1A. Screening of Cotton genotypes for drought tolerance and estimation of for seed oil, gossypol and protein

Bio Chem1B. Screening of Cotton genotypes for salinity stress tolerance and estimation of for seed oil, gossypol and protein

Implementing Centres Hisar (Bio chem 1A)

- **Genotypes: Pre-released cultures +Zonal Check +Local Check**
- **Action:** Data should be given in every monthly report – Centres.
- Seed requirement: 100g of each entry per centre.

Observations to be recorded:

- 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
- Oil estimation, gossypol and protein
- Monitoring of soil salinity at initial and final stages
- Leaf Na and K content at peak flowering stage
- Salinity studies soil EC should be more than >0.8 and water EC should be more than >8.0

Note: All the breeders are requested to provide 200 g of pre released genotypes of varieties/hybrids/local check/zonal check including compact cultures directly to Bio chemist of the respective zone with communication to PC & Head, and PI of agronomy and plant breeding

Bio Chem.2.EFFECT OF PGRs ON INSECT RESISTANCE IN COTTON

Implementing Centres Hisar

Technical Programme

Main Factor:Pest control

P₁ - Protected (Insecticide sprayed for sucking pest)

P₂ - Unprotected (insecticide-NOT sprayed)

Sub factors: Genotypes (2)

G₁ - Leafhopper-resistant

G₂ -Leafhopper-susceptible

Sub-sub factors: Foliar sprays

F₀. Control

F₁- NAA @ 20 ppm foliar spray at 60 DAS

F₂ – MC @ 50 ppm foliar spray at 90 DAS

F₃ – NAA @ 20 ppm foliar spray at 60 DAS followed by MC @ 50 ppm foliar spray at 90 DAS

Observation to be recorded (Replication wise data to be reported)

- | | |
|---------------------------------|---|
| 1) Plant height (cm) at harvest | 2) No. of monopodia at harvest |
| 3) No. of sympodia at harvest | 4) No. of Bolls/squaremetre |
| 5) Boll weight (g) | 6) Final Plant population (no. /net plot) |
| 7) Seed cotton Yield (kg/ha) | |

Statistical Analysis:

- 1) Standard Deviation
- 2) Critical Difference
- 3) Coefficient variation

Analysis

- Estimation of antioxidative (superoxide dismutase, catalase, and peroxidase) and oxidative stress parameters (H₂O₂ and lipid peroxidation) in the treated and untreated plant samples using standard protocols.
- Estimation of secondary metabolites (tannins, polyphenols and flavonoids) in the treated and untreated plant samples using standard protocols.
- Pest count by AICRP entomologist

Due Date for submission for Data (Zone wise)

North Zone Centres December 31, 2019

PROCEEDINGS OF THE ENTOMOLOGY PANEL

The technical session of Entomology was held in the seminar room of Department of Entomology, CCSHAU, Hissar on March 11, 2019. The session was Chaired by Dr NandiniGokte-Narkhedkar, HOD, Plant Protection, ICAR-CICR, Nagpur and Co-Chaired by Dr Yogesh Kumar, Professor & Head, Department of Entomology, CCS HAU, Hisar and Dr Y.P. Singh, Principal Scientist, ICAR, New Delhi. Dr. (Mrs) B. Dharajothi, PI (Entomology)performed the duties of convener. Dr Anil Kumar, Assistant Professor Entomology, CCSHAU, Hisar and Dr. Satnam Singh, Assistant Entomologist, PAU, RRS Faridkot were the rapporteurs of the session. Dr.B. Dharajothi appraised the house about the last year's findings and the technical programme of the current year 2019-20. There was detailed discussion on the experiment for determining the ETL of whitefly based on nymphal populations and the feedback was fruitful in the formulation of technical programme.Dr Joginder Singh from Rasi Seeds emphasized on stringent monitoring of the pink bollworm in North India. It was also suggested to keep a watch on the cotton ginneries to have a fore hand information about the infestation of pinkbollworm if any.Finally Dr B. Dhara jothi PI Entomology thanked the panel members and industry representatives for their critical and valuable suggestions for the finalization of technical programme.

TECHNICAL PROGRAMME DETAILS

Ent. 1a: Screening of breeding material for resistance to insect pests (National & Zonal Trials) (All North Zone Centres)

Check entries:

Sl. No.	Title of the Experiment	Participating Centers
Ent 1a	Screening of breeding material for resistance to insect pests (National and Zonal Trials)	All Centres
Ent 1b	Advanced screening of promising entries for development of repository for sucking pests	North Zone:Sriganganagar, Hisar, Faridkot,Sirsa and Bathinda
Ent 2	Population dynamics to develop suitable forecasting model	All Centres
Ent 3	Survey for key and emerging pests in cotton farmers' fields for weekly advisory	All Centres
Ent 4	Determination of nymphal based ETL estimation of yield losses for cotton for whitefly	North Zone
Ent5	Evaluationofnew Bt formulation against bollworm complex of cotton	North Zone
Ent 6	Validation of IPM module for PBW	Sri ganga Nagar

North Zone: RS2013 (resistant to jassid& whitefly); GA (susceptible) MRC 7017 BGII (bollworm resistant); MRC 7017 NBt (bollworm susceptible)

Action: Dr. Roop Singh Meena, Sri Ganganagar, to provide seeds of RS2013 and GA to all concerned.

- Note:**
1. Include check entries without seed treatment as that of coded entries
 2. Find out resistant/tolerant entries (reference to varieties)
 3. Shortlist resistant/tolerant entries-based on only grading as tolerant/susceptible.
 4. Collect seeds for advanced screening trial.

Besides the zonal trials, entomologists of all centres should observe the National Trials (Breeding/ Pathology) for healthy plants from point of sucking pests up to 70 DAS and at harvest and tag them, report them and collect seeds for further screening in the next year.

Ent. 1b: Advanced screening of promising entries for development of repository for sucking pests

Centres: All centers

Promising entries from the 2018-19 breeding trials and selected entries from the repository except (Ent 1C) during 2018-19 have to be screened in common trial and evaluate further. The large scale testing (3 rows) will be carried out in two replications along with the susceptible and resistant checks. In the Annual Report the genotypes to be mentioned in alphaphetical order for easy compilation.

Ent. 2: Population dynamics to develop suitable forecasting model ----(All centres)

Data should be taken for both sucking pests and bollworms from RS 2013, GanganagarAgeti, HS-6, BG and BG-II respectively for North India.

Sl.No	States	Genotypes for sucking pests	Genotypes Bollworm		Centres
			Non BG	BG-II hybrids	
1	Rajasthan	GanganagarAgeti, RS2013	HS6	Any popular Bt hybrid	Sri Ganganagar
2	Punjab	GanganagarAgeti, RS2013	HS6	RCH650BG-II	Faridkot, Bhatinda
3	Haryana	GanganagarAgeti, RS2013	HS6	RCH-650BG-II	Hisar

- **Experimental layout:** At least 3000-4000 sq. meter plots (as per availability) be sown for the studies on population dynamics. Divide the plot into 2 half each (both under protected and unprotected condition). In North Zone, division of area will be according to the varieties/hybrids sown. Keep one half untreated (for sucking pests) and apply required sprays of neonicotinoids (imidacloprid/ acetamiprid/ thiamethoxam/ clothianidin) in the other half as

per requirement to keep the population of leafhopper under control, along with Gaucho seed treatment so that the observations for the bollworm can be taken. Collect 150 bolls from each variety and hybrid at 120, 140 and 160 DAS and send the bolls to CICR, Sirsa (North), CICR, Nagpur (Central) for further recovery of bollworms, particularly the PBW.

- Monitor for the presence of dead pink bollworm larvae beginning 90 DAS to 150 DAS record the egg parasitism of PBW and percentage of parasitism and observe for the emergence of endoparasitoids at each centre.
- Observations to be recorded: Weekly observations for aphid, jassid, whitefly, thrips (3 leaves/plant), mealy bug, ABW, SBW, PBW and associated natural enemies after one month of sowing (Natural enemies to be recorded species wise).
- Any unusual survival and higher levels of infestation must be notified to Dr. B. DharaJothi immediately by mail or phone. The surviving bollworms (*Helicoverpaarmigera* and *Pectinophoragossypiella*) larvae both from Bt and conventional cotton will be brought to the laboratory. From North Zone the larvae shall be sent to Dr. Rishi, Sirsa, Central Zone to Dr.ChinnaBabu, Nagpur for carrying out resistance monitoring bioassays.
- Dr.Roop Singh Meena, Sriganaganagar will supply the seed of GanganagarAgeti and RS2013 to all the concerned centres. Dr.Anil, HAU, HISAR will arrange for the seed of HS-6.
- Monitoring of bollworms across the country, through Pherosensor-TM Sleeve-SP traps and lures uniformly sourced from concerned company (pheromonechemicals@gmail.com 9440897918 Mr Raghu NathKaja) source may be carried out during the season and off season and data may be recorded. Care must be taken to change lures at recommended frequency.
- Monitoring of insect fauna in protected and unprotected plots: Apart from the regular 6 plant scouting, yellow sticky traps from standard companies (uniform source across centres) may be installed at recommended rates in the protected and unprotected plots to monitor the insect fauna (pest and natural enemies both diversity and numbers) to understand seasonal dynamics. Care must be taken to replace installation of yellow sticky traps at recommended frequency during the season.
- Use of sleeve cages to study parasitoids of whitefly (Sirsa, Faridkot, Hisar, Nagpur and TNAU Coimbatore)
- Dr. M.Sabesh, CICR-RS, Coimbatore, Dr. Satnam Singh, Faridkot and Dr.Rishi Kumar will expedite the possibility of developing a forecasting / distribution model for whitefly from the available data.

Ent. 3: Survey for key and emerging pests in cotton in Farmers Field for weekly advisory ----
----- (All Centers)

All the centers are requested to collect weekly information on the incidence of the pest on farmers fields and inform through mail to the PI, Entomology for further publishing the information through weekly advisory. The centre Co-PI are requested to send the raw data also as per the population dynamics experiment proforma. Recommended insecticides for sucking pests are Flonicamid/ Dianoteferon, Diafenthurion based on ETL .

Experiment 4: Determination of nymphal based ETL estimation and yield losses for cotton whitefly *Bemisia tabaci*.

Cultivar: ABCH 2099-BG-II Hybrid

Locations: Bathinda, Faridkot, CICR Sirsa, HAU Hisar, ARS Sri Ganganagar

Replications: Three

- Regularly monitor (once a week) the whitefly nymphal and adult population. From 30 tagged plant select one leaf from 7 node leaf and observe the total number of red eyed nymphs on it. Whitefly will be recorded once a week beginning from 50 days old crop up to crop harvest
- Examine the nymphs closely, preferably with 8x magnification to determine if they are dead due to predators (i.e., shrunken, deflated, or ghost-like in appearance), parasites [i.e., golden, black, or possessing asymmetrical or insecticides (i.e., discolored or distorted in body-shape)].
- Do not include dead nymphs in the counts.
- An untreated control will ensure maximum whitefly incidence
- Apply the Insect growth regulators Lano 10EC (pyriproxyfen) @ 500 ml/acre when desired level of nymphal number /adult number /honey dew percent observed in a particular treatment.
- The total number of sprays given throughout the period in individual treatment will also be recorded.
- * Honeydew experiment is optional and may be conducted where you find the symptoms

Experiment 4: Determination of nymphal based ETL estimation and yield losses for cotton whitefly *Bemisia tabaci*.

S. No	Treatment	Observation	Additional Observation		
			Nymphs to be observed	Additional Observations	Required level
1	30 or more live red eyed nymph (select & tag 30 plants)	Nymphal counts from one (uniformly fixed) leaf of middle/lower strata of 30 tagged plants	5 th main stem internodes leaf of each 30 plant (randomly selected and tagged)	Observe three leaves from upper/middle/lower strata for total number of nymphal and adults counts only from 3 plants of each plot other than the selected 30 tagged plants	Observe/counts the number of ants/3 leaves in all treatments
2	60 or more livered eyed nymph (select & tag 30 plants)				
3	120 or more livered eyed nymph (select & tag 30 plants)				
4	180 or more livered eyed nymph (select & tag 30 plants)				
7*	Honey dew symptoms on 20 per cent of the plants	Count on plot basis			
8	Honey dew symptoms on 30 per cent of the plants				
9	Honey dew symptoms on 40 per cent of the plants				
10	Honey dew symptoms on 50 per cent of the plants				
11	6-8 adults//leaf(Treated control)				
12	Untreated control				

Experiment 5.Management of thrips through biorational approaches

	Treatments	Dosage/lit
1	Sesame oil	10ml
2	Pongamia oil	10 ml
3	Castor oil	10ml
4	Neem oil	5ml
5	Neem 300 ppm	5ml
6	Neem 1500ppm	5 ml
7	Horticultural Mineral oil	5ml
7	Spinosad 2.5EC	0.8ml
8	Profenophos 50 EC	3.3ml
9	Diafenthiuron 50EC	1.6ml
10	Control	

Cultivar: RCH773BG-II**Replications: Three****Locations:** Bathinda, Faridkot, Sirsa, Hisar, Sri Ganganagar**Methodology:** First spray after observing ETL of Thrips (10 nymphs of thrips /leaf), subsequent sprays at 15 days interval upto 80 days.**Experiment 5:** Evaluation of new Bt formulation against bollworm complex of cotton**Treatments – 5**

Sl.No	Treatments	Dosage/litre
1.	Bt-127 SC formulation	2.0 ml/l
2.	Bt-127 SC formulation	3.0 ml/l
3.	Bt-127 SC formulation	4.0 ml/l
4.	Chlorpyrifos 20 EC	@ 2.5ml lit (250 a.i/gm, 1250 ml/ha)
5.	Chlorantraniliprole 18.5 SC	0.6 ml/l, (30 ai (gm), 150 ml/ha)
6.	Lambda cyhalothrin 5% EC	2.0ml /l, (15-25 a.i(gm), 300-500ml/ha)
7.	Untreated check	

Cultivar: Non-Bt cultivar found susceptible to bollworms**Variety:** FDK124**Locations:** Bathinda, Faridkot, Sirsa, Hisar, Sri Ganganagar

Time and No. Spray: First spray after observation of 5-10% of fruting body damage followed by 2-3 sprays as per the infestation.

Replications -3

Observations:

- Larval population before and 3, 7 and 14 days after each spray
- Natural enemies before and 3, 7 and 14 days after each spray
- Phytotoxicity symptoms before and 15 and 30 days after spray
- Seed cotton yield

Experiment 6: Enhancing the efficacy of yellow sticky trap using essential oils against sucking pests of cotton

Treatments:

T1-Yellow StickyTrap + Basil oil

T2-YST + sandalwood oil

T3-YST+ cotton seed oil

T4- YST alone

Replications – 5 traps

Methodology: 1.5 ml of essential oil will be taken and placed in eppendoff tube and cover the tube with muslin cloth to avoid external impurities.

Yellow sticky traps will be placed in the cotton field at equidistance between the traps (20 traps/acre). Eppendoff tube with essential oil will be placed in centre of the yellows sticky trap at both the sides.

Observations will be recorded on number of leaf hoppers, whiteflies and others including natural enemies every day at 6 days interval from 5 random selected square of YST

After observations, replace the trap with new set of yellow sticky trap with essential oil and it will be continued till the crop season ends.

Statistical analysis: Analysis will be carried out by using One way ANOVA.

PROCEEDINGS OF PLANT PATHOLOGY PANEL

Chairman: Prof. Anil Kumar, Head of Department, Department of Plant Pathology, HAU, Hisar
Co-Chairman/Convener: Dr. SK Sain, Senior Scientist (Plant Pathology), ICAR-CICR Regional Station, Sirsa

Rapporteurs :

Dr. Naresh Kumar Yadav, Asst. Scientist (Plant Pathology), CCS HAU, CRS, Sirsa
Dr. Pradeep Kumar, Asst. Professor (Plant Pathology), ARS, Sriganaganagar

The meeting was held on 11th March, 2019 at CCS HAU, Hisar to discuss the results of plant pathology trials conducted during 2018-19. Dr. SK Sain, Senior Scientist (Plant Pathology), welcomed all the participants and Chairman Prof. Anil Kumar Head, Department of Plant Pathology, HAU. During his introductory remarks, he highlighted the achievements made from different centres of AICRP and CICR under the AICRP cotton Pathology during 2018-19. He informed the house about thematic research programmes and experiments under AICRP Plant Pathology program.

The following scientists from different AICRP Centres attended the meeting and presented the results of Kharif 2018-19 trials.

Sr. No.	Name & Designation	Centre
1.	Dr. Rupesh Kumar Arora, Asstt. Plant Pathologist	PAU (Regional Station), Bathinda Email: rkarora@pau.edu
2.	Dr. Pradeep Kumar, Asstt. Professor (Pl. Path.)	ARS (SKRAU), Sriganaganagar Email: pradeep.patho@gmail.com
3.	Dr. Manmohan, Asstt. Pathologist	CCS HAU, Hisar, Email: mmbaghel@gmail.com
4.	Dr. Ashok Kumar, Asstt. Plant Pathologist	PAU (RRS), Faridkot Email: ashokkumar@pau.edu
5.	Dr. Naresh Kumar Yadav Asstt. Scientist (Plant Path.)	CRS (CCS HAU), Sirsa Email: yadavnk67@gmail.com
6.	Mr. Bimal Gopinath, GM	SeedWorks International Pvt. Ltd., Hyderabad, Email: bimalgopinath@seedworks.com

During the centre wise presentation, Chairman Prof Anik Kumar and Co Chairman Dr Sk Sain said that the observations on occurrence of diseases in farmers filed should be recorded atleast on monthly interval basis. In epidemiological studies correlation should be worked out with complete data viz. hourly or day basis collectively over the locations, only then the accurate prediction can be made regarding occurrence of CLCuD. Dr. SK Sain, pointed out that constant observations on TSV should also be done alongwith the CLCuD and FFS survey in 2019.

The technical programme for the year 2019-20 was finalized after thorough discussion.

Technical Programme: 2019-20.

Path.1: Epidemiological studies on cotton diseases (continued)

1(a): Observations on the occurrence of the diseases (in farmer's field and research farms) - (All centers* except ICAR-CICR Sirsa). (Long term)

All Information regarding major / minor / new (e.g. Tobacco streak virus disease, *Helminthosporium* Leaf spot and *Cercospora* leaf spot etc) diseases have to be reported. The participating centres should record the data in per cent disease index in minimum 10 locations each in farmers' fields and research farm **during early, mid and late season** as per the earlier finalized AICRP standardized protocols. The disease occurrence in organic cotton and high density planting trials conducted at different centres should also be recorded and reported by the concerned Pathologists. In representative areas the names of varieties or hybrids raised under farmers holdings need also be recorded. Information on various nematode diseases causing losses in cotton may also be recorded in association with experts of AICRP on nematodes or other university scientists during surveys.

(PAU, Faridkot; PAU, Bhatinda; CCSHAU, Hisar; ARS(SKRAU), Sriganaganagar)

Note: Name of the district surveyed and the approximate cotton area in that district may be added in the table. The centres carrying surveys on the occurrence should mention the jurisdiction of university along with names of the districts covered.

1(b): Disease progress in relation to weather factors (All centers) (Long term)

The experiment will continue as per the earlier procedure suggested. Each centre will focus on most important disease on a susceptible variety/hybrid or Bt hybrid for correlation. Further it was decided that:

The regression equations developed by few centres based on long term data for example-

1. CLCuD by Sirsa, Hisar and Faridkot centre 2. Alternaria bight at Rahuri & Guntur centres 3.Bacterial blight and rust at Guntur centre and Grey mildew at Nanded & Guntur Centres will be validated in the respective zones by other centres during 2019-20 where the diseases are prevalent, with their existing data. Following centres were requested to develop prediction model based on the collection and collation of the existing and current data.

1. North Zone - Pool the existing data on CLCuD and develop prediction models for the region. (Action: Dr. Manmohan Singh, CCSHAU, Hisar with the help of Statistician of the University)

The exercise will be completed and disease wise regression models will be developed within the next season.

1(c): Studies on the variability of *Alternaria* leaf spot (All centers*)

All the scientists from different centres should collect the cultures of *Alternaria* isolates from the leaf blight samples (**Atleast 5-10 samples from different locations**). One set of all isolates is to be sent to PI (Dr. Dilip Monga) who will coordinate the identification and further registration process and another set to TNAU, Coimbatore. The pathogenicity and taxonomy for diversity analysis of *Alternaria* at species level will be carried out by Cotton Pathologist at Department of Cotton, Tamil Nadu Agricultural University, Coimbatore – 641 003.

1(d) Survey and Epidemiology of TSV (Centers-Lam, Guntur, TNAU, Coimbatore, TNAU, and Dr PDKV, Akola; CRS, Nanded; MPKV, Rahuri, ICAR-CICR (RS), Sirsa and CICR, Nagpur). (Since 2009-10)

Survey for occurrence of TSV from major cotton growing tracts of different districts in the states mentioned above will be carried out. Area wide TSV incidence may be recorded to have idea on threat perception.

Tentative disease rating scale (0-4) which was finalised during last Annual Group Meet for TSV will be validated

There are reports on occurrence of TSV in north zone. Cotton pathologists of north zone should be alert and careful to record such observations during the season. Molecular characterization for disease confirmation will be done at ICAR-CICR, RS, Sirsa and CICR, Nagpur.

Path. 2: Screening of AICRP entries for disease reaction (continued)

Path. 2: (a) Screening of breeding lines for disease reaction (all centers)

North Zone Centres: Both National and Zonal entries*

*Only National entries at CICR, RS, Sirsa

Central and South Zones: National and Zonal entries

Susceptible check for each important disease (Common or individual) should be maintained in each screening trial at all the centres.

Observations will be taken for occurrence of CLCuD at 100 DAS. All the centres will calculate PDI by dividing average grade of the test entry with highest grade i.e. six (6) (0-6 rating scale).

Note: A PDI of 40 or less will be kept as cut off for the purpose of identification of a variety/hybrid in CLCuD. In case of other diseases, the reaction less than the local/Zonal check will be the cut off for the above purpose.

Path.2 (b) Confirmation and maintenance of disease resistant lines (all centers) (DOS 2009- 10)

At all centres, scientists will keep the resistant entries (few bolls of selfed seed) from the initial evaluation trials (National trials) like **Br. 02a or b for *G. hirsutum* varieties, Br. 22 a/b for *G. arboreum*, Br. 34b for *G. herbaceum* and Br. 14a for *G. barbadense*** after screening against important diseases.

A maximum of 2-3 important diseases prevailing in the area will be considered. A maximum of five entries will be kept from each trial.

Seed cotton yield and quality aspects will also be recorded keeping resistance as first priority. Those lines will be evaluated again next year by the concerned pathologist at his centre under field conditions and also tested at hot spot for that particular disease under nursery/ artificial inoculation condition at below mentioned centres to have confirmed final reaction.

Artificial Screening Centres:

1. Cotton leaf curl virus, CICR, Regional Station, Sirsa
2. Bacterial leaf blight PDKV, Akola
3. *Alternaria* leaf spot MPKV, Rahuri
4. *Myrothecium* leaf spot, Khandwa
5. Grey mildew, Dharwad
6. Root rot, CICR, RS, Sirsa
7. *Fusarium* wilt, Pune

Such entries with two years field screening and one year artificial screening data will be kept by plant pathologists for use in developing resistant varieties/ hybrid by that centre.

Note: The field screening will be considered valid only in those years when at least 3 or 4 grade reaction is observed in susceptible checks in screening trials.

One set each of confirmed resistant entries (25-50 g seed) may be sent to Head, Division of Crop Protection, CICR, Nagpur and to PI Plant Pathology, which will serve as a repository.

Path.2 (c) Monitoring of breakdown of resistance against CLCuD in cotton.

(Centres- Hisar, Sriganaganar and Bhatinda) (Since 2019-20 with new cultivars:)

Entries: 8;

Replications: 3;

Design: RBD

Plot Size: 5.4m x 3.75m

Spacing: 67.5 x 30 cm (114 Plants) – For Varieties 67.5 x 60cm (60 Plants) – For Hybrids

Observation: Incidence and severity of CLCuD

Varieties: HS6, F846, RST-9 (Susceptible) H1098(i), F 2228, CSH-3075(Moderately Resistant),

Hybrids: Bio 6317 (Susceptible) RCH 773 (Moderately Resistant)

Seed of varieties to be supplied by respective centers @ 500 g for each variety.

Path.3: Management of Diseases

Path.3 (e). Innovative interventions for the management of CLCuD (DOS-2015-16)

Concluded

Path. 3 (f): Management of sooty mould (*Capnodium spp.*) in cotton (DOS 2017-18)

Locations: Field experiment : Faridkot, Abohar, Hisar,

Screen house : CICR, Sirsa and TNAU, Coimbatore

Treatment details:

1. Copper oxy chloride (COC) 50 WP @ 0.75 g/litre of water
2. Copper oxy chloride (COC) 50 WP @ 1.25 g/litre of water
3. Copper oxy chloride (COC) 50 WP @ 1.75 g/litre of water
4. Copper oxy chloride (COC) 50 WP @ 2.25 g/litre of water
5. Propiconazole 25 EC @ 1 ml / litre of water
6. Mancozeb 50 WP @2.0 g /litre of water
7. Detergent powder @ 5.0 g / litre of water
8. Water spray
9. Control

Spacing - 1.0 x 0.6 m

Plot size –50M²

Replications – 3

Design - RBD

Spray: Total three sprays will be applied at fortnightly interval.

Observations: Pre spray, 7 DAS and 15 DAS observations on severity of sooty mould.

To work out severity, observations will be recorded according to the rating scale (0 to 4) as follows:

0-Free from the sooty mould, 1- 25 per cent leaf area covered with sooty mould, 2- 50 per cent leaf area covered with sooty mould, 3-75 per cent leaf area covered with sooty mould and 4-100 per cent leaf area covered with sooty mould.

Another set of experiment with prophylactic treatments with same treatment details will be taken up at honey dew appearance and with recording of data of sucking pest (adult/ pre adult) at the time of spray.

Data will be analyzed statistically and tabulated.

The experiment will be repeated for another one year ie 2019-20. The data of three year trials will be compiled at the end of 2019-20 trials;

Path 4 g: Management of parawilt of cotton (New experiment)(Since: 2018-19)

Locations: Field experiment : Bathinda, Hisar, Akola, Nanded and Junagarh

A. Treatment details:

1. Cobalt chloride foliar spray 10 ppm foliar spray immediately after occurrence of disease
2. Sodium benzoate foliar spray 50ppm foliar spray immediately after occurrence of disease
3. Salicylic acid (Commercial grade) @ 250ppm foliar spray immediately after occurrence of disease
4. Foliar spray of *Pseudomonas fluorescens*@ 10gm or ml/litre of water (University strain/commercial preparation)
5. Drench plants with a mixture of Copper oxychloride 25g and 200g Urea in 10 ltr of water
6. Drench plants with Carbendazim 1g/L
7. Control

Design: RBD

Replications:3

Plot size: around 50m² or minimum 10 tagged plants

B. Observations: Recovery of plant will be assessed by using following scale

0=No recovery; 1=25% recovery; 2= 50% recovery; 3=75% recovery; 4= 100% recovery

C. Observations: Data on plant vigour parameters like: (120 DAS)

- Root length density
- Shoot length
- Total root mass
- Plant height and density,
- Number of fruiting branches per plant.
- Number of open bolls per plant.
- Boll weight gm.
- Seed cotton yield

Path. 4. Crop loss estimation

Path.4 (e) Crop loss estimation due to CLCuD and distribution pattern of CLCuD in North Zone (Since 2011-12)

Experiment 1: To work out relationship between Disease index and yield reduction due to cotton leaf curl virus disease.

Locations: Hisar, Faridkot and Ganganagar

Variety/hybrid: Local Popular Bt hybrids

Treatment details and observations: On research farm 4 local popular hybrids will be sown in half an acre area and diseased and healthy plants will be tagged grade wise and also healthy vs diseased plants and data on Disease Index, yield loss and quality parameters will be recorded and analyzed. **Date must be recorded as per the disease rating scale: the yield loss (Disease Index, yield loss and quality parameters) must be estimated corresponding to the respective disease grades.**

Continue with same hybrids for this year (2017-18 to 2019-20)

US51	RCH 773 BGII	NCS 9013 BGII	Bioseed 6688 BGII
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Experiment 2: Study on distribution pattern of cotton leaf curl virus disease on local popular Bt hybrid at farmer's field. (DOS: 2009-10)

Location: Hisar (Sirsa - Sub Centre to collect data of Sirsa and Fatehabad districts), Faridkot, Ganganagar and Bhatinda

Observations of CLCuD occurrence (PDI) in two villages (minimum 2-3 hybrids in each village) in each block (district wise) will be recorded during the cropping season for popular hybrids. The locations will be evenly spread over the entire state. **At each location, 4 set of observations (25 plants each, totalling 100 plants) will be recorded in a field.**

Data from farmers' fields and research farm must be recorded during early, mid and late season as per the earlier finalized AICRP standardized protocols.

The data recording should be uniform at all the centers. GPS location may be used while data recording.

While making disease maps the following disease scale may be followed: Very severe > 50 %, Severe- 30.1-50 % (combining MS & S of Disease scale), Moderate- 20.1-30 %, Low- 10.1-20 %, Traces-0.1-10 % in place of that presently being followed.

In the end Dr. SK Sain thanked the Chairman Dr. Anil Kumar, Head of Department, Department of Plant Pathology, CCS HAU, Hisar for his critical suggestions to improve the technical programme.

