



# Annual Program

## 2020-2021



CIM-775



CENTRAL COTTON RESEARCH INSTITUTE, MULTAN



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## PREFACE

The Annual Programme of Research Work for the year 2020-21 of Central Cotton Research Institute, Multan has been prepared keeping in view the changing climatic conditions, insect pests and disease scenario, effectiveness of Bt gene and cropping pattern. The programme has been thoroughly reviewed and discussed with the scientists of Central Cotton Research Institute, Multan. The research studies will be focused on cotton production technology, high density trials, climate resilient varieties, CLCuV disease management, efficient fertilizer use, seed health improvement, insect pest management (especially Pink bollworm, Whitefly, Mealybug), insecticide resistance management, introduction and demonstration of advanced machinery including Mechanical Cotton Picker, Boll Picker, Seed Grader etc and technology dissemination.

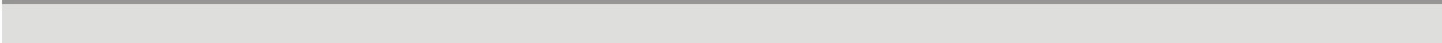
In addition, the Institute has launched BCI Cotton Project through which farmers will be trained to produce environment-friendly and economically better cotton utilizing the latest technology in collaboration with the Better Cotton Initiative (BCI). Moreover, the Institute has also submitted various projects under the federal PSDP 2020 which includes supply of PB Ropes, farmers training programs and advancement of research programs for varietal development.

Suggestions for further improvement of the Programme will be highly appreciated and duly acknowledged.



**DR. ZAHID MAHMOOD**  
Director  
Central Cotton Research Institute  
Multan

March, 2020



## 1. AGRONOMY SECTION

### 1.1 Effect of time of sowing on productivity of advanced genotypes

#### Objective:

To determine the optimum sowing time of different advanced genotypes for productivity and CLCuD incidence

#### Treatments:

(a) **Sowing Date = 7**

[March 15, April 01&15,  
May 01&15, June 01&15]

(b) **Genotypes = 4**

[Cyto-226, Cyto-164, CIM-735, CIM-610]

**Layout** : Split plot  
[Main plot: sowing date]  
[Sub plot: genotypes]

**Replications** : 3  
**Plot size** : 20' x 30'  
**Year of Expt.** : Continuous

#### Observations:

- Plant structure
- Seed cotton yield and its components
- Data on CLCuD incidence
- Fibre characteristics

#### Previous Year's Results

- Crop planted on 15<sup>th</sup> April produced maximum yield (2440 kg ha<sup>-1</sup>), while minimum by 15<sup>th</sup> June (1182 kg ha<sup>-1</sup>).
- Averaged across the sowing dates, CIM-610 produced significantly higher seed cotton yield than Cyto-226 and Cyto-164.
- The reduction in yield was 9.2%, 25.5%, 42.6% and 51.6 % by delayed sowing.

### 1.2 Effect of time of sowing on productivity of transgenic genotypes

#### Objective:

To determine the optimum sowing time of different transgenic genotypes for productivity and CLCuD incidence

#### Treatments:

(a) **Sowing Date = 7**

[March 15, April 01&15,  
May 01&15, June 01&15]

(b) **Genotypes = 7**

[*Bt.* CIM-775, *Bt.* CIM-785, *Bt.* CIM-875, *Bt.* Cyto-533, *Bt.* Cyto-535, *Cyto-A* and *Bt.* Cyto-179]

**Layout** : Split plot  
[Main: sowing date]  
[Sub-plot: genotype]

**Replications** : 3

**Plot size** : 20' x 30'

**Year of Expt.** : Continuous

#### Observations:

- Plant structure
- Seed cotton yield and its components
- CLCuD incidence
- Fibre characteristics

#### Previous Year's Results

- Crop planted on 15<sup>th</sup> March produced maximum yield (4035 kg ha<sup>-1</sup>), while minimum by 1<sup>st</sup> June (1643 kg ha<sup>-1</sup>).
- Averaged across the sowing dates, CIM-678 produced higher seed cotton yield than *Bt.* CIM-303, *Bt.* CIM-785, *Bt.* Cyto-511, *Bt.* Cyto-179 and *Bt.* CIM-789.
- The reduction in yield was 21.4%, 36%, 38.1%, 48.8% and 59.3% by delay in sowing.

### 1.3 Yield response and nitrogen use efficiency of transgenic cotton cultivars to nitrogen application

#### Objective:

To determine the nitrogen requirement and nitrogen use efficiency of transgenic cotton

#### Treatments

(a) **Genotypes = 5**

[*Bt.* CIM-775, *Bt.* CIM-785, *Bt.* CIM-875, *Bt.* Cyto-535 and *Bt.* *GH-Himalaya*.]

(b) **Nitrogen = 6**

[0, 50, 100, 150, 200, 250 kg N ha<sup>-1</sup>]

**Layout** : Split plot  
[Main: nitrogen]  
[Sub-plot: genotypes]

**Replications** : 3

**Plot size** : 20' x 30'

**Sowing date** : 2<sup>nd</sup> week of May

**Year of Expt.** : Continuous

#### Observations:

- Plant structure
- Seed cotton yield and its components
- Agronomic nitrogen use efficiency

- Fibre characteristics

#### Previous Year's Results

- The seed cotton yield was significantly affected by genotype and nitrogen levels
- Crop fertilized with 300 kg N ha<sup>-1</sup> gave increase in yield than 0, 75, 150 and 225.
- The genotype *Bt.CIM-678* produced significantly higher seed cotton yield than *Bt.CIM-789*, *Bt.GH.Hamalia*, *Bt.Cyto-511*, and *Bt.CIM-533*.
- The genotype CIM-678 and CIM-789 gave the highest agronomic nitrogen use efficiency over rest of the genotypes.

#### 1.4 Modeling the cotton genotypes performance at temporal variations

##### Crop growth model:

Decision Support System for Agro-Technology Transfer (DSSAT)

##### Objective:

To assess the impact of climate change on genotypes performance and their adaptability

##### Treatments:

###### Main plot: Temporal variations: 04

- I. Mid March
- II. Mid April
- III. Mid May
- IV. Mid June

###### Genotypes: 03

- I. *Bt. CIM-789*
- II. *Bt. Cyto-511*
- III. *Bt. Cyto-179*

**Layout:** Split plot  
**Replications:** 3  
**Plot size:** Available experimental area  
**Year:** 3<sup>rd</sup>

##### Observations:

- Phenology
- Plant morphology
- Seed cotton yield and its component
- Fiber quality

#### Previous Year's Results

- Crop planted on 15<sup>th</sup> March produced maximum seed cotton yield (3983 kg ha<sup>-1</sup>), while minimum yield by 15<sup>th</sup> June (1509 kg ha<sup>-1</sup>)
- Average across the sowing date, *Bt.Cyto-511* produced significantly higher seed cotton yield than *Bt. CIM-789* and *Bt.Cyto-179*.
- The reduction in yield was 36.2%, 51.8% and 62.1% by delay in sowing.
- Among sowing dates, April-15 took minimum days for squaring and flowering, while March-15 took minimum days for first boll split
- Among genotypes, *Bt.Cyto-179* took minimum days for squaring, flowering and first boll split.

#### 1.5 Cotton yield response to residues management and tillage systems in cotton-wheat cropping system

##### Objective:

To evaluate the effects of cotton sticks and wheat straw incorporation in combination with tillage systems on crop productivity

##### Treatments:

###### Main plot: Residues incorporation: 04

- I. No residue incorporation
- II. Wheat straw incorporation
- III. Cotton sticks incorporation
- IV. Cotton sticks and wheat straw incorporation

###### Sub-plot: Tillage system: 02

- I. Conventional
- II. conventional and chiseling

**Layout:** Split plot  
**Plot size:** Available experimental area  
**Sowing time:** Mid May  
**Variety:** *Bt. Cyto-179*  
**Year:** 3<sup>rd</sup>

##### Observations:

- Pre and post harvest soil organic matter contents
- Plant structure
- Seed cotton yield and its components
- Fiber traits

#### Previous Year's Results

- Among the tillage treatments. The combination of chiseling and conventional tillage produced significantly higher seed cotton yield than conventional tillage.
- The cotton sticks incorporation produced higher seed cotton yield than rest of treatments.

#### 1.6 Cotton yield and fiber quality response to high density planting system (HDPS)

##### Objective:

To evaluate the impact of high density planting system on cotton yield and fiber quality

##### Treatments:

**Row spacing:** 3 (45 cm, 60 cm and 75 cm)

**Plant spacing:** 3 (15 cm, 22.5 cm and 30 cm)

**Layout:** Split plot

**Main plot:** Row spacing

**Sub-plot:** Plant spacing

**Plot size:** 20 X 30 ft

**Replication:** 03

**Sowing date:** 1<sup>st</sup> week of May

**Genotypes:** *Bt. CIM-775* and *Bt. CIM-875*

**Year of exp.:** 2<sup>nd</sup>

##### Observations:

- Plant structure
- Seed cotton yield and its components
- Fiber quality

#### Previous Year's Results

- The genotype *Bt. Cyto-313* produced more seed cotton yield than *Bt. CIM-343*.
- The row spacing 45 cm produced 15.1% and 21.4% more seed cotton yield than 60 cm and 75 cm, respectively.
- The plant spacing 15 cm produced 21.5% and 37.8% more seed cotton yield than 22.5 cm and 30.0 cm, respectively.

#### 1.7 Agro-economic feasibility for cotton – based intercropping system.

**Objective:** To assess the economic feasibility of different cotton-based intercropping systems.

##### Treatments:

**Main Plot :** Cotton

**Sub plot :** Intercrops: (Mung bean, Fodder maize, Sesame)

**Layout :** Split plot  
**Plot size :** 20'x30'  
**Sowing date :** Mid March  
**Replication :** 03  
**Variety :** *Bt. CIM-678*  
**Year of exp :** 1<sup>st</sup>  
**Observation :**

- Plant structure
- Economic feasibility assessment
- Seed cotton yield and its components
- Fibre characteristics

#### 1.8 Effect of planting and picking time on cotton seed quality

**Objective:** To evaluate the impact of planting and picking time on seed quality

##### Treatments:

**Planting time:** March 15, April 15, May 15 and June 15

**Picking time:** Last week of August, September and October

**Layout:** RCBD

**Plot size:** 20'x30'

**Replication:** 03

**Variety:** *Bt. CIM-179*

**Year of exp:** 1<sup>st</sup>

**Observation:** Daily germination count, Mean germination time, Germination index, Coefficient of velocity of germination, Seed index.

#### 1.9 Weed diversity survey in cotton growing areas of the Punjab

**Objective:** To estimate the weeds distribution pattern in various cotton growing regions

##### Observation:

- Frequency
- Density
- Relative mean field density
- Relative abundance

#### 1.10 Evaluation of the impact of mulching strategies on weed control and seed cotton yield

**Objective:** To study the feasibility of mulches for weed control and its impact on seed cotton yield

**Treatments:** No mulch, Wheat straw, maize straw, berseem straw, weed mulch and plastic mulch

**Layout:** RCBD

**Plot size:** 20'x30'

**Replication:** 03

**Variety:** *Bt. CIM-179*

**Year of exp:** 1<sup>st</sup>

##### Observation:

- Weeds control (%)
- Weeds biomass (g m<sup>-2</sup>)
- Seed cotton yield and its components



### 1.11 Impact of sowing method on seed cotton yield, insects population and water consumption

**Objective:** To study the impact of sowing methods on yield performance, insect behavior and water consumption

**Treatments:**

Drill sowing

Bed furrow

Conversion of beds into ridges at 45 DAS

Conversion of beds into ridges at 60 DAS

**Layout:** RCBD

**Plot size:** 20'x30'

**Replication:** 03

**Variety:** *Bt.* CIM-179

**Year of exp:** 1<sup>st</sup>

**Observation:**

- Plant population
- Water consumption
- Insects population
- Seed cotton yield and its components
- Cost of production

### 1.12 Screening of pre- and post-emergence weedicides in cotton

**Objective:**

To screen out pre- and post-emergence weedicides for effective weed control in cotton.

**Treatments:**

**Weedicides** : Variable

**Layout** : RCBD

**Replications** : 3

**Plot size** : 20' X 30'

**Sowing time** : Mid May

**Variety** : *Bt.* CIM -179

**Year of Expt.** : **Continuous**

**Observations:**

- x Weed density
- x Plant structure
- x Seed cotton yield and its components

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## 2. – BREEDING & GENETICS SECTION

Institute/ Station	Name of the Head	No. of Exp.	Study Title	Name of Scientist	Estt Cost
Central Cotton Research Institute, Multan	Dr. Muhammad Idrees Khan, Head PB& G Section	1	2.1. 1 Varietal Trial -1 Evaluation of long staple Bt. strains against commercial varieties.	Dr. Muhammad Idrees Khan /Dr. Khadim Hussain	<b>33000</b>
		1	2.1. 2 Varietal Trial -2 Evaluation of medium long staple and high GOT Bt. strains against commercial varieties.	Dr. Muhammad Idrees Khan/ Mr. Muhammad Akbar Mr. Saeed Muhammad	<b>33000</b>
		1	2.1. 3 Varietal Trial -3 Evaluation of virus resistant/tolerant Bt. strains against commercial varieties.	Dr. Muhammad Idrees Khan /Hafiz Abdul Haq	<b>33000</b>
		1	2.1. 4 Varietal Trial -4 Evaluation of medium long staple Non-Bt. strains against commercial varieties.	Dr. Muhammad Idrees Khan / Dr. Fazl-I-Dayim Shehzad	<b>33000</b>
		7	2.2. Micro-Varietal Trial -1-7 Evaluation of newly bulked medium long staple Bt. strains against commercial varieties	Mr. Muhammad Akbar, Dr Khadim Hussain, Hafiz Abdul Haq, Dr Fazl-I-Dayim Shehzad and Mr. Saeed Muhammad	<b>154000</b>
		1	2.3 .1 Standard Varietal Trial -1 Evaluation of commercial Non-Bt. varieties at CCRI Multan condition	Mr. Muhammad Akbar	25000



Institute/ Station	Name of the Head	No. of Exp.	Study Title	Name of Scientist	Estt. Cost
Central Cotton Research Institute, Multan	Dr. Muhammad Idrees Khan, Head PB& G Section	1	2.3.2 Standard Varietal Trial -2 Evaluation of commercial Bt. varieties at CCRI Multan condition	Dr. Fazl-i-Dayim Shehzad	25000
		4	2.4 National Coordinated Varietal Trial-A to D To test the performance of candidate varieties from all over Pakistan	Dr. Muhammad Idrees Khan Mr. Muhammad Akbar, Dr Khadim Hussain, Hafiz Abdul Haq, Dr Fazal-i-Dayim Shehzad and Mr. Saeed Muhammad	160000
		2	2.5 Provincial Coordinated varietal Trial 1 to 2 To test the performance of candidate varieties from all over Punjab	Mr. Muhammad Akbar, Dr Khadim Hussain, Hafiz Abdul Haq, Dr Fazal-i-Dayim Shehzad and Mr.Saeed Muhammad	80000
		5	2.6 F <sub>1</sub> Hybrids To raise F <sub>2</sub> population for further selection according to desirable traits	Mr. Muhammad Akbar, Dr. Khadim Hussain, Hafiz Abdul Haq, Dr. Fazal-i-Dayim Shehzad and Mr.Saeed Muhammad	102000
		5	2.7 F <sub>2</sub> generation Block 1-5 To select the segregates for further Filial generation according the desirable traits.	Mr. Muhammad Akbar, Dr Khadim Hussain, Hafiz Abdul Haq, Dr. Fazal-i-Dayim Shehzad and Mr. Saeed Muhammad	600000
		1	2.8 Early generation seed (Bt) To produce pre-basic seed of approved commercial varieties of CCRI Multan	Dr. Khadim Hussain	33000
		1	2.9 Early generation seed (Non-Bt) To produce pre-basic seed of approved commercial varieties of CCRI Multan	Mr. Muhammad Akbar	35000
		5	2.10 Fresh crosses	Mr. Muhammad Akbar, Dr Khadim Husain, Hafiz Abdul Haq, Dr .Fazal-i-Dayim Shehzad and Mr. Saeed Muhammad	102000
		1	2.11 Maintenance of genetic stock	Hafiz Abdul Haq	600000

## OBJECTIVES.

1. Evolution of new varieties equipped with:

High yield potential, High lint percentage, Desirable fibre traits, Resistant/ tolerant to CLCuD, Early maturity, Heat & Drought tolerance, Resistance against insect pest, Wider climatic adaptability.

2. Testing of newly developed cotton strains in NCVT & PCCT.

3. Preservation/maintenance of cotton germplasm.

4. Research publication in National & International journals.

5. Provide facility of germination test to farmers.

6. GMOs testing

7. Collaboration with other research organizations/ Universities

### 2.1 Testing of New Strains Developed at CCRI, Multan

#### 2.1.1 Varietal Trial-1

Objective Evaluation of long staple *Bt.* strains against commercial varieties.

Strains 5 CM-1 to CM-5  
Standards 2 IUB-13, *Bt.*CIM-602  
Design Randomized complete block  
Repeats 3  
Plot Size 10'x 40'  
Locations 2 (Multan, Khanewal)  
Year of Expt. Continuous

#### 2.1.2 Varietal Trial-2

Objective Evaluation of long staple with high GOT *Bt.* Strains against commercial varieties

Strains 6 **CM-6 to CM-11 (6+2 Std)**  
Standard 2 IUB-13, *Bt.*CIM-602  
Design Randomized complete block  
Repeats 3  
Plot Size 10'x 40'  
Locations 2 (Multan, Khanewal)  
Year of Expt. Continuous

#### 2.1.3 Varietal Trial-3

Objective Evaluation of Virus resistant/tolerant *Bt.* strains against commercial varieties.

Strains 08 CM-12 to CM-19 (8+2 Std)  
Standards 2 IUB-13, *Bt.*CIM-602  
Design Randomized complete block  
Repeats 3  
Plot Size 10'x 40'  
Locations 2 (Multan, Khanewal)

Year of Expt. Continuous

#### 2.1.4 Varietal Trial-4

Objective Evaluation of medium long staple non-*Bt.* strains against commercial varieties.

Strains 08 CM-20 to CM-27 (8+2 Std)  
Standards 1 CIM-610  
Design Randomized complete block  
Repeats 3  
Plot Size 10'x 40'  
Locations 2 (Multan, Khanewal)  
Year of Expt. Continuous

#### 2.2.1 Micro-Varietal Trial-1

Objective Evaluation of newly bulked medium long staple *Bt.* Strains against commercial varieties

Strains 8 1/2020 to 08/2020  
Standard 1 *Bt.*CIM-602  
Design Randomized complete block  
Repeats 3  
Plot Size 10'x 30'  
Year of Expt: First

#### 2.2.2 Micro-Varietal Trial-2

Objective Evaluation of newly bulked high lint percentage *Bt.* strains

Strains 8 9/2020 to 16/2020  
Standard 1 *Bt.*CIM-602  
Design Randomized complete block  
Repeats 3  
Plot Size 10'x 30'  
Year of Expt. First

#### 2.2.3 Micro-Varietal Trial-3

Objective Evaluation of newly bulked long staple *Bt.* Strains

Strains 8 17/2020 to 24/2020  
Standard 1 *Bt.*CIM-602  
Design Randomized complete block  
Repeats 3  
Plot Size 10'x 30'  
Year of Expt. First

#### 2.2.4 Micro-Varietal Trial-4 (Non Bt)

Objective Evaluation of newly bulked Non *Bt.* Strains

Strains 8 25/2020 to 32/2020  
Standard 1 CIM-610  
Design Randomized complete block  
Repeats 3

Plot Size 10'x 30'  
 Year of Expt. First

**2.2.5 Micro-Varietal Trial-5**

Objective Evaluation of newly bulked Non *Bt.* Strains

Strains 8 33/2020 to 40/2020

Standard 1 CIM-610

Design Randomized complete block

Repeats 3

Plot Size 10' x 30'

Year of Expt. First

**2.2.6 Micro-Varietal Trial-6**

Objective Evaluation of newly bulked strains

Strains 8 41/2020 to 48/2020

Standard 1 *Bt.* CIM-602

Design Randomized complete block

Repeats 3

Plot Size 10' x 30'

Year of Expt. First

**2.2.7 Micro-Varietal Trial-7 (Non-Bt)**

Objective Evaluation of newly bulked strains

Strains 8 49/2019 to 56/2019

Standard 1 CIM-610

Design Randomized complete block

Repeats 3

Plot Size 10' x 30'

Year of Expt. First

**2.3.1 Standard Varietal Trial-I**

Objective To test the performance of commercial varieties under Multan conditions

Varieties 7 CIM-482, CIM-573, CIM-496, Cyto-124, CIM-620, CIM-608, CIM-610

Design Randomized complete block

Repeats 3

Plot Size 10' x 30'

Year of Expt. Continuous

**2.3.2 Standard Varietal Trial-II**

Objective To test the performance of commercial *Bt.* varieties under Multan conditions

Varieties 12 *Bt.* CIM-600, *Bt.* CIM-602, *Bt.* CIM-632, Crystal-12, RH-668, RH-662,

NIAB-545, Sahara-150, Sitara-15, FH-142, NIAB-1048, FH-152

Design Randomized complete block

Repeats 3

Plot Size 10' x 30'

Year of Expt. Continuous

**2.4. Testing of Promising Strains of Cotton Breeders under National Coordinated Variety Testing Programme**

**2.4.1. National Coordinated Varietal Trial (Set-A)**

Objective To test the performance of *Bt.* strains

Strains Variable (seed to be provided by PCCC)

Design Randomized complete block

Repeats 4

Plot Size 10' x 30'

Year of Expt. Continuous

**2.4.2. National Coordinated Varietal Trial (Set-B)**

Objective To test the performance of *Bt.* strains

Strains Variable (seed to be provided by PCCC)

Design Randomized complete block

Repeats 4

Plot Size 10' x 30'

Year of Expt. Continuous

**2.4.3. National Coordinated Varietal Trial (Set-C)**

Objective To test the performance of *Bt.* strains

Strains Variable (seed to be provided by PCCC)

Design Randomized complete block

Repeats 4

Plot Size 10' x 30'

Year of Expt. Continuous

**2.4.4 National Coordinated Varietal Trial (Set-D)**

Objective To test the performance of *Bt.* strains

Strains Variable (seed to be provided by PCCC)

Design Randomized complete block

Repeats 4

Plot Size 10' x 30'

Year of Expt. Continuous

**2.5.1 Provincial Coordinated Cotton Trial-I**

Objective To test the performance of promising *Bt.* strains of the Punjab

Strains Variable (Seed to be provided by Director, Cotton Research Inst., Faisalabad).

Design Randomized complete block

Repeats **3**

Plot Size 20' x 10'

Year of Expt. Continuous

**2.5.2. Provincial Coordinated Cotton Trial-II**

Objective To test the performance of promising strains of the Punjab

Strains Variable (seed to be provided by Director, Cotton Research Inst., Faisalabad).

Design Randomized complete block

Repeats **3**

Plot Size 20' x 10'

Year of Expt. Continuous

## 2.6. Raising Hybrids.

### 2.6.1 F<sub>1</sub> Hybrids

Objective To raise F<sub>2</sub> seed for further selection and screening against CLCuD

Hybrids **91 (H-2203 to H-2293)**

Standard **1** *Bt.*CIM-602

Plot Size Variable

Year of Expt. First

### 2.7.1. F<sub>2</sub> Generation Block 1

Objective To select the desirable segregates and screening against CLCuD

Families **18** (H-2053 to H-2070)

Standard **1** *Bt.*CIM-602

Plot Size 10' x 50'

Locations **3** (Multan & Khanewal)

Year of Expt. 1st

### 2.7.2 F<sub>2</sub> Generation Block-2

Objective To select the desirable segregates and screening against CLCuD

Families **22** (H-2071 to H-2092)

Standard *Bt.*CIM-602

Plot Size 10' x 50'

Locations **3** (Multan & Khanewal)

Year of Expt. First

### 2.7.3. F<sub>2</sub> Generation Block-3

Objective To select the desirable segregates and screening against CLCuD

Families **34** (H-9293 to H-2126)

Standard *Bt.*CIM-602

Plot Size 10' x 50'

Locations **3** (Multan, Khanewal, Kot Addu)

Year of Expt. First

### 2.7.4 F<sub>2</sub> Generation Block-4

Objective To select the desirable segregates and screening against CLCuD

Families **14** (H-2127 to H-2140)

Standard *Bt.*CIM-602

Plot Size 50' x 10'

Locations **3** (Multan, Khanewal, Kot Addu)

Year of Expt. First

### 2.7.5 F<sub>2</sub> Generation Block-5

Objective To select the desirable segregates and screening against CLCuD

Families **23** (H-2163 to H-2163)

Standard *Bt.*CIM-602

Plot Size 10' x 50'

Locations **3** (Multan & Khanewal)

Year of Expt. First

## 2.8 Performance of Promising Strains in Bigger Block

### 2.8.1 Testing of advanced strains

Objective To test the performance of advanced strains at Punjab Seed Corporation Farms, Khanewal

Strain **6** CIM-717, *Bt.*CIM-343, *Bt.*CIM-663, *Bt.*CIM-303, and *Bt.*CIM-678, *Bt.*CIM-789

Plot Size 0.5 hectare

Location Khanewal

Year of Expt. First

### 2.9.1 Selection of single plant from filial generation for high yield potential and CLCuV resistance/tolerance

Objective	Selection of promising single plants to develop further generation (F <sub>3</sub> to F <sub>6</sub> )
Families	Variables
Design	Simple
Repeats	2
Plot Size	Variables
Year of Expt.	Continues

### 2.10. Nucleus Seed Blocks

Objective	To produce pre-basic seed of approved commercial varieties of CCRI, Multan
Varieties	7 CIM-496, CIM-506, CIM-554, CIM-573, <i>Bt</i> CIM-598, <i>Bt</i> .CIM-599, <i>Bt</i> . CIM-602
Plot Size	Variable
Year of Expt.	Continuous

#### 2.11.1. Early Generation Seed

Objective	To produce pre-basic seed of approved commercial varieties of CCRI, Multan
Varieties	4 CIM-610, CIM-496, CIM-554, CIM-620,
Plot Size	Variable
Year of Expt.	Continuous

#### 2.11.2. Early Generation Seed (*Bt*.)

Objective	To produce pre-basic seed of approved commercial varieties of CCRI, Multan
Varieties	4 <i>Bt</i> CIM-602, <i>Bt</i> .CIM-600, <i>Bt</i> .CIM-632,
Plot Size	Variable
Year of Expt.	Continuous
Year of Expt.	1 <sup>st</sup>

### 2.12. Fresh Crosses

Objective	Development and widening of genetic base for the inducing desirable traits for evolution of new varieties through: <ul style="list-style-type: none"> <li>❖ Direct crosses</li> <li>❖ Back crosses</li> <li>❖ Three-way crosses</li> </ul> Crosses with exotic material
Year of Expt.	Continuous

### 2.13. Maintenance of Genetic Stock of World Cotton Collection

Objective	❖ Maintaining of Genetic stock ❖ Exchange of germplasm.
Germplasm	1500
Plot Size	5' x 12'
Year of Expt.	Continuous

### 2.14. Screening of cotton germplasm for CLCuV resistance/tolerance, economic traits, along with Heat and Drought tolerance

Objective	❖ To use tolerant germplasm in future breeding program
Genotypes	100
Plot Size	5' x 12'
Year of Expt.	Continuous
Collaboration	Pathology & Physiology

### 2.15. Mutation Breeding

Strains	3	Deebal, <i>Bt</i> . CIM598 and Hadi
Mutagens	2	Ethyl MethaneSulfonate (EMS), Na Azide
Plot Size		Variable
Locations	1	(Multan)
Year of Expt.		1 <sup>st</sup> Year

### 2.16. Study of Gene Flow in cotton

Strains	2	CIM-632, CIM496
Marker genotype	2	Russian red leaf & petal spot
Repeats Treatments	3	
Plot Size		Variable
Locations	1	(Multan)

### 2.17. ICARSA Cotton Project Material Screening of US germplasm for CLCuV resistance/tolerance.

Strains	25+1	USG-18-4156 to USG-18-4180CIM-496std
Repeats Treatments	1	
Plot Size		Variable



Locations            **1**       (Multan)  
 Year of Expt.        1<sup>st</sup> Year  
 Year of Expt.        1<sup>st</sup> Year

Cytogenetics	Inter specific hybridization
Entomology	Screening of advanced strains for insect pest tolerance
Fibre technology	Testing of breeding material for fibre quality traits
Pathology	Screening of breeding material against CLCuD and other diseases
Physiology/ Chemistry	Screening of advanced strains: <ul style="list-style-type: none"> <li>• Heat tolerance</li> <li>• Drought tolerance</li> </ul>

**2.18. Coordination with other Sections**

Section	Area of research
Agronomy	Agronomic assessment of advanced strains: <ul style="list-style-type: none"> <li>• Sowing dates</li> <li>• Irrigation</li> <li>• Fertilizer</li> <li>• Spacing</li> </ul>



### 3. CYTOGENETICS SECTION

#### 3.1 Collection and maintenance of *Gossypium* germplasm

- Thirty-four wild species of *Gossypium* along with 5 diploid, and 5 tetraploid hybrids; 6 triploid and 4 hexaploid hybrids; 2 pentaploid hybrids, 3 tri-species combinations will be maintained
- Utilization of this wider genetic base for hybridization.
- Exotic collection of missing culturable species/ races for strengthening germplasm.

#### 3.2 Interspecific hybridization

##### 3.2.1 Development of new hybrids involving species of different genomes by incorporating specific genes of wild species i.e. CLCuD resistance, drought and resistance or tolerance and fibre quality traits into upland cotton.

The following crossing programme will be attempted depending upon the availability of flowers.

##### Diploid x Diploid

- *G. arboreum* x *G. gossypoides*
- *G. arboreum* x *G. laxum*
- *G. arboreum* x *G. stocksii*
- *G. arboreum* x *G. somalense*
- *G. arboreum* x *G. areysianum*
- *G. arboreum* x *G. longicalyx*
- 

##### Diploid x Tetraploid

- *G. hirsutum* x *G. capitata viridis*
- *G. hirsutum* x *G. somalense*
- *G. hirsutum* x *G. gossypoides*
- *G. hirsutum* x *G. laxum*
- *G. hirsutum* x *G. areysianum*

##### Tetraploid x Tetraploid

- *G. hirsutum* x 2 (*hir. x anomalum*) x *G. hir.*
- *G. hirsutum* x 2 (*G. arbo. x G. anomalum*) x *G. hir.*
- 2(*G. hirsutum* x *G. stocksii*) x <sup>2</sup>*hir.*

Cytological and morphological studies will be carried out by doubling of chromosomes number where necessary.

**Year of Expt:** Continuous

#### 3.3. Colchipoity

##### Objectives:

- To make the species auto-tetraploid by doubling the chromosome numbers
- *Gossypium somalense*
- *G. hirsutum* x *G. gossypoides*
- *G. hirsutum* x *G. austral*

**Year of Expt:** Continuous

##### a. Seed treatments:

- i. 0.01% for 24 hours
- ii. 0.05% for 48 hours
- iii. 0.10% for 72 hours

##### b. Shoot Treatments:

- i. 0.01 % for 24- hrs
- ii. 0.01 % for 48-hrs
- iii. 0.01% for 72-hrs
- iii. 0.05 % for 24-hrs
- iv. 0.05 % for 48-hrs
- vi. 0.05 % for 72-hrs
- vii. 0.10% for 24 hours
- viii. 0.10% for 48 hours
- ix. 0.10% for 72 hours

\*according to Dhamayanthi and Gotmare, 2010 for the induction of polyploidy in *Gossypium*.

#### 3.4. Search for *Bt* homozygous resistance against CLCuD under field conditions

##### 3.4.1 F<sub>1</sub> Generation

##### Objective:

To raise F<sub>1</sub> seed for further selection and screening against CLCuD

##### Methodology:

**Hybrids:** 80 (1-1/20 to 80-1/20)

**Standard:** (Cyto-179)

**Plot size:** Variable

**Year of Exp.** Continuous

##### 3.4.2 Screening of F<sub>2</sub> material

##### Objective:

To select the desirable segregates having *Bt.* with concurrent tolerance against CLCuD

##### Methodology:

**Families:** 275 (1-2/20 to 275-2/20)

**Standard:** (Cyto-179)

**Plot size:** Variable

Year of Exp. Continuous

### 3.4.3 Screening of F<sub>3</sub> material to obtain homozygous plants

**Objective:**

To select the desirable segregates having *Bt* gene with tolerance against CLCuD

**Methodology:**

**Families:** 380 (1-3/20 to 380-3/20)

**Standard:** (Cyto-179)

**Plot size:** Variable

**Year of Exp.** Continuous

### 3.4.4. Screening of F<sub>4</sub> material to obtain homozygous plants

**Objective:**

To select the desirable segregates having *Bt* gene with tolerance against CLCuD

**Methodology:**

**Families:** 365 (1-4/20 to 365-4/20)

**Standard:** (Cyto-179)

**Plot size:** Variable

**Year of Exp.** Continuous.

### 3.4.5. Screening of F<sub>5</sub> material to obtain homozygous plants

**Objective:**

Testing and screening of promising families in F<sub>5</sub> generation

**Methodology:**

**Families:** 425 (1-5/20-425-5/20)

**Standard:** (Cyto-179)

**Plot size:** Variable

**Year of Exp.** Continuous

### 3.4.6. Screening of F<sub>6</sub> material to obtain homozygous plants

**Objective:**

Testing and screening of promising families in F<sub>6</sub> generation.

**Methodology:**

**Families:** 175(1-6/20-175-6/20)

**Standard:** (Cyto-179)

**Plot size:** Variable

**Year of Exp.** Continuous

## 3.5 Testing of Cyto-material in Micro-Varietal Trials.

### 3.5.1 Micro Varietal Trial-1.

**Objective:**

Testing of virus tolerant material for economic and fibre quality traits

**Treatments:**

**Strains:** 6 (M-1/20 to M-6/20)

**Standard:** 1 (Cyto-179)

**Lay-out** RCBD

**Repeats:** 3

**Plot size:** 30'x10'

**Year of Expt.** 1st

### 3.5.2 Micro Varietal Trial-2

**Objective:**

Testing of newly bulked Long staple material for economic and fibre quality traits

**Treatments:**

**Strains:** 6 (M-7/20 to M-12/20)

**Standard:** 2 (Cyto-179)

**Lay-out** RCBD

**Repeats:** 3

**Plot size:** 30'x10'

**Year of Expt.** 1st

### 3.5.3 Micro Varietal Trial-3

**Objective:**

Testing of newly bulked White fly tolerant material for economic and fibre quality traits

**Treatments:**

**Strains:** 6 (M-13/20 to M-18/20)

**Standard:** 1 (Cyto-179)

**Lay-out** RCBD

**Repeats:** 3

**Plot size:** 30'x10'

**Year of Expt.** 1st

### 3.5.4 Micro Varietal Trial-4

**Objective:**

Testing of newly bulked early maturing material for economic and fibre quality traits

**Treatments:**

**Strains:** 6 (M-19/20 to M-24/20)

**Standard:** 1 (Cyto-179)

**Lay-out** RCBD

**Repeats:** 3

**Plot size:** 30'x10'

**Year of Expt.** 1st

### 3.5.5 Micro Varietal Trial-5

**Objective:**

Testing of newly bulked heat tolerant material for economic and fibre quality traits

**Treatments:**

**Strains:** 6 (M-25/20 to M-30/20)

**Standard:** 1 (Cyto-179)

**Lay-out** RCBD

**Repeats:** 3

**Plot size:** 30'x10'

**Year of Expt.** 1st

### 3.6. Testing of Cyto-material in varietal trial-1

#### 3.6.1 VT-1

**Objective:**

Testing of new advance *B*<sub>1</sub> strains against commercial varieties

**Treatments:**

**Strains:** 6 (V1-V7)

**Standard:** 2 (FH-142 & Cyto-179)

**Lay-out** RCBD

**Repeats:** 3

**Plot size:** 30'x10'

**Year of Expt.**

#### 3.6.2 VT-2

**Objective:**

Testing of new advance *Bt* strains against commercial varieties

**Treatments:**

**Strains:** 7 (V8- V14)

**Standard:** 2 (FH-142 & Cyto-179)

**Lay-out** RCBD

**Repeats:** 3

**Plot size:** 30'x10'

**Year of Expt.** 1<sup>st</sup>

#### 3.6.3 VT-3 (Non *Bt*)

**Objective:**

Testing of new advance non-*Bt* strains against commercial varieties

**Treatments:**

**Strains:** 5 (V15-V19)

**Standard:** 2 (Cyto-124)

**Lay-out** RCBD

**Repeats:** 3

**Plot size:** 30'x10'

**Year of Expt.**

### 3.7. Mapping population development for fiber quality

**Objectives:**

Development of mapping population for fiber quality

**Methodology:**

**Hybrids:** Long satlpe x Short satlpe

**Year of Expt.** 2<sup>nd</sup>

F<sub>1</sub> plants will be sown in the field for the enhancement of population.

### 3.7. Early Generation System

**Objective**

To produce pre-basic seed of approved commercial varieties

**Varieties:** 5 (Cyto-124, CIM-608, Cyto-177, Cyto-178 & Cyto-179)

**Plot Size:** Variable

**Year of Expt:** Continues

### 3.8 Evaluation of new strain under varied ecological zones

**Objective:**

1. Strain *Bt*. Cyto-536 will be included in NCVT during cropping season 2019-20 for its adaptability. Year of Expt. 1<sup>st</sup>

2. Strain Non-*Bt*. Cyto-227 will be included in NCVT during cropping season 2010-21 for its wider adaptability. Year of expt. 1<sup>st</sup>

### 3.9 Biotechnological Studies

- i) Utilization of genes for developing resistance against biotic stresses (insect pests, diseases) and abiotic stresses (drought and nodulation for nitrogen compensation).
- ii) Cotton Fiber Culture Technology for fibre development under *in-vitro* aseptic conditions.
- iii) Weeds resistance program
- iv) Liaison with national and multinationals for biotechnological cooperation (exchange of technologies, gene acquisition, training, collaborative projects).
- v) Strengthening of laboratory (manpower, equipments, chemicals & glasswares)

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## 4. ENTOMOLOGY SECTION

### 4.1 Studies on Pink Bollworm

#### 4.1.1 Pink bollworm infestation in green bolls in major cotton growing area

**Objective:**

- To conduct survey for pink bollworm infestation in green bolls.
- Comparison of PBW infestation with previous years.
- Presence of Bt toxin.

**Locations** : Variable  
**Year of Expt.** : Continuous

**Survey timing** : 3  
i. September  
ii. October  
iii. November

**Observations:**

- Collection of susceptible green bolls from Bt & non-Bt cotton varieties.
- Dissection of collected bolls to record PBW infestation.

**Previous Year's Results**

Maximum boll infestation and live larvae were found in district Vehari followed by Multan as compared to other districts. Comparatively variety BS-20 seems more vulnerable to pink bollworm infestation.

#### 4.1.2 Studies on inclination of PBW to cotton genotypes

**Objective**

To assess preference and non-preference of PBW towards different promising genotypes of cotton under field and lab. conditions.

**Cultivars** : Variable

**Field studies**

**Treatments:**

Set-I Untreated  
Set-II Plant protection against PBW

**Layout** : RCB  
**Replications** : 3  
**Plot size** : 30' x 30'

**Lab. studies**

**Bolls bioassays:** 60, 90, 120 DAS  
**Year of Expt.** : First

**Observations:**

- Collection of susceptible green bolls from field at biweekly intervals.
- Record PBW infestation.
- Collection of bolls from glass house for PBW F1 generation bioassays.
- Correlation of mortality with Bt toxin.

#### 4.1.3 Behavioral studies of Pink Bollworm

**Objective:**

To study behavior and population dynamics of PBW on Bt and non-Bt paired plots.

**Year of Expt.** : First  
**Cultivars** : 2 Bt and 2 non-Bt  
**Replications** : 3

**Methodology:**

- Bt 10 rows with non-Bt 1 row
- Bt 1 row with non-Bt 1 row
- Bt
- Non-Bt

**Observations:**

- Collection of susceptible green bolls from Bt & non-Bt cotton varieties.
- Dissection of collected bolls to record PBW infestation.

#### 4.2 Monitoring of population dynamics of different lepidopterous pests

**Objective:**

To record fluctuations in the population of different lepidopterous pests of cotton by using sex pheromone and light traps.

**Methodology:**

- ◆ Installation of sex pheromone baited traps for lepidopterous pests at CCRI, Multan and farmer's field at Khanewal for:
  - *Earias* species
  - *Helicoverpa armigera*
  - *Pectinophora gossypiella*
- ◆ Installation of light traps for lepidopterous pests at CCRI, Multan for:
  - *Earias* species
  - *Helicoverpa armigera*

- *Spodoptera litura*
- *Spodoptera exigua*

**Year of Expt.** : Continuous

**Observations:**

- Recording male moth catches of different lepidopterous pests through sex pheromone baited traps daily at Multan and weekly at farmer's field throughout the year.
- Recording the moth catches through light traps daily throughout the year.

**Previous Year's Results**

**A) Sex pheromone traps**

- Overall, increasing population trend was detected in all lepidopterous pests at both locations as compared to last year. Male moth catches of *P. gossypiella*, *E. vittella*, *E. insulana*, *S. litura*, *S. exigua* and *H. armigera* were 29.7%, 37.0%, 38.2%, 80.0% 21.0% and 75.5% higher as compared to last year at farmer's field. Comparatively, male moth catches of all the species except *E. insulana* were higher at farmer's field than at CCRI, Multan.

**B) Light traps**

- Number of moth catches of *E. vittella*, *E. insulana*, *S. litura*, *S. exigua* and *H. armigera* were 46.7%, 64.2%, 66.7%, 68.9% and 79.7% higher as compared to last year.

**4.3 National Coordinated Varietal Trials**

**Cultivars** : Variable  
**Layout** : RCBD  
**Replications** : 3  
**Year of Expt.** : Continuous

**Observations:**

- Population of sucking pests
- Bollworms infestation and live larval population

**Previous Year's Results**

**A. Non Bt strains (Set-A):**

Jassid population remained below ETL during growing season on all the tested strains while its intensity was highest on PC-1908. Whitefly population was above ETL during July except on PC-1915, 24, 17, 19, 22, 16 and 10, respectively. During the month of August Whitefly population was below ETL during August on all the testing strains except on PC-1917, 24, 23, 13 and 2, respectively. However, in September whitefly was above ETL level on all the strains except on PC-1906. Overall, its intensity was highest on PC-1901 while lowest on PC-1906. Thrips remained

below ETL throughout the season on all the strains while its population was highest on PC-1904 and lowest on PC-1922. Bollworms population remained zero on all the tested strains.

**B. Bt strains (Set-B):** Jassid population was below ETL on all the tested strains during study period. Overall, its intensity was highest on PC-1940 while lowest on PC-1950. Thrip population remained below ETL throughout the season on all the strains except on PC-1941 and 44. Bollworms population remained zero on all the tested strains.

**C. Bt strains (Set-C):** Overall, Jassid population was highest on PC-1956 and 1961. Overall whitefly population was recorded on PC-1957 and lowest on PC-1953. Thrips population remained below ETL during study period on all the tested strains and its intensity was higher on PC-1973 and 63, respectively and lowerest on PC-1951. Bollworms population remained zero on all the tested strains.

**D. Bt strains (Set-D):**

Overall, Jassid population was highest on PC-2002. . Population of whitefly was above ETL during July and September mostly on all the tested strains while population of whitefly was fluctuating on all the tested strains in August. Overall, its intensity was highest on PC-1964 and 1990, respectively. Thrips population observed below ETL during July and August and September on all the tested strains except on 20 02. Overall, its intensity was higher on PC-2002. Bollworms population remained zero on all the tested strains.

**4.4 Impact of sowing period on the Dusky cotton bug infestation**

**Objective:**

Quantitative and qualitative intensities of infestation at different sowing period.

**Treatment** :

**Main Plots** : Sowing period  
 1. March  
 2. April  
 3. May

**Sub plots** : 3 Bt & 2 non Bt varieties

**Design** : Split plot

**Replication** : 3

**Year of Expt.:** Continuous

**Observation:**

- Pest count on all fruiting parts at weekly interval

- Record yield
- Seed Germination
- Fiber parameters
- Oil contents

#### 4.5 Impact of pesticides on the crop physiology/shape/canopy

##### Objective:

To evaluate non-phytotoxic potential insecticides for management of PBW and whitefly.

**Insecticides** : Variable  
**Lay out** : RCBD  
**Replicates** : 3  
**Year of Expt.** : First

##### Observations:

- Plant structure
- Leaf physiology and morphology

#### 4.6 Monitoring of insecticide resistance

##### Objectives:

- To monitor the levels of resistance in field strains of cotton pests
- To develop management strategies

**Year of Expt.** : Continuous

##### Methodology :

- Collection of sucking pests from different locations
- Collection of bollworms from different locations and establishing their culture in the laboratory
- Determining resistance in F1 generation

#### Previous Year's Results

##### ***Amrasca devastans***

LC<sub>50</sub> values were very high for acephate as compared to other tested insecticides in populations of all the locations

##### ***Phenacoccus solenopsis***

LC<sub>50</sub> value of pyriproxyfen was comparatively higher as compared to other tested insecticides.

##### ***Oxycareus hyalinipennis***

LC<sub>50</sub> values for actamiprid followed by profenophos found to be very high as compared to other insecticides.

##### ***Bemisia tabaci***

Results showed moderate to very high LC<sub>50</sub> values for all the tested insecticides. These LC<sub>50</sub> values indicate resistance development to the tested insecticides in various locations. Hence, there is a dire need to develop and imply insecticide resistance management (IRM) strategies.

#### 4.7 Screening of new and commercially available insecticides

##### Objective:

To determine comparative efficacy of new and commercially available insecticides against major insect pests

**Insecticides** : Variable  
**Lay out** : RCBD  
**Replicates** : 3  
**Location** : CCRI, Multan / Farmer's field  
**Year of Expt.** : Continuous

#### 4.8 Projects (Punjab Agriculture Research Board (PARB))

##### 4.8.1 Studies on Pink bollworm

##### Activities:

1. Rearing technology
2. Diapausing and cyclic behavior of PBW
3. Efficacy of different insecticides against PBW in field and lab conditions
4. Identification /import and rearing of PBW predators and parasites
5. Impact of pesticides on the crop physiology/shape/canopy
6. Optimum BT toxin required for PBW control in existing cotton varieties.
7. Optimum timing and stage of spray against PBW
8. Topping fifty days before last picking and its impact on PBW infestation
9. Bt Resistance Monitoring



10. Study behavior on BT and non BT paired plots
11. Modelling of PBW epidemiology dynamics
12. Onset of PBW attack
13. Weather variables and relationship of PBW

#### **4.8.2 Studies on Whitefly**

1. Rearing Technology
2. Surveys of alternate host plants
3. Planting time evaluation
4. Efficacy of different insecticides against WF in field and lab conditions
5. Varietal screening for Plant resistance against WF
6. Micro-nutrient effects on plant physiology and association with WF incidence
7. Resistance monitoring
8. Identification and evaluation of high quality adjuvants

#### **4.9 Project (ALP)**

##### **4.9.1 Studies on dusky cotton bug**

1. Monitoring of dusky cotton bug population in relation to crop position and farmers practices in core and noncore cotton zones of the Punjab during cotton period
2. Qualitative and quantitative impact of pest infestation on early and normal sown crop in sprayed and control condition
3. Assessment of losses caused by dusky cotton bug in field controlled cage condition
4. Host plant resistance studies
5. Spray regime with suitable insecticides
6. Insecticide resistance monitoring against dusky cotton bug
7. Screening of insecticides from different groups of commercially available insecticides



## 5. PLANT PATHOLOGY SECTION

### 5.1 Survey on Prevalence of Diseases and Collection of Diseased Plant samples

#### Objective:

- i) To estimate the incidence and severity of cotton leaf curl Disease (CLCuD) and other diseases in cotton growing areas.
- ii) To collect the diseased cotton plants and other alternate hosts of CLCuV for virological studies.

#### Detail:

- i) Documentation of CLCuD incidence and severity on cotton varieties.
- ii) Collection of samples of cotton and other possible alternate hosts of whitefly infected with CLCuV

### 5.2 Evaluation of NCVT against CLCuD.

#### Objective

Evaluation of cotton varieties /strains for their reaction to CLCuD and other diseases .

#### Detail

- i) The material developed by the breeding, Cyto-genetics and other stations to be screened against CLCuD.
- ii) Confirmation of resistant material for their resistance to CLCuD through petiole-graft-transmission technique.

**Year of Experiment:** Continuous

#### Previous Year's Results

- i) 213 lines included in NCVT, National Coordinated Hybrid Trial, Bt Trial, PCCT and Standard Varietal Trials, except one line in NCVT all others showed susceptibility to CLCuD under field conditions.
- iii) Out of 48 US germplasm only one line shows highly tolerance to CLCuD under field condition.

### 5.3 Epidemiological Studies of CLCuD.

#### Objective:

To findout the factors for incidence and severity progression of Cotton Leaf Curl Disease

#### A: None Bt Genotypes

#### Treatments

(a) Sowing Date = 6  
[March 01, March 15, April 01, April 15, May 01, May 15]

(b) Genotype = 3  
[Cyto-226, Cyto-164 and CIM-610]

**Layout** : Split plot  
(main: sowing date)

**Repeats** : 3

#### Detail:

- i) Data on incidence of disease at fortnightly interval after sowing.
- ii) Main stem height
- iii) Data on weather parameters

**Year of Experiment** : Second  
(In Collaboration with Agronomy Section)

#### Previous Year's Results

- i) The progression of disease was gradually low on crop planted earlier, whereas the progression was sharply high on crop planted in June.
- ii) Average across cultivars, minimum disease index was recorded on crop planted on 15<sup>th</sup> April
- iii) Averged across sowing time, minimum disease incidence was observed in cv Cyto -164 and Cyto-226 as compare to CIM-610
- iv) Fortnightly increase of disease when compare with weather parameter, it indicates that disease incidence was maximum in 15<sup>th</sup> May and June 1<sup>st</sup> planting
- v) Maximum temperature 33.6~36.1°C and minimum temperature 23.4 ~ 26.0 with relative humidity 86.8 %~89.1 % favoured the increase of fortnightly increase of CLCuD.

## B: Bt Genotypes

### Treatments

(a) Sowing Date = 6  
[March 01, March 15, April 01, April 15,  
May 01, May 15]

(b) Genotype = 6  
Cyto-535, Cyto-533, CIM-785, CIM  
775, CIM875, Cyto-179,

**Layout** : Split plot  
(main: sowing date)

**Repeats** : 3

### Detail:

- i) Data on incidence of disease at fortnightly interval after sowing.
- ii) Main stem height
- iii) Data on weather parameters

**Year of Experiment** : Second  
(In Collaboration with Agronomy Section)

#### Previous Year's Results

- i) The progression of disease was gradually low on crop planted earlier, whereas the progression was sharply high on crop planted in 15<sup>th</sup> May.
- ii) Average across cultivars, minimum disease index was recorded on crop planted on 15<sup>th</sup> March.
- iii) Averged across sowing time, all cultivars showed susceptibility against CLCuD. Fortnightly increase of disease when compare with weather parameter, it indicates that disease incidence was maximum in 1<sup>st</sup> May and 15<sup>th</sup> May planting
- iv) Maximum temperature 33.6~36.1°C and minimum temperature 23.4 ~ 26.0 with relative humidity 86.8 %~89.1 % favoured the increase of fortnightly increase of CLCuD.

## 5.4 Evaluation of Advanced Strains in National Co-ordinated Varietal Trial (NCVT) in tolerance to Cotton Diseases.

### Objective:

To determine comparative resistance/tolerance of NCVT strains to different diseases of cotton.

### Details:

Data on following diseases:

- Stunting
- Cotton Leaf Curl .
- Bacterial Blight
- Wilt
- Boll rot

**Year of Experiment** Continuous

#### Previous Year's Results

- i) All strains showed susceptibility against CLCuD except one strain.
- ii) In Set A Minimum disease severity was recorded in 1906 and minimum disease index was recorded in 1918.
- iii) In Set B All the NCVT strains found highly susceptible to cotton leaf curl disease. Minimum disease incidence and index was recorded in 1942 and disease severity was recorded in 1941
- iv) In Set C All the NCVT strains observed highly susceptibility to cotton leaf curl disease. Minimum disease severity and disease index was recorded in 1962. Maximum, disease boll rot incidence (1.8 %) was observed in 1961.
- v) In Set D All the NCVT strains found highly susceptible to cotton leaf curl disease except 1987 was highly tolerant. Minimum disease incidence and disease index was recorded in 1987. Maximum CLCuD severity and disease index was observed in 2001
- vi) Strains were little affected by stunting and boll rot.

## 5.5 Studies on cotton seed germination and seedling diseases of cotton.

### Objective:

- i) Effect of Plasma treatment on seed germination and Seedling diseases of cotton.

### Details:

Treat the seeds of cotton with different gasses at different time duration to estimate its effect on seed germination and Seedling mortality.

**Year of Experiment:** First

## 5.6 Cotton Leaf curl virus management using Allelopathic plants extract

### Objective:

- i) To enhance yield by managing the CLCuD Vector through allelopathic Plants



**Details:**

- i) T1 Neem (*Azadirachta indica*) seed kernel extracts (20g)
- ii) T2 Pyrethrin (*Chrysanthemum cinerariifolium*) flower extracts (20g)
- iii) T3 citronella (*lemongrass*) extract (20)
- iv) T4 Chilli (*Ipomoea carnea*) extracts (10g)
- v) T5 Garlic (*Allium sativum* L.) extracts (10g)

- vi) T6 Tobacco (*Nicotiana tabacum*) leaf extracts (10g)
- vii) T7 Mustard (*Brassica nigra*) seed extract (20g)
- viii) T8 Untreated control
- ix) Data of disease incidence and yield

**Year of experiment** First

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## 6. PLANT PHYSIOLOGY / CHEMISTRY SECTION

### 6.1 Studies on genotype - Environment Interactions

#### 6.1.1 Adaptability of genotypes to high temperature stress

##### Objectives

- (i) Comparative performance of promising genotypes under high temperature stress
- (ii) To quantify physiological traits contributing to heat tolerance

##### Treatments

<b>Genotypes</b>	:	Promising
<b>Planting date</b>	:	mid-April
<b>Design</b>	:	RCB
<b>Replications</b>	:	3
<b>Year of experiment:</b>		Continuous

##### Observations:

- Physiological traits contributing to heat tolerance
- Seed cotton yield and its parameters.

##### Previous year's Results

1. A total of 24 genotypes were tested against thermal stress tolerance under field conditions.
2. The genotypes GH-Hamaliya, CRIS-682, CIM-775, NIAB-1011 and Cyto-535 performed better in terms of heat-tolerance by maintaining highest dehiscence of anthers, fruit setting on first and second positions along sympodia and seed cotton production.
3. There were positive relationships of fully dehiscent anthers, pollen viability, percent boll set on 1<sup>st</sup> and 2<sup>nd</sup> position along sympodia with seed cotton yield.
4. The parameters such as cell injury, cell membrane thermostability had negative correlations with seed cotton yield.

#### 6.1.2 Evaluation of stress alleviating chemicals in cotton under heat stress conditions

##### Objectives

- i) To improve heat tolerance in variable cotton genotypes by the use of stress alleviating chemicals
- ii) To quantify physiological and biochemical traits contributing to heat tolerance

Tr.	Bio-chemicals	Dose
T1	Control	Water alone
T2	Indole-3-acetic acid (IAA)	80mg/L
T3	Hydrogen peroxide (H <sub>2</sub> O <sub>2</sub> )	30 mg/L
T4	Salicylic Acid (SA)	50 mg/L
T5	Moringa Leaf Extract (MLE)	30 ml/L
T6	Ascorbic Acid	150 mg/L

The experiment will be divided into two sets prior to sowing:

Set-I: Non-heat treated seed

Set-II: Heat treatment of seed

Bio-chemicals will be applied by foliar method

<b>Genotypes</b>	:	2
<b>Planting date</b>	:	mid-April
<b>Design</b>	:	split-plot
<b>Replications</b>	:	3
<b>Year of experiment:</b>		2 <sup>nd</sup>

##### Observations:

- Physiological traits contributing to heat tolerance
- Seed cotton yield and its parameters

##### Previous year's Results

1. All six different bio-chemicals tested were found to improve heat tolerance in both CIM-678 and M1-18 cotton genotypes.
2. Maximum yield was obtained in plots where three sprays of Salicylic Acid (SA) @ 50 mg/L were done. Seed cotton yield increased, with SA applications, from 1291 to 1372 kg ha<sup>-1</sup> in M1-18 and from 1372 to 1650 kg ha<sup>-1</sup> in CIM-678, respectively.
3. Improvement in yield by SA application was 6.3% in M1-18 and 26.3% in CIM-678 over control.

#### 6.1.3 Characterization of cotton germplasm for heat tolerance

##### Objective:

- To screen the cotton germplasm for heat tolerance characteristics

<b>Sowing date</b>	:	mid-April
<b>Design</b>	:	RCBD
<b>Target entries</b>	:	200
<b>Year of experiment:</b>		2 <sup>nd</sup>

##### Observations:

- Cell injury
- Anther dehiscence

(In collaboration with Breeding Section)

##### Previous year's Results

Relative cell injury (RCI%) were determined in 199 accessions of the cotton genepool entries. On the basis of RCI%, 30 entries were characterized as tolerant, 86 as medium tolerant and 83 as heat sensitive entries.

### 6.2 Soil Health and Plant Nutrition

#### 6.2.1 Long term effects of reduced tillage on soil health and cotton-wheat/ berseem productivity

##### Objectives:

- i) To evaluate the effects of reduced tillage on soil health and crop productivity
- ii) To lower cost of production

**Treatments**

Cotton - Wheat		Cotton - Berseem	
NT	RT	NT	RT

NT: normal tillage, RT: Reduced tillage

**Duration** : 5 years

**Planting time:** mi-April

**Area:** 1 Acre

**Observations:**

- Pre-sowing and post-harvest soil analyses
- Crop growth and productivity
- Cost analysis

**6.2.2 Does phosphorus application time affect root development and cotton productivity?**

**Objectives**

- i) To determine the appropriate time of phosphorus application in cotton
- ii) Phosphorus use efficiency in relation to application time

Tr.	Application time		
	Pre-Sowing	25 DAP	50 DAP
T1	0	0	0
T2	50	x	x
T3	x	50	x
T4	x	25	25

Phosphorus dose @ 50 kg P<sub>2</sub>O<sub>5</sub>/ha

**Design** : RCBD

**Variety** : Two

**Year of experiment:** 2<sup>nd</sup>

**Location** : CCRI, Multan

**Planting time:** mid-April

**Observations**

- Pre-sowing and post-harvest soil analyses
- Plant structure
- Root growth & development
- Fruit production
- Dry matter yield
- P concentration and uptake by cotton plant
- Seed cotton yield

**Previous year's studies**

1. P application time showed variable response in both genotypes. Seed cotton yield and its components were improved in plots where delayed and split doses of P were applied. The plot receiving P ½ at 25 DAP & ½ at 50 DAP produced 1997 and 1682 kg ha<sup>-1</sup> seed cotton, 23 and 15 bolls per plant, 2.29 and 3.22 g boll weight in Cyto-511 and Cyto-535, respectively.
2. Improvement in seed cotton yield in plot that receiving P ½ at 25 DAP and ½ at 50 DAP was 17.6% and 12.5% in Cyto-511 and Cyto-535,

respectively as compared to pre-planting P application. Between the genotypes, CYTO-511 produced the maximum seed cotton yield in all treatments.

**6.2.3 Improving resource use efficiency and soil health by integrating seasonal crops in cotton**

**Objectives**

- i. To increase farm income per unit land area
- ii. Efficient utilization of available resources with concurrent improvement in soil health

**Treatments**

T1	Cotton-sole
T2	Cotton-straw mulch
T3	Cotton-Rice
T4	Cotton-Soybean
T5	Cotton-Cluster bean

**Design** : RCBD

**Variety** : 1

**Year of experiment:** 1<sup>st</sup>

**Location** : CCRI, Multan

**Sowing time** : mid-April

**Observations**

- Pre-sowing & post-harvest soil analyses
- Plant structure and yield
- Soil temperature
- soil bulk density
- water holding capacity
- Harvest index
- Land equivalent ratio
- Area time equivalent ratio,
- Cotton equivalent yield

**6.3 Plant-Water Relationships**

**6.3.1 Adaptability of genotypes to water stress conditions**

**Objectives**

- i) Evaluating the performance of transgenic genotypes under water stress conditions
- ii) Quantifying physiological traits contributing to water stress tolerance

**Treatments:**

**Irrigation levels** : 2

No stress : [(-1.6 ± 0.2 MPa LWP (ψ<sub>w</sub>)]

Water stress : (-2.4 ± 0.2 MPa LWP ψ<sub>w</sub>)

**Genotypes** : Multiple

**Design** : Split plot (Main: Irrigation levels)

**Replications** : 4

**Year of expt.** : Continuous

**Location** : CCRI, Multan

**Sowing time** : mid-April

**Observations**

- Crop growth parameters
- Gas exchange characteristics
- Seed cotton yield and its parameters

- Relative water content
- Water use efficiency
- Fibre quality

#### Previous year's studies

1. Twelve cotton genotypes were tested under normal irrigation and water deficit stress conditions.
2. The genotypes showed variable response to applied irrigation water levels. Seed cotton yield varied from 1572 to 2417 kg ha<sup>-1</sup> in normal irrigated crop while the yield ranged from 1007 to 1945 kg ha<sup>-1</sup> under water deficit condition in different genotypes. Genotype CIM-785 produced the maximum seed cotton yield of 2417 kg ha<sup>-1</sup> in no stress while the highest yield of 1945 kg ha<sup>-1</sup> under water stress was produced by GH-Deebal.
3. Imposition of water stress caused an average decrease of 23.2% in seed cotton yield, 9.2% in boll weight and 18.4% in bolls per plant.

#### 6.3.2 Exogenous application of bio-chemicals to improve drought tolerance in cotton

##### Objectives:

- i) To evaluate the role of bio-chemicals in eliminating adverse effects of drought stress
- ii) Quantification of drought related parameters influenced by applied bio-chemicals

<b>Design</b>	:	Split-split plot
<b>Replications</b>	:	3
<b>Varieties</b>	:	2
<b>Year of expt</b>	:	1 <sup>st</sup>
<b>Sowing time</b>	:	mid-April

##### Treatments

Tr.	Bio-chemicals	Dose
T1	Control	Water alone
T2	AgNO <sub>3</sub>	40 µM
T3	γ-amino butyric acid	100 µM
T4	Acetic acid	50 mM
T5	Calotrope Leaf Ext.	50 ml/L
T6	Methyl Jasmonate	40 µM

##### Observations

- Physiological traits
- Water use efficiency
- Fiber traits
- Seed cotton yield

#### 6.4 Seed Physiology

##### 6.4.1 Effect of foliar applied bio-chemicals in improving the cottonseed health and quality

##### Objective

- i) To evaluate the efficacy of applied bio-chemicals on seed health and transgenic cotton production
- ii) To quantify physiological and biochemical traits of cotton seed health

##### Methodology

The experiment will be divided into two sets:

Set-I: Non-heat treatment

Set-II: Heat treatment prior to sowing

(Bio-chemicals will be applied by 3 foliar sprays)

##### Treatment

Tr.	Bio-chemicals	FS Dose
T1	Control	Water alone
T2	IAA	80 mg/L
T3	Hydrogen peroxide	30 mg/L
T4	Salicylic Acid	50 mg/L
T5	Moringa Leaf Ext.	30 ml/L
T6	Ascorbic Acid	150 mg/L

<b>Design</b>	:	Split-plot
<b>Replications</b>	:	3
<b>Variety</b>	:	Promising
<b>Date of sowing</b>	:	Mid, April 2020
<b>Year of Expt.</b>	:	1 <sup>st</sup>

##### Observations

- Plant structure development
- Fruit production
- Seed cotton yield and components
- Seed health parameters

## 7. TRANSFER OF TECHNOLOGY

### 7.1 Integrated Multi-Media Publicity Campaign

- Objectives :
- i) Development of multi-media publicity materials on seed technology & cotton production technology.
  - ii) Use of mass media campaign to disseminate the new technology/research findings to various target groups.
    - ◆ Extension workers/staff
    - ◆ Cotton growers
    - ◆ Field staff of private pesticide / fertilizer / seed industry
    - ◆ Students from Agriculture Colleges/ Universities
      - Staff & farmers working under Non-government organizations(NGO's)

#### 7.1.1 Print Media

##### A Publications

- i) Management of cotton cultivars
- ii) Recommendations for better germination of cotton seed
- iii) *Kapaas mein Potash ki Ahmiyat*
- iv) Management of sucking pests
- v) Management of bollworms
- vi) Weed management in cotton
- vii) Production technology for approved CCRI varieties.
- viii) Balanced use of fertilizers
- ix) Management of Mealy bug
- x) Management of CLCuV
- xi) Importance of nozzle for better spray coverage (insecticide & weedicides).
- xii) Micronutrients
- xiii) Production technology of Bt. cotton
- xiv) Clean cotton picking and its storage.
- xv) Articles on various aspects of cotton production for newspapers, magazines and journals
- xvi) Preparation of technical reports

##### B Press Releases

Variable.

#### 7.1.2 Electronic Media

##### A T.V. Programs

- i) Participation of scientists/experts in agriculture programs of different channels
- ii) TV Tellops
- iii) TV Discussion
- iv) Video stock-shots of different cultivation practices in cotton.

##### B Radio Programs

Dissemination of new cotton production technology for cotton growers and other stakeholders by the scientists of the institute through radio programs

##### C New Studio-Setup

To make a new studio-setup in a recording room

##### D. Farmers Advisory Committee (FAC)

Fortnightly farmers advisory committee will be continued

### Previous Year's Activities

1. سٹنٹرل کائن ریسرچ انسٹیٹیوٹ، ملتان۔۔۔۔ ایک تعارف	= 2000
2. Bt. CIM-343	= 2000
3. Bt. CIM-343	= 2000

Programs	Number
<b>Radio Programs</b>	
Radio Talks	04
Radio Interview	02
Group Discussion	02
Radio News/Press releases	56
<b>TV Programs</b>	
Interview/Programs	35
TV / Press Coverage	17
Meetings / Seminars	
Press releases	56
Articles in newspapers & magazines	09
Press Report	01

### 7.1 Training Programs

Objectives : Training Programs / Refresher Courses for

- i) Cotton Production Technology
- ii) Best agronomic practices for cotton production
- iii) Soil Fertility & Health
- iv) Organic Cotton Cultivation
- v) Cotton Mealybug and its Management
- vi) "Best Management Practices for Persistent Organic Pollutants"
- vii) Weed Management
- viii) Advanced breeding techniques for variety evolution
- ix) Production Technology of new approved commercial cotton varieties
- x) Seed Technologies
- xi) Seed Health and nutrient management
- xii) integrated pest management
- xiii) Management of cotton diseases
- xiv) Cotton crop management
- xv) Causes of fibre traits deterioration in Pakistan
- xvi) Management of PBW & sucking insect pests

7.2 Target : i) Officers and staff of the Department of Agriculture Extension

- ii) Cotton growers
- iii) Technical / Field staff of pesticide, fertilizer & seed industry.
- iv) Staff & cotton growers working under NGO's

- Activities :
- ◆ Planning, development and execution of training / refresher courses
  - ◆ Production for training materials

### Previous Year's Activities

Organized/ Coordinated by	Participant	No. of Participants
Agri.(Ext.), Punjab & CCRI ,Multan	Master Trainees	12
Agri.(Ext.), Sindh & CCRI ,Multan	Master Trainees	20
CCRI & SANGTANI, (NGO)	Master Trainees	32
Ministry of Climate Change, UNDP and CCRI Multan	Master Trainees	34
PCSI ,Multan	Cotton Selectors	30
WWF & CCRI	i. Master Trainees	151
	ii. Farmers	864
WWF Pakistan ,	Master Trainee	50
CCRI & Agriculture Extension Department, Balochistan	i.Master Trainees	182
	ii. Farmers	90
ILO & CCRI, Multan	Master Trainee	23
	Farmers	118
CCRI & FFC	i.Master Trainees	200
	ii. Farmers	1300
Pedaver Foundation (NGO), Lahore & CCRI,Multan	i.Master Trainees	10
	ii. Farmers	55
	Farmers	35

### 7.3 E-mail & face book page CCRI, Multan

- Updating cotton research & development (RD) activities on link [www.facebook.com/CCRIM.PK](http://www.facebook.com/CCRIM.PK)

<b>Email</b>	<b>: <a href="mailto:ccri.multan@yahoo.com">ccri.multan@yahoo.com</a></b>
Email sent	> 331
Email received	> 486

### 7.4 Seminars/Workshops

Participation in seminars, workshops and conferences organized by different institutions:

Previous Year's Activities	
Seminars/ Workshops/Conference	Numbers
<b>Seminars</b>	
i. National	06
iii. Travelling	-
Workshops	02
Conference	02

### 7.5 Other Activities

- Making arrangements of meetings, seminars & workshops.
- Facilitate the visits of dignitaries and students of different institutions.
- Participation in Agricultural Exhibitions.
- Social media activities (face book, Whatsapp & YouTube)
- Use of Infographic technology

Previous Year's Activities	
Meetings	Presided over by
Agriculture Research Sub-Committee (ARSC)	Vice President, PCCC
Cotton Crop Assessment Committee	Federal Secretary, Mintex
National Assembly Standing Committee on Textile Industry	Chairman, Standing Committee
Cotton Crop Management Group (04)	i.Minister Agri.Punjab ii.Sec.Agri.Punjab

### Visits to Institute

Dignitaries/Delegation	Dated
Mr. Bilal Israel Khan and Mr. Ibrahim Khan progressive cotton farmers	01.03.2019
Haji Irfan Ahmad Khan Daha, former minister and Mr. Muhammad Khan Daha, MNA	08.04.2019
2-member agriculture researchers from Pakistan Agriculture Research Council (PARC)	03.05.2019
Prof Dr Idrees Ahmad Nasir, Head, Seed Biotechnology Research Group from Center of Excellence in Molecular Biology (CEMB), Lahore	20.06.2019
Mr. Arif H. Makhdum, Country Manager and Mr. Toheed Ghani Mahesar, Supply Chain Consultant, Cotton Connect Pakistan	26.08.2019
Mr. Bilal Israel Khan and Mr. Ibrahim Khan progressive cotton farmers	01.03.2019
Dr. Abdul Majeed, Country Manager ICARDA; Mr. Muhammad Arshad, Cotton Consultant and Ms Sameera Younas, Consultant, ICARDA	16.09.2019
The delegation from FAO comprising Ms Jessie Fagan, Decent Rural Employment Consultant; Ms Ariane Genthon, Child Labour Expert; Dr. Shakeel Ahmad Khan, Seed Sector Consultant and Mr Jam Muhammad Khalid, Participatory CSA Extension Specialist	25.09.2019
4-member delegation from ICI, Pakistan	05.11.2019
9-member Chinese delegation led by Mr. Wen Wanhe, Group Leader, CMEC International, China	06.11.2019
Dr. Muhammad Anjum Ali, Director General Agriculture (Ext.) Punjab	02.12.2019
Mr. Muhammad Yasin, Cotton Botanist CB from Cotton Research Institute, Khan Pur and its team ; Mr. Taj Muhammad, Assistant Agronomist, Dr. Abdul Khaliq, and Mr. Abdul Raof, ARO.	10.12.2019
Mr. Manzoor Hussain Soomro, Agriculture Specialist SIAPEP, Hyderabad Sindh; Dr. Abdul Sattar Buriro, Coordinator Exposure	15.12.2019
Makhdum Ahmad Alam Anwar, former chairmanship National Assembly Standing Committee on Agriculture	20.01.2020

Mr. Bilal Israel, Progressive Grower & Dr. Muhammad Shakeel, Entomologist	23.01.2020
Mr. Mirpayoz Mirsaatov, Head, Foreign Economic Relations Department, Uzbekistan Agrotech Trading Company	26.01.2020
Dr. Khalid Abdullah, Vice President, PCCC	27.01.2020
Ms Rabia Sultan, progressive cotton farmer from Muzafargarh	02.02.2020

Institutions	No. of Participants
University of Agriculture, Faisalabad	384
University College of Agriculture, BZU, Multan	27
Agricultural Training Institute, Karor, Layyah	44
Pak German Polytechnic Institute for Agriculture Technology, Chak 5 Faiz, Multan	36
Govt.College of Technology ,Textile department ,DAE	49

Presentations	
Multimedia slides for presentations for Meetings / seminars/Workshops etc	>3407

#### 7.6 Tele-Cotton Activities

Previous Year's Activities	
Tele-Cotton SMS	42
No.of Clients	>22000

#### 7.7 Agriculture Show/ Mela

Previous Years Activity		
Date	Organized by	Venue
October 9-10,2019	MNSUA,Multan	MNSUA,Multan





Treat-ments	Bio-chemicals	Dose
T1	Control	Water alone
T2	Indole Acetic Acid (IAA)	80 mg/L
T3	Hydrogen peroxide (H <sub>2</sub> O <sub>2</sub> )	30 mg/L
T4	Salicylic Acid (SA)	50 mg/L
T5	Moringa Leaf Extract (MLE)	30 ml/L
T6	Ascorbic Acid	150 mg/L

Bio-chemicals will be applied by foliar method

**Genotypes** : 2 (M1-18 & CIM 678)

**Design** : RCB

**Year of experiment:** 2<sup>nd</sup>

**Methodology:**

- iv. Collections of opened bolls.
- v. Ginning of seed cotton samples for various fibre characteristics.
- vi. Testing of fibre characteristics

**Observations:**

- Lint %
- Fibre Length
- Uniformity Index
- Micronaire Value
- Fibre Strength
- Colour Grade

(Collaboration: Plant Physiology/Chemistry Section)

**8.5 Quality survey of lint collected from ginning factories**

**Objective:**

A quality survey will be conducted to know the lint quality of the ginning factories during the cotton season.

**Methodology:**

- Collection of lint samples from the ginning factories of different districts in Punjab.

**Observations:**

- Fibre Length
- Uniformity Index
- Micronaire
- Fibre Strength
- Colour Grade

**Year of Experiment:** Continuous

**8.6 ICA-Bremen Cotton Round Test Program, Faser Institute, Germany**

**Objective:**

To keep the fibre testing equipment in calibrated form. Moreover, to examine analysis of fibre at par with other fibre testing facilities in the world.

**Detail:**

Three lint samples will be received from the Faser Institute, Bremen, Germany. The samples will be tested for different fibre characteristics. The results will be sent to Faser institute, Germany for comparative analysis.

**Year of Experiment:** Continuous

03 samples were received from Faser Institute, Germany for fibre analysis during the period under report.

**8.7 Collaborative Study with Spinning Industry**

**A:** To collect data regarding the consumption of cotton fibre with special reference of the cotton fibre traits and others fibres as well, in industry to focusing the Economics comparatives.

**Methodology:**

A comprehensive questionnaire will be shared to keeping in-view all the set objectives and industry will be visited to collect the required data.

**B:** \*Development of Artificial neural network-based system for intelligent prediction of the potential of high yielding as well as high quality indigenous cotton varieties/genotypes.

\*(Subject to the approval of project)

## 9. STATISTICS SECTION

### 9.1 Experimental Design Layout.

#### Objective:

To make lay out plan for field experiments which will be conducted by different sections of Central Cotton Research Institute Multan. The facility will also be provided to various Research Stations of Pakistan Central Cotton Committee.

#### Detail:

In collaboration with sections of the institutes lay out plan for different experimental design will be chalked out. Data tables of experiments will be analyzed statistically.

<u>Previous Year's Work</u>	
R.C.B.D.	165
Split-Split Plot.	13
F-Pool	9
Regression.	--
Corelation	--
Graphical Representation	--
<b>Total:</b>	<b>187</b>

### 9.2 Statistical Analysis

#### Objective:

To perform statistical analysis of experimental data provided by sections of the institute. The analysis facility will also be provided to Cotton Research Stations of PCCC. Guidance will be provided for the interpretation of the analysis.

### 9.3 Design and analysis of NCVT

#### Objective:

The Directorate of Research Pakistan Central Cotton Committee performs National Coordinated Varietal Trail at fourteen locations all over Pakistan. The layout of the experiment will be made and analysis will be performed by this section.

<u>Previous Year's Work</u>	
R.C.B.D. (NCVT)	118

### 9.4 Maintenance of Cotton Statistics

#### Objective:

To maintain the record of cotton statistics and rates of cotton commodities.

#### Detail:

The record of cotton statistics and daily rates of cotton commodities will be maintained.

**Year:** Continuous

<u>Previous Year's Prices</u>	
(Average Price Rs per 40 Kg at Multan)	
Seed cotton	3892
Cottonseed	1690
Cottonseed Cake	1850
Lint	9470

#### Source:

Market Committee Multan.  
(October 2019 to January 2020)

### 9.5 Study of factors affecting the cotton lint rate in Pakistan

#### Objective:

The main objective of this experiment is to identifying different factors and study their relative influence on cotton lint rate.

**Year:** Second.

### 9.6 Cost of cultivation for Cotton and major substitutive crops.

#### Objective:

To study the comparison of per acre cost for production of cotton and its major substitute crops namely Sugarcane, Maize and Sunflower etc.

**Year:** First.

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