ANNUAL PROGRAM OF WORK

2019-2020

CENTRAL COTTON RESEARCH INSTITUTE, MULTAN

ANNUAL PROGRAM OF WORK

2019-20

CENTRAL COTTON RESEARCH INSTITUE, MULTAN
Pakistan Central Cotton Committee
Ministry of National Food Security & Research
Government of Pakistan

C O N T E N T S

PREFACE

The Annual Programme of Research Work for the year 2019-2020 of Central Cotton Research Institute, Multan has been prepared keeping in view cotton production problems / constraints which limit the growers to improve cotton productivity and their profitability. 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 and technology dissemination.

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

DR. ZAHID MAHMOOD
Director
Central Cotton Research Institute
Multan

March, 2019

COTTON RESEARCH & DEVELOPMENT PLANS 2019

Central Cotton Research Institute, Multan

Cotton crop has been facing many challenges during the current decade. The crop remained vulnerable to the vagaries of climatic stresses, outbreak of Pink bollworm, whitefly, bugs and cotton leaf curl virus disease. CCRI, Multan remained proactive in mitigating cotton crop challenges by evolving climate resilient and insect pest tolerant varieties. Moreover, the Institute had always endeavored to provide cost-effective cotton production technologies to the farmers using all available means. The efforts have yield fruitful results in skill development of cotton farmers for sustaining cotton productivity.

The annual cotton research programs of the Institute have always been designed keeping in view the current production problems.The 2019 plan of work will encompass varietal development with high yield and tolerance to climatic stresses, high density planting system, insect pests management, insecticide resistance management program, soil health improvement and extension and outreach programs.

By the grace of Almight Allah, the Institute is reaching to its 50th Year of Establishment and plans to celebrate its Golden Jubilee during the year 2020. Efforts will also be made for its preparation during the current year.

Cotton Research Experiments 2019-20

The following cotton research experiments have been proposed for planting during 2019-20 crop season by various research disciplines. Moreover, the developmental activities have also been planned by the sections as listed below:

Section		Experiment
Agronomy	1.	Effect of time of sowing on productivity of advanced genotypes
	2.	Effect of time of sowing on production of transgenic cotton
	3.	Yield response and nitrogen use efficiency of transgenic and conventional cotton cultivars to nitrogen application
	4.	Modeling the cotton genotypes performance at temporal variations
	5.	Cotton yield response to residues management and tillage systems in cotton-wheat cropping system
	6.	Cotton yield and fiber quality response to high density planting system (HDPS)
	7.	Efficacy of pre and post plant herbicides application for weed control in cotton
	8.	Screening of pre- and post emergence weedicides in cotton
Plant Breeding & Genetics	1.	Testing of New Strains Developed at CCRI, Multan
	2.	Standard Varietal Trial
	3.	Testing of Promising Strains of Cotton Breeders under National Coordinated Variety Testing Programme
	4.	Raising Hybrids.
	5.	Performance of Promising Strains in Bigger Block
	6.	Screening of Breeding Material against CLCuD
	7.	Maintenance of Genetic Stock of World Cotton Collection
	8.	Screening of cotton germplasm CLCuV resistance, economic traits, along with Heat and Drought tolerance
	9.	Mutation Breeding
	10.	Exploitation of out crossing in cotton
	11.	Screening of US germplasm for CLCuV
Cytogenetics	1.	Collection and maintenance of *Gossypium* germplasm
	2.	Species hybridization

	3.	Colchiploidy
	4.	Search for Aneuploids/haploids
	5.	Search for *Bt* homozygous resistance against CLCuD under field conditions
	6.	Testing of Cyto-material in
	7.	Testing of Cyto-material in varietal trial-1
	8.	Mapping population development for CLCuV resistance
	9.	Production of Pre-basic Seed
	10.	Evaluation of new strain under varied ecological zones
Entomology	1.	Impact of sowing period on the PBW infestatio
	2.	Monitoring of population dynamics of different lepidopterous pests
	3.	Studies on tolerance level of cotton genotypes to sucking insect pest complex
	4.	National Coordinated Varietal Trials
	5.	Monitoring of insecticide resistance
	6.	Screening of new and commercially available insecticides
	7.	Activities under Projects
Plant Pathology	1.	Survey on Prevalence of Diseases and Collection of Diseased Plant samples
	2.	Evaluation of Breeding Material against CLCuD
	3.	Epidemiological Studies of CLCuD
	4.	Evaluation of Advanced Strains in National Co-coordinated Varietal Trial (NCVT) in tolerance to Cotton Diseases.
Plant Physiology / Chemistry	1.	Studies on genotype - Environment Interactions
	2.	Plant Nutrition
	3.	Soil-Plant-Water Relationships
	4.	Seed Physiology
Transfer of Technology	1.	Integrated Multi-Media Publicity Campaign
	2.	Training Programs
	3.	E-mail & face book page CCRI, Multan
	4.	Seminars/Workshops
	5.	Tele-Cotton Activities
Fibre Technology	1.	Testing of Lint Samples
	2.	Testing of Commercial Samples
	3.	Effect of different moisture levels on fibre characteristics of cotton cultivars.
	4.	Effect of Potassium fertilizer & water stress on quality characteristics of cotton fibre.
	5.	Role of stress alleviating chemicals on cotton fibre characteristics under heat stress conditions.
	6.	Saw & Roller Ginning Comparison for Cotton Fibre Quality
	7.	Quality survey of lint collected from ginning factories
	8.	ICA-Bremen Cotton Round Test Program, Faser Institute, Germany
	9.	Survey of Pakistan's Spinning Industry
Statistics	1.	Experimental Design Layout.
	2.	Statistical Analysis
	3.	Design and analysis of NCVT
	4.	Maintenance of Cotton Statistics
	5.	Study of factors effecting the cotton lint rate in Pakistan

Activities Planned under Research Projects

Pink bollworm Project : A comprehensive integrated scientific approach for the development of sustainable management strategies of Pink Bollworm (*Pectinophora gossypiella*)

- Rearing Technology
- Diapausing and Cyclic Behavior of PBW
- Efficacy of different insecticides against PBW in field and lab conditions.
- Identification/import and rearing of PBW predators and parasites.
- Impact of pesticides on the crop physiology/shape/canopy
- Optimum Bt toxin required for PBW control in existing cotton varieties.
- Optimum timing and stage of spray against PBW.
- Bt Resistance Monitoring
- Modelling of PBW epidemiology dynamics.
- Weather variables and relationship of PBW

Whitefly Project: Management of whitefly by integrated strategies and development of resistant cotton germplasm through genetic engineering

- Agronomic practices (planting time, spring crops associated with whitefly, weeds or alternative host plants).
- Varietal screening of plant resistance against whitefly.
- Efficacy of different insecticides against whitefly in field and lab condition.
- Resistance monitoring.
- Identification and evaluation of high quality adjuvants

Pak-US-ICARDA Cotton Project "Screening and maintenance of US cotton germplasm for the development of CLCuV resistant/tolerant genotypes by using traditional breeding approaches at CCRI Multan"

- Screening of exotic cotton germplasm for CLCuV resistance/tolerance.
- Evolution of CLCV resistant germplasm using inter- and intera-specific hybridization.
- Characterization of cotton germplasm (according to the Standard protocol of CCRI Multan).
- Preservation of newly imported cotton germplasm along with the local Cotton Germplasm
- Participation in different trainings/conferences and fellowship programs (Local).

Functioning of Insect Rearing Laboratories

- An insect rearing laboratory with controlled temperature light and humidity has been established in the Entomology Section.
- The culture of Whitefly is being maintained on living plants along with developing its susceptible strain.
- Culture of Pink bollworm is also maintained on semi-syntehetic and natural diets.
- In addition, work on developing susceptible strain of armyworm (Spodoptera litura) is also underway.

Insecticide Resistant Management Program

- The Institute continued to conduct studies on Insecticide Resistance Management program in the past. Now, the program has again been started during the year 2018-19.
- Insecticide has been tested against various insect pests both under laboratory and field conditions.
- The most effective pesticides were advised for sprays to the cotton farmers.

Cotton Biotechnology Program

- Established protocols for different procedures:
  - DNA extraction
  - GEL electrophoresis,
  - Prepared stock solution and working solution,
  - Genomic DNA extraction from cotton leaves,
  - Gel electrophoresis for DNA analysis,
  - DNA quantification on the Spectrophotometer,
  - Qualitative and quantification testing of cotton sample through ELISA for Cry1AC testing of seed cotton for GMO status.
- Streamline & repair of required equipment
- Arrangements for the chemicals
- The advancement in cotton biotechnology will be furthered during the crop season 2019-20.

Establishment of Seed Testing Laboratory

- Seed germination test
- Seed Viability test (Teterazolium)
- Seed Index
- Seed kernel weight
- Pollen viability test
- Formulation of Chemical (solution) for boll setting
- Seed delintation
- Seed packing for short, medium and long term preservation
- Measurement of root-shoot length of Plant seedling for drought tolerance

Provision of Seed for Organic Cotton Cultivation in Baluchistan

- Collaboration with WWF Pakistan, SIA Foundation, Karachi and Agriculture Extension Department, Balochistan for production of organic cotton in Balochistan.
- Moreover, the Institute also will continue providing non-GMO cotton seed for experimentation to the WWF & SIA for experimentation purpose.
- The scientists of the Institute will impart training to the officials from Balochistan in advanced cotton production technology.

Growing Cotton in Hydroponics for Nutrient-Efficiency Studies at CCRI, Multan

- Initiated study of growing cotton in hydroponics to screen germplasm for potassium uptake efficiency.
- Identify potassium efficient and in-efficient cotton genotypes under low to high levels of applied potassium.
- Pot and field trials followed to evaluate the role of K in drought tolerance and its impact on nitrogen uptake.
- Study conducted in collaboration with Department of Soil & Environmental Sciences, MNS University of Agriculture, Multan.

Extension & Developmental Activities

The following extension oriented programs will be carried out during crop season 2019-20.

Training Programs:

- Agriculture Extension Specialists
- Plant Protection Officials
- Pesticide/Seed/Fertilizer Companies

- Textile & Ginning Industry
- Pakistan Cotton Standards Institute
- NGOs
- Farmers

National Seminars

- Cotton Production Technology
- Use of PB Ropes and Management of Pink bollworm
- Cotton Whitefly Management
- Cotton Leaf Curl Virus Management

Cotton Crop Management Group (CCMG)

- Fortnightly Meetings
- Formation of Recommendations for Technical Advisory Committees
- Follow up for implementation of decisions taken in meetings
- Advisory for Farmers through print and electronic media

Farmers Field Day

- Two farmers field days will be organized during crop season 2019-20.

Demonstration of Advanced Machinery

- Mechanical Cotton Picker
- Mechanical Boll Picker
- Stick Puller & Shredder

"Pakistan Cottongrower" Journal

- Increased dissemination of Journal among cotton stakeholders and farmers.
- Inclusion of articles by the cotton specialists working in private sector.

TeleCotton

- The cotton farmers and Agriculture Extension & Research officials from Khyber Pakhtunkhwa and Balochistan will be added in the list.
- Technical Staff of private pesticide and seed companies will also be added in the list.

Gold Jubilee Celebrations (1970-2020)

- Planning for arragnements during 2020
  - Holding of National Seminars
  - Mega Farmers Gatherings
  - Cotton Scientists Alumini formation
  - Rennovation of Labs, Main Building, Hostels, Auditorium, Seminar Hall

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1. AGRONOMY SECTION

1.1 Effect of time of sowing on productivity of advanced genotypes

Objective:

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

Treatments:

(a) Sowing Date = 5
[April 15, May 01, May 15, June 01, June 15]

(b) Genotypes = 3
[Cyto-226, Cyto-227, CIM-610]

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

Replications : 4

Plot size : 20' x 30'

Year of Expt. : 1st

Observations:

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

Previous Year's Results

- Crop planted on 15th April produced maximum yield (2994 kg ha^{-1}), while minimum by 15th June (1696 kg ha^{-1}).
- Averaged across the sowing dates CIM-717 produced significantly higher seed cotton yield than Cyto-161 and CIM-620.
- The reduction in yield was 10%, 16%, 34% and 43 % by delay in sowing of crop.

1.2 Effect of time of sowing on production of transgenic cotton

Objective:

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

Treatments:

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

(b) Genotypes = 6
[*Bt.* CIM-789, *Bt.* Cyto-511, *Bt.* CIM-678, *Bt.* CIM-303, *Bt*. Cyto-510 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 1st March produced maximum yield (4012 kg ha^{-1}), while minimum by 15th May (2830 kg ha^{-1}).
- Averaged across the sowing dates, *Bt*.Cyto-511 produced significantly higher seed cotton yield than *Bt*. CIM-789, *Bt.* CIM-663, *Bt.* CIM-343, *Bt.* Cyto-515 and *Bt*. Cyto-179.
- The reduction in yield was 5%, 15%, 18%, 24% and 30% by delay in sowing.

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

Objective:

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

Treatments

(a) **Genotypes** = 5
[Cyto-226, Cyto-227, *Bt.* CIM-789, *Bt.* Cyto-511 and *Bt.* CIM-678]

(b) **Nitrogen** = 5
[0, 75, 150, 225, 300 kg N ha^{-1}]

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

Replications : 3

Plot size : 20' x 30'

Sowing date : 2nd week of May

Year of Expt. : 1st

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^{-1} gave increase in yield than 0, 75, 150 and 225.
- The genotype *Bt.*CIM-343 produced significantly higher seed cotton yield than *Bt*.CIM-663, *Bt*.Cyto-515, CIM-717 and Cyto-161.
- The genotype *Bt*.CIM-343 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 adoptability

Treatments:

Main plot: Temporal variations: 04
I. Mid March
II. Mid April
III. Mid May
IV. Mid June

Genotypes: 03
I. *Bt.* Cyto-511
II. *Bt.* CIM-789
III. *Bt.* Cyto-179

Layout: Split plot

Plot size: Available experimental area

Year: 2nd

Observations:

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

Previous Year's Results

- Crop planted on 15th March produced maximum seed cotton yield (3854 kg ha^{-1}), while minimum yield by 15th June (1979 kg ha^{-1})
- 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 14%, 27% and 49%.
- 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-511 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. Chiseling and conventional

Layout: Split plot

Plot size: Available experimental area

Sowing time: Mid May

Variety: *Bt.* Cyto-179

Year: 2nd

Observations:

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

Previous Year's Results

- The experiment is in process and cotton sticks have been incorporated at the rate of 2150 kg ha^{-1} and tillage system are also being applied according to treatment

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: 1st week of May

Genotypes: *Bt.* CIM-343 and *Bt.* Cyto-313

Year of exp.: 2nd

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 seed cotton yield was decreased by widening the plant to plant spacing
- The seed cotton yield was decreased from 2927 to 2342 kg ha^{-1} by increasing plant to plant spaces from 15.0 to 30.0 cm

1.7 Efficacy of pre and post plant herbicides application for weed control in cotton

Objective:

To find out the effect of various pre and post emergence herbicides on weed control in cotton.

Treatments:

Main plot: Pre-plant herbicides

T_1: No herbicide (conventional method), **T_2:** Glyphosate (pre-plant) and **T_3:** Paraquat (pre-plant)

Sub-plot: T_1: Weedy check, **T_2:** Manual weed control, **T_3:** Pendimethalin (pre-sowing) and **T_4:** Dual Gold (pre-emergence)

Layout : Split plot

Replications : 3

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

Sowing time : 1st week of May

Variety : *Bt*.CIM -179

Year of Expt. : 1st

Observations:

- Weed density
- Weeds fresh and dry mass at 30 and 60 DAS
- Plant structure
- Seed cotton yield and its components

1.8 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 : R.C.B.D

Replications : 4

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

Sowing time : Mid May

Variety : *Bt*.CIM -179

Year of Expt. : **Continuous**

Observations:

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

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2. BREEDING & GENETICS SECTION

2.1 Testing of New Strains Developed at CCRI, Multan

2.1.1 Varietal Trial-1

Objective		Evaluation of medium long staple *Bt.* strains against commercial varieties.
Strains	**5**	CM-1 to CM-5 (5+2 Std)
Standards	**2**	IUB-13, *Bt.*CIM-602
Design		Randomized complete block
Repeats	**3**	
Plot Size		40' x 10'
Locations	**2**	(Multan, Khanewal)
Year of Expt.		Continuous

2.1.2 Varietal Trial-2

Objective		Evaluation of medium long staple *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		40' x 10'
Locations	**2**	(Multan, Khanewal)
Year of Expt.		Continuous

2.1.3 Varietal Trial-3

Objective		**Evaluation of medium long staple non-Bt. strains against commercial varieties.**
Strains	**8**	CM-12 to CM-19 (8+2 Std)
Standards	**2**	IUB-13, Bt.CIM-602
Design		Randomized complete block
Repeats	**3**	
Plot Size		40' x 10'
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	**8**	CM-20 to CM-27 (8+2 Std)
Standards	**2**	IUB-13, Bt.CIM-602
Design		Randomized complete block
Repeats	**3**	
Plot Size		40' x 10'
Locations	**2**	(Multan, Khanewal)
Year of Expt.		Continuous

2.1.5 Varietal Trial-5

Objective		**Evaluation of medium long staple non-Bt. strains against commercial varieties.**
Strains	**6**	CM-28 to CM-33 (6+1 Std)
Standards	**2**	CIM-620
Design		Randomized complete block
Repeats	**3**	
Plot Size		40' x 10'
Locations	**2**	(Multan, Khanewal)
Year of Expt.		Continuous

2.1.6 Micro-Varietal Trial-1

Objective		Evaluation of newly bulked medium long staple *Bt. S*trains against commercial varieties
Strains	**8**	1/2019 to 08/2019
Standard		*Bt.*CIM-602
Design		Randomized complete block
Repeats	**3**	
Plot Size		30 'x 10'
Year of Expt:		First

2.1.7 Micro-Varietal Trial-2

Objective		Evaluation of newly bulked high lint percentage *Bt.* strains
Strains	**8**	9/2019to 16/2019
Standard		*Bt.*CIM-602
Design		Randomized complete block
Repeats	**3**	
Plot Size		30' x 10'
Year of Expt.		First

2.1.8 Micro-Varietal Trial-3

Objective		Evaluation of newly bulked long staple *Bt*. Strains
Strains	**8**	17/2019to 24/2019
Standard		*Bt.*CIM-602
Design		Randomized complete block
Repeats	**3**	
Plot Size		30' x 10'
Year of Expt.		First

2.1.9 Micro-Varietal Trial-4 (Non Bt)

Objective		Evaluation of newly bulked Non *Bt*. Strains
Strains	**8**	25/2019 to 32/2019
Standard		CIM-573
Design		Randomized complete block
Repeats	**3**	
Plot Size		30' x 10'
Year of Expt.		First

2.1.10 Micro-Varietal Trial-5

Objective		Evaluation of newly bulked Non *Bt*. Strains
Strains	**8**	33/2019 to 40/2019
Standard		CIM-573
Design		Randomized complete block
Repeats	**3**	
Plot Size		30' x 10'
Year of Expt.		First

2.1.11 Micro-Varietal Trial-6

Objective		Evaluation of newly bulked strains
Strains	**8**	41/2019 to 48/2019
Standard		*Bt.*CIM-602
Design		Randomized complete block
Repeats	**3**	
Plot Size		30' x 10'
Year of Expt.		First

2.1.12 Micro-Varietal Trial-7

Objective		Evaluation of newly bulked strains
Strains	**8**	49/2019 to 56/2019
Standard		*Bt.*CIM-602
Design		Randomized complete block
Repeats	**3**	
Plot Size		30' x 10'
Year of Expt.		First

2.2.1 Standard Varietal Trial-I

Objective		To test the performance of commercial varieties under Multan conditions
Varieties	**7**	CIM-482,CIM-473, CIM-573, Cyto-124, CIM-620 CIM-608, CIM-610
Design		Randomized complete block
Repeats	**3**	
Plot Size		30' x 10'
Year of Expt.		Continuous

2.2.2 Standard Varietal Trial-II

Objective		To test the performance of commercial *Bt*. varieties under Multan conditions
Varieties	**20**	CIM-600, CIM-602, 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		30' x 10'
Year of Expt.		Continuous

2.3 Testing of Promising Strains of Cotton Breeders under National Coordinated Variety Testing Programme

2.3.1 National Coordinated Varietal Trial (Set-A)

Objective		To test the performance of non Bt. strains
Strains		Variable (seed to be provided by PCCC)
Design		Randomized complete block
Repeats	**4**	
Plot Size		30' x 10'
Year of Expt.		Continuous

2.3.2 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		30' x 10'
Year of Expt.		Continuous

2.3.3 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		30' x 10'
Year of Expt.		Continuous

2.3.4 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		30' x 10'
Year of Expt.		Continuous

2.3.1 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

2.3.2 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

2.4 Raising Hybrids.

2.4.1 F_1 Hybrids

Objective		To raise F_2 seed for further selection and screening against CLCuD
Hybrids	**150**	(H-2053 to H-2202)
Standard	**1**	*Bt.*CIM-602
Plot Size		Variable
Year of Expt.		First

2.4.2 F_2 Generation Block 1

Objective		To select the desirable segregates and screening against CLCuD
Families	**16**	(H-1905 to H-1920)
Standard	**1**	*Bt.*CIM-602
Plot Size		50 'x 10'
Locations	**3**	(Multan & Khanewal)
Year of Expt.		1st

2.4.3 F_2 Generation Block-2

Objective		To select the desirable segregates and screening against CLCuD
Families	**17**	(H-1921 to H-1937)
Standard		*Bt.*CIM-602
Plot Size		50' x 10'
Locations	**3**	(Multan & Khanewal)
Year of Expt.		First

2.4.4 F_2 Generation Block-3

Objective		To select the desirable segregates and screening against CLCuD
Families	**18**	(H-1938 to H-1955)
Standard		*Bt.*CIM-602
Plot Size		50' x 10'
Locations	**3**	(Multan, Khanewal, Kot Addu)
Year of Expt.		First

2.4.5 F_2 Generation Block-4

Objective		To select the desirable segregates and screening against CLCuD
Families	**20**	(H-1956 to H-1975)
Standard		*Bt.*CIM-602
Plot Size		50’ x 10’
Locations	**3**	(Multan, Khanewal, Kot Addu)
Year of Expt.		First

2.4.6 F_2 Generation Block-5

Objective		To select the desirable segregates and screening against CLCuD
Families	**52**	(H-1976 to H-2027)
Standard		*Bt.*CIM-602
Plot Size		50’ x 10’
Locations	**3**	(Multan & Khanewal)
Year of Expt.		First

2.4.7 F_2 Generation Block-6

Objective		To select the desirable segregates and screening against CLCuD
Families	**25**	(H-2027 to H-2052)
Standard		*Bt.*CIM-602
Plot Size		50’ x 10’
Locations	**3**	(Multan & Khanewal)
Year of Expt.		First

2.5 Performance of Promising Strains in Bigger Block

2.5.1 Testing of advanced strains

Objective		To test the performance of advanced strains at Punjab Seed Corporation Farms, Khanewal
Strains	6	CIM-717, *Bt.*CIM-343, *Bt*.CIM-663, *Bt*.CIM-303, *Bt*.CIM-678, *Bt.*CIM-789
Plot Size		0.5 hectare
Location		Khanewal
Year of Expt.		First

2.5.2 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, *Bt* CIM-598, *Bt.*CIM-599, *Bt.* CIM-602
Plot Size		Variable
Year of Expt.		Continuous

2.5.3 Early Generation Seed

Objective		To produce pre-basic seed of approved commercial varieties of CCRI, Multan
Varieties	**6**	CIM-610, CIM-496, CIM-506,CIM-554,CIM-573, CIM-620
Plot Size		Variable
Year of Expt.		Continuous

2.5.4 Early Generation Seed (Bt)

Objective		To produce pre-basic seed of approved commercial varieties of CCRI, Multan
Varieties	**4**	*Bt* CIM-598, *Bt.*CIM-599, *Bt.* CIM-602, Bt.CIM-632,
Plot Size		Variable
Year of Expt.		Continuous

2.6 Screening of Breeding Material against CLCuD

2.6.1 Progeny Row Trials (Medium staple with high lint %age)

Objective		Testing and screening of promising families in F_4 to F_6 generations against CLCuD
Families		130
Design		Compact Family Block
Repeats	**2**	
Plot Size		20 'x 7.5'
Year of Expt.		First

2.6.2 Progeny row trials (Long Staple)

Objective		Testing and screening of promising long staple families in F_4 to F_6 generations against CLCuD
Families		40
Design		Compact Family Block
Repeats	**2**	
Plot Size		20 'x 7.5'
Year of Expt.		First

2.6.3 Selection from filial generation

Objective		Selection of promising single plants to develop further generation (F_3 to F_6)
Families		Variables
Design		Simple
Repeats	**2**	
Plot Size		Variables
Year of Expt.		Continues

2.6.4 Fresh Crosses

Objective	Development and widening of genetic base for the inducing desirable traits for evolution of new varieties through: ❖ Direct crosses ❖ Back crosses ❖ Three-way crosses Crosses with exotic material
Year of Expt.	Continuous

2.7 Maintenance of Genetic Stock of World Cotton Collection

Objective	❖ Maintaining of Genetic stock ❖ Exchange of germplasm.
Germplasm	2000
Plot Size	12' x 5'
Year of Expt.	Continuous

2.8 Screening of cotton germplasm CLCuV resistance, economic traits, along with Heat and Drought tolerance

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

2.9 Mutation Breeding

Strains	**3**	Deebal, Bt. CIM-598 and Hadi
Repeats	**3**	
Mutagens	**2**	Ethyl MethaneSulfonate (EMS), Na Azide
Plot Size		Variable
Locations	**1**	(Multan)
Year of Expt.		1st Year

2.10 Exploitation of out crossing in cotton

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

2.11 Screening of US germplasm for CLCuv

Strains	**25+1**	USG-18 -4156 to USG-18-4180 CIM-496 (Std.)
Repeats Treatments	**1**	
Plot Size		Variable
Locations	**1**	(Multan)
Year of Expt.		1st Year
Year of Expt.		1st Year

2.12 Coordination with other Sections

Section	**Area of research**
Agronomy	Agronomic assessment of advanced strains: • Sowing dates • Irrigation • Fertilizer • Spacing
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: • Heat tolerance • Drought tolerance

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3. CYTOGENETICS SECTION

3.1 Collection and maintenance of *Gossypium* germplasm

- Thirty culturable 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 Species 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.

- *G. arboreum* x *G. gossypioides*
- *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*
- *G. hirsutum* x *G. capitis viridis*
- *G.hirsutum x G.gossypioides*
- *G .hirsutum* x *G. stocksii*
- *G. hirsutum* x *G. somalense*
- *G.hirsutum* x 2 (*hir.x anomalum*) x ^{3}*hir*.
- *G.hirsutum* x 2*(G.arbo. x G. anomalum*) x ^{3}*hir.*
- (*G.hirsutum* x *G. stocksii*) x ^{2}*hir.*

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

3.2.2: Exotic germplasm selected from germplasm collection with high ginning outurn and other fiber traits will be utilized for hybridization program.

Year of Expt: 2nd

3.3. Colchiploidy

Objectives:

- To make the species auto-tetraploid specially *Gossypium arboreum* by doubling the chromosome numbers
- To transfer CLCuV resistance in upland cotton after attaining fertility.

Year of Expt: Contineous

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 Aneuploids/haploids

- Continuous search for aneuploids especially monosomes to identify individual chromosomes and haploids to make homozygous lines in cotton
- Tagging of suspected plants, screening and analyses for confirmation of their chromosome number/ploidy level.

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

3.5.1 F_1 Generation

Objective:

To raise F_1 seed for further selection and screening against CLCuD

Methodology:

Hybrids: **97** (1-1/19 to 97-1/19)
Standard: 2 (FH-142 & Cyto-179)
Plot size: Variable
Year of Exp. Continuous

3.5.2 Screening of F_2 material

Objective:

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

Methodology:
Families: 295 (1-2/19 to 195-2/19)
Standard: 2 (FH-142 & Cyto-179)
Plot size: Variable
Year of Exp. Continuous

3.5.3 Screening of F_3 material to obtain homozygous plants

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

Methodology:
Families: **195**(1-3/19 to 195-3/19)
Standard: 2 (FH-142 & CIM-602)
Plot size: Variable
Year of Exp. Continuous

3.5.4 Screening of F_4 material to obtain homozygous plants
Objective:
To select the desirable segregates having *Bt* gene with tolerance against CLCuD
Methodology:
Families: **335** (1-4/19 to 335-4/19)
Standard: 2 (FH-142 & Cyto-179)
Plot size: Variable
Year of Exp. Continuous.

3.5.5 Screening of F_5 material to obtain homozygous plants
Objective:
Testing and screening of promising families in F_5 generation

Methodology:
Families: **242(1-5/18-242-5/18)**
Standard: 2 (FH-142 & Cyto-179)
Plot size: Variable
Year of Exp. Continuous

3.5.3 Screening of F_6 material to obtain homozygous plants
Objective:
Testing and screening of promising families in F_6 generation.
Methodology:
Families: **335(1-6/18-335-6/18)**
Standard: 2 (FH-142 & Cyto-179)
Plot size: Variable
Year of Exp. Continuous

3 .6 Testing of Cyto-material in Micro-Varietal Trials.

3.6.1 Micro Varietal Trial-1.
Objective:
Testing of virus tolerant material for economic and fibre quality traits
Treatments:
Strains: 6 (M-1/19 to M-6/19)
Standard: **1** (Cyto-179)
Lay-out RCBD
Repeats: 3
Plot size: 30′x10′
Year of Expt. 1st

3.6.2 Micro Varietal Trial-2
Objective:
Testing of newly bulked long staple strains against commercial varieties.
Treatments:
Strains: 6 (M-7/19 to M-12/19)
Standard: **2** (Cyto-179)
Lay-out RCBD
Repeats: 3
Plot size: 30′x10′
Year of Expt. 1st

3.6.3 Micro Varietal Trial-3
Objective:
Testing of newly bulked long staple strains against commercial varieties.
Treatments:
Strains: 6 (M-13/19 to M-18/19)
Standard: **1** (Cyto-179)
Lay-out RCBD
Repeats: 3
Plot size: 30′x10′
Year of Expt. 1st

3.6.4 Micro Varietal Trial-4
Objective:
Testing of newly bulked long staple strains against commercial varieties.
Treatments:
Strains: 6 (M-19/19 to M-24/19)
Standard: 2 (FH-142 & Cyto-179)
Lay-out RCBD
Repeats: 3
Plot size: 30′ x12.5′
Year of Expt. 1st

3.7. Testing of Cyto-material in varietal trial-1

3.7.1 `VT-1

Objective:

Testing of new advance Non-Bt 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. 2nd

3.7.2 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. 1st

3.7.3 VT-3 (Non *Bt*)

Objective:

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

Treatments:

Strains: 4(Cyto-225, Cyto-226, Cyto-227, Cyto-228)
Standard: **2** (Cyto-124 & CIM-608)
Lay-out RCBD
Repeats: 3
Plot size: 30′x10′
Year of Expt. 2nd

3.8. Mapping population development for CLCuV resistance

Objectives:

Development of mapping population for CLCuV resistance

Methodology:

Hybrids: Unknown
Year of Expt. 1st

F_1 plants will be sown in greenhouse for the enhancement of population.

3.9. Production of Pre-basic Seed

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

3.10 Evaluation of new strain under varied ecological zones

Objective:

1. Strain *Bt*. Cyto-512,513 & 514 will be included in NCVT during cropping season 2019-20 for its adaptability.
Year of Expt. 1st

2. Strain Non-*Bt*. Cyto-226 & 227 will be included in NCVT during cropping season 2019-20 for its wider adaptability.
Year of expt. 1st

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4. ENTOMOLOGY SECTION

4. Studies on Pink Bollworm

4.1 Impact of sowing period on the PBW infestation

Objective:

Levels 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

Methodology:

- Appearance of rosette flower
- Record number of male moth catches trapped in sex pheromone traps
- Correlation among percentage infestation, trap catches & sowing period

Observation:

1. Note the appearance date of rosette flower
2. Collection of susceptible bolls to record PBW infestation level
3. Record number of male moth catches trapped in sex pheromone traps

Previous Year Results

Overall, pink bollworm infestation and percentage of live larvae were higher in early-March planting in Set I compared with May planting, Set III. So the farmers are advised to avoid planting cotton before 1 April

4.1.2 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 Khanewal followed by Vehari as compared to other districts. Comparatively variety SS-32 seems more vulnerable to pink bollworm 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

- Comparatively, the moth catches of *P. gossypiella* were 77.5% higher at farmer's field than at Multan. Overall male moth catches were 0.6% and 47.0% lower at Multan and

farmer's field to that of last year

- Male moth catches of *S. littura* were 33.1% and 25.5% higher at Multan and farmer's field respectively as compared to last year
- Male moth catches of *H. armigera* were 31.0% and 20.7% higher at Multan and farmer's field respectively as compared with last year

B) Light traps

- Number of moth catches of *S. littura* was 70.8% higher than that of last year
- Moth catches of *H. armigera* were 52.2% higher as compared to last year

4.3 Studies on tolerance level of cotton genotypes to sucking insect pest complex

Objective

To assess the tolerance level in the promising genotypes to sucking pests.

Cultivars : Variable
Layout : RCBD
Replications : 4
Plot size : 30' x 30'
Year of Expt. : Continuous

Observations:

- Sucking pests population and bollworms damage

Previous Year's Results

Sucking Pests/leaf (Set-II)

During the month of August Jassid populations in untreated plots were above ETL on all tested varieties except on CIM-600, Sitara-15 and NIAB-1048 respectively but during the month of September Jassid populations were below ETL all tested varieties. In the treated plots, Jassid was below ETL on all tested varieties in August and September.

Maximum seasonal population of whitefly was noted on CIM-602. Populations in untreated plots were above ETL on all tested varieties during August and September except on FH-152, CIM-600 and CIM-632 respectively. In the treated plots, their population was below ETL on all tested varieties except on FH-152 in August but their population was fluctuating on all tested varieties during September. Maximum population was observed on Crystal-12.

In the treated and untreated plots, thrips population was below ETL on all tested varieties during cropping season. Maximum population was observed on CIM-632.

4.4 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 and its intensity was highest on TH-88/11. Whitefly intensity was highest on NIAB-88/11 followed by NIAB191 while lowest on CIM-620 during study period. Thrips remained below ETL throughout the season on all the strains.

B. *Bt* strains (Set-B): Jassid population was below ETL on all the tested strains during study period however, its maximum number was recorded on BS-18. Overall, whitefly intensity was highest on BZU-05 & MNH-1020 during study period. Thrips population remained below ETL on all the tested strains.

C. *Bt* strains (Set-C): Jassid population was above ETL on Tassco-902, Vh-189, Badar-1 (C11), Suncrop-6, and Weal AG-6 in August while it remained below ETL in September on all the tested strains except Sahara-210, VH-383.and VH-189. Overall whitefly highest population was recorded on Suncrop-6, TJ-MAX,(C11), SLH-6 Weal AG-6, SLH-19, Tassco-902, and Badar-1 (C11) during study period. Thrips population remained below ETL during August and September on all the tested strains and its intensity was higher on NU-21(C11), and lower on RH-Manthar and C11-ICI-2222.

4.5 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

Very high level of resistance to thiamethoxam was detected in tested populations of all the locations as compared to the Sus population.

Phenacoccus solenopsis

LC^{50} value of methoxyfenozoid was generally higher in Bahawalpur location as compared to other tested insecticides.

Bemisia tabaci

LC^{50} values of all the tested insecticides were very high except flonicamid & spirotetramat + biopower in Bahawalpur location, and acetamiprid & Bifenthrin in Muzaffar Gahr locations.

High LC^{50} values indicate resistance development to all the tested insecticides in various locations. Hence, there is a dire need to develop and imply insecticide resistance management (IRM) strategies.

4.6 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

4.7 Projects (Punjab Agriculture Research Board (PARB))

4.7.1 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. Modeling of PBW epidemiology dynamics
12. Onset of PBW attack
13. Weather variables and relationship of PBW

4.7.2 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

4.8 Project (ALP)

4.8.1 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

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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.
iii) Survey will be conducted with the Collaboration of Entomology

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
iii) Management studies for the prevelance of any disease using different fungicides and other integrated management measures.

Year of Experiment: Continuous

Previous Year's Results

i) The maximum CLCuD was recorded in Melsi, kot addu, Bahawal Pur.
ii) Minimum incidence of the disease was recorded in Kacha khu followed by Multan districts
iii) Average severity level of disease remained medium i.e. rating scale 2.2 in all the surveyed areas
iv) The incidence of boll rot varied from 0 to 2 percent
vi) The occurrence of stunting phenomenon was very low
vii) The occurrence of wilting disease was low

5.2 Evaluation of Breeding Material against CLCuD

Objective

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

Detail

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

Year of Experiment: Continuous

Previous Year's Results

i) 263 lines included in NCVT, National Coordinated Varital Trial, PCCT and Standard Varietal Trials, showed susceptibility to CLCuD under field conditions. Only 1 line in MVT6 showed tolerance.

5.3 Epidemiological Studies of CLCuD

Objective:

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

A: Non Bt Genotypes

Treatments

(a) Sowing Date = 5
[April 15, May 01, May 15, June 01 June 15]
(b) Genotype = 3
[Cyto-226, Cyto-227 and CIM-610]

Layout: Split plot (main: sowing date)
Repeats: Four

Detail:

i) Data on incidence of disease at fortnightly interval after sowing
ii) Disease Index
iii) Data on weather parameters

Year of Experiment : Continuous
(In Collaboration with Agronomy Section)

Previous Year's Results

i) The progression of disease was gradually low on crop planted in March & April, whereas sharply high on crop planted in June.
ii) Average across cultivars, minimum disease index was recorded on crop planted on 15th April
iii) Averaged across sowing time, there is no varietal difference
iv) Fortnightly increase of disease when compared with weather parameter, indicated that disease incidence was maximum in early July to the mid of September
V) Maximum temperature at 33.6~ 37.2°C and minimum temperature at 23.0 ~ 30.0°C with relative humidity of 80.9 %~ 89.1 % favoured the fortnightly increase of CLCD.

B: Bt Genotypes

Treatments

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

(b) Genotype = 6
(CIM-789, CIM-678, CIM-303, Cyto-510, Cyto-511,Cyto-170)

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

Repeats : Four

Detail:

i) Data on incidence of disease at fortnightly interval after sowing.
ii) Disease Index
iii) Data on weather parameters
iv) Data on severity level of CLCuV disease at 1st and 30th September (For supporting Fiber Technology Section)

Year of Experiment : Continuous
(In Collaboration with Agronomy Section)

Previous Year's Results

i) The progression of disease was low on crop planted 1^{5th} March to 1st April, whereas moderately high on crop planted in 15th May.
ii) Average across cultivars, minimum disease index was recorded on crop planted on 1st March and 1st April.
iii) Averaged across sowing time, no difference of disease incidence was observed
iv) Fortnightly increase of disease when compared with weather parameter, indicated that disease incidence was maximum during mid-July to the end of August.
v) Maximum temperature of 33~ 37.2°C and minimum temperature of 23.0 ~ 30.0°C with relative humidity of 80.9 %~89.1% were favoured fortnightly increases of CLCD in Bt cotton

5.4 Evaluation of Advanced Strains in National Co-coordinated 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.
ii) The stunting phenomenon was very lowin all strains
iii) In Set A minimum CLCuD severity and disease index was recorded on CRIS -613 The incidence of disease index ranged from 58.82 to 76.19 %
iv) In Set B a minimum CLCuD severity and disease index was recorded on BH-221. The incidence of disease index ranged from 24.85. to 77.58 %
v) In Set C minimum CLCuD severity and disease index was recorded on Badar-1 (CII). The disease index ranged from 71.0 to 78.97 %.
vi) In Set D minimum CLCuD severity and disease index was recorded on Eagle-3. The disease index ranged from 73.62 to 78.05 %.
vii) In Set E minimum CLCuD severity and disease index was recorded on CIM-602 (Bt Std-1) The disease index ranged from 74.40 to 79.71 %.

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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

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

Observations:

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

Previous Year's Results

1. A total of 21 genotypes were tested against thermal stress tolerance under field conditions.
2. The genotypes M1-18, BH-221 and CIM-343 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 1st and 2nd 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

Treat-ments	Bio-chemicals	Dose
T1	Control	Water alone
T2	Selenium (Se)	150 mg/L
T3	Hydrogen peroxide (H_2O_2)	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)

Planting date : mid-April

Design : RCB

Replications : 3

Year of experiment: 1st

Observations:

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

6.1.3 Characterization of cotton germplasm for heat tolerance

Objective:

- To screen the cotton germplasm for heat tolerance characteristics

Sowing date : mid-April

Design : RCB

Target entries : 100

Year of experiment : 1st

Observations:

- Cell injury
- Anther dehiscence (In collaboration with Breeding Section)

6.2 Soil Health and Plant Nutrition

6.2.1 Long term effects of minimum tillage on soil health and cotton-wheat productivity

Objective:

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

Treatments

Crops	Bed-Furrow		Flat-bed	
Cotton	NT		NT	
Wheat/Cotton	NT	MT	NT	MT

NT: normal tillage, MT: minimum tillage

Duration: 5 years

Area: 1 Acre

Observations:

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

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

Treatments

Treat-ments	Application time		
	Pre-Sowing	25 DAP	50 DAP
T1	Control (0)	-	-
T2	50	-	-
T3	-	50	-
T4	-	25	25

Phosphorus dose @ 50 kg P_2O_5/ha

Design : RCBD

Variety : Two

Year of experiment: 1st

Location : CCRI, Multan

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

6.2.3 Comparative effectiveness of CAN and NP in comparison with Urea and DAP fertilizers in cotton

Objectives:

i) To evaluate the effectiveness of 1:1 Ammonical and Nitrate based CAN (N = 26%) and NP (P_2O_5 =20% N= 22%) in comparison to Ammonical DAP (P_2O_5 = 46%, N = 18%) & Urea (N = 46%) combination in increasing yield of Cotton crop.
ii) To determine the value cost ratio of CAN and NP in comparison to DAP & Urea combinations
iii) To assess the role of Calcium in reducing CLCV attack at different growth stages in cotton crop.

Location : CCRI, Multan

Area : 1 Acre

Treatments				
Nutrients (kg/acre)				Source of Nutrients
	N	P_2O_5	K_2O	
T1	0	0	0	Control
T2	90	35	38	DAP + Urea + SOP
T3	90	35	38	DAP + CAN + SOP
T4	90	35	38	NP + Urea + SOP
T5	90	35	38	NP + CAN + SOP

Observations:

- Pre-sowing and post-harvest soil analyses
- Seed cotton yield & Components
- Plant Structure Development
- Fruit production

6.3 Soil-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 $\pm$ 0.2 MPa LWP (ψ_w)]
Water stress : (-2.4 $\pm$ 0.2 MPa LWP ψ_w)

Genotypes : Multiple

Design : Split plot
(Main: Irrigation levels)

Replications : 4

Year of expt. : Continuous

Location : CCRI, Multan

Observations

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

Previous Year Studies

1. A total of 16 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 1958 to 2334 kg ha^{-1} in normal irrigated crop (80%) while the yield ranged from 1211 to 2184 kg ha^{-1} under water deficit condition (50%) in different genotypes. The genotype CIM-678 produced highest yield in no stress while the highest yield under water stress was produced by Cyto-510.
3. Imposition of water stress (50% of normal irrigation) caused an average decrease of 12.5% in seed cotton yield, 7.3% in boll weight and 4.5% in bolls per plant.

6.3.2 Evaluation of selected K-screened cotton cultivars for drought tolerance characteristics

Objectives:

i) To evaluate the role of K in eliminating adverse effects of drought stress

ii) To explore the genetic variability of cotton genotypes in K-utilization efficiency

Design : Split-split plot

Replications : 4

Irrigation levels		K_20 levels (kg ha^{-1})	
		0	50
No Stress -1.6 ± 0.2 MPa LWP	Cotton genotypes	V1	V1
		V2	V2
		V3	V3
		V4	V4
		V5	V5
Water stress -2.4 ± 0.2 MPa LWP		V1	V1
		V2	V2
		V3	V3
		V4	V4
		V5	V5

Varieties 5: (K-efficient: 3, K-sensitive: 2)

Date of sowing: May 2019

Year of expt. 2nd

Observations

- Crop growth parameters
- Gas exchange characteristics
- Seed cotton yield and its parameters
- Water use efficiency
- Fibre quality

Previous year's studies

1. A total of 5 genotypes were used to explore K role in normal irrigation (NS; -1.6 ± 0.2 MPa LWP) and water deficit stress (WS; -2.0 ± 0.2 MPa LWP) conditions.
2. The genotypes showed variable response to applied K and irrigation water levels. In the absence of K seed cotton yield varied from 1723 to 2234 kg ha^{-1} in NS plots while the yield ranged from 1498 to 2035 kg ha^{-1} in WS plots in different genotypes. Seed cotton yield increased with K application and it varied from 1910 to 2800 kg ha^{-1} in NS plots while from 1874 to 2645 kg ha^{-1} in WS plots in different genotypes.
3. Improvement in yield across the genotypes by K application was 22.8% and 29.8%, respectively in NS and WS conditions. Among the genotypes, CYTO-124 produced the maximum seed cotton yield and boll weight in all treatments.

6.4 Seed Physiology

6.4.1 Exploring the role of antioxidants, growth hormone in cotton plant growth, cottonseed health and productivity

Objective

i) To evaluate the efficacy of applied antioxidants, growth hormone on seed health and transgenic cotton production

ii) To find out the best application method

Methodology

- Antioxidant ascorbic acid and growth hormone gibberellic acid will be applied by seed priming with or without foliar sprays.
- Three foliar sprays at 30, 60 and 90 DAP will be applied with prescribed concentrations.
- All the plots will receive recommended fertilizers.

Treat-ments	Seed Priming (SP)	SP + Foliar Application
	(mg/L)	
T1	Water alone (Control	Water alone (Control)
T2	AA (50)	AA (200)
T3	CA (100)	CA (400)
T4	GA (10)	GA (50)
T5	AA (50) + CA (100)	AA (100) + CA (200)
T6	AA (50) + GA (10)	AA (100) + GA (25)

AA= Ascorbic acid, GA= Giberellic acid

Design : Split-plot

Replications : 3

Variety : CIM-343

Date of sowing : May, 2018

Year of Expt. : 2nd

Observations

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

Previous Year's Results

1-Seed cotton yield differed significantly among various treatments. In seed primed plots, yield varied from 3505 to 3864 kg ha^{-1} while in foliar sprayed plots it ranged from 3545 to 4143 kg ha^{-1} in different treatments.

2-The maximum yield was produced in Gibberellic acid (GA) treated plots both in seed primed (10 mg/l) and foliar sprayed (50 mg/l).

3-GOT in different treatments varied from 35.4 to 37.5%.

4-Free fatty acids were within safe limits (<1.0%). In primed plots, seed germination varied from 70-85%, seed index from 6.57-7.44g, oil content from 10 to16 % and crude protein from 21.0 to 27.7% in different treatments. While in foliar sprayed plots seed germination varied from 77-87%, seed index from 6.91-7.87g, oil content from 11 to 18% and crude protein from 22.0 to 28.9% in different treatments

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7. TRANSFER OF TECHNOLOGY

7.1 Integrated Multi-Media Publicity Campaign

Objectives **:**

i) Development of multi-media publicity materials on profitable cotton production technology.

ii) Use of media campaign to disseminate the latest technology/research findings to various target groups.

- ♦ Extension workers
- ♦ Cotton growers
- ♦ Field staff of private pesticide / fertilizer / seed industry
- ♦ Students from Agriculture Colleges/ Universities

Non-government organizations(NGO's)

7.1.1 Print Media

A <u>Publications</u>

i) Management of Cotton cultivation
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 <u>Press Releases</u>

Variable.

7.1.2 Electronic Media

A <u>T.V. Programs</u>

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 <u>Radio Programs</u>

Dissemination of new cotton production technology.

C <u>New Studio-Setup</u>

To make a new studio-setup in a recording room

<u>Previous Year's Activities</u>	
1. کپاس کی گلابی سنڈی اور اس کا طریقہ انسداد	= 5000
2. کپاس کی گلابی سنڈی کا تدارک بذریعہ پی بی روپس	= 5000
3. *Bt.CIM-632*	= 2000
4. Bt.Cyto-177	=2000
5. CIM-610	=2000

Programs	**Number**
Radio Programs	
Radio Talks	04
Radio Interview	01
Group Discussion	01
Radio News/Press releases	53
TV Programs	
Interview/Programs	12
TV / Press Coverage	10
Meetings / Seminars	
Press releases	53
Articles in newspapers & magazines	03
Press Report	01

7.2 Training Programs

Objectives	**:**	Training Programs / Refresher Courses for : i) Agronomy of the cotton crop ii) Soil health & nutrient management iii) Cotton Production Technology iv) Seed Production technology v) Integrated Weed Management (IWM) vi)Integrated Pest Management (IPM) sucking insect pests especially white fly Strategy against Pink Bollworm vii) Management strategy against CLCuV viii) Seed health and nutrient management ix) Application of PB-Rope & sucking insect pest management
Target Groups	**:**	Officers and staff of the Department of Agriculture Extension Cotton growers Technical / Field staff of pesticide, fertilizer & seed industry. Staff of 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	139
CCRI & South Asian Sourcing (SAS)Pvt.Ltd	i.Farmers ii.SAS staff	13 05
CCRI & Private Sector	i. Field Staff: Pesticide & Seed ii.NGO	14 06 190
FFC & CCRI	i.Farmers ii FFC Staff	13
Pakistan Farmers Forum (NGO)	i. Farmers ii NGO's Staff	67 13
CCRI & FSC&RD	Seed dealers	450
PCSI ,Multan	Cotton Selectors	88
CCRI & Sangtani Organization, NGO	i. Master Trainee ii. Farmers iii. NGO's Staff	07 247 13
CCRI,Multan	Farmers	378
Agri.Ext.KPK& Balochistan	Master Trainee	23
WWF & CCRI	i.Master Trainee ii.Farmers	31 115

7.3 Email & facebook page CCRI, Multan

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

Email : ccri.multan@yahoo.com	
• Email sent	> 1023
• Email received	> 1719

7.4 Seminars/Workshops

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

Previous Year's Activities	
Seminars/ Workshops/Conference	Numbers
Seminars	**12**
i. National	05
iii. Travelling	01
Workshops	05
Conference	01

7.5 Other Activities

i) Making arrangements of meetings, seminars & workshops.

ii) Facilitate the visits of dignitaries and students of different institutions.

iii) Participation in Agricultural Exhibitions.

iv) Social media activities(face book, Whatsapp & YouTube)

Previous Year's Activities	
Meetings	**Presided over by**
Agriculture Research Sub-Committee (ARSC)	Vice President , PCCC
Cotton Crop Assessment Committee (02)	Federal Secretary, Mintex
National Assembly Standing Committee on Textile Industry	Chairman, Standing Committee
Cotton Crop Management Group (05)	i.Minister Agri.Punjab ii.Sec.Agri.Punjab

Institutions	**No. of Participants**
Burewala Agri.College, (B.Z.U Campus)	98
University of Agriculture, Faisalabad	376
UCA, BZU, Multan	138
MNSUA Multan	35
ARI, Karor, Layyah	100
Govt. College of Layyah	49
BZU, Bahadur Sub-Campus, Layyah	66

Presentations	
Multimedia slides for presentations for Meetings / seminars/Workshops	>3278

7.6 Tele-Cotton Activities

Previous Year's Activities	
Tele-Cotton SMS	30
No. of Clients	>18,000

7.7 Agriculture Show/ Mela

Previous Years Activity		
Date	**Organized by**	**Venue**
30th March to 1st April ,2018	Dunya TV, Lahore & B.Z.U Multan	B.Z.U Multan
April 4,2018	Nawa-e-Waqt Group	Qila Quhna Qasim Baugh,Multan

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8. FIBRE TECHNOLOGY SECTION

8.1 Testing of Lint Samples

Objective:

To provide technical support to various sections of the Institute and other Research Institutes/Stations of public sector and PCCC in testing of the fibre characteristics and spinning of their research material.

Year of Experiment : Continuous

Previous Year's Result	
Departments	**No. of Samples**
Breeding, CCRI, Multan	52237
Cytogenetics, CCRI Multan	15735
Agronomy, CCRI, Multan	141
Fibre Technology, CCRI, Multan	931
Plant Physiology, CCRI, Multan	1599
Director's research material, CCRI, Multan	1533
CCRI, Sakrand	2475
CRS, M.P. Khas	441
CRS, Sahiwal	750
CRS, Ghotki	2604
CRS, D.I.Khan	4650
CRS, Lasbella	357
CEMB, Lahore	105
Spot Examination, Faisalabad	105
FSC & RD, Khanewal	279
Thatha Gurmani Farm	984
Yield competition, Agri Ext. M.garh	9
Quality Survey (Sindh)	4443
Quality Survey (Punjab)	2428
Quality Survey (KPK)	144
Research Scholars (MNSUA+BZU)	219
Total	**92169**

8.2 Testing of Commercial Samples

Objective:

To extend fibre testing facilities to private sector in testing of lint samples.

134 samples received from private sector for fibre analysis.

Year of Experiment: Continuous

8.3 To study the effect of different moisture levels on fibre characteristics of cotton cultivars.

Objective:

Moisture is very important factor in cotton fibre testing & processing. The standard atmospheric conditions are temperature 20 ± 2□C & RH% 65 ± 2. It is recommended that the samples should be conditioned for at least 24 hours at standard atmospheric conditions. The samples should be tested at different moisture levels to investigate the effect of moisture on different fibre traits.

Year of Experiment: Continuous

Treatments:

(a) **Varieties:** Variable

(b) **Methodology:**

i. Samples collection of different cultivars.
ii. Samples conditioning for three moisture levels
    a) 6 %
    b) 8.5 %
    c) 11 %
iii. Testing of fibre characteristics
    a) Lint %
    b) Seed Index (g)
    c) Fibre Length
    d) Fibre Strength
    e) Uniformity Index
    f) Micronaire Value
    g) Short Fibre Index
    h) Elongation %

8.4 To study the effect of Potassium fertilizer & water stress on quality characteristics of cotton fibre.

Objective:

The objective of this study to evaluate the role of potassium fertilizer on fibre quality characteristics under no stress and water stress conditions.

Treatments			
Water stress levels		**K_2O levels (kg ha^{-1})**	
		0	**50**
No Stress -1.6 ± 0.2 MPa LWP	**Cotton genotypes**	V1 V2 V3 V4 V5	V1 V2 V3 V4 V5
Water stress -2.4 ± 0.2 MPa LWP		V1 V2 V3 V4 V5	V1 V2 V3 V4 V5

V1=CIM-707, V2=Cyto-124, V3=IUB-2013
V4=MNH-886, V5= BH-212

Design: Split-Split plot

Methodology:

i. Collection of opened bolls from no potassium application, 50 kg ha^{-1} potassium application with water stress and no water stress conditions of five varieties.
ii. Ginning of seed cotton samples for various fibre characteristics.
iii. Testing of different fibre characteristics

Observations:

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

(Collaboration: Plant Physiology/Chemistry Section)

Year of Experiment : 2nd

8.5 The role of stress alleviating chemicals on cotton fibre characteristics under heat stress conditions.

Objectives

The objective of this study is to evaluate the role of stress alleviating chemicals on cotton fibre characteristics under heat stress conditions.

Treat-ments	Bio-chemicals	Dose
T1	Control	Water alone
T2	Selenium (Se)	150 mg/L
T3	Hydrogen peroxide (H_2O_2)	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: 1st

Methodology:

i. Collections of opened bolls.
ii. Ginning of seed cotton samples for various fibre characteristics.
iii. Testing of fibre characteristics

Observations:

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

(Collaboration: Plant Physiology/Chemistry Section)

8.6 Saw & Roller Ginning Comparison for Cotton Fibre Quality

Objective:

The experiment is design to investigate the effect of Roller & Saw ginning on lab and commercial scale on fibre quality.

Methodology:

Two varieties (long and short staple) of the institute will be selected for experiment. The collected seed cotton is ginned at roller and saw ginning machines on lab scale and commercial ginning machines.

Observations:

- Lint %
- Seed Index (g)
- Fibre Length
- Uniformity Index
- Micronaire Value
- Fibre Strength
- Colour grade

Year of Experiment: 2nd

8.7 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

8.8 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.

8.9 Survey of Pakistan's Spinning Industry

Objective:

To collect data regarding the utilization 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.

Year of Experiment : Continuous

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9. STATISTICS SECTION

9.1 Experimental Design Layout.

Objective:

To make lay out plan for experiments which will be conducted by sections of the institute. The experimental design facility will also be provided to various Research Stations of PCCC.

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.

Previous Year's Work	
R.C.B.D.	179
Split Plot.	8
F-Pool	12
Regression.	--
Corelation	--
Graphical Representation	--
Total:	**199**

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.

Previous Year's Work	
R.C.B.D. (NCVT)	140

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

Previous Year's Prices (Average Price Rs per 40 Kg at Multan)	
Seed cotton	3807
Cottonseed	1407
Cottonseed Cake	1455
Cottonseed Oil	4236
Lint	9304

Source: Market Committee Multan.
(October 2018 to December 2018)

9.5 Study of factors effecting 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: 1st

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CENTRAL COTTON RESEARCH INSTITUTE

Old Shuja Abad Road, Multan, Pakistan

Phones +92-61-9200340-41
Website: www.ccri.gov.pk
FB: www.facebook.com/CCRIM.PK

Fax: +92-61-9200342
Email: ccri.multan@yahoo.com
dir@ccri.gov.pk