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Cotton Exchange Building, 2nd Floor, Cotton Green, Mumbai - 400 033
Phone: 3006 3400 Fax: 2370 0337 Email: cai@caionline.in
www.caionline.in

Is Bt Cotton in North Cotton Zone of India Under Threat from Pink Bollworm?

Dr. Monga is a Plant Pathologist by profession. He worked as Head of Regional Station, Sirsa, Haryana of ICAR-Central Institute for Cotton Research for more than two decades. He also worked as Principal Investigator of Plant Pathology under All India Coordinated Research Project on Cotton for over a decade. He contributed significantly in strengthening the research and development network for cotton crop in the North Zone.



GUEST COLUMN

Dr. Dilip Monga
*Ex-Head, ICAR-Central Institute for Cotton
Research, Regional Station, Haryana*

protected from American, spotted and pink bollworms.

However, during 2015, severe damage to BG II cotton by pink bollworm and yield losses were observed in many regions of Gujrat and some parts of AP, Maharashtra and Telangana.

Studies conducted at ICAR-CICR showed that pink bollworm had developed resistance to two Cry toxins deployed in BG II. (Kranthi, 2015).

After the introduction of single (Cry1Ac) gene transgenic cotton in Central and South Zone in 2002 and in North Zone of India in 2005 and subsequent approval of dual gene (Cry1Ac + Cry2Ac BG II) hybrids in 2006, cotton crop was

Again in 2017-18, Maharashtra state witnessed unprecedented attack and losses due to pink bollworm infestation in cotton. However, in North cotton zone, BG II cotton hybrids continued to remain effective against pink bollworm whereas the pest used to cause damage (Table 1) in non Bt

Table-1 Pink Bollworm Larval recovery (%) from green bolls in non Bt cotton crop at 160 days from different locations of the North Zone

S.N	Locations	2016-17	2017-2018	2018-19	2019-20
1.	RRS, Bathinda*, Punjab	15.4-18.7	4.0-7.1	5.0-11.3	10.0-18.0
2.	RRS, Faridkot*, Punjab	12.2-18.0	4.7-8.2	6.0-8.3	4.0-8.0
3.	ARS, Sriganaganagar**	15.6-22.5	3.6-7.6	6.0-6.3	6.0-14.0
4.	CICR, RS, Sirsa	10.2-13.6	4.0-6.9	4.7-6.7	4.0-16.0
5.	CCS HAU, Hisar	10.2-18.6	6.3-9.6	6.3-8.7	4.0-14

*Regional Research Station of Punjab Agricultural University, **Agricultural Research Station of Swami Keshwanand Rajasthan Agricultural University, Bikaner

especially desi cottons (*G arboreum*) that is grown in a small area (Rishi, personal communication).

Pink Boll Worm on BG II Cotton Hybrids

Pink bollworm infestation was noted on BG II at two locations (Jind in Haryana and Bhatinda in Punjab) during 2018-19, but this was restricted near the ginning factories –cum –oil extraction units. However, this created anxiety among the scientists of regional station of ICAR-Central Institute for Cotton Research (ICAR-CICR) located at Sirsa and forced further investigation regarding the cause of its occurrence.

During investigation, it was found that to keep the mills in operation round the year and to earn higher profit, many of the ginners in the North Zone were procuring cotton seeds from central and south Indian states like Gujarat, Andhra Pradesh and Telangana. The main reason

for this was that the quality of cotton cake as well as the oil extraction percentage from procured seeds was superior and fetched better price compared to local cotton seeds. It was further observed that when such procured seeds were heaped in the open, the cotton fields in the vicinity showed highest infestation. The infestation levels decreased in fields away from the unit.

During 2019-20, the infestation was again observed at three locations in Haryana and it further increased to five locations during the current year till date. However, the data recording was still in progress at the time of writing this article. In Punjab, around 100 acres of cotton crop has come under the attack of pink bollworm in Jodhpur Romana village in Bhatinda district this year. Aggrieved farmers under the banner of Bhartiya Kisan Union gheraoed the officials who visited the affected fields. (Tribune news service,

Fig 1: Damage due to Pink Bollworm in BG II Hybrids in North Zone



1-Rosette flower 2-PBW exit hole 3-Larva in green boll 4-Damaged open boll

Table 2: Pink Bollworm incidence on BG II hybrids from North Zone

State	Districts	No of villages and Incidence (%)					
		2018		2019		2020	
		No	Incidence	No	Incidence	No	Incidence
Haryana	Jind	1	100	3	1.25-58.52	5	0.5-10(up to August, 2020 and data in Progress)
Punjab	Bathinda	1	5.53-27.76	1	0-30	1	Upto 30% (data in progress)
Rajasthan	----	- No report So far from BG-II cotton					

Bhatinda, September 3,2020). A farmer Sukhwant Singh of the village informed that 80-90 % of his crop has been damaged by pink bollworm (Fig. 1 and Table 2).

Bioecology and Resistance Monitoring

Studies were conducted on larvae collected from pink bollworm infested bolls in farmer fields. The larvae collected from another area from non-Bt cotton were kept as controls for comparison. The results of the study revealed that the larval duration was short in case of larvae collected from BG II surviving population (no larval diapauses/hibernation), whereas it was very long (larval diapauses) in the control population. It is well known that the population of North Zone shows natural larval diapauses as the cotton season is followed by wheat.

This gave indications that larval population collected from BG II infested bolls was different from North Zone population and might have been brought along with seed transported from Central and South Zone which had acquired resistance against BG II were responsible for this damage and the native population of North Zone did not cause any damage to BG II hybrids. (Rishi et al. 2020).

Possibility of Spread of Pink Bollworm Resistant to BG II In North Zone

The information generated during the past three years including the current season, clearly indicates the spread of pink bollworm slowly from the initially observed areas. In Punjab, there are around 40 factories dealing with ginning and oil extraction. In Haryana, there are about 200 units and in Rajasthan around 75 units. Around

25 million tons of cotton seed brought from Central and South Zone is used by various mills for oil extraction (personal communication with Shri. Mahesh Sharda, President, Indian Cotton Association Limited, Bhatinda and Shri. Kailash Garg, Kailash Cotton Factory, Bhatinda).

The seed is stored sometimes in open spaces also before crushing. The adults may emerge from resistant pink bollworm larvae present in such seed and cause damage to the cotton crop in nearby fields.

A detailed study of year-round cotton seed trade from outside the zone needs to be conducted urgently to make a clear assessment of trade. There also is a distinct possibility of development of new focal points arising from the resistant larvae being brought along with the transported cotton seed from Central and South Zone by the ginning and oil extraction units around the different cotton growing areas of North Zone. The infestation can then further spread to adjoining areas around the newly developed focal points.

In addition to that, seed cotton is also transported from outside the zone (personal communication with Shri. Kailash Garg, Kailash Cotton Factory, Bhatinda) for which exact information needs to be generated as this can also become a source for spread of resistant pink bollworm larvae in the zone thereby causing losses to the cotton crop.

Steps Initiated

An advisory based on the developing situation was issued by the Regional Station

of ICAR-Central Institute for Cotton Research, located at Sirsa, to three state agricultural universities and state departments of agriculture in the region in 2019, to gear up their resources and prepare strategies for pink bollworm management. A project on IRM: Dissemination of pink bollworm management strategies from Department of Agriculture Cooperation and Farmers Welfare, Government of India already in operation in Central and South Zone, was extended to North Zone and started operating from ICAR-CICR, Sirsa Regional Station from 2019-20. Awareness meets for ginning cum oil extraction unit operators and farmers were organised regularly.

Management Strategies to be Followed

- Avoid movement of cotton seed from the states of Central and South Zone, where incidence of bollworms on BG-II cotton is already prevalent, to North Zone.
- If seed is being transported, then install pheromone traps in such units for mass trapping of adults. Trapped adults should be destroyed/killed.
- Ensure proper cleaning of mills in April and fumigation of such seed left uncrushed in the mills. Fumigation using Celphos/ Phostoxin/Delicia @ one 3-g tablet per cubic metre space should be done by exposure for 48 hours. In case of 24 hours exposure use, two tablets each of 3g can be used.
- Installation of pheromone traps @ 5/ha, after 45 days of sowing for monitoring moth activity of pink bollworm in fields located around ginning factories cum oil extraction units.
- Such farmers should inspect the crop at squaring and flowering stage. Rosette flowers suspected for the presence of pink bollworm larvae should be removed and destroyed.
- At boll formation stage, these farmers are advised to inspect for presence and damage of pink bollworm larvae within bolls.
- Recommended chemical control measure should be initiated when pest crosses

Economic Threshold Level (ETL) i.e. 10 % damaged bolls (at least two bolls out of 20 having white or pink larvae or exit holes) or 8 moths catch per pheromone trap per night for consecutive 3 days.

- Picking of clean and infested cotton may be carried out separately. Clean cotton may be stored or marketed. Infested cotton should be destroyed.
- After the last picking, allow sheep, goats and other farm animals into cotton fields to feed on plant debris and un-opened bolls. Destroy residual stalk and partially opened bolls.
- Do not stack the cotton sticks under shade or in the field. Beat the sticks on ground to dislodge the pink bollworm larvae surviving the unopened bolls. Stack the cotton bales vertically.
- Prevent the movement of the cotton stalk from the infested areas to the new areas.

Acknowledgement

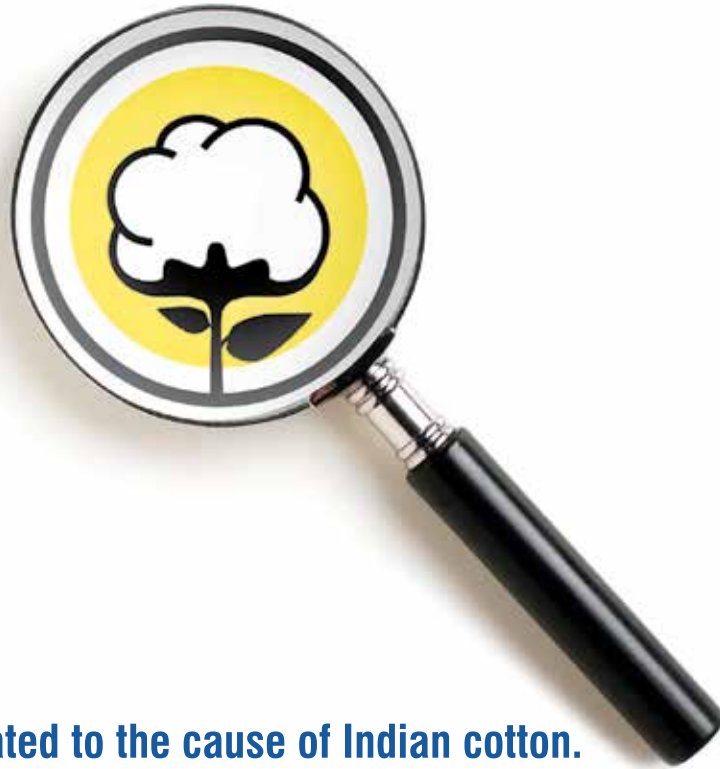
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(The views expressed in this column are of the author and not that of Cotton Association of India)



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The Cotton Association of India (CAI) is respected as the chief trade body in the hierarchy of the Indian cotton economy. Since its origin in 1921, CAI's contribution has been unparalleled in the development of cotton across India.

The CAI is setting benchmarks across a wide spectrum of services targeting the entire cotton value chain. These range from research and development at the grass root level to education, providing an arbitration mechanism, maintaining Indian cotton grade standards, issuing Certificates of Origin to collecting and disseminating statistics and information. Moreover, CAI is an autonomous organization portraying professionalism and reliability in cotton testing.

The CAI's network of independent cotton testing & research laboratories are strategically spread across major cotton centres in India and are equipped with:

- State-of-the-art technology & world-class Premier and MAG cotton testing machines
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LABORATORY LOCATIONS

Current locations : • **Maharashtra :** Mumbai; Yavatmal; Aurangabad • **Gujarat :** Rajkot; Kadi; Ahmedabad • **Andhra Pradesh :** Adoni
 • **Madhya Pradesh :** Khargone • **Karnataka :** Hubli • **Punjab :** Bathinda • **Telangana :** Warangal, Adilabad



COTTON ASSOCIATION OF INDIA

Cotton Exchange Building, 2nd Floor, Opposite Cotton Green Railway Station, Cotton Green (East), Mumbai - 400 033, Maharashtra, INDIA
 Tel.: +91 22-2370 4401/02/03/04 • E-mail: cai@caionline.in • www.caionline.in

Virtual Inauguration of CAI's Cotton Testing Laboratory in Jalgaon

Shri. Pradeep Kumar Agarwal, CMD, Cotton Corporation of India (CCI) virtually inaugurated Cotton Association of India's twelfth cotton testing and research laboratory in Jalgaon on November 12, 2020.

CAI has set up Cotton Testing Laboratories in all major cotton producing and consuming centres of the country to provide state-of-art, reliable and timely cotton testing facilities locally in a cost-effective manner. With laboratories set up so far in Punjab, Maharashtra, Gujarat, Madhya Pradesh, Andhra Pradesh, Karnataka and Telangana, CAI has one of the largest networks of cotton testing laboratories in India.

In his virtual address, Shri. Atul S. Ganatra, President, CAI, laid emphasis on the benefits of the instrument-based testing of cotton in India. He stated that, "The world over, marketing of cotton is done on the basis of quality parameters rather than varieties and instrument-based testing of cotton has become the order of the day. In fact, in countries like USA, every single bale is tested on HVI equipment and the results of each bale in respect of various quality parameters are available online. CAI has set up this laboratory to cater to the needs of the local ginners and traders of Khandesh region, since there is no cotton testing laboratory to provide this facility in and around Jalgaon," Shri. Ganatra added.

Shri. Pradeep Kumar Agarwal, CMD, CCI, commended the role played by the CAI in providing various services to the cotton and textile industry adding that both CCI and CAI



are complementing and supplementing the roles played by each other. He assured that CCI would continue to lend all possible support to the CAI in its endeavour to serve the cotton and textile sector better.

Maharashtra Cotton Ginners Association President Shri. Bhupendra Singh Rajpal and other invited ginners, exporters, traders and brokers also attended the virtual inauguration in large numbers.

In his thanks giving address, Shri. Pradeep Shantilal Jain, Founder President of Khandesh Gin Press Karkhandar & Traders Development Association, thanked the CAI President and the CAI Board of Directors for agreeing to the request of the trade in and around Jalgaon and setting up a laboratory in Jalgaon.

He added that cotton traders and ginners of Khandesh region would benefit immensely from this laboratory. He also thanked the CMD, CCI Shri. Pradeep Kumar Agarwal for sparing his valuable time to inaugurate this laboratory and also the participants for attending this virtual inauguration in large numbers.



Revision in Testing Charges at CAI Laboratories

The following are the charges for cotton testing in the laboratories of the Cotton Association of India with effect from 1st October 2020.

Particulars	Per Sample Testing Fees in Rs.		
	Testing Fees	GST	Total
HVI Test	145	26	171
Micronaire Test	85	15	100
Colour Grade on HVI	85	15	100
Gravimetric Trash Test on HVI	85	15	100
Moisture	85	15	100
Grading (Manual Classing)	235	42	277

VOLUME BASED DISCOUNTS

Particulars	Per Sample Testing Fees in Rs.		
	Testing Fees	GST	Total
For 250 samples and above but less than 500 samples	140	25	165
For 500 samples and above but less than 750 samples	135	24	159
For 750 samples and above but less than 1000 samples	130	23	153
For 1000 samples and above but less than 2000 samples	125	23	148
For 2000 samples and above but less than 5000 samples	120	22	142
For 5000 samples and above but less than 10,000 samples	115	21	136
For 10,000 samples and above	105	19	124

The fees under the above volume based discount scheme is payable within 15 days from the receipt of the invoices to be raised on monthly basis.

We would also like to inform that the parties can avail the benefit of testing of cotton at multiple laboratories of the Associations against the CAI Credits made by them.

We earnestly request you to avail the facility of testing at the Association's laboratories.



Cotton Association of India

Cotton Exchange Building, 2nd Floor, Opp. Cotton Green Rly. Station,
Cotton Green, Mumbai-400 033.

Tel.: +91 22 2370 4401/02/03/04 E-mail: cai@caionline.in Website: www.caionline.in

UPCOUNTRY SPOT RATES													(Rs./Qtl)
Standard Descriptions with Basic Grade & Staple in Millimetres based on Upper Half Mean Length [By law 66 (A) (a) (4)]								Spot Rate (Upcountry) 2019-20 Crop November 2020					
Sr. No.	Growth	Grade Standard	Grade	Staple	Micronaire	Gravimetric Trash	Strength /GPT	9th	10th	11th	12th	13th	14th
3	GUJ	ICS-102	Fine	22mm	4.0 - 6.0	13%	20	7255 (25800)	7255 (25800)	7255 (25800)	7339 (26100)	7339 (26100)	
Spot Rate (Upcountry) 2020-21 Crop													
1	P/H/R	ICS-101	Fine	Below 22mm	5.0 - 7.0	4%	15	10770 (38300)	10770 (38300)	10770 (38300)	10770 (38300)	10770 (38300)	
2	P/H/R (SG)	ICS-201	Fine	Below 22mm	5.0 - 7.0	4.5%	15	10911 (38800)	10911 (38800)	10911 (38800)	10911 (38800)	10911 (38800)	H
3	GUJ	ICS-102	Fine	22mm	4.0 - 6.0	13%	20	-	-	-	-	-	
4	KAR	ICS-103	Fine	23mm	4.0 - 5.5	4.5%	21	7902 (28100)	7902 (28100)	7902 (28100)	7930 (28200)	7930 (28200)	
5	M/M (P)	ICS-104	Fine	24mm	4.0 - 5.5	4%	23	9954 (35400)	9954 (35400)	9954 (35400)	9983 (35500)	9983 (35500)	O
6	P/H/R (U) (SG)	ICS-202	Fine	27mm	3.5 - 4.9	4.5%	26	11079 (39400)	11079 (39400)	11079 (39400)	11107 (39500)	11107 (39500)	
7	M/M(P)/SA/TL	ICS-105	Fine	26mm	3.0 - 3.4	4%	25	9055 (32200)	9055 (32200)	9055 (32200)	9083 (32300)	9083 (32300)	
8	P/H/R(U)	ICS-105	Fine	27mm	3.5 - 4.9	4%	26	11248 (40000)	11248 (40000)	11248 (40000)	11276 (40100)	11276 (40100)	L
9	M/M(P)/SA/TL/G	ICS-105	Fine	27mm	3.0 - 3.4	4%	25	9476 (33700)	9476 (33700)	9476 (33700)	9505 (33800)	9505 (33800)	
10	M/M(P)/SA/TL	ICS-105	Fine	27mm	3.5 - 4.9	3.5%	26	9983 (35500)	9983 (35500)	9983 (35500)	10011 (35600)	10011 (35600)	
11	P/H/R(U)	ICS-105	Fine	28mm	3.5 - 4.9	4%	27	11332 (40300)	11332 (40300)	11332 (40300)	11360 (40400)	11360 (40400)	I
12	M/M(P)	ICS-105	Fine	28mm	3.7 - 4.5	3.5%	27	10911 (38800)	10911 (38800)	10911 (38800)	10939 (38900)	10939 (38900)	
13	SA/TL/K	ICS-105	Fine	28mm	3.7 - 4.5	3.5%	27	10939 (38900)	10939 (38900)	10939 (38900)	10967 (39000)	10967 (39000)	
14	GUJ	ICS-105	Fine	28mm	3.7 - 4.5	3%	27	10995 (39100)	10995 (39100)	10995 (39100)	11051 (39300)	11051 (39300)	D
15	R(L)	ICS-105	Fine	29mm	3.7 - 4.5	3.5%	28	11332 (40300)	11332 (40300)	11332 (40300)	11360 (40400)	11360 (40400)	
16	M/M(P)	ICS-105	Fine	29mm	3.7 - 4.5	3.5%	28	11135 (39600)	11135 (39600)	11135 (39600)	11164 (39700)	11164 (39700)	
17	SA/TL/K	ICS-105	Fine	29mm	3.7 - 4.5	3%	28	11192 (39800)	11192 (39800)	11192 (39800)	11220 (39900)	11220 (39900)	A
18	GUJ	ICS-105	Fine	29mm	3.7 - 4.5	3%	28	11304 (40200)	11304 (40200)	11304 (40200)	11360 (40400)	11360 (40400)	
19	M/M(P)	ICS-105	Fine	30mm	3.7 - 4.5	3.5%	29	11248 (40000)	11248 (40000)	11248 (40000)	11276 (40100)	11276 (40100)	
20	SA/TL/K/O	ICS-105	Fine	30mm	3.7 - 4.5	3%	29	11304 (40200)	11304 (40200)	11304 (40200)	11332 (40300)	11332 (40300)	Y
21	M/M(P)	ICS-105	Fine	31mm	3.7 - 4.5	3%	30	11557 (41100)	11557 (41100)	11557 (41100)	11585 (41200)	11585 (41200)	
22	SA/TL/K/TN/O	ICS-105	Fine	31mm	3.7 - 4.5	3%	30	11614 (41300)	11614 (41300)	11614 (41300)	11642 (41400)	11642 (41400)	
23	SA/TL/K/TN/O	ICS-106	Fine	32mm	3.5 - 4.2	3%	31	11838 (42100)	11838 (42100)	11838 (42100)	11867 (42200)	11867 (42200)	
24	M/M(P)	ICS-107	Fine	34mm	3.0 - 3.8	4%	33	15635 (55600)	15635 (55600)	15635 (55600)	15663 (55700)	15663 (55700)	
25	K/TN	ICS-107	Fine	34mm	3.0 - 3.8	3.5%	34	15972 (56800)	15972 (56800)	15972 (56800)	16000 (56900)	16000 (56900)	

(Note: Figures in bracket indicate prices in Rs./Candy)