

## Field Evaluation of Bt Cotton Hybrids for Susceptibility to Cotton Leaf Curl Virus

(Results uploaded on the web-site on 3<sup>rd</sup> March 2015; Revised version uploaded on 11<sup>th</sup> April 2015 based on the decisions taken at the AICCIP Annual review meeting held on 8-10 April at TNAU Coimbatore)

### Technical Program

**Locations of Testing: Five:** Haryana (Hisar & Sirsa); Punjab (Abohar & Faridkot) & Rajasthan (Sriganganagar)

**Four experiments were conducted at each of the five locations**

1. Pre-release hybrids –Normal date of sowing
2. Pre-release hybrids –Late sown
3. Released hybrids –Normal date of sowing
4. Released hybrids –Late sown

### Number of Hybrids (coded entries) at each centre

Released hybrids	100
Pre-release hybrids	50
Number of rows per entry	2
Row length	5.4 metres (10 dibbles per row)
Number of plants	20 per replication
Number of replications	2
Spacing	67.5 x 60 cm
Experimental Design	Released hybrids:10x10 lattice; Pre release hybrids: RBD
Susceptible check	Standard susceptible check planted after every four lines of the test entry hybrids

Observations on cotton leaf curl virus disease were recorded at three intervals from all the 40 plants (20 plants in 2 replications). A rating scale of 0-6 was used while grading as detailed below:

Location	Crop sown on normal date				Late sown crop			
	Date of sowing	Observation schedule: Days after sowing (DAS)			Date of sowing	Observation schedule: Days after sowing (DAS)		
		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
<b>Sirsa</b>	14 May '14	60	90	120	4 June '14	40	70	100
<b>Hisar</b>	20 May '14	54	90	105	7 June '14	37	73	88
<b>Sriganganagar</b>	21 May '14	53	83	103	7 June '14	37	67	87
<b>Abohar</b>	20 May '14	64	89	107	6 June '14	48	73	91
<b>Faridkot</b>	24 May '14	51	79	113	6 June '14	40	68	102

Grading	Symptoms
0	Complete absence of symptoms
1	Thickening of few small scattered veins on one or few leaves of a plant observed after careful observations.
2	Thickening of small group of veins, no leaf curling, no reduction in leaf size and boll setting.
3	Thickening of all veins, minor leaf curling, leafy enations, deformity of internodes with minor reduction in leaf size but no reduction in boll setting.
4	Severe vein thickening, moderate leaf curling, leafy enations, minor deformity of internodes and <b>minor reduction in leaf size and boll setting.</b>
5	Severe vein thickening, moderate leaf curling, leafy enations, & deformity of internodes <b>with moderate reduction in leaf size and boll setting</b> followed by moderate stunting.
6	Severe vein thickening, leaf curling, reduction in leaf size, leafy enations, deformed internodes and severe stunting of plant <b>with no or few boll setting</b>

**Analysis:** Average of grades from each of the observations from all five centres was considered separately for the three observations, to calculate the PDI and 'mean data grade' of all the locations tested was considered for the final categorization as tolerant, moderately tolerant, slightly tolerant or susceptible.

**PDI:** % Disease Index for an entry was calculated as % in comparison to the highest grade on the most susceptible entry in the experiment at the time of observation.

$PDI = (\text{Average grade in test entry} / \text{Average grade in the most susceptible entry}) \times 100$

**Average Grade:** Sum of grades of all plants of the entry/ total number of the entry plants

**Tolerant:** PDI less than 30% at all three observations

**Moderately Tolerant:** More than 30% PDI but less than 40% PDI at 1<sup>st</sup> and 2<sup>nd</sup> observation with less than 45% PDI at 3<sup>rd</sup> observation

**\*Slightly Tolerant:** More than 30% PDI but less than 40% PDI at 1<sup>st</sup> and 2<sup>nd</sup> observation respectively

**Susceptible:** Disease symptoms of PDI more than 40% PDI at any of the 1<sup>st</sup> and 2<sup>nd</sup> observation respectively

\*The new category 'SLIGHTLY TOLERANT' was added based on the discussions held and decision taken at the AICCIP annual review meeting held at TNAU Coimbatore in the special session on CLCuD on 8-4-15 (Chairman: Dr C. D. Mayee; co-chairman: Dr N. Gopalakrishnan; members: Dr K. R. Kranthi, Dr D. Monga, Dr AH Prakash and Dr Siwach)

## Summary Results

### Pre-release Hybrids

Tolerant	Moderately Tolerant	Susceptible		
Bio 6451-2 BG II	RCH 791 BG II	RCH 809 BG II	SP 7228 BG II	PCH-4142 BG II
Bio 6261-2 BG II	KSCH-218	RCH-821 BG II	VICH-332 BG II	SP 7600 BG II
Bio 6165-2 BG II	ACH-531-2 BG II	Ankur-Sonakshi BG II	Ankur-Samsher BG II	PCH-5055 BG II
	RCH 773 BG II	PRCH 772 BG II	VICH-343 BG II	Ankur-Jaideep BG II
	GK 239	RCH-818 BG II	GK 228	ABCH-181 BG II
	Deltapine 5149 BG II	VICH-307 BG II	PRCH 7177 BG II	FILLER
	ACH-551-2 BG II	NCS 8899 BG II	PRCH 771 BG II	KCH-999
	SP 7583	PCH 9603 BG II	NBC-71 BG II	NCS 9199 BG II
	KSCH-213	RCH 569 BG II	NCS 234 BG II	HS6(susceptible check)
		NCS 123 BG II	MRC 7081 BG II	JACKPOT
		PCH 9601 BG II	SP 7223 BG II	Deltapine 5142
		PRCH 770 BG II	NCS 4545 BG II	ABCH-146 BG II
		MRC 7071 BG II	Deltapine 5141	KSCH-211

Three entries NCCH-0316, NCCH-0337 and KSCH-211 were tested only at one location (Sriganganar). These entries were found to be moderately tolerant to CLCuD at Sriganganagar, but the results will be applicable only for Rajasthan and not for the entire north zone.

### Released Hybrids

Tolerant	Moderately Tolerant			Slightly Tolerant	Susceptible		
846-2 BG II	RCH 314 BG II	Bio 6539-2 BG II	Ankur-3224 BG II	PRCH 708 BG II	Neo 1602 BG II	NCH 4455 BG II	ABCH-4899 BG II
841-2 BG II	PCH 9609 BG II	45-5533 II	NCS 2223 BG II	NCS 855 BG II	KSCH-207 BG II	PCHH 560 II	Tulasi 4 BG II
ZCH 1101(Singham)	RCH 602 BG II	RCH 776 BG II	VICH-309 BG II	PRCH 333 BG II	PCH 225 BG II	Ajeet-33-II	NECH-6 Bt (Fusion)
ZCH 1102(Zuari Milkha)	Neo 1604 BG II	NCS 558 BG II	Ankur-3244 BG II	NSPL 2223 BG II	NCH 145 BG II	MRC 7361 BG II	PRCH 711 BG II
6317-2 BG II	VICH-321 BG II	54-5533 II	PCH 9611 BG II	ABCH-192 BG II	SP 7010 BG II	ATM	KSCH-209 BG II
6488-2 BG II	SWCH 4704 BG II	NCS 9024 BG II	DPC 3083 BG II	PCH 9605 BG II	51-5533 II	NCS 9011 BG II	JAADOO
Bio 2510-2 BG II	SRCH-888 BG II	SP 7171 BG II	Tulasi 162 BG II		ABCH-2099 BG II	NECH-51 Bt (Fusion)	NECH-26 Bt (Fusion)
Bio 2113-2 BG II	SWCH 4713 BG II	PRCH 7799 BG II	MH 5302		NCS 495 BG II	ACH 177-2 BG II	RCH 605 BG II
ZCH 904 (Rajath)	PCH 9604 BG II	Neo 1603 BG II	Ankur-3028 BG II		SSRCH-999 BG II	Ankur-8120 BG II	BULLET
NCS 858 BG II	NCS 9002 BG II	SO7H878 BG II	MRC 7365 BG II		NCS 9013 BG II	NECH-31 Bt (Fusion)	ACHH-1
RCH 650 BG II	NCS 9012 BG II	DPC 3085 BG II	*NCCH 0337 II		NCS 857 BG II	VICH-310 BG II	Jai BG II
MRC 7017 BG II	Jassi BG II	SWCH 4711 BG II	*KSCH-215 BG II		Ajeet-133-II	HS6(susceptible check)	SP 7007
	PCH 1414 BG	KSCH-211 BG II	*NCCH 0316 II		PCH 9602 BG II	GK 212	Tulasi 171 BG II
	Ajeet-155-II	D29 II	*KSCH-210 BG II				
	RCH 653 BG II	PCH 877 BG II	*KSCH-213 BG II				

\*The entries NCCH 0337 BG-II, NCCH 0316 BG-II, KSCH 215 BG-II and KSCH 210 BG-II were tested only in Haryana and thus the results are applicable only for Haryana. Similarly KSCH 213 BG-II was tested only in Punjab and thus the results are applicable only for Punjab.

### Recommendations

1. The 'tolerant entries' may be approved for cultivation in north India for two years (2015 and 2016 Kharif)
2. The 'moderately tolerant' and 'slightly tolerant' entries may be approved for cultivation in north India for one year (2015 kharif)
3. The 'susceptible' entries may be banned for cultivation in Haryana, Punjab and northern Rajasthan (Sriganganagar & Hanumangarh districts).
4. The leaf curl virus disease is not prevalent in southern region (Jodhpur, Pali, Nagaur, Ajmer, Bhilwara, Udaipur, Banswara etc.) of Rajasthan and thus these results are not applicable to the region. Therefore any Bt hybrid approved by the GEAC to be cultivated in north India may be permitted in southern Rajasthan.
5. Early sowing (before 15<sup>th</sup> May) helps the crop to escape the leaf curl virus (CLCuD) disease. Steps may be taken to release canal water for two to three weeks period before 15<sup>th</sup> May to enable early sowing.
6. Late sown crop becomes highly vulnerable to the leaf curl virus (CLCuD) disease. Hence late sowing should be strictly avoided.
7. Extension agencies may give wide publicity to encourage the cultivation of hybrids that are tolerant to CLCuD as mentioned in the lists.