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Performance of second generation Bt cotton genotypes against sucking pests under rainfed conditions*

Insect pest management in cotton alone adds to 50% of the total cost of cultivation. To overcome problem of bollworms worldwide major cotton growing countries have adopted Bt transgenics expressing *cry*1Ac protein. Though *cry*1Ac is target specific toxin for bollworms its effect on sucking pests have been assessed either to explore added advantage or induced susceptibility if any in terms of sucking pest complex management. Recently as resistance management strategy, second generation Bt cotton are being cultivated in many countries. With this in view, a field experiment was conducted during 2007-08 at Main Agricultural Research Station, Dharwad to assess the performance of second generation Bt cotton (BG-II) hybrids expressing *cry*1Ac + 2Ab against sucking pests under rainfed conditions.

The experiment was consisting of ten genotypes replicated thrice in a randomized block design. Every genotype was occupying a 5.4 m x 4.5 m plot in each replication. The crop was raised by following recommended package of practice for zone-8 of Karnataka with a spacing of 0.9 m x 0.6 m. between the rows and plants respectivety.

The plant protection for entire experimental setup was uniform against sucking pests. The seeds were treated with Imidacloprid 48% FS (at the source) to check the incidence of early season sucking pests. Later two applications of Acetamiprid 20 SP @ 10 g ai/ha were given at 60 and 110 days after sowing as thrips and leafhoppers crossed economic threshold limits. The observation for incidence of thrips, leaf hoppers, white flies and aphids were made at weekly interval from 20 to 160 days after germination sowing on three leaves selected randomly from top, middle and bottom portion of 10 tagged plants/genotype. For analysis population per leaf has been considered. Similarly from 70 DAS, the late sucking pests like red cotton bugs and dusky cotton bugs were counted on 10 randomly selected tagged plants at weekly interval till last picking. Red cotton bugs were counted on the whole plant basis, whereas dusky cotton bugs were counted from 10 randomly picked bolls. The seed cotton from each plot excluding border rows was extrapolated to q/ha. The data were subjected to statistical analysis after suitable transformation and the means were separated by DMRT (p=0.05). As population appeared to be below ETL and could not differ significantly between genotypes only seasonal mean has been presented in the table.1.The data for thrips and leafhoppers at peak incidence and significant among genotypes has been given separately as figure.

The thrips population in different genotypes at different days of observation remained same during the cropping period as revealed by non significant difference between the genotypes. The seasonal mean incidence of thrips (table.1) ranged from 1.95 to 2.53 per leaf. However it could cross ETL (10/leaf) only in September first week wherein RCH 530 and DHH-11 had significantly higher incidence(13.33/leaf) over Bunny and RCH -2 (fig) as per transformed values with 0.48 CD at 18 df. Similarly the leaf hopper incidence could cross ETL (2/leaf) only during third week of October wherein MRC-7351 had significantly least incidence(1.67/leaf) over the rest.DHH-11had significantly higher (2.9/leaf) incidence.(transformed values CD = 0.18,df 18). The seasonal mean ranged from 0.73 to1.05 leaf hoppers/leaf. From the table(1) it is evident that the seasonal mean incidence of aphids was very low and no genotype has shown considerable susceptibility. Infact the aphid incidence in the season could be considered as negligible (1.07-1.25/leaf). Similarly, the population of whiteflies/leaf in all the genotypes was below ETL (5 whiteflies/leaf) at all the periods of observation as well as seasonal mean. But relatively higher incidence (3.73 to 4.67/leaf) was noticed at later part of the season ie during third week of October as observed by Strickland and Annells (2005). The seasonal mean of red cotton bugs and dusky cotton bugs indicated no differential susceptibility between BG-II, BG-I and non-Bt genotypes. Thus the second generation (BG-II) Bt cotton genotypes have shown the reaction against sucking pests similar to those of first generation (BG-I) and non-Bt hybrids. However non significant variation in population (seasonal mean) of all sucking pests is not an indicative of resistance/ tolerance of any genotypes as sucking pests at early season have been limited by imidacloprid seed treatment. The severe incidence of thrips and leafhoppers at later part of the season wherein populations crossed ETL and reaction of genotypes varied significantly is an indication of host plant resistance. Previously Benedict and Altman (2001) revealed that Bt cotton required one or two sprays for control of thrips. Like in the present study Reed *et al.* (2000) also have experienced equal incidence of aphids in Bt and conventional cotton. Due to reduced use of insecticides the incidence of red and dusky cotton bugs is higher these days, however as reported by Rajanikantha (2004) no variation between Bt and non-Bt cotton hybrids. In the absence of unprotected check for sucking pests the host plant resistance realized in the present study has not been linked to explain direct influence on yield potential of any genotypes. Based on genetic potentiality and inbuilt protection against bollworms through one or two Cry

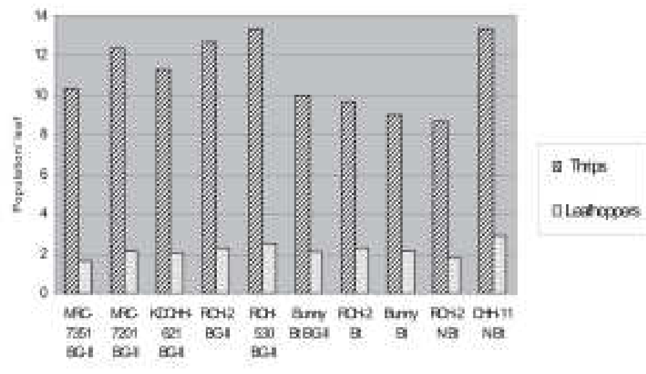

Fig: Population levels of thrips and leafhoppers at peak incidence in different cotton hybrids

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Table 1. Seasonal mean incidence of sucking pests on different Bt cotton genotypes and seed cotton yield

Genotypes	Thrips/leaf	Leaf hoppers/ leaf	Aphids / leaf	White flies/leaf	Red cotton bugs/leaf	Dusky cotton bugs/boll	Seed cotton yield (q/ha)
MRC-7351 BG-II	1.99	0.78	1.09	0.71	0.57	4.06	20.37 a
	(1.73)	(1.33)	(1.45)	(1.31)	(1.25)	(2.24)	
MRC-7201 BG-II	2.32	0.85	1.14	0.72	0.68	3.96	19.13 abc
	(1.82)	(1.36)	(1.46)	(1.31)	(1.29)	(2.23)	
KDCHH-621 BG-II	2.20	0.84	1.07	0.72	0.55	3.93	19.75 ab
	(1.79)	(1.36)	(1.44)	(1.31)	(1.25)	(2.22)	
RCH-2 BG-II	2.53	0.95	1.24	0.80	0.73	4.34	17.95 bc
	(1.88)	(1.40)	(1.50)	(1.34)	(1.31)	(2.31)	
RCH-530 BG-II	2.51	1.05	1.34	0.87	0.76	4.49	17.33 c
	(1.87)	(1.43)	(1.53)	(1.36)	(1.33)	(2.34)	
Bunny Bt BG-II	2.08	0.90	1.15	0.82	0.68	4.29	18.60 abc
	(1.75)	(1.38)	(1.46)	(1.35)	(1.29)	(2.30)	
RCH-2 Bt	2.13	1.01	1.25	0.75	0.77	4.78	17.19 c
	(1.77)	(1.42)	(1.50)	(1.32)	(1.33)	(2.40)	
Bunny Bt	2.00	0.89	1.16	0.74	0.70	4.89	17.98bc
	(1.73)	(1.37)	(1.47)	(1.32)	(1.30)	(2.42)	
RCH-2 N Bt	1.95	0.73	1.07	0.69	0.76	4.47	12.15 d
	(1.72)	(1.32)	(1.44)	(1.30)	(1.33)	(2.34)	
DHH-11	2.50	1.10	1.52	1.07	0.86	4.71	11.72 d
	(1.87)	(1.45)	(1.57)	(1.43)	(1.36)	(2.38)	
CD at 5%	NS	NS	NS	NS	NS	NS	1.97
CV (%)	5.08	5.30	5.38	6.27	5.06	5.45	6.67

Means with followed by similar alphabets do not differs significantly by DMRT.

toxin expressing Bt genes MRC-7351 BG-II recorded highest seed cotton yield of 20.37 q/ha. The yield in MRC 7351 was at par with KDCHH-621 BG-II, MRC-7201 BG-II, and Bunny Bt BG-II, but superior to BG-I genotypes *viz.*, RCH-2 Bt (17.19 q/ ha) and Bunny Bt (17.98q/ha) which intern stayed significantly superior over non Bt hybrids. Due to large scale adaptation of BG-II Bt cottons the host plant resistance to sucking pests need to be addressed critically. The studies under epizootic and zero protection levels are essential. The present investigation serve as firsthand information for status of sucking pest resistance in selected BG-II cottons.

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