Study No. 15:

Title **: Aggressiveness, Weediness studies in transgenic *B.t.* cotton hybrids carrying Metahelix *cry1C* gene in comparison with other *B.t.* and non-*B.t.* hybrids**

Organization **: Metahelix Life Sciences Pvt. Ltd., Bangalore**

Year of study **: 2007**

Objectives: To assess if the transgenic *B.t.* cotton hybrids containing *cry1C* gene have any advantage over the non-*B.t.* and *cry1Ac* based *B.t.* cotton hybrids in terms of its aggressive ness at seedling stage which may lead to its weediness potential and therefore interfere with the ecosystem.

Introduction: Cotton has been a commercial crop and so far there has been no indication or report that the establishment and growth of transgenic cotton will lead to weediness compared to the non transgenic cotton. The genus *Gossypium* has not been reported to exhibit any particular weedy aggressive tendencies anywhere. Cottonseed, just like any other seed, may remain in the field after harvesting and may germinate under favourable conditions. As seed is the major source for spread, factors such as germination, seedling vigor, survivorship etc, were studied to see if there is any difference that would offer advantage to the transgenic *B.t.* cotton hybrids carrying *cry1C* gene in its invasiveness in comparison to the non-transgenic cotton.

Materials and Methods: Three groups of cotton hybrids as per the table below were selected, and acid-delinted seeds with a germination percentage of 75 to 85 were used in this study.

Table 1: List of *B.t.* and non *B.t.* hybrids used in the study

No.	***B.t.* cotton hybrids carrying *cry1C* gene**	**Other *B.t.* cotton hybrids carrying *cry1Ac* gene**	**Non-*B.t.* cotton hybrids**
1.	MLS 5174 *B.t.*	Bunny *B.t.*	Badri
2.	MLS 3134 *B.t.*	RCH2 *B.t.*	Dhanno
			Bunny

The selected materials were subjected to the following tests as per standard ISTA (International Seed Testing Association) protocols.

1. Standard Germination test.
2. Field emergence test.
3. Cold test.

1. Standard Germination test: Four hundred seeds were sown in four replicates at the rate of 100 seeds per replication. The seeds were germinated between two layers of germination paper. The rolled paper towels were placed inside the germinator in an upright position maintained at 25° ± 2° C temperature for a week. First count was taken on the 4th day. Final count on germination was taken on the 12th day as recommended by ISTA.

2. Field emergence test: Four hundred seeds were sown in four replicates at the rate of 100 seeds per replication in the middle of ridges and furrows in the field. Irrigation was carried out to maintain the moisture at optimum level. First count was taken on the 5th day after sowing and the final count of emergence was taken after completion of two weeks from the date of sowing.

3. Cold test: To know the ability of seed to survive and emerge under adverse field conditions, 100 seeds were placed between germination papers and rolled into towels. Rolled paper towels were then placed in the germinator at 10° C for 7 days and later shifted to normal conditions for standard germination test.

Results and Discussions : The germination percentage of two Metahelix *B.t.* cotton hybrids and one conventional commercial Metahelix hybrid along with two each of commercial *B.t.* and conventional hybrids were estimated through the standard germination test, field emergence test and the cold test. The results are presented in Table 2.

Table 2: Data on the seed quality traits of *B.t.* and non *B.t.* hybrids

Test Hybrid group	Germination % *		Field Emergence * (% seedlings emerged)		Cold Test (% germination)
	4th DAS	12th DAS	7th DAS	14th DAS	
MLS-*B.t.* hybrids	89.0	87.0	78.5	85.5	78.5
Other *B.t.* hybrids	88.5	86.0	82.5	87.0	79.0
Non *B.t.* checks	89.0	89.5	83.8	90.0	81.5

* Mean of four replications, 100 seeds per replication
DAS: Days After Sowing

There was no difference in the observed germination percentages on first-count and 12th day count between the three groups of hybrids studied. Field emergence results further confirmed the results observed in the paper towel germination tests. The cold test results also confirmed no observable differences in seed germination between the three groups. These results clearly indicated that the *B.t.* cotton hybrids carrying *cry1C* gene do not have any advantage over other *B.t.* cotton hybrids carrying *cry1Ac* gene or the conventional non *B.t.* hybrids for any of the seed germination and vigour traits. The results thus suggest that the aggressiveness, weediness or invasiveness potential of the *B.t.* hybrids carrying *cry1C* gene is none or highly negligible.

The rate of germination and vigour comparisons between *B.t.* and non *B.t.* lines through laboratory and soil tests are good indicators to see the potential differences for weediness and aggressiveness traits, if any. We did not see any difference in the parameters related to the vigour between the *B.t.* and non *B.t.* cotton hybrids. Similarly, APCoAB in 2006 reported no difference between *B.t.* and non *B.t.* with reference to aggressiveness or weediness. Eastick (2002) concluded that cotton, whether transgenic or non transgenic does not have weediness potential.

References:

APCoAB. 2006. *B.t.* Cotton in India- A status Report. Asia Pacific Consortium on Agricultural Biotechnology, New Delhi, India.p34

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