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Bt cotton - The debate continues

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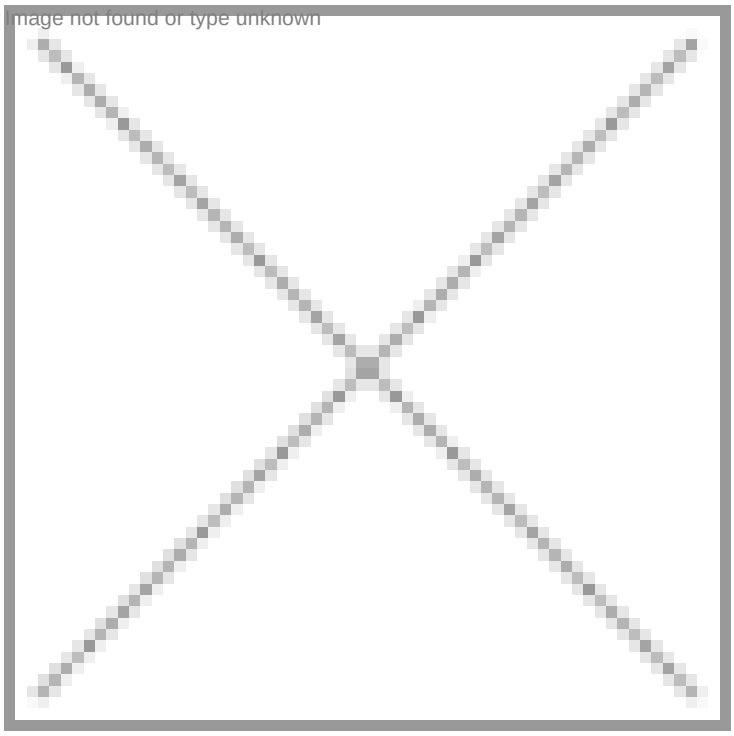

It may be noted that BioSpectrum was not a part to any of the findings and does not have any stand on the issue. Bt MECH 12, Bt MECH 162 and Bt MECH 184 were the three transgenic varieties approved by the regulator, GEAC and the period of validity of approval is three years from April 2002-March 2005. As of now, it is premature to give a verdict on the performance of Bt cotton in any part of India. Its performance can be judged only at the end of the validity period, when there would be adequate and reliable data to do so.

Gene Campaign report

The Gene Campaign report was compiled by Dr Suman Sahai and Shakeelur Rahman.

The study compared the performance of Bt to non-Bt cotton. It found that Bt cotton is not performing well and is in fact lagging behind the normal cotton in many respects. The study showed Bt cotton to be a shorter duration crop (90-100 days) than non-Bt cotton (100 to 120 days) but the plants showed less vigorous growth, with fewer branches and smaller leaves.

A major problem reported was the premature dropping of bolls in Bt cotton. A comparison of bolls and fibre showed that the number of bolls per plant was higher in the non-Bt cotton variety. Whereas the non-Bt variety averaged 95 bolls per plant, in the Bt variety the average was only
50 bolls.

Fibre length was also longer in the non-Bt varieties, which had better grade cotton. Non-Bt cotton was graded as A and B quality whereas Bt cotton was graded as B and C. Although both cotton types demonstrated a range of small to large bolls, more Bt cotton bolls were of a smaller size than the non-Bt cotton.

A significant finding of this study was the indication that Bt cotton variety does not offer protection against pink bollworm (Pectino-phora gossypiella). Pink bollworm attack was found to be severe after 60 to 70 days. There could be two possible reasons for this. The first could be that the period of expression of Bt endotoxin does not coincide with the time of the bollworm attack. This would mean that when the pest attacks the cotton, it is not expressing the endotoxin gene and therefore not offering any protection against the pest.

The other explanation could be that the pink bollworm is not susceptible to Bt endotoxin. The pink bollworm in India has probably developed resistance after being exposed to Bt toxin from the field trials that have been conducted during the past years and from the use of Bt pesticide sprays.

Economics of Bt cotton cultivation

The study stated that the economics of cultivating Bt cotton was not in favour of farmers. The seed being four times more expensive than the good local hybrids. The difference in the price of seed is approximately Rs 1200 per (450 gm) bag, which is needed to plant an acre.

As against this outlay, savings on pesticide were meagre, averaging Rs 217 per acre. Thus the investment per acre is much higher for Bt cotton than for non-Bt cotton varieties. The Bt cotton farmer had to invest on average, Rs 983 more per acre than his non-Bt counterpart.

And the average yield per acre of Bt cotton in all categories of landholdingsâ€"low, medium and high, was found to be poor when compared to its non-Bt counterpart. The result was that the net profit from Bt cotton was lower per acre compared to non-Bt cotton in all types of fields (low to high yielding).

The study pointed out that in fact, 60 percent of the farmers cultivating Bt cotton were not even able to recover their investment and incurred losses averaging Rs 79 per acre. The performance of Bt cotton in the areas studied in Maharshtra and Andhra Pradesh was poor and the farmers have had to suffer losses. Not surprisingly, an overwhelming majority of the farming families surveyed (98 percent) said they were not interested in growing Bt cotton again.

Gene Campaign's methodology of survey

The Bt cotton varieties compared by Gene Campaign were Bt 162 and Bt 184 belonging to Mahyco-Monsanto and the non-Bt cotton varieties were the local hybrids "Brahma" and "Banny". This field study was done on the basis of data obtained from the first commercial Bt crop. The survey was conducted in selected locations in Maharashtra and Andhra Pradesh, which are two of the six states that have been granted permission to commercially cultivate Bt cotton. The survey included a total of 100 farming families selected by random sampling from those who had chosen to grow Bt cotton on a portion of their landholding. These farmers were also growing non-Bt cotton simultaneously. Of the total of 100 families surveyed, 25 were from Maharashtra and 75 from Andhra Pradesh. Scientists from the Agricultural University in Hyderabad accompanied the Gene Campaign

Comparison between bolls and fibre of non-Bt and Bt cotton

Item	Non-Bt	Bt
Number of bolls/plant	95 (70 - 120)	50 (25 - 75)
Boll size	6 - 8 gm	3.5 - 5 gm

Comparative income from Bt and non-Bt cotton

Non-Bt cotton				Bt cotton		
Farm Type	Farmers (%)	Income/acre (Rs)	Net Profit/ acre (Rs)	Farmers (%)	Income acre (Rs)	Net Profit/ acre (Rs)

Low Yielding	35	7394	2661	60	5637	-79*
Medium Yielding	58	12512	7779	35	9737	4021
High Yielding	7	20475	15742	5	15375	9659

Findings of C Kameshwar Rao

Another survey on the performance of the first commercial standing Bt cotton crop was done by Dr C Kameshwar Rao, a botanist and executive secretary, Foundation of Biotechnology Awareness and Education last year.

His overall impression was that the Bt cotton variety, Boll Guard MECH 162, is performing well providing an effective control of the cotton bollworm. It should be mentioned that Dr. Rao had visited five fields and observed that one's visit of a few fields could not be the basis to generalize the situation in the entire state of Karnataka but nevertheless serves as a good indicator of the situation.

He observed that Bt cotton plants were more vigorous and early maturing at least by two weeks compared to the non-Bt refuge plants in the same field. A farmer told him that the yield was about 40 percent more than his past experience with the non-Bt cotton harvest and was full of praise for Bt cotton. Th farmer had applied only two sprays of insecticides for the sucking insects and one spray for the bollworm and hence saved a lot of money in terms of pesticide costs, which would have been incurred otherwise. He planned to pick cotton till March 2003, which was not possible with non-Bt cotton, all these years.

Dr Rao observed that in the neighbouring non-Bt farms, farmers had applied two sprays for sucking insects and five sprays for bollworm and still there was heavy infestation by bollworm. At this rate the farmers would be spraying insecticides about a dozen times more by the end of the cropping season. Due to this the resulting loss of yield would certainly be more than 20 percent and may even be 40 percent.

He observes that there is propaganda regarding a fall in the yield of Bt cotton. Boll Guard was never projected for improved yield. Whatever higher yield the farmers get is due to prevention of loss rather than improved performance of Bt-cotton in terms of yield. He counters the claim that since even Boll Guard needs insecticide spray, it is a deceitful introduction. Boll Guard is effective only against the bollworm, which is the principal pest responsible for the loss of the end product, which is the cotton fibre. The sucking insects damage the leaves and this would certainly reduce the yield to an extent but they are not as damaging as the bollworm, as they do not affect the economic product directly. Insecticides need to be sprayed against pests other than the bollworm and the difference of insecticide use between non-Bt- and Bt-cotton is very significant.

Methodology

Dr C Kameshwar Rao visited five cotton fields, near Ranibennur (central Karnataka), along with a team of cotton breeders and scientists in September 2002. They visited one irrigated Bt cotton field at a farm of Mahyco, the licensee of Monsanto to market Boll Guard, the Bt cotton seed, in India. They also visited three other Bt-cotton fields (one of them irrigated) and neighbouring these, two non-Bt cotton fields. These five belonged to farmers. All these five fields are small, each about an acre, and the crop was about 80 days old. The varieties of Bt and non-Bt cotton in the neighbouring fields were not the same. One non-Bt was Indo-American Hybrid seed and the other was Brahma, while the Bt cotton was MECH 162.