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## THE RETURN OF PINK BOLLWORM IN INDIA'S BT COTTON FIELDS AND ITS POSSIBLE WAYS TO DEAL WITH IT

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**B***acillus thuringiensis* (Bt) cotton technology has been the subject of heated discussion among academics and non-academics alike ever since it was introduced in India. Cotton farmers in several Indian states are worried about widespread resistance to endotoxins produced by Indian Bt cotton plants among Lepidopteran pests and the consequent loss of their livelihoods as a result of the return of pink Bollworm (*Pectophora gossypiella*) in those states recently rediscovered. There has been a recent spate of bollworm outbreaks in India, and this research is the first to examine the socio-economic impact that these assaults have had on the local economy. According different study, it explains why smallholders are now more vulnerable than ever before, and why some can only handle the repercussions of this technical failure to such a limited level. Pink Bollworm, the primary pest of Bt Cotton, has returned to a number of Indian cotton-producing states in recent months, and this is a major turning point. From last 5-6 years, the infection has extended across the central and southern zone of cotton production, resulting in yield losses of up to 30 percent in fields in Gujarat, Maharashtra, Karnataka, and Andhra Pradesh. Since this occurrence, there has been a renewed discussion over the long-term viability of Bt cotton technology among cotton farmers and other stakeholders in the business. While the Bt cotton technology offered built-in protection against pink Bollworm and other Lepidopteran pests, it is now reported to have 'lost the war'. Many possible factors for the pest's recurrence are contested in this context, of which we only address those that are directly connected to farmers' livelihoods systems, such as the trafficking of illegal and bogus seeds, and the need of planting refuge crops surrounding Bt plants

## Pink Bollworm

- ❖ Insects like the pink Bollworm, also known as the *pectinophora gossypiella*, are well-known cotton-farming pests.
- ❖ Originally from Asia, the pink Bollworm has spread across the world's cotton-growing areas.
- ❖ The pink Bollworm has developed resistance to first-generation transgenic Bt cotton (Bollgard cotton), which expresses a single Bt gene, in certain regions of India (Cry1Ac).



**Fig. 1:** Pink Bollworm and its effect on cotton

## Possible Reason for the Reappearance of the Pink Bollworm

Because of the frequency of unregulated seed trades, it's possible that the pest may return. Bt cotton seeds are more expensive than conventional cotton seeds and have a "stronger official intellectual property (IP) status," which encourages the development of informal marketplaces for Bt cotton. In the battle against Bollworm, the illegally sold seeds have a negative impact because of the poor quality of the seeds. This is owing to the fact that transgenic cotton plants express different amounts of Bt toxin. Toxin proteins cannot be produced in sufficient numbers in stealth and counterfeit seeds in order for the technology to work throughout the season. As a result, farmers are unable to make an informed decision based on credible information because of the illegal seed problem. For the sake of using the most popular brand and variety of seed each season, farmers "essentially ignore what they know about the previous years' seeds." Thus, farmers seldom replant seeds, limiting their ability to learn about the environment in a seed market that is becoming more opaque.

Farmers' non-compliance with refuge rules may also be a factor in the pest's recurrence. To minimise the evolutionary pressure of the pest to adapt to the endotoxins

generated by the Bt plants, refugia consisting of non-GE cotton crops must surround each field prior to sowing GE cotton. It blames the 'erosion of resistance to pink bollworm' on poor management of the technology and claims that farmers could have extended the technology's effectiveness if they had followed instructions. Others, on the other hand, point the finger at the technology itself: Technology must be judged in context, says Glover (2010), since it is not only "in the seed," but must "function in certain socio-technical and institutional situations. In light of the current issues regarding the resurgence of pink Bollworm in India's Bt cotton fields, we ask the following two questions: In Karimnagar district, how has the recent adoption of Bt technology affected agricultural families in general? As pink bollworm pests return to Karimnagar district farms due to the breakdown of host resistance, what immediate livelihood vulnerabilities have they produced and how are they coping with this new situation?

### **Socio-Economic Effects of Bt Cotton**

**Farmer's Subsistence Cultivation** According to the socioeconomic impacts of Bt cotton growing on the livelihoods of peasant farmers, the technology has a disputed impact on the amount of cotton that can be produced. Scholars with economics degrees have claimed that Bt technology improves yields. Almost all of these studies credit Bt cotton for the early 2000s' success in yield improvements. So it is said, that Bt cotton has performed far better than traditional cotton, resulting in a 40 percent yield advantage. Others take into account numerous major developments in Indian cotton production for total yield gains and find lower contributions from the GE technology. For instance, just 18 percent of the proposed yield gain is attributed to the technology itself. Recent long-term research claims that "yield increases are explained much better by other technological changes" and thus credits yield increases in the early 2000s to a variety of agricultural factors, such as cotton seed hybridization, improved access to irrigation facilities throughout Indian cotton-producing states, and most notably the increasing use of fertiliser. According to some experts, 'the yield advantage of Bt over non-Bt is insignificant' and that it is due to cultivars and agronomic approaches, not the technology itself. Larger effective yields have resulted to higher profits, according to some experts, who claim a 50 percent rise in cotton profit among smallholders, which boosted family living standards by 18 percent and increased household spending. Because most peasant families adopting Bt cotton are rather poor, the authors conclude that 'Bt cotton leads to good economic and social growth.' Furthermore, according to another study, both the greater yields and the increased earnings were long-term advantages.

In addition to this, however, there is a counterargument: Several academics have described the technique as raising farmers' risks since it is not characteristically yield-enhancing, but rather its success is strongly dependent on local appropriateness, irrigation, and rainfall circumstances. Because of this, 'any effects beyond particular bollworm infection' are not assured. Furthermore, gaurav and Mishra (2012) claim that Bt cotton's yield swings are much greater than the irregularity of conventional cotton in terms of risk. Since net returns have risen at a slower rate than input costs over the years.

### **Effects of the Pink Bollworm Pest Infestation on farmers Health and Welfare**

Recent studies estimate yield losses of up to 30 percent, making smallholders and other people involved in the cotton sector more anxious, a critical re-examination of the technology is necessary in light of the immediate livelihood hazards and associated coping techniques that may arise. An August and September 2018 study shows that the pest has returned to cotton-producing regions in central and southern India since the *Kharif* season of 2015, and that this infestation from 2017/2018 has had lasting effects. Despite the lack of data for later seasons, a researcher might deduce that this issue had a negative impact on cotton production in the upcoming years. An interviewers viewed the infestation as unexpected and stressed the idea of surprise in its occurrence "I opened approximately 50 cotton bales to make sure they weren't contaminated, but sadly the whole field was infested with pink bollworm." Farmers different area/ region have acknowledged these assaults and claim to have lost a significant amount of money as a result of these incidents. After the pink bollworm pest reappeared, another group of farmers explained how they began constructing their homes with the excess they had collected during the early years of adopting the technique but were unable to make enough money to complete the construction due to lower production and productivity of cotton.

### **Plan to Tackle Pest**

- ❖ For example, the “Central Institute for Cotton Research” plans to put up pheromone traps to attract male moths and teach farmers and oil extraction facilities to take precautions against cotton seed brought in from outside being a cause for the infestation to grow.
- ❖ Unusual RIB (Refugia in Bag) idea has been advocated by the federal government as an alternative solution to this issue. In this case, 25 grams non-Bt Cotton seed is combined with an equal amount of Bt Cotton seeds.

- ❖ The goal of planting 'refuge' plants near GM crops is to prevent Bt-resistant insects from developing. This allows for the cultivation of non-BT cotton, which may host pink bollworm wild insects, and prevents the pink Bollworm from developing resistance to pink Bollworm.
- ❖ Agriculturalists fear that the infection may lead to a 10 percent reduction in the area planted to cotton, resulting in lower yields and lower pricing.
- ❖ The National Seeds Association of India (NSAI) has also endorsed the RIB idea, which it claims would reduce the spread of pink Bollworm on Bt Cotton.

### Why the Case is Unique for India?

**Toxin-resistant pink bollworms have been found in India because of this.**

- ✓ Since the advent of Bt cotton in 2002, India has confined itself to farming long-duration hybrids.
- ✓ There are no other Bt cotton-producing nations that cultivate open-pollinated cotton types like China or the United States.

### What's Next?

Agricultural rotation with other crops, biological control of insects with the assistance of insects and parasites that consume pink Bollworm, and destruction of crop waste and garbage in the field are all part of the NSAI's IPM programme. There has also been a recommendation from NSAI for the government to return to Bollgard. Short-duration crop varieties should be adopted as soon as possible by growers. As Monsanto did not patent BG-2 in India, seed firms cannot create open-pollinated cultivars using BG.

### Solutions

- to 3 pesticide applications on average since the seeds at the time were resistant to pests.
- There are three primary ways to manage and eradicate pink bollworms as outlined by scientists and field researchers.
- There are two methods of reducing the population of the pink Bollworm, the first of which is known as the mating disruption technique.

- To prevent the spread of the disease, sterile male moths are dispersed across fields to inhibit procreation. Third, cotton seed types that are resistant to pink Bollworm may be widely used.
- BG-3 seeds and mating disruption have been offered as a permanent solution to this problem by researchers. According to them, the only other option is to drastically increase the quantity of pesticides used.
- To limit the spread of the pink Bollworm, the crop will need to be sprayed with pesticide every 7-8 days, therefore after 50 days in the field, the crop will need a dose of pesticide every 10 days.
- Cotton crops were pest-resistant prior to the arrival of the pink Bollworm, which needed just two to three pesticide treatments per acre.

### Conclusion

This article demonstrates how the livelihood effects of the Bt cotton technology on Indian farmers are varied and have changed over time. The early years of Bt cotton adoption were marked by detectable yield of cotton, noticeable decreases in pesticide use, and increased economic prosperity. The farmers who were interviewed said that in the last 4–5 years, they had significant output losses as a result of pink bollworm infestation—a Lepidopteran pest that Bt technology is said to guard against. This insect infestation severely harmed farmers' livelihoods, and the resulting additional vulnerabilities disproportionately impacted households with few assets. Therefore, those farmers with marginal assets have been put at the greatest risk as a result of the Bt technology's failure. Given the re-emergence of pink Bollworm in Indian cotton fields, we have reason to worry that the second generation Bt cotton technology's (Bollgard-II) built-in pest management is no longer effective. The livelihoods of cotton farmers in India are at danger because of this.

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