

Insecticides and Biotech Varieties Protect Indian Cotton from Significant Losses

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India is the world's second largest cotton producer and consumer, and number one exporter. Cotton is primarily grown by smallholder farmers [1]. The value of the cotton crop to these farmers is about \$8 billion/year.

Traditionally, the principal insect pests included species that suck sap from the plants (leafhoppers and planthoppers [jassids], mirids), and bollworms. Bolls fed upon by the sap-feeding pests are shed from the plant causing loss in yield. Bollworm larvae feed on cotton bolls. In many instances, the entire contents of the boll are consumed. Uncontrolled, the bollworm complex and sap-feeding pests can cause about a 50-60% loss in cotton yield [2]. Increased cotton yields in India between 1965 and 1980 (+70%) were due principally to the use of chemical insecticides [3].

Traditionally, the bollworm complex was the target of most insecticide sprays owing to the direct damage to bolls. Beginning in the 1990s, cotton yield losses occurred despite these sprays because of widespread resistance to the insecticides in bollworm populations. The insecticide sprays did have the effect of controlling the sap-feeding pests. Without the sprays, sap-feeding pests could reduce the cotton yields by up to 22% [4].

In 2002, the Indian government approved the planting of cotton plants genetically modified with the insertion of a Bt gene that is toxic to bollworms. By 2011, 7 million farmers had adopted Bt cotton on 26 million acres, around 90% of total Indian cotton area [1]. The more effective control of bollworms with Bt cotton is credited with increasing cotton yields in India by 24% [1]. The adoption of the BT varieties led to a reduction of 39% in insecticide sprays [5]. However, the sap-feeding pests are unaffected by the Bt gene. As a result, Bt cotton growers still need to make two insecticide applications during the season to control the sap-feeding insect pests [6].

In recent years, a sap-feeding mealybug species (*Phenacoccus solenopsis*) exotic to India appeared for the first time feeding on leaves, stems and fruit causing yield losses of 30-40% [7]. Indian cotton growers have been advised to spray for this pest when 10% of the plants have at least one stem completely colonized with mealybugs. Research has shown that insecticide sprays on Bt cotton provide 95% mortality of mealybugs [8].

Current market research data from Phillips-McDougall indicate that the cotton insecticide market is the largest single market for pesticides in India (\$155 million).

References

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India Cotton Field



Bt Cotton (left)



Mealybug Damage