

A Wasp Parasitoids of Genus Cotesia (Hymenoptera: Braconidae) Naturally Parasitizing Pectinophora gossypiella (Saunders) on Transgenic Cotton in Indian Punjab

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Abstract : India is one of the largest cultivators of cotton in the world. Among the various constraints, insect pests are posing a major hurdle to the success of cotton cultivation. Various bollworms, including the pink bollworm, *Pectinophora gossypiella* (Saunders), cause serious losses in India, China, Pakistan, Egypt, Brazil, tropical America, and Africa, etc. Bt cotton cultivars having Cry genes were introduced in India in 2002 (Cry1Ac) and 2006 (Cry1Ac+ Cry2Ab) for control of American, spotted, and pink bollworms. Pink bollworm (PBW) larvae infest flowers, squares, and bolls. Larva burrows into flowers and bolls to feed on pollen and seeds, respectively. It has a shorter lifecycle and more generations per year, so it develops resistance more quickly than other bollworms. Further, it has cryptic feeding sites, i.e., flowers and bolls/seeds, so it is not exposed to harsh environmental fluctuations and insecticidal applications. The cry toxin concentration is low in its feeding sites, i.e., seeds and flowers of cotton. The use of insecticide and Bt cotton is the primary control measure that has been successful in limiting the damage of PBW. But with the passage of time, it has developed resistance against insecticides and Bt cotton. However, the use of insecticides increases chemical control costs while causing secondary pest problems and environmental pollution. Extensive research has indicated that monitoring and control measures such as biological, cultural, chemical, and host plant resistance methods can be integrated for effective PBW management. The potential of various biological control organisms needs to be explored. The impact of transgenic cotton on non-target organisms, particularly natural enemies, which play an important role in pest control, is still being debated. According to some authors, Bt crops have a negative impact on natural enemies, particularly parasitoids. An experiment was carried out in the Integrated Pest Management Laboratory of the Department of Entomology, Punjab Agricultural University, Ludhiana, Punjab, India, to study the natural parasitization of PBW on Bt cotton in 2022. A large population of larvae of PBW were kept individually in plastic containers and fed with cotton bolls until the emergence of a parasitoid cocoon. The first cocoon of the parasitoid was observed on October 25, 2022. Symptoms of parasitization were never seen on larvae. Larvae stopped feeding and became inactive before the emergence of parasitoids for pupation. Grub makes its way out of larvae by making a hole in the integument, and immediately after coming out, it spins the cocoon. The adult parasitoid emerged from the cocoon after eight days. The parasitoids that emerged from the cocoon were identified as *Cotesia* (Braconidae: Hymenoptera) based on the features of the adult. Out of 475 larvae of PBW, 87 were parasitized, with 18.31% of parasitization. Out of these, 6.73% were first instar, 10.52% were second instar, and 1.05% were third instar larvae of PBW. No parasitization was observed in fourth instar larvae. Parasitoids were observed during the fall end of cropping season and mostly on the earlier instars. It is concluded that the potential of *Cotesia* may be explored as a biological control agent against PBW, which is safer to human beings, environment and non-target organisms.

Keywords : biocontrol, Bt cotton, *Cotesia*, *Pectinophora gossypiella*

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