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W129

Bt Cotton

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What is Bt Cotton?

Bt cotton has been genetically modified by the insertion of one or more genes from a common soil bacterium, *Bacillus thuringiensis*. These genes encode for the production of insecticidal proteins, and thus, genetically transformed plants produce one or more toxins as they grow. The genes that have been inserted into cotton produce toxins that are limited in activity almost exclusively to caterpillar pests (Lepidoptera). However, other strains of *Bacillus thuringiensis* have genes that encode for toxins with insecticidal activity on some beetles (Coleoptera) and flies (Diptera). Some of these genes are being used to control pests in other crops, such as corn.

What insects does it control?

In 1996, Bollgard cotton (a trademark of Monsanto) was the first Bt cotton to be marketed in the United States. The original Bollgard cotton produces a toxin called Cry 1Ac that has excellent activity on tobacco budworm and pink bollworm. These two insects are extremely important caterpillar pests of cotton, and both are difficult and expensive to control with traditional insecticides. Consequently, Bt cotton was widely adopted by growers in the western Cotton Belt for pink bollworm and by growers in the Midsouth and Southeast, primarily for tobacco budworm. Bollgard toxin also has moderate activity on bollworm and to a lesser extent on loopers, fall armyworm and beet armyworm.

Bollgard II was introduced in 2003, representing the next generation of Bt cottons. Bollgard II contains a second gene from the Bt bacteria, which encodes the production of Cry 2Ab. WideStrike (a trademark of DowAgrosciences) was registered for use in the fall of 2004. Like Bollgard II, WideStrike cotton expresses two Bt toxins (Cry1Ac and Cry1F). Both Bollgard II and WideStrike have better activity on a wider range of caterpillar pests than the original Bollgard technology. Bt cottons from other companies are currently under development but have not been commercially introduced.

Bollworm

Bollworm egg

Tobacco Budworm

How does Bt cotton affect insect pest management?

Bt cotton eliminates the need to treat for infestations of tobacco budworm (or pink bollworm in areas with this pest). Prior to bloom, the need to treat for bollworm is greatly reduced. However, the level of bollworm control provided by Bollgard cotton may not be sufficient once cotton has begun to bloom. Bollgard may also suppress the development of damaging populations of other caterpillar pests, but insecticidal oversprays of Bollgard cotton for control of bollworm, loopers, and beet and fall armyworm are sometimes needed. The need for supplemental insecticide sprays for bollworm, loopers and armyworms will be reduced on Bollgard II and WideStrike cottons.

Research and practical experience in the Midsouth and Southeast suggest that some pests are more problematic in Bt cotton because of a reduction in the use of broad-spectrum insecticides for control of tobacco budworm and bollworm. Tarnished plant bug, clouded plant bug and stink bug infestations tend to be more common in Bt cotton. This problem is, perhaps, more the result of a reduction in insecticide use resulting from boll weevil eradication.

Tarnished Plant bug

Can insects develop resistance to Bt cotton?

It seems likely that some cotton pests could develop resistance to Bt crops if they are extensively used. Insects such as the tobacco budworm are well known for their ability to develop resistance to many insecticides, including Bt toxins. Because of this, there are restrictions associated with the use of Bt cotton that are intended to prevent or delay the development of resistance. The primary resistance management strategy is the mandatory planting of a non-Bt cotton refuge. The refuge serves as a source of susceptible insects that would potentially breed with any resistant insects generated in Bt cotton fields. The offspring of this mating would be susceptible to Bt toxins (assuming the genetic trait for resistance is at least partially recessive).

A second resistance management tactic would be the introduction of Bt crops that produce two or more relatively dissimilar toxins. Presumably, it is less likely that any one insect will be simultaneously resistant to more than one toxin. It is expected that Bollgard II, WideStrike and Bt cottons from other companies will eventually replace the original Bollgard technology.

Is Bt cotton safe?

Bt toxins are highly specific. The toxins produced by Bt cotton and corn are toxic to a select number of arthropod species. Because cotton is primarily a fiber crop, the contamination of food with toxins from cotton is highly unlikely. However, extensive testing indicates a very low public health risk from the use, including ingestion, of food products that utilize currently available Bt crops.

Negative impacts on non-target arthropods are potential concerns resulting from the use of Bt crops. Concerns were raised because corn pollen, containing Bt toxins, could be blown onto plants that serve as hosts to monarchs, swallowtails and other butterflies. This is a minor issue with cotton because, unlike corn, it is not wind pollinated. It should also be considered that Bt crops often reduce the use of broad-spectrum insecticides, thereby reducing the impacts of these applications on the environment and non-target organisms.

Precautionary Statement

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label.

Disclaimer

This publication contains pesticide recommendations that are subject to change at any time.
The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label always takes precedence over the recommendations found in this publication.

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