



# Should I Plant Bt Corn?<sup>1</sup>

by

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The European corn borer (ECB), a billion dollar pest of field and sweet corn, is the primary target of a new technology called Bt corn. Bt corn is one of the first tangible fruits of biotechnology that has practical implications for corn producers. These hybrids provide protection against the European corn borer equal to, and usually far greater than, optimally timed insecticides. Rapid introduction of Bt corn hybrids creates uncertainty about the technology and new questions about its use.

## What is Bt?

Bt is the common abbreviation for a naturally occurring bacteria *Bacillus thuringienus* that is found in the soil. A unique feature of this bacterium is its production of crystal like proteins that selectively kill specific groups of insects. These crystal proteins are insect stomach poisons that must be eaten to kill the insect. Bt insecticides have been used for over 60 years and are considered safe to non-target organisms. However, because it is a “natural” product it is unstable and short lived.

## How is Bt corn created?

Plant geneticists create Bt corn by inserting selected exotic DNA (in this case Bt DNA) into the corn plant’s DNA. DNA is the genetic material that controls the expression of a plant’s or animals’s traits. The Bt gene, modified for improved expression in corn, produce the crystal proteins which are toxic to some caterpillars, such as the European corn borer. Promoters determine where the toxin will be expressed in the plant. Varieties that express the toxin in silks, kernels and pith tend to offer longer season protection than varieties that express only in the pollen and green tissue of the plant.

## How safe is Bt and Bt corn?

The EPA considered 20 years of human and animal safety data before registering Bt corn. Bt proteins are not toxic to people, domestic animals, fish, or wildlife; and they have no impacts on the environment. Bt crystal proteins are highly selective in killing larvae of moths. Bt corn, however, does not affect beneficial insects including honey bees, lady beetles, green lacewing larvae, spiders, pirate bugs or parasitic wasps.

## What are the economical benefits of Bt corn?

Bt corn technology is so new that performance data from research and extension entomologists are limited. Also, few studies have compared Bt corn with other management options. Many questions remain concerning benefits of Bt corn, and whether these benefits are worth the extra cost. During low infestation years of ECB, the yield protection offered by Bt corn barely covers the price premium for seed. During outbreak years of ECB, yield saving maybe 4 -5 times the added cost of seed.

## Can European corn borer develop resistance to Bt corn?

European corn borer may have the potential to develop resistance to Bt crystal proteins. Insects are known for their ability to rapidly develop resistance to certain insecticides. Because Bt corn provides unprecedented control of ECB, widespread use could set the stage for resistance. Proactive use of “refuges” of non-Bt corn is encouraged to delay development of resistance by ECB and to preserve the longevity of Bt corn technology.

## What is the best strategy for using Bt corn?

Insect control by Bt expression is only one trait that farmers need to consider in their selection of hybrids. Bt genes only protect the yield potential inherent in the hybrid. Expect yield protection with Bt hybrids when ECB infestations are heavy, and little to no yield advantage when infestations are light. Producers should consider using Bt corn only in areas where the economic risk of ECB justifies the premium price for Bt corn. In central Wisconsin the best choice may be earlier planted fields with their higher yield potential and heavier first generation ECB attack. Conversely, using Bt corn in later-planted, later-pollinated fields provides optimal protection against second-generation or late-season infestation.

## Should I plant or recommend Bt corn? Points to consider:

### *Positive Considerations:*

- > Bt corn provides nearly season-long protection from European corn borer.
- > Little scouting investment, except to verify performance and monitor for resistance.
- > No insecticide-related concerns (timing, performance, health risks, environmental).
- > Price premium, or technology fee cost less than a single insecticide application.
- > Management shifts from reactive, in-season decision to proactive pre-season decision.
- > Production benefits include reduced yield loss and harvest loss, less volunteer corn and lower disease incidence.
- > Direct impacts of Bt corn on beneficial insects have not been observed.

### *Negative Considerations:*

- > **Bt corn is essentially insurance;** No predictive tools exist to pinpoint where or when Bt corn will be advantageous.
- > Late-season effectiveness against European corn borer varies. The spectrum of activity is limited.
- > Economics appear favorable but are based on assumptions such as market acceptance, continued risk of European corn borer infestations and stable or increasing corn prices.
- > May not see economic benefits every year and in every field.

Strategies for using Bt corn will become more refined as producers and agricultural scientists gain experience with the product.

<sup>1</sup> Condensed from *Bt Corn & European Corn Borer long-term success through resistance management*. North Central Regional Extension Publication NCR 602.

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