Chapter 17

YieldGard Transgenic Corn Insect Technologies

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YieldGard Corn Borer (YGCB) was the first transgenic or genetically improved corn to offer whole-plant, full-season protection against certain targeted lepidopteran insects known to cause severe annual damage to corn crops. YGCB corn controls damage from the European corn borer [*Ostrinia nubilalis* (Hübner)], southwestern corn borer (*Diatraea grandiosella* Dyar), and southern cornstalk borer [*Diatraea crambidoides* (Grote)]. It suppresses damage from corn earworm [*Helicoverpa zea* (Boddie)], fall armyworm [*Spodoptera frugiperda* (J. E. Smith)], and stalk borer [*Papaipema nebris* (Guenee)]. Since YGCB was first introduced in 1997, it has been planted on millions of acres throughout the United States and Canada.

YGCB corn produces a protein derived from *Bacillus thuringiensis*, or *Bt*; and it is often called *Bt* corn. Incorporating the genetic material from *Bt* into corn plants enables the plants to produce the same insecticidal protein and defends against several key lepidopteran pest species. YGCB produces the Cry1Ab *Bt* protein that binds to specific receptors in the midgut, disrupting the digestive tract of the targeted insect so the pest stops eating and dies.

YieldGard Rootworm (YGRW) is the first genetically improved corn that provides consistent corn root protection and control of western corn rootworm (*Diabrotica virgifera virgifera* LeConte), northern corn rootworm (*Diabrotica barberi* Smith & Lawrence), and Mexican corn rootworm (*Diabrotica virgifera zeae* Krysan & Smith) throughout the larval feeding period.

Similar to YGCB corn, YGRW corn produces a protein derived from *Bt,* but YGRW technology uses a different *Bt* protein (Cry3Bb1) with a different insect control spectrum. Once YGRW is eaten by the targeted coleopteran pest species, the crystal protein binds to specific receptors in the midgut of the digestive tract, and the insects stop eating and die. As with YGCB, the incorporation of genetic material from *Bt* into corn plants enables the YGRW plants to produce a protein that acts as a toxin that protects the corn plants against key coleopteran pest species.

Benefits of YieldGard Corn Technologies

YGCB corn and YGRW corn provide many benefits to the grower. The main benefit is the reduction in insect damage to the corn stalk or roots and associated protection of the genetic yield potential of the hybrids. Other benefits include reduced use of chemical insecticides and reduced grower handling of and exposure to insecticides. Improved plant health, standability, and harvestability are additional benefits. Corn that has been fed on by corn borers and corn rootworm larvae often can be lodged, making harvest difficult. Insects and their feeding also may act as a vector for pathogens like stalk and ear rots.

Unique benefits of YGCB or YGRW technologies are described in this chapter. YGCB significantly reduces crop damage and yield loss due to corn borers compared with genetically similar non-*Bt* hybrids. YGCB protects corn against first- and second-generation European and southwestern corn borer feeding throughout the plant for the entire growing season. The built-in protection of YGCB corn results in healthier corn plants that are better able to withstand adverse weather and disease. YGCB also is effective in reducing insect feeding damage to corn ears, thereby reducing the incidence of associated Fusarium species and accumulation of fumonisin mycotoxins compared with genetically similar non-*Bt* corn.

The main benefit of YGRW is the season-long root protection from western, northern, and Mexican corn rootworm larval feeding damage. In addition, YGRW provides consistent corn rootworm protection independent of weather, time of planting, or field conditions. YGRW technology is easy to use because it is contained in the seed, and no extra application equipment is required. YGRW corn is delivered to the grower accompanied by a seed treatment. The combination of *Bt* corn rootworm control and a seed treatment to control secondary pests such as wireworms, white grubs, seed corn maggots [*De-*