The European Corn Borer and Bt Corn: Sustainable or Temporary?

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The European Corn Borer (*Ostrinia nubilalis*) is an invasive species of insect that has become one of the most prevalent and damaging in the agricultural world. To combat the problem caused by the European Corn Borer larvae, a genetically modified organism (GMO), or genetically modified (GM) crop, known as Bt corn has been developed. Bt (*Bacillus thuringiensis*) is a naturally occurring soil bacterium that contains a gene that produces a protein that is lethal to the European Corn Borer (Bessin, 2004). Bt was first used in France in 1938, when large quantities of the bacteria were grown and sprayed on corn crops to prevent borer damage (Hall, 2006). While sprays are still in use, through genetic modification, this gene has been inserted directly into corn plants since 1996 (Hyde, et. al., 1999). The protein is produced, ingested by the European Corn Borer, binds to the gut wall, and causes the insect to stop feeding. In hours, the gut wall breaks down and bacteria begin to flow into the body cavity; the insect dies while bacteria multiply in the blood (Bessin, 2004). Since the late 1990’s, Bt corn has been viewed as both the thorn-in-the-side and the poster child when it comes to the plant biotechnology industry. I believe that Bt corn cannot be used without causing the insect to build up a resistance to the insecticide, whether it is natural or not. Therefore, I strongly believe that Bt corn should not be used to control European Corn Borer due to the fact that, in the overall spectrum of time, it is only a temporary solution.

Thought to have been introduced to North America in the early 1900s in broom corn imported from Hungary and Italy, the European Corn Borer’s presence has been felt in all but seven of the western continental states, in addition to portions of southern Canada (Iowa State, 2006). As a holometabolous insect, the European Corn Borer exhibits four life stages—egg, larva, pupa, and adult. It is in the larval stage that damage
by the Borer usually happens. The larvae initially feed on the whorl of the corn, especially on the tassel. When the tassel emerges from the whorl, the larvae then disperse down and start to burrow into the stalk and ear (Capinera, 2000). From there, they form cavities which interfere with the flow of water and nutrients. Additionally, these cavities reduce stalk and ear shank strength, therefore making the plant vulnerable to stalk breakage and ear drop (Witkowski and Wright, 1997).

The most widely produced feed grain in the United States is corn; it accounts for more over 90% of the total value and production of feed grains. Approximately, 80 million acres of land are planted to corn. The United States plays a big part in the world’s corn trade, exporting around 20% of all corn exported to other countries (ERS, 2006). The European Corn Borer is playing a huge role in damaging this important crop. There are estimates that there is a yield reduction of between 5 and 7.5 percent annually in the United States due to the borer (University of Illinois, 2004). When totaled, yield losses and control expenditures related to the European Corn Borer cost United States farmers over 1 billion dollars annually (Iowa State, 2006). The introduction of Bt corn to protect this industry has been hotly debated, with many on both sides of the issue.

The use of GM Bt corn has many beneficial aspects. By ingesting the protein produced by Bacillus thuringiensis, European Corn Borer larvae are killed when they would otherwise be causing the most damage. This is an extreme benefit when compared to Bt spray which, due to its topical nature, has almost no effect after the point where the larvae tunnel into the corn. Due to its nature, Bt is not known to cause any harm in humans, other mammals, birds, fish, or bees (University of Illinois, 2004). In years where the European Corn Borer infestation is high, Bt corn also provides many economic
benefits. In a study conducted from 1991-1995 in southern Minnesota, it was found that while corn produced through IPM (integrated pest management) techniques returned $.38 per acre, corn produced using a GM Bt crop returned upwards of $2.79 per acre (University of Minnesota, 2002). In high infestation years, this economic gain would have been nearly impossible without Bt.

Conversely, there are many problems associated with the use of Bt corn. Some consumers are wary of the product due to its roots being in genetic modification. While this has not had much effect in the United States, countries outside of the U.S. hold very strong concerns when it comes to genetic modification. In June, 2005, the European Union Environmental Ministers allowed five states to keep their GM crop bans, including France, Austria, Germany, Greece, and Luxembourg (Friends of the Irish Environment, 2005). In a 2003 survey by The Pew Research Center, when asked whether scientifically altered fruits and vegetables are good or bad, approximately 55% of those surveyed in the United States said bad whereas in countries like Germany the opposing percentage was upwards of 81% (The Pew Research Center, 2003). If these trends were to reach the U.S., the agricultural industry would face a severe blow in terms of being able to market their crops, including Bt corn. Another potential risk is that of resistance. As with most insecticides and insects, when the European Corn Borer is repeatedly exposed to Bt (as it would be in the form of Bt corn) it has an almost undeniable future of resistance to Bt. Already, researchers at the University of Minnesota have developed a population of Bt resistant corn borers by repeatedly exposing them to it. Furthermore, while Bt corn is economically beneficial in years where corn borer population is high, in years where the
population is down (and it does tend to fluctuate from year to year) the cost of the GM crop can often not be returned in yield benefits (University of Illinois, 2004).

Due to the short lifespan of Bt corn, it is hard to say whether the crop is good or bad. To put it simply, not enough time has passed to see whether there are any serious implications or benefits. Because of the ability to develop resistance to Bt, as seen in the population at the University of Minnesota, I think the use of Bt cannot be routine. As long as it is engineered directly into the corn plant, though, routine is the only way it can be. Because of these two factors—the ultimate lack of knowledge about long term effects and the almost undeniable future of resistance—I believe Bt corn is neither a good nor sustainable option for European Corn Borer control in agriculture.