10. Insect Resistant Broccoli

Approximately 90% of U. S. broccoli production is planted and harvested in California (2 billion pounds produced/yr.) for both fresh market sale and processing. More than 75% of California broccoli acreage is treated with insecticides each year. In 1999, over 11,000 pounds of esfenvalerate, permethrin, spinosad, tebufenozide and thiodicarb were applied to California broccoli acreage for control of caterpillar pests such as the diamondback moth, cabbage looper and imported cabbage worm. These caterpillar pests decrease production by feeding on leaves, buds and other growing points of developing plants. When broccoli plants are mature, caterpillar feeding on the heads and the leaves surrounding the heads results in damage, but also results in contamination of harvested heads with the insects and their wastes. Protection of broccoli heads from insect contamination and damage is imperative for the production of marketable broccoli. Broccoli packers have zero tolerance for caterpillar contamination, rejecting entire loads of harvested heads if one caterpillar is detected.

The diamondback moth (DBM) is a severe pest in broccoli. Infestations may affect 100% of broccoli fields during outbreak years, with counts of 30 to 40 DBM larvae per plant. During one such outbreak in 1997, an estimated $6 million in crop value was lost. Factors contributing to the outbreak included hot, dry weather conducive to DBM population growth, the unusually high DBM population densities overwhelming usual insecticide applications, and possible insect resistance to permethrin, the insecticide most commonly used for DBM management. The diamondback moth is notorious for its ability to quickly develop resistance to insecticides, including organophosphates and carbamates in the 1980s, pyrethroids and some Bts in the 1990s.

Researchers at Cornell University have transformed broccoli to express a high level of the Cry1C protein from the soil bacterium Bacillus thuringiensis, or Bt. In laboratory evaluations, the transgenic broccoli plants were protected from DBM, and from cabbage looper and imported cabbage worm larvae. Trials are underway to test the performance of the Bt broccoli under field conditions. If successful, transgenic Bt broccoli may provide the protection needed to prevent losses during caterpillar pest outbreak years.

Potential Impacts of Insect Resistant Transgenic Broccoli

Change in Production: prevent loss of 3.4 million lbs./yr. ($1.2 million/yr.)
Change in Pesticide Use: 11,623 lbs./yr. reduction in insecticides (-5%)

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