



Biotechnology for Sustainability

What is Insect Resistance in crops?

Insect damage is one of the leading causes of reductions in crop production. Farmers use pesticides to kill these insects, but another way to reduce this yield loss is to produce plants that the insects cannot eat. These “insect resistant” crops can be produced either through natural resistance or by using genetic engineering. Bt is a trait which has been successfully engineered into crops we eat today, particularly corn. When insects eat crops containing Bt, the gut of the insect is damaged and they are no longer able to eat the plant. Bt is safe for humans and has been used by itself as a pesticide for the past 70 years. In fact, it is still used in both conventional and organic agriculture today. Bt corn and Bt cotton have been credited with reducing the amount of chemical insecticides applied worldwide by over 300 million pounds, a 29.9% reduction in insecticide use for these crops.

Significance

Insects have long been an unpredictable cause of crop damage and yield reduction. In countries with tropical climates, such as India, insect damage can be very severe, leading to yield reductions of over 60%. Insect-resistant crops have become important tools for farmers, both large and small, around the world. The addition of Bt-derived genes to other crops promises to extend these benefits to more farmers, reducing environmental impacts and increasing standards of living. In addition, insect-resistant crops help to lower overall pest populations in regions in which they are grown, benefitting even growers who do not use those varieties. Properly managed, insect-resistant crops will be an important tool for dealing with increased insect pressure and meeting the nutritional requirements of a burgeoning global population.

Crops in Production

Corn and cotton are the two major crops containing the Bt gene that are currently being grown by farmers. Other crops being developed with this form of insect resistance include soybean, rice and eggplant. In 2008, insect-resistant crops were grown on 53,600,000 acres worldwide, an area larger than Kansas.

CORN – One of the most important U.S. crops, corn is susceptible to an array of insect predators, most prominently the European corn borer and western rootworm. Chemical insecticides have been used to control these insects since World War II, albeit at significant cost to farmers and the environment. The first Bt corn was released in 1996 and is now grown on 63% of the corn acres in the U.S. Resistance to the corn rootworm has been found to have the added effect of enhancing drought tolerance due to the maintenance of better root systems in the resistant plants.

COTTON – Cotton is subject to heavy insect pressure from pests such as the pink bollworm, cotton bollworm, and American bollworm. Bt cotton was introduced in 1996 in the U.S. and is now grown in eleven countries on five continents. The Bt gene allows farmers in industrialized countries to rely less heavily on toxic insecticides and farmers in developing countries to significantly increase yields. Bt cotton field trials in India, a country where farmers often don't have the resources to buy insecticides, showed an average 60% gain in yield.

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