Commentary

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Advantages and Disadvantages on *Bacillus thuringiensis*

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Bacillus thuringiensis (Bt) is also known as soil-dwelling bacteria that produces a toxin that kills some herbivorous insects naturally. Since the 1920s, *Bacillus thuringiensis* (Bt) toxin has been employed as an insecticide spray, and it is widely utilised in organic farming. Bt contains source of genes that have been used to modify genes genetically to produce a variety of food crops so that they may manufacture the toxin on their own to prevent various insect pests. The toxin is fatal to a variety of insect orders, including Lepidoptera (butterflies, moths, and skippers), Diptera (flies), and Coleoptera (beetles), though there are numerous Bt strains available to make it more target-specific.

A Japanese scientist discovered Bt in 1901 while looking into the collapse of silkworm moth populations, which he linked to the rod-shaped, Gram-positive bacterium. A solution of crystalline Bt poisons was given a clarity about particularly some genes are efficient against some crop pests, including the corn borer, corn rootworm, corn earworm, and bollworms, by a German scientist in 1911. The product was initially used commercially as an insecticide spray in the United States in 1958, and numerous strains of the bacterium are now employed to control a variety of agricultural insect pests and their larvae.

Bt toxin is given to crops such as potatoes, corn, and cotton as a spray or, less typically, as granules. Genetic engineering can also be used to incorporate Bt proteins into the crops themselves. Bt crop types are genetically modified to produce a protein that is harmful to specific insects and are utilised in places where the targeted pests are prevalent. Commercial production of Bt corn, cotton, potatoes, and rice has expanded considerably in many nations since 1995, when the US Environmental Protection Agency (EPA) first permitted use of the technology, however plantings sometimes fluctuate depending on pest infestation levels.

To be impacted, susceptible insects must consume Bt toxin crystals. Unlike toxic insecticides that attack the nervous system, Bt works by creating a protein that obstructs the insect's digestive tract, thus starving it. Bt is usefulness as a fast-acting insecticide: infected insects stop feeding within hours of ingestion and die within days, usually from starvation or a digestive tract rupture. Each Bt strain is effective against a specific spectrum of insects, whether applied as a spray or by genetic engineering. Only select caterpillar species are targeted by the most widely employed Bt strain (kurstaki, or Btk). Bt strains (e.g., israelensis, or Bti) have been created to control some species of fly larvae, such as mosquitoes, black flies, and fungus gnats, since the late 1970s. San diego and tenebrionis are two more frequent strains that are efficient against specific leaf bugs like the Colorado potato beetle and elm leaf beetle.

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Bt is harmful to a small number of insects, unlike other pesticides, which target a wide variety of species, including both pests and beneficial insects. According to research, Bt does not affect insects' natural adversaries, nor does it harm honeybees and other pollinators important to agroecological systems. Many organic farmers use Bt for integrated pest management since it works well with other natural treatments.

The adoption of insect-resistant Bt plants has the potential to reduce the usage of highly toxic and expensive chemical insecticide treatments. Following the introduction of Bt corn, use of conventional insecticides advised for control of the European corn borer fell by around one-third.

Because humans and other animals lack the digestive enzymes required to activate the Bt protein crystals, Bt toxin used as an insecticide or consumed with GMO food crops is deemed innocuous to people and other mammals. However, every introduction of new genetic material poses a risk of introducing allergies, which is why some Bt strains are not approved for human consumption.

Because Bt crops only kill a small percentage of the insects that prey on them, extra pesticides are frequently needed to protect the plants from other pests. Furthermore, in the extensive cultivation of Bt crops, the risk of insects developing resistance to the toxin as a result of repeated exposure is a major worry. Such resistance would render one of the most ecologically friendly insecticides now in use ineffective. Certain moth and cotton pest populations have already developed resistance.