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Biosecurity of transgenic Bt technology

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In the context of modern agricultural biotechnology the term biosecurity has two components, biosafety, the safety of genetically engineered (GE) organisms and/or their products to humans and animals as food, feed and medicine; and environmental safety, the safety of non-target organisms, soil and water. The terms biosecurity and biosafety are often used incorrectly as synonyms.

Biosecurity issues raised to oppose GE crops by anti-tech activists are relevant even to products of classical agricultural biotechnology, but were never made an issue in that context.

It was the international scientific community, not the anti-tech activists, who have identified the possible biosecurity risks from the transgenic crops and devised testing and mitigation protocols. Science has reasonable peer reviewed experimental evidence to answer biosecurity concerns. The regulatory process in every country ensures that all questions are answered reasonably satisfactorily before commercialization is permitted. Most of those who raise biosecurity issues to voice their opposition to GE crops have no locus standi in terms of scientific knowledge and expertise to trash the combined global scientific wisdom.

Biosafety of Bt

Bt being a universally occurring soil bacterium, all species of plants and animals in agricultural and other situations, and those that use plants as food have been exposed to Bt and Bt proteins for centuries. Bt proteins are transient in the environment, the toxicity of Bt proteins is pest specific, dependent upon a set of biological pre-requisites. The use of Bt as a conventional pesticide for over 60 years has demonstrated that it is safe to a variety of non-target organisms. Cry proteins were shown to be harmless to vertebrates, including mammals and humans, even at high doses, by ingestion, inhalation or injection.

Toxicity and allergenicity

Anti-tech activists raise issue after issue to brand GE crops as toxic. Reports of the death of peacocks and the death of farm animals in Andhra Pradesh and honey bee colony collapse disaster in Europe and North America, were attributed to the presumed toxicity of Bt proteins in GE crops. These incidents projected as major issues have been effectively shown to be due to causes other than Bt protein toxicity. Several claims have been made of allergenicity of transgenic crops, including Bt cotton in some places in India, but there has never been any scientific evidence.

Impact of Bt on non-target organisms

The much-brandished instance of toxicity of Bt proteins to non-target organisms was based on the study by Losey, et al., (Nature, 1999) who reported that transgenic Bt corn pollen harm monarch larvae, a conclusion immediately questioned by Hodgson
(Nature Biotechnology, 1999). Subsequently, Sears, et al., (2001) re-examined the issue, avoiding the flaws in the experimental design in the study of Losey et al., and concluded that impact of Bt corn pollen on monarch butterfly populations was not significant.
A February 2008 publication indicates that Cry 1Ab Bt proteins do not affect the performance of bumble bees in any manner. In May 2008 Bt Cry1C proteins were shown to be safe to parasitoids that control pest populations in many crops, in contrast to the severe damage caused to the parasitoids by the traditional insecticides.

How safe are Bt transgenics?
All the evidence indicates that Bt transgenics are very safe and over a decade's cultivation of Bt transgenics has neither confirmed the scary scenarios aired by the critics nor has thrown up any new threats. Biosecurity issues are unfortunately often mixed up with political, economic, management, societal and ethical issues, emotionalizing and sensationalizing the concerns, to spread fear and suspicion of GE technology.