Understandings of risk assessment biology essay

Science, Biology

\n[toc title="Table of Contents"]\n

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1. Introduction \n \t
2. What is Bt cotton. \n \t
3. Understandings of risk assessment \n

\n[/toc]\n \n

Introduction

Genetically modified (GM) crops have become a ground for the conflicting slogans of _sound science, bio technology, GMOs _ versus _the precautionary principle, health concerns anti GMOs group and ethical concerns. What difference do these slogans make for scientific judgements? which leads to police development. Such issues can be illustrated by larger scale developments in regulatory science for commercial authorization of GM Bt Cotton'. (Levidow, 1999, 2001; Levidow and Carr, 2001). Genetically modified (GM) crops are increasingly gaining acceptance but concurrently consumers' concerns are also increasing as peoples of developing countries also becoming more and more health conscious. The introduction of Bacillus thuringiensis (Bt) genes into the plants has raised issues related to its risk assessment and biosafety. The International Regulations and the Codex guidelines regulate the biosafety requirements of the GM crops. In addition, these bodies synergize and harmonize the ethical issues related to the release and use of GM products in different societies. Despite various institutional reforms in the World about GMOs. Regulatory procedures for genetically modified (GM) products are still held up by great debates among experts; claims about a product's safety often correspond to a narrower account of precaution than broader counter-claims from objectors. WE have to give these conflicts practical meaning to the concept of precaution, rather than any explicit interpretation of an a religious principle by saying as we playing against god . Yet decisions about GM products still face legitimacy problems, because they arise fundamentally from the great burden placed on science as the basis for societal choices about agri-biotechnology. GM crops made for human beneficial and should be cultivated as long as it remains beneficial. We have to think that these GMOs which are beneficent at that time could be harmful in future. This short article focuses on Bt Cotton in the world and risks associated with it.

What is Bt cotton.

The Bt is a short form of soil bacterioum Bacillus thuringiensis. This is a gram positive and spore forming bacterium that forms parasporal crystals during stationary phase of its growth cycle. The crystalline proteins called ' endotoxins' are highly toxic to certain insects like bollworms. They kill the insect by acting on the epithelium tissues of midgut of caterpillars. Bacillus thuringiensis strains are distributed worldwide in soil, stored products, insects, insect breeding environments, and the phylloplane. Several B. thuringiensis ICPs have been found which are highly toxic against coleopteran, lepidopteran, or dipteran insect species (H€ofte and Whiteley, 1989). Varying levels of susceptibility of Hymenoptera, Mallophaga, Homoptera, Orthoptera, mites, nematodes, and protozoa to B. thuringiensis strains have been reported (Feitelson, 1993). Up to now, more than 200 ICP genes have been cloned, sequenced, and classified into 2 groups of cyt and

32 groups of cry genes genes based on the amino acid homology of the that proteins (Crickmore et al., 1998). The Cry1, 2 and 9 groups exhibit strongest activity to Lepidoptera; the Cry3, 7, and 8 goups are most toxic to Coleoptera; whereas the Cry4 and 11 groups are highly active to Diptera. Some Cry proteins were reported to display toxicity to more than one insect order, for example the Cry1I protein that is toxic to both Coleoptera and Lepidoptera (Tailor et al., 1992), and the Cry1B protein with activity against Coleoptera, Lepidoptera, and Diptera (Zhong et al., 2000). Apart from Cry proteins, some B. thuringiensis strains also have insecticidal proteins. These proteins have been referred to as vegetative insecticidal proteins (Vip proteins) as they are expressed during the vegetative stage (Estruch et al., 1996). However, there are still a significant number of important agricultural insect pests that are not sensitive to the available known B. thuringiensis toxins, and resistance to formulated B. thuringiensis products has been reported (Tabashnik, 1994). The identification of new B. thuringiensis isolates and the search for novel genes encoding new insecticidal proteins will remain a long-term objective for pest control. There are two main events in the history of cotton to develop Bt cotton resistant for the insects of lepidoptra. Bollgard cotton Event 531, developed by Monsanto and tested since 1992, produces protein (Cry1Ac) derived from the Bacillus thuringiensis subsp. kurstaki (B. t. k.). Production of the Cry1Ac protein in the cotton plant provides effective season-long protection against key Lepidopteran insect pests, including pink bollworm, tobacco budworm and cotton bollworm (Wilson et al., 1994; Betz et al., 2000). The genetically insect protected Bollgard cotton product was produced using Agrobacterium tumefaciens-

mediated transfer of the cry1Ac gene into the genome of a conventional cotton variety, Coker 312, using a binary plasmid vector first time. The nptII gene encodes a selectable marker enzyme, neomycin phosphotransferase II (NPTII), was also present on the plasmid to facilitate selection of insect-protected plants. The NPTII protein served no pesticidal properties. The plasmid also contained the antibiotic resistance aad gene encodes the bacterial selectable marker enzyme 3"(9)-O- aminoglycoside adenyltransferase (AAD). This gene confers resistance to the antibiotics spectinomycin and streptomycin, and facilitated the selection of bacteria containing the plasmid in the initial steps of transforming the cotton tissue. The aad gene is under the control of a bacterial promoter and the encoded protein is not detected in Bollgard cotton plant tissue. Bollgard II cotton event 15985 was developed by Monsanto Company by using gene product Cry2Ab2 insect control protein, which provides effective long term control of key lepidopteran insect pests. This product was produced by re-transformation of Bollgard® cotton event 531, that produces the Cry 1 Ac insect-control protein and the NPTII selectable marker protein. so Bollgard II cotton produces two proteins for effective control of the major lepidopteran insect pests of cotton, including the cotton bollworm, pink bollworm, tobacco budworm and armyworm. Bollgard II cotton also produces the P-D-glucuronidase (GUS) marker protein. In addition, Bollgard II cotton provides a more effective insect resistance management program compared to single gene alone. nptll, aadA, and uidA marker genes, CaMV 35S promoter, nos terminator, endogenous Sadi gene, and specific gene constructs in MON531/MON15895

Understandings of risk assessment

Regulatory conflicts over GM crops involve different criteria for evidence from different sources. According to some advocates of the precautionary principle, more evidence is needed to clarify uncertain risks before taking decisions to permit commercial use of GM crops or not. According to some critics how follow that principle, it imposes an unreasonable burden of proof for safety, discriminates against safer products, and make regulation on politics rather than science. Often _sound science_ is counter posed, as if official experts can readily distinguish between sound, unsound and inadequate science of health. In recent years, scientific uncertainty has been more readily acknowledged, though it is generally attributed to inadequate scientific information by edia and political and nonscientific persons. From that standpoint, it is surprising to know that more information has not always facilitated scientific consensus and regulatory decisions. As one researcher has lamented, These scientific studies. have intensified the debate rather than building public confidence in GM technology from the birth f this techonology. Such an outcome is explained by attributing a cognitive deficiency to the public: the complexity of assessing risk is well understood by specialists but somewhat misunderstood by non-specialists especially anti Gmos group (Poppy, 2000). Rather, there are different understandings of the complexities and dangers, even among scientists. Indeed, we should think: how do specialists conceptualize the relevant uncertainty? How do they set criteria for evidence truth? Can there be a value-neutral or a political way to base decisions upon science of GMO? How are scientific questions posed, answered them and changed? Such issues involve precaution in a more subtle sense in responsible manner not simply demanding proof of safety, but rather For any GMO release, the authority requires a prior risk assessment, which implies a burden of evidence to demonstrate safety. By 1998 an intense public controversy erupted over GM crops, especially in the UK and France. Some member states banned the product. When Monsanto sought a similar EU-wide authorization to commercialize its Bt maize and then Bt cotton , the regulatory criteria became more easy for approval. In 1998 France and Spain imposed requirements for monitoring fields for resistant insects and non-target harm, as the basis for commercial approval. Since then, no additional GM crops have been approved for cultivation by the EU or member states. The rest of this article world conflicts around evidence for two main risks in turn—insect resistance and non-target harm—though these issues have arisen in parallel. For both risks, optimistic assumptions were challenged and turned into uncertainties that warrant more complex methods to gain meaningful scientific knowledge.