Review

Genetically modified organisms from the point of view of horizontal gene transfer

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Abstract: Main challenges facing the researchers today is the rigorous assessment of the gene flow from the genetically modified organisms to microbial community, others commercial crops, wild relatives and weeds. Although transgenic crops benefit the society, the introduction of the transgenic crop into the food system has raised number of questions regarding the possible negative effects. The concern not only relegated to the field of plant scientists and activists, but also with the realm of the biomedical sciences in the aspects of allergenicity, assessing nutritional benefit, evaluating nutritional quality, meeting the nutritional needs of developing nations, and expanding the sustainable food supply to meet future demands. Food hazard of the transgenic is concerned mainly with the mechanisms such as the expression of the inserted genes, its secondary effects of gene expression, and insertional mutagenesis of the gene. The main focus is thus done on these areas to view the in-depth knowledge of the gene flow consequences. According to National Research Commission, the environmental hazard of gene flow leads to resistance evolution against herbicide, virus and insect/pest, movement of genes and non-target effects. Horizontal gene transfer of bacteria takes place by means of transformation, transduction and conjugation, which occurs mainly in prokaryotes, and is considered to be an important and dominant force in shaping the evolution of the genome. Public concern regarding the transgenic crop is still under controversial debate, so education and familiarization of the genetically modified products with the public will enable them to accept the gene technology concept and will put an end to this controversy in minor sense.

Key words: transgene, genetically modified crops, risk and benefits, environmental concern, consumer opinion.

Abbreviations: *Bt*, *Bacillus thuringiensis*; GM, genetically modified; GMO, genetically modified organisms; ACNFP, Advisory Committee on Novel Foods and Processes; LGT, lateral gene transfer; NRC, National Research Commission.

Introduction

Genetic engineering provides a powerful tool for modification of plant for potential benefit of the society. However, as with the new scientific advancement, handling of this tool has to be watched clearly to ensure that at the end it benefits the society. Recent controversies about the genetically modified (GM) crops have insisted for the experimental evidences and scientific judgments for the assessment of risk versus benefits. Previously, this debate has just been relegated to the field of plant scientists and activists but now has entered the realm of the biomedical sciences in the aspects of allergenicity, assessing nutritional benefit, evaluating nutritional quality, meeting the nutritional needs of developing nations, and expanding the sustainable food supply in order to meet future demands. Plant biologists and also animal scientists also deal with this matter in their own sense. This article discusses the risk and benefits of this new technology, describes the consumer knowledge and attitudes.

Agricultural biotechnology deals with the use of plant organisms or its parts to produce food and feed, such as insect resistant corn, herbicide resistant soybean, vitamin-rich golden rice, and the services, such as phytoremediation with the use of GM poplars (Rugh, 1998). Although gene technology appears to be new, the underlying concept is not new. Farmers have been using the genetic manipulation to improve the crop some thousand years ago. During last century farmers used various techniques other than gene manipulation techniques including chemical mutagenesis, radiation mutagenesis, somoclonal variation and embryo rescue (Day, 1996). These techniques do not allow control at the genome level; rather they allow multiple genes to transfer and require a rigorous selection process to ensure

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