

SEMINAR- 2

POTENTIAL BENEFITS OF TRANSGENIC CROPS

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Summary

Although genetically modified organisms (GMOs) in agriculture have been available only for a few years, their commercial use is expanding rapidly. However, transgenic crops, popularly known as genetically modified (GM) crops, are widespread globally, including maize, soybeans, cotton, potatoes, and canola (rapeseed). The first GM crops were commercialized by China in the early 1990s, with the introduction of virus-resistant tobacco and later a virus resistant tomato. Among industrialized nations, the first commercial use of a genetically modified food product was the 'Flavr Savr' tomato, a delayed ripening tomato introduced in the US by Calgene in 1994. Between 1996 and 1998, transgenic crops area increased fifteen-fold, to almost 28 million hectares. By 2000 GMO crop area had expanded to 44.2 million hectares. Most GM crops are grown in North America, but large areas of cultivation are found in Argentina, Mexico, and South Africa.

A simplistic interpretation of human development in agriculture is the search for genes that produce characteristics of value to humans. Domestication of crops has meant that plants with valuable characteristics to humans are encouraged. The power of genetic engineering is the ability to move genes between organisms that are not sexually compatible, creating novel organisms. Transgenic crops of GM crops have been developed in the following categories: herbicide tolerance, disease/insect tolerance, quality improvements, tolerance to biological stresses, and productivity enhancements.

Roundup Ready (glyphosate tolerant) crops, such as maize and soybeans have been developed utilizing the *cp4 epsps* gene from *Agrobacterium tumefaciens* which codes for an altered 5-enolpyruvylshikimate-3-phosphate (EPSP) synthase enzyme (Monsanto Company). 'Golden rice' was created by transforming rice with three beta-carotene biosynthesis genes: *psy* (phytoene synthase) *lyc* (lycopene cyclase), both from dafodill (*Narcissus pseudonarcissus*), and *crtl* from the soil bacterium *Erwinia uredovora* (Potrykus and Beyer, 1992-2000).

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This GM golden rice will help 124 million people in 118 countries in Africa and South East Asia, who were estimated to be affected by Vitamin A deficiency. Earlier technological changes in agriculture, such as hybrid maize in the US and Green Revolution rice and wheat, had opponents. But hostility to crops produced using recombinant DNA technologies has arisen much more quickly and been much more in the public eye. This opposition, driven by concerns about consumer safety, the environment, corporate control of agriculture, and ethics, is strongest in Europe, but resistance to its use in developing countries has also risen. Some of the broad issues in use of GM crops include assessing costs and benefits of the technology and its products, formulating regulatory strategies to enhance human and environmental safety, and structuring legal institutions to encourage development of intellectual property. This seminar highlighted on the benefits, concerns, challenges and opportunities for GM crops.

