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Impacts of Genetically Modified Crops on the Environment

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Abstract – Molecular Biotechnology is an exciting, revolutionary scientific discipline that is based on the ability of researchers to transfer specific units of genetic information from one organism to another. This conveyance of gene (s) relies on the techniques of genetic engineering (recombinant DNA technology). The objective of recombinant DNA technology is often to produce a useful product or a commercial process. This technology offers a large variety of benefits. It has increased crop yield by making plants less vulnerable to drought, frost, insects, and viruses. It has enabled plants to compete more effectively against weeds for soil nutrients. In many cases, it has also enhanced the quality and nutrition of foods. Genetic modification involves altering an organism's DNA. This can be done by altering an existing section of DNA, or by adding a new gene altogether. A number of commercialized, genetically engineered varieties of canola, cotton, maize and soybean, were created using this technology. This technology has also introduced herbicide and pest tolerance in crops. The Gene technology has also decreased the costs of growing and farming, due to the reduced use of pesticides. It has also enhanced the resistance to pests, viruses etc. The present article focuses on the impacts of genetically modified crops on the environment.

Keywords: Salmonella gene, genetically modified crop, Gene Technology, pharmaceutical drugs, Environment, transgenic plants.

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INTRODUCTION

A genetically modified organism (GMO) or genetically engineered organism (GEO) is an organism whose genetic material has been altered using genetic engineering techniques. These techniques, generally known as recombinant DNA technology, use DNA molecules from different sources, which are combined into one molecule to create a new set of genes. This DNA is then transferred into an organism, giving it modified or novel genes. Transgenic organisms, a subset of GMOs, are organisms that have inserted DNA from a different species. The general principle of producing a GMO is to add new genetic material into an organism's genome. This is called genetic engineering and was made possible through the discovery of DNA and the creation of the first recombinant bacteria in 1973; an existing bacterium *E. coli* expressing an exogenic *Salmonella* gene. GMOs have widespread applications as they are used in biological and medical research, production of pharmaceutical drugs, experimental medicine, and agriculture. With the application of gene technology to plants and animals, goals can be achieved more quickly than by traditional selection. GM pesticide-producing crops kill specific pests, by secreting toxins known as Bt, which originate from a bacterium.

PRODUCTION OF GENETICALLY MODIFIED ORGANISMS

There are several methods of production of genetically modified organisms. The foreign gene that has been inserted into the cell of a microorganism, a plant or an animal is called a transgene. It is integrated into the genome of the recipients which are called transgenic. The transgenes are genes with known traits or mutated variants of known genes. The integration of transgene into the cell is carried out by different methods: (a) Transduction with the use of bacteriophages (b) Transgene injection using pronuclear microinjection; (c) Transfer using modified viruses and plasmids (d) Electroporation method by which higher permeability of cell membrane is achieved. Transgenes can be transferred into the egg-cell by spermatozoa containing fragments of chromosomes.

REASONS FOR PROMOTION OF GM FOODS

Genetically-modified crops are the crops that have been created in the laboratory to enhance desired traits such as increased resistance to herbicides or improved nutritional content. Genetic engineering can create plants with the exact desired trait very rapidly and with great accuracy. For example, plant geneticists can isolate a gene responsible for drought tolerance and insert that gene into a different plant.

The new genetically-modified plant will gain drought tolerance as well. Not only can genes be transferred from one plant to another, but genes from non-plant organisms also can be used. The best known example of this is the use of B.t. genes in corn and other crops. B.t., or *Bacillus thuringiensis*, is a naturally occurring bacterium that produces crystal proteins that are lethal to insect larvae. B.t. Crystal protein genes have been transferred into corn, enabling the corn to produce its own pesticides against insects.

IMPACTS ON THE ENVIRONMENT

Genetically-modified crops might be better for the environment than the unmodified form, allowing insects and spiders to flourish around their edges and providing more food for birds.

GM crops hold the promise of potentially higher yields, because their genetic modification means farmers can spray them with weed-killer without harming them; only the weeds die.

By using these crops, we can reduce the amount of pesticides needed to be used due to insect pest resistant plants. These crops are more eco-friendly, as pesticides do not go into the air, soil and water (especially freshwater supplies). Their production hazards to the environment also decreases. These crops are helpful in spreading of new, more resistant "super weeds"

They also help in reducing deforestation. These crops give higher yields than a conventional crop. So these crops are able to feed the world's growing population. This decreases carbon dioxide in the atmosphere, which in turn slows global warming.

They promote the development of new kinds of crops that can be grown at extreme climates, for example, dry or freezing environments (like deserts). For example, scientist developed a type of tomato that grows in salty soil. Also the tolerance of crops to drought and salinity can be increased to a large extent.

These crops also provide resistance to pathogens like fungal resistance and nematode resistance. They also provide resistance against pests like insect resistance against the larvae of different types of butterflies and moths, as well as against aphids.

They also control weed i.e. they give tolerance to herbicides. They also remove harmful substances i.e. allergens.

CONCLUSIONS

In order to achieve good crop yield, agricultural scientists discovered a technology in which, the genetic material of the plant can be altered using genetic engineering techniques known as recombinant DNA technology. The desired traits of plants are selected and combined together and a new crop is prepared which is known as Genetically Modified (GM) Crop. Genetic modification has increased production in many crops.

Genetically-modified crops are better for the environment than the unmodified form. They allow insects and spiders to flourish around their edges and provide more food for birds. These crops give higher yield. These crops are more eco-friendly, as pesticides do not go into the air, soil and water. These crops are helpful in spreading of more resistant super weeds. They also help in reducing deforestation. They also help in slowing global warming. They promote the development of new kinds of crops that can be grown at extreme climatic conditions. These crops also provide resistance to pathogens and pests. So we conclude that we should use and promote GM crops. They are safe to use and are not harmful for environment and ecology.

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