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Impacts of Genetically Modified Crops on Human Health

Sunita Sharma[1] Rajbir Sharma[2]

[1]Research Scholar, CMJ University, Shillong, Meghalaya, India

[2]GIMT, Karnal, India

Abstract – Biotechnology 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 some 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 gene is a code that governs the appearance and characteristics of an organism. 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. Gene transfer is used to modify the physical and chemical composition and nutritional value of food. Gene transfer in animals will play a part in boundless possibilities of improving qualitative and quantitative traits. The present article focuses on the positive impacts of genetically modified food on human health.

Keywords: Bacillus thuringiensis, genetically modified food, Gene Technology, Human Health, Pharmaceutical Drugs, transgenic plants.

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INTRODUCTION

Genetically modified (or GM) plants have attracted the people all over the world these days. A Genetically modified organism (GMO) or Genetically engineered organism (GEO) is an organism whose genetic material has been altered using genetic engineering technology. These technologies are generally known as recombinant DNA technology. With this technology, DNA molecules from different sources 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. GMOs have widespread applications as they are used in biological and medical research, production of pharmaceutical drugs, experimental medicine and agriculture. The use of gene technology in food production has become interesting due to increased needs of food as well as its improved quality. With the application of gene technology to plants and animals, goals can be achieved more quickly than by traditional selection.

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 HUMAN HEALTH

- **Disease resistance:** There are many viruses, fungi and bacteria that cause plant diseases. Plant biologists are working to create plants with genetically-engineered resistance to these diseases.

- **Pest resistance:** Farmers typically use many tons of chemical pesticides annually. Consumers do not wish to eat food that has been treated with pesticides because of potential health hazards, and run-off of agricultural wastes from excessive use of pesticides and fertilizers can poison the water supply and cause harm to the environment.

Growing GM foods such as B.t. corn can help to eliminate the application of chemical pesticides and reduce the cost of bringing a crop to market.

- **Nutrition:** Malnutrition is common in third world countries where impoverished peoples rely on a single crop such as rice for the main staple of their diet. However, rice does not contain adequate amounts of all necessary nutrients to prevent malnutrition. If rice could be genetically engineered to contain additional vitamins and minerals, nutrient deficiencies could be alleviated. For example, blindness due to vitamin A deficiency is a common problem in third world countries. Researchers at the Swiss Federal Institute of Technology Institute for Plant Sciences have created a strain of "golden" rice containing an unusually high content of beta-carotene (vitamin A). Plans were underway to develop golden rice that also has increased iron content.

- **Pharmaceuticals:** Medicines and vaccines often are costly to produce and sometimes require special storage conditions. Researchers are working to develop edible vaccines in tomatoes and potatoes. These vaccines will be much easier to ship, store and administer than traditional injectable vaccines.

- **Herbicide tolerance:** Crop plants genetically-engineered to be resistant to one very powerful herbicide could help to prevent environmental damage by reducing the amount of herbicides needed. For example, Monsanto has created a strain of soybeans genetically modified to be not affected by their herbicide product Roundup. A farmer grows these soybeans which then only require one application of weed-killer instead of multiple applications, reducing production cost and limiting the dangers of agricultural waste run-off.

- **Cold tolerance:** An antifreeze gene from cold water fish has been introduced into plants such as tobacco and potato. With this antifreeze gene, these plants are able to tolerate cold temperatures that normally would kill unmodified seedlings.

- **Drought tolerance/salinity tolerance:** As the world population grows and more land is utilized for housing instead of food production, farmers will need to grow crops in locations previously unsuited for plant cultivation. Creating plants that can withstand long periods of drought or high salt content in soil and groundwater will help people to grow crops in formerly inhospitable places.

- **Phytoremediation:** Plants such as poplar trees have been genetically engineered to clean up heavy metal pollution from contaminated soil.

CONCLUSIONS

To save the increasing population from starvation, a good crop yield is required. To achieve this destination, agricultural scientists discovered a technology in which, the genetic material of the plant can be changed. This technology of modifying the genetic material is called as plant breeding and the crop produced by using this technology is known as GM crop. Genetic modification has increased production in large number of crops. Genetically modified crops have various advantages like high yield, Drought/salinity tolerance, Herbicide tolerance, Cold tolerance, insect resistance, disease resistance, increase in nutritional value of food etc. Some trees have been genetically engineered to clean up heavy metal pollution from contaminated soil. Lastly we conclude that we should use GM crops. They are the need of present time. They are safe to human and animal health.

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