

Q: How can Biotechnology, Bioengineering and the increasing use of Genetically modified organisms (GMOs) help us to deal with increasing food demands?

Introduction

Advances in the molecular biology provided Scientist the opportunity to manipulate DNA, the chemical building blocks that specify the characteristics of living organisms at the molecular level. This technology is called genetic engineering. This technology allows the transfer of genetic material (DNA) from one organism to other. Today, this technology has reached a stage, where scientists can take one or more specific genes from nearly any organism including plants, animals, bacteria, or viruses and introduce those genes into another organism. An organism that has been transformed using genetic engineering techniques is referred to as genetically modified organism (GMO). Similarly, foods derived from transgenic plants have been called "GMO foods", "GMPs", and biotech foods. Some refer to foods developed from genetic engineering technology as biotechnology-enhanced foods.

An Overview of Biotechnology

Biotechnology is the application of scientific techniques to modify and improve

plants, animals and microorganisms to enhance their value. The pioneering achievement in the field of biotechnology was the production of greater genetic varieties of plants and animals through the techniques of **Hybridization** in SOBC. It was through this technique that present day high yielding varieties of plants and animals were evolved. Norman E. Borlaug, an American Agriculturist received the Nobel Prize for the year 1970 for his contribution of increasing the world food supply through different techniques like gene transfer. GMOs have been sold since 1994.

Role of Genetic Engineering and GMOs in dealing with increasing food demands

Genetic Engineering has provided many benefits to agriculture. By modifying crops so that they are resistant to diseases and insects and by reducing the amount of chemical pesticides; genetic Engineering has also made it possible to produce new varieties of crops by mixing genes from multiple species.

1. Increased Crop productivity:-

Biotechnology has helped to increase crop productivity by introducing such qualities as disease resistance and increased drought tolerance to crops. By altering the lipide, protein and carbohydrate composition of these seeds, it may be possible to create

more nutritious food and obtain by-products with improved functional characteristics - Corn and soybeans are two of most important food and feed commodities in the US and worldwide. Most (65 to 70%) of the 9 billion to 10 billion bushels of corn produced in this country are used for livestock feed; about 25% is exported and remaining 10% is processed into food ingredients, non-food coatings and adhesives.

2. Enhanced Crop protection:

Crops such as corn, cotton and potato have been successfully transformed through genetic engineering to make a protein that kills certain insects when they feed on the plants. The protein is from soil bacterium, which has been used for decades as the active ingredient of some "natural" insecticides. In some cases, an effective transgenic crop-protection technology can control pests better and more cheaply than other technologies. Organic farmers apply it as insecticide to control insect pests in their crops.

3. Improvements in Food Processing:

In agriculture, GM-crops are being produced through genetic engineering. The food produced from genetically modified crops is called as GM-food. The first

food product resulting from genetic engineering technology to receive regulatory approval in 1990 an enzyme produced by genetically engineered bacteria. Its benefits include increased purity, reliable supply, cost reduction, and high yield.

4. Improved nutritional value and Better Flavor:

Genetic Engineering has allowed new options for improving the nutritional value, flavor, and texture of foods. Transgenic crops in development include soybeans with higher protein content, potatoes with more nutritionally available starch and improved amino acid content, beans with more essential amino acids, and rice with the ability to produce beta-carotene, a precursor of vitamin A, to help prevent blindness in people who have nutritionally inadequate diets. Better flavor can be altered by enhancing the activity of plant enzymes that transform aroma precursors into flavoring compounds. Transgenic peppers and melons with improved flavor are currently in field trials.

5. Fresher produce:

Genetic Engineering can result in improved keeping properties to make the transport of fresh produce easier,

giving consumers access to nutritionally valuable whole foods and preventing decay, damage

Highlight imp points

o Benefits for developing countries:

Genetic engineering technologies can help to improve health conditions in developed countries. Researchers from the Swiss-Federal Institute of Technology's Institute for Plant Science inserted genes from a daffodil and a bacterium into rice plants to produce "golden rice", which has sufficient beta-carotene to meet total Vitamin A requirements in developing countries with rice-based diets. This crop has the potential to significantly improve vitamin uptake in poverty-stricken areas where vitamin supplements are costly and difficult to distribute, and Vitamin A deficiency leads to blindness in children.

"The biggest era of innovation of the 21st century will be at the intersection of biology and technology. A new era is beginning."

o Conclusion:

Biotechnology is a facet of science that has the potential to provide benefits if used carefully. Modern biotechnology represents unique application of science that can be used for betterment of society through development of crops with improved nutritional quality, resistance to pests and reduced cost of production.

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