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Short Review Paper

Uses and benefits of Genetically Engineered Crops-A Brief Perspective

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Abstract

Genetic engineering involves direct manipulation of DNA sequences. This genetic modification of genes can be done by using rDNA technology. Gene technologies plays an important role to analyses all the modifications in engineered product. These techniques can be used for isolation and transfer of specific DNA molecules into particular crops and plants. The most common gene transfer method is Agrobacterium tumefaciens, which transfers DNA into plants by stable integration of DNA molecule. Cotton plants have been modified by using a gene from Bacillus thruringiensis (Bt). Current research in genetic engineering is oriented towards a variety of possible ways with their specific applications. Genetically modified (GM) plants can give rise to number of useful ways to provide benefit to human beings. Also, they can be used to provide resistance against various diseases. Hence, production of GM crops can open multiple ways to treat many challenges in the current and future research. Therefore, in this review we have highlight maximum possible uses of GM crops, production methods and applications.

Keywords: rDNA technology, Antibiotic resistance, Bt cotton.

Introduction

Genes can influence health, human traits, behavior and disease. Gene work and behave differently at all times. At several times genes are "turned on" and "turned off". This is due to the fact, all tissues and organs have to perform their unique functions. Genetic diseases mainly involve multiple mistakes in DNA that result in disruption in the normal production of various proteins. Scientist and researchers are using new genetic technologies to unravel the genomic contributions to these different phenotypes. The advancement in ongoing research shows remarkable achievements in the process of genetic engineering to attain certain desired traits.

Genetic engineering is a marvelous science which involves engineering of genes. It has great potential to alter our society. Genetic engineering can be used for insertion of specific genes in plants and animals. The genetic engineering of crops can give rise to toxic and allergic reactions in humans. With the help of this technology, new proteins from various bacteria can be transferred. Due to the fact, the use genetically engineered foods and crops could be sometimes uncomfortable. Genetic engineering has gained much importance in the present era. This involves genetic modification of organisms by using recombinant DNA technology.

Genetic material can be modified and transfer to other cells, tissues and organisms by using this marvelous technique[1,2]. Most techniques are involved in direct manipulation and expression of particular genes. The genome of all organisms have different level of organization.

Study of mammalian genome gives a clear view about its complex organization and its size which is larger than viruses. The mammalian genome is found to be larger size and has a more complex organization than in viruses, bacteria and plants. Hence, this is observed that the genetic modification and engineering of animals is more complex by using recombinant DNA technology.

Recombinant DNA technology can be used to modify plants by altering their genetic material. Genetically modified plants are those that have been genetically modified using recombinant DNA technology.

They are also termed as transgenic plants. Multiple endogenous genes can be engineered. The genes can be expressed by little modification. The gene which encodes for particular protein will show special characteristic to that plant.

Uses

Studies suggested the advance use of genetic engineering as a useful technology. It can better provide resistance to abiotic stresses, in conditions liked rought, salinity, severe temperature levels and biotic stress conditions including insects and pathogens. Moreover, genetic engineering can be used to improve and enhance the nutritional quality of many crops mainly plants. Research shows production of some new generation GM crops which helps to produce some recombinant medicines such as monoclonal antibodies, vaccines, plastics and various biofuels[3-5].

GM Production Methods

A number of different methods are now being used to engineer plants. The most common is *Agrobacterium tumefaciens*, which is used to transfer specific DNA molecule inside host or subject plants. It follows particular DNA delivery method to stably integrate the DNA into host plant. Another most important technique is used which is referred as gene gun. It involves direct bombardment of DNA into plant cell. Various number of selectable markers can be used to identify the transformed cells. These markers can be used to accomplish the transformation process. One common example is of selectable marker gene which can be used to confer resistance to an antibiotic kanamycin. This resistance can help to kill a normal non GM plant cell which is often cotransferred with the particular gene of interest. These methods have gained much importance for production of genetically engineered crops. Mainly includes, heat processing methods, PCR based methods, DNA base methods, Protein based methods and various molecular methods. Autoclaving and microwave heating methods can damage the DNA. The standardized PCR based methods are used detect DNA in genetically modified crops like soybean and maize. DNA and protein based methods are now being used for detection of GMO.

These antibiotic resistance genes were initially found and isolated from bacteria. According to previous studies, to transfer antibiotic resistance from plants to bacteria is found to be very low and hazardous process. Multiple selection methods which are not dependent on antibiotic resistance have been developed in the modern era. Also, various new ways have been suggested to eliminate theses selectable markers providing antibiotic resistance from the plant genome after completion of their main function[6].

Role of GM plants in Environment

Genetically modified crops plays an important role in removal of pollutants through process of phytoremediation. Genetically engineered plants store some heavy metal which are causing soil contamination such as mercury to higher levels[7,8]. Because of this, they can grow on contaminated sites.

Production of Engineered Genes

Genes have been engineered by geneticists to explore the deep insights of many biological processes. The *Bacillus thuringiensis* (Bt) genes produces certain lethal proteins for some crop plants. *Bacillus thuringiensis*, is a soil bacterium which is involved in production of several crystaltoxin proteins that destroy the gut of most of the invading pests. Up till now, almost 50 *cry* genes have been identified which can affect insect orders in a different pattern. It was observed under the control of efficient plant regulatory sequences the crystal toxin genes (cry) from B. thuringiensis are difficult to express in plants. A number of different cotton plants have been modified by using a gene from Bacillus thruringiensis. The newly modified lines produced were proved to be more similar to their parent lines[9]. The average production of GM crops varies and depends upon number of different factors. Mainly, the environmental factors and genetic factors. The table below shows the average production rate of genetically modified crops.

Table-1
Shows the average rate of GM crops

Sr.No	Country	Average
1.	United States	39.0
2.	Argentina	13.5
3.	South Africa	0.3
4.	China	2.1
5.	Canada	3.5
6.	Australia	0.1

Discussion

The way to introduce foreign genes into plants by altering or engineering the total gene will have a negative impact on human health. The best possible way to transfer any gene is through horizontal gene transfer. The most powerful technology used for bacterial identification involves analysis and identification of 16S and 23S rDNA nucleotide sequences for similarity searching many molecular techniques like enzyme electrophoresis. Techniques like AFLP and multi-locus sequence typing are now being used for analysis[10-13]. Hence, this shows future GM plants will enhance the nutrient level of plants and also increase the resistance to diseases. Therefore, it is now understood about transfer of genes among bacteria by using horizontal gene transfer method. However, on the basis of some negative assumptions the use of antibiotic resistance genes as markers in genetically modified crops is not strongly supported[14]. This review highlights the production of GM crops, their uses and importance at present and also in future. Also, the effects of genetically engineered crops on human health.

Conclusion

Genetic engineering has enabled to alter genetic material for production of new substances. Genetic engineering can help to produce monoclonal antibodies by using hybridomas. With the advent of modern applications, GM crops are now being actively produced. The use of recombinant DNA technology has gained importance for genetically altered plants, animals, and microbes. However, a number of medicinal products are now available. The first two commercially prepared products from recombinant DNA technology were insulin and human growth hormone. Moreover, genetic manipulation of genes helps to produce transgenic plants and animals for benefit of mankind.

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