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Transgenic Crops and the Environment

Madhusudhan L*

Department of Biotechnology, Joginapally B.R Engineering College, JNTUH, Ranga Reddy, Dist., Telangana, India

***Corresponding author:** Madhusudhan L, Department of Biotechnology, Joginapally B.R Engineering College, JNTUH, Ranga Reddy, Dist., Telangana, India, Tel: + 9177856523; E-mail: mslingampally@gmail.com

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Abstract

Continuous practice of old methods in agriculture cannot reduce the food scarcity, as the over use of chemicals, drought and infertile soil are a severe issues where the investment is more and the yielding is less, these all due to unpredictable climatic changes and uncontrolled pesticides. To overcome these issues scientist have concentrated on the new technology by combining the specific genes *in-vivo* for the crops which is called transgenic crops/plants.

Keywords: Transgenic Crops; Genetic transformation; Pesticides, Agriculture; Low toxicity

Introduction

Transgenic crop/plants contain genes which are artificially inserted. Genes of another plant is taken and transferred to a specific plant or may transfer from different species to specific plant/crop. Most of the farmers prefer transgenic crops/plants for various reasons like pest resistant crops, drought resistant, weed resistant, and high yielding are the important problems which are replaced by transgenic crops. Earlier farmers used to spray different chemical for various diseases but the genetic transformation replaced all the problems. These transgenic plant/crops are called as genetically modified crops [1-6].

Researchers aim to assemble group of genes in a plant/crop to overcome the various aspects which are harmful to plant and are decreasing the yield. Genetic transformation is a process of identifying the specific gene responsible for particular qualities and segregating the quality from various harvests/plant or from various species, these qualities are exchanged to the particular yield to from different species, these genes are transferred to the specific crop to acquire the specific characters. Genetic transformation brought vast changes in the crop yielding and crop protection from drought stress, salt stress and other diseases [7-10].

Crops with beneficial traits had been produced for thousands of years with the aid of traditional breeding approaches. Desirable characteristics are selected, mixed and propagated via repeated sexual crossings over countless generations. It is a long procedure, taking as much as 15 years to provide new types. Genetic engineering not simplest enables this process to be dramatically accelerated in a totally precise method by way of introducing a small quantity of genes, it may well also overcome the barrier of sexual incompatibility between plant species and vastly expand the dimensions of the to be had gene pool [11-15].

Transgenic vegetation which was genetically modified utilizing recombinant DNA technology. This may be to precise a gene that's not local to the plant or to change endogenous qualities. The protein encoded by utilizing the quality will give a specific attribute or trademark to that plant using the gene will confer a particular trait or characteristic to that plant. The technological know-how will also be utilized in a number of ways, for example to engineer resistance to abiotic stresses, corresponding to drought, extreme temperature or salinity, and biotic stresses, reminiscent of insects and pathogens, that would frequently show dangerous to plant development or survival. The technological know-how can also be used to reinforce the dietary content material of the plant, and software that would be of precise use in the constructing world. New-iteration GM crops are actually also being developed for the creation of recombinant drugs and industrial products, akin to monoclonal antibodies, vaccines, plastics and biofuels [16-25].

In 2007, for the twelfth back to back year, the worldwide control of biotech yields planted endured to broaden, with a development expense of 12% across 23 countries. The precept crops developed are soybean and maize, despite the fact that cotton, canola and rice are additionally on the expansion. Be that as it may, genetically changed plants grown within the amount to only a few thousand hectares (~0.03% of the arena creation), which is in general a mirrored image of European opposition to this technology. In contrast, meals derived from GM vegetation are ubiquitous in the USA. Indeed, many animal feeds utilized in Europe derived from imported plant material contain GM merchandise. In a similar fashion, Bt-cotton is broadly used in apparel and other products [26-33].

Even though there are various functions of genetic engineering in agriculture, the current focal point of biotechnology is to generate transgenic plants equivalent to herbicide resistant vegetation (HRCs) and pest and ailment resistant plants. HRCs and insect resistant crops (Bt vegetation) accounted for 54 and 31% of the total world subject in 1997. More and more, giant acreages of transgenic soybean (18 million hectares), maize (10 million hectares), potato, tomato, tobacco, and cotton are being commercially deployed in agricultural landscapes global. Transnational organizations equivalent to Monsanto, DuPont, Norvartis etc. That are the foremost proponents of biotechnology argue that cautiously deliberate introduction of these vegetation should cut back and even get rid of the enormous crop losses because of weeds, insect pests, and pathogens. Correctly they argue that the usage of such vegetation may have delivered necessary effects on the atmosphere with the aid of tremendously lowering using agrochemicals. What is ironic is the truth that the bio-revolution is being brought ahead by using the same interests that promoted the first wave of agrochemically-founded agriculture, however, this time, by using

equipping each and every crop with new "insecticidal genes," they're promising the arena safer pesticides, discount on chemically intensive farming and a more sustainable agriculture [33-40].

Effect of Transgenic Plants

Transgenic crops are the important step forward in the production of production of agricultural crops. These crops are modified to contain specific characters like resistant to drought, pests etc., in different agricultural crops. Transgenic crops are in which genes are transferred from one source to another specific crop. Transgenic crops gave better result in product yield, Pests resistance, and herbicide resistance etc., for this some of the farmers are attracted to transgenic crops and some farmers are opposing due to its impact on health in the future. Farmers are attracted to transgenic crops which are non-consumable crop like cotton, which gives high product yield and reduced the use of more pesticides and herbicides. Farmers who grow consumable crops are opposing the transgenic crops due to the genetic transformation which may show its impact on health [41-45].

Biotechnology developed various strategies to control plant viruses, they are divided in to three categories, first category make use of sequences derived from the viral genomes, second is plant derived genes, and the third is no-viral, non-plant derived sequences.

Genetic engineering makes it feasible to switch genes from almost any animal species, micro-organism, plant or virus—into nearly every other species, regardless of how unrelated the two species maybe. Along these lines, these creative atomic methodologies let researchers produce organisms with entirely new mixtures of properties. For example, a jellyfish gene transferred to crops makes them luminescent, and the Monsanto organization is developing new kinds of grass on the way to produce colored lawns [46-50].

Past these extra fantastic applications, genetically engineered crops would offer useful benefits: accelerated yields, increased taste or dietary fine of meals and decreased pesticide use. Alternatively, transgenic crops also pose abilities dangers. Most public concentration has focused on harmful results to human wellness, together with the production of novel allergens or cancer causing agents. But there may be additionally a variety of feasible environmental effects, including increased reliance on herbicides, the creation of recent pests, detrimental effects on non-goal species and the disruption of ecosystem techniques—concerns which have been the focal point of my work.

Sadly, scientists lack the imperative information to foretell the penalties of standard business planting of transgenic vegetation, largely on the grounds that the technological know-how itself remains so new. Nevertheless, transgenic vegetation are currently being planted on a commercial scale, and the discipline devoted to transgenic plants accelerated from 4.3 million acres in 1996 to 69.5 million acres in 1998. With such speedily growing use of transgenic vegetation, scientists and society have got to weigh whether the talents advantages outweigh the advantage risks.

Scientists have got to ask: Do transgenic vegetation pose distinctive risks from those long-established to plants created through normal approaches of plant breeding? In the end, plant breeders used natural methods for millennia to create organisms with fairly novel characteristics. For illustration, varieties as unique as broccoli, Brussels sprouts and cabbage came from a single species of mustard. Many scientists emphasize that the product—no longer the system—wishes to be regulated and evaluated for threat. In different words, transgenic crops will have to not require law without problems considering that they are genetically engineered. As an alternative, a transgenic crop should be regulated most effective whether it is likely to pose elevated threats to human health or the environment. Nevertheless, genetic engineering can create many extra combos of genes and new traits than can typical breeding. This largely improved novelty diminishes any one's capacity to foretell the defense of a transgenic organism on the groundwork of previous experience.

Economic Importance of Transgenic Crops

Majorly agriculture based economic development is considered in every country; some of the developed countries adopted transgenic crops for their economic development and reduced the investments on chemicals and other labor costs. Slowly developing countries are also adopting transgenic crops in the agriculture and they are gaining profits compared to earlier. There is an issue with the consumable food crops at international markets due to its effect on health, but this is not a major issue if the harmless genes are isolated from the specific sources or if the toxicity is induced properly.

Use of transgenic crops raises yields and reduces the necessity for pesticide use, thereby preventing gigantic ecological injury. GM pesticide-producing plants are engineered to supply Bt toxins, a crystal protein naturally synthesized by way of the bacterium Bacillus thuringiensis. The United States Environmental security company has discovered that these toxins don't spark off within the human intestine, and pose no hazard to human well-being. The endotoxins are insecticidal and showcase low environmental persistence (meaning they degrade speedily), making them ideal for expression in crops. Although Bt is deadly to many bugs, a couple of scientific reviews have determined them to be harmless to wild mammals, birds, pets, and people; Bt endotoxins may as well be viewed "biopesticides". Herbicide-resistant crops are engineered to be immune to glyphosate, an herbicide with somewhat low toxicity stages, which allows for the spraying of glyphosate on crops to kill weeds. An illustration of any such plant is the Roundup ready soybean produced by using Monsanto, and the EPA has labeled glyphosate with a "low toxicity" rating.

The European corn borer, a widespread crop pest, claims 7 percentage of the sector's corn deliver every yr. Use of Bt corn has saved US farmers in Iowa and Nebraska on my own up to 1.7 billion dollars in fighting this pest during the last 14 years, when compared to non-Bt versions (Hutchinson). Spanish ranchers who have done Bt maize have decided a 10% expand in yields, with as much as 20% increments in borer-infested areas (Europa). Along with growing yields, Bt crops also cut back pesticide usage. Some estimates point out that if "50% of maize, oil seed rape, sugar beet, and cotton grown within have been GM types, pesticide within the year would decrease with the aid of 14.5 million kg of formulated product", and "there would be a discount of 7.5 million hectares sprayed, which might store 20.5 million liters of diesel and effect in a discount of roughly 73,000 lots of carbon dioxide being launched into the surroundings". A discount of 13 million kg of pesticide in this has been recorded in soybean and corn fields in between 1997 and 2009, after the introduction of genetically modified vegetation. Pesticide usage is lowered by way of a projected 2.5 million pounds a year in the U.S. By me because of introduction of Bt crops. It's projected that the introduction of Bt resistant sugar beet in Europe would scale back pesticide usage in kilograms per year by 2,208 kg and expand yield via

5,050 kg per year. Europe, a position the place transgenic crops are marginally utilized, uses roughly three kg of pesticide per hectare, compared to the united states' 2.5.

Overall, we feel that biotechnology has exceptional competencies to deliver about many benefits to furnish for food safety, peculiarly within the 0.33 world. These benefits include, however, should not limited to, the discount of crop loss to environmental stress, the prevention of nutrition deficiency by way of more nutritious crops, the prevention of meals spoilage earlier than it is dropped at market, the alleviation of soil degradation within the third World, the potential use in agroforestry methods to create extra effective and non-aggressive nitrogen fixers, the abilities to synthesize more effective biopesticides for natural and organic farming, the competencies to create plants built to bioremediate contaminated soils, and the abilities to create plants that thrive in rooftop or vertical farms. Nonetheless, although promising, agricultural technological know-how has now not yet delivered on the aforementioned fronts.

Advantages of Transgenic Crops

Transgenic crops are developed according to needs of human beings and to protect from the harmful organisms. So, majorly it has benefits like:

- Transgenic crops are resistant to various diseases and reduce the investment cost on chemicals and more labor force.
- High product yielding in lesser time and also reduces the food scarcity.
- Advanced farming techniques are developed.
- Some African countries are facing nutritious food scarcity, to avoid such problems crops are modified to more nutrients by genetic transformation.
- These transgenic crops can be stored for long time due to its increased resistance to spoilage.
- These crops can also grow under drought conditions.

Limitation

The only major disadvantage is the name “genetic transformation” sounds threatening to consumers and it creates marketing disadvantage for the transgenic products.

Future Prospects

There are different varieties of food crops and are under various stresses like drought, salt stress etc. to avoid this, genetic transformation was developed and to meet the food requirement for human beings. Farmers are investing lot of money on the chemicals and labor force which also reducing the income of the farmers. By 2050 world population would be 920 crores to meet the food requirement the transgenic crops will be the major solution.

Conclusion

Farmers are tired of spraying chemicals, facing drought, loss of fertility in soil, low product yielding, low income and one side the food requirement for growing population is increasing. So to reduce such problems researchers concentrated on agriculture and developed transgenic crops by transferring gene from one species to another or to same species. Which brought vast changes in agricultural world and most of the developed countries are adapted to transgenic crops by which they are gaining profits. So, by this it is concluded as transgenic crops are beneficial for the economic development of a country and can also reduce the food scarcity with rich nutrients.

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