



Transgenic plants and their impact on the agricultural yield

Hülya Servi *¹, Furkan Ayaz^{1,2}

¹Mersin University, Biotechnology Department, Türkiye, hulyaservi582@gmail.com, 19133015@mersin.edu.tr

²Mersin University, Biotechnology Research and Application Center, Türkiye, furkanayaz@mersin.edu.tr

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Abstract

Despite the positive and negative opinions about transgenic plants, the cultivation of transgenic plants is increasing day by day. A significant portion is for plant health. One of the goals of working with transgenic plants is to reduce herbicides and achieve higher yields with transgenic plants. Thanks to the genes transferred to the plants by applying recombinant DNA technology, product loss has decreased and it has been observed that herbicide resistance has decreased. Despite the criticism against the genetically modified organisms (GMOs) and their utilization, biotechnological approaches for transgenic plants are promising solutions to increase the agricultural yield and enable food security.

Introduction

Weeds have a structure that makes them stronger than cultivated plants. In this way, they can suppress plants, grow and spread. The use of chemical pesticides in the fight against weeds is an effective, reliable and simple need [1]. When using these drugs, it should be used appropriately to increase the efficiency and quality. Pesticide in these products is an integral component of the modern agriculture [2]. One of the most commonly used methods in agricultural control is herbicides, which fall into the pesticide group [3]. In addition to the importance of the pesticides, herbicides are also widely used in sustainable agriculture. More than 200 herbicides are used today, and the most of them have been evaluated for their toxicity potential and approved daily by JMPR (Joint Meeting on Pesticide Residues) [4]. But pesticide residues can contaminate the air, soil, water and food. Thus, it can pose a danger to animals, plants and humans [3]. According to the previous studies, it has been determined that the toxic effect of newly developed herbicides on mammals is low. In another study, development and reproduction were affected in one or a few species of animals exposed to the herbicide effect [4]. Some weed species can show resistance to the conditions such as herbicides, UV, ozone, and drought [5]. More herbicides are used against this resistance, but as a result of using too much herbicide, it causes accumulation and pollution in the soil. These deposits can also build up in the product and cause deadly diseases such as cancer [6]. Such problems are on the increase with the increasing population. With the increase in population, agricultural fields shrink down. In order to solve the problem with the food insecurity, we need to increase the yield from agricultural areas [7].

Today, thanks to the biotechnological studies, important solutions are tried to be found for this purpose. There are 2 purposes in the aim of those studies; the first is to increase product quality and quantity, the second is to increase the resilience to the adversity. In addition to the classical methods, modern methods have been developed. The biggest advantage of these methods is that there is no kinship obligation between the species to be transferred. Thus, it was possible to transfer the gene to be taken from a plant, animal or microorganism to a completely different organism and act as if it were a part of the genome [7]. A plant whose genome has been transferred from another organism by biotechnological methods is called a "transgenic" plant. The origin of this

transferred gene may be another plant species that cannot be crossed with the plant to which the gene is transferred, or it may be an organism from other realms other than the plant universe [8]. The studies carried out to obtain these plants The use of technology with the gene transfer of the bacteria *Agrobacterium tumefaciens* has revolutionized the field. In the continuation of the technology, many GMO plants including tomatoes have been started to be developed. Thanks to recombinant DNA technology, crop losses have decreased all over the world, and herbicide resistance has decreased significantly compared to traditional agriculture. Apart from these, plants that are endangered due to biotic and/or abiotic stress can now be produced and reproduced by cloning, thanks to recombinant DNA technology. Thanks to the genetically modified plants, soils that are polluted and cannot be cleaned or that will take a long time to clean can also be cleaned with bioremediation methods such as phytoremediation method and recycled to the nature [6].

Results

The use of transgenic plants is increasing day by day, and its effect on human health, environment and living things causes controversy. New methods should be found to prevent these concerns and risks, and new varieties should be revealed thanks to the biotechnological methods. In order to increase the yield of the plants under cultivation, high yielding new varieties can be obtained by means of traditional breeding methods and/or recombinant DNA technologies of foreign genotypes, and plant product loss can be prevented by intervening harmful ones at the gene level [2,6].

Discussion

Before obtaining transgenic plants, it is extremely important to take the necessary legal, ethical and legal measures to protect biological diversity and natural resources. This should be done in a timely manner, based on the conservation of biodiversity. It is important to protect Turkey's geographical structure and plant gene resources, including special conditions, and to implement the obligations arising from international conventions, taking into account the rules of the European Union on this subject. Comprehensive measures should be taken to minimize the negative effects of genetically modified plants by realizing the richness of our country, especially in terms of the number of endemic species [6]. GMO plants can also be utilized without spoiling the nature with novel genes as well as chemicals that have been used as herbicides or pesticides. Legal and ethical actions should be taken together with the training of the farmers and the society for the safe usage of GMOs and their potential to increase the yield. GMOs might be an important tool to overcome food shortages and insecurities all around the World.

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