IMPORTANCE OF GENETICALLY MODIFIED ORGANISMS

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Abstract

In the past, men, at different levels of practice and science, dealt with the plants and animals in specific environmental conditions according with their needs and abilities. Selected plants, fruits and seeds as well as animals of which man had the greatest benefit were cultivated. By learning from nature and adopting scientific knowledge man developed methods of creating an economic and cost-effective varieties and hybrids. At the same time he was developing methods of breeding, feeding and protection from environmental stress factors. In the breeding practice man used heterosis in plants, induced mutations, and nowadays new techniques in biotechnology. Numerous varieties and hybrids were created using conventional breeding methods, which are characterized by a high genetic yield potential. Breeding effects are evident in the change of architecture of plants, ripening time, increased productivity as well as biodiversity. Studies have shown that breeding programs of important plant species contributed to the average annual yield increase in about 1%. However, the application of new bioengineering technologies has contributed significantly to increased productivity of plant species. Realization of several times higher yields is crucial in ensuring safe raw materials for food production and helping to solve world hunger.

Keywords: genetically modified organisms, genes, food safety

Introduction

Since the genesis of living beings it was expressed diversity at all system levels of the organization as well as within taxa. Mechanisms of maintenance of organisms variability were expressed in the reproduction process and coexistence with the other living beings and environmental conditions. Although the man since his creation had selection approach in the use of plants and animals for their own needs, he did not know the causes of the recognized advantages of the organisms and was not able to explain them scientifically. With the explanation of sexual reproduction of plants in the 17th century, it was open new perspective for the possible impact of changes in plant organism. With the first cross breedings between organisms man has created the first engineering, although the open pollination and fertilization of these processes already existed in the nature. In the second half of the 18th century from cross breedings are created new varieties and hybrids of different plant species. The knowledge of the inheritance of traits is provided planned cross breeding and directed selection of genotypes. Hard work in organisms breeding is proved to be justified and successful where as a result has been achieved increment in the total biomass production, yield, quality and content of organic compounds, resistance to the pests and diseases as well as increased adaptibility to environmental conditions (Knezevic et al., 2006).
Changes in characteristics of the organisms in the cross breeding process have been carried out on the basis of reproductive compatibility (Kondic et al., 2012) and had a contribution to maintenance and increment of genetic variability and economic impact in terms of increasing the quantity and quality of food.

Progress in the cross breeding of organisms and their transformation was accompanied by the development of the scientific methods. Special contribution has been given by the study that gives knowledge of the role of the individual genes and their function regarding on the interaction with the other genes. In addition, it is important to know the function of gene compensation for the damaged gene, which might be caused by physiological nature on the level of the metabolism adaptation or the level of activation of multiple alleles. To create varieties and hybrids with higher yields and quality and increasing adaptive ability were used sources of genes from natural population, wild relatives of certain species. The major challenge for research in the laboratory and in the field experiments is the ability to identify and evaluate the variability of genes alleles that have the function of the controlling the phenotypic changes.

Modern technology including recombinant DNA technology provides an opportunity for studying gene function and genetic regulation of gene interactions. With this technology is possible to determine the gene sequences that could be used for genetic mapping and to determine the chromosomal locations of genes that control the required properties. Beside that it is possible to detect and to take advantage of the changes in DNA sequence that occur due to changes of basis, deletion or addition of purine or pyrimidine base or varying the number of repetition of short sequences. In order to determine the differences it is used restricted enzymes or polymerase chain reaction (PCR) which requires separation of DNA on the gel (Karp et al., 1997).

Also, biotechnology allows the transfer of favorable alleles at loci through conventional cross breeding using marker technology and the introduction of new loci at the transformation. This feature is essential for the transfer of desirable genes from wild relatives of one species. One of the most important goal of transformation is to improve crops in relation to their protection using herbicides and insecticides (Miflin, 2000). There are numerous examples of the transformation of the genome and introduction of genes that are responsible for resistance to herbicides.

**Creation of genetically modified organisms**

Creation of genetically modified organisms is based on the results achieved in 1973 with using restriction enzymes, bacterial nuclease, which accurately recognize and cut the DNA chain, whereupon such fragments can be reconnected i.e. recombined. During the following two years at Stanford University it was found that the gene recombination can be done not only in bacteria but also in vertebrates (Berg et al., 1974, 1975). This possibility has caused concerns that led to fear for the future and strengthening security, which initiated introduction of rules in performing experiments with recombinant organisms. The first rules were defined in 1975 in USA which also included ethical code. Despite many obstacles and suspiciousness, biotechnology is developing rapidly especially in the pharmaceutical and food industry (Konstatinov & Drinić-Mladenović, 2006). The first examples of products derived by recombinant DNA technology are: cheese obtained with synthesized enzyme chymotrypsin, increased lactation of cows by injecting recombinant bovine somatotropin, FlavrSavr tomato with extended freshness, insect-resistant Bt corn, golden rice which contains more carotene and iron, etc.
This technology has contributed to the production of specific protein in bacteria instead of expensive and slow industrial processes. To create genetically modified organisms altered through recombinant DNA technology at least two genes should be inserted, of which one should allow the synthesis of a protein that is required for commercial use and the second gene that serves as a marker. This technology has made it possible to carry out the transfer of genes from evolutionarily distant, unrelated, species of organism into another, without provoking transformation of one organism to another, but only the expression of desirable trait in organism that the gene was inserted into.

Plant breeding to increase yields, resistance to disease and other stress factors, is focused on the introduction of genes controlling resistance to insects, causal agents of disease, herbicide resistance. Up today, was realized transfer of genes which are controlling these traits in numerous different agricultural plant species: corn soybeans, cotton, sugar beets, potatoes, pumpkin, banana (Knezevic et al. 1998; Drinić Mladenovic et al., 2006).

So, the transfer of genes from yeast was achieved in tomato lycopene content three times higher than that of ordinary tomatoes, and expression of three enzymes, the levels of flavonoids and antioxidants in potatoes were increased in potatoes. From wheat to corn is transferred gene that controls the synthesis of enzyme dehydoascorbate reductaze and modified corn has increased contents of vitamin C, more than 100 times (Chen et al., 2003), and transformed genes controlling vitamin E, which have been isolated from barley, wheat and rice, wheat and rice and by its transferring into the corn had the effect to increasing 6 times of contents of vitamin E (Cahoon et al., 2003).

### GMO Safety use

The creation of genetically modified organisms, has allowed greater production of raw materials for the food industry, thanks to productivity gains multiple GMOs in relation to the breeding organisms obtained by classical methods. GM plants have a higher content of protein, oil, starch with a specific structure. Specific biochemical composition can have different effects on human health. There are examples of some of GM organisms used as a human food caused adverse effects. So, GM soya, in which is transferred gene from Brazilian nut, used as food caused allergic reactions in people, or transgenic tomato with a gene from the fish, used in human food, was causing allergies in people who are normally allergic to fish.

On the base of this, is possible say that it’s not just the gene and its expression, no matter what organism is. This leads us to not exclude pleiotropic effect of foreign genes, which increases the unpredictability of the possible effects of GM foods. If we look without prejudice the effect of transgenic organisms, we can say that up to nowdays registered negative effects of GMO are not only frightening, but is normal and expected, considering that among the natural plants and animals are the ones that cause certain adverse reactions that are known as an allergy to milk, flour (lactose, gluten).

In addition to higher yields, which is the most important economics feature, the advantage of GM crops was increased resistance to diseases and pests and viruses, which helps to reduce costs due to reduced use of pesticides during cultivation. This can be illustrated by the sweet potato in Africa in which the transferred gene for resistance to *Feathery Mottle Virus*, which had a 60% higher yield than ordinary potatoes. In transformed organisms can be achieved increasing of adaptability to different environmental factors, such plants with high content of linoleic acid are
more resistant to low temperatures and frost. Or, plants with entered resistance to herbicides allow more effective control of occurrence of weeds in crops. From this, it can be derived that the creation of plants with desirable functional properties, contributes to reduced allergenicity, toxicity, extending maturing plant species, increasing the content of starch, improved the proteins and fats, etc., which is of great nutritional importance.

Advantages of GMO crops and food in developing countries is reflected in the quality of nutrition and health, improving: the quantity and quality of meat, milk and livestock production, the ability to clean and safe method for the production of edible vaccines and medicines, reduced use of fertilizers and herbicides, and the preservation of agricultural resources and so on.

Disadvantages of using GMOs are reflected in the appearance of loss of genetic diversity of crops, and thereby economic losses, the threat of use of generic drugs, change the nutritional quality of food, many religious and ethical pressures, potential monopoly ownership of major food products.

It is important to promote the existence of selection, approval, precautions and preventive measures in the field of biological safety, food safety, consumer choice, public research and commerce are contained in the developing countries (Gómez-Galera et al., 2010). Public debate and concern in industrialized societies about environmental protection, uncertainties and risks for health with the use of GMO technology, should not discourage developing countries to use GM crops to harvest and that use of GMOs can solve their most pressing problems of hunger and malnutrition.

The use and trade of genetically modified organisms is framed by appropriate and legislation in the European Union. Food which is derived from genetically modified organisms should not be present more than 1% of the specific product and must be labeled (Ramessar et al., 2010).

**Conclusion**

Food production is very important on a global and local level, so that the variation in the quantity and quality of food causes certain changes on the market in terms of supplying and demanding. This is an important factor for connecting all institutions and companies in the chain of production and distribution of food to provide for mankind healthy and safe food, that meets the nutritional requirements for quality and technology. Modern agriculture is characterized by large production of genetically modified organisms (GMOs), GM crops and products of them in the world. Economy and biothechnology in the most overpopulated states in the world, is based on GMO agriculture that is the field of interest of all spheres not only politics and science. Also, a number of fermented foods that may contain all or a parts of natural organisms, are prepared and stored in a safe hygienic conditions and are in wide use. Achievement in biotechnology contribute to the improvement of life in the agricultural and economically poor countries. Investigations in molecular biology are increasingly associated with information technology and nano-technology, which leads to new achievements in the field bionanomatics. However, we are aware of the fact that the developed world already met his heeds in the food using intensive agriculture in disturbed ecosystems in which is placed a "dirty industriy". Today developed world stimulate ecological awareness and organized movement for organic food production. Regardless of the legitimacy of different views on the importance of biotechnology and GMOs, it is fair to say that responsible biotechnology is better than the phenomenon of hunger and vulnerability of human health.
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References


