

Letter to the Editor

Biotechnology and agriculture; Future prospects

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Biotechnology in agriculture has the potential to be a powerful tool to increase yield and quality in plant and animal production. It provides a significant contribution to product development, resistance to abiotic stresses, disease and pest management, and sustainable agricultural activities. Numerous biotechnological studies are being conducted to meet the needs of the rapidly growing world population in today's world where stress factors are extremely high, to eliminate food insecurity. But, it is necessary to eliminate public concerns about genetically modified organisms.

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Biotechnology is "the use of living beings and their products to provide a product beneficial to humans or the environment or to solve a problem". Although it has recently attracted attention, its history dates to ancient times. Though it is a branch of science remembered with genetically modified organisms, biotechnology is a very old branch of science. When we look at the archaeological records, we see that the Babylonians, Egyptians, Romans, Greeks and Chinese have been using biotechnology since 2000 BC. The production of bread, yogurt, cheese and alcoholic beverages with fermentation, and selective breeding to grow more productive plants and animals date back thousands of years. The use of antibiotics is one of the most common biotechnological applications. With the discovery of penicillin by Alexander Fleming, antibiotic production began, and later commercially valuable molecules were isolated from microorganisms and mass production began. With the deciphering of DNA structure and function, gene cloning techniques began to be applied and studies in the field of genetic engineering accelerated. The human genome project made very important contributions to the treatment of diseases.

There are many types of biotechnology, which is a multidisciplinary branch of science. Forensic biotechnology, medical biotechnology, food biotechnology, microbial biotechnology, plant biotechnology, animal biotechnology, aquatic biotechnology, environmental biotechnology and agricultural biotechnology are a few of them. Although there are different types of biotechnology, they all are related to each other, and all are used together to solve today's important issues.

Agriculture is an important strategic sector that feeds the world's population and prevents diseases and deaths caused by malnutrition or hunger. The main purpose is to grow plant and animal products, increase their yield and quality, properly preserve them and offer them to people. It is also a source of income for many families. Food security is defined as "the

measure of an individual's ability to access nutritious and sufficient amount of food". According to the World Food Summit held in 1996, "food security is defined as the physical and economic access of all people to sufficient, safe and nutritious food that meets their nutritional needs and food preferences for an active and healthy life at all times". Today, arable agricultural lands are decreasing, and the world population is increasing rapidly. Due to climate change, urbanization, incorrect agricultural practices, etc., there are decreases in the growth, development, yield and quality of plants. All of these threaten food security. According to the United Nations, African countries will only be able to feed 1/4 of their population in 2025. Again, it is predicted that the world population will reach 9.6 billion in 2050, and food needs will increase by 70%. Therefore, increasing plant and animal production is of great importance.

Agricultural biotechnology, which continues to develop rapidly, works on plant and animal breeding (high yield-quality, resistant to stress conditions), alternative agricultural control opportunities (biopesticides), plant vaccines, drugs developed from plant products, biofuels, etc. using biotechnological methods such as molecular markers, gene transfer, cloning, creation of gene maps, tissue culture, etc. Agricultural biotechnology has the potential to prevent food insecurity by increasing product quality and yield, reducing product losses caused by various environmental reasons. It is thought that consumers, especially in developing countries, will benefit from biotechnological products if they are cheaper or more nutritious. While hunger continues to be a problem worldwide, it is important to produce more productive, nutritious, abiotic and biotic stress-resistant plants. Biotechnology is widely used today in the production of such plants. On the other hand, the use of biotechnological methods that are thought to be harmful to human health and the environment is a concern.

Today, although many scientists agree that genetically modified organisms and products derived from them are safe, people have concerns about consuming these products. In particular, the allergic reactions they may cause and antibiotic resistance resulting from the use of marker genes increase concerns for human health. Again, antibiotic or pesticide resistance that may occur in soil microorganisms, herbicide resistance that may occur in weeds, and the threat to biodiversity due to horizontal gene escapes constitute the main concerns about the environment.

Malnutrition and poor-quality food have caused health problems in many developing countries, especially among children and women. Biotechnology is a potential tool for improving agricultural production. It is envisaged that biotechnology can provide global food security by increasing the quality and quantity of food grown and/or produced. New, large-scale and adaptable research on agricultural biotechnology can contribute to food security, especially in developing countries. At the same time, if biosafety issues are solved through studies on marker genes, horizontal gene escapes and proteins that cause allergic reactions, the rate of people using agricultural biotechnology-produced products will increase.