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Review Article

# APPLICATIONS OF BIOTECHNOLOGY TO THE IMPROVEMENT IN QUALITY OF CROPS

**Dhirendra Kumar Singh[1*]**

[1]Associate Professor, Department of Agricultural Biochemistry, B.B.D. Govt. College Chimanpura, Shahpura, Jaipur, Rajasthan, India

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**Corresponding author: Dhirendra Kumar Singh**
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## Abstract

You will learn briefly about the application of biotechnology in agriculture in this article. The best definition of biotechnology is the application of scientific methods to enhance and change the value of microbes, plants, and animals. Biotechnology has been a part of several industries throughout the years, including genetic engineering, agriculture, and medicine. The general public who are not experts in the field but are interested in taking part in the current discussion regarding the future of genetically modified crops is the target audience for this introductory essay. This subject is especially pertinent at this time since a new round of international trade negotiations will be discussed in Seattle in December 1999, and one of the topics up for discussion will be the international commerce of genetically modified organisms (GMOs). This essay only discusses genetically engineered plants. In the future, CAST plans to publish a number of studies that will go into further detail and consider genetic manipulation in a wider context than just crops.

**Keywords:** Biotechnology, agriculture, crops, Developments.



## Introduction

Biotechnology, in its broadest sense, refers to the use of a variety of scientific methods to improve and modify economically significant plants, animals, and microbes. Applied biotechnology for agriculture is known as agricultural biotechnology. Since the introduction of the earliest agricultural methods thousands of years ago, conventional biotechnology has been used broadly to improve plants, animals, and microorganisms

The method used to apply biotechnology to agriculturally significant crop species has traditionally been selective breeding, which involves exchanging genetic material between two parent plants to create offspring with desired traits, such as increased yields, disease resistance, and improved product quality. Genetic material can only be transferred when the two plants being crossed (bred) are of the same species or closely related species. Superior plant varieties have developed much more quickly as a result of active plant breeding than would have been the case in the wild owing to random mating.

Traditional techniques of gene exchange, however, frequently result in traits of interest not existing in any related species, are confined to crosses between the same or very closely related species, and might take a long time to produce desired outcomes. The precision and speed with which these modifications in plant features can be

achieved are substantially improved by contemporary biotechnology, and the number of potential sources from which desired traits can be derived is greatly increased.

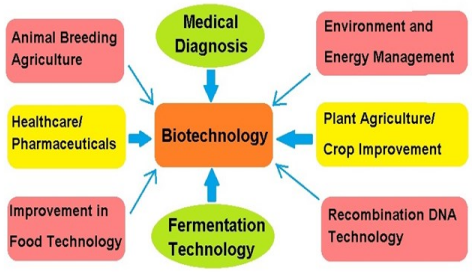


**Fig.1.Applications of Biotechnology**

**Application and Important Role of Biotechnology in Agriculture**

Agricultural biotechnology can be defined as a group of scientific techniques based on DNA and its concepts that can improve plants, microbes, and animals.

It might be argued that using biotechnology in agriculture is preferred over using agrochemicals. The latter is thought to be the culprit for environmental harm and is also fairly impractical for farmers.

The following highlight the few ways in which biotechnology has found its way in agriculture –

•Genetic engineering / rDNA technology: This approach involves the purposeful lab modification of one or more genes. Recombinant DNA (rDNA) technology is used to do this, changing an organism's genetic make-up in the process.

•Tissue culture: Tissue culture is the process of preserving and promoting the growth of small pieces of plant or animal tissue in a sterile setting. It is necessary to isolate this tissue first.

•Embryo rescue: It is a particular form of in-vitro plant culture. Here, to improve the chances of survival, a developing embryo is reared in a controlled environment. This might help protect seed species that are at danger of extinction. This can contain heritage seeds, locally grown grains having cultural importance, etc.

•Somatic hybridization: It is a procedure whereby the cellular genome is changed through the joining of two protoplasts.

•Molecular-gene markers: Molecular-gene markers in genetic engineering are distinct DNA segments connected to specific locations within the genome.

•Molecular diagnostic: A group of methods known as molecular diagnostics are used to examine biological markers found in the genome and proteome. Finding out how their cells express their genes as proteins is made easier by it.

•Vaccine: In order to cause the appropriate immunological reaction, a mixture is injected into the host's body. It helps to prevent a variety of diseases, including polio. It is currently produced in big amounts to fight COVID.

**Micropropagation**

It is the aseptic and controlled clonal multiplication of plants in a closed vessel.

Role of Biotechnology in Agriculture

Agriculture uses biotechnology in a variety of ways. The following are some of the most common advantages of biotechnology in agriculture:

•Increase in Crop Production: By strengthening disease prevention and resistance to drought and flooding, biotechnology dramatically raises agricultural productivity. This not only meets the growing need for food but also helps farmers make a profit.

•Better Crop Protection: Techniques based on biotechnology provide realistic, economical solutions to pest control problems. Farmers have created a protein that effectively shields crops like cotton, maize, and potatoes from pest issues.

•Increase in Nutrition Value: It has also enabled farmers to produce crops with

superior flavour, texture, and nutritional value. For example, technological advancements have made it possible to grow potatoes rich in carbs, beans rich in additional amino acids, and soybeans rich in protein.

•Fresher Produce and Better Taste: By boosting the activity of enzymes found in plants, it also contributes to enhance the flavour and taste of crops. Additionally, it aids in extending the freshness of the yield.

•Chemical Tolerance: Herbicides are used by the majority of farmers to prevent weed development, which frequently causes soil erosion. But because genetically modified crops is resistant to many different chemicals, including herbicides, soil erosion is considerably reduced.

•Disease Resistance: In addition to the fact that insecticide use frequently threatens the quality of the soil and the crop, viral diseases spread by insects are frequently challenging to control. However, genetically modified plants are less prone to virus contamination and help farmers control crop loss.

Although using biotechnology in agriculture has many advantages, it is not without drawbacks. To elaborate, there are certain worries regarding societal, environmental, and health concerns.

Among the many concerns surrounding the use of biotechnology in agriculture are resistance to antibiotics, pesticide, superweed development, and biodiversity loss. One might, however, hold out hope that with the development of technology, scientists will discover workable solutions to properly address the worries and associated risks.

Benefits and Risks of Agricultural Biotechnology

There are a number of issues that need to be considered when weighing the advantages and risks of using modern biotechnology so that wise decisions can be made regarding whether it is appropriate to use it to address current issues in food, agriculture, and natural resource management. These concerns range from risk evaluation and management within an efficient regulatory framework to the function of intellectual property management in encouraging local innovation and facilitating access to technologies created by others.

The OECD has suggested six safety factors that must be taken into account when mitigating any risks created by environmental plant production. These include the expression of genetic material from pathogens, worker safety, genetic and phenotypic diversity, trait impacts, and gene transfer

It is crucial to distinguish between hazards that are inherent in technology and risks that transcend technology when making value judgements about the risks and advantages of using biotechnology. In the first, potential risks to food safety and the effects of a biotechnology-based product on the environment are assessed. The latter are a result of how technology is used in a political and social environment, as well as how its uses may promote or imperil the interests of certain social groups.

**Conclusion**

Understanding the numerous facets and how modern technology can alter the face of agriculture can be achieved by learning about the role of biotechnology in agriculture and become familiar with agricultural applications of biotechnology.

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