

Agricultural biotechnology: evolution and impact assignment

[Technology](#)



Lack of awareness among the people, and fight against World Hunger were one of the prime reasons I chose this topic. Biotechnology plays an important role in improving the quality and nutrition in the food that we eat, it focuses on facilitating farmers in most parts of the world. With proper testing and quality control, GM foods can be a savior to world hunger. Biotechnology has a long history of use in food production and processing. For centuries, humans have used simple techniques of selecting, sowing and harvesting to improve wild plants and animals through the breeding of desirable characteristics.

In the present age, with a growing population, the global food demand has increased. Biotechnology helps us to produce not only higher crop yields, but also a trait that naturally protects them from disease, insects as well as a higher nutritional value and better taste. Breeding today has become more sophisticated. Agriculture Biotechnology refers to various scientific techniques used to produce specific desired traits in plants, animals or microorganisms through the use of genetic knowledge. Based on the understanding of DNA, scientists have developed solutions to increase agricultural productivity.

Modern food biotechnology, also known as genetic engineering or recombinant DNA (rDNA) technology, allows for the identification and transfer of one or more specific genes, creating desired qualities and a more precise way to produce food'. Biotechnology enables improvements that are not possible with traditional crossing of related species alone. A BRIEF

HISTORY ; ; ; About 10-15 thousand years ago humans started to

domesticate the production of crops by carefully selecting the seeds from <https://assignbuster.com/agricultural-biotechnology-evolution-and-impact-assignment/>

the best crops. About 4 thousand years ago, Sumerians and Babylonians used fermentation to make wine, beer and bread. Around 3000 BC Egyptians were known for breeding geese to make them bigger and better for cooking. Invention of the microscope and later (in the 19th century) the development of pasteurization led to better milk production and improvement in food hygiene. The foundation of food technology was the introduction of pasteurization and the 19th century. This was followed by the discovery of enzymes and their role in fermentation and digestion. With these various technological developments of enzymes emerged. DNA structure was described in the 20th century.

The main biotechnological advanced crops include: ; Enhanced input traits: these include herbicide and insect-resistant maize, soybean, cotton etc. Also, several government authorities have approved the use and environmental release of extended freshness tomato, rice, insect resistant-potato, virus resistant- papaya and squash and sugar beet. Value-added output traits: such as vegetable oils with increased levels of omega-3 fatty acids or grains like corn with higher amounts of lysine for animal feed. Crops producing medicine or pharmaceuticals and those which improve the processing of bio-based fuels.

TECHNIQUES USED: Fermentation: This was one of the earliest techniques used (by the Sumerians and Babylonians) to make bread, wine and beer. Fermentation is a process in which an organism causes an organic substance to break down into simpler substances, especially the anaerobic breakdown of sugar into alcohol. Genetic engineering: Scientists have learnt how to

move specific genes from one organism to another. This method is known as genetic modification (GM), process it is possible to transfer useful and specific characteristics into a plant, animal or microorganism (such as resistance to disease) by inserting genes from another organism.

This has aided farmers to produce GM crops to increase productivity by reducing the damage to crops from insects, weeds or diseases.

Steps for making a Recombinant DNA: 1. Isolate DNA of the donor organism 2. Cut with restriction enzymes (into sticky or blunt ends) 3. Legate the donor DNA into cloning vector 4. Transform recombinant DNA molecule into host cell (bacterial) 5. Each transformed cell will divide lots of times to form millions of cells, each of which carries the radar molecule or DNA clone. . This culture is then mixed with the target plant tissue. Some of the target plant cells incorporate the desired gene into their own DNA. 7. The tissue is then regenerated using tissue culture techniques. Molecular Markers:

Traditionally, good breeding involves the selection of individual plants or animals based on visible or measurable traits. In agriculture biotechnology, the DNA of the organism is examined and molecular markers are used to select the plants or animals that contain the desirable gene (even in the absence of a visible trait).

In this way, the breeding is more precise and efficient. Another use of molecular markers can be to identify undesirable genes and eliminate them in future generations. Molecular Diagnostics: They are methods used to detect genes or gene products that are very precise and specific. Molecular

diagnostics are used in agriculture to more accurately diagnose crop/livestock diseases. Vaccines: Since Louis Pasteur first developed an attenuated vaccine for rabies in humans, rabies vaccine has gradually improved. The development of the vaccines using recombinant technology is now in use.

Biotechnological derived vaccines are used to protect cattle from various fatal diseases. These vaccines may be cheaper, better and safer than traditional vaccines (stable at room temperature and do not need refrigerated storage). For example in the Philippines, biotechnology has been used to develop an improved vaccine to protect cattle and water buffalo from hemorrhagic septicemia which was a cause of death. Edible vaccines are among the most innovative approaches for administering new vaccines. For example, researchers have investigated putting a vaccine into bananas that would prevent food borne pathogens.

Tissue Culture: It is the process of regeneration of plants by growing cells artificially in the laboratory under sterile conditions on a nutrient culture medium. Tissue culture is used to produce clones by exploiting the Totipotency property in plant cells and the ability of generating a whole plant from a cell on a culture media given the required nutrients and plant hormones- auxin and cytokine. Steps followed: 1 . Plant tissue (explants) is first selected from a healthy plant and is sterilized to remove contaminants. 2. A suitable culture medium is designed which sustains the explants and encourages cell division.