

A Guide to Biotechnology in Crop Production

The development and use of new or improved food and fiber products through biotechnology have been the subject of widespread discussion and debate. Examples of these new products include plants that make more protein or resist pests better than conventional varieties. But what is biotechnology? How does it work? Are the products safe? These are important questions. They involve concepts that should be understood by citizens so that they can participate in discussions and decisions about the use of this technology.

This publication is intended to help readers gain a basic understanding of biotechnology and its application in plant agriculture. It also discusses some of the potential benefits and drawbacks of biotechnology.

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Terms and Concepts

Biotechnology: The process of using living organisms (such as plants, animals, or microbes) or any part of these organisms to create new or improved products. Biotechnology is often divided into "old" and "new" biotechnology. The older biotechnologies, such as plant and animal breeding and microbial fermentation, are based on the use of whole, living organisms. The newer biotechnologies make use of parts of living organisms. Some of the "new" biotechnologies are cell and tissue culture, monoclonal antibody technology, and genetic engineering.

Cell Fusion: Combining two cells of the same or different species by using certain chemicals or electrical current.

DNA: The structure within a cell that carries genetic information.

Gene: The functional unit of inheritance. It is a segment of DNA that is responsible for the development of specific characteristics (or traits) in an organism.

Genetic Engineering: A broad range of molecular techniques for combining genetic material from two organisms. Techniques for genetic engineering include cell fusion, use of a bacterium or virus for inserting the DNA into a cell, electroporation, microinjection, and DNA injection by particle gun. The intent is to move desirable genes that control specific functions--for example, production of enzymes for the degradation of a certain herbicide or production of a chemical for insect resistance--into the host plant, animal, or microbe.

Hybridization: The process of producing an offspring of two genetically dissimilar parents, whether

cells, animals, or plants.

Interspecific Hybridization: Transferring genes between species--for example, from a noncultivated plant species to a crop variety of a related species.

Microbe: Any microscopic organism; a microorganism such as yeast or bacteria.

Species: A population or populations of organisms that are made up of a common gene pool and are reproductively isolated from other species. (For example, tomatoes and potatoes, although closely related, are of different species.)

Variety: A subgroup within a species having distinctive traits that are different from other members of the species. (For example, 'Better Boy' tomatoes are a different variety from 'Rutgers' tomatoes.)