Biotechnology

Technology

But recent developments n molecular biology have given biotechnology new meaning, new prominence, and new potential. It Is (modern) biotechnology that has captured the attention of the public. Modern biotechnology can have a dramatic effect on the world economy and society (3). One example of modern biotechnology is genetic engineering. Genetic engineering is the process of transferring individual genes between organisms or modifying the genes In an organism to remove or add a desired trait or characteristic. Examples of genetic engineering are described later In this document.

Through genetic engineering, genetically modified crops or organisms are formed. These GM crops or Smog are used to produce biotech-derived foods. It is this specific type of modern biotechnology, genetic engineering, that seems to generate the most attention and concern by consumers and consumer groups. What Is interesting is that modern biotechnology is far more precise than traditional forms of biotechnology and so is viewed by some as being far safer.) How does modern biotechnology work? All organisms are made up of cells that are programmed by the same basic genetic material, called DNA (deoxyribonucleic acid).

Each unit of DNA is made up off ambition of the following nucleotides adenine (A), guanine (G), thymine (T), and cytosine (D) as well as a sugar and a phosphate. These nucleotides pair up Into strands that twist together into a spiral structure call a " double helix. " This double helix is DNA Segments of the DNA tell individual cells how to produce specific proteins. These segments are genes. It is the presence or absence of the specific protein that gives an organism a trait or characteristic. More than 10, 000 different genes are found In most plant and animal species.

This total set of genes for an organism is organized into chromosomes within the cell nucleus. The process by which a multicultural organism develops from a single cell through an embryo stage into an adult is ultimately controlled by the genetic information of the cell, as well as Interaction of genes and gene products with environmental factors. (5). When cells reproduce, the DNA strands of the double helix separate. Because nucleotide A always pairs with T and G always pairs with C, each DNA strand serves as a precise blueprint for a specific protein.

Except for mutations or mistakes In the replication process, a single cell Is equipped with the Information to replicate Into millions of identical cells. Because all organisms are made up of the same type of remove DNA segments from one organism and recombine it with DNA in another organism. This is called recombinant DNA (radar) technology, and it is one of the basic tools of modern biotechnology (6). radar technology is the laboratory manipulation of DNA in which DNA, or fragments of DNA from different sources, are cut and recombined using enzymes. This recombinant DNA is then inserted into a living organism. DNA technology is usually used synonymously with genetic engineering. radar technology allows researchers to move genetic information teen unrelated organisms to produce desired products or characteristics or to eliminate undesirable characteristics. Genetic engineering is the technique of removing, modifying or adding genes to a DNA molecule in order to change the information it contains. By changing this information, genetic engineering changes the type or amount of proteins an organism is capable of producing. Genetic engineering is used in the production of drugs, human gene therapy, and the development of improved plants (2).

For example, an " insect protection" gene (Bet) has been inserted into several crops - corn, ton, and potatoes - to give farmers new tools for integrated pest management. Bet corn is resistant to European corn borer. This inherent resistance thus reduces a farmers pesticide use for controlling European corn borer, and in turn requires less chemicals and potentially provides higher yielding Agricultural Biotechnology. Although major genetic improvements have been made in crops, progress in conventional breeding programs has been slow.

In fact, most crops grown in the US produce less than their full genetic potential. These shortfalls in yield are due to the inability of crops to tolerate or adapt to environmental stresses, pests, and diseases. For example, some of the world's highest yields of potatoes are in Idaho under irrigation, but in 1993 both quality and yield were severely reduced because of cold, wet weather and widespread frost damage during June. Some of the world's best bread wheat and malting barley's are produced in the north-central states, but in 1993 the disease Fauvism caused an estimated $1 billion in damage.

Scientists have the ability to insert genes that give biological defense against diseases and insects, thus reducing the need for chemical pesticides, and they will non be able to convey genetic traits that enable crops to better withstand harsh conditions, such as drought (8). The International Laboratory for Tropical Agricultural Biotechnology (IL TAB) is developing transformation techniques and applications for control of diseases caused by plant viruses in tropical plants such as rice, cassava and tomato.

In 1995, IL TAB reported the first transfer through biotechnology of a resistance gene from a wild species of rice to a susceptible cultivated rice variety. The transferred gene expressed resistance to Assonants rosary, a bacterium which can destroy the crop through disease. The resistant gene was transferred into susceptible rice varieties that are cultivated on more than 24 million hectares around the world (9). Reduce the need for chemical pesticide use.

Insect-protected crops allow for less potential exposure of farmers and groundwater to chemical residues, while providing farmers with season-long control. Also by reducing the need for pest control, impacts and resources spent on the land are less, thereby preserving the topsoil (10). Major advances also have been made through conventional breeding and selection f livestock, but significant gains can still be made by using biotechnology (23). Currently, farmers in the U. S spend $17 billion dollars on animal health. Diseases such as hog cholera and pests such as screwworm have been eradicated.

Uses of biotechnology in animal production include development of vaccines to protect animals from disease, production of several calves from one embryo (cloning), increase of animal growth rate, and rapid disease detection (7). Modern biotechnology has offered opportunities to produce more nutritious and better tasting foods, higher crop yields and plants that are naturally protected from eases and insects. Modern biotechnology allows for the transfer of only one or a few desirable genes, thereby permitting scientists to develop crops with specific beneficial traits and reduce undesirable traits (10).

Traditional biotechnology such as cross-pollination in corn produces numerous, non-selective changes. Genetic modifications have produced fruits that can ripen on the vine for better taste, yet have longer shelf lives through delayed pectin degradation (7). Tomatoes and other produce containing increased levels of certain nutrients, such as vitamin C, vitamin E, ND or beta carotene, and help protect against the risk of chronic diseases, such as some cancers and heart disease. (10).

Similarly introducing genes that increase available iron levels in rice three-fold is a potential remedy for iron deficiency, a condition that effects more than two billion people and causes anemia in about half that number (19). Most of the today's hard cheese products are made with a biotech enzyme called chinos. This is produced by genetically engineered bacteria which is considered more purer and plentiful than it's naturally occurring counterpart, net, which is derived from calf stomach tissue. In 1992, Monsanto Company successfully inserted a gene from a bacterium into the Russet Burbank potato.

This gene increases the starch content of the potato. Higher starch content reduces oil absorption during frying, thereby lowering the cost of processing French fries and chips and reducing the fat content in the finished product. This product is still awaiting final development and approval. Modern biotechnology offers effective techniques to address food safety concerns.

Botanical methods may be used to decrease the time necessary to detect debtor pathogens, toxins, and chemical contaminants, as well as to increase detection sensitivity.

Enzymes, antibodies, and microorganisms produced using radar techniques are being used to monitor food production and processing systems for quality control (7). Discoveries into applications. This is done by controlling which genes are altered in an organized fashion. For example, a known gene sequence from a corn plant can be altered to improve yield, increase drought tolerance, and produce insect resistance (Bet) in one generation. Conventional breeding techniques would take several years.

Conventional breeding techniques would require that a field of corn is grown and each trait is selected from individual stalks of corn. The ears of corn from selected stalks with each desired trait (e. G, drought tolerance and yield performance) would then be grown and combined (cross-pollinated). Their offspring (hybrid) would be further selected for the desired result (a high performing corn with drought tolerance). With improved technology and knowledge about agricultural organisms, processes, and ecosystems, opportunities will emerge to produce new and improved agricultural products in an environmentally sound manner.