Genetic Engineering

The future of food and medicine

Zakaria Ahmed

THE world population continues to increase at an explosive rate, our arable land is deteriorating, fresh water is becoming scarce, and increasing environmental stresses will pose ever more serious threats to global agricultural production and food security in future years. Genetically engineered foods are produced from crops whose genetic makeup has been altered through a process called recombinant DNA or gene splicing, to give the plant a desirable trait. Genetically engineered foods are also known as biotech, bioengineered or genetically modified; although "genetically modified" can also refer to foods from plants altered through other breeding methods. Scientists and farmers have been genetically modifying plants for hundreds of years. Hybrid corn and tangelos, for example, are the result of genetic modification through traditional methods of plant breeding and the many varieties of apples we eat today were produced through genetic modification. Using traditional genetic modification methods, such as cross-fertilization, scientists can produce a desired trait, such as a hardier plant. But in doing so, they mix thousands of genes from several plants, requiring many attempts over many years to weed out the unwanted traits that occur. Newer methods of genetic modification, in the form of genetic engineering, are more precise, predictable and faster. By controlling the insertion of one or two genes into a plant, scientists can give it a specific new characteristic without transferring undesirable traits. Bioengineering or genetic engineering refers to new methods of plant breeding that permit scientists to improve food crops by introducing a copy of a gene for a specific trait (e.g., fruit softening).

Genetically modified foods

Tomatoes, potatoes, squash, corn, and soybeans have been genetically altered through the emerging science of biotechnology. For example, scientists have developed a variety of rice capable of synthesizing beta-carotene, a precursor to vitamin A, by inserting genes from a soil bacterium and two genes from a daffodil. Although it's the staple food for half the world's population, rice is a poor source of many essential nutrients and contains no vitamin A. The genetically engineered rice someday could help millions of people worldwide who suffer from vitamin A deficiency, a condition that leads to blindness in a quarter million children annually in Southeast Asia. Scientists can also use the same procedure of inserting genes and a promoter to create biotech wheat, corn and other cereal plants that can withstand harsh conditions.

The first genetically engineered whole product-a tomato-went on the market in 1994. The Grocery Manufacturers of America estimates that between 70 - 75 percent of all processed foods available in U.S. grocery stores may contain ingredients from genetically engineered plants. Breads, cereal, frozen pizzas and soda are just a few of them. Soybean oil, cottonseed oil and corn syrup are ingredients used extensively in processed foods. The first generation of genetically engineered crops was developed primarily to benefit the growers. Plants were created to resist pests and diseases and to tolerate herbicides used to kill weeds. Scientists see the next generation of genetically engineered products benefiting consumers directly. They are adding nutrients to foods to help prevent diseases, reducing allergens and toxins, and making foods tastier. Using the tools of biotechnology, researchers are working to reduce the bitterness in citrus fruits, reduce saturated fats in cooking oils, produce more flavorful tomatoes, and even lessen the gassiness caused by beans. Grains, fruits and vegetables that contain more nutrients and potatoes that absorb less oil when made into chips and French Fries are also in the development pipeline. As the tools and techniques used in biotechnology become more complex and a broader range of plants are researched for a wider variety of uses.

Scientists have inserted into corn a gene from the bacterium Bacillus thurigiensis, usually referred to as BT. The gene makes a protein lethal to certain caterpillars that destroy corn plants. This form of insect control has two advantages: It reduces the need for chemical pesticides, and the BT protein, which is present in the plant in very low concentrations, has no effect on humans. Another common strategy is inserting a gene that makes the plant resistant to a particular herbicide. The herbicide normally poisons an enzyme essential for plant survival. Other forms of this normal plant enzyme have been identified that are unaffected by the herbicide. Putting the gene for this resistant form of the enzyme into the plant protects it from the herbicide. That allows farmers to treat a field with the herbicide to kill the weeds without harming the crop. The new form of the enzyme poses no food safety issues because it is virtually identical to nontoxic enzymes naturally present in the plant.