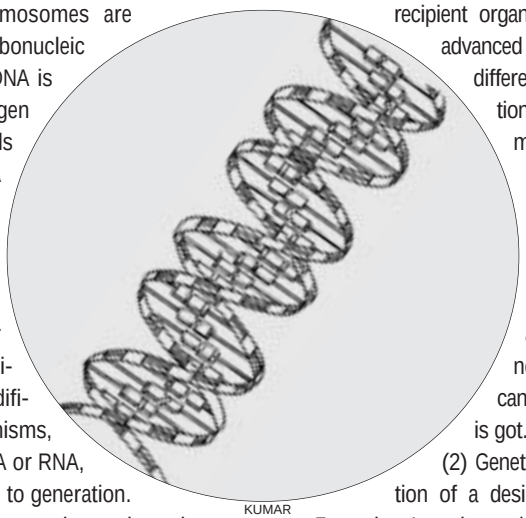
Uncorking t

What is a GMO?

Genetic modification is the process by which the genetic material of any living organism (plant, animal or micro-organism) is altered to bring about a required change. This change is not through any natural process but done in labs, by humans. It is a well-thought -of, planned action. Well then what is genetic material?

All living things are made of cells. The control centre of all plant and animal cells is called the nucleus, which contains thread-like structures called chromosomes. Chromosomes are made up of the genetic material - deoxyribonucleic acid (DNA) and ribonucleic acid(RNA). DNA is made up of sugars, phosphates and nitrogen bases. It looks like two string of beads coiled around each other. DNA and RNA carry 'genetic codes' that represent the characteristics of an individual. During reproduction, DNA or RNA passes from the parent cells into the new cells and thus the offspring (be it a plant, animal or micro-organism) gets characteristics similar to that of the parents. If changes, modifications and mixing of two or more organisms, are made in the genetic codes in this DNA or RNA, the changes will pass on from generation to generation. Selective breeding has been done by humans since a long time to produce desirable characteristics, for example, to increase yields or to resist disease. Two or more varieties of a crop are cross-bred to create a new variety with the best characteristics of each. This process is very slow and it may take years to get the perfect organism. Radiation has also been used to change the genetic characteristices of seeds. This is called mutation. The mutated seeds are then crossbred with other varieties. These processes are called hybridisation.



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Today, the laboratory processes (in making a GMO) that are used to manipulate this genetic code are like the process of cutting and pasting. Strands of DNA, the basic chemical of life, which produce a particular effect in one living organism, can be 'cut' out and then 'pasted' into the DNA of another living organism. The genetic strands are 'trimmed' so that only a precise, fully defined piece of DNA is pasted into the recipient organism.The process of GMO making uses advanced molecular techniques.There are two major differences between modern genetic modification and traditional animal and plant breeding method of hybridisation.

(1) Genetic modification enables single, well-defined genes to be isolated and transferred. In the traditional method of hybridisation, traits are 'crossbred'. The plants or animals thus produced are then again selected to produce the right quality needed and crossbred again. This process can go on for years until the required quality is got.

(2) Genetic modification even allows the introduction of a desired gene from an animal into a plant. Example: A toxin-producing gene from the bacteria *Bacillius thuringiensis* has been introduced in cotton to make the cotton resistant to bollworms, a pest inherent to the plant. In hybridisation a cross between animal and plant is not possible. Crossing two different kinds of crop also cannot done. Example: Selective breeding between two or more varieties of rice can be done to give long stalks of rice that has high per plant yield. The same cannot be done between two varieties of different crops, e.g.wheat and rice

The Promise....

a) food production- an area in which biotechnology plays a significant role is the production of vitamins, and enzymes for food processing.
b) agriculture - fruits and vegetables can be improved in appearance, taste, nutrient content, shelf life, resistance to pests and even stability under unfavorable climatic conditions.
c) plants- Better yield, more efficient use of land. Less herbicides, pesticides and other chemicals.
d) medicine - new methods of producing critical vaccines that cost cheaper.
e) environmental management - biotechnology offers new opportunities for the protection of the environment, e.g. genetically modified bacteria may one day be used to convert non-biodegradable wastes to useful products.

....and the Risk

a) unintentional introduction of allergens and other antinutrients in foods and soils.
b) escape of transgenes from cultivated crops into wild relatives. Such effects may affect or reduce plant species in natural communities, or influence diversity of wildlife as a result of changes in available food and food sources.
c) super weeds may play havoc in the wild, being resistant ot most herbicides and pests.
d) transgenic crops carrying antibiotic genes may generate antibiotic resistance in livestock or humans,
e) pests may evolve resistance to toxins produced by GM crops
f) toxins of GM crops may affect non target pests.
g) small farmers will lose out as the technology cost is very high, the price of products low.
h) the technological development has a hazy future.

In 2000, about 109.2 million acres were planted with transgenic crops. Worldwide 70 c