

Introduction to Plant Breeding

Plant breeding is an art and a science. May be it should be added that it is also a business , Modern plant breeding is a discipline that is firmly rooted in the science of genetics. As an applied science, breeders are offered opportunities to apply principles and technologies from several scientific disciplines to manipulate plants for specific purposes. The changes made in plants are permanent and heritable. The professionals who conduct this task are called plant breeders.



Consequently, the term “plant breeding” is often used synonymously with “plant improvement” in modern society. It needs to be emphasized that the goals of plant breeding are focused and purposeful.

Even though the phrase “to breed plants” often connotes the involvement of the sexual process in effecting a

desired change, modern plant breeding also includes the manipulation of asexually reproducing plants (plants that do not reproduce through the sexual process). Breeding is hence about manipulating plant attributes, structure, and composition, to make them more useful to humans. Plant breeders specialize in breeding different groups of plants. Some focus on field crops (e.g., soybean, cotton), horticultural crops (e.g., vegetables), ornamentals, fruit trees (e.g., citrus, apple), forage crops (e.g., alfalfa, grasses),

- **Why breed plants?** The reasons for manipulating plant attributes or performance change according to the needs of society.

Plants provide food, feed, fiber, pharmaceuticals.

Genes can now be transferred from virtually any organism to another. specifically called **genetic engineering**. Current successes include the development of insect resistance in crops such as maize by incorporating a gene from the bacterium *Bacillus thuringiensis* Cultivars containing an alien gene for insect resistance from this particular organism are called *Bt* cultivars, diminutive of the scientific name of the bacterium.

The products of the application of this alien gene transfer technology are generally called genetically modified (GM) or **transgenic** products. **Plant biotechnology**, the umbrella name for the host of modern plant manipulation techniques, has produced, among other things, molecular markers to facilitate the selection process in plant breeding.

- **Achievements of modern plant breeders**

1- Yield increase.

Yield increase in crops has been accomplished in a variety of ways including targeting yield *per se* or its components, or making plants resistant to economic diseases and insect pests, and breeding for plants that are responsive to the production environment. Yields of major crops (e.g., corn, rice, sorghum, wheat, soybean).

2- Enhancement of compositional traits.

Breeders have identified the quality traits associated with these uses and have produced cultivars with enhanced expression of these traits Genetic engineering technology has been used to

produce high oleic sunflower for industrial use, while it is also being used to enhance the nutritional value of crops (e.g., pro-vitamin A “Golden Rice”). The shelf-life of fruits (e.g., tomato) has been extended through the use of genetic engineering techniques to reduce the expression of compounds associated with fruit deterioration.

3- Crop adaptation.

Crop plants are being produced in regions to which they are not native, because breeders have developed cultivars with modified physiology to cope with variations, for example, in the duration of day length (photoperiod). Photoperiod-insensitive cultivars will flower and produce seed under any day length conditions. The duration of the growing period varies from one region of the world to another.