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Significance of Plant Breeding in Organic Farming Agriculture

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DESCRIPTION

The science of plant breeding is modifying a plant's properties to generate required qualities. It has been applied to enhance the nutritional value of goods for both people and animals. Plant breeding aims to create crop varieties with superior and distinctive features for a range of agricultural uses. The qualities that are most frequently discussed are those that relate to grain or biomass yield, end-use quality traits like flavor or the concentrations of particular biological components, and ease of processing.

Plant breeding can be done using a variety of methods, such as simply choosing plants with useful traits for propagation, genetics and chromosome-based procedures, and more sophisticated molecular methods. What kinds of qualitative or quantitative qualities a plant will have is determined by its genes. Plant breeders work to produce certain plants and perhaps entirely new varieties of plants, and in the process, they reduce the genetic diversity of that variety to a select few biotypes.

If a haploid cell containing the alleles for those qualities can be created, it can be used to create a doubling haploid, which can then be utilized to produce homozygous plants with the required traits from heterozygous starting plants. The doubled haploid will have the required features in homozygosity. Additionally, two distinct homozygous plants made in that manner can be used to create a generation of F1 hybrid plants that benefit from heterozygosity and have a wider variety of potential features. So, without the need for vegetative reproduction, a single heterozygous plant selected for its required traits can be transformed into a heterozygous variety (F1 hybrid) by crossing two homozygous/doubled haploid lines descended from the original selected plant.

Haploid or double haploid plant lines and generations can be produced using plant tissue culture. In order to select for features that would improve an individual's fitness, this reduces the genetic variety obtained from that plant species. By using this technique, less time is spent compared to the natural version of the same procedure since fewer generations of plants must be bred to produce a generation that is homogeneous for the required features. The microbiomes of breeding lines revealed that hybrid plants, such Cucurbita seeds and apple shoot endophytes, share a large portion of their bacterial population with their parents. Additionally, the quantity of genetic material provided by each parent during breeding and domestication corresponds to the proportional input of the microbiome.

Organic farming is criticized for having a yield that is too low to be a competitive alternative to conventional farming. However, planting poorly adapted cultivars could contribute to some of that low performance. Despite the fact that the production settings found in organic vs. conventional farming systems are greatly different due to their unique management approaches, it is believed that over 95% of organic agriculture is based on cultivars that have been conventionally adapted. The main difference between organic and conventional growers is the amount of inputs available to manage the growing environment. It is essential for this industry to breed types that are specifically suited to the particular requirements of organic agriculture in order to reach its full potential. This requires selection for traits such as:

- Efficient use of water
- Efficiency of nutrition usage (particularly nitrogen and phosphorus)
- Competitive weed market
- Mechanical weed control tolerance
- Disease/insect resistance
- Tolerance to abiotic stress

Few breeding initiatives are currently focused on organic agriculture, and those that were up until recently tended to use indirect selection. A given genotype may, however, function considerably differently in each environment due to an interaction between genes and the environment because organic and conventional environments differ greatly from one another. If this interaction is strong enough, an essential attribute needed for the organic environment might not emerge in the artificial environment, leading to the selection of individuals who are ill-suited to it. Advocates of organic breeding currently support the use of direct selection for a variety of agronomic traits to guarantee the identification of the most suitable varieties.