LECTURE 3: Roles of hybridization

Hybridization is the fusion of genetically different gametes resulting in hybrid organisms heterozygous for one or more allelic genes. It is the same thing as crossing.

Through hybridization changes are induced or incorporation directly into the genotypes of the crop. The ratio of homozygous genotypes to heterozygous genotypes 50: 50 %

No two plants breeders carrying out hybridization have completely identical roles. Yet despite differences of emphasis here and there, depending on the crop and the climatic cultural and economic different of the country where it is grown, there are underling similarities in all hybridization/breeding programme. The basic roles/objectives of most crop plant breeding/hybridization are for hybridization process (breeding) to be able to contribute both to a more secure world food supply.

(1.) High crop yields

(2.) High quality

(3.) High nutritional levels and wide range of end uses

(4.) The maintenance or extension of adaption to soil and climate and as well as varieties for local, specific

(5.) Pest and disease resistance and development of varieties with better resistance to pest and disease.

(6.) Produced varieties which have improved resistance to various abiotic stress condition and which make better use of crop inputs.

The details of such a list are much more complex and deserves careful examination

1. **Yield**: The breeding /hybridization must consider what type of yield is desired; more seeds, tubers and so forth, of the same size, or the same number of seeds or tubers of the greater size, or

both. Yield is obviously connected with the nutritional value of the plants. The four components of increased crop production are:

- increase in yield per hectare per crop and

-displacement of lower yielding crop by higher yielding ones.

-the factors that all breeding /hybridization for yield should be based on a thorough understanding of the physiological processes of growth, assimilation and photoperiodic response.

-Response to moisture and fertilizer is important to obtain good yields.

Quality: The general palatability, acceptable colour, texture, and flavor of raw, cooked or baked produce, and factors affecting marketing. Keeping, storage, ease of handling or packing are all qualities that are important, no less in developing than in developed countries. Because consumers have become accustomed to certain flavours, colors, textures and so on, Breeder must provide these aspects of quality in their new produce, even though it would often be easier not to have to do so.

High Nutritional Levels: Improving the nutritional value of a crop is of obvious importance. It is the hybridizations aim to increase protein in cereals and tuber crops wherever possible. The protein should contain reasonable levels of amino acids, lysine, tryptophan etc. Nowadays, hybridization has brought about a very wide range of plants used for oils or fats, including soybeans, cottonseed, groundnut, maize, sunflower, rapeseed, safflower, sesame, olive, copra and oil palm. The main concern of the breeder is to select varieties with an ever higher oil content in the harvested product, thus the proportion of oil-bearing to non oil bearing tissue in the seeds or fruits is of great importance. Questions of vitamin and mineral contents must not be overlooked, especially in fruits and vegetables and appropriate substances must be bred for in stimulants spices and condiments.

Adaptation: Adaptation is an immensely complex subject. Not only does the crop plant need to be generally adapted to the soil and climate of a particular region, it can also be bred to tolerate a wide or a narrow range of conditions. Resistance to drought is becoming of ever greater importance in the modern world, because as land with good soils and rainfall becomes used up and as still more is needed to grow food, marginal lands must be brought into production.

Disease resistance: Breeding crop for resistance to pests and pathogens has perhaps occupied more breeders time and more space in the literature tham any other breeding activity. Resistance to fungi, bacteria, viruses, vivoids, insects, mites and nematodes must be sought out by appropriate screeming methods.

SELECTION

For all the enormous impact that cultivated plants have made on us, it comes as something of a shock to realize that of the approximately 200,000 species of flowering plants in exsistence only about 3000 species have been used for food even though most have probably been sampled at one time or another, often, perhaps, with disastrous consequences. Possibly only some 19-20 are now crops of major importance (Heiser, 1973).

There are three types of selection.

-Natural selection

-Artificial selection

-Aesthetic selection

Natural selection: Natural selection operates on the fitness of individuals. Individuals that have low adaptive values are eliminated in favour of high adapted ones. The versatility of a plant thus ensures its survival.

In general, cultivated plants respond to the same processes of natural selection as wild ones and this selection acts on the variation derived from gene mutation and recombinations.

Changes caused by natural selection may have different evolutionally co-sequences depending on the circumstances.

The first occurs when the environmental factors determining natural selection are fairly uniform throughout the population of a species in this, the entire population will tends to become better and better adapted to its environment and as the environment change the entire species will change with it, giving enough time more changes can occur in this way. This is called **PHYLETIC EVOLUTION.**

The 2^{nd} consequence of changes caused by natural selection occurs when the different populations in a species somehow become isolated and subjected to different environmental conditions with natural selection acting non-uniformly; so different lines of changes will occur in various combinations. In this way, they may become more and more divergent unit the single original species are split into two or more new ones. The latter case is the way which the number of species can increase and is referred to as **SPECIATION or SPECIE FORMATION.**

Artificial selection: As is practiced by man when he deliberately chooses plants that suit his goal, in fact, the act of plant breeding is an artificial selection.

However, in addition to the natural selection presumes to which wild plants are exposed, cultivated plants also face artificial selection by man, which in some instances, is of greater importance in effecting rapid change than natural selection. Much artificial selection was, and perhaps still 'unconscious selection' in which a man acts without any awareness of his role as an agent of selection.

Aesthetic selection: Early ancestors designed and decorated basketry, pottery, weaving, metal work, bone, and stone carvings, bark paintings and many other objects. They select interesting colours, and shapes of mutants of pepper, gourd, and tomato fruits and colour of potato tubers and maize grains as well, domesticated plants are partly creations of human.