

Principal of Plant breeding

Introduction: Man is almost absolutely dependent on plants for food. With the rapidly increasing population in the world the food supply is already grossly inadequate. The solution of the problem lies in efforts to check the population growth and to increase food production.

How we can increase food production?

Increased food production can be achieved by several methods for e.g., increasing the land area under cultivation, better agronomic practices, (including irrigation facilities fanned use of fertilizers), improved agricultural practices (including more effective crop rotation, improved tillage methods, effective weed, disease and insect control) and by improved novel varieties of plants.

Plant breeding:

- Plant breeding is concerned with developing varieties superior to existing ones.
- It can be defined as a science, an art and a technology which deals with genetic improvement of crop plants in relation to their economic use for mankind.
- Frankel (1968) defined plant breeding as the genetic adjustment of plant to the Social, cultural, economic and technological aspects of the environment. Plant breeding is also called as crop improvement. A person changing and improving the heredity of plants is known as plant breeder.

➤ **Aims and Objectives of Plant Breeding:**

1. High Yields:

The ultimate aim of the plant breeder is to improve the yield of crop plants. It may be of grain yield, fodder field, fibre yield, tuber yield, cane yield or oil yield depending upon the crop species. It can be achieved by developing more efficient genotypes e.g., hybrid varieties of maize, sorghum, bajra etc.

2. Better Quality:

Quality of products determines its price and suitability for various uses.

Quality differs from crop to crop. It refers to:

- i. grain size, colour, milling and baking quality of wheat
- ii. cooking quality in rice.
- iii. malting quality in barley
- iv. stronger, longer and fine fibre in cotton
- v. more protein contents in pulses and cereals
- vi. lysine content in cereals
- vii. nutritive and keeping quality in fruits, vegetables and flowers
- viii. oil contents in oil seeds
- ix. higher sugar contents in sugarcane and sugar beets
- x. appealing flavour in apples

3. Disease and insect resistance:

Crop plants are attacked by various diseases and insects resulting in considerable yield loss. Development of resistant varieties can minimize such losses.

4. Abiotic resistance:

Crop plants also suffer from abiotic factors such as drought, soil salinity, cold and frost etc. The objective of the plant breeder should be to develop resistant varieties for such environmental conditions.

5. Photosensitivity and Thermo-sensitivity:

Development of photosensitive and thermo-sensitive varieties permits their cultivation in new areas. Rice is now cultivated in Punjab while wheat is a major rabi crop in West Bengal.

6. Early maturities:

Early maturity of crop reduces management period, insecticide spray and overall production cost. It also permits double cropping system. Development of wheat varieties suitable for late planting has permitted rice-wheat rotation.

7. Synchronous maturities:

It refers to maturity of a crop species at a time. It is highly desirable in crops like mung (*Vigna radiata*) where several pickings are necessary.

8. Non-shattering characters:

The shattering of pods is a serious problem in a crop like mung. Hence, resistance to shattering is an important objective to plant breeders.

9. Non-shedding characters:

In arboreum cotton shedding of kapas after ball bursting is a serious problem. Locule retentive varieties have to be developed in this species of cotton.

10. Dormancy:

In some crops such as green gram, black gram, barley and pea, seeds germinate in the standing crop before harvesting if rains received. A period of dormancy in such cases would check the loss due to germination. In some other cases, however, it may be desirable to remove dormancy.

11. Determinate Growth:

In crops like cotton, pigeon pea and mung, development of varieties with determinate growth is desirable.

12. Desirable Agronomic Characters:

One of the important objectives of plant breeding is to modify agronomic characters such as plant height, tillering habit, branching, erect habit, growth habit etc.

Usefulness of these traits also differ from crop to crop. Dwarfness in crop plants is generally associated with lodging resistance and fertilizer responsiveness e.g., wheat, rice, pearl millet, Sorghum etc. Tallness, high tillering and profuse branching are desirable characters in forage crops.

13 Varieties for New Season:

It is another important objective. To develop varieties for new seasons will solve the food problem, for example mung is now grown as a summer crop in addition to main kharif crop.

14. Removal of toxic compounds:

Some crops have toxic substances. **So it is essential to develop varieties free from toxic substances to make them safe for human consumption for e.g.**

- i. Removal of neurotoxin [B-N-Oxalylamine alanine, (BOAA)], from Khesan dal (*Lathyrus sativus*) which causes paralysis of lower limbs (lathyrism).
- ii. Erucic acid from Brassica which is harmful for human health.
- iii. Gossypol from seed of cotton to make them fit for human consumption.

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