Aims and objectives of Plant Breeding.

Notes By Agrilearner

What'sApp Group

Join Agrilearner What'sapp Group What's App us On 6201733962

Join if you are Preparing for IBPS AFO, NABARD, BHU, ICAR &any other compititive exam related to Agriculture

01. Aims and objectives of Plant Breeding

Plant breeding is an art and science, which tells us ways and means to change the genetic architecture of plants so as to attain a particular objective. Plant breeding can be accomplished through many different techniques ranging from simply selecting plants with desirable characteristics for propagation, to more complex molecular techniques Plant breeding has been practiced for thousands of years, since near the beginning of human civilization. It is now practiced worldwide by individuals such as gardeners and farmers, or by professional plant breeders employed by organizations such as government institutions, universities, crop-specific industry associations or research centers.

International development agencies believe that breeding new crops is important for ensuring food security by developing new varieties that are higher-yielding, resistant to pests and diseases, drought-resistant or regionally adapted to different environments and growing conditions.

The objectives may be

a) Crop improvement
b) Improved agronomic characters
c) Resistance against biotic and abiotic stress

1. Increased yield

Majority of our breeding programmes aims at increased yield. This is achieved by developing more efficient genotypes. The classical examples are utilization of Dee Gee Woo Gen in rice and Norin10 in wheat. Identification and utilization of male sterility

2. Improving the quality

- Rice -milling, cooking quality, aroma and grain colour
- wheat- milling and baking quality and gluten content.
- pulses -Protein content and improving sulphur containing amino acids
- oilseeds- PUFA content

3. Elimination of toxic substance

- HCN content in jowar plants

Agrilearner whatsapp group 6201733962

- Lathyrogen content in *Lathyrus sativus* (βN oxalyamine alanine BOAA)
- Erucic acid in Brassicas
- Cucurbitacin in cucurbits

4. Resistance against biotic and abiotic stresses

- Biotic stress: Evolving pests and diseases resistant varieties there by reducing cost of cultivation, environmental pollution and saving beneficial insects.
- Abiotic stress: It is location specific problem. Soil factors and edaphic factors some times poses severe problems. Breeding resistant varieties is the easy way to combat abiotic stress**.**

5. Change in maturity duration – Evolution of early maturing varieties

6. Improved agronomic characters -Production of more tillers – E.g. Rice, Bajra,

7. Reducing the plant height to prevent lodging – Rice

8. Photoinsensitivity – Redgram, sorghum

9. Non-shattering nature – Green gram, Brassicas

10. Synchronized maturity – Pulses

11. Determinate Growth habit –determinate growth – Pulses

12. Elimination or introduction of dormancy –Groundnut

Scope of plant breeding

Since the cultivable land is shrinking and there is no scope for increasing the area under cultivation, the only solution to meet the food requirement is by increasing the crop yield through genetic improvement of crop plants. There are two ways by which yield improvement is possible.

1. Enhancing the productivity of crops

This can be done

a) By the proper management of soil and crops involving suitable agronomic practices and harvesting physical resources.

b) By using high potential crop varieties created by appropriate genetic manipulation of crop plants.

Agrilearner what'sapp group 6201783962

2. Stabilizing the productivity achieved

This is done by using crop varieties that are bred especially for wide adaptation or for specific crop zones to offset the ill effects of unfavorable environmental conditions prevailing in the areas.

Plant breeding, the past, present and future scopes

Indian agriculture remained stagnant particularly during early sixties. Long spells of severe drought and serious out break of disease in some parts of the country led some futurologists to state that a possible doom in India by the end of the decade. However, we achieved break through in crops such as rice, wheat, pearlmilelt, jowar and maize.

The *indica x japonica* cross derivative ADT 27 is the first high yielding rice of Tamil Nadu. The identification of Dee Gee Woo Gen and release of Wonder rice IR 8 (peta x DGWG) changed the scenario from poverty to problem of plenty.Like wide identification of dwarfing gene in Japanese wheat variety Norin-10 by Borlaug and breeding of Mexican dwarf wheat varieties led to the release of wheat varieties life Kalyan sona in India.

In pearl millet, breeding by male sterile line Tift 23A at Tifton, Georgia by Burton and his coworker and later on its introduction to India led the release of hybrid bajra HB1 to HB4, which increased bajra production many fold. In Jowar, breeding of first male sterile line combined kafir 60A and its introduction into India led to the release of first hybrid sorghum CSH 1 (CK 60A x IS 84) during 1970s.

At present we are in search of alternate source of cytoplasm in almost all crops to breed hybrids with new source of cytoplasm to prevent the possibility of appearance of new pest and diseases. Thus, the future of plant breeding is a challenging task. The deployment of innovative breeding techniques will be a new tool to assist the conventional breeding techniques.

Undesirable effects of Plant Breeding

1. **Genetic erosion:** Disappearance of land races due to introduction of high yielding varieties. Eg. Introduction of IR 20 rice led to disappearance of land races of samba rice.

2. **Narrow genetic base**: Genetic vulnerability to pest and diseases.

Tift 23A	-	Bajra	- Susceptible downy mildew
T cytoplasm	-	Maize	- susceptible to *Helminthosporium*

3. Minor disease and pest become major due to intensive resistance breeding

RTV (Rice Tungro Virus)

Agrilearner what'sapp group 6201739962

Grey mold in Bengalgram

4. **Attainment of yield plateau**: No more further increase in yield.

History of Plant Breeding

It started when man first chose certain plants for cultivation. There is no recorded history when the plant breeding started.

- As early as 700 BC Babylonians and Assyrians artificially pollinated the date palm.
- In 1717 Thomas Fairchild produced the first artificial hybrid.
- Joseph Kolreuter, a German made extensive crosses in Tobacco and Solanum between 1760 and 1866 and studied the progenies in detail.
- Thomas Andrew Knight (1759-1835) was the first man to produce several new fruit varieties by using artificial hybridization.
- Le Coutier, a farmer published his results on selection in wheat in the year 1843. He concluded that progenies from single plants were more uniform.
- Patrick Shireff a Scotsman practiced individual plant selection in wheat and oats and developed some valuable varieties.
- Vilmorin (1857) proposed individual plant selection based on progeny testing. This was known as "Vilmorins principle of progeny testing'. He proposed this progeny testing in sugar content in sugar beets (Beta vulgaris). But this method was ineffective in wheat. This clearly demonstrated the difference between effect of selection in cross and self-pollinated crops.
- Nilsson and his associates in Sweedish Seed Association, Svalof Sweeden (1890) refined the single plant selection.
- In 1903 Johansen proposed the famous 'pure line theory' which states that a pure line is progeny of a single self fertilized homozygous plant. He proposed this theory based on his studies in *Phaseolus vulgaris.*
- G.H. Shull work in maize is the forerunner for the present day hybrid maize programme. He described in detail about the effect of inbreeding.
- During 1960's Norman Borlaug, the Nobel laureate developed Mexican semi dwarf wheat varieties, which paved the way for green revolution in wheat. The dwarfing gene was isolated from wheat variety Norin 10. Later on this Mexican dwarf were introduced

Agrilearner whatsapp group 6201783962

in the India by Dr. M.S.Swaminathan and a number of high yielding wheat varieties like Kalyan Sona, Sharbathi Sonara were developed.

- In rice the identification of dwarf Dee Gee Woo Gen from a tall rice variety by a Taiwan farmer revolutionized rice breeding. Using this DGWG at IRRI during 1965 the wonder rice IR 8 was released.
- Nobilisation in sugarcane by C.a. Barber and T.S.Venkataraman is another monumental work in plant breeding.

Agrilearner what'sapp group 6201733962

Aims and objectives of Plant Breeding.

Notes By Agrilearner

What'sApp Group

Join Agrilearner What'sapp Group What's App us On 6201733962

Join if you are Preparing for IBPS AFO, NABARD, BHU, ICAR &any other compititive exam related to Agriculture