

Lecture: - 3

Domestication & Acclimatization

3.1 Domestication-It is the process of bringing wild species under human management.

This began ~ 10,000 years ago when man began agriculture.

- Domestication of wild species is still being done and is likely to continue for a long time in the future. This is because, the human needs are likely to change with time. Consequently. The wild species of little importance today may assume great significance tomorrow.
- **Plant Domestication:** - Domesticated plants differ from their wild progenitors in several morpho-physiological traits, most of which are associated with seed retention and germination, growth habit, size, coloration, and/or edibility of economically important organs.
- **Domestication syndrome (DS)**-Denotes differences between domesticated plants and their wild progenitors

3.2 Adaptability:-It is ability of a genotype to produce a relatively narrow range of phenotypes in different environments.

- It is the result of genetic homeostasis, which refers to the buffering capacity of a genotype to environmental fluctuations.
- The performance of a genotype mainly depends on the environmental interaction

Adaptation:-It is the process by which organisms become more suited to survive and function in a given environment. It also refers to the results of this process.

3.2 Acclimatization:-The process that leads to the adaptation of a variety to a new environment is known as "Acclimatization".

- Acclimatization or acclimatisation (also called acclimation or acclimatation) is the process in which an individual organism adjusts to a change in its environment (such as a change in altitude, temperature, humidity, photoperiod, or pH), allowing it to maintain performance across a range of environmental conditions
- Acclimatization is brought about by a faster multiplication of those genotypes, that are better adapted to the new environment. Thus acclimatization is essentially natural selection.

- The extent of acclimatization is determined by:-
- Mode of pollination
 - Range of genetic variability present in the original population and
 - Duration of life cycle of the crop.

As a result, cross-pollination is much more helpful in acclimatization than self-pollination.

Plant Introduction

Definition and Types: - It consists of taking a genotype or a group of genotypes of plants into new environments where they were not being grown before.

➤ Introduction may be classified into two categories:-

a) **Primary Introduction:**- When the introduced variety is well suited to the new environment. It is released for commercial cultivation without any alteration in the original genotype, this constitutes primary introduction.

- Example:- Introduction of semi-dwarf **wheat** varieties, **Sonora 64, Lerma-roja** and of semi dwarf **Rice** varieties: **Taichung native 1, IR 8, IR 28, IR 36, IR 64, IR 66, IR 72** are some examples of primary introduction in this country

b) **Secondary Introduction:**-The introduced variety may be subjected to selection to isolate a superior variety.

➤ Alternatively, it may be hybridized with local varieties to transfer one or few characters from this variety to the local ones these processes are known as secondary introduction.

➤ Secondary introduction is much more common than primary introduction.

- Examples of secondary introduction are **Kalyan Sona and sonalika wheat** varieties selected from material introduced from CIMMYT, Mexico.

➤ Semi dwarf wheat and rice varieties developed through hybridization with introduced varieties etc.,TKM 9, ADT 36, ADT 39, ADT 43, TRY 1, TRY (R) 2, ASD 18 rice varieties.

Purpose of Plant Introduction:-The main purpose of plant introduction is to improve the plant wealth of the country. Main objective of plant introduction:-

- To obtain an entirely new crop plant e.g. Maize, potato, tomato
- To serve as new varieties. E.g. IRRI varieties.
- To be used in crop improvement
- To save the crop from diseases and pests. E.g. Coffee from leaf rust. Hevea Rubber from leaf diseases.
- For scientific studies & Aesthetic value.

Procedure of Plant Introduction:-

1. Procurement: Any individual or institution can introduce germplasm in India. But all the introductions must be routed through the NBPGR, New Delhi. There are two routes for plant introduction. In first route the individual or the institution makes a direct request to an individual or institution abroad, who has the desired germplasm, to send it through the NBPGR, New Delhi. In second procedure the individual or institute submits his germplasm requirements to the NBPGR with a request for their import.

2. Quarantine: Quarantine means to keep materials in isolation to prevent the spread of diseases etc. All the introduced plant propagules are thoroughly inspected for contamination with weeds, diseases and insect pests. Materials that are suspected to be contaminated are fumigated or are given other treatments to get rid of the contamination. If necessary, the materials are grown in isolation for observation of diseases, insect pests and weeds. The entire process is known as quarantine and the rules prescribing them are known as quarantine rules.

3. Cataloguing: When an introduction is received, it is given an entry number. Further, information regarding name of the species, variety, place of origin, adaptation and its various characteristics are recorded. The plant materials are classified into three groups. 1. Exotic collections are given the prefix 'EC' 2. Indigenous collections are designated as 'IC' and 3. Indigenous wild collections are marked as 'IW'

4. Evaluation: To assess the potential of new introductions, their performance is evaluated at different substations of the Bureau. In case of those crops for which Central Research Institutes are functioning, e.g., rice, sugarcane, potato, Tobacco etc., the introduced materials are evaluated and maintained by these institutes. The resistance to diseases and pests is evaluated under environments favoring heavy attacks by them.

5. Multiplication & Distribution: Promising introductions or selections from the introductions may be increased and released as varieties after the necessary trials. Most of the introductions, however, are characterized for desirable traits and are maintained for future use.

Such materials are used in crossing programmes and are readily supplied by the bureau on request.

Plant Introduction in India:-

- **NBPGR**-National Bureau of Plant Genetic Resource, New Delhi (Routed only through NBPGR). The bureau is responsible for the introduction and maintenance of germplasm of agricultural and horticultural plants.
- **FRI**-Forest Research Institute, Dehra Dun, It looks after the introduction, maintenance and testing of germplasm of forest trees.
- **BSI**-Botanical Survey of India, Calcutta, it was responsible for the introduction, testing and maintenance of plant materials of botanical and medicinal interest.
- **Central Research Institute for various crops.** e.g., tea, coffee, sugarcane, potato, Tobacco, rice etc.

Merits of Plant Introduction:-

- It provides entirely new crop plants
- Provide superior varieties either directly, after selection or hybridization.
- Introduction and exploration are the only feasible means of collection germplasm and to protect variability from genetic erosion.
- It is very quick and economical method of crop improvement, particularly when the introduction are released as varieties either directly or after a simple selection.
- Plants may be introduced in new disease free areas to protect them from damage e.g. Coffee and Rubber.

Demerits of Plant Introduction:-

- Plant introduction are associated with the introduction of weeds, diseases and pests.
 - **Weeds:** Aregemone mexicana, Eichhornia crassipes ,Phylaris minor ; are the some of the noxious weeds introduced in India.
 - **Diseases:** Late blight of potato was introduced from Europe, flag smut of wheat was introduced from Australia, Bunchy top and Coffee rust came from Ceylon of Banana.
 - **Insect pests:** Potato tuber moth came from Italy in 1900 Woolly aphids of apple and fluted scale of citrus were also introduced in India along with plant introductions.

- **Ornamentals turned weeds:**-Water hyacinth, Lantana camara were both introduced as ornamental plants, but they are now noxious weeds.
- **Threat to ecological balance:**-Some introduced species may disturb the ecological balance in their new home, and may cause serious damage to the ecosystem. e.g. Eucalyptus sp. introduced from Australia cause a rapid depletion of the sub soil water reserves.