

Plant Breeding Class-6

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Online Class Taken on 19th May 2020

Plant Introduction

- It is a process of introducing plants (a genotype or a group of genotypes) from their own environment to new environment.
- Two types:
 - **Primary Introduction**-When introduced variety is well suited to new environment, then released for commercial cultivation without any alteration of genotype. E.g. Dwarf wheat variety like ‘Sonora-64’.
 - **Secondary Introduction**- When introduced variety is subjected to selection or used in hybridization programme with local varieties to get improved variety with some new characters introduced. E.g. ‘Kalyan Sona’ and ‘Sonalika’ variety of wheat selected from material introduced from CIMMYT, Mexico.

Acclimatization

- **Acclimatization** is the **adaptation** or adjustment of an individual plant or a population of plants under the **changed climate** for a number of generations.
- Thus, it is a sort of natural selection operating into the introduced plant material.
- The process leads **to increase in frequency of most adapted genotypes** which depends on
 - Breeding system
 - Genetic variation
 - Duration of the crop
- The success of acclimatization depends on
 - Place effect
 - The selection of new genotype

Purpose of Introduction

- **Use in agriculture, forestry and industry**
 - New varieties of plants or crops introduced for use as food, fibre, wood, medicine or as breeding material for hybridization work.
- **For aesthetic interest**
 - Ornamental plants introduced for beautification
- **For germplasm conservation**
 - Collection and conservation of germplasm help to maintain lines, clones, mutants, cultivars, etc.
- **For studying origin and distribution**

Plant Introduction Agencies

- Most of the introductions occurred very early in the history.
- In earlier days the agencies were invaders, travellers, traders, explorers, pilgrims and naturalists.
 - Muslim invaders introduced in India cherries and grapes.
 - Portuguese introduced maize, ground nut, chillies, potato, sweet potato, guava, pine apple, papaya and cashew nut.
 - East India Company brought tea.
- Later, Botanic gardens played a major role in plant Introduction

NBPGR

- A centralized plant introduction agency was initiated in 1946 at IARI, New Delhi.
- In 1976 **National Bureau of Plant Genetic Resources (NBPGR)** was started.
- The bureau is responsible for introduction and maintenance of germplasm of agricultural and horticultural plants.
- NBPGR also maintain working germplasm of various crops.
- All introductions in India must be **routed through NBPGR, New Delhi.**
- The bureau functions as the central agency for export and introduction of germplasm.
- At International level International Board of Plant Genetic Resources (IBPGR) with head quarters at Rome, Italy is responsible for plant introduction between countries.
- Similarly Forest Research Institute, Dehradun has a plant introduction organization, which looks after introduction, maintenance and testing of germplasm of forest trees.

Procedure of Introduction

- **Procurement of plant or germplasm-** Requisition to be submitted to NBPGR or IBPGR (International Bureau Of Plant Genetic Resources); procured by exchange or purchase or as free gift
- **Packaging and despatch-** Propagules are cleaned, decontaminated, packed and despatched keeping viability as priority.
- **Entry and plant quarantine-** plant materials inspected, treated with pesticides, fungicides etc as required. All quarantine and regulatory measures met with to prevent pest or disease entering into the country or spreading further.
- **Cataloguing-**
 - Exotic collection
 - Indigenous collection
 - Indigenous wild collection
- **Evaluation-** Performance and disease resistance evaluated at different substations and under different environments.
- **Multiplication and distribution-** promising introduced material propagated and released as variety after trials.

Agencies in India

- **NBPGR** has gene bank for long term storage and future use, it helps to assess the introduced plant material, coordinates the work of other agencies and imparts training in plant collection, introduction and maintenance in India.
- The substations under **NBPGR, New Delhi** are
 - **Simla:** Temperate zone and high altitude
 - **Jodhpur:** Arid zone, it is under Central Arid Zone Research Institute.
 - **Amravati:** Central zone of India
 - **Kanya Kumari:** Tropical zone of South India
 - **Shillong:** North-East India

Other agencies engaged

- **Forest research Institute, Dehradun:** Forest Trees
- **Botanical Survey of India:** Medicinal plants and other plants of botanical importance
- **Other sources:** Different **Central Research Institutes** as well as **Agricultural universities** play the role for collection, introduction and maintenance of germplasm of crop plants.

Merits

- It provides entirely **new plants** to a place
- **Superior varieties** may be originated directly or after selection of hybridization
- **Germplasm collection, maintenance and protection of genetic variability** are possible through the ways of introduction and exploration
- **Quick and economical** method of **crop improvement** when introduced material can be used directly
- Introduction of some varieties to newer areas may **protect** them from some **diseases**.

Demerits



- Demerits of plant introduction mainly associated with introduction of weeds, diseases and pests.
 - **Weeds** like *Argemone*, *Eichornia*, *Lantana* have been introduced from other countries with introduction of crop plants
 - **Fungal diseases** like late blight of Potato, flat smut of wheat, coffee rust, etc are introduced in India along with plant materials
 - **Insect pests** like potato tuber moth, woolly aphis of apple, fluted scale of *Citrus* introduced in India along plant introduction

Achievements

- **New crop species:**
 - **Crops :** potato, maize, groundnut, chillies, coffee, rubber, guava, grapes, pineapple, etc.
 - **Ornamental plants:** Gulmohor, Phlox, Salvia, Aster
- **New Crop Varieties:**
 - **Direct multiplication and released as new variety-**
 - **Selection of desirable varieties**
 - **Introduced variety as donor in hybridization programme**
 - **Mutation breeding**

Direct multiplication and released as new variety-

- There are many crop plant varieties introduced directly like-
 - Dwarf wheat varieties like ‘Sonora 64’, ‘Lerma Rojo’
 - Dwarf rice varieties like-TN-1, IR-8

Selection of desirable varieties

- Many varieties have come up after selection from introduced varieties.
 - **Kalyan Sona, Sonalika** were selected after introduction of Mexican varieties.

Introduced variety as donor in hybridization programme

- When introduced superior variety used as **donor** for **disease/ pest/ stress resistance** or any other **desirable quality**
 - In Rice: dwarfing gene from TN-1 or IR-8 used to develop dwarf rice varieties
 - All sugarcane varieties derived from superior introduced variety of *Saccharum officinarum*.

Mutation breeding-

- When introduced variety is agronomically superior but lack few characters, may be treated with mutagens to rectify the defect. E.g.
 - **Sonora-64**- red coloured grains were not acceptable by farmers
 - mutagenic product **Sharbati Sonora** with amber colour grains developed by **gamma ray** treatment

Germplasm maintenance

- **Germplasm:** The sum total of hereditary material or genes present in a species is known as **germplasm** of that species.
- **Genetic Erosion:** With modernisation of agriculture, gradual loss of wild and desi varieties lead to gradual loss of variability in cultivated form or wild relatives.
- **IBPGR** is associated with coordinated germplasm conservation activities throughout the world.

Germplasm preservation

- Germplasm can be **preserved** in following ways
 - Long term storage
 - Live plants
 - Tissue culture
- For germplasm conservation or maintenance various devices developed like
 - Gene bank
 - Gene Sanctuaries
 - Seed bank
 - Pollen or spore bank

Reference

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- Internet archives