

## Importance of a clone:

- Owing to heterozygosity and sterility in many crops clones are the only means of propagation.
- Clones are used to produce new varieties.
- Clones are very useful tools to preserve the heterozygosity once obtained. In many crops the superior plants are maintained. (Mango, orange, apple, sugarcane).

## Clonal selection:

**Sources of clonal selection:-**Local varieties, introduced material, hybrids and segregating populations

The various steps involved in clonal selection are briefly mentioned below.

- **First year:** From a mixed variable population, few hundred to few thousand desirable plants are selected. Rigid selection can be done for simply inherited characters with high heritability. Plants with obvious weakness are eliminated.
- **Second year:** Clones from the selected plants are grown separately, generally without replication. This is because of the limited supply of propagating material for each clone, and because of the large number of the clones involved. Characteristics of the clones will be more clear now than in the previous generation. Based on the observations the inferior clones are eliminated. Fifty to one hundred clones are selected on the basis of clonal characteristics.
- **Third year:** Replicated preliminary yield trial is conducted. A suitable check is included for comparison few superior performing clones with desirable characteristics are selected for multi location trials.
- **Fourth to eighth years:** Replicated yield trials are conducted at several locations along with suitable check. The yielding ability, quality and disease resistance etc. of the clones are rigidly evaluated. The best clones that are superior to the check in one or more characteristics are identified for release as varieties.
- **Ninth year:** The superior clones are multiplied and released as varieties.

### **Advantages:-**

- Varieties are stable and easy to maintain
- Avoids inbreeding depression
- Clonal selection, combined with hybridization generates necessary variability for several selections.
- Only method to improve clonal crops
- Hybrid vigour is easily utilized selection may be used in maintaining the purity of clones.

### **Disadvantages:-**

- Selection utilizes the natural variability already present in the population.
- Sexual reproduction is necessary for creation of variability through hybridization.
- Applicable only to the vegetatively propagative crops.
- Problems in Breeding asexually propagated crops
- Reduced flowering and fertility
- Difficulties in genetic analysis
- Perennial life cycle.

### **Genetic variation within a clone:-**

It may arise due to: Mutation, Mechanical mixture, Sexual Reproduction.

- **Mutation:** The frequency is generally very low ( $10^{-5}$  to  $10^{-7}$ ). Ordinarily dominant mutations would be expressed in the somatic tissue. A mutant allele would be homozygous only when:-
- Both the alleles in a cell mutate at the same time producing the same mutant allele or
  - The mutant allele is already in heterozygous condition in the original clone. Though rare, both these events are possible. Bud mutations may often produce chimeras i.e. an individual containing cells of two or more genotypes. But mutations make possible selection of buds to establish new desirable clones, the process being known as Bud selection. It is of some importance in improvement of perennial crops like fruit trees or of those crops where flowering does not take place.

- **Mechanical mixtures:** Mechanical mixtures produce genetic variation within a clone much in the same way as in the case of pure lines.
- **Sexual reproduction:** Occasional sexual reproduction would lead to segregation and recombination. The seedlings obtained from sexual reproduction would be genotypically different from the asexual progeny. It is evident that only clones would tend to become variable at least in annuals and biennials. Eg. Potato

**Clonal degeneration:** The loss in vigor and productivity of clones with time is known as clonal degeneration and results due to:

1. Mutation
2. Viral diseases
3. Bacterial diseases

### **Achievements:**

#### **▪ Through clonal selection :**

**Potato :** 1. Kufri Red from Darjeeling Red Round, Kufri Safed from phulwa, Bombay Green banana is a bud selection from dwarf Cavendish : pidi monthan from Monthan

**▪ Through hybridization:- Potato :** Kufri Alankar, Kufri Kuber, Kufri Sindhuri, Kufri Kundan, Kufri Chamatkar Kufri Jyothi (late blight resistant), Kufri Sheetman (frost resistant)

**Sugarcane :** Co 1148, Co 1158, CoS 510, Co 975, Cos 109, Co 541

**Mango :** Pedda Neelam, Chinna Suwarnarekha Bana : High gate from Gross Michel

**Citrus :** Robertson Navel Orange Sweet oranges : Yuvaraj blood Red

**Turmeric :** Kesari, Kasturi.