Quadrant II – Transcript and Related Materials

Programme: Bachelor of Science (Third Year)

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Paper Title: Cytogenetics & Plant Breeding

Unit: 09

Module Name: Selection methods for vegetatively propagated plants.

Module No: 44

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Notes:

Introduction:

Selection is most primitive and simplest method used for crop improvement. It can be defined as preservation of certain individual plants of desirable characters. It is sorting out of the plants having desired characters. Selection of good quality is the most common method of plant breeding (crop improvement) among the cultivators. The selection is of two kinds.

A. Natural Selection – Natural Selection is the rule in nature. This is a continuous and autonomous process which is influenced by natural factors. According to Darwin's theory the fittest can survive and rest wipe out. Certain climatic and regional races are result of this process.

B. Artificial Selection – In this method the plant breeders or cultivators select certain types of plants from the mixed population for their own advantage. Thus "artificial selection is a process to choose certain individual plants for the purpose of having better crops from a mixed population where the individuals differ in Characters". It may be –

- Mass Selection
- Progeny selection
- Pure Line Selection
- **Clonal Selection**

Characteristics of vegetatively propagated crops

- All the members of a clone are identical or there is no variation within a clone.
- Many crops show reduced flowering and seed set.
- All the members of a clone are heterozygous.
- Clones crops are either polyploids or have polyploid species.
- The phenotypic variation within a clone is due to environment.
- Crops are inter-specific hybrids.

Clonal Selection:

In some plants, seeds are either lacking or they are of low viability. In such condition the vegetative parts are used for their propagation and these propagated plants are clone. Thus "a clone is a group of plants produced by vegetative propagation of a single plant" or all the vegetative progenies of a single plant are known as a clone. Many crops, such as bananas, potato, sugarcane, onion, garlic, turnip, grapes, ginger, colocasia are propagated

through their vegetative part. Generally, their commercial varieties are sterile due to non-flowering habits, meiotic irregularities or other genetic causes and produce no seeds.

All the plants of a clone are the off springs of a single plant descended by mitosis through the process of vegetative propagation and possess the following characteristics:

- ✓ **Identical genotype:** individual belongs to single clone are identical in genotype.
- ✓ **Lack of genetic variation:** phenotypic variation present with in clone due to environment.
- ✓ **Immortality:** clone can be maintained indefinitely through asexual reproduction.
- ✓ **Severe in breeding depression:** Clones are heretrozygous and shows sever loss due to inbreeding.

Clonal selection is the method of selection of desirable clones from the mixed population of vegetatively propagated crops. It is one of the methods for improving the vegetatively propagated crops such as sugarcane, banana, potato, citrus, mango, etc.

Clonal degeneration:

The loss in vigour and productivity of clones with the passing time known as clonal degeneration and it may be due to mutation and infection of virus and bacteria.

Clonal degeneration may result from:

- **Mutation:** some mutation occurs at high frequency and becomes problem over a long period of time.
- **Viral diseases:** diseases easily transmit and spread with time.
- **Bacterial diseases:** easily spread with time and results into sever infections.

Procedure of clonal selection:

First year: From a mixed variable population, a few hundred to few thousand desirable plans are selected. A rigid selection can be done for simply inherited characters with high heritability. Plants with obvious weakness are eliminated. In fruit plants, it is difficult to get large number of individual selections. In such case, few plants may be selected.

Second Year: Clones from the selected plants are grown separately, generally without replication. This is because of the limitation in propagation material in each clone, and also because of the large number of clones involved. The characteristics of clones will be clear now than in the previous generation when the observations were based on single plant. The inferior clones are eliminated at this stage. The selection is based on visual observation and on the breeder's judgment of the value of clones. 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. At this stage, selection for quality is done. If necessary, separate disease nurseries may be planted to evaluate disease resistance of the selected clones.

Fourth to Sixth years: Replicated yield trials are conducted at several locations along with a 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.

Seventh year: The superior clone is multiplied released as a new variety.

Merits of Clonal selection

- Useful in conserving heterosis for several generations.
- Avoids inbreeding depression.
- Can be combined with hybridization.
- Maintain purity of clones.
- Useful in isolating best genotype from mixed populations.

Demerits of clonal selection:

- It is **only applicable** to vegetative propagated crops.
- It **does not create new variation**.
- Varieties developed by clonal selection are **highly prone to new diseases.**
- The progress of clonal selection is **limited to the isolation of best genotypes** already present in the population.

Achievements

Several varieties of clonal crops have been developed e.g. Kufri Red from Darjeeling, Red Round and kufri safed from Phulwa have been isolated in

potato and are already under commercial cultivation. Kufri Red was developed from a disease-free plant of Darjeeling Red Round. Bud Selection has been done in several fruit trees e.g.- K.O.11, K.O.22, Mundapa Pedda Neelum in mango, Bombay green in banana. Yuvraj Blood Red in Sweet orange etc.