

Quadrant II – Transcript and Related Materials

Programme	: Bachelor of Science (Third Year)
Subject	: Botany
Course Code	: BOC108
Course Title	: Cytogenetics and Plant Breeding
Unit IX	: Methods of crop improvement
Module Name	: Selection methods – for self pollinated crops
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Selection methods for self pollinated crops

A. Mass selection

B. Pureline selection

C. Pedigree

D. Backcross

E. Bulk

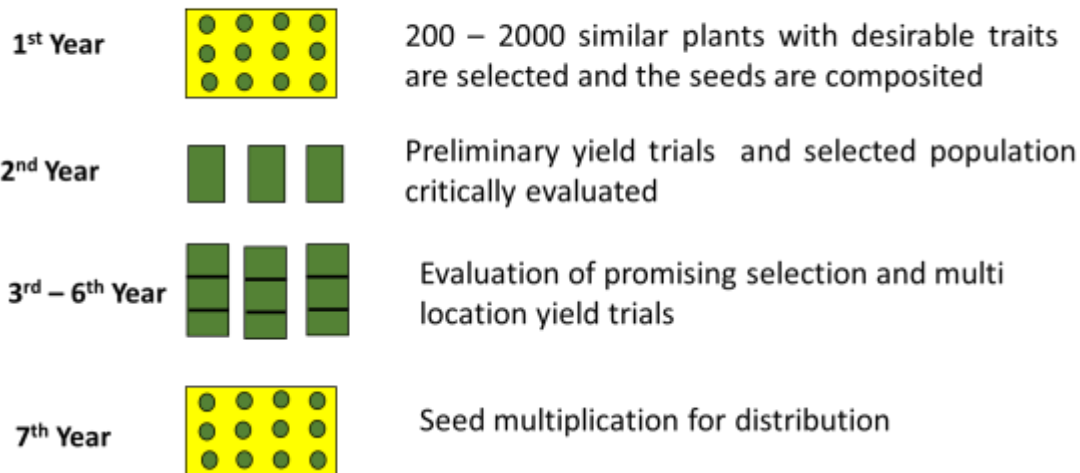
A. Mass selection

A large number of plants of similar phenotype are selected and their seeds are mixed together to constitute the new variety.

Applications

- Improvement of local variety
- Purification of existing pureline varieties
- Procedure of Mass Selection

Procedure of Mass Selection



Merits and demerits of Mass Selection

Merits

- Widely adapted
- Prolonged yield trials not necessary
- Retain considerable genetic variability

Demerits

- Show variation, less uniformity
- Varieties are difficult to identify

B. Pureline selection

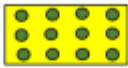




A pureline is the progeny of a single, homozygous self pollinated plant.

In pureline selection, a large number of plants are selected from a self pollinated crop and are harvested individually, individual plant progenies from them are evaluated, and the best progeny is released as a pureline variety.

Applications

- Improvement of local variety and old pureline variety
- Pureline selection in introduced variety

Procedure of Pureline Selection

1 st Year		<ul style="list-style-type: none">• 200 – 3000 plants are selected based on their phenotype
2 nd Year		<ul style="list-style-type: none">• Individual plant progenies are grown
3 rd Year		<ul style="list-style-type: none">• Preliminary yield trials
4 th – 7 th Year		<ul style="list-style-type: none">• Multi location yield trials , disease resistance and quality tests are done
8 th Year		<ul style="list-style-type: none">• Seed multiplication for distribution

Advantages and disadvantages of pureline selection

Advantages

- Achieves maximum possible improvement
- Extremely uniform
- Variety is easily identified

Disadvantages

- No wide adaptation
- Requires more time and expensive yield trials

C. Pedigree method

In pedigree method, individual plants are selected from F₂ and subsequent generations, and their progenies are tested.

A detailed record of the relationships between the selected plants and their progenies is maintained.

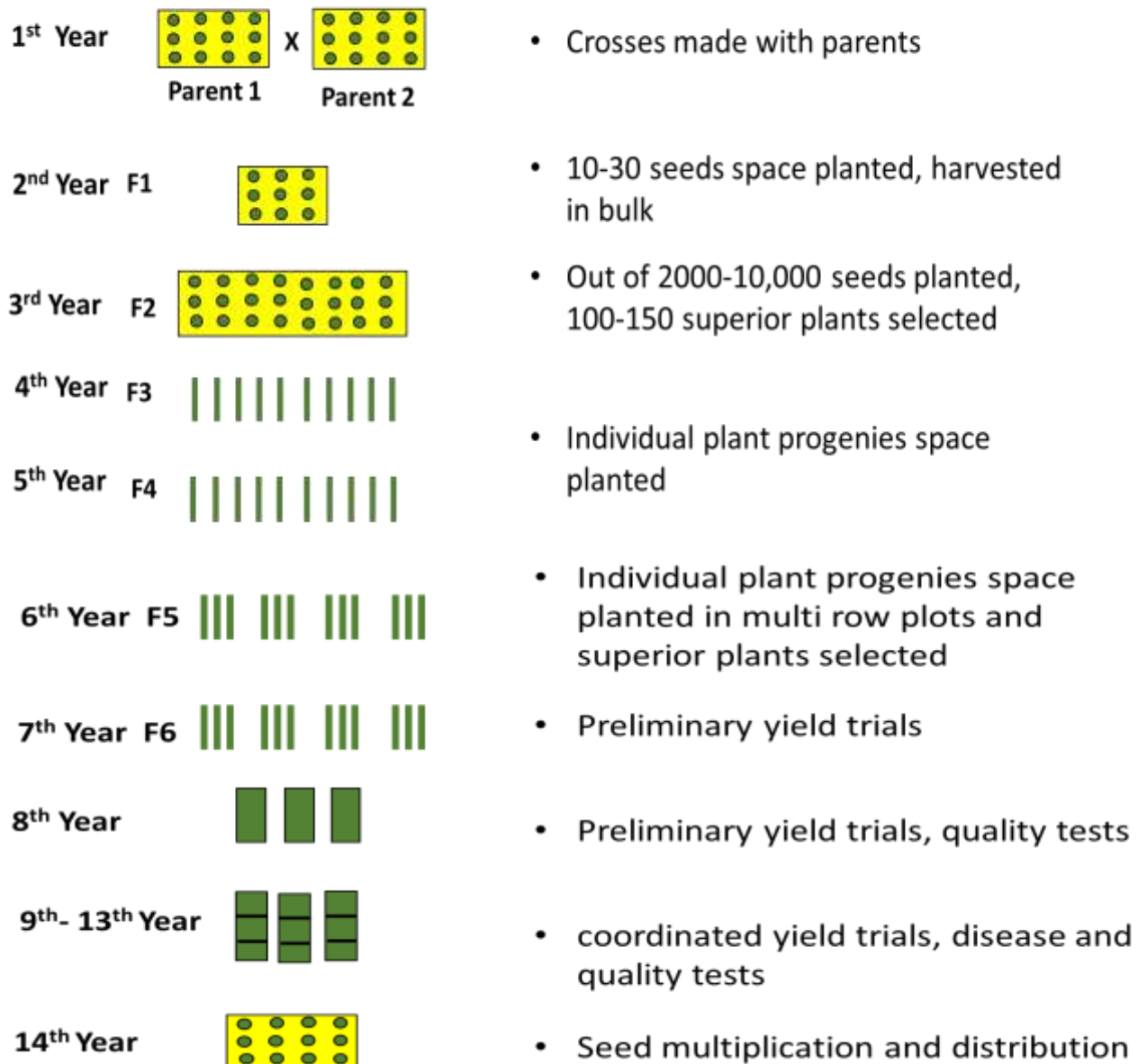
As a result, each progeny in every generation can be traced back to the F₂ plant from which it is originated. Such a record is known as pedigree record or simply pedigree.

Applications of pedigree method

- Most commonly used method for selection from segregating generations of crosses in self pollinated crops.

- Often used to correct some specific weaknesses of an established variety.
- Also useful in the selection of new superior recombinant types.

Procedure for Pedigree method



Merits and demerits of pedigree method

Merits

- Gives maximum opportunity for the breeder to use his/ her skill and judgement for selection of plants

- Well suited for the improvement of characters which can be easily identified and simply inherited
- Information available in the form of pedigree record

Demerits

- Take up valuable time in maintaining pedigree record
- Selection is laborious and time consuming
- Success is largely dependent on skill of the breeder

D. Bulk method

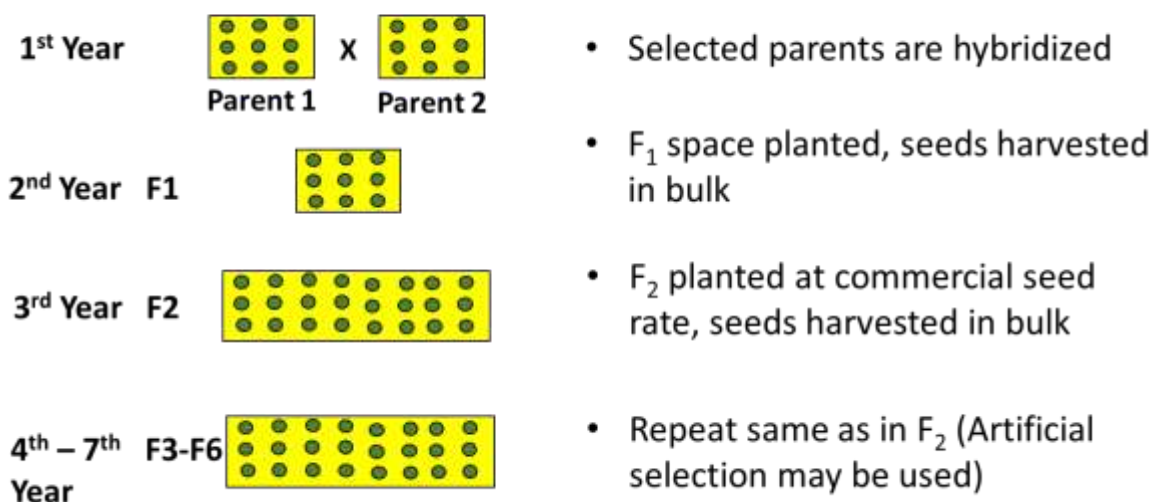
In the bulk method, F₂ and the subsequent generations are harvested in mass or as bulks to raise the next generation.

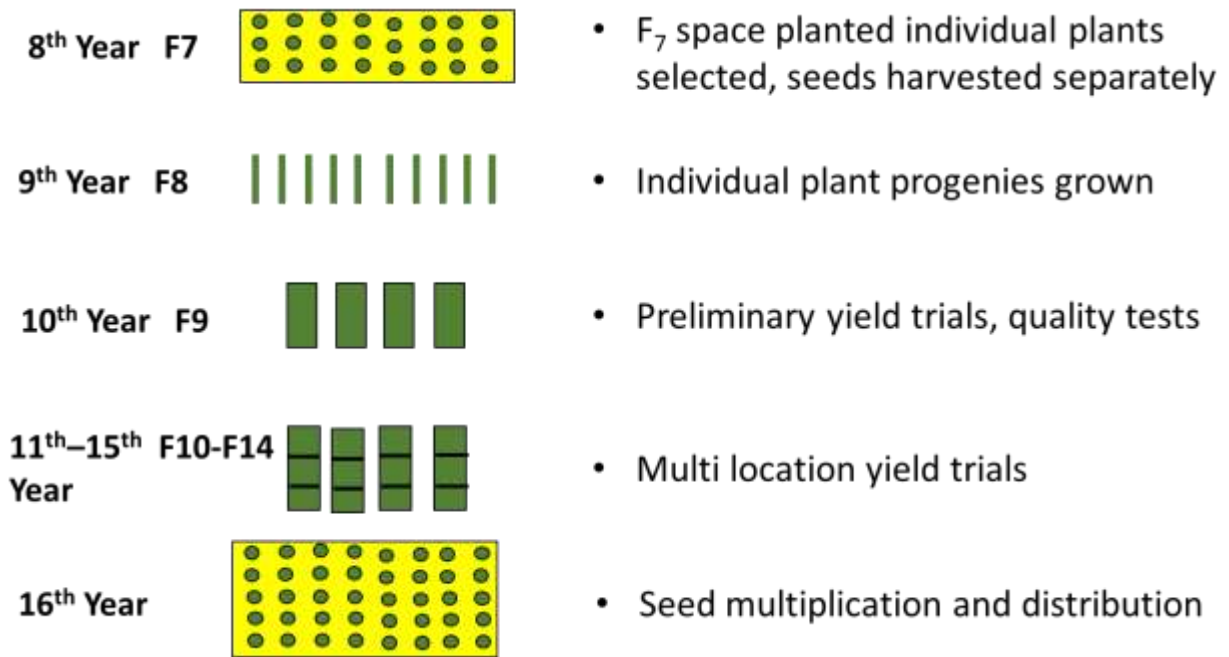
At the end of bulking period, individual plants are selected and evaluated in a similar manner as in the pedigree method of breeding

Applications

- Isolation of homozygous lines
- Opportunity for natural selection

Procedure for Bulk method





Merits and demerits of bulk method

Merits

- It is simple, convenient and inexpensive
- Natural selection increases the frequency of superior types
- Suitable for studies on the survival of genes and genotypes in populations

Demerits

- Takes much longer time to develop a new variety
- Large number of progenies have to be selected at the end of the bulking period
- No information on the inheritance of characters

E. Backcross method

A cross between a hybrid (F₁ or a segregating generation) and one of its parents is known as backcross.

In the backcross method, the hybrid and the progenies in the subsequent generations are repeatedly backcrossed to one of their parents.

As a result, the genotype of backcross progeny becomes increasingly similar to that of the parent to which it is backcrossed.

Applications of backcross method

- Intervarietal transfer of simply inherited characters
- Intervarietal transfer of quantitative characters
- Interspecific transfer of simply inherited characters
- Transfer of cytoplasm
- Production of isogenic lines

Procedure for Backcross method

Selection of the parents

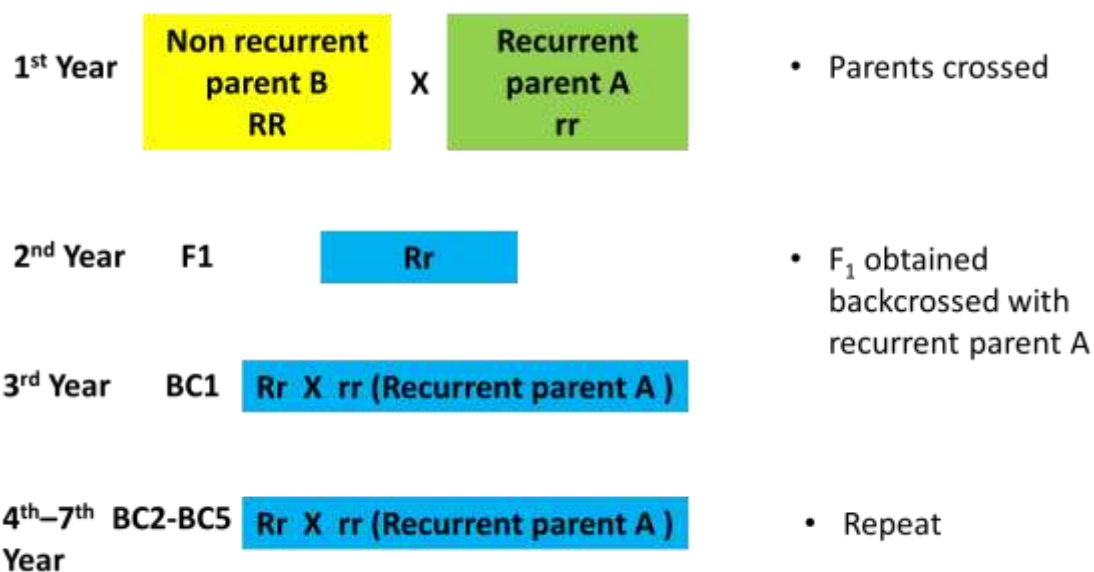
Backcross method of breeding changes the genotype of the recurrent parent only for the gene under transfer

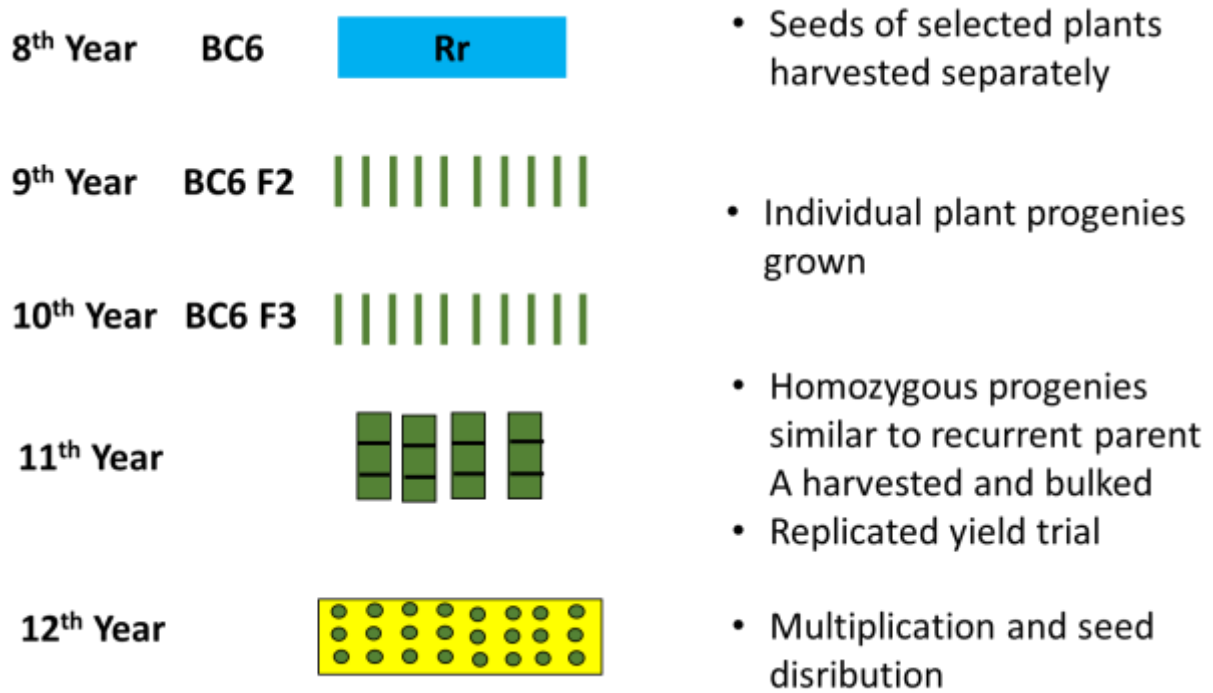
- **Recurrent parent**

Must be the most popular variety of the area, which has high yielding ability, desirable quality and high adaptability

- **Non recurrent parent**

Is selected for the character that is to be improved in the recurrent parent





Merits and demerits of backcross method

Merits

- Outcome is known beforehand
- Much smaller population are needed
- Defects can easily be removed without affecting is performance and adaptability

Demerits

- New variety cannot be superior to the recurrent parent
- Undesirable genes closely linked
- Hybridization has to be undertaken