Quadrant II – Transcript and Related Materials

Programme: Bachelor of Science (Third Year)

Subject: Botany

Course Code: BOC 108

Course Title: Cytogenetics and Plant Breeding

Unit: Methods of Crop Improvement

Module Name: Hybridization for Self-pollinated Plants- Part 1

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Notes

Introduction to hybridization

Hybridization is a process of crossing genetically dissimilar plants to create a hybrid. The main objective of hybridization is to combine desirable characters found in the two genotypes into one hybrid.

Hybridization methods for self- pollinated crops

1. Pedigree method
2. Bulk Method
3. Bulk- pedigree method
4. Single seed descent method
5. Modified bulk method
6. Backcross method

- **Pedigree method**

Pedigree is the maintenance of record of ancestry of selected plants for various generations. Pedigree breeding method is a hybridization-cum-selection method used in self-pollinated species that keeps proper record of plants and progeny selected in each generation. In this method individual plants are selected till the progenies become homozygous. Selection for plants in the desired combination of characters is started in the F_2 generation and continued in succeeding generations until genetic purity is reached**.**

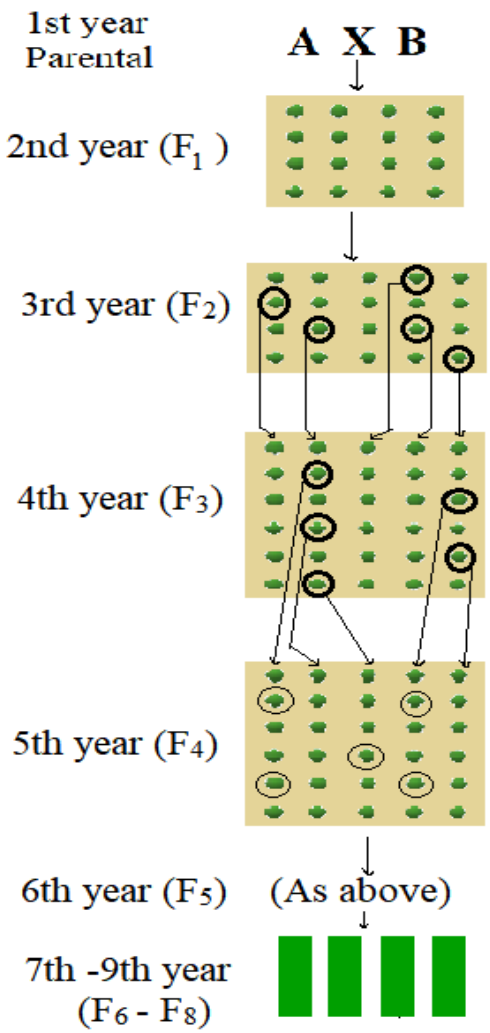
Procedure for handling:

1st year: Plants selected for hybridization are crossed and F_1 seeds are collected.

2nd year: The F_1 plants are raised to produce F_2 seeds.

3rd year: F_2 seeds are space planted to raise F_2 population (2000-10,000 plants). At this stage, segregants start to appear. 200-500 plants from the segregants are selected based on desired combination traits. To aid selection, diseases and pests are sometimes artificially inoculated. Each selected plant is harvested and seeds kept separately.

4th year: F_3 seeds from each plant selected in F_2 are space planted in progeny rows (20-100 plants in each row) to raise the F_3 generation. Individual plants are again selected from promising progenies, harvested and seeds stored separately.



5^{th} and 6^{th} year: F_4 and F_5 generations are handled in same way as F_3 but emphasis is given on progeny selection. Few best plants are selected from each of the best progenies.

7^{th} year to 9^{th} year: Uniform and promising progenies are selected and bulk harvested for evaluation in field trials. They are compared with best available varieties. If any progeny is found to be better than the existing varieties repeated tests are conducted for 3 to 5 years at several locations and then released as new variety.

The time may be shortened if more than one generation can be grown in a year.

- **Bulk Method**

Bulk breeding method is a hybridization-cum-selection procedure used in self-pollinated species in which plants are grown in bulk plot from F_2 to F_5 with or without selection. The next generation i.e. F_6 is grown from bulk seed and individual plant selection is practiced in F_6 and later generations.

This method is also known as population breeding, bulk population breeding, mass method or evolutionary method.

Procedure for handling:

1^{st} year: Plants selected for hybridization are crossed and F_1 seeds are collected.

2^{nd} year: F_1 seeds are sowed to raise F_1 plants. F_2 seeds produced are collected.

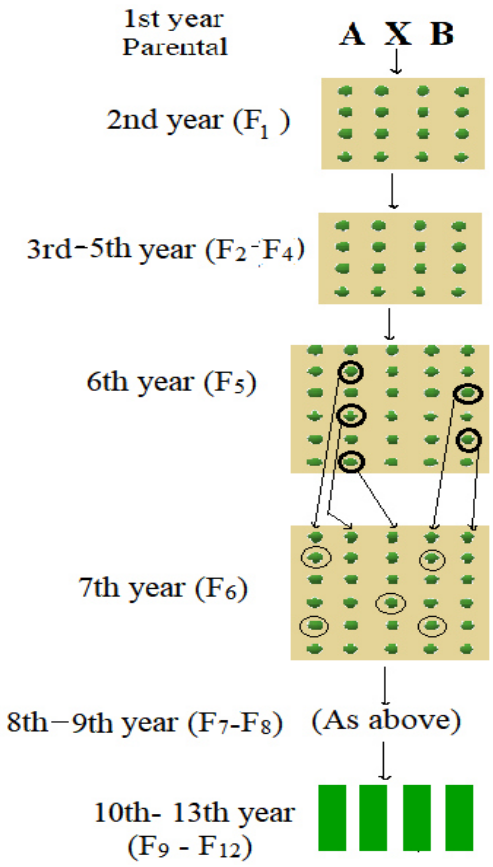
3^{rd} year: F_2 seeds are grown into plants that produce F_3 seeds. These F_3 seeds are harvested in bulk.

4th and 5th year: F_3 and F_4 generations are grown by taking a random sample from the bulk produce of F_2 and F_3, respectively.

6th year: F_5 generation is raised in bulk and single plant selections are made from this population. Seeds from these plants are grown in progeny rows in the following generation (F_6).

7th - 9th year: At F_6 - F_8 single plant selections are made. The best progenies are selected based on promise and uniformity.

10th - 13th year: Promising and uniform progenies are tested in yield trials and most promising one is released as a variety.



- **Bulk- pedigree method**

The bulk-pedigree breeding method is also known as the Mass-pedigree method. This method involves a combination of two methods (bulk and pedigree methods). Here, first, the material is grown in bulk until favorable season provides condition for selection of desirable plants. Next, the selection is made and seeds are grown in progeny rows in the next season as described in pedigree method.

The details of single seed descent method, modified bulk method and backcross method have been discussed in the next module.

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