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Method of Plant Breeding in Self Pollinated Plants

Bulk Population Method

Bulk population method of breeding in self pollinated crop is also known as mass method or population method of breeding.

It was first used by Nilsson Ehle in 1908. It refers to a species is grown in bulk plot (from F1 to F5) with or without selection, a part of the bulk seed is used to grow the next generation and individual plant selection is practised in F6 or later generation. In this method duration of bulking may vary from 6-7 to 30 generation.

Application of Bulk Population Method: This method is suitable and most convenient for handling the segregating generation of cereals, smaller millet, grain legume and oilseeds.

This may be used for three different purposes:

- i) Isolation of homozygous lines.
- ii) Waiting for the opportunity of selection.
- iii) Opportunity for natural selection to change the composition of the population.

Procedure of Bulk Population Method:

1) Hybridization: Parents are selected according to the objective of the breeding programme and crossed.

2) F1 Generation: The F1 generation (10 to 25 F1) is space planted and harvested in bulk.

3) F2-F6 Generation: F2 to F6 generations are planted at commercial seed rate and spacing. These generations are harvested in bulk. During these generations the population size should be as possible, preferably 30 to 50 thousand plants should be grown in each generation.

4) F7 Generation: About 30-50 thousand plants are space planted and out of this only 1000 to 5000 plants with superior phenotypes are selected and their seeds harvested separately. Selection is made on the basis of phenotypes of plants, grain characteristics etc.

5) F8 Generation: Individual plant progenies are grown in single or multi row plots. Most of the progenies would be homozygous and are harvested in bulk. Weak and inferior progenies are rejected and only 100- 300 individual plant progenies with desirable characters are selected.

6) F9 Generation: Preliminary yield trial is conducted along with standard variety as check. The evaluation of progeny is done for important desirable characteristics. Quality test may be conducted to reject the undesirable progenies.

7) F10- F12 Generation: Replicated yield trails are conducted at several locations using standard commercial varieties as check. The lines are evaluated for important agronomic characteristics. If lines are superior to the standard check, released as new varieties.

8) F13 Generation: Seed multiplication of the newly released variety for distribution to the farmers.

Merits of Bulk Population Method:

- 1) This method simple, convenient and inexpensive.
- 2) Little work and attention is required in F2 and subsequent generation.
- 3) No pedigree record is to be kept.
- 4) It eliminates undesirable types and increases the frequency of desirable types by artificial selection.
- 5) It is suitable for studies on the survival of genes and genotypes in populations.
- 6) There are greater chances of isolation of transgressive segregates than pedigree method.

Demerits Bulk Population Method:

- 1) It takes much longer to develop a new variety.
- 2) It provides little opportunity for the breeder to exercise his skill in selection.
- 3) A large number of progenies have to be selected at the end bulking period.
- 4) Information of inheritance of characters cannot be obtained like that of pedigree method.

Achievement: This method has been used in Barley crop for developing some varieties from the crosses (Allas X Vaughn), like Arival, Beecher, Glacier, etc. In India only one variety "Narendra Rai" has been developed in Brown Mustard. This method has a limited application in practical plant breeding.