

25. Hybridization

Clonal crops are generally improved by crossing two or more desirable clones, followed by selection in the F1 progeny and in the subsequent clonal generations. Once the F1 has been produced, the breeding procedure is essentially the same as clonal selection. The improvement through hybridization involves the following three steps:

1. Selection of parents,
2. Production of F1 progeny, and
3. Selection of superior clones.

Hybridization can be used only in such crops, which can reproduce sexually. In case of those crops where sexual reproduction is lacking, mutagenesis or biotechnological approaches can be applied.

Selection of Parents

Selection of the parents to be used in hybridization is very important since the value of F1 progeny would depend upon the parents used for producing the F1. Parents are generally selected on the basis of their known performance both as varieties and as parents in hybridization programmes. The performance of a strain in hybridization programmes depends on its prepotency and general combining ability. It would be highly desirable to know the relative values of CGA and SCA in the crop to be improved. If GCA is more important, a small number of parents with good should be used in hybridization programmes. On the other hand, when SCA is more important, a large number of parents should be used to produce a large number of F1 families. In an effort to find some outstanding crosses.

A recent suggestion is to partially inbreed the parents to be used in hybridization programmes. Clonal crops show severe inbreeding depression, but it is expected that one generation of selfing or 2-3 generations of sib-mating may not reduce vigour and fertility too severely. Inbreeding may enable the breeder to identify plants that would have a greater concentration of desirable alleles. These plants may be more prepotent as parents than the highly heterozygous clones. The practice is gaining some favour with plant breeders.

Production of F1 progeny

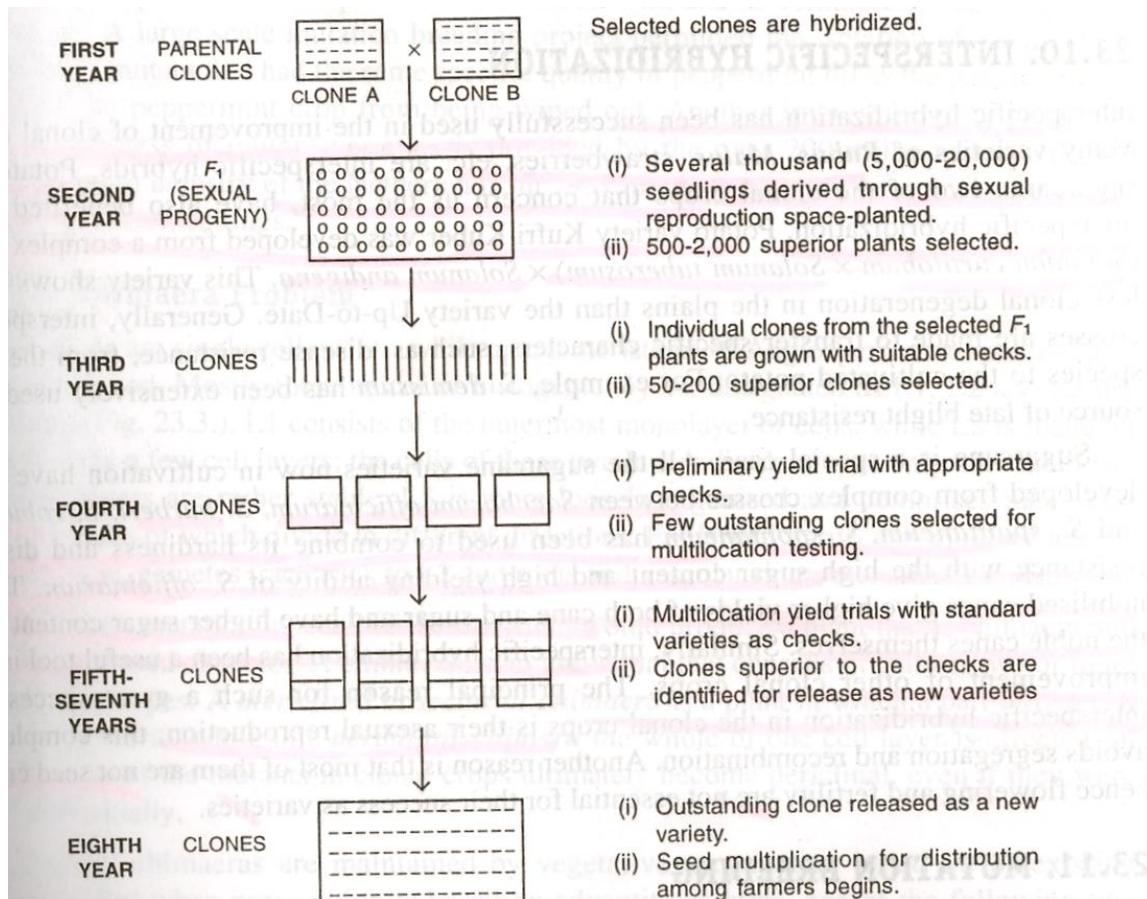
Generally, clonal crops are cross-pollinated and they may show self-incompatibility. The selected parents may be used to produce single crosses involving two parents or an equivalent of a polycross involving more than two parents.

Selection among FI Families

When the breeding value of parents is not known, and the relative contributions of GCA and SCA is not available, a large number of crosses have to be made in order to ensure that at least some of the crosses would produce outstanding progeny in F_1 . This is particularly true in a species where crop improvement has not been done or has been done at a small scale. In such cases, it would be cumbersome to evaluate a large number of F_1 progeny in detail. To avoid this, generally small samples of several F_1 populations are grown. The general worth of individual F_1 populations is estimated visually. The presence of outstanding individuals in the F_1 populations is also noted, and inferior F_1 's are eliminated. Promising F_1 's with outstanding individuals are then grown at a much larger scale for selection. The procedure is designed to save time, space and labor by planting only small populations of a large number of crosses at the preliminary stage.

Selection within FI Families

The selection procedure within F_1 populations is essentially the same as that in the case of clonal selection. The various steps involved in the breeding of clonal crops through hybridization are briefly described below. From second year onward, these should be read along with the steps described in clonal selection.



First Year

Clones to be used as parents are grown and crosses are made to produce F_1 progeny.

Second Year

Sexual progeny from the cross, i.e., seedlings obtained from seeds, are grown. Undesirable plants are eliminated. Few hundred to few thousand desirable plants are selected.

Third Year

Clones from the selected individual plants are grown separately. Poor and inferior clones are eliminated. Up to 200 superior clones may be selected for preliminary yield trial.

Fourth Year

A replicated preliminary yield trial is conducted in which suitable checks are included for comparison. Few outstanding clones are selected for trials at several locations.

Fifth to seventh year

Replicated yield trials are conducted at several locations. Suitable checks are included for comparison. One or a few outstanding clones are identified and realised as new varieties.

Eighth year

The clones released as varieties are multiplied and distributed among farmers.