

LIGHT. Some seeds, e.g. lettuce, some Gramineae species, and *Nicotiana* spp., do not germinate in the dark and need continuous or periodic exposure to light.

GROWTH REGULATORS AND CHEMICALS. Seed dormancy may be broken with the application of low levels of growth regulators and chemicals. Gibberellic acid (GA_3) and kinetins, potassium nitrate (KNO_3), thiourea, ethylene, chlorohydrin, hydrogen peroxide, and sodium hypochlorite in low concentrations have proved very useful.

6.4 Seed production

New varieties seldom occur as a result of chance; they are usually produced by knowledgeable and skillful plant breeders, but the amount of seed produced is usually small, sometimes a handful of seed (Carter 1965). Seed obtained from selected individual plants of a particular variety needs to be purified and multiplied in such a way as to maintain its genetic purity. This handful of seed, called **nucleus seed**, provides the basis for breeding and production programmes. The varietal purity of prebasic, basic, and certified seed classes largely depends upon the quality of the nucleus/breeder seed.

Since breeder seed is the source for the initial and recurring increase of seed of a newly developed or introduced variety, it has to pass through several stages of multiplication to reach the level of certified seed. Certification begins with breeder seed and ends several generations later with **certified class** seed in a continuous cycle. Thus seed production is *limited* to a restricted number of generations from the original seed stock (breeder seed).

6.4.1 Breeder-seed production in self-pollinated crops

In order to maintain the genetic purity of a promising line, off-type seeds are removed by negative selection during mass increase. It is very easy to select good plants, check their progenies, and bulk the seed of those progenies which are pure and true to type. The seed thus obtained is called breeder seed. The method of producing it is explained below using wheat as an example.

Selection and multiplication.

1. SELECTION OF EARS

- a. In a plot laid out for seed multiplication of a promising line, some 300–5000 ears are selected based upon the unique characters of the varieties.

- b. These ears are threshed individually and examined for colour, shape, and size. Seed from any ears which are not true to type is rejected.

2. BREEDER-SEED PRODUCTION

- a. A 3 m row is sown from the seed of each selected ear. This is called the 'ear row'.
- b. About 300–5000 ear rows are sown per variety.
- c. The ear rows are examined periodically, particularly at:
- Early tillering
 - Before ear emergence
 - At ear emergence
 - At dough stage (milky grain stage), and
 - At maturity

The characters to be examined and compared within an accepted range of variation are: Initial growth habit, auricle colour, waxy bloom on leaf/sheath/blade, colour of leaves, days to flowering, plant height, ear character, awning, density, colour, spikelets, and seed colour.

- d. Based on these characters, ear rows which are segregating for one or several characters are rejected. Ear rows which possess the typical characters of the variety and show uniformity with regard to the aforementioned characters are harvested and threshed individually.
- e. Each selected ear row (nucleus seed) is planted the following year in progeny blocks of 6 rows, 5 m long and 30 cm apart. Those progeny blocks which do not conform to the variety characters are removed. The selected progeny blocks are bulk harvested and threshed. This seed is called breeder/nucleus seed.

Planting and cultural practices.

A. LAND AND ISOLATION REQUIREMENTS

- Breeder seed should be raised on clean, fertile, well-prepared and levelled soil at an experiment station in the region for which the seed is being produced.
- Soil should be free from weeds, crops of the same species, seeds, or pollen transported by wind, water, or birds.
- The plot should have not produced the same species for at least two years. Distance between upland rice, wheat, and other crop species should be at least 2–3 m.

B. SOWING

- Breeder seed may be sown with a small-scale planter since production areas are small.
- The rows should be spaced 30 cm apart.
- The plants should be spaced far enough apart to allow them to express their characteristics.
- Dormancy will be a problem in seed such as freshly harvested rice when it is sown for prebasic seed production.

C. ROGUING

- **Roguing** means removal of contaminants—unwanted cultivars, other species, or weeds—from the crop. Seed production plots of breeder seed must be carefully rogued to remove any off-type plants or any admixture.
- Plots should be rogued before pollination.

D. HARVESTING/THRESHING. Breeder seed should not be harvested with large-scale equipment because of the smallness of the plots and poor cleaning of field-size equipment. Since every grain of prebasic seed is precious, threshing and harvesting must be done carefully by hand.

6.4.2 Prebasic, basic, and certified seed production

Prebasic seed is the progeny of nucleus/breeder seed, and is handled so as to maintain specific genetic purity and identity as completely as possible. Prebasic seed should be produced in the defined region (geographical area) of adaptation for that variety so that there is no change in the genetic and phenotypic stability of the population due to climatic pressure. It must be approved by the Federal Seed Certification Department.

Basic seed is the progeny of prebasic seed produced so as to maintain genetic purity and identity. It may be produced on extension farms, research farms, and by progressive farmers depending on the demand of the region of adaptation. The seed must be certified by the Federal Seed Certification Department.

Certified seed is the progeny of basic seed and is produced by registered growers of seed-producing agencies. Quality is controlled by the Federal Seed Certification Department.

Planting and cultural practices.

ISOLATION

- Isolation requirements must be in conformity with internationally accepted standards.