

Basic Principles of Quality Seed Production in Vegetable Crops

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Seed production is an exacting task. During seed production strict attention must be given to maintenance of genetic purity and other qualities of seed in order to exploit the full dividends sought to be obtained by introduction of new superior crop plant varieties.

Quality seed: A quality is one which is genetically pure, physically pure, physiologically active and is healthy as per prescribed seed certification standards. To maintain the quality of seed basic principles may be grouped into genetic and agronomic principles.

Genetic principles:

Genetic purity of a variety can deteriorate due to several factors during production cycles. The important factors responsible for genetic deterioration of varieties as listed by Kadam (1942) are:

- Developmental variations
 - Mechanical mixture
 - Mutations
 - Nature crossing
 - Minor genetic variations
 - Selective influence of diseases
 - The technique of plant breeder
- **Developmental variations:** When the seed crops are grown in difficult environment, under different soil and fertility conditions, or different climatic conditions, or under different photoperiods, or at different

elevations for several consecutive generations, the developmental variations may arise sometimes as differential growth responses. To minimize the opportunity for such shifts to occur in varieties, it is advisable to grow them in their areas of adaptation and normal growing seasons.

- **Mechanical Mixture:** Mechanical mixture may take place at the time of sowing, if more than one variety is sown with same drill or through different varieties grown in adjacent field. Two varieties growing alongside each other in the same field are often mixed at the time of harvesting and threshing operation. Threshing equipments (i.e. threshing machine) is often contaminated with seeds of other varieties. The gunny bags, seed bines are also quite responsible for mechanical mixture of varieties. To avoid mechanical mixture, it is necessary to rogue the seed fields and care should be taken at the time of harvesting, threshing and handling.
- **Mutations:** Though chances of mutations are very rare (10^{-6}) but if noticed in a seed crop, the plants should be rouged out as soon as visible. e.g. 'rabbit ear' in peas.
- **Natural Crossing:** In sexually propagated crops, natural crossing is most important source of varietal deterioration. The deterioration in varieties due to natural crossing may occur due to natural crossing with undesirable type, natural crossing with diseases plants or natural crossing with off-type of plants. According to Bateman (1947) genetic contamination in seed fields due to natural crossing depends upon factors like the breeding system of species, isolation distance, varietal mass and pollinating agents. As the isolation between varieties is increased the contamination decreases. Isolation of seed crop is the primary factor in the seed production of crop plants of cross pollinated by wind or insects and their activities, humidity and temperature at the time of anthesis etc.
- **Minor genetic variations:** Minor variations exist in phenotypically uniform and homogeneous varieties at the time of their release which

are eliminated in later production cycles by the selective influence of environment. Multi-location yield trials before release of the variety in self-fertilized crops (Hann, 1953) and due care during production of nucleus and breeder's seed of cross-fertilized crops will be helpful in minimizing such variations.

- **Selective Influences of Diseases:** New crop varieties often become susceptible to new races of diseases often caused by parasite. Some vegetative propagated stocks deteriorate fast if infected by viral, fungal and bacterial diseases. Therefore, it is very important to produce diseases free-seeds /stocks.
- **Techniques of the plant breeder:** Some irregularities at the time of development of a variety may lead to the deterioration of such variety, if the material is not properly assessed. Further, premature release of a variety still segregating for resistance to insect-pests and diseases may also result in its deterioration. Hence, careful handling and assessment of the material during development of a variety is necessary.

Agronomic principles

Selection of agro-climatic region: A crop variety to be grown for seed production in an area must be adapted to the photoperiod and temperature conditions prevailing in that area.

Selection of seed plot and land preparation: The plot selected for seed crop must be free from volunteer plants, weed plants and have good soil texture and fertility. The soil of the seed plot should be comparatively free from soil borne diseases and insects pests. Good land preparation helps in improved germination, good stand establishment and destruction of potential weeds. It also aids in water management and uniform irrigation.

Isolation of seed crops: The seed crop must be isolated from other nearby fields of the same crops and other contaminating crops as per requirement of the certification standards. Contamination can be avoided through different methods:

- a) Space isolation:** By providing minimum specified distance from the sources of genetic contamination so that foreign pollens are unable to reach in viable state.
- b) Time isolation:** By adjusting the time of sowing i.e. keeping a gap of 15-20 days between sowing of varieties /cross-compatible crops.
- c) Barrier isolation:** Isolation can be achieved by physical barriers such as barrier crop/ polythene sheet of optimum height around the seed plot, polyhouse/ polytunnels/ net houses and mountains which reduce the movement of pollen.
- d) Discarding border rows:** Foreign pollens mainly pollinate the plants present on the outer periphery of the seed plot. Therefore, contamination can be reduced by discarding the produce of 5-6 lines on the outer periphery.

Selection of variety: The variety for seed production must be a higher yielder, should possess disease resistance, earliness, grain quality, and adapted to the agro-climatic conditions of the region.

Seed sowing/ planting: Seed should be obtained from an authentic source and should be sown after suitable treatment depending upon the seed. Preferably seed crops should be sown at their normal planting time following some adjustments, if necessary. To facilitate rouging operations and inspection of seed crops, slightly lower seed rates than usual for raising commercial crops are desirable. The most efficient and ideal method of sowing is by mechanical drilling as it ensures sowing at uniform and proper depth resulting in good plant stand.

Rouging: Adequate and timely rouging is extremely important in seed production. Rouging in most of the field crops may be done at vegetative/ pre-flowering stage, flowering stage and maturity stage as per need of the seed crops. Rouging should be done in the morning or evening. Dull, excessively bright and windy days should be avoided for doing rouging operations. The back of the person doing rouging should be towards the sun.

Supplementary pollination: Provision of honey bees hives in close proximity to the seed fields of crops largely cross pollinated by the insects ensure good seed set thereby greatly increase the seed yield.

Weed control: Effective weed control is the basic requirement in producing good quality seed. Weeds may cause contamination of the seed crop besides reduction in yield due competition between crop and weed plants for light, space, moisture and nutrients. Wild cucumber (*Cucumis hardwickii*) and wild watermelon (*Citrullus colocynthis*) are the objectionable weeds in cucumber and water melon, respectively.

Disease and insect control: Successful disease and insect control is another important factor in raising healthy seed crops. Apart from reduction in yield, the quality of seeds from diseased and insect damaged plants is invariably poor. Black rot (*Xanthomonas campestris* pv. *Campestris*), black leg (*Leptosphaeria maculans*) and soft rot (*Erwinia carotovora*) are designated diseases in cole crops.

Nutrition: In the nutrition of seed crops, nitrogen, phosphorus, potassium, and several other elements play an important role for proper development of plants and seed. It is, therefore, advisable to know and identify the nutritional requirements of seed crops and apply adequate fertilizers.

Irrigation: Irrigation can be important at planting of seed crops on dry soils to ensure uniform germination and adequate crop stands. Excessive moisture or prolonged drought adversely affect germination and frequently results in poor crop stands. Dry regions are more suitable for quality, disease free seed production and hence, assured source of irrigation is a must.

Harvesting and storage of seed: It is of great importance to harvest a seed crop at the time that will allow both the maximum yield and the best quality seed. In order to preserve seed viability and vigour, it is necessary to dry seeds to safe moisture content levels. The best method of storing seed for short periods is in sacks or bags in ordinary buildings or godowns.

References:

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