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# Recent Advances in Quality Seed production

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***Abstract***

Quality seed is the basic input for agriculture. However, few principles of quality seed production are sometimes overlooked by the seed growers. This can result in poor quality of seed produce. Seed growers are expected to follow all the basic principles which are meant for the quality seed production. Agricultural scientists have made several recommendations for each step after the years of research. Following these recommendations, farmers and other seed growers can be benefitted in terms of both increased production of quality seeds and profitable market price of the produce.

## Introduction

Agriculture is the boon for Indian economy. In order to strengthen it, the main focus of agricultural scientists has been to serve the farming community with high yielding varieties and improved package of practice for different agroclimatic zones. Breeders have developed various varieties which are suitable for different climatic conditions, biotic and abiotic stresses with advanced and budget friendly practices and low input cost (fertilizer use efficient, water use efficient etc). These varieties and packages of agronomic practices are expected to help farmers in production of more quantity of quality seeds. Quality is one of the most important factors for determining the market cost of the produce as far as agricultural produce are concerned. The principles of quality seed production can broadly be categorized in two forms viz. genetic principles and agronomic principles. Genetic principles deal with selection of suitable varieties for the specific agroclimatic condition and the ways by with the produce can be kept genetically pure. Agronomic principles are related field selection and its management practices. Farmers are thus, expected to double their income by increasing the production of quality seeds which can ultimately fetch good market price. This article is intended to provide basic information about principles of quality seed production for field crops.



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**Genetic Principles of Quality Seed Production**

**Variety Selection**

Selection of variety should be done according to the agroclimatic conditions of the location. Only certified and truthfully labelled seeds should be used as planting material. This will ensure physically and genetically pure seed production. It is necessary that the variety is having high demand in the market in order to fetch more profit from the agronomic produce. In general, varieties which have high yielding capacity, good quality and biotic abiotic stress resistance are having high market demand.

**Maintenance of Isolation-**

Quality seeds have basic requirement of being genetically pure. Genetic purity can be contaminated by natural outcrossing, mechanical mixture and disease contamination between adjoining fields. In order to avoid these factors, isolation through various means is recommended. Most widely practiced isolation is spatial that is distance isolation. Mode of pollination and pollinating agent are the major determinants of isolation distance. Isolation distance is kept more for cross pollinating crops like maize. Plot size also determines the isolation distance. Isolation distance is more between small sized plots. In case of hybrid seed production, male parents should also be grown in borders. This avoids contamination of female parent with other pollens from nearby field. Other forms of isolation are time isolation and barrier isolation. Two varieties of same crop having cross compatibility should be grown with time isolation. Minimum time isolation of 15 days is recommended. The main idea here is to keep a significant time difference in flowering time of two cross compatible varieties as to avoid outcrossing. For Barrier isolation, the plants which are taller than the crop should be grown on the borders. Generally tall heighted crops like maize, sesbania etc. can be used barrier. In any case of isolation, the prevention from pollen contamination should be ensured.

**Agronomic principles of quality seed production-**

**Site Selection**

Site selection is the first step in quality seed production. A particular quality of the produce is achieved when it is grown at the specific site. For an instance, high quality fragrant basmati rice is produced in specific regions of India and Pakistan. The phenotypic expression of the variety for the particular trait may be morphological, physiological or biochemical is the result of genotype, and Genotype x environment interaction. Environment including weather and edaphic conditions contribute towards development of the specific environment. In order to get specific quality of produce, a particular combination of all the environmental factors is required. Thus, scientists have recommended to grow the variety in the area for which it has been recommended. Major deciding



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whether parameters are temperature, rainfall, wind speed and humidity. Similarly, the edaphic factors constitute soil pH, mineral content, water holding capacity, soil texture, structure and organic matter content. Several varieties have been recommended for optimum environment. However, varieties adapted to extreme environmental conditions have also been developed by our breeders. Wind velocity at the during pollination affects the fertilization efficiency and ultimately grain yield. Temperature is major factor affecting the anthesis, attainment of reproductive stage, photoperiod etc. Very high temperature at the time of fertilization results heat stress which cause high amount of chaffy grains in paddy. However, some crops like safflower, castor and linseed are well adapted to high temperature environment. Extreme dry spell causes drought conditions which affects the reproductive development along with reduced vigor. For an instance, in maize the draught condition affects pollen viability and silk receptivity which in turn affects kernel setting in corn cob. For drought prone areas, millets are found to give better performance. High humidity and rainfall at grain maturity induce development of fungus and other saprophytes and also cause sprouting. While in pulses it can also cause discoloration. For quality seed production, cool and dry conditions are considered best.

**Field preparation**

A good field preparation ensures the development of favorable microclimatic condition for the crop growth. The field should be prepared using various tillage operations which may vary from crop to crop. Removal of any weeds and volunteer plants should be ensured before seed sowing. In order to avoid volunteer plants, specific crop related weeds and soil nutrient degradation, it is advised not to repeat the same crop for consecutive seasons. For example, the field where any grain crop is being grown should be replaced with pulse crop or the next season. This will allow maintenance of nitrogen level at that site as the root nodule of pulse crop provide nitrogen to the field for next year crop. If such rotation is not possible, then

**Seed sowing, Crop establishment, Planning ratio and Weed control-**

There are various suggested methods for seed sowing for different crops like broadcasting, line sowing, raised bed sowing and transplanting etc. Optimum seed sowing method should be adopted according to the area, filed conditions and the resource availability. Specified quantity of seeds (seed rate) should be sown for getting higher yield. Optimum row to row and plant to plant distance should be maintained for the better expression of plant phenotype. Sowing should be done according to the maturity habit of the variety (Early maturing, late maturing) so that the variety can meet all the favorable climatic conditions for all the growth stages. At vegetive growth period, prevention of weeds should be taken care off. If hybrid seed production is practiced then, planting ratio tat is ratio of female and male parents should be maintained. Planting ratio is based on the amount of viable pollen male parent can produce and the pollen load of the pollinating insects which is enough to fertilized specified number of female lines. Climatic conditions and type of hybrid also affects planting ratio. For an



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instance, planting ratio for maize single cross hybrid is 4:2 while for double cross hybrid it is 6:2.

**Roughing**

Roughing is the practice of removal of undesirable off type plants from the field at the earliest stage where crop plants and undesirable plants can be differentiated. Roughing however, should be done before reproductive stage is reached. This will ensure maintenance of genetic purity of the variety. At this stage, if any diseased plants are there then they should also be removed in order to reduce disease spread.

**Irrigation and Fertilizer management-**

Crops are frown under different edaphic conditions. In Rainfed conditions crop is totally dependent of the natural rainfall whereas irrigated condition requires artificial watering that is irrigation. Each crop has certain critical stage at which irrigation is very necessary. If crop undergoes water stress at these critical stages, the quantity and quality of economic produce is reduced drastically. For example, in rice booting and grain filling stage is critical for irrigation and in wheat there are 6 critical stages for irrigation right from crown root stage till dough stage. Soil available nutrient content can be increased by using fertilizers. Primary nutrients like Nitrogen, phosphorus and potassium should be given in split doses through different fertilizers like urea, DAP and MOP. Micronutrients like zinc are required in very low quantity but play crucial role in growth and development of the plants by affecting the metabolic and biochemical activities. Recommended dose of fertilizer varies with crop, location and soil type. Higher dose of fertilizer as compared to recommended should be avoided. For an instance, High dose of urea can burn the plant and resultant high nitrogen in plant can enhance the disease and insect pest attack. It is suggested to go for soil testing before fertilizer application.

**Biotic stress management-**

Disease causing agents like fungus, bacteria, nematode, virus and various insect pests constitute the biotic factors which influence the plant health and ultimately the quantity and quality of the seed. Carryover insect pest and seed borne diseases can even affect the planting material (seeds) generated from the affected plants. Optimum crop protection packages should be adopted and the infected plants should be removed as early as possible. Very first step to avoid biotic stress is selection of disease-free planting material. Site selection is also important as far as biotic stress management is considered. Disease free plots should be selected for quality seed production. Recommended isolation distance in case of presence of specific disease should be followed.

**Harvesting**

Determination of harvesting stage also affects the quality of seed. It is crucial to determine the harvesting maturity stage of the crop. Seeds should be harvested at optimum moisture level. Early harvesting result in less vigorous poor-quality seeds along with low yield. Late harvesting result in



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seeds which have low germination and viability. Harvesting should be done at bright sunny day. Many morphological indicators have been identified for the optimum harvesting stage in different crop. Avoid mechanical mixture at the time of harvesting, threshing and drying. After all these operations, seeds should be stored in gunny bags and should not be kept in direct contact with floor. Store house should be kept clean and dry and fumigation should be done time to time.

**Conclusion**

All the information mentioned above are crucial for the potential production of quality seeds. The article is expected to spread the major information about quality seed production. We hope that this article will help farmers and other commercial seed growers to improve the seed production practice.



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