

## **SEED PHYSIOLOGY**

Crops are to be harvested at an optimum stage of maturity to get a qualitative and quantitative yield. Seed yield and its quality depends on number of factors. Time of sowing and harvesting stages are among the major considerations in deciding the seed quality and productivity.

**3.1 PHYSIOLOGICAL MATURITY:** Identification of harvesting stage in terms of easily measurable parameters is an important problem being faced by the farmers. **Physiological maturity or Biological maturity** in terms of average moisture content and maximum dry weight of seed is one such parameter on which farmers can depend to harvest maximum.

Physiological maturity can be defined as “**the stage at which the seed reaches to its maximum dry weight, viability and vigor capability**”.

### **3.1.1 MORPHOLOGICAL AND PHYSIOLOGICAL CHANGES ASSOCIATED WITH PHYSIOLOGICAL MATURITY IN CROPS – SOME EXAMPLES:**

Determination of physiological maturity in crops is very essential. Certain morphological and physiological changes in different parts of the plants can serve as a guideline to decide the physiological maturity. Effective and practicable guidelines in this regard help the farmers to reap a good harvest.

- Formation of black layer in placenta region near the point of kernel attachment in Maize and Sorghum.
- 35 to 40 days after anthesis in Sorghum.
- Change of internal pod walls in to brown color and attainment of pink colored seed coat in groundnut.
- Change of color of involucre bracts from green to yellow in Sunflower.
- Measuring BRIX reading (Total soluble solids) in sugar cane by ‘Brix sugar hydro meter’. If the reading is 17 or more the crop is ready for harvest. Sucrose content of the cane and brix can be estimated with hand refracto meter.

### **3.2 HARVESTABLE MATURITY:**

Generally, farmers decide the maturity period for harvesting in terms of crop duration from the time of sowing. However, this will change by the variety, soil fertility and climatic conditions. Such harvest, which coincides with the ripeness of seed beyond physiological maturity, is referred to as **harvestable maturity**. If the seeds are retained on the mother plant beyond physiological maturity, several morphological and physiological changes takes place in seeds and result in the decline of seed quality and yield. For example,

- Rice crop harvested at 15% seed moisture content instead of 21%, results in a yield reduction by 20 per cent.
- Harvesting the seed of Green gram crop after 4 weeks of pod initiation reduces the yield compared to a harvest of 2-3 weeks pod initiation.

### 3.3 SEED VIABILITY AND VIGOR

Generally the terms viability and vigor are misused at different levels. To most of the seed technologists viability means the capacity of a seed to germinate and produce a normal seed ling. In another sense viability denotes the degree to which a seed is active and possesses enzymes capable of catalyzing metabolic reactions needed for germination and seedling growth. In this context, a given seed may contain live and dead tissue and they may are may not be capable of germination i.e they may be viable or non viable.

Vigor is usually defined as that condition of active good health and robustness in seeds which upon planting, permits germination to proceed rapidly under a wide range of environmental or field conditions. A seed is said to be vigorous when it shows uniformity in germination and plant development under non-uniform conditions.

In most of the cases vigor and viability are probably the highest at the time of harvest and decrease gradually in storage. It is the vigor that declines first followed by viability (Fig.2). The potential with which a seed produces a healthy seedling depends on the vigor of seeds.

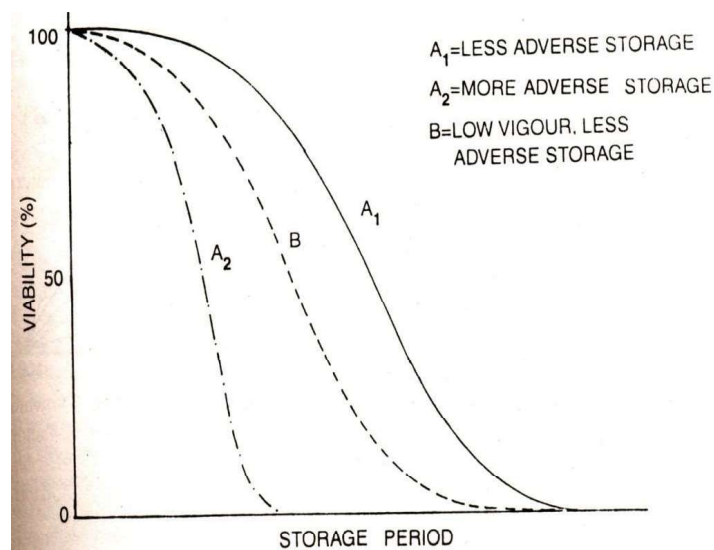


Figure.2 . Loss of viability and vigor during storage period

\*Figure is from seed science and technology (by A.K.Joshi & B.D.Singh)

There are several factors affecting viability and vigor in seeds. Among them the most important are

### **3.4.1. Genetic make-up**

Vigorous seeds produce seedlings of good health and natural robustness. The vigor of the seeds depends on the genome history of the individual seed and the environment in which it is sown.

Hybrid seeds normally possess greater vigor due to their inherent genetic make up. Genetic factors such as hard-seededness, resistance to diseases, and seed chemical composition influence the expression of seed vigor.

Viability is also influenced by the genetic make up of the seed. Some kinds of seeds are inherently short lived (e.g. onion, soybeans, ground nut etc.) and quickly lose their viability.

### **3.4.2 Time of harvest**

Generally, seed viability and vigor are maximum at the time of physiological maturity. After physiological maturity seeds begin to deteriorate at varying rates depending on genetic factor and on the conditions of storage environment

### **3.4.3 Environmental factors during seed development**

- a) Temperature
- b) Moisture availability
- c) Soil fertility

Fluctuating temperature during seed formation and maturity , Pre-harvest rain and Pre harvest environment of high humidity and warm temperatures will affect seed viability and vigor.

The amount of moisture in the seeds is the most important factor influencing seed viability during storage. Generally if the seed moisture content increases storage life decreases. If seeds are kept at high moisture content the losses could be very rapid due to mould growth .very low moisture content below 4% may also damage seeds due to extreme desiccation in some crops.

Seeds developed under moisture stress, nutrient deficiency, extreme temperatures, etc. often result in light, shriveled seed or poor-vigor seeds.

### **3.4.4 Mechanical damage during threshing, Cleaning and transportation:**

The rate of deterioration increases due to mechanical injury at the time of harvesting and processing.

### **3.4.5 Infestation by micro organisms of seed in storage:**

Storage fungi adversely affect the seed by bringing down the seed viability, seedling vigor and also affect the chemical composition of seeds.

Aspergillus, Penicillium. Rhizopus were some most commonly occurring storage fungi which reduces seed germination and seedling vigor and causes a variety of symptoms on seedling.

The microflora activity is controlled by Relative Humidity temperature and Moisture content of seed.

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