



Factor Affecting Seed Deterioration

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INTRODUCTION

Deteriorative alterations that occurs with time which increases the seed's exposure to external challenges and involves cytological, physiological, biochemical and physical changes in seeds which eventually decreases the ability of the seed to germinate or give a healthy seedling, in other words causes loss of seed quality, is called Seed Deterioration.

Factor Affecting Seed Deterioration

1. Kind/variety of the Seed

The seed storability is considerably determined by the kind or variety of seeds. Some are short lived, some are long and some are intermediate. Genetic make-up of varieties also influences storability

Eg. - Short-lived- onion, soybeans, peanuts, etc.

2. Effect of Temperature

Temperature is important factor because it influences the amount of moisture and also alter the rate of the biochemical processes which ultimately enhances the rate of deteriorative reactions occurring in seeds.

- ☐ High temperature increases the respiration rate of the seed, because of which the stored carbohydrates are degraded. Sometimes, high temperature also causes the seed to perform such metabolic activities which are harmful to it.
- ☐ Extremely high temperature degrades the protein and enzymes, which leads to breaking up of vital chains and biochemical processes occurring in seed to keep itself viable.
- ☐ While, low temperature, below its critical temperature, will crystalize the enzymes and protein.

Therefore, different crops and different varieties have different temperature requirement to germinate and to store.

Seeds sensitivity to high temperatures is strongly dependent on their water content, loss of viability being quicker with increasing moisture content.

3. Effect of Moisture Content

Seeds are hygroscopic in nature; they can pick up and releases moisture from and to the surrounding air. They absorb or lose moisture till the vapor pressure of seed moisture and atmospheric moisture reach equilibrium.

i. High Moisture Content

Deteriorative reactions occur more readily in seeds at higher moisture content and subsequently, this condition constitute hazard to the longevity of seed survival. Seeds stored at high moisture content demonstrate increased respiration, heating, and fungal invasion resulting in reduced seed vigor and viability. Environmental moisture, predominantly intermittent or prolonged rainfall, during the postmaturation and pre-harvest period, is quite detrimental to seed quality and cause rapid deterioration.

ii. Low Moisture Content

The lower the moisture content, the longer seeds can be stored provided that the moisture level can be controlled all through the storage period. But below 4-6% seed moisture content lipid autoxidation becomes a damaging factor and seeds become more susceptible to mechanical damage.

4. Fluctuating Environmental Conditions

Fluctuating environmental conditions are harmful for seed viability. Rapid changes in seed moisture content and temperature cause deleterious effect.

5. Oxygen Pressure

Recent researches on the role of a gaseous environment on seed viability indicate that increases in pressure of oxygen incline to decreases the viability period.

6. Effect of Organisms Associated with Seeds

Organisms associated with seeds in storage are bacteria, fungi, mites, insects and rodents. The activity of these entire organisms can lead to

damage resulting in loss of vigor and viability or, complete loss of seed.

i. Bacteria and fungi:

There are several factors which favor infection fungi and promote their infestation such as moisture content of seed and interspace relative humidity, temperature, prestorage infection and storage pest. They induce seed deterioration by producing toxic substances that destroy the cells of seeds. Mechanically damaged seed allow quick and easy access for mycoflora to enter the seed. Most storage fungi belong to *Penicillium* and *Aspergillus* genera.

Optimum relative humidity to survive in seeds-

- Fungi – 75% and above
- Bacteria – 90 % and above

To minimize the risk of bacterial and fungi invasion, seeds have to be stored at low moisture content, low temperature, and RH.

ii. Insect and Mites:

The insect and mites either damage the seed or consume it completely. Some insects hibernate in the seed. While some lays eggs in them. Result is, the seeds get damaged.

- There is no insect activity at seed moisture contents below 8%, but if grain is infected, increased activity may generally be expected up to about 15% moisture content.
- The optimum temperature for insect activity of storage insects ranges from 28 to 38°C.
- The temperatures below 17 to 22°C are considered unsafe for insect activity.

Although it is usually preferable to control insect and mite activity by the manipulation of the seed environment, i.e., use of fumigants and insecticides. The main problem of chemical control is the adverse effect of chemicals on seed viability and vigor, and some of them are dangerous to handle.

That are safe: -

- **Fumigants** - methyl bromide, hydrogen cyanide, phosphine, ethylene dichloride and carbon tetrachloride in 3:1 mixture, carbon disulphide and naphthalene.
- **Insecticides** –DDT, lindane and Malathion.

Consequences of deteriorative changes in seeds are:

1. Decreased percent germination;
2. Reduction in vigor and viability;
3. Degradation of cellular membranes and loss of permeability control;
4. Increased solute leakage;
5. Impairment of energy-yielding and biosynthetic mechanisms;
6. Reduced biosynthesis and respiration;
7. Reduced germination rate and early seedling growth;
8. Reduced rate of plant growth and development;
9. Reduced storage potential;
10. Decreased growth uniformity;
11. Increased susceptibility to environmental stresses, especially during germination, emergence, and early seedling development;
12. Reduced tolerance under adverse conditions
13. Decreased yield;
14. Decreased emergence percentage;
15. Increased percentage of abnormal seedling;
16. Loss of the capacity to germinate; and
17. Loss in seed weight