ISSN–0974–0759 | ●●● Popular Article ●●● |Visit us : *www.researchjournal.co.in*|

Seed deterioration: An irresistible physiological phenomenon

Rohit Chhabra

Department of Botany, Punjab Agricultural University, Ludhiana (Punjab) India
(Email : rohit-bot@pau.edu)

Seed deterioration is the "deteriorative alterations occurring with time that increase the seed's exposure to external challenges and decrease the ability of the seed to survive". It leads to reduction in seed quality with storage duration and as the seed germinability decreases causing loss of vigour and making seeds less viable resulting in the death of seedlings in field. The process of seed deterioration could be associated with progressive decrease in germinability, increased mean time of germination, increase in the number of abnormal seedlings and lower tolerance to adverse storage conditions (Dahuja and Yadav, 2015).

Seed deterioration is related with various metabolic, cellular and chemical alterations including lipid peroxidation mediated by free radicals, decrease in proteins, DNA damage, inactivation of enzymes, breakdown of cell membranes, protein synthesis, impairment of RNA and causes several negative effects on seed (Mahjabin *et al.*, 2015). The primary cause for loss of viability is loss in cellular membrane integrity. Weakening of membrane and permeability loss occur at an early phase during the seed deterioration. As a result, seed cells are not able to hold their regular physical state and function. During seed deterioration, weakening of membrane increases electrolyte leakage which results in loss of field emergence, seed germination and vigour of the seedlings (Mahjabin *et al.*, 2015).

During seed aging, injury to the organization of cell membranes might represent an important factor in explaining seed deterioration. The deteriorative reactions take place in the seed more readily when moisture content is higher, thus, it imposes a threat to survival and longevity. Seeds stored at high moisture content demonstrate increase in the respiration rate, heating and fungal attack resulting in reduced seed vigour and viability. The inactivation of proteins during seed storage may lead to deterioration as it depresses the metabolic capacity and reduces the ability of metabolic system to repair the damages incurred during storage. The proteins may be inactivated by losing or gaining certain functional groups or by conversion of amino acids within the protein structure (Dahuja and Yadav, 2015). Lipid peroxidation of membrane leads to decline in membrane integrity and increases the membrane permeability. Loss of seed viability is extremely related with various metabolic and biochemical alterations that result in loss of reduction in the energy metabolism, membrane integrity, RNA impairment, ATP production, protein synthesis and degradation of DNA.

Seeds rich in lipids have limited longevity due to its specific composition. Composition of fatty acid is the most essential factor that determines oil susceptibility to oxidation (Morello *et al.*, 2004). For example, sunflower seeds need special care during storage due to high oil content which can easily give rise to processes that lead to loss of per cent germination and seed viability (Shaban, 2013). Damage caused by lipid peroxidation at cellular level can be prevented or reduced by protective mechanism involving free radical and peroxide-scavenging enzymes such as catalase (CAT), glutathione reductase (GR) and superoxide dismutase (SOD). These enzymes play a key role in the process of seed deterioration and thus changes in the activity of these enzymes can be an indication of seed quality loss. Thus, enzyme activity is positively correlated with the seed germination.

Seed viability is a matter of great concern, therefore, procedures to keep germination effectiveness of stored seeds. Storability of seeds is mainly influenced by quality of the seed at the time of storage, pre-storage history of seed (environmental factors during pre and post-harvest

stages), relative humidity, moisture content of seed, storage temperature and extent of storage. For successful storage of seeds, zeolite drying beads a newly developed desiccant technology is being used. Using drying beads, seeds can be rapidly and efficiently dried to secure storage moisture contents and preserving seeds in moisture impervious containers not only helps to maintain low moisture contents, but also prevents losses to insects, rodents and pests. Seed desiccant drying beads provide a simple, inexpensive and reusable method for seed storage. Drying beads are ceramic materials, especially absorbing and holding water molecule in their microscopic pores. The beads continue to take up water until all of its pores are filled, upto 20 to 25 per cent of their initial mass. When kept in moisture impervious container, the beads eradicate water from the atmosphere, maintaining and creating a very little humid environment. Seeds when placed into a container with the beads at low air humidity will lose water and will continue to do so until they approach equilibrium. Hence, desiccant-based drying basically transfers the water in the seed to the drying beads from the air without the need of heating process. The beads can afterwards be removed and regenerated individually by heating at >200°C for 2 hours to release the absorbed water.

Hence, the accessibility of a sufficient supply of high quality seed is necessary for a successful seed production programme and for the maintenance of a viable and fruitful agriculture. In agriculture, unpredicted losses in seed viability negatively affect storehouse inventories, seed sale and production schedule, causing the industry huge losses every year (Walters *et al.*, 2010).

References:

Dahuja, A. and Yadav, S. (2015). Biochemical basis of seed deterioration-an overview. *Seed Res.*, **43**: 1-8.

Mahjabin, Bilal S. and Abidi, A.B. (2015). Physiological and biochemical changes during seed deterioration: A Review. *Int. J. Recent Sci. Res.*, **6** : 3416-3422.

Morello, J. R., Motilva, M. J., Tovar, M. J. and Romero, M. P. (2004). Changes in commercial virgin olive oil (CV Arbequina) during storage with special emphasis on the phenolic fraction. *J. Food Chem.*, **85** : 357-364.

Shaban, M. (2013). Review on physiological aspects of seed deterioration. *Int. J. Agric. Crop Sci.*, **6** : 627-631.

Walters, C., Ballesteros, D. and Vertucci, V.A. (2010). Structural mechanics of seed deterioration: Standing the test of time. *Plant Sci.*,**179**: 565–573.

Received : *08.06.2019* ***Revised :*** *02.10.2019* ***Accepted :*** *04.11.2019*