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Seed Quality Changes During Storage of Oil Seeds- a Review

Agriculture

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ABSTRACT

Seed production and supply of good seeds have gained much importance in recent years. Lack of post harvest preservation techniques and a large portion of annual yield gets lost in storage are some of the important factors leading to poor seed supply. The relative physiological and biochemical changes occurred in seeds during storage are briefly reviewed in this paper.

Introduction

The storage potential of seed is a heritable character. It is envisaged that bulk of the carryover seeds would be stored in bags under ambient conditions because in India storage of bulk quantity of seeds under controlled conditions is neither economical nor practicable. Stored seeds of sunflower, groundnut and sesame loose their viability during storage under ambient conditions. Oilseeds are recalcitrant in nature and due to the presence of oil content they develop rancidity and easy spoilage. Storage potential of seeds of various oilseed crops ranged from 9 to 23 months under ambient condition.

Seed quality changes during storage

In groundnut, erect varieties showed quick increase in germinability upto 91 per cent after two months of storage and decreased to 12 per cent after eight months of storage; whereas in the semi-spreading group, germinability increased to 97 per cent after three months of storage then gradually decreased to 16 per cent after eight months of storage (Swain *et al.,* 2001). Chowdhury *et al.* (2003) elucidated that the validity period fixed for 9 months was found to be appropriate for groundnut. Nautiyal *et al.* (2004) reported that groundnut seeds could be stored for six months under ambient storage conditions.

Shelar *et al.* (2002) reported that the germination of soybean varieties decreased during storage irrespective of varieties, threshing and processing methods and storage containers. Adugna (2006) reported a decrease in seed quality in prolonged seed storage of musk melon, onion and chickpea, respectively. Balesevic *et al.* (2007) observed a decline in seed vigour of naturally aged sunflower seeds compared to the vigour of fresh seeds. Simic *et al.* (2007) observed decrease in germination of maize, soybean and sunflower seeds after 4 years of storage.

Khaldun and Ehsanul (2009) observed a decline in moisture content, germination percentage, vigour and increase in percentage of abnormal seedling, fresh seed, dead seed, hard seed, root-shoot ratio and amount of dry matter after three months of storage in cucumber seeds. Shakuntala (2009) reported that germination of sunflower seeds declined progressively with increase in the period of storage. Alsadon *et al.* (2011) in carrot, cucmber, onion and tomato observed a decline in germination after 12 months of storage. The reduction in germination might be due to the depletion of food reserves, and decline in synthetic activity due to ageing as reported by Heydecker (1972).

Biochemical changes of seeds during storage

Biochemical constituent of seeds is an important factor which influenced the physiological soundness of seed. In the course of storage, the biochemical characteristics of seeds such as carbohydrate, protein and oil content decreased, whereas free amino acid, free fatty acid and electrical conductivity increased. Changes in chemical constituents of cell have been related to viability of seeds. The germination of groundnut seed has negatively correlation with electrical conductivity of seed leachates and its soluble sugar and free amino acid concentration. The alteration of permeability of cell membrane for increased leakage over a period of storage could be the reason for the changes in the electrical conductivity of the seed leachate (Abdul-Baki and Anderson, 1973).

Vertucci (1992) studied the changes in lipids during storage of groundnut and other oil seeds and suggested that the changes in lipid components of seeds were associated with seed deterioration and could be measured using differential scanning colorimetry. Braccini *et al.* (2000) observed reduction in protein, lipid and poly unsaturated fatty acids content and increased hexanal production in storage of soybean seeds. Simic *et al.* (2007) noticed a decrease in oil content of sun flower, soybean and maize seeds during storage. Similar results were observed by Balesevic *et al.* (2005) in sunflower during storage. The decrease in oil content with increased free fatty acid content may be due to the hydrolysis of storage lipids, coalescence of lipid bodies, subsequent formation of free radical and led to lipid peroxidation (Paramasivam, 2005).

Murali *et al*. (2002) stated that germination and field emergence of the pulse seeds decreased while the electrical conductivity of seed leachate increased with increase in storage period. Peroxidation of unsaturated fatty acids led to leaching of electrolytes and other solutes in soybean (Singh and Dadlani, 2003). Verma *et al.* (2003) reported a decrease in carbohydrates and protein content in deteriorated seeds. So it is concluded that oil, protein and field emergence of groundnut seeds decreased but free fatty acid and EC increased with advancement of storage period. Simic *et al*. (2007) noticed a decrease in oil content of sun flower, soybean and maize seeds during storage. Similar results were observed by Balesevic *et al.* (2005) in sunflower during storage.

Enzyme activity during storage

The exact cause of loss of seed viability is still unknown as deterioration of seed is a complex process. In the presence of oxygen, ageing of seed can lead to peroxidative changes in polyunsaturated fatty acids. The free radical-induced non-enzymatic peroxidation, which has the potential to damage membrane, is likely to be a primary cause of deterioration of stored seeds (Sung and Chiub, 1995).

It has been well documented that certain anabolic enzymes help in maintaining viability while some catabolic enzymes decrease viability. It was reported that the free radical scavenging enzymes such as catalase, peroxidase and superoxide dismutase are generally increased when the plants exposed to stress condition (Heath, 1987). But the seed catalase and peroxidase activity seem to be decreased during storage. Chauhan *et al.,* 2011 in wheat)**.**

During seed storage, certain anabolic enzymes help in maintaining viability while some catabolic enzymes decrease viability. Pallavi *et al.* (2003) reported a sharp decline in peroxidase emzyme activity in aged seeds of radish and sunflower, respectively. Goel *et al.* (2003) stated that the decrease in germinability was well correlated with increased accumulation of total peroxide and malondialdehyde content and decreased activities of antioxidant enzymes peroxidase, catalase, ascorbate peroxidase, glutathione reductase and superoxide dismutase.

Rao *et al.* (2006) stated that activity of peroxidase catalase and super oxide dis mutase were decreased in onion seeds under prolonged storage. Loycrajjou *et al.* (2008) reported that ageing induced deterioration and increase the extent of protein oxidation thus inducing loss of functional properties of proteins and enzymes. A change in enzyme activity due to ageing of seeds was reported by many researchers. Cakmak *et al.* (2009) observed a decrease in the activities of catalase and peroxidase enzymes, but an increase in activity of superoxide dismutase in both the old dry seeds of legumes during storage for 40 years. Chauhan *et al.* (2011) studied the reduction in catalase and peroxidase activities as the ageing progressed in wheat and the rate of decreasing of both the enzymes activity was higher after 18 months of storage.

Conclusion
It is clear from the literatures that with increase in storage period, the seed quality parameters decreased with a relative biochemical changes.

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