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The effect of Artificial ageing on germination components and seedling growth of Basil (*Ociumum basilicm L.*) seeds

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ABSTRACT

The effect of accelerated aging (AA) was studied in Basil (*Ociumum basilicm L.*) seeds. The objective of this research was to evaluate Effect of seed ageing on germination of Basil Seeds in Roodan University in year 2012. experiment was CRD design with 3 replicate. The seeds were artificially aged at 45°C and 100% relative humidity for 24, 48, 72, and 96 hours. Results indicated germination percentage, germination speed, root and shoot length decreased with AA (Artificial ageing).

Keywords: Accelerated aging, Basil, Germination.

INTRODUCTION

Recently, medicinal and aromatic plants have received much attention in several fields such as agro alimentary, perfumes, pharmaceutical industries and natural cosmetic products. Although, secondary metabolites in the medicinal and aromatic plants were fundamentally produced by genetic processing but, their biosynthesis is strongly influenced by environmental factors [Omidbaigi, 2005].

Seeds deteriorate during storage. This aging is apparent as a reduction in percentage germination, while those seeds that do germinate produce week seedlings. During aging, seeds lose their vigor, viability for germination and ultimate feasibility (Maity et al. 2000). Losses in seed quality occur during field weathering, harvesting and storage. The losses are exacerbated if seeds are stored at high temperatures and/or high relative humidity conditions. Membrane disruption is one of the main reasons attributed to seed deterioration. As a result, seed cells are not able to retain their normal physical condition and function. The major causes of membrane disruption are an increased free fatty acid level and free radical productivity by lipid peroxidation (Goel et al. 2003). The rate at which seeds lose vigor during storage is affected by environmental factors such as temperature, moisture and O2/CO2 concentrations. Harrington (1972) suggested that within the normal range of moisture and temperature for stored seeds, each 1% reduction in seed moisture or each 5ºC reduction in temperature doubles the storage life of the seeds. Using such “rules-of thumb” and assuming that the effects are additive, it can be assumed that seed vigor would deteriorate 500 times more rapidly at 40ºC and 18% moisture content than it would at 20ºC and 8% moisture. Thus accelerated ageing has been developed as a self-ageing technique. To study the physiological and biochemical changes in seeds during ageing, accelerated ageing has been widely used. In accelerated ageing, the seeds are self-aged by subjecting them to high relative humidity (>90%) and temperatures of (≥40ºC). The seeds, so aged, are compared for morphological, physiological, biochemical and genetic changes with controls. The present study has been set up to investigate the physiological and biochemical aspects of seed deterioration in cottonseeds during accelerated ageing (Sveinsdottir et al. 2009).

MATERIALS AND METHODS

Basil (*Ociumum basilicm L.*) seeds were obtained from Iran medicinal plant Research Center. The experiments were carried out at the Seed Research Laboratory of Roodan University, Iran.

Accelerated aging

Accelerated aging of seeds was performed in a plant growth chamber at 45ºC and 100% relative humidity for the following periods: T0 = 24 hours; T1 = 48 hours; T2 = 72 hours and T3 = 96 hours. After aging, seeds were

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forced air dried to establish their original weight. All the seeds were stored at 20ºC in sealed plastic containers until used for vigor studies.

Germination and vigor tests

Seed germination tests were carried out according to ISTA (1993), and performed on 3 replicates of 20 seeds. The seeds were incubated on top of moist Whatman No. 1 double filter papers in the 9 cm Petri dishes in a growth chamber. Water requirements were checked daily and topped-up according to necessity. The seed germination percentages and root and shoot length, numbers of were observed after 7th day of sowing (Basra et al. 2003). Germination speed index (GSI) was measured according to the AOSA (1983) on vigor as described below:

$$GSI = \frac{number\ of\ normal\ seedlings}{days\ of\ first\ count} + \frac{number\ of\ normal\ seedlings}{days\ of\ final\ count}$$

Time to get 50% germination

Time to get 50% germination was worked out by graph (Fig5.) as described by Khan et al. (2003).

RESULT

Seed viability

The results for seed viability (germination %age) are presented in (Fig1.). Accelerated ageing showed significant ($p<0.05$) reduction in the ability of seeds to germinate whilst the control seeds showed high germination percentages (100%). The ability of seeds to germinate was reduced in relation to the time taken for ageing. (Fig1.).

Root and shoot length and germination speed (Vigor Tests)

Root and shoot lengths of germinated seeds were measured 7th day of sowing. At periods of 24 h after sowing, Root and shoot lengths were greatly reduced with the amount of time in the ageing environment. The largest average root and shoot length of 4 and 3 cm was recorded for the control and the shortest Root and shoot length of 1 and 0.5 cm was recorded with 96 days in the ageing environment. (Fig3 and 4).

Germination speed is a direct measure of seed vigor. It may be defined as “number of germinated seeds per unit day”. Accelerated ageing also decreased the germination speed of seed material. The fastest germination speed was observed in control (17) compared to the lowest (10) at 96 days under ageing treatment (Fig2.). Significant differences were observed in all treatments. For example the maximum germination speed was achieved with the control (17) followed by 48, 72 and 96 days of ageing (15, 12 and 10, respectively). Results demonstrated that ageing slowed down the process of germination.

Time to complete 50% germination

The time to complete 50% germination of seeds was directly proportional to the time of ageing (Fig5.). The value of T50 increased with the process of accelerated ageing.

DISCUSSION

The decrease in radical length, germination speed, germination and seed germination and increased time to complete 50% by accelerated aging may be a result of progressive loss of seed viability and vigor, which was evident in the results of this study (Jain et al. 2006). These observations that showed a decline in seed vigour were in accordance with earlier works on Artiplex cordobensis (Aiazzi et al. 1996) and soybean (Filho et al. 2001).

Priestley (1986) concluded that free fatty acids have a deleterious effect on membranes probably because they are detergents. Isolated plant mitochondria showed swelling and uncoupling of oxidative phosphorylation in the presence of free fatty acids (Verma et al. 2003). Sveinsdo´ttir et al. (2009) showed that the addition of free fatty acids increased fusion of plant vesicles which led to an increase in membrane leakage. Copeland and McDonald (1995) reported that continual accumulation of free fatty acids culminated in a reduction of cellular pH and was detrimental to normal cellular metabolism. Furthermore, it denatures enzymes resulting in their loss of activity.

REFERENCES

Aiazzi MT, JA Arguell, A Perezo, CA Guzman (1996) Deferioration in *Artiplex cordobensis* (Gandoger et Suckert) seed: Natural and accelerated ageing Seed Sci Technol 25: 147-155.

Copeland LO, MB McDonald (1995) Principles of Seed Science and Technology Chapaman and Hall, p115 Fifth Avenue, New York, USA.

Filho JM, ADC November, H.M.C.P Chamma (2001) Accelerated ageing and controlled deterioration seed vigour tests for soybean. Sci Agric 58:421-426.

Goel A, Goel AK, Sheoran IS (2003) Change in oxidative stress enzymes during artificial ageing in cotton (*Gossypium hirsutum* L.) seeds *Journal of Plant Physiol* 160 1093-1100.

Harrington JF (1972) Seed storage and longevity *In: Seed Biology* Kozlowski, T.T (ed) Vol 3 p 145 Academic Press, New York ISTA (1993) International rules for seed testing. *Seed Sci Technol*, (suppl) 21: 1-288.

Khan MM, MJ Iqbal, M Abbas, M Usman (2003) Effect of accelerated ageing on viability, vigour and chromosomal damage in pea (*Pisum sativum* L.) seeds *Pakistan J.* Agri Sci 40: 50-4.

Khan MM, M Qasim, MJ Iqbal, A Naeem, M Abbas (2003) Effect of seed humidification on germinability, vigour and leakage in cockscomb (*Celosia argentia var. cristata* L.). Int J Agric Biol 5: 499–503.

Jain N, Koopar R, Saxena S (2006) Effect Accelerated Ageing on Seed of Radish (*Raphanus Sativu* L.). *Asian Journal of plant* Sciences, 5 (3): 461-464.

Omidbaigi, R., (2005) Production and processing of medicinal plants Vol. 2 Astane Quds Publ. Tehran, 438p.

Maity S, Banerjee G, Roy M, Pal C, Pal B, Chakrabarti D, Bhattacharjee A (2000) Chemical induced prolongation of seed viability and stress tolerance capacity of mung bean seedlings. Seed Sci Technol 28: 155-162.

Powell AA, Yule LJ, Jing H-C, Groot SPC, Bino RJ, Pritchard HW (2000) The influence of aerated hydration seed treatment on seed longevity as assessed by the viability equations J Exp Botany 51: 2031-2043.

Priestley DA (1986) Seed aging Comstock Publishing Associates Itheca New York, pp: 137-55.

Sveinsdottir H, Yan F, Zhu Y (2009) Seed ageing-induced inhibition of germination and post-germination root growth is related to lower activity of plasma membrane H^+-ATPase in maize roots. *Journal of Plant Physiology* 166: 128-135.

Verma SS, Verma U, Tomer RPS (2003) Studies on seed quality parameters in deteriorating seeds in Brassica (Brassica campestris) Seed SciTecnol 31: 389-396.

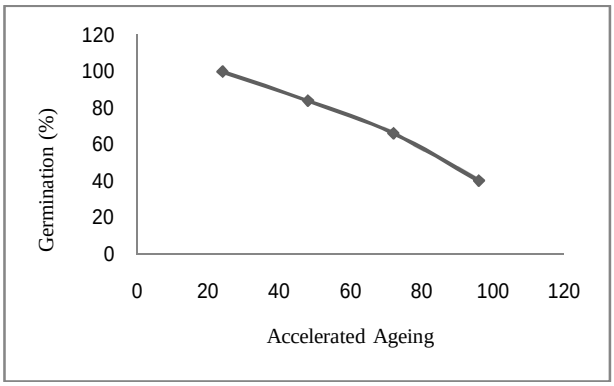

Fig1**.** Effect of ageing on germination percentage in Basil

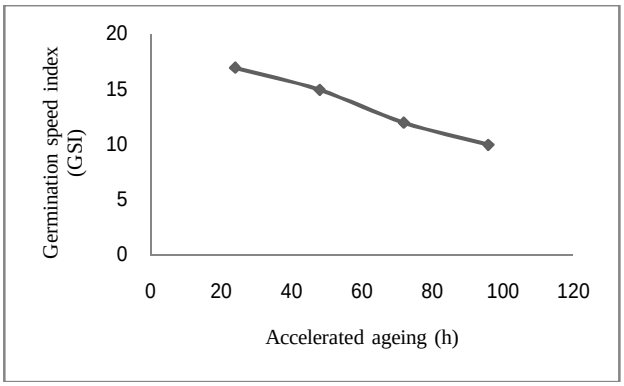

Fig2**.** Effect of ageing on GSI in Basil

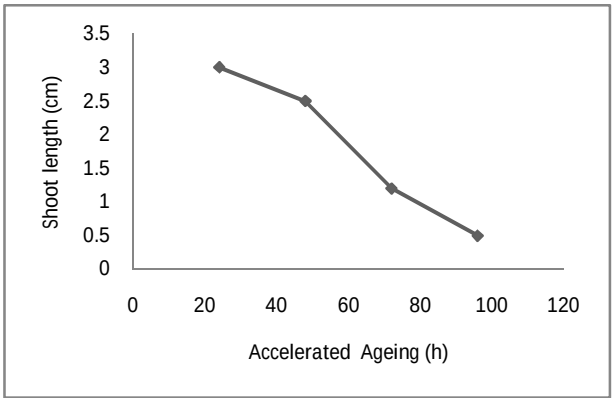

Fig3. Effect of ageing on shoot length in Basil

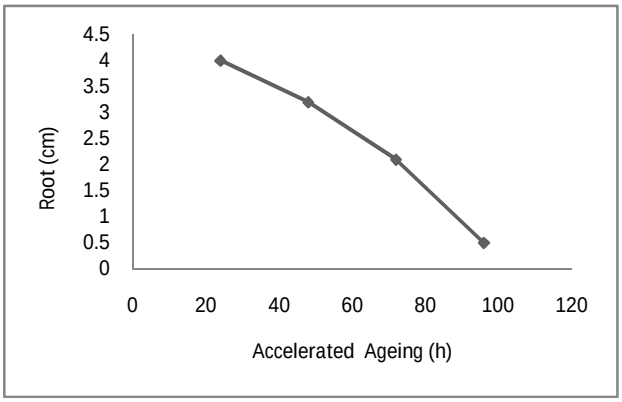

Fig4. Effect of ageing on Root length in Basil

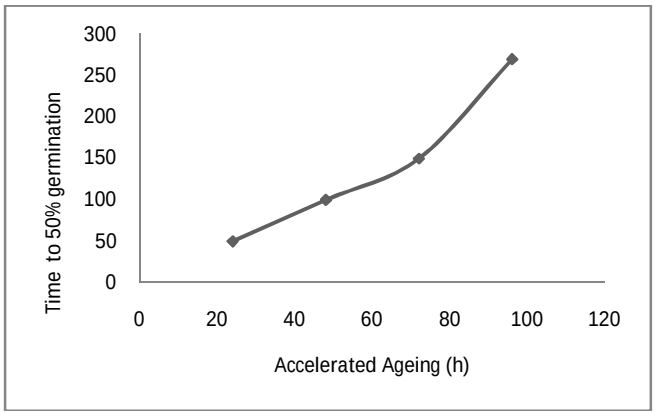

Fig5. Effect of ageing on time to 50% germination in Basil seeds