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Evaluation of seed storage potential in forty medicinal plant species

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ABSTRACT: Seeds of forty species of medicinal plants produced in the Medicinal Plant Garden of the Faculty of Agriculture; Ferdowsi University of Mashhad, Iran, were obtained to assess their potential of storage. Germination tests on four replications of 25 seeds conducted at the beginning of storage, 9 months and 12 months after storage in both controlled (stored at 4 ^{o}C) and uncontrolled conditions (room temperature). In some species germination changed significantly during storage. Dormancy breaking pre-treatments, TZ test or evaluation of empty seeds were also carried out before and after storage. A wide range of germination was observed depending on the species. Storage period had different effects on germination of different species. In 20 species seed germination had no significant changes during storage period. In 6 species germination increased after storage period. Nine species showed reduction in their germination percentage during storage and 3 species showed cyclic changes in their germination. Seeds of the species showed a different reaction to storage at controlled or uncontrolled conditions.
Keywords: germination; medicinal plants; seed storage potential; TZ test

INTRODUCTION

Germination rate is related to seed vigour. High vigour seeds have high germination rate whereas low vigour seeds show low germination rate. Frequently aged seeds have low vigour and low germination rate. Seeds deterioration leads the seeds to lose their viability and at the end to seeds death (Bewley and Black, 1994: Matthews and Khajeh-Hosseini, 2006; Matthews and Khajeh-Hosseini, 2007).

Aging, both before harvest and in storage after harvest, is the major determinant of the germination level and the physiological quality, sometimes referred as vigour, of a seed population, or seed lot; which is the term used to describe a uniform population of crop seeds that is produced, tested and sold as a unit for sowing (Matthews, 1985).

Storage effect could be a problem, especially when the seeds are kept under unfavourable conditions like high temperature or high humidity. However, even under the best storage conditions, some species will only survive a very short time. No matter how optimal storage conditions are, seeds will sooner or later die. Ageing denotes the progression of deteriorating events that take place within the seed and which ultimately lead to the death of the seed. The term 'progression' suggests that ageing takes place over a prolonged period, during which cytological and biochemical deterioration accumulate (Schmidt, 2000). Ageing does, accordingly, not include momentary loss of viability due to an instant damage, e.g. by temperature or mechanical impact.

Ageing events can be slowed down by appropriate storage. Temperature and moisture content are the two major factors determining the rate of ageing. Oxygen pressure and light may have some influence on ageing in some instances (Schmidt, 2000). Biochemical processes are generally slowed down at low temperature; the lower the temperature, the slower the process. That also includes processes leading to deterioration. Further, low temperature (< 8-10°C) inactivates most seed insects and storage fungi. Most biochemical and cytological deterioration is most likely to take place at high moisture content. Low temperatures are harmless to orthodox seeds with a low moisture content, but if moisture content is high (> 6-8%), seeds are prone to fatal damage by ice formation when exposed to sub-zero temperature (Schmidt, 2000).

The vast majority of species (orthodox) have seeds whose period of viability maybe extended by decreasing their temperature and moisture content during storage. There is however another group of species (recalcitrant), far less numerous than the first in which the general rule does not apply (Roberts, 1972).

Aged seeds with reduced vigour typically germinate slowly, produce small or abnormal seedlings, and have little resistance to stress. Much is known about the influence of storage conditions on the rate of decline of viability in stored seeds. In general, the higher temperature and the higher humidity of the storage atmosphere,