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Original Article

Standardization of Storage Conditions to Prolong Viability of Seeds of *Embelia ribes* Burm.F. - A Medicinal climbing shrub

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Abstract

Recalcitrant seeds are desiccation and chilling sensitive and are viable for a very short period. Seeds of *Embelia ribes* being recalcitrant in nature pose storage problems. The present study was taken up to identify methods to prolong seed viability of the species. Seeds were stored at four different temperatures: Ambient (25 ± 2°C), 20°C, 10°C and 0 ± 2°C and subjected to germination tests at the end of 1, 2, 3, and 4 weeks of storage. Seeds stored at 10°C retained viability for 3 weeks with 12% germination. The viability of seeds can be prolonged to 4 weeks (with 7% germination) when stored at 10°C.

Keywords: seed viability, *Embelia ribes*, climbing shrub, storage, recalcitrant.

Introduction

Seeds of several tropical plants show recalcitrant storage behaviour. The seeds do not withstand drying or are unable to survive low temperatures during storage. Thus, they are difficult to store for longer period (Ellis, 1984). The exact causes of recalcitrant seed death and its relationship with moisture content are not fully understood (Fu *et al.*, 1993). It is stated that loss of viability could be either due to the moisture content falling below a certain critical value or simply a general physiological deterioration with time (Chin *et al.*, 1984). It is also noteworthy that several pre-harvest factors determine the longevity, like cumulative effect of environment during seed maturation, harvesting, drying and the pre-storage environment, time of seed harvesting, duration of drying and the subsequent period before seed is placed in store (Hanson, 1984).

Existing thrust for germplasm conservation emphasizes quest for storage techniques, especially the short viable recalcitrant seeds. Germplasm can be conserved in several ways; however, conservation in the form of seeds has many advantages as it is simple to use, easy to handle, practicable, inexpensive and capable of maintaining genetic stability during storage (Purohit and Doijode, 1998).

The *Embelia ribes* Burm.f., is an evergreen climbing shrub belonging to the family Myrsinaceae. The species is indigenous to the evergreen rainforests of the Western Ghats of India. It comes up well at altitudes of 700 - 1200 MSL. *Embelia ribes* is an important medicinal plant the dried fruit is considered anthelmintic, astringent, carminative, alterative and stimulant. The dried fruits are used in decoction for fever, piles and for diseases of the chest and skin and also used as an ingredient of application for ringworm. The roots are used for cough and diarrhoea. The powder made from the dried bark of the root is a remedy for toothache (Anon, 1952; Ravikumar and Ved, 2000).

Seed propagation is the most common method of reproduction practiced (Purseglove, 1968). The need for prolonging the viability of *Embelia ribes* seeds gains attention on the basis of being a recalcitrant species. and for the purpose of germplasm conservation. Hence the aims of this investigation were: (1) to confirm the existence of recalcitrant storage behavior of the seeds (2) to observe if this behavior could be overcome through control of the external environment (temperature and moisture).

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Materials and Methods

Collection and processing

Fruits of *Embelia ribes* were collected from Anamalai Hills, Tamilnadu. Random sampling was followed during collection. Ripe fruits were collected during April – June, 2005. The seeds were separated by macerating the fruits by hand (Fig.1). Extracted seeds were washed in running water and surface dried at room temperature (25 ± 2 ^{o}C) under shade and used for the study.

Moisture content and germination test

Initial moisture content and germination percentage were tested as per the ISTA rules (ISTA, 1999). Germination study was conducted in the nursery on sand medium (Fig. 2). Germination was complete after 35 days of sowing.

Storage studies

Freshly collected and completely cleaned seeds were stored at four different temperatures namely ambient (25 ± 2 ^{o}C), 20 °C, 10 °C and 0 ± 2 °C in air-tight plastic jars. The viability of the seeds was tested at weekly intervals for four weeks.

Statistical analysis

All the experiments were carried out in randomized block design with four replications of fifty seeds each. The means were tested at 5 per cent level of significance (Panse and Sukhatme, 1995).

Results

The moisture content of fresh seeds was 29.70% with 52 % germination. Initiation of germination was noticed after 11 days of sowing. Effect of temperature on storability of *Embelia ribes* seeds (Table-1) reveals that under ambient (25 ± 2 ^{o}C) conditions seeds lose their viability drastically from 52% initial germination to 17% within two weeks of storage. The germination percentage diminished to 3 and 1% after three and fourth weeks of storage respectively under ambient conditions. Storing seeds at 10 and 20°C showed better results when compared to ambient storage (Table-1). *Embelia ribes* seeds stored at 10°C gave promising results up to four weeks time. A linear reduction in germination was observed over a period of four weeks. Seeds stored at 20°C remained viable for three weeks while low temperatures (0±2°C) were deleterious to the seeds.

Fig. 1: Seeds of *Embelia ribes* Burm.f.

Fig. 2: Seed Germination of *E. ribes* Burm.f.

Table-1. Effect of storage temperature on germination of *Embelia ribes* Burm.f.

Treatment	Germination (%)				
	I week	II weeks	III weeks	IV weeks	V weeks
Ambient (25 ± 2 °C)	0	17	3	1	0
20°C	0	30	10	6	0
10°C	0	33	12	7	0
0±2°C	**0**	**0**	**0**	**0**	**0**

	SEd	CD
Temp. x Storage period	4.83	9.15

Discussions

The moisture content of fresh seeds was very high (29.70%) with 52 % germination. The reports are similar to the earlier studies conducted (Shanmugavelu, 1971), wherein fresh *A. heterophyllus* seeds germination was observed to be 80% without any pretreatment. This is a characteristic feature of recalcitrant seeds, which are shed from parent plant with high moisture content ranging from 30 to 70% (Chin, 1984).

Variations in temperature affected the storability of *Embelia ribes* seeds. Ambient (25 ± 2 ^{o}C) conditions were not conducive for the storage of seeds for more than three weeks. Seeds stored better at 10 and 20 °C. Reports are available by various other researchers using different methods to control temperatures and maintain the lowest safe moisture content (LSMC) of recalcitrant of seeds. 40% germination was obtained in Mango stones after 90 days of storage at 25 ^{o}C in polyethylene bags with charcoal powder while those stored at lower temperatures (8 ^{o}C) did not germinate (Patil *et al*., 1986). In the present study, *Embelia ribes* seeds stored at 10°C gave promising results up to four weeks time. A linear reduction in germination was observed over a period of four weeks. Seeds stored at 20°C remained viable for three weeks while low temperatures (0 ± 2°C) were deleterious to the seeds. It has been reported that temperatures well above 0 °C are able to induce total loss of viability in several species like mango (5-10°C) (Chacko and Singh, 1971), mangosteen (10°C) (Winters and Rodriquez-Colon, 1953) and rambutan (6°C) (Chin, 1975). From the observations it could be concluded that *Embelia ribes* seeds could not withstand freezing temperatures suggestive of their recalcitrant nature.

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