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STORAGE OF *AEGLE MARMELOS* (L) CORREA. SEEDS

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ABSTRACT

The present paper deals with the storage of freshly collected seeds of *Aegle marmelos* (L) correa. The effect of two storage conditions *viz;* open and closed under five temperature regimes -10^0,0^0, 10^0, 15^0C and ambient temperature were observed. The initial germination and moisture content of seeds were 62.50% and 15.1% respectively.

Among all the storage conditions, seeds stored at room temperature showed rapid decline of moisture content. Maximum seed moisture retention was found with storage in open and closed conditions at 10ºC, after 32 months of storage, showed maximum germination of 32.25% and 39.50% respectively. The result envisaged that the seeds of the species can be stored at low temperature with seed moisture content below 10% for longer period. Further the results of the present study clearly indicate that the seeds of *Aegle marmelos* exhibit the intermediate storage physiology.

Figures : 03 References : 30 Table : 01

KEY WORDS : *Aegle marmelos*, Intermediate seeds, Moisture content, Storage, Temperature

Introduction

Seeds with orthodox and recalcitrant storage were first introduced in 1973 and described the storage behavior of seeds[24]. Orthodox seeds are those which can be safely dried to low moisture content and can be stored at low temperature for a long period. On the other hand recalcitrant seeds cannot be dried safely below a critical moisture content and loses their viability at low temperature. A third category intermediate between orthodox and recalcitrant has also been recognized, these seeds tolerate desiccation to 7-10% moisture content but longevity in dry storage is decreased by reduction in temperature below 10ºC[7].

Aegle marmelos (L) Correa. commonly known as 'Bael' belongs to family Rutaceae is a moderate sized deciduous, aromatic tree which is widely distributed throughout the Indian subcontinent along Srilanka, Burma and Thailand.[8,30]Leaves are used as offering to Lord Shiva .[21] In addition to being regarded as medicinal, good diatery supplement and some bioactive compounds have been isolated from these species.[1,2,9,18,19,22] It is also drought and frost resistant species and suitable for plantation purposes in drier areas.

Due to unsustainable harvesting,this species is becoming locally endangered[23] It is also reported that the seeds of *A.marmelos* are generally referred as short lived and recalcitrant[5,15] and has been included in intermediate storage category[20]. More regeneration, cultivation and conservation programmes are required. *Ex–situ* conservation by seeds can be used to support plant production and recovery programmes. However, banking of seeds under conventional storage conditions is not straight forward for many species.[3,17]

The present study investigated the longevity of *A. marmelos* seed under different storage conditions and temperature regimes. The aim was to identify optimum conditions for their artificial regeneration and to explore possibilities for their

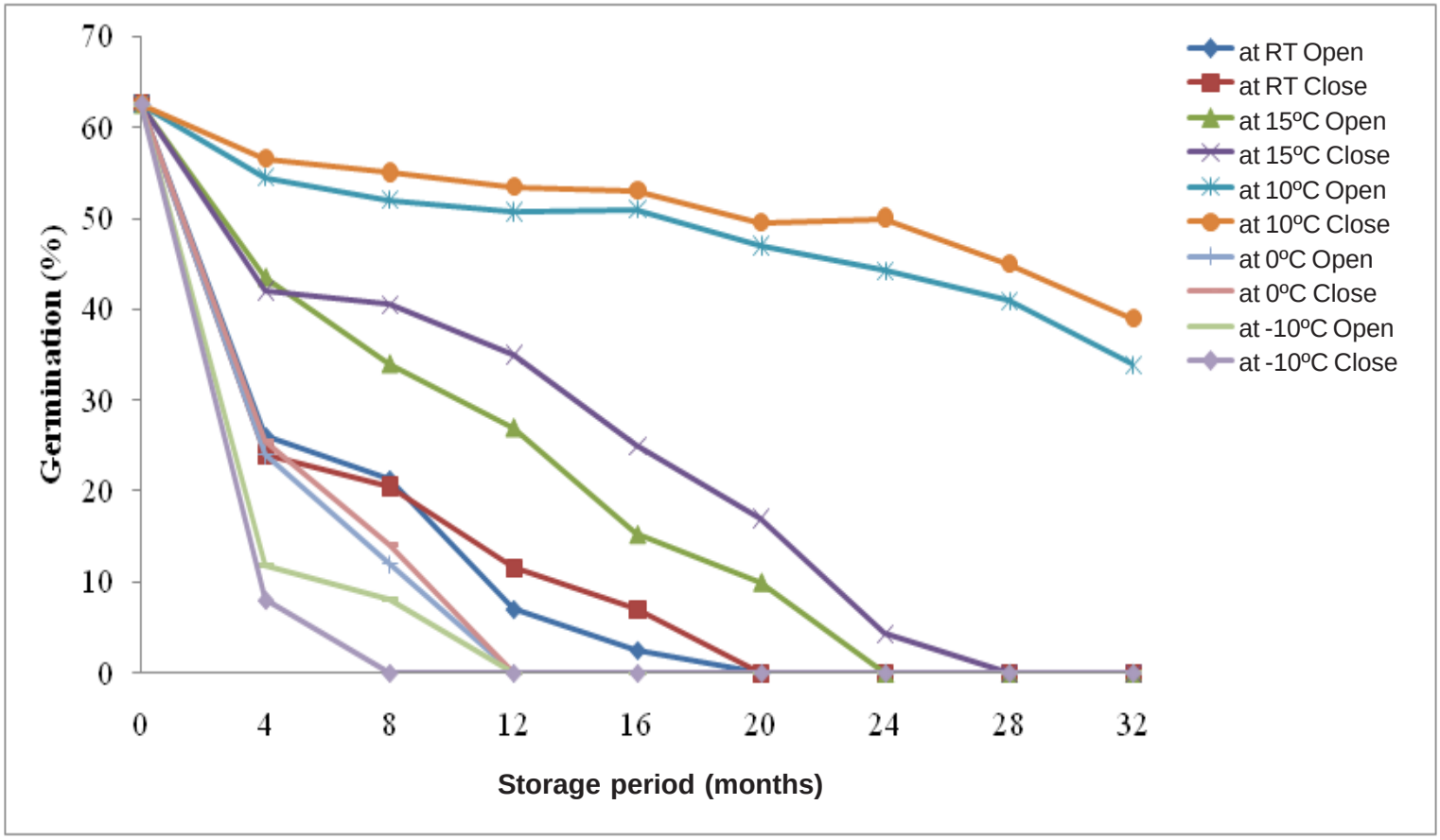

Fig. 1 : The relationship between germination percentage and storage period for seeds of *Aegle marmelos* at different temperatures in open and closed containers.

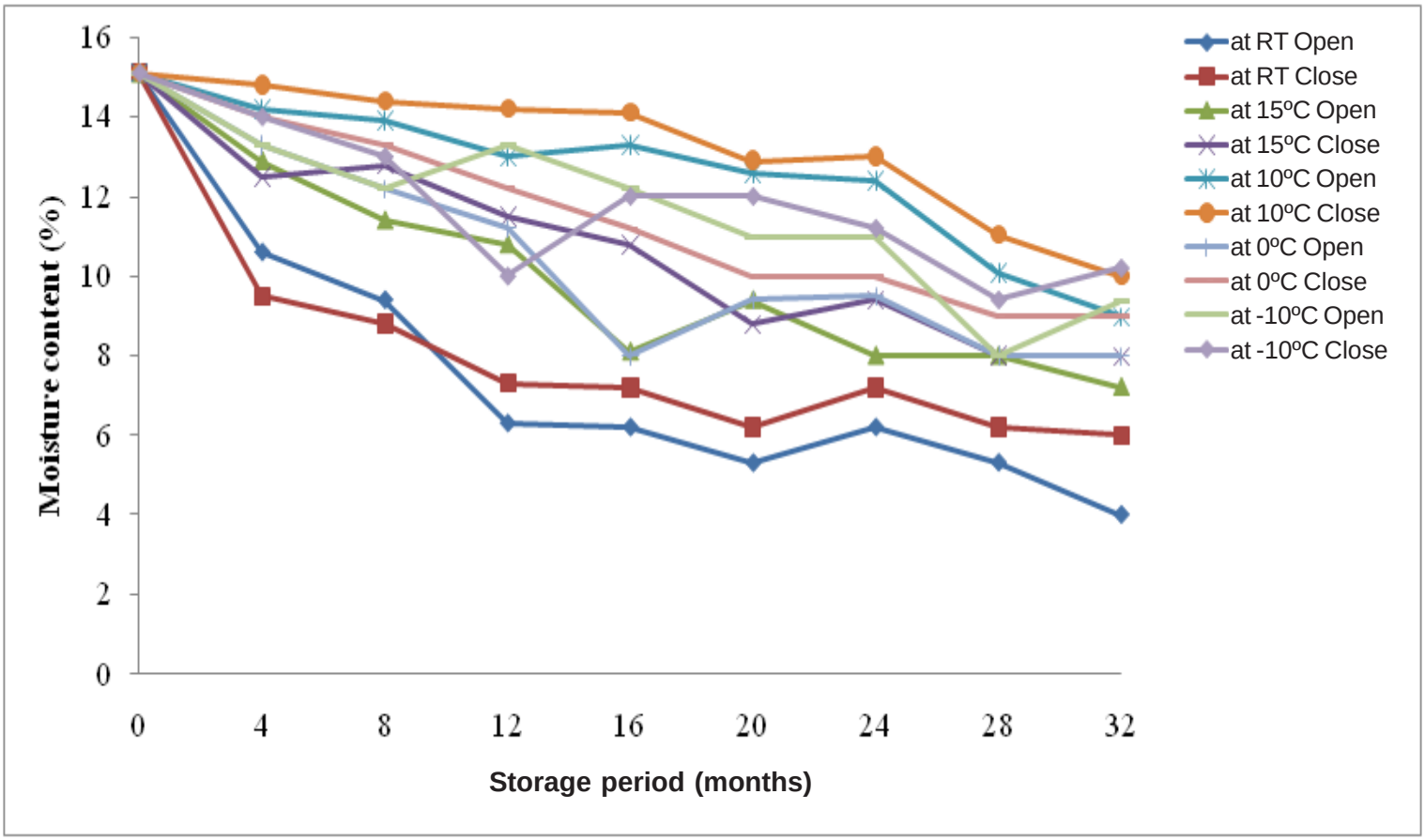

Fig. 2 : Moisture content percentage of *Aegle marmelos* seeds after various periods of storage at different temperatures in open and closed containers.

ex- situ conservation.

Materials and Methods

Collection of seeds

Mature fruits of *A. marmelos* collected from tropical dry deciduous forest from Manpani district Sagar(M.P) India situated between 23^0-472 N Latitude and 76p - 462 E Longitude during the month of June. Tree with sound physiognomy were marked and fruits were manually collected. Immediately after collection, fruits were transported in gunny bags within 24 hours to the laboratory. Seeds were extracted by breaking the shell and washed in water for 32 hours to remove the pulp and extracted seeds were then airdried on filter paper under fan at 25ºC for 24 hours.

Moisture Content

Seeds moisture content determined soon after extraction of seeds in laboratory. Determination was carried out in duplicate independently drawn samples (50 seeds) following the rules of ISTA.[12,13] The weight was determined by electronic balance. Seeds were ground later by grinding meal in a small fragment and dried in covered metal containers in an oven at constant temperature of103^0C for 17 hours, cooled in desiccators and reweighed.

Seed Storage Experiment

Seeds were stored in open and closed glass bottle at room temperatures (23 to 35°C), 15, 10, 0 and -10ºC up to 32 months. Observations were taken at an interval of four months.

Assessment of Viability and Germination

Viability was determined by taking four replicates of 100 seeds sectioned longitudinally imbibing in 1% 2,3,5- triphenyle tetrazolium chloride solution for 8 to 10 hours in the dark for evaluation of staining pattern[13,16]. Simultaneously, surface sterilized seeds(4×100) were placed on moistened sterilized filter paper(Whatman No.1) in seed germination incubator at alternating temperature 20-30ºC for germination. The criteria of germination was normal seedling development and observations were made at an interval of 24 hours upto 28 days.

Statistical Analysis

Factorial analysis for interaction of different storage content conditions, temperature of storage and storage period on seed germination was followed.[18]

Result and Discussion

Results of the present study are based on the freshly collected *A. marmelos* seeds with 15.1% moisture content having 62.50% germination. Seeds showed 11.25% and 8.0% germination in open and closed condition at -10ºC temperature after four months of storage irrespective of storage condition (Fig.-1). Seeds exhibited gradual loss of moisture content under all storage condition with maximum (4.02% after 32 months) at room temperature in open storage (Fig-2). Simultaneously the viability as determined by tetrazolium chloride declined as percentage germination declined (Fig - 3).

Seed with 62.5% germination showed rapid loss of germination during storage at room temperature. Complete loss of germination was exhibited at room temperature after 20 months of storage. Seed did not survive for long at 0ºC and -10ºC temperature, However, germination varied under different storage. After 8 months of storage at 0^0C and -10^0C temperature, the germination was less than 14% and moisture content did not drop much and remained above 8.02%. The seed did not survive at -10ºC in closed condition after 8 months of storage. Successful storage of seeds was found at 10ºC under closed conditions where germination was 39.5%. Similarly at 10ºC under open storage conditions seed showed germination upto 34.5%. Surprisingly seed moisture content did not decline much except at room temperature.

Results of analysis of variance of duration, temperature and storage conditions and their interactions reveal significant effects of temperature. The interaction of temperatures and storage conditions was also found significant at ($p<0.05$). However, there was no significant effect of these parameters with storage duration and conditions (Table 1).

The seeds of *A. marmelos* are better stored at an ambient (25 to 28ºC) and at 10ºC to 12ºC temperature showed higher germination by 50% and 45% respectively for 12 months of storage.[28] Storage under low temperature (0 to -5ºC) was found to be deleterious. Similar results have been found in the present study also. However, another study showed that the seeds of *A.marmelos* stored at moisture content (18.9, 13.8, 6.3 and 4.47%) and at temperature range of 30, 20, 10, 0, -20 and -19.6ºC for 15 days, it was observed that high moisture content 18.9% and high temperature 30ºC

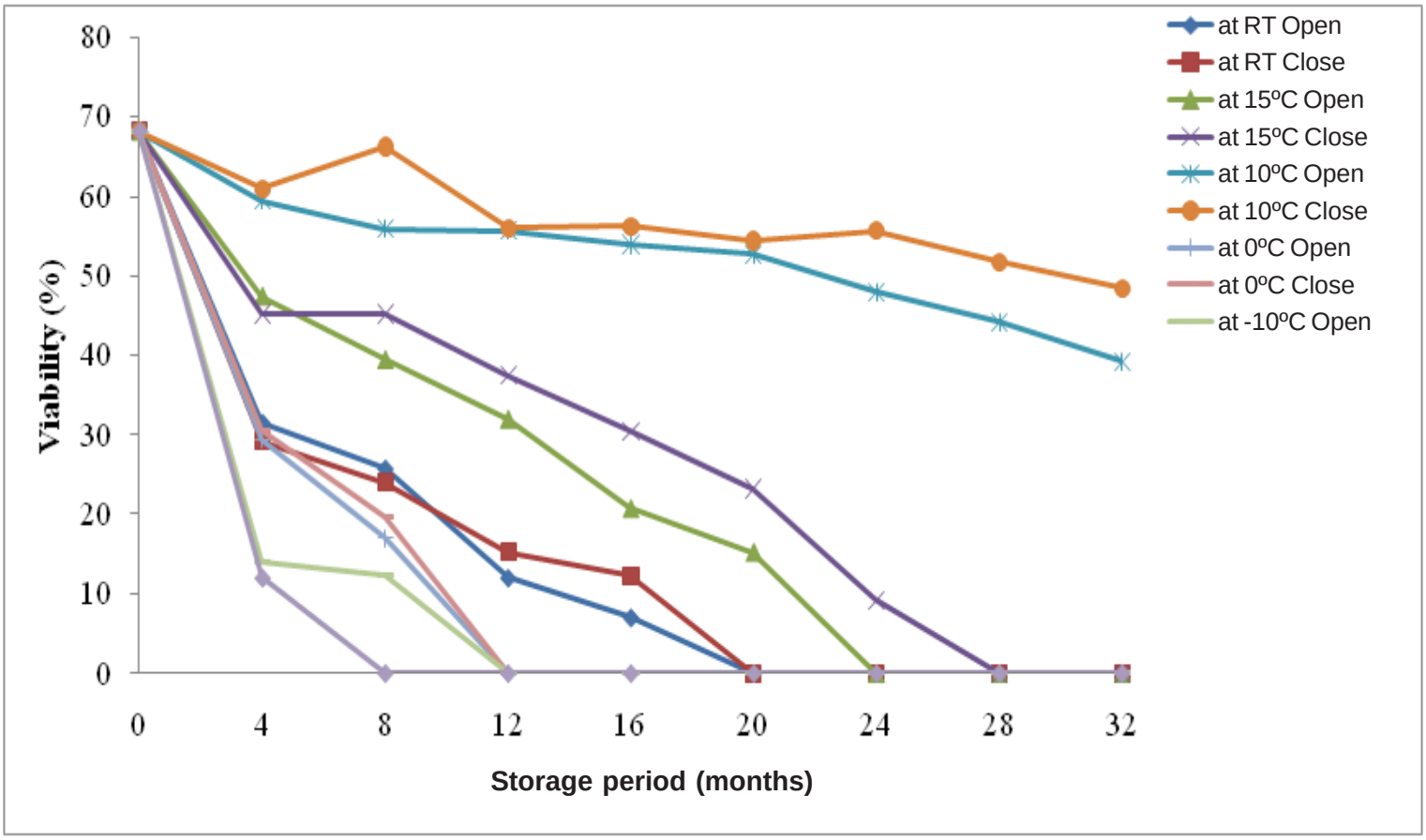

Fig. 3 : The relationship between viability as determined by Tetrazolium chloride staining and storage period for seeds of *Aegle marmelos* at different temperatures in open and closed containers.

TABLE-1 : Analysis of variance for seed germination in intermediate *Aegle marmelos* stored at different temperature duration and storage conditions.

Item		Sum of squares	Degree of freedom	Mean square	Variance ratio
Main effects	Storage months (M)	5267.3	7	752.47	0.7NS
	Temperature (T)	23381.44	4	5845.36	5.2**
	Storage conditions (C)	42.41	1	42.41	0.0NS
First order interaction	MT	30926.4	28	1104.51	1.0NS
	MC	5341.58	7	763.08	0.7NS
	TC	23509.88	4	5877.47	5.3**
Second order interaction	MTC	31179.68	28	1113.56	--
	(Error)				
	Total	119648.69	79	--	--

(Significance : ** 0.01, NS – not significant.)

showed maximum germination within short time period.[27] In the present study results envisaged that there was gradual decrease in seed germination with increasing storage time. However, loss of germination was rapid at room temperature, 0ºC and -10ºC . A slow decline in seed germination was observed at 15ºC. Seed retained maximum germination at 10ºC temperature in closed conditions. Rapid loss of germination at ºC and -10ºC may be attributed that the intermediate seeds are chilling sensitive, particularly in tropical region[4,11]. However, their behavior is different from recalcitrant and orthodox seeds[24].

A group of species which can be dried to a moisture content low enough to qualify at orthodox, but is sensitive to low temperature typical for orthodox seed has been termed intermediate[7]. Such seeds are able to tolerate desiccation to moisture content in equilibrium with about 40-50% relative humidity *i.e.* about 7- 10% moisture content depending upon species but further drying may result in more rapid loss in viability of stored seed and sometimes immediate damage occurs on further desiccation.[7,10] Our results confirm the earlier reports that *A.marmelos* produce intermediate seeds .[20]Seedsof*A.marmelos* often have relative high levels of desiccation tolerance compared to other non –orthodox seeds, but do not have the very high desiccation tolerances of orthodox seeds. In contrast with orthodox seeds intermediate seeds showed decreased seed longevity at low moisture content as storage temperature are decreased .[6,7] The present study clearly indicated that the storage behavior of seeds *A.marmelos* is intermediate because seed could not survive at freezing temperature *i.e* 0ºC and -10ºC temperature. Such conditions has also been observed by various workers[14,20,25,26,29].

It is evident from the results that seeds with unaltered moisture content and under slow desiccation can be stored for comparatively longer period of time than those stored rapid desiccation.

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