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EFFECTS OF STORAGE PERIOD ON LONGEVITY OF *MURRAYA KOENIGII* (L) SPREGEL

V.K. Yadav* and Sonam Sharma

Department of Botany, D.V. College, Orai - 285 001 (Uttar Pradesh), India.
*Corresponding author E-mail : vkyadavdvc@gmail.com
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ABSTRACT

Storage studies to prolong the viability of *Murraya koenigii* (L) Spregel seeds were conducted. The seed possesses a very short life and displays recalcitrant behavior which is desiccation and freezing sensitive. The effect of two storage conditions *viz.* open and closed and four temperature regime of 0^0C, 10, 15 and ambient temperature was observed on freshly collected seeds. The initial moisture content and germination was 47.05% and 100%, respectively. Maximum germination was found at 15 in open and closed conditions are 35% and 56%, respectively after 50 days storage.

Key words : Recalcitrant, Storage physiology, Moisture content, *Murraya koenigii.*

Introduction

Murraya koenigii the curry leaf plant is a popular plant species for its medicinal values and its use in domestic use in the kitchen. This being a recalcitrant plant the seeds have a very short life span under very low temperature. Due to its importance in Ayurveda and domestic use extensive studies are under way to somehow enhance its seed Lifespan to propagate it frequently in nature. Seeds are the primary propagules for regeneration and reintroduction of plant species in ecological restoration to mitigate environmental degradation and species extinction (Broadhurt *et al*., 2008; Leon-Lobs *et al*., 2012; Elzenger and Bekker, 2017; Mithun *et al*., 2021). Roberts (1973) separated seeds into broad categories orthodox seeds, which cannot be dried to about 5% moisture content without damage and can be stored at low temperature and those which cannot be dried below relatively high moisture content without subcellular damage and cannot be stored for a long period at low temperature with retention of viability as recalcitrant. Recalcitrant seeds impose serious storage problems due to their desiccation and chilling sensitivity (Chin and Robers, 1980).

Murraya koenigii (L) Sprengal, is an important multipurpose evergreen small tree commonly known as curry leaves belonging to the family Rutaceae. The leaves are used as herbs in Ayurvedic and Siddha medicine in which they are believed to possess anti disease properties (Singh *et al*., 2014). The leaves, bark and roots contain glycoside called "Koenin'' which helps for easy digestion in the human digestive system (Raja *et al*., 2001). The seeds of curry leaves cannot resists the effect of drying or exposure to temperature less than 10. Thus, they cannot be stored for a long period like orthodox seeds because they can lose their viability and are considered as recalcitrant (Sivasubramaniam and Selvani, 2012; Arulmoorthy *et al*., 2022).

The present paper deals with the longevity of *M.koenigii* seeds under different storage conditions and temperature regime. The aim was to identify optimum storage conditions for retaining seed viability and longevity, which would be helpful for its conservation.

Materials and Methods

Plant material

Mature fruits of *M. koenigii* were collected in Orai of district Jalaun (U.P.), India located between 25^0 59' N latitude and 79^0 28' longitude during the month of July 2022. The fruits from all the plants were pooled into a single lot and epicarps removed. Extracted seeds were then air dried on filling paper under fan at 322 for 08 hours.

Seed moisture content

Seed moisture content was determined as per the recommendations by ISTA (1985) after drawing two independent samples containing 25 seeds each. Seeds dried in covered metal containers in oven at constant temperature of 103 ± 2^0 for 17 hours and cooled in a desiccator. Percentage moisture content was calculated on a fresh weight basis.

Germination

Surface sterilized seeds (25×4) were placed on moistened sterilized filter paper sheets in seed germination incubator at 27 ± 2^0. Emergence of radicals was considered as germination and observation were made at an interval of 24 hours. Seeds showing radical extension of 2 mm were considered to have germinated.

Storage experiment

Fresh seeds were stored in open and closed glass bottles at room temperature (24 to 41^0C), 15^0C, 10^0C and 0^0C up to 50 days. Observations were taken at an interval of ten days.

Statistical analysis

Factorial analysis for interaction of different storage conditions, temperature of storage and storage period on seed germination was followed after Mather (1966).

Results

Result of the present study is based on the freshly collected *M. koenigii* seed with 47.05% moisture content having 100% germination. Germination of seed was observed up to a period of 50 days under storage condition. In general, germination and moisture content of seeds decreased with the increasing days of storage. Seed storage was done by taking two variables into consideration *i.e.*, storage temperature and condition of storage. Seeds lost their viability at ambient temperature after 20 days irrespective of storage conditions (Table 1).

Seed exhibited gradual loss of moisture content under all storage conditions with maximum (9.8% after 50 days) at room temperature in open storage (Table 2). Seed moisture content did not decline much except at ambient temperature and remained above 31% under other storage conditions. Seeds did not withstand chilling below 10^0C. However, germination varied under different storage. Successful storage of seeds were found under at 15 under open and closed conditions where the viability was 35% and 56%, respectively after 50 days of storage. More than 70% loss in viability is exhibited in seeds stored at 10^0C beyond 20 days of storage period. Surprisingly, seed moisture content did not decline much except at room temperature.

Results of the analysis of variance for temperature, duration and storage condition and their interaction reveal significant effects of temperature. The interaction of temperature and condition was also found significant ($p < 0.001$). However, there was no significant effect of these parameters with storage duration.

Discussion

Seeds of *M. koenigii* are recalcitrant in nature and lose viability within a short span of fourteen days (Arulmoorthy *et al.*, 2019). The importance of moisture content alone in maintaining viability becomes fairly evident in seed stored at ambient room temperature. Thus at ambient room temperature seeds dehydrated significantly to maintain this moisture content. A hermetically sealed container could be an alternative and cheap technology

Table 1 : Germination (%) of *Murraya koenigii* seeds at different temperature and storage condition.

Storage condition	Temperature ^{0}C	Storage period (days)					
		0	**10**	**20**	**30**	**40**	**50**
Open Container	RT	100	21	00	00	00	00
	15	100	80	60	56	45	35
	10	100	40	14	00	00	00
	0	100	00	00	00	00	00
Closed Container	RT	100	25	00	00	00	00
	15	100	90	80	74	66	56
	10	100	45	22	00	00	00
	0	100	00	00	00	00	00

RT = Room Temperature.

Table 2 : Variation in Moisture content (%) of *Murraya koenigii* seeds at different temperature and storage condition.

Storage condition	Temperature ^{0}C	Storage period (days)					
		0	**10**	**20**	**30**	**40**	**50**
Open Container	RT	47.05	24	20.33	14.81	13.2	9.80
	15	47.05	42.85	35.71	33.3	32.75	30.5
	10	47.05	43.85	43.13	39.28	38	32.69
	0	47.05	43.33	40	39.28	35.71	31.37
Closed Container	RT	47.05	28.84	26.78	21.78	19.23	11.00
	15	47.05	44.44	40.38	33.88	34.54	31.37
	10	47.05	42	41.17	40.17	37.03	33.3
	0	47.05	42.59	40.07	39.59	33.33	32.14

RT = Room Temperature.

Table 3 : Analysis of variance for seed germination in recalcitrant *Murraya koenigii* stored at different temperature duration and storage conditions.

	Sources	**Sum of squares**	**Degree of freedom**	**Sum of mean square**	**Variance of square**	**Probability**
Main effects	Storage Days (D)	3505.25	4	876.31	0.3196	NS
	Storage Temperature (T)	266181	3	887.27	32.36	×××
	Storage Conditions (C)	280.9	1	280.9	0.10	NS
First order interaction	D×T	32008.5	12	2667.37	0.97	NS
	D×C	3794	4	948.5	0.3460	NS
	T×C	274287	3	91429	33.35	×××
Second order interaction	D×T×C	32893.5	12	2741.12	-	
	Total	612950.15	39	-	-	

for at least for the short term storage (Parthyal *et al.*, 2003). Maintenance of appropriate storage temperature is the only way to contain all three types of damage viz. mechanical damage, metabolism induced damage and macromolecular denaturation during storage of recalcitrant seeds (Umarani *et al.*, 2015).

The result envisaged that *M. koenigii* seed showed that compared to ambient temperature, lower temperature helps to retain seed viability potential. But below a certain limit, low temperatures have been reported to cause detrimental effects on seed viability because of its recalcitrant nature (Sivasubramaniam and Selvarani, 2012). Seeds of recalcitrant species have been found to lose viability completely above freezing temperature *e.g.*, *Dipterocarpus* at <14^{0}C, *Cacao* at <10^{0}C and *Mangifera indica* at <3-6^{0}C (King and Roberts, 1979). Chilling temperatures are known to adversely affect the viability of seeds of tropical origin (Chin *et al.*, 1989; Bedi and Basra, 1992; Yadav and Khare, 2010). In the present study, curry leaf seed can not resist the effects of drying or exposure to temperature less than 10^{0}C, thus they can not be stored for long periods like orthodox seeds because they can lose their viability.

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

Conclusion

Seeds of *M. koenigii* are recalcitrant in nature and lose viability with a short span in room temperatre open conditions. Hence, their storage is problematic for conservation and large scale planting. Here, we have standardized a conventional technique whereby the viability of seeds can be extended for 50 days without much expenses by storing the seeds in closed containers at 15^{0}C. Further, refinement of storage methods is in progress to extend the viability of the medicinally important species.

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