



SEED GERMINATION STUDIES ON *LOPHOPETALUM WIGHTIANUM* ARN. - AN EVERGREEN SPECIES OF THE WESTERN GHATS.

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ABSTRACT: The germination and storage behavior of *Lophopetalum wightianum* Arn. has been studied. It is an invariable component of *Myristica* swamps and a riparian species. Experiments on germination, viability, germination speed, germination energy cumulative daily total number of seeds were carried out. Initial moisture content (MC) was 15.7 ± 0.3 . Germination was initiated from the second day and germination percentage was highest in the seeds kept on first day (84.37 ± 2.5). Germination percentage gradually decreased with increase in days. After 30 days the moisture content was 9.21 ± 0 and there was no germination.

Key Words: *Lophopetalum wightianum* Arn. Seeds, moisture content, multiple shoots, seed storage, viability

INTRODUCTION

Lophopetalum Wight. has 18 species distributed from indomalayan to tropical Australia.[1]. *Lophopetalum wightianum* Arn. is an important riparian species in the evergreen forests of the Western Ghats at low elevations and extending up to 3,000 ft. from South Kanara southwards, and in central Sahyadris. Capsule is elongated, 3-4 angled; seeds many with white papery wings [2]. It's an invariable component of the endangered *Myristica* swamp ecosystem.[3]. It is one of the nesting trees of the near threatened Great Hornbill [4] and is a common fodder tree of Hanuman Langur and Bonnet Macaque [5]. Here, seed germination allied studies have been undertaken to understand the regeneration potential of the species.

MATERIALS AND METHODS

Seeds were collected from the *Myristica* Swamp forest of Charmady range forests of the Western Ghats in Dakshina Kannada District, Karnataka - India in the month of April 2013. Immediately after collection, healthy seeds without any apparent physical damage were selected for the experiments. Germination was carried out in 6 replicates containing 16 seeds in sand bed. To check the viability we have sown the seeds on 1st day, 5th, 10th, 20th and on 30th day after collection.

Germination test

Germination percentage is determined by using sand bed method [6]. The seeds were pressed onto the surface of sand with a distance of 4 cm on the sand bed [7] and watered daily. Germination was scored on the emergence of radical (2 cm in length) and results were expressed as percentage of seeds germinated.

Moisture content

Moisture content (MC) was determined following low constant oven drying method [6]. Randomly selected seeds was cut into pieces of definite quantity (5g). Then dried at 103°C for 17 hours in hot air oven. This experiment was done in triplicate. Seed MC was calculated on a fresh mass basis.

$$\text{Moisture percentage} = \frac{M_2 - M_3}{M_2 - M_1} \times 100$$

Where,

M_1 - is the weight of petriplates; M_2 - is the weight of petriplates with seeds before drying; M_3 - is the weight of petriplates with seeds after drying.

Seed Viability

Randomly selected seeds were dissected and the embryo containing portion treated with 1% 2, 3, 5 - triphenyl tetrazolium chloride solution (TZ) for 17 hours. [7].

Cumulative daily total number of germination of seeds (CDTG)

Cumulative daily total number of germination of seeds was calculated by counting the number of seeds germinated per day

Germination Speed Index (GSI)

Germination speed index was estimated using the formula given by Maguire [8].

$$\text{GSI} = \frac{G_1}{T_1} + \frac{G_2}{T_2} + \frac{G_3}{T_3} + \dots + \frac{G_n}{T_n}$$

Where G_1 - Number of seeds germinated on first day
 G_2 - Number of seeds germinated on second day
 G_3 - Number of seeds germinated on third day

T_1 - Day one; T_2 - Day two; T - Day three etc.

Germination Energy (G.E.)

It is the number of days required to attain 50% of germination [8].

Germination percent

It is the ratio to number of seeds germinated to the number of seeds kept for germination

$$\text{Germination per cent (\%)} = \frac{\text{No. of seeds germinated}}{\text{No. of seeds kept for germination}} \times 100$$

Vigour Index

Vigour Index = (ASL + ARL) × % of germination

Where, ASL= Average Shoot Length, ARL = Average Root Length.

Statistical Analysis

Data was subjected to analysis of variance (ANOVA) and Pearson's correlation in SPSS Version 17.0

RESULTS AND DISCUSSIONS

Survival and establishment of seeds of *Lophopetalum wightianum* is very poor [10]. But this is one of the fastest growing evergreen trees. Seed dispersal starts in the month of April during the dry season and is complete by the first week of June [11]. The seeds do not exhibit any dormancy [12]. Germination is hypogeal. This type of germination is most prevalent in species associated with seasonally flooded habitats [13]. Earlier studies reported that seeds start germinating only after 10-20 days [10]. But in our study, in all the replicates, no seed is germinated beyond 6th day (Table-1) of sowing. In fact, germination was initiated on the second day in many seeds indicating very high seed vigour. [10] observed a maximum germination of 40%; this study indicates a maximum germination percentage of 84.37 ± 2.5 and minimum of 43.75 ± 11 (Table-2). The vigour index of seeds were given in (Table -2) and similar trend with germination percentage.

The moisture content of the seeds, immediately after four hours of collection was 15.7 ± 0.3 % and there was a significant decrease ($p < 0.05$) in the moisture content on the 5th day (10.39 ± 2.1 %). Similar results were obtained in the seeds of *Vitex altissima* L. [14]. A continued gradual decrease in moisture content was observed up to 20th day and on the 30th day the MC reached to 9.21 ± 0.43 % and germination was stopped. Ganesh [15] also observed that there is a negative correlation between MC and germination percentage. (Fig-2). Moisture content also relates with the cumulative total number of seeds germinated. In the initial days (1-20th) germination is higher. Delayed germination was observed in the seeds sown after 20th days of storage. These results indicate that decrease in the germination is due to the loss moisture and seed vigour [16]. Shedge [17] reported decreased germination energy in the seeds of *Jatropha curcas* L. with the increase in storage days [17]. The present study also supports these observations. Pearson's Correlation Coefficient between different parameters of germination is given in (Table-3) there is a significantly positive correlation between the germination percent and germination speed; germination percentage and germination energy and also positive correlation is observed between germination speed and germination energy.

Formation of Multiple shoots

Formation of multiple shoots is the occurrence of more than one shoot in a seed with only one root which could be easily noted during germination. Two or three shoots per seed were seen in this study (Fig-4G-H). Multiple shoots were reported in species like *Garcinia mangostana* L. [18].

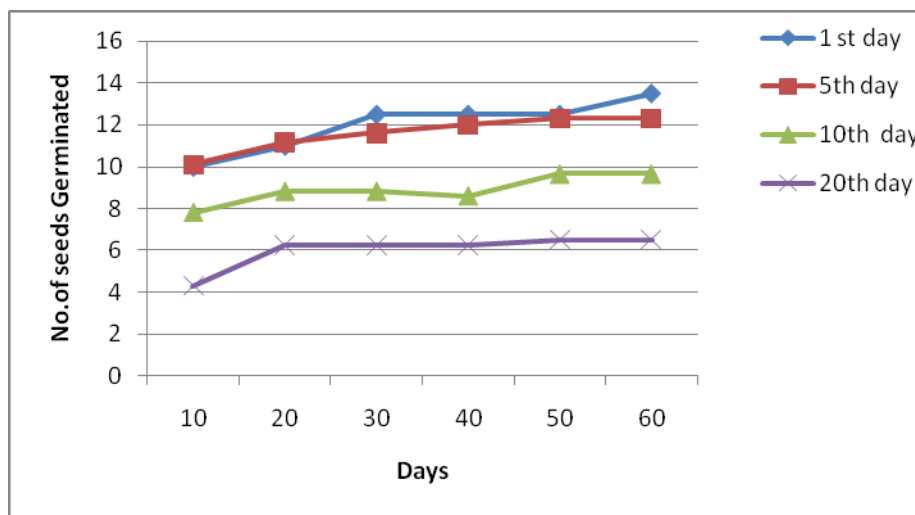


Fig 1. The cumulative daily total number of seeds germinated (CDTG) up to 60 days is given in the interval of 10 days.

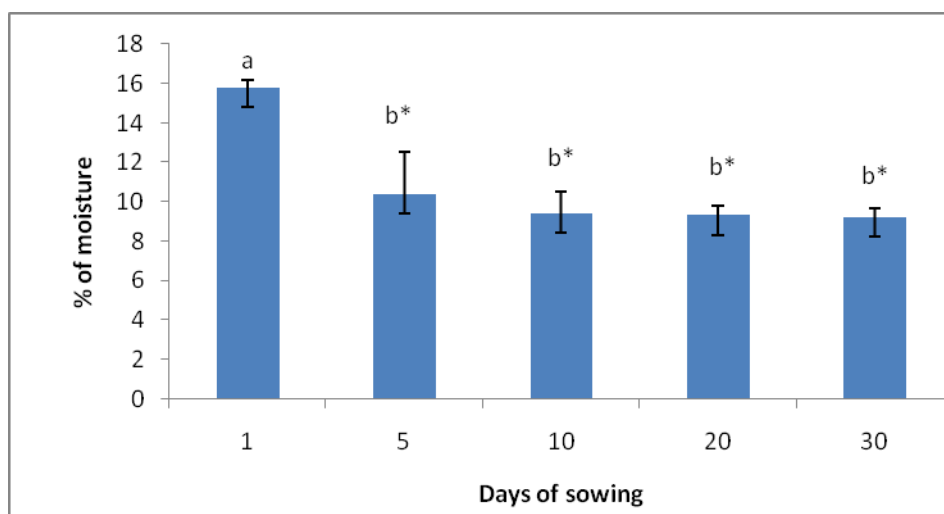


Fig 2. Moisture content Vs days ($p < 0.05$)

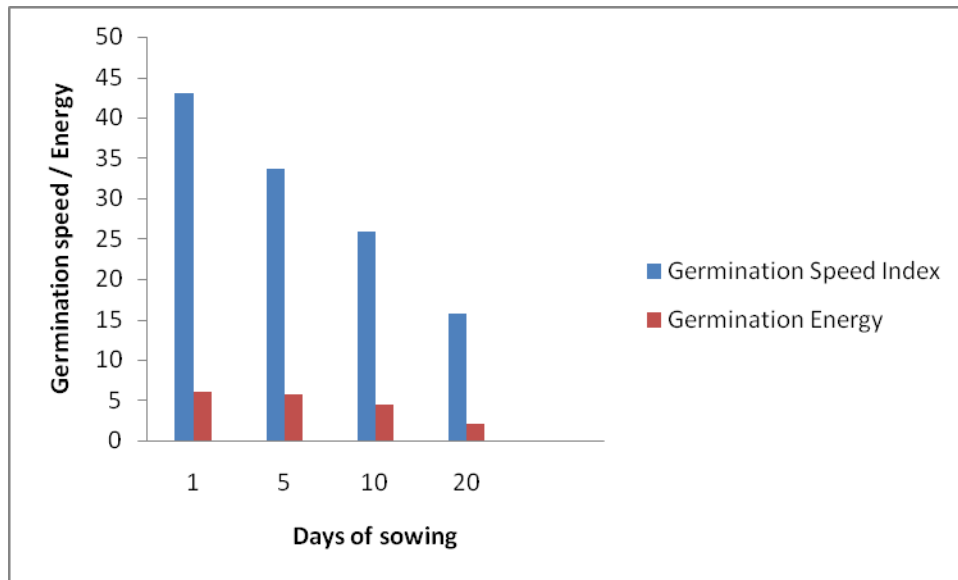


Fig 3. Germination Speed Index and Germination Energy Vs days

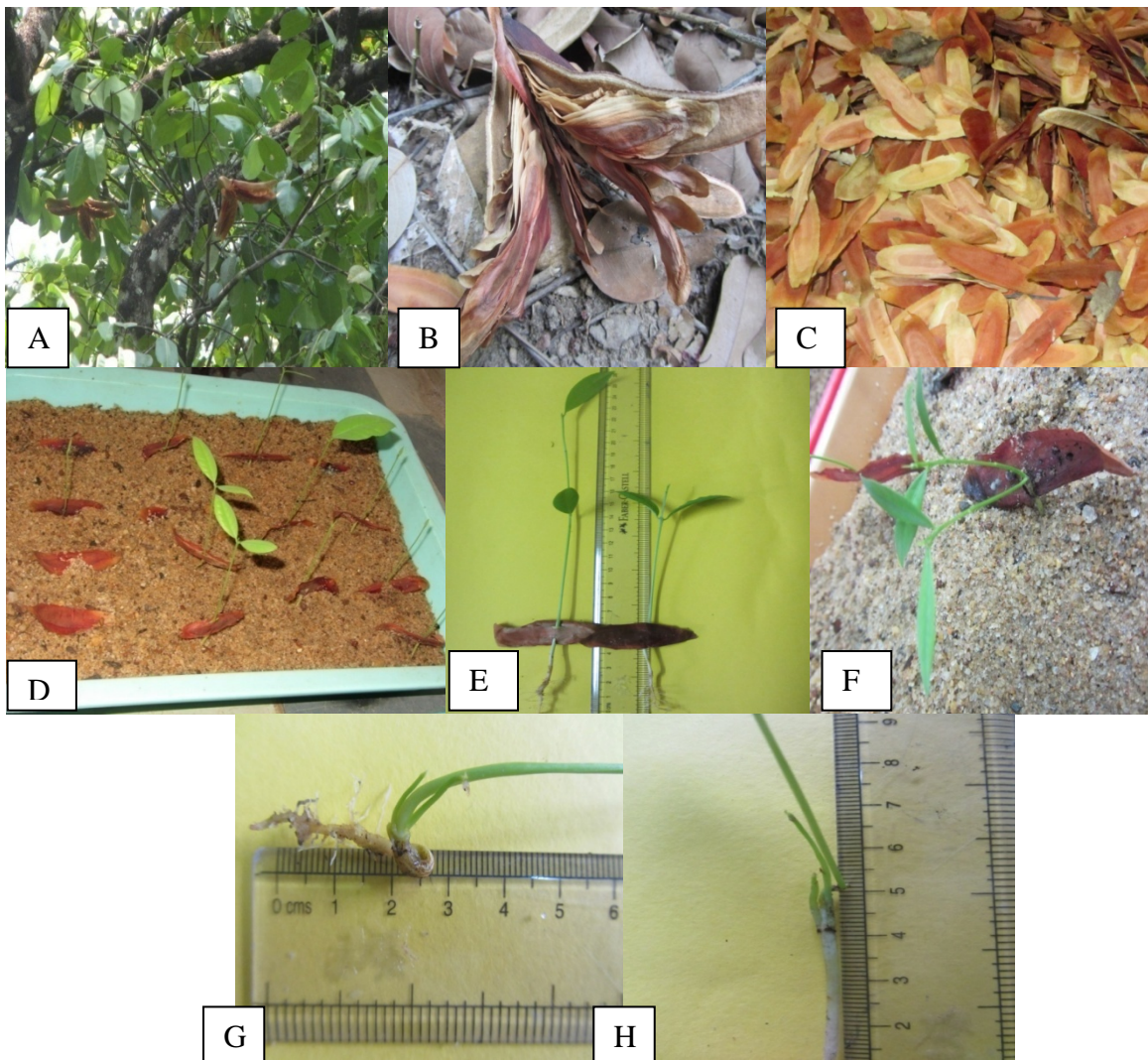


Fig 4. A. habit of *Lophopetalum wightianum* Arn., B. fruit, C. seeds, D. germinated of the seeds, E. Normal seedlings, F & H. emergence of Multiple shoots during germination.

Table1. Beginning of germination and leaf occurrence in *Lophopetalum wightianum* seeds.

Observations	Germination initiated	First leaf occurred
	2-6days (within a week)	19-25 days(3weeks – 4 weeks)

Table 2. Percentage Germination and Vigour Index of *Lophopetalum wightianum*

Days of sowing the seed	Germination Percentage	Vigour Index
0	84.37±2.5	1461.06
5	68.75±13	1261.48
10	50±19	750.99
20	43.75±11	681.95

Table 3. Pearson's Correlation: Pearson's Correlation Coefficient between Germination, Moisture Content, Germination Speed and Germination Energy

Germination		Moisture	GS
Germination	1		
Moisture	0.820	1	
GS	0.978**	0.762	1
GE	0.901*	0.626	0.966**

Correlations

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

CONCLUSION

On the basis of the results obtained *Lophopetalum wightianum* Arn. Seeds have a very short life span. Seeds viability is lost within 20-30 days of storage in lab condition (30°C±4°) and is a recalcitrant seed. This is an important tree species of the rain forests ecosystem of the Western Ghats, particularly of the *Myristica* swamps and riparian ecosystems and needs to be protected and monitored for its successful regeneration.

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