



Seed Maturity Indices of *Semecarpus anacardium* Linn under Garhwal Himalayan Condition: A Highly Valuable Medicinal Tree

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/EJMP/2020/v31i230215

Editor(s):

- (1) Dr. Paola Angelini, University of Perugia, Italy.
- (2) Dr. Marcello Iriti, Milan State University, Italy.

Reviewers:

- (1) Schirley Costalonga, Universidade Federal do Espírito Santo, Brazil.
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- (3) Joseph Nunoo, Nuclear Agriculture Research Centre, Ghana.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/55088>

Original Research Article

Received 20 December 2019

Accepted 26 February 2020

Published 27 February 2020

ABSTRACT

In the Himalayan region, there are several tree species which are relatively less studied particularly in reference to their seed maturation. *Semecarpus anacardium* Linn (Marking Nut) is a medicinal tree which is found in Garhwal Himalaya and mostly propagated through seeds. In perennial crops, selection of fruits is an important management techniques adopted after fruit harvest as it plays an important role in production of high quality seedlings in nursery. Hence, studies were formulated to evaluate the influence of fruit colour variation on seed quality characters. Fresh marking nut were collected from Dehradun, Lansdowne and Kalagarh Forest Division, Uttarakhand, India. The fruits were categorized based on the colour into four different groups such as T₁ as Ground collection (dried), T₂ as fully ripened fruits, T₃ as Semi ripened & T₄ as unripened (fully green) and seeds were sown on petri dish with five replications of 20 seeds each by Randomized block design (CRD) under Laboratory condition. In all parameters, seed maturity indices- ground collection and fully ripened seeds showed significant results with respect to germination percentage, germination capacity, seedling vigour index, collar diameter and height.

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Keywords: Maturity indices; *Semecarpus anacardium*; medicinal tree; germination; Garhwal Himalaya.

1. INTRODUCTION

Trees are generally propagated through seeds expecting long life and efficient tap root system though vegetative propagation is feasible. The basic characters of seed used for regeneration is the quality of the seed which are characterized in terms of physical, physiological and health status of the seed but is widely variable as it is influenced by many factors that influence the seed quality. The embryo should be fully developed at the time of seed fall, if it is not developed the seed lies dormant till it is fully developed. *Fraxinus floribunda* is typical example which the seed lies dormant on the ground for the whole year. Even if the embryo is fully developed, seeds, sometimes, do not germinate because the embryo is not chemically ready for germination. Such problem is faced by *Juniperus macropoda* for after ripening.

Semecarpus anacardium Linn is one of the best, versatile and most commonly used trees as a household remedy, distributed in sub-Himalayan region, Tropical region, Bihar, Bengal, Orissa and central parts of India. It has been freely used everywhere in India since centuries. The word *Semecarpus* springs from Greek word Simeion meaning marking or tracing and *carpus* meaning nut. *Anacardium* means like cardium; - "Heart shaped marking nut". It is commonly known as Marking nut or Dhobi nut or Oriental Cashew nut. *Semecarpus anacardium* may be a medicinal tree; various drugs were derived from plant which is available in market against several diseases like disease of the skin, tumors, malignant growth, fungal disease, excessive menstruation, vaginal discharge, fever, haemoptysis, constipation and intestinal parasites [1]. Anti-Cancer Activity [2,3], Neuroprotective Activity [4] Anti-inflammatory activity [5] Antioxidant activity [6], Antimicrobial activity [7], Anti-spermatogenic effect [8], Antiatherogenic effect [7].

Quality seed possess higher seed germination and higher vigour characters normally measured in terms of seedling growth. These characters could be achieved with the seed if it is harvested at optimum stage, which is normally designated as the physiological maturity of the seed [9]. Physiological maturation is the stage at which the seed attains the maximum dry weight that is accompanied with maximum seed and seedling quality characters in terms of seed germination and seedling vigour [10] and are widely indicated

through physical indices such as size, colour and weight, which are much useful in perennial crops [11] as seed collection is mainly from ground than from the tree due to difficulties faced on climbing the tree for selection of fruit. Researchers (In *Jatropha curcas*, [12] in Neem, [13,14], in Simaruba [15]; in *Calophyllum inophyllum* (Punnai), [16] revealed that fruit colour serve as an indicator of seed maturation in tree crops as it is easily identifiable and applicable and the results are also highly reproducible and also suggested collection of fruits based on fruit colour could as an reliable index of seed maturation and for selection of quality seed for raising plantation [17]. Hence, the present study was undertaken to know the influence of seed maturity indices on germination of *Semecarpus anacardium*.



Fig. 1. Seed maturity indices of *Semecarpus anacardium*

2. METHODOLOGY

The present study was undertaken at HNB Garhwal University, Srinagar during 2015-2016 (30.22°N 78.78°E and altitude of 560 m asl). Fruits were collected from different trees in a natural forest near Dehradun, Lansdowne and Kalagarh Forest Division (Uttarakhand) during the end of April 2015. Immediately after fruit collection, seeds were shade dried for about a 10 day. Healthy seeds were selected and grouped into 4 classes manually based on fruit colour such as T₁ as a Ground collection (dried), T₂ as fully ripened fruits, T₃ as Semi ripened & T₄ as unripened (fully green) and seeds were sown on a petri dish with five replications of 20 seeds

each by complete randomized design (CRD) under Laboratory condition. Regular watering was done as per the requirement. Observation on daily seed germination was counted upto 50 days from the date of sowing. Seedling growth parameters were recorded at a month intervals. A final reading on plant height, collar diameter, was recorded at the age of one month from the date of transplanting. The germination percentage of each category was recorded in percentage as per the standards of ISTA [18].

Germination Percentage

$$= \frac{\text{Total number of seeds germinated}}{\text{Total number of seeds sown}} \times 100$$

Germination Capacity =

$$\frac{\text{Total seeds germinated} + \text{total ungerminated seeds found sound}}{\text{Total number of seeds sown}} \times 100$$

Paul [19]

Seedling Vigour Index

$$= \text{Germination Percentage} \times \text{Radical Length}$$

(Abdul-Baki and Anderson, [20]).

2.1 Statistical Analysis

The data gathered for various colour categories of the tree were analyzed as per Agrees software, significance at 0.5% level adopting the statistical design complete randomized design (CRD) for understanding the level of significance among the seed germination and seedling quality characters.

3. RESULTS AND DISCUSSION

Standardization of fruit colour for each and every species of forestry would be of immense assistance to seed collectors of forest trees as collection is a gruelling process in these species owing to their inaccessibility for manual collection and the longer duration of harvesting period. Hence in most of the species fruits are collected from ground for extraction of seed. The fruits of ground collection vary with their physical characters. Fruit colour is considered as an easily identifiable visual index of seed maturation in most of the forestry tree species [21]. Willan [10] also revealed that fruit colour would serve as a tool for collection of good quality seeds in forestry as the persons involved in the collection process, mostly lack the technical skills. In the present study also similar observation were made, where the fruit colour changes from green to greenish yellow to yellowish black to black, where the yellowish black colour coincide with the predicted day of maturation in conjunction with physical status of seed.

In germination parameters: germination percentage, germination capacity and seedling vigour index and seedling growth: collar diameter and plant height that the fruits collected during ground collection and fully ripened seeds has shown better performance when compare to other indices. Similar research are also present in *Pongamia pinnata*, *Simarouba glauca*, *Azadirachta indica*, *Madhuca longifolia* by [16]; in *Gmelina arborea* by Saralch and Singh [22].

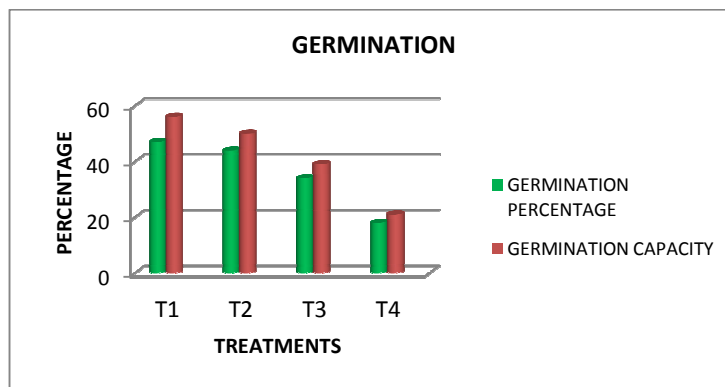
The germination percentage was significantly affected by fruit colour. The significantly maximum germination percent of 47 was found when ground collected fruits (T_1) were used. The germination capacity was significantly affected by the fruit colour which ranges from 56 to 21 percent. The significantly maximum germination capacity of 56 percent was recorded in ground collection fruit (T_1) which is followed by T_2 as 50 percent. Maturity indices significantly affected the seedling vigour index ranges from 107.9 to 21. The highest seedling vigour index was found in T_1 (Ground collection) is 107.9 which is followed by T_2 (Fully ripened) is 90.7.

In seedling growth parameters: Collar diameter was significantly affected by maturity indices. Collar diameter ranges from 1.04 mm to 2.68 mm. the maximum diameter was observed in T_1 is 2.68 mm which is followed by T_2 is 2.22 mm. The plant height was significantly affected by maturity indices which rangers from 2.56 to 5.9 cm. The highest plant height was obtained in T_1 is 5.9 cm which is followed by T_2 is 5.1 cm.

In all parameters, seed maturity indices- ground collection and fully ripened seeds showed a significant results with respect to germination percentage, germination capacity, seedling vigour indices, collar diameter and height. This may be due the *Semecarpus anacardium* seed are fully developed and chemically ready for germination. The findings reported by Ponnuswamy [12], Bharathi et al. [13], Bharathi [23], Maithani et al. [24] and Sacande et al. [25] in *Azadirachta indica*, Sekar [14] in *Simarouba glauca*, Gurunathan et al. [11], in *Jatropha curcas* were in similar of the above findings insisting on consideration of fruit colour as an index of seed maturation particularly in forestry. Standardization of fruit colour for each of the perennial species would be of huge help to seed collectors of forest trees as collection is a laborious process in many species, owing to their inaccessibility for manual collection and the longer duration [24,25].

Table 1. Effect of seed Maturity Indices on germination and seedling growth of *Semecarpus anacardium*

Treatments	Germination percentage	Germination capacity	Collar diameter (mm)	Plant height (cm)	Seedling vigour index
T1	47	56	2.68	5.9	107.9
T2	44	50	2.22	5.1	90.7
T3	34	39	1.34	3.14	47.0
T4	18	21	1.04	2.56	21.0
SEd	3.73	4.15	0.19	0.23	12.77
CD (p=0.05)	8.13	9.05	0.43	0.51	27.83

**Fig. 2. Effect of seed maturity indices on germination of *Semecarpus anacardium***

4. CONCLUSION

The study revealed that the overall performance of the seeds of ground collection and fully ripened of *Semecarpus anacardium* was found to be performing better compared to other fruit colours, highlighting the suitability of colours for selection of good quality seeds as it could be the maturation colour of this species. Hence during harvest, colours specific should be considered for obtaining good germination and elite seedlings from nursery.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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