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Effect of Seed Size on Germination of *Semecarpus anacardium* (Marking Nut) in Garhwal Himalaya

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A B S T R A C T

The present study was conducted to generate information on effect of seed size on germination of *Semecarpus anacardium* in Garhwal Himalaya. *Semecarpus anacardium* is a medium sized deciduous tree, growing up to 10-15 metres in height. The plant grows naturally in tropical and sub-tropical climate and distributed in sub-Himalayan region, Tropical region, Bihar, Bengal, Orissa and central parts of India. It's an important medicinal plant species possessing Anti-Cancer, Anti-inflammatory and several diseases like skin disease, fungal disease, excessive menstruation, fever, constipation, etc. The experiment was carried out at HNB Garhwal University, Srinagar during 2015-2016 in CRD experimental design with five replications. There were 3 treatments namely S_1 as small seeds, S_2 as medium seeds and S_3 as larger seeds. The highest germination percent was found in S_3 (Large sized seed) is 32%. Thus the experiment reveals that the seed size enhances the seed germination percent of *Semecarpus anacardium*.

Introduction

Semecarpus *anacardium* Linn. an important species of the Anacardiaceae family, is commonly known as Oriental cashew nut or Marking nut in English, Dhobi nut in Hindi and Bhallataka or bhilawa in Sanskrit. It is one of the best, versatile and most commonly used trees as a household remedy, distributed in the sub-Himalayan region, Tropical region, Bihar, Bengal, Orissa and central parts of India. It is a medium-sized deciduous tree, growing up to 10-15 metres in height. The plant grows naturally in the tropical and dry climate.

The seed contains several alkaloids, flavonoids, bioflavonoids and other components (Rao *et al.,* 1973; Ishratulla *et al.,*

1977; Premalatha, 2000). Various drugs were derived from *Semicarpus anacardium* Linn plant which is available in the market against several diseases like skin disease, tumors, malignant growth, fungal disease, excessive menstruation, vaginal discharge, fever, haemoptysis, constipation and intestinal parasites (Jain and Sharma, 2013; Chandra, 1989). Anti-Cancer Activity, Neuroprotective Activity, Anti-inflammatory activity, Antioxidant activity, Antimicrobial activity, Anti-spermatogenic effect (Sharma *et al.,* 2003).

Like many other medicinal species, *S. anacardium* is collected from the wild at present. As the demand for plant-based drugs is increasing, the pressure on natural resources is growing at an alarming rate (Waman and Bohra, 2016). In the absence of a sustainable replenishing strategy, rare and endemic flora is under constant threat. Existing forests have been fragmented due to anthropogenic activities which affect these species and drive them towards extinction (Prasad and Prasad, 2009). Habitat enrichment is a viable strategy to support the conservation and sustainable use of biodiversity. Seed propagation is one of the easiest yet effective methods for regenerating medicinal plants (Butola and Badola, 2004).

Generally, seed germination is controlled by many internal and external factors. Seed size is one among them. Size is an important characteristic of seed quality as larger seeds with larger volume contain more resources and are likely to exhibit greater vigour than smaller seeds (Ellis, 1992). In a range of plant species, seed size has been shown to affect germination rate, emergence rate, success of establishment, and growth (Bentley *et al.,* 1980; Sanderson *et al.,* 2002), which can indirectly determine plant distribution and abundance across different habitats (Silveira *et al.,* 2012). Sowing of the mixed seed of a species may result in non-uniform density of seedlings, which may lead to heterogeneity in the vigour and size of the seedlings. The seed size often controls the germination and initial seedling growth in many tree species (Murali, 1997). Generally, bigger seeds germinate quicker and would take lesser duration when compared to that of smaller ones (Manonmani *et al.,* 1996, Negi and Todaria, 1997; Gunaga *et al.,* 2007). In contrast, seeds of medium to smaller produced higher seed germination in a few multipurpose trees of Jammu (Dar *et al.,* 2002). Hence, the present study was undertaken to know the influence of seed size on germination of *Semecarpus anacardium.*

Materials and Methods

The present study was undertaken at HNB Garhwal University, Srinagar during 2015-2016 (30.22°N 78.78°E and altitude of 560m). Matured fruits were collected from 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 three classes manually based on seed size such S_1 as small (< 15 mm), S_2 as medium (15 to 20mm) and S_3 as large (> 20 mm) and Completely Randomized Design (CRD) for the experimental design, three treatments, with five replications of 50 seeds each treatments. Regular watering was done as per the requirement. Observation on daily seed germination was counted up to 45 days from the date of sowing. After germination, germinated seeds are transplanted into poly bags, Seedling growth parameters were recorded after one month of planting. Initiation of germination, germination percentage and germination capacity were calculated and plant height, collar diameter was recorded at the age of one months from date of transplanting.

The data were subjected for analysis of variance and mean separation (least significant difference) using Web Agri Statistical Package WASP 2.0 (ICAR RC for Goa, Ela, India).

Results and Discussion

The three grades of seed viz, small (S_1), medium (S_2) and large (S_3) were used to see their effect on germination behaviour. It was revealed from the data in table 1 that seed size exert a significant effect on germination behaviour of *Semecarpus anacardium.*

The seed size usually reflects the comparative nutrient pool and energy of a seed which affects the future growth and development. The bigger seed size and more seed weight contain more amount of reserve food material in contrast to smaller seed (Athaya, 1985). These results are in line with the findings of Gurunathan *et al.,* (2009) for *Jatropha curcas*. Similar results have also been reported for *Emblica officinalis*, *Syzygium cumini*, *Zizyphus mauritiana* and *Tamarindus indica* (Parameswari and Srimathi, 2009) and *Pongamia pinnata* (Manonmani *et al.,* 1996).

The seed size had a significant effect on initiation of germination. The number of days taken to initiation of germination varies from 30.6 to 25.8 days. The significantly minimum initiation of germination of 25.8 days was found when large sized seed (S_3) were used. The maximum value obtained in S_1 was 30.6 days in small sized seed (S_1). This might more amount of reserve food material which helped to germinate quicker. It coincides with other research that bigger seeds germinate quicker in *Emblica officinalis*, *Syzygium cumini*, *Zizyphus mauritiana* and *Tamarindus indica* (Parameswari and Srimathi, 2009) and *Jatropha curcas* (Gurunathan *et al.,* 2009).

The germination percent was significantly affected by seed size. The significantly maximum germination percent of 32.0 was found when large sized seeds (S_3) were used. However, the significantly minimum germination percent was recorded when small sized seeds (S_1) was used giving a value of 22.0 percent only. The highest germination with large and heavy seeds of various trees has been reported (Singh *et al.,* 1973; Kandya, 1978; Santon, 1985; Kackar *et al.,* 1986 and Manga and Sen, 1996). Similar results have been reported in *Sapindus emerginatus* (Venkatesh and Nagarajaiah, 2010; Suresha *et al.,* 2007), *Albizia lebbek* (Mutha *et al.,* 2004), *Acacia catechu* (Khera *et al.,* 2004), *Syzygium cumini* (Sasthri *et al.,* 2001), *Azadirachta indica* (Uniyal *et al.,* 2007), *Jatropha curcas* (Singh and Saxena, 2009), *Pongamia pinnata* (Arjunan *et al.,* 1994) and *Leucaena leucocephala* var.K8 (Sharma and Sood, 1990).

The germination capacity was significantly affected by the seed size. The significantly maximum germination capacity of 46.0 percent was recorded in large sized seeds (S_3), while the significantly minimum value of 34.0 percent was observed in small sized seeds (S_1). The present research are in line with other research in *Jatropha curcas (*Singh and Saxena, 2009); *Eucalyptus citriodora* (Aguiar and Nakane, 1983)*; Sapindus mukorossi* (Attri, 2011).

The collar diameter was not significantly affected by the seed size. The maximum collar diameter of 4.5 mm was recorded in large sized seeds (S_3), while the minimum value of 3.8 was observed in small sized seeds (S_1).

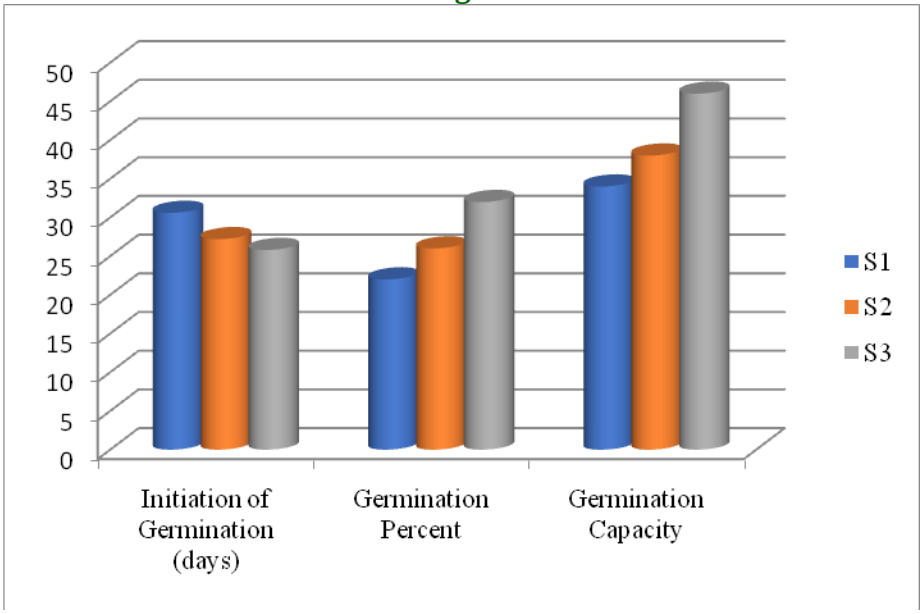
The seed size had a significant effect on plant height. The significantly maximum plant height was recorded in large sized seeds (S_3) giving a value of 13.18 cm.

Table.1 Effect of seed size on germination behaviour of *Semecarpus anacardium.*

Treatments	Initiation of Germination	Germination Percentage	Germination Capacity	Collar Diameter (mm)	Plant Height (cm)
S_1	30.6	22.0	34.00	3.8	8.2
S_2	27.2	26.0	38.00	4.34	10.46
S_3	25.8	32.0	46.00	4.5	13.18
Mean	27.87	26.67	39.33	4.21	10.61
CD (5%)	1.631	6.657	9.072	NS	0.926

*NS= Non Significant

Fig.1



The significantly minimum value of 6.06 was obtained when small sized seeds (S_1) were used. The results are in agreement with the findings in *Mammea suriga (*Gunaga *et al.*, 2008); *Pongamia pinnata (*Arjunan *et al.*, 1994); Similarly, Khera *et al.*, (2004) reported in *Acacia catechu*, *Acacia nilotica* and *Dalbergia sissoo* showed a positive relationship with the germination and related parameters with growth of seedling.

The present results showed that seed grading is an essential step to improve the germination and produce vigorous seedlings. Use of large sized seeds could help improve quality of nursery stock as well as their performance at field condition. A Large number of seedlings produced following seed size could be ideal for afforestation programmes for the conservation of this species, for broadening the resource base to obtain the raw material for traditional medicines, and possible exploitation as rootstocks to related species.

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