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Effect of Seed Size and Organic Manure Doses on Growth and Development of Sapindus mukorossi (Gaertn)

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ABSTRACT

The study was conducted to study the effect of seed size and different organic manure doses on growth and development of the Sapindus mukorossi seedlings. Among three seed size categories viz., small (L1), medium (L2) and large (L3), large sized seeds (L3) showed significantly higher shoot length (26.68cm), root length (18.28cm), seedling height (44.97cm), collar diameter (4.64mm), number of lateral roots (63.03), dry shoot weight (3.29g), total root weight (1.12g), and total dry weight (4.52 g). Among different organic manure doses treatment, vermicompost @ 10 t/ha recorded significantly higher shoot length, root length, seedling height, collar diameter, number of lateral roots, dry shoot weight, total root weight, and total dry weight (26.44 cm, 17.46 cm, 43.91 cm, 4.50 mm, 57.67, 3.29 g, 1.10 g and 4.38 g, respectively). It was followed by the application of FYM @ 10 t/ha. On the other hand various growth attributes were recorded minimum in control i.e. no manure during the experiment.

Key words:

FYM, organic manures, Sapindus mukorossi, seed size category, seedling growth attributes,vermicompost

INTRODUCTION

Sapindus mukorossi or soapnut tree commonly known as Ritha is an important multipurpose trees (MPTs) of north India. It belongs to the family Sapindaceae. The dried fruits of Ritha are most valuable part of the plant. Its fleshy portion contain saponin, which is a good substitute for washing soap and as such is used for the preparation of quality shampoos, detergents. Soap nuts are known for its medicinal values as an expectorant, emetic, contraceptive and for treatment of excessive salivation, epilepsy, psoriasis, head lice and migraines.

The seed size have been found to have a

marked bearing on the quality of the nursery stock in numerous species and *S.mukorossi* need not necessarily provide an exception to this. It is therefore, worthwhile to determine the optimum seed size for improving the physical quality of the seedlings/growing stock. The seedling biomass of any crop is the result of available nutrients during the seedling growth period and these nutrients can be supplied either by chemical fertilizers, organic manures or some other means. Organic manuresare best way to attain sustainable growth and productivity by taking care of quality of produce, which is considered imperative for human and animal health. These include farm yard

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manure, vermicompost, enriched manure, biofertilizer, green manures etc. Most commonly used organic manure is farm yard manure (FYM) in which cattle dung constitute the major source of nutrients and contains 0.72, 0.35 and 0.80 per cent of NPK, respectively. Similarly vermicompost enrich the soil by improving the residual build up of organic carbon (C:N ratio) and available NPK (nitrogen, potassium and phosphorus) in the soil and as a renewable energy source.

MATERIALS AND METHODS

The seeds of S. mukorossi were collected from the three districts of Himachal Pradesh viz., Sirmour, Solan and Kullu during November-December 2009. The fresh seeds were collected manually and packed in gunny bags and brought to the laboratory at Dr. Y.S. Parmar University of Horticulture and Forestry, Solan (H.P.) for detail studies. The nursery is located at 30°51' N latitude and 76°11' E longitudes at an altitude of 1100 m above mean sea level, with north-east aspect.Experimental field was prepared by ploughing the field twice and made smooth by harrowing followed by planking during January-February, 2010. The plots were prepared to accommodate all the treatments. The sunken nursery beds (1m x 1m) were prepared in the nursery area. Sowing was done during the month of March, 2010. Before sowing, the seeds based on their diameter were graded into three classes i.e. small (<1.2 cm), medium (1.2-1.4 cm) and large (>1.4 cm).Hundred seeds of S. mukorossi were sown for raising seedlings. Nursery beds were kept moist by sprinkling water and kept free from weeds. Organic manures viz., FYM and vermicompost were applied to all the plots except control. Two different doses of both the organic manures viz. 5t/ha and 10t/ha were applied to respective plots. Observations pertaining to various growth and seedling development parameter like shoot length, root length seedling height, collar diameter; number of lateral roots, shoot dry weight, root dry weight and total biomass was observed at 120 days after sowing. The data obtained from the experiment was subjected to statistical analysis as per the standard methods. The least significant difference at 5 % level was used for testing the

significant differences among treatments.

RESULTS AND DISCUSSION

The growth and seedling biomass characters of S. mukorossi were significantly influenced by the seed size categories and application of different doses of organic manure. It is evident from Table-1 that among seed size categories, large sized seeds of soapnut exhibited superior growth and seedling biomass characteristics such as shoot length (26.68 cm), root length (18.28 cm), collar diameter (4.64 mm), seedling height (44.97 cm) and number of lateral roots (63.03), dry shoot weight (3.29 g), dry root weight (1.12g) and total dry weight (4.52 g) than medium and small sized. Growth parameters have good positive relationship with seed size and weight. Similar variation among the seed size categories in the growth characteristics and seedling biomass has also been reported by several researchers in many species. Maximum height and collar diameter in Jatropha curcas (Singh and Saxena 2009). Shoot length and root length in Azadirachta indica (Uniyal et al. 2007). Shoot and root growth in Sapindus emerginatus (Venkatesh and Nagarajaiah 2010). Root length and shoot length in Hardwickia binata (Ponnammal et al., 1993). Large size seeds of S. mukorossi exhibited superior seedling biomass production than medium and small size seeds. Similar results have been reported in Sapindus emerginatus (Venkatesh and Nagarajaiah 2010) and Syzygium cumini (Ponnammal et al. 1992).

Seed size showed a positive relation with dry weight of seedling. Maximum total dry weight was found in seedlings raised from large seed in *Jatropha curcas* (Singh and Saxena 2009). The data indicates in Table -2 that among the five different doses of the manures, vermicompost @10t/ha was found more effective in enhancing the root and shoot length, seedling height, collar diameter, number of lateral roots, root and shoot dry weight and total dry weight production (26.44 cm, 17.46 cm, 43.91cm, 4.50 mm, 57.67, 3.29 g, 1.10 g and 4.38 g, respectively). The effectiveness of organic manures was in the order as vermicompost @10 t/ha > FYM @ 10t/ha > vermicompost @ 5 t/ha **Table 1:** Effect of seed size on the growth characteristics of S.smukorossi seedlings at different time interval

 under nursery condition

| Seed size category | Shoot length (cm) | Root length (cm) | Seedling height (cm) | Collar diameter (mm) | No. of lateral roots | Dry shoot weight (g) | Dry root weight (g) | Total dry weight (g) |
|-----------------------|-------------------------|------------------------|----------------------------|----------------------------|----------------------------|-------------------------------|------------------------------|-------------------------------|
| Small (L1) | 21.24 | 13.55 | 34.78 | 3.86 | 45.97 | 2.89 | 0.84 | 3.73 |
| Medium (L2) | 24.53 | 16.13 | 40.65 | 4.07 | 53.07 | 3.23 | 1.01 | 4.24 |
| Large (L3) | 26.68 | 18.28 | 44.97 | 4.64 | 63.03 | 3.39 | 1.12 | 4.52 |
| CD _{0.05} | 0.18 | 0.20 | 0.37 | 0.04 | 2.28 | 0.05 | 0.01 | 0.05 |

Table 2:Effect of organic manure doses on the growth and biomass characteristics of *S.mukorossi* under nursery conditions

| Organic Manure Doses | Shoot length (cm) | Root length (cm) | Seedling height (cm) | Collar diameter (mm) | No. of lateral roots | Dry shoot weight (g) | Dry root weight (g) | Total dry weight (g) |
|--|-------------------------|------------------------|----------------------------|----------------------------|----------------------------|-------------------------------|------------------------------|-------------------------------|
| No manure (control) (M ₁) | 21.61 | 14.23 | 35.83 | 3.81 | 48.89 | 3.00 | 0.87 | 3.87 |
| Vermicompost @ 5 t/ha (M ₂) | 24.36 | 16.11 | 40.48 | 4.26 | 52.17 | 3.17 | 1.00 | 4.16 |
| Vermicompost @ 10 t/ha (M ₃ |) 26.44 | 17.46 | 43.91 | 4.50 | 57.67 | 3.29 | 1.10 | 4.38 |
| FYM @ 5 t/ha (M ₄) | 23.15 | 15.44 | 38.59 | 4.03 | 54.39 | 3.14 | 0.98 | 4.12 |
| FYM @ 10 t/ha(M ₄) | 25.18 | 16.68 | 41.86 | 4.33 | 55.33 | 3.26 | 1.02 | 4.28 |
| CD 0.05 | (0.23 | (0.25) | (0.47) | (0.05) | (2.94) | (0.06) | (0.01) | (0. 07) |

> FYM @ 5t/ha > control (no manure). Application of different doses of organic manures (vermicompost and Farm yard manure) was found to substantially support the growth of *S. mukorossi* seedlings. Vermicompost has substantially enhanced the growth as it has been reported by several researchers. Srivastava et al. (2006) inferred that vermicompost @ 10 t/ha substantially increased the dry matter yield in *Ceriodaphnia* *cornuta.* In *Pterocarpus marsupium* (Venkatesh et al. 2009), the plant height, collar diameter, root length,number of leaves and number of primary and secondary branches showed positive relationship with application of vermicompost.

These results are in conformity with Khomami (2008) who reported that the vermicompost significantly increased the shoot dry and fresh weight and increase in overall biomass in *Ficus bengamina*. Similar results of increased growth and seedling biomass parameters with vermicompost treatment have been reported in *Eucalyptus saligna* (Caldeira et al. 2000) and *Dalbergia sissoo* (Singh et al. 1998).

CONCLUSION

S.mukorosii is a multipurpose tree species which need to be exploited by using different treatments and from the present study it can be concluded that the large sized seeds excelled over other seed category with respect to all growth characters and seedling biomass attributes. Among different doses of organic manure, application of vermicompost @ 10t/h recorded significantly higher seedling growth and biomass as compared to FYM. Further research work is required so as to fetch maximum benefits from the present species.

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