



Research Article

Economics of growing softwood grafts of Nutmeg (*Myristica fragrans* Houtt.) on different potting media

M. S. Gawankar, D. C. Rajput, B. R. Salvi

Abstract

Potting media plays an important role in the growth of any horticultural crop in the nursery. In Nutmeg (*Myristica fragrans* Houtt.), both nutmeg (kernel) and mace are used as condiments particularly in sweet foods, baking, etc. Softwood grafting is a commercially adopted propagation method followed in nutmeg. However, the growth of such grafts in the nursery is slow and takes more time to attain a salable stage. This increases the maintenance cost during the nursery stage. Hence, it is necessary to find out the solution to hasten the growth to reduce the maintenance cost. In this context, the potting medium is one of the most important and responsible inputs for uniform and vigorous graft growth. It helps to produce quality planting material on a large scale and get good market value. With this view the experiment on the effect of potting media on the growth of softwood grafts of nutmeg was laid out at College of Horticulture, Dapoli during the year 2018. The six different media were replicated four times in Randomized Block Design. The different media combinations namely T₁: Soil + FYM + Sand (2:1:1) (Control), T₂: Soil + FYM + Sand (2:1:1) with 1" cocopeat at top, T₃: Soil + Vermicompost + Sand (2:1:1) with 1" Cocopeat at top, T₄: Soil + FYM + Vermicompost + Sand (1:1:1:1) with 1" Cocopeat at top, T₅: Soil + FYM + Vermicompost + Rice husk (1:1:1:1) with 1" Cocopeat at top, T₆: Soil + FYM + Vermicompost + Cocopeat (1:1:1:1) were tried.

The results revealed that treatment T₅ i.e. the media having Soil + FYM + Vermicompost + Rice husk (1:1:1:1) with 1" Cocopeat at the top had maximum survival percentage of grafts (82.00 %), and maximum absolute growth rate (AGR) (0.0646 cm/day). The grafts grown on this media were light in weight (2.050 kg/ bag) and economically viable resulting in the highest net returns of Rs. 4815.80 with benefit-cost ratio (B:C) ratio of 1.64. Hence, Soil + FYM + Vermicompost + Rice husk 1:1:1:1 with 1". Cocopeat at the top is the most economically viable media for enhancing the growth of nutmeg grafts and also light in weight for transport.

Keywords economic, graft survival, growth, media

Introduction

Nutmeg (*Myristica fragrans* Houtt.) is an important evergreen, aromatic tree spice that occupies 22,640 ha in India with a production of 14,060 tonnes. Kerala is the leading state in area and production followed by Karnataka and Andaman and Nicobar [1]. Nutmeg is the kernel of the fruit and mace is waxy red colored dried aril that surrounds a single seed within a fruit. [2]. Nutmeg is dioecious in nature; hence, vegetative propagation is the only way to propagate. Softwood grafting is a reliable method standardized by Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli for nutmeg

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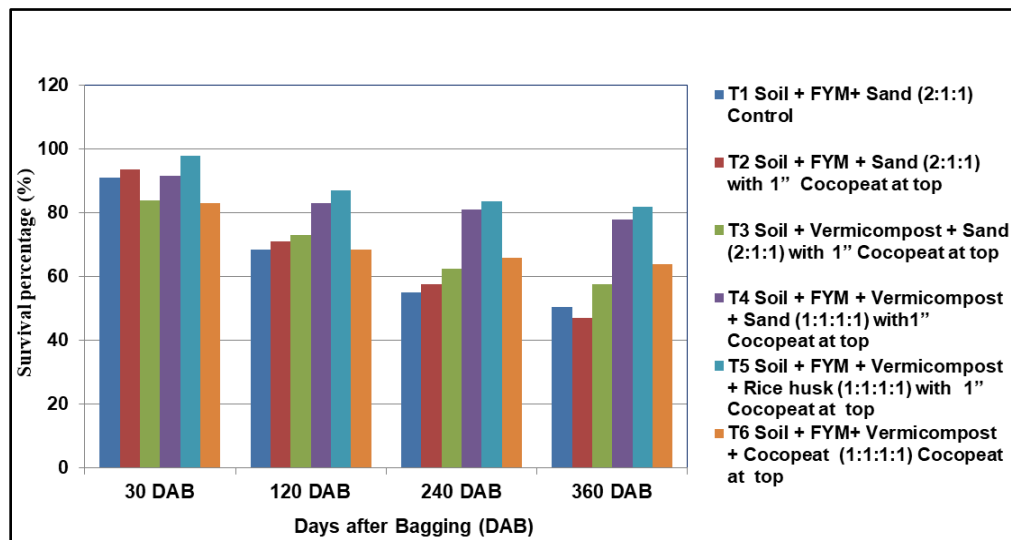


Figure 1. Percentage of Nutmeg graft survival in different potting media at various growth stages

propagation. According to Haldankar et al., [3], the month of May is the best for softwood grafting in nutmeg. Though agro-climatic conditions of Konkan are suitable for nutmeg cultivation, the initial growth of nutmeg grafts is very slow which needs to be hastened for getting the quality planting material and better price in a short span. Growing media in nursery plays an important role in the growth of any horticultural crop which helps in producing vigorous and quality planting material on a large scale with a good market price. In this context, an experiment was carried to find out the most economical growing media for the better growth and performance of the nutmeg softwood grafts.

Methodology

The experiment was conducted at the College of Horticulture, Dapoli under Dr. Balasaheb Sawant Konkon Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri 415 712 (MS.) during the year 2018. It was laid in Randomized Block Design with four replications and six treatment namely T₁: Soil + FYM + Sand (2:1:1) (Control), T₂: Soil + FYM + Sand (2:1:1) with 1" cocopeat at top, T₃: Soil + Vermicompost + Sand (2:1:1) with 1" Cocopeat at top, T₄: Soil + FYM + Vermicompost + Sand (1:1:1:1) with 1" Cocopeat at top, T₅: Soil + FYM + Vermicompost + Rice husk (1:1:1:1) with 1" Cocopeat at top, T₆: Soil + FYM + Vermicompost + Cocopeat (1:1:1:1). Three months old softwood grafts of nutmeg grown in 6"×8" size polybags were used for the experimental purpose. Such grafts were transferred to 9"×11" size polythene bags to find best-suited media combination among soil, FYM, vermicompost, sand, cocopeat, and rice husk. A unit of 50 grafts was replicated 4 times to form replications. The length of fresh root from six randomly selected grafts from each treatment was measured in centimeters at the time of rebagging and at the end of the experiment. Grafts survival percentage after transferring to 9"×11" size polythene bags was recorded as per the treatments at 30 days, 120 days, 270 days, and 360 days after bagging (DAB), and the percentage was calculated by using the following formula given by Meena et al., [4].

$$\text{Survival percentage (\%)} = \frac{\text{No. of grafts survived}}{\text{Total no. of grafts rebagged}} \times 100$$

Fresh root weight and dry weight of the graft of randomly selected six grafts were recorded at the time of bagging and at the end of the experiment i.e. 360 days after bagging. Roots were dried in a hot air oven at 60°C. Drying was continued until the samples attained constant weight. This constant weight of roots was recorded as dry weight. Growth rate and percent increment in height were measured as follows.

Table 1. Effect of different potting media on survival percentage (%) of nutmeg grafts

| Treatments | | Graft survival (%) | | | |
|--------------------|---|--------------------|------------------|------------------|------------------|
| | | 30 DAB | 120 DAB | 240 DAB | 360 DAB |
| T ₁ | Soil + FYM+ Sand (2:1:1) Control | 91.00 (72.87) | 68.50 (55.87) | 55.00 (47.89) | 50.50 (45.28) |
| T ₂ | Soil + FYM + Sand (2:1:1) with 1” Cocopeat at top | 93.50 (75.41) | 71.00 (57.84) | 57.50 (47.58) | 47.00 (42.26) |
| T ₃ | Soil + Vermicompost + Sand (2:1:1) with 1” Cocopeat at top | 84.00 (64.44) | 73.00 (58.76) | 62.50 (66.21) | 57.50 (64.94) |
| T ₄ | Soil + FYM + Vermicompost + Sand (1:1:1:1) with 1” Cocopeat at top | 91.50 (73.33) | 83.00 (65.75) | 81.00 (62.74) | 78.00 (62.08) |
| T ₅ | Soil + FYM + Vermicompost + Rice husk (1:1:1:1) with 1” Cocopeat at top | 98.00 (83.05) | 87.00 (69.43) | 83.50 (66.21) | 82.00 (64.94) |
| T ₆ | Soil + FYM+ Vermicompost + Cocopeat (1:1:1:1) | 83.00 (49.31) | 68.50 (55.89) | 66.00 (54.36) | 64.00 (53.15) |
| S.Em± | | 1.39 | 2.59 | 1.79 | 2.52 |
| C.D. at 5 % | | 4.19 | 7.80 | 5.39 | 7.62 |

(Values in parenthesis indicate arcsine transformed values)

Table 2. Effect of different potting media on absolute growth rate (cm/ day) of nutmeg grafts

| Treatments | | Absolute growth rate (cm/day) | |
|----------------|---|-------------------------------|---------------|
| | | 0-180 DAB | 180-360 DAB |
| T ₁ | Soil + FYM + Sand (2:1:1) Control | 0.0777 | 0.0600 |
| T ₂ | Soil + FYM + Sand (2:1:1) with 1” Cocopeat at top | 0.0708 | 0.0612 |
| T ₃ | Soil + Vermicompost + Sand (2:1:1) with 1” Cocopeat at top | 0.0507 | 0.0558 |
| T ₄ | Soil + FYM + Vermicompost + Sand (1:1:1:1) with 1” Cocopeat at top | 0.0484 | 0.0606 |
| T ₅ | Soil + FYM + Vermicompost + Rice husk (1:1:1:1) with 1” Cocopeat at top | 0.0619 | 0.0646 |
| T ₆ | Soil + FYM+ Vermicompost + Cocopeat (1:1:1:1) | 0.0658 | 0.0637 |
| Mean | | 0.0626 | 0.0610 |

Absolute growth rate (cm/day) AGR for an increase in plant height was calculated by using the formula given by Radford [5] and expressed as height in cm/day.

$$AGR = \frac{(H_2 - H_1)}{(t_2 - t_1)}$$



Where, H1 and H2 represent height per plant at t1 and t2 time intervals of the two observations, respectively.

Statistical analysis of the data was analyzed by following the standard method of analysis of variance as described by Panse and Sukhatme [6]. The standard error of the mean (S.E. ±) was worked out and the critical difference at 5 percent level of significance was calculated wherever the results were found significant.

Results and Discussion

Effects of different potting media on the survival percentage of nutmeg grafts

The data about the survival percentage of the nutmeg graft as influenced by the different potting mixture treatments are presented in Table 1 and illustrated with Figure 1. It is seen from the data that treatments differ significantly in the survival percentage of nutmeg grafts.

The obtained data revealed that potting media containing the Soil + FYM + Vermicompost + Rice husk 1:1:1:1 with 1” Cocopeat at top recorded maximum survival percentage of graft at 30, 120, 240 and 360 days after bagging.

At 30 and 120 DAB, the maximum survival percentage was observed in treatment T₅ (98.00 and 87.00 % respectively) i.e. in Soil + FYM + Vermicompost + Rice husk 1:1:1:1 with 1” Cocopeat at top which was at par with T₄ (83.00 %). The minimum survival percentage was recorded in treatment T₆ (68.50 %) i.e. Soil + FYM + Vermicompost + Cocopeat 1:1:1:1 and T₁ (68.50 %) i. e. in Soil + FYM + Sand 2:1:1 (Control) which was at par with T₂ (71.00 %) and T₃ (73.00 %).

At 240 DAB, the survival percentage was 83.50 percent in treatment T₅ and was at par with T₄ (81.00 %). The minimum survival percentage was observed in treatment T₁ (55.00 %) i.e. Soil + FYM + Sand 2:1:1 Control which was at par with T₂ (57.00 %).

Table 3. Economics of soft wood grafts of nutmeg grown in different potting media (100 grafts)

| Treatments | | Graft Survival (%) | Gross income Rs. | Total cost Rs. | Net income Rs. | Net B:C ratio | Weight of single grafts (kg) |
|----------------|---|--------------------|------------------|----------------|----------------|---------------|------------------------------|
| T ₁ | Soil + FYM+ Sand (2:1:1) Control | 50.50 | 7575 | 6607.96 | 967.04 | 1.14 | 2.800 |
| T ₂ | Soil + FYM + Sand (2:1:1) with 1” Cocopeat at top | 47.00 | 7050 | 6522.20 | 527.80 | 1.08 | 2.800 |
| T ₃ | Soil + Vermicompost + sand (2:1:1) with 1” Cocopeat at top | 57.50 | 8625 | 7283.50 | 1341.50 | 1.18 | 2.750 |
| T ₄ | Soil + FYM + Vermicompost + Sand (1:1:1:1) with 1” Cocopeat at top | 78.00 | 11700 | 7662.60 | 4037.40 | 1.52 | 2.600 |
| T ₅ | Soil + FYM + Vermicompost + Rice husk (1:1:1:1) with 1” Cocopeat at top | 82.00 | 12300 | 7484.20 | 4815.80 | 1.64 | 2.050 |
| T ₆ | Soil + FYM + Vermicompost + Cocopeat (1:1:1:1) | 64.00 | 9600 | 6997.66 | 2602.34 | 1.37 | 2.100 |

At 360 DAB, the survival percentage was 82.00 percent in treatment T₅ which was at par with T₄ (78.00 %). Treatment T₆ (64.00%) was at with T₃ (57.50%). The minimum survival percentage was found in treatment T₂ (47.00 %) i.e. in Soil + FYM + Sand 2:1:1 with 1”. Cocopeat at the top which was at par with T₁ (50.50 %). The survival and further growth depend upon the activities in cambium in scion and rootstock. The rootstock gets nutrients as well as other biochemical substances from growing media. Rice husk is reported to be rich in silicon and also known to be a source of triacontanol, cellulose, and lignin which can exert the influence so that better graft survival and healthy grafts were obtained and was

attributed to improved metabolic activity for survival [7]. Similarly, Ebaid and El-refaee [8] also explained the role of rice husk as an organic fertilizer that might have a vital role in improving the soil's physical condition; thus, enhancing the efficiency of grafted plants for nutrient absorption.

Effect of different potting media on absolute growth rate (AGR cm/day) of nutmeg grafts

According to Radford, [5] AGR is the actual increase in the size of an individual per unit time under a given condition. Data presented in Table 2 revealed that absolute growth rate (cm/day) at 0-180 DAB was maximum (0.0777 cm/day) in treatment T₁ i.e. Soil + FYM + Sand 2:1:1 control. The minimum AGR (0.0484 cm/day) was recorded in treatment T₄ i.e. in Soil + FYM + Vermicompost + Sand 1:1:1:1 with 1" cocopeat at top. While at 180-360 DAB the maximum AGR (0.0646 cm/day) was found in treatment T₅ (Soil + FYM + Vermicompost + Rice husk 1:1:1:1 with 1" Cocopeat at top). The minimum AGR (0.0558 cm/day) was observed in treatment T₃ (i.e. Soil + Vermicompost + Sand 1:1:1:1 with 1" cocopeat at top).

The study revealed that treatment T₁ recorded maximum AGR at 0-180 DAB while at the lateral stage of growth i.e. at 180-360 DAB maximum AGR was noticed in treatment T₅. This could be due to the properties of vermicompost and rice husk as a fertilizer. In the present study, the physiological changes observed in a plant grown on vermicompost media could be attributed to the humic substances and microelements like Zn presence in vermicompost and silica in rice husk [8].

Economics of nutmeg softwood grafts grown in different potting media

The detailed cost of inputs and the cost of cultivation are shown in Table 3. The data on gross realization and net return, B:C ratio and weight of graft at a time of sale (after 360 DAB) as an influence by different potting media are presented in Table 3. The data revealed that the total cost of growing 100 nutmeg grafts in media T₄ was the highest i.e. Rs. 7662=60 while it was low in treatment T₂ (Rs.6522=20). However, gross income (Rs. 12,300) and net returns of Rs. 4815.80 with BCR (1.64) was the highest in media treatment T₅ i.e. in media Soil + FYM + Vermicompost + Rice husk (1:1:1:1) with 1" Cocopeat at top and found profitable followed by the treatment T₄ with Rs. 4037.40 as a net return and 1.52 B:C ratio. This might be due to the fact that the highest survival percentage was obtained in media treatment T₅. Treatment T₂ recorded the lowest net returns of Rs. 527.80 with BCR 1.08 due to lower survival percentage. Additionally, it was revealed that the weight of the grafts along with a bag containing media was more in treatment T₁ and T₂ (2.80 kg) while it was only 2.05 kg in treatment T₅ (Soil + FYM + Vermicompost + Rice husk (1:1:1:1) with 1" Cocopeat at the top (Table 3).

The study revealed that the growing nutmeg grafts in polybags having media treatment T₅ Soil + FYM + Vermicompost + Rice husk 1:1:1:1 with 1" Cocopeat at the top not only reported maximum returns, but were also light in weight and easy to transport. Similar results have been reported by Meena et al., [4] in papaya and Gawankar [9] in jackfruit grafts in media having Soil + Vermicompost + Rice husk + Cocopeat (1:1:1:1).

Conclusion

It could be concluded that Soil + FYM + Vermicompost + Rice husk (1:1:1:1) with 1" Cocopeat at the top was the most economical media combination for enhancing the growth and obtaining the vigorous softwood grafts of nutmeg.

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