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Effect of Various Potting Media on Growth Characteristics of Phalsa Cuttings (*Grewia subinaequalis* L.)

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ABSTRACT

Phalsa (*Grewia subinaequalis*), belonging to the Tiliaceae family, is a bushy plant adapted to the arid and semi-arid regions of India. Known for its hardiness, it thrives in diverse soil and climatic conditions where other fruit crops often fail. Phalsa fruits are valued for their exceptional medicinal and nutritional properties. Although traditionally propagated by seeds in India, the rapid loss of seed viability has made vegetative propagation a more reliable method, ensuring true-to- type plants and simplifying cultivation. An experiment conducted by the Department of Horticulture, Faculty of Agriculture, Annamalai University, Cuddalore, Tamil Nadu, evaluated the impact of different potting media on the growth characteristics of phalsa cuttings. The study was arranged in a Completely Randomized Design (CRD) with three replications. Results showed that hardwood cuttings planted in a mixture of Soil + Farmyard Manure (1:1) exhibited superior performance, with the shortest number of days taken for sprouting (10.21), highest number of sprouts per cutting (6.60), number of leaves per cutting (8.74), leaf area per cutting (15.08 cm 2), length of longest root per rooted cutting (18.51 cm), survival percentage of rooted cuttings (70.78%), fresh weight of the roots (3.22 g) and dry weight of the roots (0.95 g).

Keywords: Cuttings, Growth characteristics, Phalsa, Potting media, Propagation

INTRODUCTION

Phalsa (*Grewia subinaequalis*), classified under the Tiliaceae family is a bushy plant that thrives in India's dry and semi-arid regions. Native to the Indian subcontinent and Southeast Asia, it is an important minor fruit crop in the northern, northwestern, and southern parts of India, with significant cultivation in states like Gujarat, Maharashtra, Madhya Pradesh, Uttar Pradesh, and Bihar (Joshi *et al*, 2020). This hardy crop is well-suited to diverse soil and climatic conditions where other fruits struggle to grow (Pujari, 2012). Phalsa fruits are renowned for their medicinal and nutritional benefits. Unripe fruits are used to lower fever, treat blood, heart, and respiratory conditions, and diminish inflammation. (Singh *et al*, 2015). Ripe fruits, enjoyed fresh or processed into cooling summer beverages, are valued for their tonic and aphrodisiac properties. Rich in vitamins A and C, as well as vital minerals like iron and phosphorus, they hold significant nutritional value. Additionally, phalsa leaves possess antibiotic properties and are traditionally used to treat skin eruptions (Singh and Tomar, 2015). In India, phalsa is commonly propagated through seeds, but its seeds lose viability within three months under ambient storage, making fresh seeds from ripe fruits essential. To overcome this limitation, vegetative propagation methods such as rooting hardwood cuttings and layering have gained preference. These methods are more reliable, ensuring true-to-type plants and simplifying the cultivation process. Propagation through cuttings is particularly beneficial due to its ease, effectiveness in root initiation, and minimal precision requirements (Samson, 1986).

MATERIALS AND METHODS

The experiment was carried out at Annamalai University's Department of Horticulture, Faculty of Agriculture, Cuddalore, Tamil Nadu. Seven treatments were included in the completely randomized design experiment namely control – soil (M_1), farmyard manure (M_2), cocopeat (M_3), vermicompost (M_4), soil + farmyard manure (1:1) (M_5), soil + cocopeat (1:1) (M_6),

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Table 1. Effect of different potting media on phalsa at 60 days after planting.

Media	Number of days it takes for phalsa to sprout	The count of sprouts per phalsa cutting	Number of leaves per phalsa cutting	Leaf area per phalsa cutting (cm^2)
M_1	24.08	2.27	4.58	8.92
M_2	16.52	4.52	6.73	11.71
M_3	20.63	3.45	5.39	10.28
M_4	17.91	4.09	6.20	11.04
M_5	10.21	6.60	8.74	15.08
M_6	13.04	5.13	7.36	12.59
M_7	11.77	5.78	7.87	14.14
S. Ed	0.26	0.07	0.11	0.19
CD at 5 % (p = 0.05)	0.57	0.16	0.23	0.41

soil + vermicompost (1:1) (M_7) and which contained three times of replications. Hardwood cuttings prepared from 3 to 4 years old plants and from the hardwood portion of the branches, cuttings measuring 20 cm in length, comprising 4–5 nodes and exhibiting a thickness of 1.0–1.2 cm, were excised for propagation. To reveal the largest absorbing surface area for the best roots following treatment, the basal end of each cutting was sliced in slanting manner. 200 ppm of IBA is applied to the hardwood cuttings for a full day before to planting. Before being planted, the hardwood cuttings are treated with IBA 200 ppm for a whole day. Potting mixtures were prepared and filled in black polythene bags. The treated cuttings were planted at a depth of 4 to 5 cm.

To record the observations, five phalsa cuttings were chosen at random from each treatment per replication, and at 60 days following the planting, the following data were recorded: the number of days it took for the roots to sprout, the number of sprouts per cutting, the number of leaves per cutting, the leaf area per cutting (cm^2), the length of the longest root per rooted cutting (cm), the survival percentage of rooted cuttings (%), the fresh weight of the roots (g), and the dry weight of the roots (g). The experimental data for various traits was statistically analysed using Analysis of Variance (ANOVA) under a Completely Randomized Design, adhering to the methodology outlined by Fisher and Yates (1963). One-way ANOVA was performed for each parameter using the software WASP 2.0. The significance of the treatments was evaluated through the "F" test at a 5% level of significance. Additionally, the standard error of difference (S. Ed) and critical difference (CD) at the 5% significance level were included in the summary table to illustrate the nature and extent of the treatment effects.

RESULTS AND DISCUSSION

The data regarding the duration required for sprouting, the count of sprouts per cutting, the number of leaves per cutting, and the leaf area per cutting (cm^2) in Phalsa cuttings under various potting media treatments are summarized in Table 1. The least duration required for sprouting was observed in soil + farmyard manure (FYM, 1:1) (M_5), followed by soil + vermicompost (1:1) (M_7), which took 10.21 and 11.77 days, respectively, compared to the Control – soil (M_1) at 24.08 d. These findings indicated that cuttings planted in FYM sprouted earlier than those in other treatments. This might be because, in comparison to alternative potting media, FYM has more porosity and improved moisture and nutrient availability, which encourage physiological activity in the cuttings and cause early leaf emergence (Jamil *et al,* 2016).

Soil + harmyard manure (1:1) (M_5) registered the highest number of sprouts per cutting (6.60) whereas M_1 recorded the lowest number of sprouts per cutting (2.27). FYM significantly improved soil's physical, chemical, and biological properties. It enhances soil structure, nutrient availability, and microbial activity, creating optimal conditions for plant growth. FYM's ability to bind soil aggregates improves water retention and aeration, while gradually releasing essential nutrients. This study showed that soil mixtures with FYM increased the number of sprouts per cutting due to better nutrient availability and moisture retention. Similar findings were observed in mulberry (Sharma, 1993).

Soil + farmyard Manure (1:1) (M_5) recorded the most leaves per cutting followed by soil + vermicompost (1:1) (M_7) which showed 8.74 and 7.87, respectively to control – soil (M_1) (4.58). FYM, a rich

Table 2. Effect of different potting media per cutting in Phalsa at 60 days after planting.

Media	Length of the most extended root per rooted cutting (cm)	Survival rate of rooted cuttings (%)	Fresh weight of the phalsa roots (g)	Dry weight of the phalsa roots (g)
M_1	10.76	60.47	1.07	0.25
M_2	15.19	68.02	2.18	0.57
M_3	12.64	67.89	1.53	0.39
M_4	13.95	67.91	1.86	0.46
M_5	18.51	70.78	3.22	0.95
M_6	16.42	68.51	2.50	0.70
M_7	16.94	69.05	2.82	0.80
S. Ed	0.23	1.01	0.04	0.01
CD at 5 % (p = 0.05)	0.51	2.20	0.08	0.02

organic matter, improves soil structure by binding aggregates, enhances nutrient availability, and boosts microbial activity. These combined effects improve moisture retention and aeration, creating ideal conditions for plant growth. FYM's nutrient supply supports photosynthesis and metabolism, leading to more vigorous shoot development and increased leaf numbers. Findings similar to the present study were reported on pomegranates (Bhagat and Saraswati, 1988) and on mulberries (Sharma, 1993).

At 60 days after planting, the highest leaf area per cutting (15.08 cm^2) in M_5 and the minimum leaf area per cutting (8.92 cm^2) were observed in M_1 . Farmyard manure improves soil structure by binding aggregates, enhances nutrient availability, and boosts microbial activity. These improvements, along with increased moisture availability and nutrient supply, likely contribute to a significant increase in leaf area. Findings similar to the present study were obtained in mulberries (Sharma, 1993), in pomegranates (Bhagat and Saraswati, 1988), and in papaya (Ramteke *et al,* 2013).

The data (Table 2) present values on the Phalsa cuttings under various potting media treatments for length of the longest root per rooted cutting (cm), survival percentage of rooted cuttings (%), fresh weight of the roots (g), and dry weight of the roots (g). The longest root per rooted cutting was recorded by M_5 whereas the lowest recorded length of the longest root per successfully rooted cutting was recorded by M_1 (10.76). The increase in root length was due to the nutrient-rich mixture, which, because of its high porosity and ability to retain water and nutrients, it supports the development of a strong root system. This combination creates ideal conditions for root growth. The organic substances in the rooting media improve soil physical properties, fostering a better environment for root development (Ramteke *et al,* 2013). Furthermore, organic amendments enhance soil structure by improving water retention, aeration, and drainage, which in turn promotes development of roots and nutrients uptake (Kumar et al., 2009). Findings similar to the present study were reported by Deol and Uppal (1990) in pomegranate, Sharma (1993) in mulberry, Lakra (2004) in passion fruit and Ramteke *et al* (2013) in Papaya.

At 60 days after planting, the highest survival percentage of rooted cuttings (70.78 %) in M_5 and the lowest survival percentage of rooted cuttings (60.47 %) was observed in M_1 . The use of FYM in soil improves plant survival by modifying soil physical properties and increasing nutrient availability, which supports healthy growth and development (Singh and Gupta, 2005). Moreover, tree cutting survival depends on potting soil with a high carbohydrate content and low nitrogen levels since these elements promote root formation, bud initiation, and leaf development in shoots, increasing the likelihood of successful sprouting (Jamil *et al,* 2016). These findings were comparable to those of Lakra (2004) in passion fruit, Sharma (1993) in mulberries,

Soil + farmyard manure (1:1) (M_5) has the most leaves per cutting, followed by soil + vermicompost (1:1) (M_7) which showed 8.74 and 7.87 respectively to control – soil (M_1) (4.58). The observed results may be due to the enhanced nutrient availability in the potting media combinations, it encourages the growth of more leaves that are photosynthetically active (Borah *et al,* 2008). The increased number of leaves per cutting could be attributed to the plant allocating more assimilates to the leaf bud, as leaves play a crucial role in natural auxin production and key processes like photosynthesis and respiration. Additionally, the higher organic matter content helped increase the number of leaves by supplying essential nutrients that fostered early root development (Awan *et al,* 2003). In conclusion, Farmyard manure and other organic soil combinations increased the biomass of leaves produced. Indriyani *et al* (2011) and Ramteke *et al* (2013) reported similar findings in pineapple and papaya, respectively.

At 60 days after planting, soil + farmyard manure (1:1) (M_5) registered the highest fresh and dry weights of the roots (3.22 and 0.95 g), whereas M_1 recorded the lowest fresh and dry weights of the roots (1.07 and 0.25 g). Organic substances in rooting media improve the soil's physical properties, creating an environment that supports better root growth (Ramteke *et al,* 2013), leading to enhanced root development. Additionally, organic amendments in potting mixtures enhance soil structure by increasing water retention, aeration, and drainage, promoting improved development of roots and absorption of nutrients (Kumar *et al*, 2009).

CONCLUSION

The findings from the study indicated that the soil and farmyard manure combination notably enhanced the growth characteristics of phalsa cuttings. This approach can serve as an effective technique for farmers to improve growth outcomes in phalsa propagation.

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