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EFFECT OF PROPAGATION MEDIA ON ROOTING IN POMEGRANATE AIR LAYERING CV BHAGWA

Rahul V. Patil*, Sachin D. Magar, Amol V. Khirsagar, Vijay R. Pawar and Sona H.S.

Department of Horticulture, Mahatma Phule Krishi Vidyapeeth Rahuri, Dist: Ahilyanagar (MS), India.

*Corresponding author E-mail: rahulpatil260@gmail.com

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ABSTRACT

The present investigation was conducted at Instructional cum Horticulture Research Farm, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri during the rainy season 2024-25. The experiment was conducted on two years old mother orchard having uniform vigor and size. Healthy and pencil thicknesses branches were used for air layering. The experiment was laid out in a Randomized Block Design with seven treatments and replicated thrice. Four types of rooting media viz., sphagnum moss, cocopeat, leaf mould and coir pith were used alone and their combinations were prepared according to the treatment plan on a volume-to-volume basis to perform air layering. The treatment includes T_1 Sphagnum moss (100 %) (Control), T_2 Cocopeat (100 %), T_3 Sphagnum moss + Cocopeat (2:1), T_4 Sphagnum moss + Cocopeat (1:1), T_5 Sphagnum moss + Leaf Mould (1:1), T_6 Cocopeat + Leaf Mould (1:1) and T_7 Sphagnum moss + Coir Pith (1:1). The experimental findings revealed that the use of different propagation media had a significant effect on rooting of pomegranate air layers. The treatment combination Sphagnum Moss + Cocopeat (2:1) proved to be the most effective among all treatments. It showed the earliest visible root initiation (19.67 days), faster bulk root formation (36.00 days) and early transplanting time (45.33 days). It also recorded a high percentage of rooted layers (96.34%) and dense rooting. The control treatment T_1 (Sphagnum moss 100 %) showed the better rooting percentage (88.20 %) and high root density. Therefore, it is concluded that among all the treatments, Sphagnum Moss + Cocopeat (2:1) was most effective, ensuring early root initiation, faster bulk root formation, early transplanting and highest rooting percentage (96.34%). The control (Sphagnum moss alone) also performed well with 88.20% rooting.

***Key words*:** Pomegranate, air layering, propagation media, rooting percentage, sphagnum moss, cocopeat, root initiation

Introduction

Pomegranate (*Punica granatum* L.) a member of the Punicaceae family (2n=18), is an important fruit crop known for its nutritional, medicinal and economic value. Native to Iran and widely grown in tropical and subtropical regions, it thrives under arid and semi-arid climates due to its drought tolerance and adaptability to diverse soils. India ranks first in global pomegranate production, with Maharashtra being the leading state. In 2023–24, India cultivated pomegranate on 2.27 lakh ha, producing 28.82 lakh MT, with Maharashtra alone contributing 14.36 lakh MT (Anonymous, 2024).

Among propagation techniques, air layering is the most commercially successful for pomegranate, ensuring true-to-type plants with better survival and early fruiting. Sphagnum moss, widely used for air layering due to its high-water retention capacity for longer period However, there are some limitations on its commercial use in propagation practices (air layering) because it is forest product and it comes under endangered species. Now a day's forests are decreasing and due to erratic monsoon availability of sphagnum moss is very difficult. Hence, there is a need to explore alternative media like coco peat, leaf mould, and coir pith.

Coco peat is a sustainable coconut by-product with high water-holding capacity and good aeration. Leaf mould, although less used, improves soil texture and moisture retention. Coir pith is an eco-friendly material

Table 1: Effect of different propagation media on the rooting of pomegranate air layers.

Tr. No.	Treatment details	Days required for initial visible root appearance	Days required for visible bulk appearance of roots	Days required for transplanting in polybags	Success precentage (rooting)	Root Density
T_1	Sphagnum moss (100%) (Control)	20.33	36.33	46.67	88.20	High
T_2	Cocopeat (100 %)	24.00	41.00	58.33	60.61	Medium
T_3	Sphagnum moss + Cocopeat (2:1)	19.67	36.00	45.33	96.34	High
T_4	Sphagnum moss + Cocopeat (1:1)	23.33	40.33	52.67	75.64	Medium
T_5	Sphagnum moss + Leaf mould (1:1)	26.67	54.33	71.67	51.30	Low
T_6	Cocopeat + Leaf mould (1:1)	28.33	58.33	76.33	42.40	Low
T_7	Sphagnum moss + Coir pith (1:1)	25.67	50.33	68.33	58.87	Medium
	S.Em. ±	1.04	1.85	2.24	3.25	—
	C. D. at 5%	3.21	5.71	6.91	10.00	—

from coconut husks that supports root development and waste management. These materials may offer cost-effective and sustainable substitutes for sphagnum moss in pomegranate propagation.

Thus, this study was undertaken to evaluate different propagation media for rooting of air layers in pomegranate to reduce dependency on sphagnum moss find out suitable alternate rooting media and support eco-friendly nursery practices.

Materials and Methods

The present investigation entitled "Effect of different propagation media on rooting in pomegranate air layers cv. Bhagwa" was undertaken with the objective to standardize suitable propagation media for pomegranate air layering. The study was conducted during the rainy season of 2024-2025 at the Instructional-cum-Horticulture Farm, Department of Horticulture, MPKV, Rahuri.

The experiment was laid out in a Randomized Block Design (RBD) comprising seven treatments and three replications. The propagation media used in the treatments were prepared on a volume-to-volume (v/v) basis to perform air layering. The treatment includes T_1: Sphagnum moss (100 %), T_2: Cocopeat (100 %), T_3: Sphagnum moss + Cocopeat (2:1), T_4: Sphagnum moss + Cocopeat (1:1), T_5: Sphagnum moss + Leaf Mould (1:1), T_6: Cocopeat + Leaf Mould (1:1), T_7: Sphagnum moss + Coir Pith (1:1).

Air layering was performed during rainy season on one year old pencil thickness branches. Once root initiation was observed and the roots matured to a brown color, the layers were detached using secateurs below the ringed zone. The rooted layers were transplanted into 4" × 6" polybags filled with clay loam soil, taking care to avoid root damage and ensuring proper establishment.

After detachment of layers from the mother plants, they were put in polybags for recording the observations. All the cultural practices involving the control measures were adopted to maintain the layers healthy and disease free. The observations on air layering performance in pomegranate were recorded from five randomly tagged layers per treatment per replication. The parameters observed included days to initial root appearance (from layering to first visible root), days to bulk root formation (appearance of full root mass) and days to transplanting (from layering to root detachment). Rooting success (%) was calculated by comparing the number of rooted layers to the total layers. Root density was categorized as high, medium or low based on root spread and mass. The average values of all recorded parameters were computed for each treatment. The data were statistically analyzed using Analysis of Variance (ANOVA) under a Randomized Block Design (RBD) as per the method outlined by Panse and Sukhatme (1985) to assess the significance of treatment differences.

Results and Discussion

The data pertaining to the rooting parameters and statistical interpretations is presented in this section.

Days required for initial visible root appearance

In respect to the various rooting media evaluated, the minimum days taken to initial visible root appearance

Plate 1: Different media used for pomegranate air layering

in air layers (19.67 days) was observed under the treatment T_3 *i.e.* Sphagnum moss + Cocopeat (2:1) and which was found statistically at par with treatment T_1 *i.e.* Sphagnum moss (100 %) which showed root initiation at 20.33 days. While the maximum number of days required for initial visible root appearance (28.33 days) was observed in T_6 (Cocopeat + Leaf mould @ 1:1). The minimum number of days required for initial visible root appearance in air layers of pomegranate might be due to moist sphagnum moss and cocopeat as an ideal rooting medium and are well known for their high-water retention capacity with good aeration. Sphagnum moss when mixed with cocopeat, it likely to provide a balanced moisture level and better aeration compared to using cocopeat alone. This could have encouraged faster root primordia development by maintaining a favorable moisture-to-air ratio around the stem tissues. Using sphagnum moss alone or in combination with cocopeat is more effective for quicker root initiation in pomegranate air layering. These results are in line with the findings reported by Tryambake *et al.*, (2004), Patel *et al.*, (2011), Dubey and Mishra (2024) in pomegranate and Awasthi *et al.*, (2022) in guava air layers.

Days required for visible bulk appearance of roots

It is observed that propagation media had a significant effect on the days taken for visible bulk root appearance in pomegranate air layers. The treatment T_3 *i.e.*, Sphagnum moss + Cocopeat (2:1) which took the minimum number of days (36 days) for the visible bulk appearance

Plate 2: Effect of different propagation media on the root density of Pomegranate air layers.

of roots in pomegranate air layers and it was found statistically at par with T_1, *i.e.*, Sphagnum moss (100%) which was recorded 36.33 days. However, the maximum number of days required for initial visible root appearance (58.33 days) was observed in T_6 (Cocopeat + Leaf mould 1:1) indicating that this media combinations delayed root initiation substantially in pomegranate air layers.

Minimum number of days required for visible bulk appearance of roots in air layers of pomegranate might be due to the ideal moisture retention properties of sphagnum moss, which ensures constant humidity around the girdled portion, thereby promoting early root primordia development. The addition of cocopeat might have improved the texture and moisture balance without reducing aeration, further facilitating faster root differentiation with early root initiation and early bulk appearance of roots. High oxygen content of the root zone accelerates the growth of healthy and strong roots.

The results of the present study are in support of the findings reported by Tryambake *et al.,* (2004), Bhosale *et al.,* (2009) and Patel *et al.,* (2011) in pomegranate. Early bulk root appearance recorded with the use of sphagnum moss as rooting media in fig air layers (Reddy *et al.,* 2014).

Days required for transplanting in polybags

The minimum number of days (45.33 days) required for transplanting of air layers in polybags was recorded in T_3 *i.e* Sphagnum moss + Cocopeat (2:1) and which was found statistically at par with T_1 *i.e.* Sphagnum moss (100 %) (46.67 days). However, the maximum number of days required for transplanting of air layers (76.33 days) was noticed in T_6 (Cocopeat + Leaf mould 1:1) over rest of the media combinations.

The minimum number of days required for transplanting of air layers in polybags is might be due to the early root maturity occurred because of sphagnum moss is well recognized for its excellent water-holding capacity, aeration and ability to maintain constant moisture levels, which makes it highly suitable for rooting in air layers. When combined with Cocopeat, the combination provides a good balance of water retention, aeration which promotes faster root development and plant vigor. The propagation media allows developing a strong and faster root system in pomegranate air-layers that helps them to be transplanted into polybags with fewer days. These results are in close agreement with the findings reported by Kumar *et al.,* (2024b). They found that sphagnum moss-based media enabled faster transplanting by ensuring early and healthy root system development grapefruit air layers.

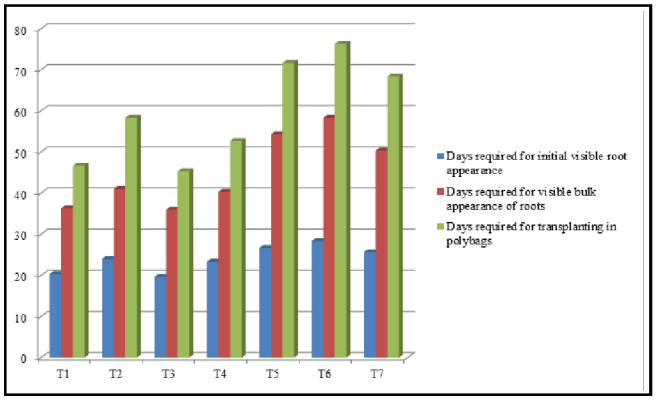

Fig. 1: Effect of different propagation media on the rooting of pomegranate air layers.

Success Percentage (rooting)

The success percentage (rooting) of pomegranate air layers is significantly influenced by the type of propagation media used. The maximum success percentage in air layers of pomegranate (96.34 %) was observed in T_3 *i.e.* Sphagnum moss + Cocopeat (2:1) and it was found statistically at par with T_1 *i.e.* Sphagnum moss (88.20 %). However, the lowest success (rooting) percentage was found in T_6 (Cocopeat + Leaf Mould 1:1) of 42.40 %.

The highest success percentage can be attributed due to the high water-holding capacity, good aeration and lightweight texture of sphagnum moss and cocopeat, which create a moist and oxygen-rich rooting environment essential for root formation and elongation. The results of the present study are in support with the findings reported by Tryambake *et al.,* (2004) they found the highest rooting in pomegranate air layers with sphagnum moss and cocopeat. Bhosale *et al.,* (2009) and Dubey and Mishra (2024) reported highest rooting in pomegranate air layers with sphagnum moss and other media combinations. Dhashlera *et al.,* (2019) they noticed superior rooting percentage in guava with sphagnum moss + cocopeat media. Rymbai and Reddy (2010), Parmar *et al.,* (2018), Naithani *et al.,* (2018) and Chhabra *et al.* (2022) reported significantly higher rooting percentage in guava air layers using sphagnum moss based medium.

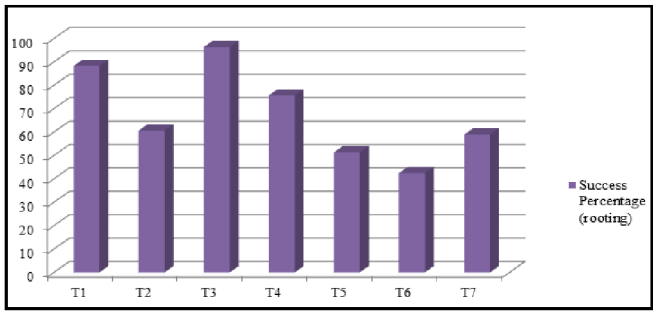

Fig. 2: Effect of different propagation media on the success percentage of pomegranate air layers.

Root Density per Layer

The different propagation media had a significant effect on the root density per air layer of pomegranate. High root density was noticed in T_1 (Sphagnum moss 100%) and T_3 (Sphagnum moss + Cocopeat in 2:1). In treatments like T_2 (Cocopeat 100%), T_4 (Sphagnum moss + Cocopeat 1:1) and T_7 (Sphagnum moss + Coir Pith 1:1) medium root density was observed. Whereas, low root density was seen in T_5 (Sphagnum moss + Leaf Mould 1:1) and T_6 (Cocopeat + Leaf Mould 1:1).

This trend clearly shows that sphagnum moss either used alone or in combination with cocopeat (2:1), supports better root proliferation. The sphagnum moss + Cocopeat (2:1) medium provides high moisture retention, good aeration and a stable structure, which together create ideal conditions for continuous root growth and branching resulting in higher root density in pomegranate air layers. These results are in close agreement with the earlier findings reported by Patel *et al.,* (2011), Tryambake *et al.,* (2004) in pomegranate and Awasthi *et al.,* (2022) in guava found that the combination of sphagnum moss and cocopeat significantly enhanced rooting performance in air layers.

Conclusion

From the forgoing discussion it can be concluded that, use of different propagation media had a significant effect on rooting of pomegranate air layers. The treatment combination Sphagnum Moss + Cocopeat (2:1) proved to be the most effective among all the treatments. It showed the earliest visible root initiation (19.67 days), faster bulk root formation (36.00 days) and early transplanting time (45.33 days). It also recorded a high percentage of rooted layers (96.34%) and dense rooting. The control treatment T_1 (Sphagnum Moss 100 %) showed the better rooting percentage (88.20 %) and high root density.

Therefore, it can be concluded that Sphagnum Moss + Cocopeat (2:1) enhances rooting performance, it does not fully replace sphagnum moss, but can partially substitute up to 33% without compromising rooting efficiency.

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