



## **Influence of Potting Media and Different Containers on Mango Stone Grafts in Coastal Zone of South Maharashtra**

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**The experiment was conducted at the Regional Fruit Research Station, Vengurla, to determine the ideal container type and growing media for the optimal growth of mango stone grafts. The main treatment consisted of three types of containers, and the sub-treatment included five different potting media combinations. Among the various treatments, grafts grown in polythene bags showed significantly better growth, recording the maximum height (35.32 cm), plant spread (30.21 cm), root spread (9.91 cm), and survival percentage (44.85%). Regarding the potting media, the highest plant height (35.35 cm) was observed in treatment T<sub>5</sub> (Soil + Vermicompost), which was at par with treatment T<sub>1</sub> (Vermicompost + Cocopeat), with a height of 35.32 cm. The maximum girth (3.45 cm) and plant spread (29.61 cm) were observed in treatment T<sub>1</sub> (Vermicompost + Cocopeat). The combination of polybags and the potting media mixture of vermicompost and cocopeat in a 1:1 ratio proved to be lightweight, space-efficient in the nursery, and cost-effective for transportation, while also supporting good plant growth. However, grafts grown in root trainers showed lower survival rates, limiting their use for this purpose.**

*(Key words: Coco peat, Mango, Media, Root trainer)*

Indian mango fruit is in great demand both domestically and internationally. Maharashtra, especially the Konkan region, is renowned for producing high-quality mango varieties like Alphonso, Sindhu, Ratna, *etc.* Good quality planting material is essential for any fruit crop, since it not only expands the growing area but also produces consistent growth, high yield and high - quality fruit. Commercially stone grafting technique is being followed for the production of mango grafts in the Konkan region. Amongst different factors influencing the development of quality planting material in mango the major factors are physical condition of the growing medium, volume of media, drainage, fertility of the media and type of container in which the grafts are grown.

Commercially stone grafting technique is being followed for the production of mango grafts in the Konkan region. Amongst different factors influencing the development of quality planting material in mango

the major factors are physical condition of the growing medium, volume of media, drainage, fertility of the media and type of container in which the grafts are grown. The poor health of grafts root system in nursery leads to root diseases as well as reduction in the general health of plant and slow growth rates which in turn will increase nursery gestation time and mortality rate. The container sizes with much smaller in volume coupled with use of artificial potting media having only half to onethird the weight of soil making the container nursery grafts very light. This helps in keeping a greater number of containers/unit area of nursery. Root trainers are specially designed containers or pots with vertical ribs and an open base. They guide roots to grow downward rather than circling around, promoting a healthier and stronger root system. It requires less nursery space compared to polybags and provides better water drainage and aeration which reduce the risk of damping-off and root rot diseases.

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The use of small containers has the additional advantage that transport of grafts become easy as it occupies less space and lower the total weight. Container size has become an issue of interest in many experiments and it has occasionally received attention especially in plant biology related fields (Salisu *et al.*, 2018).

The coastal zone of Konkan region of Maharashtra is blessed with paddy and coconut plantation and also locally vermicompost and cocopeat are easily available for media preparation for nursery. Soilless medium containing proportions of both organic and inorganic like coir pith, rice husk and compost is also used to fill the container. According to Salisu *et al.* (2018) air contact of the root tips, self-pruning and well aeration of this planting medium helps the plants to experience little stress and these subsequently leads to the emergence of a significant quantity of well-developed lateral roots without deformation.

It is imperative to determine the type of container and standardize the growing medium to provide best physio-chemical environmental attributes for growth of mango grafts which occupy less space in the nursery, light in weight and easy for transport. This study also serves as alternative to soil in near future in coastal region.

Keeping in view the above facts regarding the significance of root trainers in promoting healthy root development and enhancing the growth and survival of grafted plants, an experiment was undertaken to evaluate the influence of different container sizes and various potting media on the growth attributes and survival percentage of mango grafts. The study was designed to generate practical recommendations for nursery management practices for producing vigorous, uniform, and healthy mango grafts with high survival.

The present investigation on effect of different type of container and growing media on mango stone graft was carried out at the Regional Fruit Research Station, Vengurla, District Sindhudurg, Maharashtra, during the year 2021-22. The experiment was executed in a factorial completely randomized block design with three main treatments and five sub treatments and two replications. The freshly extracted mango stones were sown in different size of containers filled with different potting media (as per treatment) in the month of May

third week and stone grafting was done in the first week of June. After grafting, 30 successful grafts per treatment combination were selected for observations. The uniform package of practices was followed for all treatments including drenching with 19:19:19::N:P:K @ 2 g L<sup>-1</sup> at fifteen days interval, plant protection measures, application of water and regular removal of sprouts below the graft union, etc. Three types of containers were used as main treatments S<sub>1</sub>: Root trainers of volume 800 cm<sup>3</sup>, S<sub>2</sub>: Pot of volume 1600 cm<sup>3</sup> and S<sub>3</sub>: Polybags of size 20 x 25 cm. The root trainers are placed on a root trainer stand in such a way that the drainage hole is exposed above the ground, which facilitates free flow of air. The second container was vertical pot like structure tapering towards base having holes at bottom of size and mound on ground. The third container is polybags of size 20 x 25 cm of 1250 cm<sup>3</sup> volume having holes at bottom and placed on weed mat. All the three containers were filled with different combinations of growing media. The treatments of media consist of T<sub>1</sub>: Vermicompost + Cocopeat (1:1), T<sub>2</sub>: Vermicompost + Rice husk (1:1), T<sub>3</sub>: Vermicompost + Cocopeat + Rice husk (2:1:1), T<sub>4</sub>: Vermicompost, T<sub>5</sub>: Soil + Vermicompost (3:1). In this study, the growth parameters, root growth and survival percentage influenced by different potting media was recorded up to 240 days and were analysed following the standard method of analysis of variance as given by Panse and Sukhatme (1995).

The data recorded during the study is presented in Table 1. Data revealed that there was significant effect of root trainer size and potting media on height of mango grafts at 240 days after grafting. Grafts grown in polythene bag S<sub>3</sub> recorded highest height (35.32 cm) while the potting media treatment T<sub>5</sub> (Soil + Vermicompost) recorded highest height (35.35 cm) and it was found at par with T<sub>1</sub> (Vermicompost + Cocopeat) (35.24 cm). However, the interaction effect was found non-significant.

At 240 days after grafting the effect of root trainer size and interaction effect of both factors with respect to girth, no. of leaves and no. of shoots was found non-significant. Similar results were reported by Srivastava *et al.* (2019) in guava and Pokhrel and Albrecht (2024) in citrus plant. Significantly maximum girth (3.45 cm) of graft was observed in potting media treatment T<sub>1</sub>

(Vermicompost + Cocopeat, 1:1) and was found at par (3.37) with T<sub>5</sub> (Soil + Vermicompost, 3:1).

Significantly maximum no. of leaves (19.78) recorded in potting media treatment T<sub>5</sub> (Soil + vermicompost) and it was found at par with treatment T<sub>3</sub> and T<sub>1</sub>. In respect of plant spread, significantly maximum

plant spread (30.21 cm) recorded in the treatment S<sub>3</sub> (Polythene bag) with potting media T<sub>1</sub> (Vermicompost + Cocopeat - 1:1). Grafts containing media mixture with proper aeration, moisture and substantial amount of nutrients, facilitate root absorption for formation of photosynthates. It helped in cell division, cell elongation

*Table 1. Effect of potting container and potting media on growth of mango graft*

Treatment	Height cm	Girth cm	No. of leaves	No. of shoots	Plant spread cm	Root length cm	Root spread cm	Survival %
Container size								
S <sub>1</sub>	31.52	3.33	16.08	1.07	24.65	25.14	7.73	36.15
S <sub>2</sub>	32.52	3.27	17.33	1.12	27.64	25.68	6.32	35.35
S <sub>3</sub>	35.32	3.29	16.44	1.26	30.21	24.87	9.91	44.85
SE + (m)	0.54	0.05	0.95	0.07	0.34	0.55	0.32	0.713
CD	1.67	NS	NS	NS	1.03	NS	0.98	2.183
Media								
T <sub>1</sub>	35.24	3.45	18.06	1.17	29.61	23.13	8.40	38.67
T <sub>2</sub>	30.49	3.21	13.86	1.08	25.16	26.98	6.82	39.08
T <sub>3</sub>	32.36	3.33	18.11	1.17	29.28	27.85	7.58	33.00
T <sub>4</sub>	32.16	3.11	13.27	1.23	24.97	20.33	6.82	38.08
T <sub>5</sub>	35.35	3.37	19.77	1.12	28.48	27.85	10.32	45.08
SE + (m)	0.70	0.07	1.23	0.09	0.43	0.71	0.42	0.92
CD	2.15	0.21	3.759	NS	1.33	2.18	1.27	2.82
Container x Media								
S <sub>1</sub> T <sub>1</sub>	35.30	3.47	20.75	1.06	29.62	28.40	10.40	36.50
S <sub>1</sub> T <sub>2</sub>	27.20	3.24	12.67	1.00	21.86	25.55	6.00	37.50
S <sub>1</sub> T <sub>3</sub>	30.82	3.42	17.15	1.00	26.26	26.55	6.25	31.25
S <sub>1</sub> T <sub>4</sub>	30.15	3.09	10.25	1.17	18.36	16.75	5.00	34.50
S <sub>1</sub> T <sub>5</sub>	34.14	3.43	19.57	1.15	27.18	28.45	11.00	41.00
S <sub>2</sub> T <sub>1</sub>	34.00	3.45	16.09	1.24	28.54	21.50	4.60	33.00
S <sub>2</sub> T <sub>2</sub>	29.75	3.25	15.75	1.13	28.13	29.00	6.45	33.25
S <sub>2</sub> T <sub>3</sub>	30.50	3.14	16.34	1.00	25.13	22.50	5.40	31.25
S <sub>2</sub> T <sub>4</sub>	32.84	3.17	16.06	1.22	28.29	26.25	6.95	36.25
S <sub>2</sub> T <sub>5</sub>	35.50	3.35	22.40	1.04	28.11	29.15	8.20	43.00
S <sub>3</sub> T <sub>1</sub>	36.41	3.44	17.34	1.21	30.66	19.50	10.20	46.50
S <sub>3</sub> T <sub>2</sub>	34.53	3.13	13.18	1.12	25.51	26.40	8.00	46.50
S <sub>3</sub> T <sub>3</sub>	35.75	3.45	20.84	1.50	36.46	34.50	11.10	36.50
S <sub>3</sub> T <sub>4</sub>	33.50	3.07	13.50	1.30	28.25	18.00	8.50	43.50
S <sub>3</sub> T <sub>5</sub>	36.40	3.35	17.35	1.17	30.16	25.95	11.75	51.25
SE + (m)	1.22	0.12	2.126	0.152	0.75	1.23	0.72	1.59
CD	NS	NS	NS	NS	2.31	3.77	2.20	NS

and adequate water supply resulted in increase in per cent of girth of grafted plants.

At 240 days after grafting, the effect of root trainer size and its interaction with potting media on the girth, number of leaves, and number of shoots was found to be non-significant, indicating that container size alone did not markedly influence these parameters. However, potting media composition had a significant impact on these growth attributes.

Significant effect of root trainer size, potting media and their interaction on root spread of mango grafts was observed at 240 days after grafting (Table 1). In respect of potting media, treatment T<sub>5</sub> recorded the highest root spread (10.31cm) followed by T<sub>1</sub> (8.40 cm) while treatment S<sub>3</sub> recorded significantly maximum root spread (9.91 cm) followed by S<sub>1</sub> (7.73 cm) and S<sub>2</sub> (6.32 cm). At 240 days after grafting, significantly maximum root length (27.85 cm) was observed in potting media treatment T<sub>5</sub> and T<sub>3</sub>, which was at par with T<sub>2</sub> (26.98 cm). While significantly, maximum root length (34.50 cm) was observed with interaction effect of S<sub>3</sub>T<sub>3</sub> followed by S<sub>2</sub>T<sub>5</sub>, S<sub>1</sub>T<sub>5</sub>, S<sub>2</sub>T<sub>2</sub>, S<sub>1</sub>T<sub>1</sub>. These results reinforce the critical role of potting media and container characteristics in shaping the root architecture of mango grafts, which is essential for better field performance and transplant success. Potting media with vermicompost is extremely rich in readily available nutrients like nitrates, exchangeable P, K, Ca, and Mg and is also made up of significant amounts of humic substances. This increases the accumulation of photosynthates in functional leaves and encourages better seedling juvenile and reproductive growth. Vermicompost is reported as having bioactive principles considered to be beneficial for root growth, root initiation, germination and growth of the plant (Gawankar *et al.*, 2021).

A significant effect of container type on the survival percentage of mango grafts was recorded at 240 days after grafting, whereas the interaction effect of container size and potting media was found to be non-significant (Table 1). Among the container types, grafts raised in polythene bags (S<sub>3</sub>) exhibited the highest survival percentage (44.85%), which was superior to those raised in root trainers (S<sub>1</sub>) (36.15%) and pots (S<sub>2</sub>) (35.35%). The superior performance in

polythene bags could be attributed to the provision of sufficient space for root development, better moisture retention, and reduced handling stress during grafting and maintenance operations. With respect to potting media, the maximum survival percentage (44.42%) was recorded in T<sub>5</sub> (Soil + Vermicompost, 3:1), followed by T<sub>2</sub> (39.08%), T<sub>1</sub> (38.67%), and T<sub>4</sub> (38.08%). The best performance of nutmeg soft wood graft was observed in the media having Soil + FYM + Vermicompost + Rice husk (1:1:1:1) with 2.5 cm cocopeat at top by Rajput *et al.* (2019). Whereas, Juvekar *et al.* (2019) found maximum survival percentage of kokum seedlings in the media having soil + FYM in 3:1 proportion. Enhanced survival in these treatments may be due to the balanced availability of nutrients, better aeration, and improved water-holding capacity provided by vermicompost, which is known to enhance plant health and stress tolerance. However, interaction effect was found non-significant. The non-significant interaction effect suggests that while both container type and potting medium individually influence graft survival, their combination does not produce a synergistic or antagonistic effect, strong enough to affect survival outcomes. The lowest survival percentage was observed in media treatment containing rice husk. The results are in line with the findings of Gawankar *et al.* (2021) who explained the allelopathic effect of saw dust in growing media.

The variation in survival percentage may be attributed to the differences in container volume and design. Although root trainers had a capacity of 800 cm<sup>3</sup>, the polybags offered a larger effective volume, providing more space for root expansion, moisture retention, and nutrient availability, which collectively promoted better growth and higher survival of mango grafts compared to root trainers.

Interestingly, the lowest survival percentage was recorded in pots, despite their greater volume compared to polybags. This paradoxical result could be due to poor drainage and restricted aeration. As pots were placed directly on the soil surface, the free flow of air around the container base was limited, potentially leading to waterlogging and reduced oxygen availability to the roots. Such conditions

may have caused root deformation, suffocation, or rot, adversely affecting the health and survival of the grafts. The finding highlights the importance of not only container size but also container design and positioning in ensuring proper drainage and aeration for optimal plant survival.

These results can be attributed to difference in growing media holding capacity of different containers (Gupta *et al.*, 2018). The findings of the present study is also in accordance with the results of Nayital *et al.* (1995) who reported that potting material influences all the growth parameters because of different container volumes which reduced root restriction and led to increased dry matter production resulting in increased survival percentage. In conclusion, polybags with potting media combination of vermicompost and cocopeat at 1:1 proportion is light weight, occupy less space in nursery and easy for transport and provide alternative for soil in coastal region. However, grafts in root trainers due to the less survival produces limitations in its use.

The study concluded that both root trainer size and potting media had a significant effect on the growth and survival of mango grafts at 240 days after grafting. Grafts grown in polythene bags (S<sub>3</sub>) exhibited the highest plant height, plant spread, root spread, and survival percentage, indicating the suitability of this container type for nursery use. Among the potting media, the treatment T<sub>5</sub> (Soil + Vermicompost in 3:1 ratio) resulted in superior growth parameters including plant height, number of leaves, root spread, and root length, followed closely by T<sub>1</sub> (Vermicompost + Cocopeat in 1:1 ratio).

#### CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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