

Effect of Various Potting Media on the Growth and Root Development of *Bougainvillea* (*Bougainvillea* spp.) Cuttings

ABSTRACT

The study aims to enhance the propagation efficiency of *Bougainvillea*, a popular ornamental plant, by evaluating the effects of different potting media on its growth and root development. The experiment was conducted over 180 days using *Bougainvillea* hardwood cuttings and was arranged in a Randomized Block Design (RBD). The study revealed that a mixture of soil, sand, FYM, and vermicompost significantly improved plant height, stem girth, number of branches, number of leaves, leaf area, root weight, and survival rate compared to other treatments, highlighting its potential as an optimal potting medium for *Bougainvillea* propagation. The highest root length was recorded in the combination of Soil + Sand + Rice husk (1:1:1).

Keywords: *Bougainvillea*, potting media, plant height, survival.

INTRODUCTION

Bougainvillea is native to the tropics and subtropics of South America, which was first collected by Commerson, a French Botanist from Rio de Janeiro (Brazil) in 1766. Name the plant after famous French navigator Lois Antoine de Bougainvillea. *Bougainvillea* is a highly adaptable plant with variety of colours and blooms to make the environment colourful and magnificent. *Bougainvillea* is a popular plant for landscaping because of its stunning flashy bracts and growing habit. It has great demand among landscape architects, horticulturists and garden lovers for development of house gardens (indoor and outdoor), bonsai, hanging basket, pot culture etc. No garden is complete without *Bougainvillea*, since it is very easy to maintain [1]. It is propagated by cuttings, layering, and budding. The methods to be employed for propagation would largely depend on the cultivar and agro-climatic condition prevailing at particular location. Cuttings can best be planted in June – July after pruning. Hardwood cuttings showed better growth compared to softwood and semi hardwood cuttings [2]. The most effective method for commercial propagation is using hardwood cuttings that are 10-15 cm long and have two to three nodes. Hardwood stem cuttings with pencil size thickness used in commerce [3].

Konkan is a hub of fruit crop and ornamental plant nurseries. At the time of transportation of plant at nursery stage, the root ball disturbance is common problem and due to this **the plants experience transplant shock**. To reduce this problem and increasing water holding capacity and aeration different media combinations used in this study. By using the different combinations of light weight media, it helps to reduce the bag weight as compared to other traditionally used media. Research on potting media for bougainvillea had not been carried out in Konkan region and hence there is immense need for reliable research data regarding this field of research.

MATERIALS AND METHODOLOGY

The experiment was conducted during the year 2023-24 i.e May-November at College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, Maharashtra. The experiment was conducted in the Randomized Block Design with eight treatments and three replications. The planting material i.e. of bougainvillea hardwood cuttings of 15 cm length of pencil size thickness were selected prior to planting.

Eight different growing media were used: T₁ Soil, T₂ Soil+Sand+FYM(1:1:1), T₃ Soil+Sand+Rice husk(1:1:1), T₄ Soil+Sand+Cocopeat(1:1:1), T₅ Soil+Sand+ Vermicompost (1:1:1), T₆ Soil + Sand + FYM + Rice husk (1:1:1:1), T₇ Soil + Sand + FYM + Cocopeat(1:1:1:1), T₈ Soil+Sand+FYM+Vermicompost(1:1:1:1). Potting mixtures were prepared with different proportions of media on volume basis and *trichoderma* was added at the rate 10g per 100 kg. Then as per the treatments, the mixture filled in polythene bags of size 9" x 11". A slanting cut was given at the base of the cuttings and each cutting had about three to four buds. A transverse cut was given at top of each cutting. For keradix powder treatment, the basal end of the cutting was dipped in water and later dipped in keradix powder taken in a beaker.

The treated cuttings were planted in polybags (9"x11") containing media as per treatments. Plant height (cm), stem girth (mm), number of leaves were recorded at 30 days interval up to 180 days after cutting. Number of branches, total leaf area (cm²), survival percentage, root length (cm), fresh weight of root (g), dry weight of root (g) recorded at 180 days after cutting. The data obtained in the present investigation were statistically analysed by the method suggested by Panse and Sukhatme [4].

RESULT AND DISCUSSION

Plant height

The maximum plant height (Table 1) was found in treatment T₈ (56.76 cm) (soil+ sand + FYM + vermicompost) and followed by treatments T₆ (51.43 cm) and T₇ (50.94 cm) which was found superior over rest of the treatments. The lowest plant height was recorded in treatment T₁ (40.60 cm). Plant height is the most important morphological character of plant. In present investigation, it was found that different media had significant effect on height of cuttings. The media containing FYM and vermicompost produced the highest plant height. It might be due to vermicompost and FYM play important role to improve physical and chemical properties of rooting media by improving its water holding capacity, aeration, organic matter mineralization and solubilisation and availability of micronutrient permitted gaseous exchange between roots and atmosphere which might have increased the growth of cuttings producing more length of shoots. Similar results were also recorded by Seifeldin and Samah [5] in (silty soil 75 per cent + compost 25 per cent) for bougainvillea, Minj *et al.* [6] (soil + sand + cocopeat) for bougainvillea.

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Stem girth

The significant effect of potting media on stem girth (Table 1) on T₈ (11.81 mm) (soil + sand + FYM + vermicompost) which was at par with treatments T₆ (11.67 mm), T₂ (11.49 mm), T₅ (11.46 mm). The minimum stem girth (10.73 mm) were noticed in treatment T₁ (soil). Shoot thickness is mostly influenced by biomass and food that is stored inside the stem. Results of present study reported that, treatment T₈ (soil + sand + FYM + vermicompost) showed maximum stem girth. A thicker stem suggests nutritional value in the medium. Shoot thickness increases as a result of media with increased nutrients and water-holding capacity, which provide adequate nutrition and water availability at all times [7]. The media containing vermicompost and FYM triggered the growth of cuttings faster than soil by increasing photosynthesis activity, cell division, cell elongation, and meristematic activity. The number of cells and vascular bundles increases due to meristematic activity of cells present in stem, which leads to increase in girth of cutting [8]. Similar outcomes were reported by Mehmood *et al.* [9] for fig cuttings in FYM. Seifeldin and Samah [5] for bougainvillea in media containing silty soil 75 per cent + compost 25 per cent and silty soil 50 per cent + compost 50 per cent.

Number of branches

There was a significant difference among all the treatments (Table 1) and the maximum number of branches (3.47) recorded in treatment T₈ (soil + sand + FYM + vermicompost) which was at par with treatment T₆ (3.40) (soil + sand + FYM + rice husk) and T₇ (3.33) (soil + sand + FYM + cocopeat) minimum number of branches in treatment T₁ (2.27). Maximum number of branches per plant demonstrated the vigorous vegetative plant growth. plant growth is encouraged by growing media which is rich in nutrient, provides aeration, better water holding capacity and cation exchange capacity which might have increased the growth of branches to greater extent and produce more number of branches. This might have attributed significant increase in the number of branches in media containing soil + sand + FYM + vermicompost (1:1:1:1). Similar results were also reported by Monika *et al.* [10] for chrysanthemum in vermicompost + FYM + garden soil (2:1:1) and Minj *et al.* [6] in bougainvillea.

Number of leaves

The number of leaves (Table 1) was significantly maximum in treatment T₈ (51.67) which was at par with T₆ (50.60) and T₇ (49.80). While minimum number of leaves recorded in treatment T₁ (39.73). Number of leaves is mainly influenced by environmental conditions, nutrients present in the growing media. The media with high organic matter content increases the water and nutrient holding capacity of the medium also high N content resulting in the vegetative growth of the plant [11]. Physical and chemical activity in the media might have resulted in increase in rate of photosynthesis of the cuttings which triggered the maximum number of leaves. In present investigation soil + sand + FYM + vermicompost has favoured the maximum number of leaves. Similar results were observed by Marasini and Khanal [12] in soil + FYM (1:1) media for bougainvillea, Kumar *et al.* [13] for pomegranate in soil + sand + FYM media, Kapre *et al.* [14] for cape jasmine in soil + FYM + rice husk (1:1:1).

Total leaf area (cm²)

There was a significant variation among all the treatments and the maximum total leaf area (587.64 cm²) (Table 1) was noted in the treatment T₈ (soil + sand + FYM + vermicompost). The minimum total leaf area (219.50 cm²) was found in the treatment T₁ (soil) at end of the experiment. The combination of soil, sand, FYM and vermicompost may create synergistic

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effects, enhancing plant growth and leaf development. Leaf area is important factor for growth and development of plant through photosynthesis activities. Maximum leaf area noted in soil + sand + FYM + vermicompost. It might be due to vermicompost improves leaf expansion and increase chlorophyll contents [15] it results leaves produced more quantity of enzymes which accelerate cell division and expansion of leaf. Similar findings were reported by Arunesh *et al.* [16] in coirpith + vermicompost + FYM + garden soil media (1:1:1:1) for gerbera, Bendre [17] for bush pepper in cocopeat + soil + rice husk + compost (1:1:1:1) media combination.

Survival percentage

The statistically maximum per cent survival of plants (Table 2) in treatment T₈ (88.33) (soil + sand + FYM + vermicompost) which was at par with T₆ (86.67), T₇ (85.00), T₄ (81.67) and T₅ (83.33). While lowest per cent sprouting observed in treatment T₁ (75.00). In present investigation media combination i.e. soil + sand + FYM + vermicompost (1:1:1:1) might have provide physical conditions and sufficient nutrients to cuttings particularly for better metabolic and physiological activities along with better development of root system. Maximum number of roots with higher length and thickness absorb more nutrients and water from the soil and resulted in maximum percentage of survival [18]. The results are in conformity with the findings of Rahman *et al.* [19] in silt for bougainvillea, Mehmood *et al.* [9] in soil + FYM + compost (1:1:1) for fig cutting, Singh *et al.* [3]

Root length

The root length was significantly influenced by different potting media treatments. The highest root length (Table 2) (32.23 cm) was recorded in the treatment T₃ (soil + sand + rice husk) which is at par with treatment T₅ (29.80 cm), T₇ (29.60 cm), T₈ (29.40 cm) T₆ (29.30 cm) and T₄ (29.03 cm). The lowest root length observed in treatment T₁ (20.33 cm). Among various media soil + sand + rice husk showed maximum root length. It might be due to good aeration, drainage and high porosity in media combination which leads to proper gas exchange by maintaining sufficient oxygen supply to the roots. Simultaneously removal of respiratory CO₂ helped in root elongation [20]. Similar results were obtained by Marasini and Khanal [12] for bougainvillea in sand and FYM media, Mehmood *et al.* [9] in FYM for fig cuttings, Minj *et al.* [6] for bougainvillea in soil + sand + cocopeat media.

Fresh weight of root

The statistically maximum fresh weight of root (Table 2) (14.33 g) was obtained in treatment T₈ (soil + sand + FYM + vermicompost) which was at par with treatment T₆ (14.23 g) (soil + sand + FYM + rice husk) and T₇ (13.73 g) (soil + sand + FYM + cocopeat). The lowest fresh weight of root observed in treatment T₁ (6.13 g). In present investigation, it was found that soil + sand + FYM + vermicompost noted maximum fresh weight of roots. According to Chatterjee and Choudhari [21] adequate drainage, constant moisture and nutrient supply in media helps in more accumulation of energy in roots which leads to enhance root growth. Hence, it may be clear that more number of roots directly correlated with root fresh weight. Similar

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results were obtained by Singh *et al.* [3] for bougainvillea in sand + cocopeat + perlite (1:1:1), Akshay *et al.* [22] for black pepper in soil+ sand + FYM + vermicompost (1:1:1:1).

Dryweight of root

The dry weight of root was influenced by effect of different potting media treatments (Table 2). The maximum dryweight of root (5.97 g) was obtained in treatment T₈(soil + sand + FYM + vermicompost) which was at par with treatment T₆(5.83 g) (soil + sand + FYM + rice husk) and T₇(5.30 g) (soil + sand + FYM + cocopeat). The lowest fresh weight of root observed in treatment T₁(2.20 g). In present investigation, it was found that soil + sand + FYM + vermicompost noted maximum dry weight of roots. Might be due to adequate drainage, constant moisture and nutrients supply through media helps in more accumulation of energy in roots which leads to enhance root growth [21] and also, helps in increasing number of roots which resulted more root weight. Similar results were obtained by Kumar *et al.* [13] for pomegranate in soil + sand + vermicompost (1:1:1), Singh *et al.* [2] for mulberry in vermicompost rooting media.

Table 1. Effect of different potting media on growth parameters of bougainvillea cuttings at 180 days after cutting

Treatments	Plantheight (cm)	Stemgirth (mm)	Numberof branches	Numberof leaves	Total leaf area (cm ²)
T ₁	40.60	10.73	2.27	39.73	219.50
T ₂	45.13	11.49	3.00	42.80	293.47
T ₃	41.09	10.77	2.67	40.13	244.85
T ₄	46.55	11.40	2.80	42.87	289.56
T ₅	47.97	11.46	2.93	47.20	348.50
T ₆	51.43	11.67	3.40	50.60	543.83
T ₇	50.94	11.41	3.33	49.80	450.35
T ₈	56.76	11.81	3.47	51.67	587.64
Mean	47.56	11.34	2.98	45.60	372.21
Range	40.60-56.76	10.73-11.81	2.27-3.47	39.73-51.67	219.50-587.64
'F'test	SIG	SIG	SIG	SIG	SIG
S.Em.±	1.11	0.13	0.09	1.13	19.61
C.D.at 5%	3.37	0.39	0.27	3.41	59.47

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Table 2. Effect of different potting media on survival percentage and rooting parameters of bougainvillea cuttings at 180 days after cutting

Treatments	Survival percentage	Root length (cm)	Fresh weight of root (g)	Dry weight of root (g)
T ₁	75.00	20.33	6.13	2.20
T ₂	80.00	23.83	6.72	2.60
T ₃	76.67	32.23	7.27	2.57
T ₄	81.67	29.03	9.30	3.03
T ₅	83.33	29.80	9.47	3.19
T ₆	86.67	29.30	14.23	5.83
T ₇	85.00	29.60	13.73	5.30
T ₈	88.33	29.40	14.33	5.97
Mean	82.08	27.94	10.15	3.84
Range	75.00-88.33	20.33-32.23	6.13-14.33	2.20-5.97
'F' test	SIG	SIG	SIG	SIG
S.Em.±	2.28	1.82	0.60	0.27
C.D. at 5%	6.92	5.51	1.81	0.83

CONCLUSION

Among the different treatments, T₈ (soil + sand + FYM + vermicompost) (1:1:1:1) treatment recorded the maximum plant height, stem girth, number of branches, number of leaves, leaf area, survival percentage, fresh and dry weight of root. Thus, on the basis of results obtained in above investigation, it can be concluded that combination of soil + sand + FYM + vermicompost gives best results for better growth performance of bougainvillea.

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