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Effect of different potting media on branch cuttings of *Dendrocalamus stocksii* (Munro)

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Abstract
Dendrocalamus stocksii is a solid bamboo with high commercial value and net returns. It is widely distributed in the Western Ghats of the country and preferred by the farmers. This species is also enlisted among 20 other species in National Bamboo Mission. However, there is difficulty in its propagation due to intermittent flowering and non- availability of seeds. Thus, the present study was conducted to obtain healthy planting stocks through branch cuttings rather than culm cuttings. The branch cuttings were subjected different potting media treatments. The *D. stocksii* planting stocks recorded highest plant growth parameters such as shoot length (121.71 cm), root length (41.86 cm), number of roots (25.54), survival per cent (83.33%), fresh weight of the planting stock (103.56 g), and total dry weight (29.51 g) in the potting media containing soil, sand and vermicompost in the ratio of 2:1:1 while planting stocks grown in sole soil (control) recorded the least values.

Keywords: Potting media, branch cuttings, *Dendrocalamus stocksii* (Munro)

Introduction
Dendrocalamus stocksii (Munro), synonym *Oxytenanthera stocksii* / *Pseudoxytenanthera stocksii* locally known as 'Chivari', 'Mes' in Maharashtra; 'Konda', 'Oor-shema', 'Marihal bamboo' in Karnataka; 'Manga' in Goa is an important species of bamboo with diverse utility. The species is distributed widely in the Central Western Ghats from Mangalore in Karnataka to Ratnagiri in Maharashtra. It is cultivated in arable land by farmers of coastal areas mostly of Karnataka such as Uttara Kannada, Shimoga, Udupi, and Dakshina Kannada. It grows vigorously within a temperature range of 25- 35 °C, with mean annual rainfall of 1500- 3000 mm and prefers well-drained deep loamy soils with pH ranging from 6.0 to 6.5 (Devar, 2001) [15]. This species has a wide adaptability in semi-humid /humid tropical soil conditions and also semi-arid black and red soil conditions.
D. stocksii is a beautiful thornless medium-sized bamboo species with widely spaced solid greyish green erect culms attains a height of about 9 m, diameter of 30-50 mm, internodal length of 15 to 30 cm with few branches originating from nodes, culm sheaths are 15 to 25 cm long and as wide as 8 to 12 cm at the base, tapering gradually upwards and somewhat concavely truncate at top and ciliate on the margins (Reddy, 2002) [16]. *D. stocksii* is a multipurpose versatile bamboo due to its unique features. The stout, strong culms are used for construction, basket making, punting poles and cottage industries and young tender shoots are edible. It is commonly used for large-scale plantation by the State Forest Department under the programs such as social forestry and wasteland development. The non-availability of fertile seeds, poor seed setting and non-gregarious flowering nature of this bamboo, it is commonly reproduced by vegetative propagation (Yellappa Reddy, 1989) [17].

Material and Methods
The primary branch cuttings of both the species were excised from the disease free and healthy mother clump located at Dharwad Agroforestry Research centre during November. The branch cuttings were extracted with least damage to the nodes and converted into two noded segments after removing leaves. The nodal segments were surface sterilized using 0.1 per cent aqueous solution of mercuric chloride for 5 minutes and washed with distilled water to remove excess chemical. The sterilized two noded cuttings were treated with rooting hormone of 10 ppm coumarin solution prepared by dissolving 10 mg amount of coumarin in 10 ml of ethanol and making the solution to 1 litre using distilled water and later the cuttings of both the species were soaked in the solution for about 24 hours (Sajad *et al.*, 2012) [6]. The present study duration was 6 months *i.e.*, from November, 2021 to April, 2022.

Factorial completely randomized design with three replications was adopted. The treated two noded branch cuttings were planted horizontally in different potting media. Ten branch cuttings were planted in each replication. Plant growth parameters regarding shoot growth (shoot length, number of tillers per cutting, number of cuttings sprouted, sprouting per cent), root growth (root length, root length, number of roots, number of shoots with rooting, rooting per cent) and plant biomass (fresh shoot weight, fresh root weight, total fresh weight, dry shoot weight, dry root weight and total dry weight) were recorded and evaluated.

Treatment details

T_1	Control (Soil alone)
T_2	Soil + Sand (2:1)
T_3	Soil + Sand + FYM (2: 1: 1)
T_4	Soil + Sand + Vermicompost (2: 1: 1)
T_5	Soil + Sand + FYM + Ash (2: 1: 0.5: 0.5)
T_6	Soil + Sand + FYM + Poultry manure (2: 1: 0.5: 0.5)
T_7	Soil + Sand + FYM + Neem cake (2: 1: 0.5: 0.5)
T_8	Soil + Sand + FYM + Perlite (2: 1: 0.5: 0.5)

Statistical analysis and interpretation of data

The collected data from the experiments were analyzed statistically following the procedure suggested by Gomez and Gomez (1984) [7]. The level of significance used in 'F' test was P = 0.05. The data obtained on each of the parameters was subjected to statistical analysis using standard statistical packages. The results were interpreted based on the statistical analysis and the results from each of these experiments was used for writing the thesis.

Results and Discussion

The planting stock of *D. stocksii* recorded maximum plant growth parameters in the potting media containing soil, sand and vermicompost of 2:1:1 ratio which was at par with T_6. Higher shoot length (121.71 cm), number of tillers per cutting (2.37), root length (41.86 cm), number of roots (25.54), number of shoots with rootings (8.3), survival per cent (83.33%) were reported in T_4 (Table 1). The increase in the shoot length, root length and number of roots, sprouting per cent and survival per cent (Table 2) is attributed to the high nitrogen (1.5- 2.5%), phosphorus (0.9- 1.7%), potassium (1.5- 2.4%), magnesium (0.2- 0.3%), calcium (0.5- 1.0%), sulphur (0.4- 0.5%) and vitamins in vermicompost (Sreekrishna, 1999) besides, it also has plant growth hormones like gibberellins, that regulates growth of the plant supplying the necessary micronutrients and improving the availability of native and added micronutrients in soil (Purakayastha and Bhatnagar, 1997) [10]. The initiation of root, enhanced biomass of root, increased growth of plant and sometimes, variations in morphology of plant are the frequently claimed effects of vermicompost (Tomati *et al.*, 1988) [11]. Most plant- available nutrients such as nitrates, phosphates and exchangeable calcium and soluble potassium are present in vermicompost and continuous usage can increase soil organic carbon, soil water retention and improvement in physical properties of soil like bulk density, penetration resistance, low pH (due to production of CO_2 and organic acids produced during metabolism) and aggregation. The granular structure of the soil facilitates providing more microsites for microbial decomposing organisms resulting in strong absorption and retention of nutrients.

Maximum fresh shoot weight (43.32 g), fresh root weight (60.24 g), total fresh weight (103.56 g), dry shoot weight (12.35 g), dry root weight (17.17 g) and total dry weight (29.51 g) of the planting stocks (Table 3) was found greater in T_4. The increase in the fresh weight and dry weight of the planting stocks can be attributed to the increased growth parameters. Chhetri and Pandey, (2021) [18] reported significantly higher growth in media containing sand + FYM + vermicompost or vermicompost + sand in poplar cuttings growth. They even recommended that treatment containing FYM + soil or soil + FYM + vermicompost, for enhancing plant biomass.

All the plant growth parameters recorded in the vermicompost potting media were at par with the potting media containing soil, sand, FYM and poultry manure in 2:1:0.5:0.5. However, maximum number of cuttings sprouted (9) and sprouting per cent (90%) were reported in this potting media. This was because poultry manure has 3.03% of N, 2.63% of P, and 1.4% of K. The presence of growth promoting hormones in poultry manure helps to produce better root growth. Similar results were obtained by Raja *et al.*, (2012) [8] who reported that poultry manure enhanced the seedling growth of *Bambusa tulda.* Increased growth of other tree species such as *Terminalia chebula* showed maximum plant height, number of leaves, collar diameter, biomass and root length with potting mixture containing red soil, sand, FYM and vermicompost (2: 1: 0.5: 0.5) along with 20 g of poultry manure (Lokesh *et al.*, 2007) [19]. Navale and Channabasappa (2013) [12] also revealed that seedlings of *Hydnocarpus pentandra* treated soil+ sand+ FYM in 2: 1: 1 ratio along with 20 g of poultry manure showed greater collar diameter (4.58 mm), seedling height (36.82 cm) and number of leaves (17.88). Gyewali *et al.* (2020) [13] stated that the use of poultry manure could enhance the root growth by helping in photosynthesis, cell division, enzyme activation, carbohydrate metabolism, and nutrient translocation. Samir *et al.* (2016) [14] also reported that combination of soil, sand and FYM of 1: 1:1 ratio enhanced seedling length, however soil, sand and vermicompost in 1: 1: 1 ratio recorded higher shoot length, dry weight and diameter. They quoted that it might be due to better nutrient availability which enhanced photosynthetic activity leading to higher production of functional leaves.

Table 1: Effect of different potting media on shoot growth of *D. stocksii* planting stocks.

Treatments	Shoot length (cm)	Number of tillers per cutting	Number of cuttings sprouted	Sprouting per cent
T_1	79.53	1.00	7.00	70.00 (56.98)
T_2	84.62	1.17	7.33	73.33 (58.98)
T_3	95.78	1.49	8.67	86.67 (68.83)
T_4	121.71	2.37	7.67	76.67 (61.20)
T_5	85.49	1.23	8.67	86.67 (68.83)
T_6	120.08	1.9	9.00	90.00 (71.54)
T_7	94.1	1.42	7.33	73.33 (59.19)
T_8	90.54	1.62	7.33	73.33 (59.69)
SEm ±	0.54	0.05	0.50	3.42
CD @ 5%	1.64	0.16	NS	10.35

Table 2: Effect of different potting media on root growth of *D. stocksii* planting stocks.

Treatments	Root length (cm)	Number of roots	Number of shoots with rooting	Survival Per cent
T_1	20.48	16.34	2.00	26.67 (30.77)
T_2	24.36	18.59	5.33	53.33 (46.90)
T_3	37.48	22.35	6.67	66.67 (54.76)
T_4	41.86	25.54	8.33	83.33 (66.12)
T_5	36.71	22.34	4.00	50.00 (44.98)
T_6	41.44	24.48	8.33	83.33 (66.12)
T_7	24.93	21.14	4.67	46.67 (42.98)
T_8	35.16	21.52	7.67	76.67 (61.90)
SEm±	0.23	0.05	0.54	3.78
CD @ 5%	0.71	0.14	1.63	11.44

Table 3: Effect of different potting media on biomass of *D. stocksii* planting stocks.

Treatments	Fresh shoot weight (g)	Fresh root weight (g)	Total fresh weight (g)	Dry shoot weight (g)	Dry root weight (g)	Total dry weight (g)
T_1	30.67	40.27	70.94	8.74	11.48	20.22
T_2	36.6	39.74	76.34	10.43	11.32	21.76
T_3	40.25	45.66	85.91	11.47	13.01	24.48
T_4	43.32	60.24	103.56	12.35	17.17	29.51
T_5	40.51	40.13	80.64	11.55	11.43	22.98
T_6	42.86	58.83	101.69	12.22	16.77	28.98
T_7	38.24	44.55	82.80	10.90	12.70	23.60
T_8	38.13	40.16	78.29	10.87	11.45	22.31
SEm±	0.05	0.09	0.09	0.02	0.02	0.03
CD @ 5%	0.15	0.26	0.27	0.04	0.07	0.08

Conclusion

The different composition of potting media impacted on the growth of the *D. stocksii* planting stocks. The enhanced plant growth was in the trend with the increase in the nutrient content of the growing media. Nutrient lacking potting media did not impact on the growth of the planting stocks as compared to nutrient enriched potting media. The potting media containing vermicompost which is enriched with nutrients and growth hormones enhanced the growth of *D. stocksii* planting stocks and was found to be the best for potting media to obtain healthy planting stocks through branch cutting.

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