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Influence of various growing media on sprouting, growth and survivability of Betelvine (*Piper betle* L.) cuttings

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Abstract

The experiment entitled “Influence of various growing media on sprouting, growth and survivability of Betelvine (*Piper betle* L.) cuttings” was conducted during 2025–26 at the College of Horticulture and Research Station, Sankara-Patan, Durg (C.G.) using betelvine cv. Maghai. The experiment was laid out in CRD with 13 treatments and 3 replications, and observations were recorded at 90 DAP. Among the treatments, T₄ [Sand: Soil: Vermicompost (1:1:2)] performed best, recording the minimum days to sprouting (18.44 days), maximum number of sprouts (4.49) and sprouting percentage (89.70%). It also recorded the highest number of leaves (13.95), shoots (4.09), shoot length (35.31 cm), shoot diameter (4.46 mm), leaf length (12.08 cm), leaf width (5.28 cm), fresh shoot weight (8.50 g) and dry shoot weight (2.13 g). For rooting, T₄ recorded the maximum primary roots (10.09), root length (22.15 cm), fresh root weight (8.19 g) and dry root weight (2.07 g). The highest survival percentage (71.76%) was also recorded in T₄, while T₀ [Sand: Soil (1:1)] recorded the lowest values for most parameters.

Keywords: Betelvine (*Piper betle* L.), growing media, sprouting, growth, rooting, survival percentage, vermicompost

Introduction

Betelvine (*Piper betle* L.) is an important perennial, evergreen, dioecious climbing plant belonging to the Piperaceae family. Its leaves, known as "paan," are widely cultivated in India. In all the chewing purpose crops in this is one of the most important used, it is widely used worldwide. According to de Candolle, the crop originated in Southeast Asia, particularly Malaysia and then spread to surrounding tropical regions such as India, Bangladesh, Sri Lanka and Indonesia. Betelvine is believed to have originated in Southeast Asia, particularly Malaysia and subsequently spread to various tropical countries, including India, Bangladesh, Sri Lanka and Indonesia (Bajpai *et al.* 2010 and Sudjaroen, 2012)^[4, 22].

In India, betelvine is widely cultivated in states such as West Bengal, Odisha, Bihar, Uttar Pradesh, Andhra Pradesh, Karnataka and Tamil Nadu under humid and partially shaded conditions. India is one of the largest producers of betel leaves in the world, with a total cultivated area of approximately 31.10 thousand hectares and a production of 684.22 thousand tons. Among the states, West Bengal leads with the largest area under betelvine cultivation (18.99 thousand hectares) and production (515.04 thousand tonnes), contributing a major share to the national production. Betelvine is mainly cultivated in Rajnandgaon, Khairagarh-Chhuikhadan-Gandai, Gariaband and Raigarh districts of Chhattisgarh, where Meetha Paan and Kalkatiya Paan are popular, predominantly grown by small and marginal farmers (Akshay *et al.* 2018)^[2].

Materials and Methods

The present experiment entitled "Influence of various growing media on sprouting, growth and survivability of Betelvine (*Piper betle* L.) cuttings" was carried out during the year 2025–26 at the College of Horticulture and Research Station, Sankara-Patan, Durg (C.G.).

The experimental material consisted of betelvine cv. Maghai used for the cutting experiment. Three replicates were used in a completely randomized design (CRD) with thirteen treatments. Each treatment included thirty cuttings, resulting in a total of 390 healthy cuttings. The treatments were as follows: T₀ [sand: soil (1:1)] as control, T₁ [sand: soil: cocopeat (1:1:2)], T₂ [sand: soil: cocopeat (1:2:1)], T₃ [sand: soil: cocopeat (2:1:1)], T₄ [sand: soil: vermicompost (1:1:2)], T₅ [sand: soil: vermicompost (1:2:1)], T₆ [sand: soil: vermicompost (2:1:1)], T₇ [sand: soil: press mud (1:1:2)], T₈ [sand: soil: press mud (1:2:1)], T₉ [sand: soil: press mud (2:1:1)], T₁₀ [sand: soil: FYM (1:1:2)], T₁₁ [sand: soil: FYM (1:2:1)] and T₁₂ [sand:soil:FYM (2:1:1)].

Sprouting parameters

Days taken to sprouting (Days)

The minimum days for sprouting (18.44 days) was recorded in T₄ (sand:soil:vermicompost 1:1:2), followed by T₅ (18.94 days) The maximum days (28.70 days) was observed in T₀ (Sand:Soil Control). This faster germination time may be due to better aeration, higher nutrient levels and the presence of growth-promoting substances in vermicompost, which accelerate root growth. Research by Sahu *et al.* (2026),^[18] and Kumar *et al.*

(2023)^[11] reported similar results, which are consistent with our findings.

Number of sprouts

At 30, 60 and 90 DAP, T₄ [Sand: Soil: Vermicompost (1:1:2)] recorded the highest number of sprouts (2.49, 3.68 and 4.49, respectively), followed by T₆ (2.29) at 30 DAP, T₃ (3.18), at 60 DAP, and T₅ (4.08) at 90 DAP. The lowest sprouting was observed in T₀ (0.90, 1.56 and 2.00, respectively). Higher sprouting in vermicompost-based media may be attributed to better nutrient availability, microbial activity and aeration. Similar findings were reported by Sharma *et al.* (2023)^[20], Reddy *et al.* (2024)^[17] and Naik *et al.* (2025)^[15].

Percentage of sprouting (%)

The highest sprouting percentage (89.70%) was recorded in T₄ [Sand: Soil: Vermicompost (1:1:2)], followed by T₆ (84.72%). The lowest sprouting (54.82%) was observed in T₀ (Control). Better sprouting in vermicompost-based media may be attributed to improved aeration, nutrient availability and microbial activity. Similar findings were reported by Ekka *et al.* (2023)^[8], Mishra *et al.* (2024)^[13].

Table 1: Effect of different growing media on sprouting behaviour of betelvine cutting

Treatments	Treatment Combination	Days taken for sprouting (days)	No. of Sprouts			Sprouting (%)
			30 DAP	60 DAP	90 DAP	90 DAP
T ₀	Sand: Soil (Control) (1:1)	28.70	0.90	1.56	2.00	54.82
T ₁	Sand: Soil: Cocopeat (1:1:2)	20.93	1.79	2.54	3.59	67.77
T ₂	Sand: Soil: Cocopeat (1:2:1)	21.43	1.20	2.29	3.62	68.77
T ₃	Sand: Soil: Cocopeat (2:1:1)	22.92	2.11	3.18	4.00	74.75
T ₄	Sand: Soil: Vermicompost (1:1:2)	18.44	2.49	3.68	4.49	89.70
T ₅	Sand: Soil: Vermicompost (1:2:1)	18.94	1.99	2.79	4.08	83.72
T ₆	Sand: Soil: Vermicompost (2:1:1)	19.93	2.29	2.89	3.67	84.72
T ₇	Sand: Soil: Press mud (1:1:2)	24.92	1.02	1.88	2.69	73.75
T ₈	Sand: Soil: Press mud (1:2:1)	25.71	1.09	1.81	2.04	72.76
T ₉	Sand: Soil: Press mud (2:1:1)	25.91	1.25	1.79	2.06	69.97
T ₁₀	Sand: Soil: FYM (1:1:2)	24.42	1.89	2.39	2.79	77.74
T ₁₁	Sand: Soil: FYM (1:2:1)	23.92	1.58	2.01	2.59	71.26
T ₁₂	Sand: Soil: FYM (2:1:1)	26.61	1.69	2.09	2.89	71.76
SEm±		0.21	0.01	0.02	0.02	0.66
C.D. at 5%		0.61	0.03	0.06	0.04	1.92

Growth Parameters

Number of leaves cutting-1

The maximum number of leaves (13.95) was recorded in T₄ [Sand: Soil: Vermicompost (1:1:2)], followed by T₆ (11.99) and T₅ (11.96), while the minimum (6.88) was observed in T₀ (Control). The higher leaf production under vermicompost-based media may be attributed to improved nutrient availability, microbial activity and aeration. Similar enhancement in leaf production due to improved growing media was reported by Rajput *et al.* (2024)^[16] and Atiyeh *et al.* (2000)^[3]

Number of shoots cutting-1

The maximum number of shoots (4.55) was recorded in T₄ [Sand: Soil: Vermicompost (1:1:2)], which was significantly superior to all other treatments, while the minimum (2.09) was observed in T₀ (Control). The higher shoot production in T₄ may be due to better nutrient availability and aeration provided by vermicompost. Similar results were reported by Usendi *et al.* (2022)^[23], Salehi (2014)^[28] and Muktar *et al.* (2023)^[14].

Length of shoot cutting-1 (cm)

The maximum shoot length (35.35 cm) was recorded in T₄ [Sand:

Soil: Vermicompost (1:1:2)], followed by T₅ (30.30 cm) while the minimum (10.10 cm) was observed in T₀ (Control). The better shoot growth in vermicompost-based media may be attributed to improved nutrient availability, microbial activity and aeration. Similar findings were reported by Sahu *et al.* (2026)^[18], Eide *et al.* (2015)^[7], Kakade *et al.* (2019)^[10] and Dawar *et al.* (2020)^[6].

Diameter of shoot cutting-1

The maximum shoot diameter (4.46 mm) was recorded in T₄ [Sand: Soil: Vermicompost (1:1:2)], while the minimum (1.41 mm) was observed in T₀ (Control). The higher shoot diameter in T₄ may be due to better nutrient availability and enhanced cambial activity. Rajput *et al.* (2024)^[16] also reported higher shoot diameter of 6.21, 6.14 and 6.17 mm in M3F3, compared with 5.31, 5.26 and 5.28 mm in M1F1 across the years.

Leaf length (cm)

T₄ (sand:soil:vermicompost 1:1:2) (12.03 cm) showed the influence of growing media on maximum leaf length, followed by T₅ (11.04 cm). The shortest leaf length (8.01 cm) was obtained by T₀ (Sand:Soil control 1:1), Sahu *et al.* (2026) reported maximum growth in T₆ [FYM: Vermicompost: Sand: Soil

(1:1:1:1)] and highest shoot length of 36.42 cm at 100 DAP. Similar findings were reported by Kumaresan *et al.* (2023)^[12] and Akshay *et al.* (2018)^[2], indicating better leaf growth with vermicompost-based media.

Leaf breadth (cm)

At 90 DAP, the maximum leaf breadth (5.28 cm) was recorded in T₄ [Sand: Soil: Vermicompost (1:1:2)], followed by T₅ (5.18 cm) and T₆ (5.00 cm), while the minimum (2.89 cm) was observed in T₀ (Control). The higher leaf breadth under vermicompost-based media may be attributed to improved nutrient availability, soil structure and microbial activity, promoting leaf development.

Similar findings were reported by Sodi *et al.* (2024)^[21] and Chattopadhyay *et al.* (2017)^[5].

Survival per cent (%)

The highest survival (71.76%) was recorded in T₄ [Sand: Soil: Vermicompost (1:1:2)], followed by T₆ (67.77%) while the lowest (43.85%) was observed in T₀ (Control). The better survival in vermicompost-based media may be attributed to improved nutrient availability, microbial activity and moisture retention, creating favourable conditions for rooting. Similar findings were reported by Aghdaei *et al.* (2019)^[1].

Table 2: Effect of different growing media on Growth Parameters of betelvine cutting. 90 DAP

Treatment	Treatment Combination	Number of leaves cutting ⁻¹	Number of shoots cutting ⁻¹	Length of shoot cutting ⁻¹ (cm)	Diameter of shoot cutting ⁻¹ (mm)	Length of leaf (cm)	Breath of leaf (cm)	Survival percent (%)
T ₀	Sand: Soil (Control) (1:1)	6.88	2.09	10.10	1.41	8.01	2.89	43.85
T ₁	Sand: Soil: Cocopeat (1:1:2)	8.67	3.75	16.16	3.06	10.05	3.89	54.22
T ₂	Sand: Soil: Cocopeat (1:2:1)	8.01	3.68	18.69	2.98	10.01	3.69	55.02
T ₃	Sand: Soil: Cocopeat (2:1:1)	8.17	4.05	17.17	3.27	10.70	3.19	59.80
T ₄	Sand: Soil: Vermicompost (1:1:2)	13.95	4.55	35.35	4.46	12.03	5.28	71.76
T ₅	Sand: Soil: Vermicompost (1:2:1)	11.96	4.12	30.30	3.76	11.04	5.18	66.98
T ₆	Sand: Soil: Vermicompost (2:1:1)	11.99	3.72	28.28	4.02	10.90	5.00	67.77
T ₇	Sand: Soil: Press mud (1:1:2)	10.04	2.78	25.25	2.38	8.90	4.01	59.00
T ₈	Sand: Soil: Press mud (1:2:1)	9.67	2.12	20.20	2.18	9.02	3.49	58.21
T ₉	Sand: Soil: Press mud (2:1:1)	9.87	2.18	21.21	1.99	9.50	3.34	55.97
T ₁₀	Sand: Soil: FYM (1:1:2)	8.87	2.92	15.86	3.07	9.80	4.21	62.19
T ₁₁	Sand: Soil: FYM (1:2:1)	8.27	2.66	14.14	2.48	9.30	3.99	55.31
T ₁₂	Sand: Soil: FYM (2:1:1)	8.37	2.95	13.13	2.87	9.20	3.31	57.41
S.Em±		0.08	0.03	0.12	0.01	0.11	0.03	0.52
C.D. at 5%		0.24	0.09	0.36	0.03	0.33	0.09	1.54

Conclusion

Based on the results obtained, T₄ (Sand: Soil: Vermicompost 1:1:2) was found superior for most growth, rooting and survival parameters of betelvine cuttings. It recorded the minimum sprouting time (18.44 days), highest sprouting percentage (89.70%), number of sprouts (2.49, 3.68 and 4.49 at 30, 60 and 90 DAP), leaves (13.95), shoots (4.55), shoot length (35.35 cm), root length (22.15 cm) and survival percentage (71.76%). It also recorded the highest fresh and dry weight of shoots and roots. The better performance of T₄ may be attributed to improved nutrient availability, aeration, moisture retention and microbial activity provided by vermicompost. Thus, Sand: Soil: Vermicompost (1:1:2) is recommended as an effective growing medium for successful propagation of betelvine cuttings.

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