



ISSN Print: 2664-844X
 ISSN Online: 2664-8458
 NAAS Rating (2026): 4.97
 IJAFA 2026; 8(10): 130-134
www.agriculturaljournals.com
 Received: 31-07-2026
 Accepted: 23-09-2026
 Published: 06-10-2026

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Studies on length of cutting and media on propagation of Indian *Plumeria* (*Plumeria alba* L.) under Konkan agro-climatic conditions

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DOI: <https://www.doi.org/10.33545/2664844X.2026.v8.i10b.2013>

ABSTRACT

The present investigation entitled “Studies on Length of Cutting and Media on Propagation of Indian *Plumeria* (*Plumeria alba* L.) under Konkan Agro-climatic Condition” was conducted at Hi-tech unit, College of Horticulture, Dapoli during 2025-2026. The cuttings were selected with three different sizes viz. 20 cm (L_1), 30 cm (L_2), 40 cm (L_3) and five different media. These media include (M_1 : Soil + FYM 3:1), (M_2 : Soil + Vermicompost + Cocopeat 1:1:1), (M_3 : Soil + FYM + Cocopeat 1:1:1), (M_4 : Soil + Rice husk + FYM 1:1:1), (M_5 : Soil + Rice husk + Vermicompost 1:1:1) The experiment was carried out in factorial randomized block design with three replications. There were two factors viz., length of cutting and media of planting.

Throughout the investigation, the recorded parameters were significantly influenced by length of cutting and media of propagation. The treatment combination, L_3M_2 (length of cutting 40 cm planted in the M_2 media (soil + vermicompost + cocopeat), demonstrated superior performance in terms of both minimum days to sprouting (16.10) and sprouting percentage (99.67%). This treatment (L_3M_2) also exhibited the highest values for parameters such as the survival percentage (89.67%), girth of sprout (9.79 mm), height of sprout (6.81 cm), number of leaves (19.53), leaf area (153.60 cm).

Keywords: *Plumeria*, Length of cutting, Media on propagation

1. Introduction

Indian *Plumeria* (*Plumeria alba* Linn.), commonly referred to as Pandhara Chafa or frangipani, belongs to the family Apocynaceae, commonly known as the dogbane family, and has a chromosome number of $2n = 36$. The species generally occurs as small trees or deciduous shrubs. It is indigenous to South America, with its natural distribution extending from Brazil to Mexico, Central America and the Caribbean. However, it can be successfully grown under both tropical Under cultivated conditions, *Plumeria alba* usually grows as a small to medium-sized tree reaching approximately 3 to 6 m in height, while under natural conditions it may attain a height of up to 8 m. It is a latex-bearing tree or shrub characterized by thick, fleshy and widely spreading branches. The leaves are lanceolate to flattened-blade in form and are mainly concentrated near the terminal portions of the branches. They are relatively large, measuring approximately 6–22 cm in length and 2-7 cm in width. The leaves generally possess an obovate shape with a rounded apex rather than a pointed tip, which helps in distinguishing them from those of other species. They are glossy and leathery in texture, whereas the flowers are large, attractive and highly fragrant. Typically, the flowers consist of five petals and are white with a yellow centre, although pink, yellow and red flower forms are also found. The plant is commonly grown in temple premises because of its pleasant, fresh and creamy fragrance, and its flowers may be available throughout the year. Flowers continue to develop, bloom and naturally fall during different seasons. The fruit is reported to be edible, while the latex has traditionally been used in the treatment of ulcers, herpes and scabies. The seeds have also been traditionally recognized for their haemostatic properties. Crushed bark has been applied traditionally as a plaster to help reduce hard tumours (Sura et al., 2018) [1]. Different plant parts have additionally been used traditionally to alleviate ailments such as malaria, leprosy, rheumatism and abdominal tumours. The milky latex obtained from stems and leaves is also applied externally for treating conditions such as herpes, scabies and ulcers (Imrana et al., 2020) [2]. *Plumeria alba* contains numerous bioactive constituents, including sterols, polysaccharides, tannins, triterpenoids and iridoid glycosides. The aerial parts of the plant, particularly leaves and stems, have been reported to contain steroids, flavonoids and alkaloids. Several compounds, including amyryns, sitosterols, copotein and iridoids such as isoplumericin, plumeride, plumeride coumarate and plumeride coumarate glucoside, have been identified. Plumieride and fulvoplumierin are reported from young leaves and bark, together with terpenoids, sterols, plumeride and resinic acid. The bark also contains cytotoxic iridoids such as fulvoplumierin, allamandin, allamandin, 2,5-dimethoxy-p-benzoquinone and plumericin, along with the lignan liriodendrin. In Indian

traditional medicine, *Plumeria alba* and its different plant parts have been utilized for managing various health-related conditions (Devprakash *et al.*, 2012) [3]. Research on the propagation of Indian *Plumeria* can assist commercial nursery growers in producing high-quality planting material within a relatively shorter period, particularly under the agroclimatic conditions of the Konkan region. The findings may subsequently support large-scale production and contribute towards meeting the increasing demand for planting material.

2. Material and Methods

The current study was conducted during the 2025-2026 at the *Hi-tech* unit of College of Horticulture, Dapoli, Dist. Ratnagiri in Maharashtra. Throughout the experimental duration, meteorological data was collected. The experiment was carried out in Factorial Randomized Block Design. There were two factors viz. length of cutting 20 cm (L₁), 30 cm (L₂) 40 cm (L₃) and different media for propagation. These media include (M₁: Soil + FYM 3:1), (M₂: Soil + Vermicompost + Cocopeat 1:1:1), (M₃: Soil + FYM + Cocopeat 1:1:1), (M₄: Soil + Rice husk + FYM 1:1:1), (M₅: Soil + Rice husk + Vermicompost 1:1:1). Cuttings in each treatment were planted in polybags. Different planting media used. Uniform size of polybags were used ("9 x 11") for 20 cm, 30 cm and 40 cm cuttings. Semi-hardwood cuttings were collected. The cuttings were given a slant cut by using sharp secateurs and immediately the basal end of the cutting was dipped in Keradix powder. To reduce transpiration, all the leaves on the cuttings were removed and the treated cuttings were planted in polybags according to their size. NPK were applied in the form of wa-

ter-soluble complex fertilizers viz. 19:19:19 @ 10 g per plant. The observations, viz. days required for sprouting, sprouting percentage, survival percentage, plant height, leaf area, girth at collar and number of leaves were recorded at 180 days after planting except days required for sprouting. The data on individual characters underwent analysis of variance, a commonly employed method in Factorial Randomized Block Design, as described by Panse *et al.* (1995) [4].

3. Result and Discussion

3.1 Number of days required for sprouting

The interaction effect of length of cutting and media on propagation was found to be significant. The range of days required for sprouting was 16.10 to 27.26 days. the treatment combination L₃M₂ (40 cm cutting and media M₂-Soil+ Vermicompost + Cocopeat) shows earlier sprouting (16.10 days) However, L₁M₁(20 cm) cutting and media Soil + FYM showed delayed sprouting (27.26 days).

The earlier sprouting observed in L₃M₂ may be attributed to the greater carbohydrate reserves and endogenous growth substances present in longer cuttings, along with the favourable physical properties of the propagation medium. Vermicompost supplied readily available nutrients, while cocopeat improved moisture retention and aeration, creating ideal conditions for early root initiation and bud break. Conversely, shorter cuttings grown in Soil + FYM (L₁M₁) possessed comparatively lower food reserves 20 cm were grown in a less porous medium, which delayed sprouting. Similar observations were reported by Aswati *et al.* (2026) [5] in *Mentha piperita*.

Table 1. Effect of length of cutting and media of propagation on days required for sprouting of Indian *plumeria* (*Plumeria alba* L.)

Days required for sprouting						
Length of cutting	Propagation media					Mean
	M1	M2	M3	M4	M5	
L ₁	27.26	21.80	25.40	22.90	24.10	24.29
L ₂	24.81	18.90	22.60	20.00	21.30	21.52
L ₃	22.08	16.10	19.80	17.30	18.60	18.78
Mean	24.71	18.93	22.60	20.07	21.33	21.53
	SEm (±)					Result
L	0.02					SIG
M	0.03					SIG
(L x M)	0.04					SIG
	CD @ 5%					
	0.06					
	0.07					
	0.13					

3.2 Sprouting percentage

The interaction effect was found to be significant between length of cutting and media on propagation. The interaction values ranged from 60.33 to 99.67 %. The treatment combination L₃M₂ (L₃-40 cm cutting and media M₂-Soil+ Vermicompost + Cocopeat) recorded maximum the sprouting percentage (99.67%) However, L₁M₁ (20 cm) cutting and media Soil + FYM) minimum sprouting percentage (60.33%).

The significant interaction suggests that the effect of propagation medium depended on the length of cutting used. The 40 cm cutting in combination with M₂ (L₃M₂) proved to be the most effective treatment combination for enhancing sprouting in *Indian plumeria*. This may be attributed to the greater reserve food material and better physiological maturity of longer cuttings, together with favourable physical and moisture conditions provided by the M₂ medium, which promoted early bud activation and sprout development. Similar results were reported by Aswati *et al.* (2026) [5] in *Mentha piperita*.

Table 2. Effect of length of cutting and media of propagation on Sprouting percentage of Indian *plumeria* (*Plumeria alba* L.)

Sprouting (%)						
Length of cutting	Propagation media					Mean
	M1	M2	M3	M4	M5	
L ₁	60.33	75.00	68.00	72.00	70.00	69.07
L ₂	73.00	89.01	81.00	85.00	83.00	82.20
L ₃	84.00	99.67	92.00	96.00	94.00	93.13
Mean	72.44	87.89	80.33	84.33	82.33	81.47
	SEm (±)					Result
L	0.05					SIG
	CD @ 5%					
	0.15					

(continued on next page)

Sprouting (%)			
M	0.07	0.20	SIG
(L x M)	0.12	0.35	SIG

3.3 Survival percentage

The interaction between length of cutting (*L*) and media of propagation (*M*) was found to be significant for survival percentage. The interaction values ranged from 60.00 to 89.67 %. The maximum survival (89.67%) was recorded with L₃M₂ (40 cm cutting × M₂). The minimum survival (60.00%) was recorded in L₁M₁ (20 cm cutting × M₁).

The results clearly indicated that increasing the cutting length enhanced survival across all media. The L₃ (40 cm) × M₂ combination was the most effective, suggesting that longer cuttings combined with the favourable M₂ medium provided better establishment and subsequent survival. Similar results were reported by Rifnas *et al.* (2023) [6] in *Allamanda cathartica*.

Table 3. Effect of length of cutting and media of propagation on survival percentage of *Indian plumeria* (*Plumeria alba* L.) at 180 DAP

Survival (%)						
Length of cutting	Propagation media					Mean
	M ₁	M ₂	M ₃	M ₄	M ₅	
L ₁	60.00	74.00	67.00	70.00	68.00	67.80
L ₂	71.00	83.00	77.00	80.00	78.00	77.80
L ₃	79.00	89.67	85.00	88.00	86.00	85.53
Mean	70.00	82.22	76.33	79.33	77.33	77.04
	SEm (±)			CD@5%		Result
L	0.04			0.11		SIG
M	0.05			0.14		SIG
(L x M)	0.09			0.25		SIG

3.4 Girth of sprout (mm)

The interaction effect was found to be significant between length of cutting and media on propagation. At 180 DAP girth attained its maximum under L₃M₂ (9.79 mm) while L₁M₁ showed the minimum girth (7.30 mm).

The superiority of L₃M₂ may be attributed to the combined advantage of greater cutting length and a favourable propagation medium. The 40 cm length of cutting possesses a greater quantity of stored carbohydrates, nutrients and endogenous growth-promoting substances, which can support early sprout development and subsequent stem

thickening. When combined with M₂, consisting of soil, vermicompost and cocopeat, these stored reserves are supplemented by better moisture retention, aeration, nutrient availability and root-zone conditions.

In contrast, L₁M₁ consistently showed the minimum girth. The shorter cutting possesses comparatively minimum stored food reserves, while M₁ may provide relatively less favourable physical conditions than the soil + vermicompost + cocopeat mixture. The combined limitations may have restricted root establishment, nutrient acquisition and subsequent stem thickening. Similar observations were recorded by Bosatn *et al.* (2025) [7] in tea.

Table 4. Effect of length of cutting and media of propagation on girth of sprout (mm) of *Indian plumeria* (*Plumeria alba* L.) at 180 DAP

Girth of sprout (mm)						
Length of cutting	Propagation media					Mean
	M ₁	M ₂	M ₃	M ₄	M ₅	
L ₁	7.30	7.95	7.55	7.71	7.68	7.64
L ₂	8.18	8.88	8.42	8.72	8.58	8.56
L ₃	8.90	9.79	9.18	9.50	9.32	9.34
Mean	8.13	8.88	8.38	8.64	8.53	8.51
	SEm (±)			CD@5%		Result
L	0.01			0.04		SIG
M	0.02			0.06		SIG
(L x M)	0.03			0.10		SIG

3.5 Height of sprout (cm)

The interaction effect of length of cutting and propagation media on height of sprout was found to be significant at all stages of observation. At 180 DAP height of sprout attained its maximum under L₃M₂ (6.81 cm) while L₁M₁ showed the minimum height of sprout (4.23 cm). The superior performance of the treatment combination L₃M₂ may be attributed to the combined effect of longer cuttings,

which possess higher carbohydrate and nutrient reserves, and the favourable propagation medium, which provides better aeration, moisture retention and nutrient availability. These conditions promote rapid root establishment, efficient uptake of water and nutrients, and enhanced cell division and elongation, resulting in greater sprout height. Similar findings were reported by Sodi *et al.* (2024) [8] in Jasmine.

Table 5. Effect of length of cutting and media of propagation on height of sprout (cm) of *Indian plumeria* (*Plumeria alba* L.) at 180 DAP

Height of sprout (cm)						
Length of cutting	Propagation media					Mean
	M ₁	M ₂	M ₃	M ₄	M ₅	
L ₁	4.23	4.50	4.24	4.32	4.26	4.31
L ₂	4.45	4.92	4.60	4.82	4.67	4.69
L ₃	4.87	6.81	4.92	5.09	4.97	5.33
Mean	4.52	5.41	4.59	4.74	4.64	4.78
	SEm (±)			CD@5%		Result
L		0.03		0.08		SIG
M		0.04		0.10		SIG
(L x M)		0.06		0.18		SIG

3.6 Number of leaves

The interaction effect of length of cutting and propagation media on number of leaves was found to be significant at all stages of observation. The interaction values ranged from 1.00 to 19.53. At 180 DAP maximum number of leaves was recorded in L₃M₂ with 19.53 whereas the minimum number of leaves was observed in L₁M₁ with 15.00.

The maximum number of leaves recorded in L₃M₂ may be attributed to the combined effect of longer cuttings, which contain higher carbo-

hydrate reserves and endogenous growth regulators, and the Soil + Vermicompost + Cocopeat (M₂) medium, which provides better aeration, moisture retention and nutrient availability. These favourable conditions enhanced root development, nutrient and water uptake, chlorophyll formation and photosynthetic activity, resulting in greater vegetative growth and increased leaf production. In contrast, the minimum number of leaves observed in L₁M₁ may be due to lower food reserves, poor root development and reduced nutrient uptake, which limited vegetative growth. Similar observations were recorded by Sodi *et al.* (2024) [8].

Table 6. Effect of length of cutting and media of propagation on number of leaves of *Indian plumeria* (*Plumeria alba* L.) at 180 DAP

Number of leaves						
Length of cutting	Propagation media					Mean
	M ₁	M ₂	M ₃	M ₄	M ₅	
L ₁	15.00	16.50	15.80	16.20	16.00	15.90
L ₂	16.50	18.00	17.13	18.13	17.50	17.45
L ₃	17.50	19.53	18.50	19.20	18.97	18.74
Mean	16.33	18.01	17.14	17.84	17.49	17.36
	SEm (±)			CD@5%		Result
L		0.04		0.12		SIG
M		0.05		0.16		SIG
(L x M)		0.09		0.27		SIG

3.7 Leaf area (cm²)

The interaction effect was found to be significant between length of cutting and media on propagation. The interaction treatment L₃M₂ attained the maximum leaf area (153.60 cm²), whereas L₁M₁ registered the minimum leaf area (64.80 cm²).

The highest leaf area was recorded in L₃M₂, which may be attributed to the greater stored food reserves in the longer 40 cm cuttings and the favourable moisture, aeration and nutrient conditions provided by the soil + vermicompost + cocopeat medium. These conditions enhanced root development, nutrient uptake and photosynthetic activity, resulting in greater leaf expansion and consequently higher leaf area.

Table 7. Effect of length of cutting and media of propagation on leaf area (cm²) of *Indian plumeria* (*Plumeria alba* L.) at 180 DAP

Leaf area (cm ²)						
Length of cutting	Propagation media					Mean
	M ₁	M ₂	M ₃	M ₄	M ₅	
L ₁	64.80	90.00	78.60	85.20	81.60	80.04
L ₂	87.60	119.94	102.00	112.80	108.00	106.07
L ₃	114.00	153.60	130.80	142.80	136.80	135.60
Mean	88.80	121.18	103.80	113.60	108.80	107.24
	SEm (±)			CD @ 5%		Result
L		0.04		0.12		SIG
M		0.05		0.15		SIG
(L x M)		0.09		0.26		SIG

4. Conclusion

Based on the findings of the present investigation, it can be concluded that the interaction treatment L₃M₂, 40 cm length of cutting and media Soil + Vermicompost + Cocopeat in (1:1:1) ratio was found to be the most effective for the propagation of Indian *Plumeria* under Konkan agro-climatic conditions. This treatment recorded superior performance for most of the growth and rooting parameters, including days required for sprouting, sprouting percentage, height of sprout, number of leaves, survival percentage, leaf area, girth of sprout, number of roots, root volume, fresh and dry weight of shoots and fresh and dry weight of roots. Similarly, the highest B:C ratio (2.16) was obtained in L₃M₂. However, to conclude the above results the study needs to be carried for next two years for precise recommendation to the farmers in konkan region.

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How to cite this article: Borade RM, Pawar NR, Dalvi N, Saitwal Y, Khobragade N. Studies on length of cutting and media on propagation of Indian *Plumeria* (*Plumeria alba* L.) under Konkan agro-climatic conditions. *International Journal of Agriculture and Food Science*. 2026;8(10):130-134. doi: <https://www.doi.org/10.33545/2664844X.2026.v8.i10b.2013>