The Pharma Innovation Journal 2023; 12(12): 1273-1276

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(12): 1273-1276

www.thepharmajournal.com
Received: 02-10-2023
Accepted: 12-11-2023

CU Raibole
M.Sc. Scholar, Department of Floriculture and Landscape Architecture, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

NV Dalvi
Associate Professor, Department of Floriculture and Landscape Architecture, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

BR Salvi
Ex. Professor, Department of Floriculture and Landscape Architecture, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

AV Mane
Deputy Director of Research (Seed), Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

YR Parulekar
Assistant Professor, Department of Vegetable Science, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

Corresponding Author:
CU Raibole
M.Sc. Scholar, Department of Floriculture and Landscape Architecture, College of Horticulture, Dapoli, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

Studies in the size of cutting and month of planting for propagation of Indian Plumeria under Konkan agro-climatic condition (*Plumeria alba* Linn.)

CU Raibole, NV Dalvi, BR Salvi, AV Mane and YR Parulekar

Abstract
The present investigation entitled Studies in the size of cutting and month of planting for propagation of Indian Plumeria under Konkan agro-climatic condition (*Plumeria alba* Linn.) was carried out at Hi-tech unit of College of Horticulture, Dapoli during August 2022 – May 2023. The cuttings were selected with three different sizes *viz.* 20 cm (T_1), 30 cm (T_2), 40 cm (T_3) and ten different months during every first fortnight. These months include August (M_1), September (M_2), October (M_3), November (M_4), December (M_5), January (M_6), February (M_7), March (M_8), April (M_9) and May (M_{10}). The experiment was carried out in Factorial Randomized Block Design with three replications. There were two factors *viz*. size of cutting and month of planting at every first fortnight.
The recorded parameters were significantly influenced by size of cutting and month of planting. The treatment combination, T_3M_7 (cutting of size 40 cm planted in the first fortnight of February) showed superior performance in terms of days required for sprouting (16.63), sprouting percentage (100%), survival percentage (87%), plant height (21.17 cm), number of leaves (14.773), leaf area (364.473 cm^2) and girth at collar (6.86 mm).

Keywords: *Plumeria*, cutting size, month of planting

1. Introduction
Indian Plumeria (*Plumeria alba* Linn.), also referred as White Frangipani, is a tropical plant species that belongs to family Apocynaceae. It is native to tropical America and the Caribbean, but because of its lovely, fragrant blossoms, it is commonly cultivated as an ornamental plant in many areas of the world.
The *Plumeria alba* plant is a small to medium-sized tree that typically grows 3 to 6 meters tall in cultivation but can grow up to 8 meters tall in the wild. The flowers typically have five petals and are white with a yellow center but can also have shades of pink, yellow, or red (Sura *et al*., 2016) [7]. *Plumeria alba* can often be propagated using stem cuttings, which makes it simple to maintain and propagate. *Plumeria* needs bright sunlight, mild temperatures, and adequate moisture to grow. They require soil with good drainage, which is neither too dry nor too wet. The requirement for water increases with the amount of light a plant receives, but excessive watering can cause root rot and plant death. The plant is also well-known for its hardiness and ability to survive drought, making it an excellent choice for low-maintenance landscaping.
Plumeria alba is also grown commercially, primarily for its essential oil, which is used in perfumes, soaps, and other beauty products. (Voon *et al*., 2012) [8]. Sometimes it is utilized as a source of wood, which is also used to make drums and other musical instruments, and its flowers are used to make leis and perfumes. In traditional medicine, the plant is used to treat a variety of ailments, including skin problems, fever, and headaches. Other plant parts, such as leaves, roots, and fruits of these trees, can be used as pharmaceutical raw materials for the treatment of diseases, including cardiovascular disorders, diabetes mellitus, wounds and skin diseases, diuretics and purgatives (Sura *et al*., 2016) [7].

2. Materials and Methods
The current study was conducted during the August 2022 to May 2023 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*. size of cutting 20 cm (T_1), 30 cm (T_2) and 40 cm (T_3) and different months during every first fortnight. These months include August (M_1), September (M_2), October (M_3), November (M_4), December (M_5), January (M_6), February (M_7), March (M_8), April (M_9) and May (M_{10}). Fifteen cuttings in each treatment were planted in polybags with three replications. Planting media was made my combining soil and FYM in 1:1 ratio. Different size of polybags was used 6" × 8" for 20 cm cuttings, and 10" × 14" for 30 cm and 40 cm cuttings. Semi-hardwood cuttings were collected on 1st fortnight of every month from August to May. 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 water-soluble complex fertilizers *viz*. 19:19:19 @ 10 g per plant. The observations, *viz*. days required for sprouting, sprouting percentage, survival percentage, plant height, number of leaves, leaf area and girth at collar were recorded at 120 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 and Sukhatme (1995) [5].

3. Results and Discussion

3.1 Number of days required for sprouting

In present investigation, number of days required for sprouting found to be significant between size of cutting and month of planting. The treatment combination T_3M_7 (cutting of size 40 cm planted in first fortnight of February) showed earliest sprouting (16.63 days) and delayed sprouting were noticed in T_1M_2 (cutting of size 20 cm planted in the first fortnight of September) (Table 1). It is presumed that longer size of cutting possesses higher reserves of carbohydrates and nutrients. When these cuttings are planted between February to April, the major stored carbohydrates are utilized, which may be responsible for the early emergence. Similar findings were obtained by Savant *et al*. (2021) [6] in Indian Plumeria where minimum number of days for sprouting was observed in maximum length of cutting when planted in the month of February.

3.2 Sprouting percentage

In interaction between size of cutting and month of planting on sprouting percentage, a significantly maximum sprouting percentage (100%) was observed in treatment combinations T_3M_3, T_3M_7, T_3M_8, and T_3M_9, which involved size of cutting 40 cm planted in the first fortnight of October, February, March, and April, respectively and minimum sprouting percentage (74.33%) was found in T_1M_6 and T_1M_{10}, which involved cutting of size 20 cm planted in the first fortnight of January and May. (Table 2). This may be due to the fact that maximum length of cuttings contains more stored nutrients and energy, when planted during the warmer months, they may encourage early sprouting due to increased metabolic activity and growth.

3.3 Survival percentage

The data presented in Table 3 shows survival percentage of Indian Plumeria (*Plumeria alba* Linn.). The data was found to be significant with size of cutting and month of planting maximum survival percentage (87%) was observed in T_3M_7 (cutting of size 40 cm planted in the first fortnight of February). However, minimum survival percentage (37%) was found in T_1M_{10} (cutting of size 20 cm planted in the first fortnight of May). Similar results were found by Kathiravan *et al*. (2009) [3] in *Jatropha curcas* Linn. Where highest survival percentage was found in maximum length of cutting.

Table 1: Effect of size of cutting and month of planting on days required for sprouting of Indian Plumeria (*Plumeria alba* Linn.)

Days required for sprouting											
Treatment	**M_1 (Aug.)**	**M_2 (Sept.)**	**M_3 (Oct.)**	**M_4 (Nov.)**	**M_5 (Dec.)**	**M_6 (Jan.)**	**M_7 (Feb.)**	**M_8 (Mar.)**	**M_9 (Apr.)**	**M_{10} (May)**	**Mean**
T_1 (20cm)	25.13	25.63	24.50	24.90	25.36	25.20	23.10	24.26	24.80	24.90	24.78
T_2 (30 cm)	20.5	21.16	20.86	21.60	22	20.90	19.13	19.46	19.90	21.26	20.67
T_3 (40 cm)	18.46	19.10	17.53	18.13	19.23	18.40	16.63	17.43	17.86	18	18.07
Mean	21.36	21.96	20.96	21.54	22.19	21.50	19.62	20.38	20.85	21.38	21.17

	S.Em (±)	CD at 5%	'F' test
T	0.06	0.19	SIG
M	0.12	0.35	SIG
(T x M)	0.21	0.61	SIG

Table 2: Effect of size of cutting and month of planting on sprouting (%) of Indian Plumeria (*Plumeria alba* Linn.)

Sprouting percentage											
Treatment	**M_1 (Aug.)**	**M_2 (Sept.)**	**M_3 (Oct.)**	**M_4 (Nov.)**	**M_5 (Dec.)**	**M_6 (Jan.)**	**M_7 (Feb.)**	**M_8 (Mar.)**	**M_9 (Apr.)**	**M_{10} (May)**	**Mean**
T_1 (20 cm)	77.66	75.33	79	78	75.33	74.33	78	78.33	79.33	74.33	76.96
T_2 (30 cm)	91.66	91.66	94	90.66	88.66	91	95.66	92.33	91.66	91.33	91.86
T_3 (40 cm)	88.33	90.66	100	89	91.66	93.33	100	100	100	95.33	94.83
Mean	85.88	85.88	91	85.88	85.21	86.22	91.22	90.22	90.33	86.99	87.88

	S.Em (±)	CD at 5%	'F' test
T	0.25	0.72	SIG
M	0.46	1.32	SIG
(T x M)	0.80	2.28	SIG

Table 3: Effect of size of cutting and month of planting on survival (%) of Indian Plumeria (*Plumeria alba* Linn.) at 120 days after planting

Survival percentage											
Treatment	**M_1 (Aug.)**	**M_2 (Sept.)**	**M_3 (Oct.)**	**M_4 (Nov.)**	**M_5 (Dec.)**	**M_6 (Jan.)**	**M_7 (Feb.)**	**M_8 (Mar.)**	**M_9 (Apr.)**	**M_{10} (May)**	**Mean**
T_1 (20 cm)	39	41	43	41.66	40.33	41.33	43	45	40.33	37	41.16
T_2 (30 cm)	45	44	47.33	45	44.66	47.66	51.66	50.33	50	45.66	47.13
T_3 (40 cm)	53.66	54.33	66.66	62	56.33	76	87	78.33	68.54	54.66	65.73
Mean	45.88	46.44	52.33	49.55	47.10	54.99	60.55	57.88	52.95	45.77	51.34

	S.Em (±)	CD at 5%	'F' test
T	0.22	0.64	SIG
M	0.41	1.18	SIG
(T x M)	0.72	2.04	SIG

Table 4: Effect of size of cutting and month of planting on increase in plant height (cm) of Indian Plumeria (*Plumeria alba* Linn.) at 120 days after planting

Increase in plant height (cm)											
Treatment	**M_1 (Aug.)**	**M_2 (Sept.)**	**M_3(Oct.)**	**M_4 (Nov.)**	**M_5 (Dec.)**	**M_6 (Jan.)**	**M_7 (Feb.)**	**M_8 (Mar.)**	**M_9 (Apr.)**	**M_{10} (May)**	**Mean**
T_1 (20 cm)	6.52	6.63	6.72	6.63	5.95	6.14	6.98	7.15	6.84	6.70	6. 63
T_2 (30 cm)	15.12	15.16	15.36	15.26	15.29	15.43	15.67	15.59	15.53	15.23	15.36
T_3 (40 cm)	19.28	19.38	19.64	19.45	19.36	19.47	21.17	20.11	19.55	19.22	19.66
Mean	13.64	13.72	13.90	13.78	13.53	13.68	14.60	14.28	13.97	13.71	13.88

	S.Em (±)	CD at 5%	'F' test
T	0.01	0.04	SIG
M	0.03	0.08	SIG
(T x M)	0.05	0.15	SIG

3.4 Plant height (cm)

At 120 days after planting, maximum increase in plant height (21.17 cm) was observed in T_3M_7 (cutting of size 40 cm planted in the first fortnight of February). However, minimum increase in plant height (5.95 cm) was recorded in T_1M_5 (cutting of size 20 cm planted in the first fortnight of December) (Table 4). This may be due to the fact that larger cuttings are better suited to supporting rapid vertical growth due to their increased stored resources. They have the ability to allocate energy toward both shoot and root development. These cuttings, when planted during the warmer months (February-April), are favourable for their growth, resulting in tall plants. Similar findings were obtained by Bosila *et al*. (2010) [2] in Bougainvillea, Ahmad *et al*. (2011) [1] in Gladiolus and Savant *et al*. (2021) [6] in Indian Plumeria.

3.5 Number of leaves

At 120 days after planting, maximum number of leaves (14.773) was recorded in T_3M_7 (cutting of size 40 cm planted in the first fortnight of February). While, minimum number of leaves (2.046) was observed in T_1M_{10} (cutting of size 20 cm planted in the first fortnight of May) (Table 5). This is due to maximum size of cuttings may contain more stored nutrients and possess several nodes. These nodes have the capacity to produce leaves, and if there are more number of nodes on cutting will produce maximum number of leaves. When planted in the month of February, the cuttings may have benefitted from congenial climatic conditions prevailing during that period, enabling them to achieve maximum efficiency in development and resulting in highest number of leaves. Simila results were found by Ahmad *et al*. (2011) [1] who noted that Gladiolus corms planted in the month of February showed the maximum number of leaves and Kathiravan *et al*. (2009) [3] in *Jatropha curcas* L. found that stem cutting with maximum length produced maximum number of leaves.

3.6 Average leaf area (cm^2): Maximum average leaf area (364.473 cm^2) at 120 days after planting was recorded in T_3M_7 (cuttings of size 40 cm planted in the first fortnight of February) and minimum average leaf area (139.443 cm^2) was observed in T_1M_1 (cuttings of size 20 cm planted in the first fortnight of August) (Table 6). Maximum size of cutting are more likely to exhibit pronounced apical dominance, inhibiting the formation of lateral branches and resulting in larger leaves when planted during the active growing season due to their increased physiological potential for growth.

3.7 Girth at collar (mm)

Maximum increase in girth at collar region (6.86 mm) was observed in T3M7 (cutting of size 40 cm planted in the first fortnight of February). However, minimum increase in girth at collar region (4.77 mm) was recorded in T1M1 (cutting of size 20 cm planted in the first fortnight of August) (Table 7).

Table 5: Effect of size of cutting and month of planting on number of leaves of Indian Plumeria (*Plumeria alba* Linn.) at 120 days after planting

Number of leaves											
Treatment	**M_1 (Aug.)**	**M_2 (Sept.)**	**M_3 (Oct.)**	**M_4 (Nov.)**	**M_5 (Dec.)**	**M_6 (Jan.)**	**M_7 (Feb.)**	**M_8 (Mar.)**	**M_9 (Apr.)**	**M_{10} May)**	**Mean**
T_1 (20 cm)	2.343	3.763	6.723	6.543	6.236	6.666	5.116	7.033	3.016	2.046	4.949
T_2 (30 cm)	2.666	3.003	9.133	8.826	8.573	8.763	10.837	10.173	3.213	5.973	7.116
T_3 (40 cm)	11.347	11.423	12.107	11.877	11.633	11.957	14.773	13.853	12.033	7.293	11.833
Mean	5.452	6.063	9.321	9.082	8.814	9.128	10.242	10.353	6.087	5.104	7.966

	S.Em (±)	CD at 5%	'F' test
T	0.003	0.011	SIG
M	0.007	0.020	SIG
(T x M)	0.012	0.034	SIG

Table 6: Effect of size of cutting and month of planting on leaf area (cm^2) of Indian Plumeria (*Plumeria alba* Linn.) at 120 days after planting

Leaf area (cm^2)											
Treatment	**M_1 (Aug.)**	**M_2 (Sept.)**	**M_3 (Oct.)**	**M_4 (Nov.)**	**M_5 (Dec.)**	**M_6 (Jan.)**	**M_7 (Feb.)**	**M_8 (Mar.)**	**M_9 (Apr.)**	**M_{10} (May)**	**Mean**
T_1 (20 cm)	139.443	141.333	150.663	147.313	145.393	148.713	152.533	152.953	151.107	149.123	147.857
T_2 (30 cm)	334.213	335.823	342.273	338.853	336.933	339.557	344.133	343.107	341.957	339.547	339.639
T_3 (40 cm)	356.237	357.553	361.707	359.973	358.227	360.407	364.473	363.283	362.673	360.103	360.463
Mean	276.631	278.236	284.881	282.046	280.184	282.892	287.046	286.448	285.246	282.924	282.653

	S.Em (±)	CD at 5%	'F' test
T	0.004	0.011	SIG
M	0.007	0.021	SIG
(T x M)	0.012	0.036	SIG

Table 7: Effect of size of cutting and month of planting on increase in girth at collar region (mm) of Indian Plumeria (*Plumeria alba* Linn.) at 120 days after planting

Increase in girth at collar region (mm)											
Treatment	**M_1 (Aug.)**	**M_2 (Sept.)**	**M_3 (Oct.)**	**M_4 (Nov.)**	**M_5 (Dec.)**	**M_6 (Jan.)**	**M_7 (Feb.)**	**M_8 (Mar.)**	**M_9 (Apr.)**	**M_{10} (May)**	**Mean**
T_1 (20 cm)	4.77	4.89	5.62	5.42	5.17	5.34	5.05	5.84	5.71	5.54	5.33
T_2 (30 cm)	5.02	5.20	5.74	5.58	5.32	5.46	6.29	6.11	5.84	5.98	5.65
T_3 (40 cm)	5.77	5.88	6.41	6.28	5.99	6.14	6.86	6.71	6.51	6.64	6.32
Mean	5.18	5.32	5.92	5.76	5.49	5.64	6.06	6.22	6.02	6.05	5.76

	S.Em (±)	CD at 5%	'F' test
T	0.01	0.03	SIG
M	0.02	0.06	SIG
(T x M)	0.03	0.11	SIG

This may be attributed to the fact that larger cuttings may have more developed vascular system, including xylem and phloem, which transport water and nutrients within the plant. A well-developed vascular system can enhance resource transfer, resulting in a thicker stem. Similar results were found by Kumar and Saralch (2019) [4] in *Popolus deltoids*, who found that larger cutting sizes exhibited a higher girth at the collar region.

4. Conclusion

According to the above studies on size of the cutting and month of planting in Indian Plumeria it may be concluded that cutting of size 40 cm planted in the first fortnight of February was promising in terms of days required for sprouting, sprouting percentage, survival percentage, plant height, number of leaves, leaf area and girth at collar region under Konkan agro-climatic condition.

5. References

1. Ahmad I, Khattak AM, Ara N, Amin NU. Effect of planting dates on the growth of gladiolus corms in Peshawar. Sarhad J. Agri. 2011;27(2):195-199.
2. Bosila H A, Zewil MA, Hamza MA, Amin MM. Influence of planting date and media on rooting of stem cutting of *Bougainvillea glabra*. J. Plant Producn. Mansoura University. 2010;1(7):1033-1040.
3. Kathiravan M, Ponnuswamy AS, Vanitha C. Determination of suitable cutting size for vegetative propagation and comparison of propagules to evaluate the seed quality attributes in *Jatropha curcas* Linn. Nat. Prod. Radiance. 2009;8(2):162-166.
4. Kumar S, Saralch HS. Effect of transplanting time and cutting size on growth parameters of *Populus deltoids* under nursery conditions. Int. J Econ. Plants. 2019;6(1):21-24.
5. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. ICAR Rev. Ed. 1995, 97-156.
6. Savant AN, Dalvi NV, Salvi BR, Borkar PG, Parulekar YR, Khandekar RG, *et al*. Optimization of size of cutting and month of planting for propagation of Indian Plumeria (*Plumeria alba* L.) J Eco-friendly Agric. 2021;16(2):141-145.
7. Sura J, Dwivedi S, Dubey R. Pharmacological, phytochemical, and traditional uses of *Plumeria alba* LINN. An Indian medicinal plant. J. Pharma. BioSci. 2018;6(1):1.
8. Voon HC, Bhat R, Rusul G. Flower extracts and their essential oils as potential antimicrobial agents for food uses and pharmaceutical applications. Comprehensive Reviews in Food Science and Food Safety. 2012;11(1):34-55.