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Effect of Different Lengths of Cuttings on Percentage of Survival and Establishment of Jasmine (*Jasminum sambac* L.) var. Local

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ABSTRACT

An experiment was conducted on effect of different lengths of cuttings on percentage of survival and establishment of Jasmine (*Jasminum sambac* L.) var. Local" in the experimental site of Instructional Farm-I, Nuagaon, Shampur which is operated under Institute of Agricultural Sciences (FAS) Siksha 'O' Anusandhan (Deemed to be University), Bhubaneswar during September 2022 to May 2023. The experiment was laid out in Factorial Randomized Block Design with four replications and nine treatment combinations consisting of three types of cuttings viz., hardwood cuttings (T_1), semi hardwood cuttings (T_2) and terminal cuttings (T_3) and three types of lengths viz., 15cm (L_1),20 cm (L_2) and 25 cm (L_3). Among three different levels of length of cuttings tried, parameters like days taken for sprouting (32.61) and days taken for establishment (41.42) were observed to be minimum in 25cm length of cuttings. Besides, maximum number of sprouts per cutting (1.81), number of shoots per cutting (1.60), length of longest shoot per cutting (14.02 cm), number of leaves per rooted cutting (8.27), length of longest root (9.91cm), survival percentage of rooted cuttings (46.25%), number of roots per cutting (15.13) and leaf area of the largest leaf (12.27cm^2) were recorded in 25 cm length of cuttings. Different levels of lengths could not influence the days taken for sprouting and survival percentage of rooted cuttings significantly. Hence, adoption of 25 cm length of cuttings was found to be most suitable for establishment and survival of *Jasminum sambac* var. Local which can be recommended to the flower growers for its commercial cultivation in and around Bhubaneswar.

Keywords Jasmine, Length, Cuttings, Rooting, survival percentage**.**

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INTRODUCTION

One of the most ancient and exquisitely scented flowers in the Oleaceae family is the jasmine. Its superior aroma and unique scent have earned it the titles "Queen of Flowers," "Queen of Fragrance," and "Belle of India." In India, where most people have an obsession with fragrant flowers, jasmine is

particularly adored. Rose is the "Queen" and it is also referred to as the "King of Oils". A room or yard can be fragrantly filled with a single jasmine vine. The name Jasmine comes from the Arabic word "Yasmin" (scent). It is regarded as an intangible flower of India's spiritual legacy and has been for a long time. India is among the countries where jasmine first appeared. The colloquial terms for *Jasminum sambac* are Malli in Odia and Madan mogra in Hindi and Arabian jasmine in English. It is referred to as Sampaguita, the national flower of the Philippines. It is also referred to as Melati putih, one of the three national flowers of Indonesia. It can be found in all tropical and subtropical regions of the planet. Estimates place the number of species in the genus Jasminum at 500. Only 89 of these species, 40 of which are found on the Indian subcontinent, are genuinely recognized as valid species, according to a thorough analysis of them. Only three of the more than 80 distinct jasmine cultivars found in India are farmed for profit (Taria 2014). *Jasminum sambac* (Arabian Jasmine) is endemic to the East Indies, despite popular belief that it originated in west India. These are Jasminum auriculatum (Mullai), *Jasminum grandiflorum* (Jathimalli / Pitchi), and Jasminum sambac (Gundumalli / Madurai Malli). Persians are the source of *Jasminum grandiflorum,* or Spanish jasmine. South India's central province is home to *Jasminum auriculatum,* a native of that region. The first two species are primarily planted for fresh flower sales, whilst the last species is typically grown for concrete extraction. The demand for jasmine concrete is rising on the international scene. On the international market, jasmine absolute and concrete are thought to sell for roughly Rs 19,000 and Rs 12,000 per kilogram, respectively. Despite being found throughout tropical and subtropical regions of the world, many perfumed species of jasmine may be found in the areas that make up Malaysia, China, and India. About 40 of these species are said to be found in India. Twenty species can be found in the erstwhile Madras Presidency State; some of these species can also be found in the Upper Gangetic plains, Mumbai, Bihar, Orissa, Chotanagpur, and Sub-Himalayan tracts. Jasmine is grown for commercial use in the Indian states of Tamil Nadu, Karnataka, and West Bengal. In India, jasmines are estimated to cover 8000 acres and yield blooms valued at Rs 80–100 million each year, while precise data regarding acreage and yield is not yet available. Tamil Nadu and Karnataka are the two states in India with the most area planted with jasmine; between them, they account for 98% of the total planted area. With a cultivated area of 9360 ha and an annual yield of 77247 t, Tamil Nadu is the nation's leading producer of jasmine. In the Odisha districts of Ganjam and Puri, jasmine is primarily farmed. The jasmine blossoms cultivated in the Puri surroundings are grown primarily for Lord Jagannath's adoration, and not much more. In Odisha, farmers cultivate jasmine, mostly for special occasions like festivals and weddings, rather than for commercial use. In times of festivity, such as weddings or other cultural events, the state typically imports jasmine flowers from neighbouring states like Tamil Nadu, Andhra Pradesh, Karnataka, and Kerala to meet the increased demand for the flower. If jasmine is grown in Odisha from cuttings of the right length and variety, the yield would be good. Cuttings of jasmine could be created for more profitable commercial uses in order to enhance jasmine output. Another significant issue with regulating jasmine production procedures in the state of Odisha is the dearth of knowledge regarding the length of jasmine cuts.

MATERIALS AND METHODS

The experiment was conducted at Siksha 'O' Anusandhan (deemed to be a university) at Instructional Farm I of the Institute of Agricultural Sciences. It was then moved to the Department of Horticulture at Siksha 'O' Anusandhan (deemed to be a university), Bhubaneswar (Odisha), which is located at 20° 28' N longitude and 85° 76' E latitude. It is located at 25.5 meters above mean sea level (MSL) and 70 kilometers from the Bay of Bengal. The experimental location is located in an agroclimatic zone of the east and southeast coastal plain, which is defined by a warm, humid environment with moderate winters. The September 2022–May 2023 timeframe for the experiment was used. According to the statistics on weather conditions, the cropping season saw no rain from November 2022 to February 2023 and a maximum rainfall of 234.1 mm in September of 2022. While the average rainfall for the experiment was 71.95 mm, the total rainfall was 647.6 mm. The highest temperature recorded during the farming season was 37.8°C in May 2023, and the lowest

recorded temperature was 16.3°C in December 2022. Throughout the season, the highest recorded temperature was 295.6°C, while the lowest recorded temperature was 192°C. The month of September saw the highest relative humidity levels (95%) in the afternoon, while the month of February saw the lowest (35.2%) in the afternoon. The Department of Floriculture and Landscaping, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar, was the source of the planting material. Jasmine (*Jasminum sambac* L.) shrubs that were 5 years old and evenly grown provided the planting material. Based on the wood's maturity, a one-year-old shoot that had developed rapidly was divided into three main sections: Terminal, semi-hardwood, and hardwood cutting. Hardwood, semi- hardwood, and terminal cutting lengths were maintained at 15, 20, and 25 centimeters (refer to Plate no.1). The mature stem's basal section was carved out of hardwood. The stem's middle section served as a semi-hardwood cutting, and the terminal section served as a terminal cutting. Terminal cuttings had very few leaves remaining. The rapid dip technique was used to treat cuttings with rootex. It involved dipping the prepared cuttings' basal ends for ten seconds, to a depth of 2.5–3.0 cm, in the rootex. Each type of cutting received twenty rootex treatments, which were then reproduced four times using a factorial Randomized Block Design. During the late *kharif* season, the treated cuttings were planted in plots with sand under shade net in beds of 135 cm by 80 cm. Each type of cutting received twenty rootex treatments, which were then reproduced four times using a factorial Randomized Block Design. During the late *kharif* season, the treated cuttings were planted in plots with sand under shade net in beds of 135 cm by 80 cm. A slant cut was made at the cuts' base. Planting was done at an angle of around 15 degrees. On the days when there was no rain, rose cane was used to apply water. For the purpose of documenting observations, five randomly selected cuttings from each plot were labelled as sample cuttings. Periodically, observations were made regarding the number of days required for sprouting, the number of sprouts/cutting, the number of shoots/cutting, the length of the longest shoot/cutting, the number of leaves/cutting, the leaf area of the largest leaf, the number of sprouted buds/cutting (based on the date), the number of roots/cutting, the length of the longest root, the number of days required for cutting establishment, the percentage of sprouts that turn into shoots, and the survival percentage of cuttings per plot were all recorded.

Plate 1. Separation of the hardwood, semi-hardwood, and terminal cuttings.

RESULTS AND DISCUSSION

Days taken for sprouting

The variation among the different length of cuttings could not show any significant difference and minimum days (32.61) taken for sprouting was seen in 25cm (L_3) (Refer Table 1 and Plate no.2) whereas 15cm (L_1) took maximum days for sprouting (33.85) (Refer Table 1 and Plate no. 2). Earlier sprouting which was seen in semi hardwood cuttings might

Table 1. Effect of different lengths of cuttings of *Jasminum sambac* on days taken for sprouting, number of sprouts, number of shoots, length of longest shoot, number of leaves per rooted cutting and leaf area of the largest leaf.

	15 cm (L_1)	20 cm (L_2)	25 cm (L_3)	CD
Days taken for sprouting	33.85	32.93	32.61	NS
Number of sprouts per cutting	1.16	1.40	1.81	0.19
Number of shoots per cutting	1.02	1.22	1.60	0.21
Length of longest shoot per cutting	12.01	12.19	14.02	1.24
Number of leaves per rooted cutting	6.21	6.41	8.27	1.43
Leaf area of the largest leaf (sq cm)	10.46	10.35	12.27	1.31

Plate 2. Sprout emergence in cuttings.

be due to interaction effect of auxins and stored carbohydrates.

Number of sprouts per cutting

Significant variation was observed among the different length of cuttings for this parameter. Maximum sprouts (1.81) were observed in 25cm (L_3) (Refer Table 1), followed by 20 cm (1.40). However lowest number sprouts per cutting of 1.16 was recorded in 15cm length cuttings (L_1) (Refer Table 2). As discussed earlier the number of days taken for sprouting was minimum in semi hardwood cuttings, the maximum number of sprouts in semi hardwood cuttings, might be also due to less number of days taken for sprouting in the same.

Number of shoots per cutting

The different length of cuttings exhibited a significant effect on number of shoots per cutting. 25cm length of cuttings (L_3) showed the maximum number of shoots per cutting (1.60) (Refer Table 1, Fig.1) whereas, minimum number of shoots per cutting (1.02) was recorded in 15cm length of cuttings (L_1) (Refer Table 1, Fig.1). The increased number of shoots in semi hardwood cuttings of 25 cm length might be due to the maximum number of sprouts found in T_2L_3 which

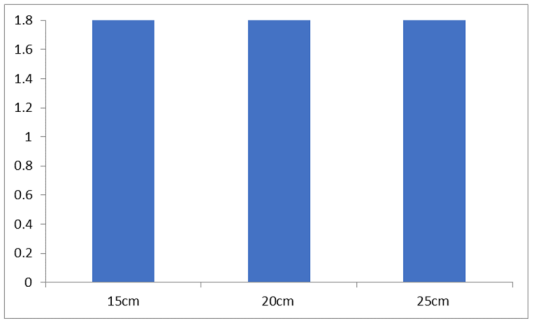

Fig. 1. Effect of length of cuttings on number of shoots per cutting.

emerged into shoots. It might be due to the presence of auxins which enhance the formation of callus and differentiation of vascular tissues.

Length of longest shoot per cutting

Significant effect was observed among the different length of cuttings for this character. The length 25cm (L_3) showed highest shoot length (14.02cm) (Refer Table 1). Lowest shoot length of 12.01cm was observed in 15 cm length of cuttings (L_1) (Refer Table 1). The increased shoot length in semi hardwood cuttings may be due to enhanced cell division, cell elongation which resulted in healthy vegetative growth.

Number of leaves per rooted cutting

Among the different length of cuttings maximum number of leaves (8.27) were showed in 25cm (L_3) (Refer Table 1). Minimum number of leaves (6.21) were observed in 15cm length of cuttings (L_1) (Refer Table 1). The maximum number of leaves per rooted cutting in (T_2L_3) might be due to maximum plant height and more number of shoots. Similar findings were observed by Kumaresan *et al.* (2019) in his experiment on *Jasminum multiflorum* (Pink kakada).

Leaf area of the largest leaf (sq cm)

The variation among the different length of cuttings with respect to leaf area of the largest leaf was found to be significant and highest leaf area of the largest leaf (12.27cm^2) was observed in 25cm (L_3) (Refer Table 1), whereas the lowest leaf area of the largest leaf (10.46 cm^2) was reported in 15 cm (L_1) (Refer Table

Table 2. Effect of different lengths of cuttings of *Jasminum sambac* on number of sprouted buds per cutting, number of roots per cutting, length of longest shoot, survival percentage of rooted cutting, number of days taken for establishment of cuttings and percentage of sprouts emerging into shoots.

	15 cm (L_1)	20 cm (L_2)	25 cm (L_3)	CD
Number of sprouted buds per cutting (According to date)	1.02	1.38	1.63	0.19
Number of roots per cutting	12.18	14.48	15.13	0.84
Length of longest root (cm)	8.32	8.74	9.91	1.38
Survival percentage of rooted	39.06 (34.59)	41.87 (36.63)	46.25 (39.33)	3.55

1). The maximum leaf area in hardwood cuttings and semi hardwood cuttings might be attributed to the presence of high humidity which is in turn supported by the planting of cuttings in rainy season that reduces heat load on the cuttings thus permitting the utilization of high light conditions to increase photosynthesis (Hartmann *et al.* 1990, Acquaah 2005). The same trend was observed for the total leaf area in hardwood cuttings by the study conducted by Okunlola and Ibironke (2013) in his study on the effects of cutting types and length on rooting of *Duranta repens.*

Number of sprouted buds per cutting (According to date)

Significant variation was observed among the different length of cuttings for this parameter. Maximum sprouted buds 1.63 were observed in 25 cm length of cuttings (L_3) (Refer Table 2). However lowest sprouted buds per cutting of 1.02 were recorded in 15 cm length of cuttings (L_1) (Refer Table 2).

Number of roots per cutting

Among the different lengths 25cm length of cuttings (L_3) showed maximum number of roots (15.13) (Refer Table 2 and Plate no. 3). Minimum number of roots (12.18) were observed in 15 cm length of cuttings (L_1) (Refer Table 2 and Plate no. 3). The higher rooting percentage might be due to the presence of high level of endogenous auxins in hard wood cuttings. It may also be due to the reason that leaf area was found to be directly related to rooting. It might be due to the enhanced hydrolysis of carbohydrates caused by auxin treatment (Saglam *et al*. 2014), supported this

Plate 3. Comparison of rooting in the terminal, semi-hardwood, and hardwood cuttings.

finding who correlated the root growth due to the action of auxin activity which might have caused hydrolysis and translocation 38 of carbohydrate and nitrogenous substances at the base of cuttings and resulted in accelerated cell elongation and cell division in suitable environment. Rooting can be induced by favorable conditions like higher temperature (30-35 ^{0}C) and high relative humidity (85-90%) through intermittent misting. These factors attribute for reduced transpiration and respiration rate associated with higher photosynthetic activity which promotes better rooting in cuttings (Hartmann *et al.* 2002).

Length of longest root (cm)

The variation among the different length of cuttings with respect to length of longest root (cm) was found to be significant and highest root length (9.91cm) was observed in 25 cm (L_3) (Refer Table 2 and Plate no.3), whereas the lowest root length (8.32 cm) was reported in 15 cm length of cuttings (L_1) (Refer Table 2 and Plate no.3). The increased root length in T_2L_3 might be due to early production of callus, differentiation of cells, greater cell elongation and differentiation of vascular tissue, which in turn favored the root growth. Similar results were obtained by (Kumaresan *et al.* 2019) in his experiment on effect of different type of stem cuttings and plant growth regulators on rooting of *Jasminum multiflorum* (Pink kakada). Kumar *et*

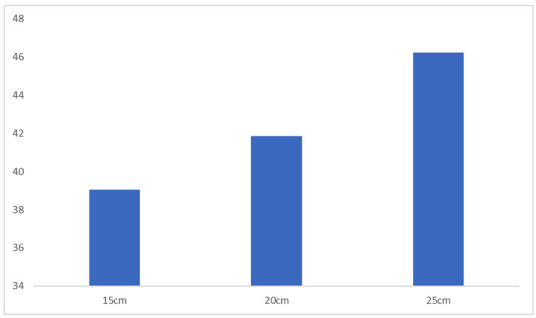

Fig. 2. Effect of length of cuttings on survival percentage of rooted cuttings.

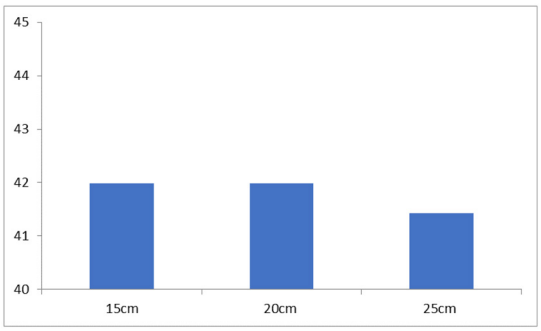

Fig. 3. Effect of length of cuttings on number of days taken for establishment of cuttings.

al. (2020) reported that the increase in root length over control may be due to the enhanced hydrolysis of carbohydrates, metabolites accumulation and cell division induced by auxin.

Survival percentage of rooted cutting

The variation among the different length of cuttings with respect to survival percentage of rooted cutting was found to be significant and highest survival percentage of rooted cuttings (46.25%) was observed in 25 cm (L_3) (Refer Table 2, Fig. 2), whereas the lowest survival percentage of rooted cutting (39.06%) was reported in 15 cm (L_1) length of cuttings (Refer Table 2, Fig. 2). The highest survival percentage in semi hardwood cuttings might be attributed to the intermediate to growth stage which help in striking roots more readily than very soft terminal cuttings or too mature hardwood cuttings. This may also be due to the nature of semi hardwood cuttings which have good balance of stored nutrients and energy.

Number of days taken for establishment of cuttings

The variation among the different length of cuttings with respect to the number of days taken for establishment was found to be significant and minimum number of days taken for establishment (41.36) was observed in 20 cm (L_2) (Refer Table 2, Fig. 3), whereas the maximum number of days taken for establishment (41.98) was reported in (L_3) (Refer Table 2, Fig. 3). The highest establishment rate in semi hardwood cuttings might be due to their initial maturity stage (not fully woody) that provides balance between the tenderness of terminal and the rigidity of hardwood cuttings which makes it ideal for root development.

Percentage of sprouts emerging into shoots

Different length of cuttings did not show significant effect on percentage of sprouts emerging into shoots. Maximum sprouts in 15 cm length of cutting (L_1) 66.37% and minimum percentage recorded in 20 cm (L_2) length of cutting 65.59%. The maximum percentage of sprouts emerging into shoots which is seen in semi hardwood cuttings might be due to the physiological stage of the mother plant and the environmental conditions. This support the findings of (Khan *et al.* 2006) that the less mature a plant, generally the easier it is to root a cutting from it, also the less mature the growth stage of a plant for example terminal cuttings more easily it can lose water, dry out and die.

CONCLUSION

Based on the performance of different types of length of cuttings of *Jasminum sambac* during late *kharif* season it was concluded that the semi hardwood cuttings performed satisfactorily with the lengths of 20 cm and 25 cm. However, performance of 25 cm length semi hardwood cuttings with respect to survival percentage, days taken for establishment, days taken for sprouting and number of sprouts per cutting was superior to the other types of cuttings with different lengths. Therefore, the jasmine growers of Odisha can be advised to take up the planting of semi hardwood cuttings of jasmine under late *kharif*

season along with the regular *kharif* season, which can provide surplus planting material that in turn will give superfluity of flowers for meeting the market requirements.

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