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Influence of growing media on rooting of stem cuttings in Jamun (*Syzigium cumini* L. Skeels)

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Abstract
Vegetative propagation of Jamun (*Syzigium cumini* L. Skeels) through cutting is the most convenient and the cheapest method to obtain true to type plants in considerably lesser time. In the present study, effect of different growing media on the rooting ability of different types of stem cuttings of jamun was assessed at College of Horticulture, University of Horticultural sciences, Navanagar, Bagalkot (Karnataka) India. The experiment was laid out in Factorial Completely Randomized Design. There was significant differences among treatments in various shoot and root parameters recorded. The hardwood cuttings and soilrite were significantly best with respect to most of the shoot and root parameters. In the interaction of treatments, number of days taken for sprout initiation was found early in T_{12} (Shoot-tip cutting and Soilrite, 8.37days), the highest number of sprouts (9.03, 7.03 and 5.03) and number of leaves per cutting (4.31, 6.33 and 7.77) at 30, 60 and 90 DAP, fresh weight of cuttings (13.86g), number of primary and secondary roots (49.98), length of longest root (15.43cm), and rooting percentage (44.87) at 90 DAP was more in interaction T_{10} (Hard wood cutting and soilrite). Whereas, the highest dry weight of cutting (8.01) was recorded in interaction T_8 (Semi-hardwood cutting and sand). Overall, T_{10} having interaction of hard wood cutting and rootex was shown superior results as compared to other treatments.

Keywords: Jamun, rooting, stem cutting, growing media, vegetative propagation, soilrite (DAP – Days after planting)

Introduction
The Jamun (*Syzygium cumini* L. Skeels) commonly known as Indian blackberry, Java plum, Jambu, black plum and Jambul belongs to family Myrtaceae are important evergreen beautiful tree, native to India. *S. cumini* is an emerging fruit crop of the twenty-first century. The fruit contains various phytochemicals such as alkaloids, fatty acids, steroids and tannins. The fruit is also known as diabetic-fighter because of its hypoglycemic properties. The dried alcoholic extract of jamun seeds has the potential to reduce blood sugar and glycosuria. The plants raised by seed takes long period to flower and bear fruits and alsothese plants will bears fruits of variable size and quality. Jamun seed longevity and the percentage of germination is three week and eight per cent respectively. (Roberts, 1983) [10]. Therefore, vegetative propagation is utmost desirable to propagate true to type plants. Propagation by cuttings is the most convenient and cheap method of obtaining a fully developed stronger tree in considerably less time.

The hardwood cuttings of pomegranate gave the maximum percentage of rooting (72.10%) when planted in a mixture of sand and vermiculite and minimum in sand (40.43%) (Ansari, 2013) [4]. Alikhani *et al*. (2011) [2] evaluated the effects of the kind of medium and kind of cuttings (Malas - Torshe Savah) in pomegranate on rooting ability and growth of cuttings. Medium of sand more than three buds of cuttings had the highest rooting potential; however, highest length of roots was observed on sand + peat medium more than three budded cuttings. Furthermore, Singh *et al*. (2015) [14] obtained better results with respect to number of sprouts per cutting (2.58) when cuttings of lemon cv. Pant Lemon-1 planted in soil + sand + vermicompost medium, number of primary roots per cutting (9.03) and number of secondary roots per cutting (16.67) in soil + sand + cocopeat medium and maximum survival percentage (82.23) in soil + sand + FYM medium respectively. The research work on rooting of jamun cuttings is very limited. Keeping these points in view the present study was conducted to study the influence of growing media on success of rooting ability of different types of stem cuttings of jamun.

Materials and Methods

The experiment was conducted at College of horticulture, University of Horticultural sciences, Navanagar, Bagalkot (Karnataka) India. The experiment was laid out in Factorial completely randomized design. There were seven treatments of different PGR combination. Each treatment was replicated twice.

Preparation of cuttings

Jamun (*Syzigium cumini* L. Skeels) stem cuttings were taken from well- developed disease-free mother plants. The cuttings were 15 cm long, containing about 4 to 5 buds. In the present study three types of stem cuttings were taken, which are as follows:

Hard-wood cuttings: The branches of pencil thickness from the past season growth having an age of ten to twelve months were selected from the mother plant. All the leaves were removed by using secateurs.

The length of the cuttings were retained about 15 to 20 cm. Straight cut was given at upper end whereas, slanting cut was given near the node at the lower end.

Semi-hardwood cuttings: The branches of pencil thickness from the past season growth having an age of seven to nine months were selected. Tender and soft terminal ends were being removed from the stem.

The length of the stem cuttings were 15 cm. The lower cut on the cutting is made close to the node. Few top leaves were retained in the cuttings.

Shoot tip cuttings: These are the fast growing soft tips of stems, usually taken from four to five months old shoots having a length of 15 cm, including the terminal bud. The cut was made just below a node. The lower leaves that would touch or be below the medium were removed.

Preparation of rooting media

The potting soil, or medium in which a plant grows, must be of good quality. It should be porous for root aeration and drainage, but also capable of water and nutrient retention. In order to plant to form a new root system, it must have a ready moisture supply at the cut surface. The media should be porous. The following rooting media were being used in the present investigation:

Soil mixture: It was prepared by mixing of garden soil, sand and FYM at a ratio of 2:1:1. These rooting media were sterilized by solarization method before one month of planting.

Cocopeat: It is a multipurpose growing medium made from coconut husk. The fibrous coconut husk is pre washed, machine dried, sieved and made free from sand and other contaminations such as animal and plant residue. The high porosity and water holding capacity makes it, an ideal growing medium for the plant crops. It is 100% organic and ecofriendly, free from soil borne pathogen and weed. It has a pH of 5.7 – 6.5, EC level <1 mS/cm is ideal for plant growth (Krishna traders, Bagalkot).

Sand: Sieved sand was used as the rooting media. Before planting, the sand was thoroughly drenched with copper fungicide at 5 g per litre. It was then filled in plastic pro trays. The prepared stem cuttings were planted after dipping in growth regulator solutions prepared as per the treatments.

Soilrite: It is a mixture of 75% Irish peat moss and 25% horticulture grade expanded perlite having pH ranging from 5.0 to 6.5. This can be easily purchased from the certified nurseries (Source-Varsha enterprices, Bengalore).

Induction of treatments

Factor A and Factor B were combined and 12 treatments obtained are as follows; T_1 - M_1 Soil + C_1 Hardwood cutting, T_2 - M_1 Soil + C_2 Semi-hardwood cutting, T_3 - M_1 Soil + C_3 Shoot-tip cutting, T_4 - M_2 Coco peat + C_1 Hardwood cutting, T_5 - M_2 Coco peat + C_2 Semi-hardwood cutting, T_6 - M_2 Coco peat + C_3 Shoot-tip cutting, T_7 - M_3 Sand + C_1 Hardwood cutting, T_8 - M_3 Sand + C_2 Semi-hardwood cutting, T_9 - M_3 Sand + C_3 Shoot-tip cutting, T_{10} - M_4 Soilrite + C_1 Hardwood cutting, T_{11} - M_4 Soilrite + C_2 Semi-hardwood cutting and T_{12} - M_4 Soilrite + C_3 Shoot-tip cutting.

Observations

The observations taken were days taken for sprout initiation, sprouting percentage, number of sprouts, number of leaves and length of shoots at 30, 60 and 90 days after planting and fresh weight of cuttings, dry weight of cuttings, number of primary and secondary roots, length of longest root, and rooting percentage at 90 Days after planting. Dry weight (g) After the fresh weight was taken, the jamun cuttings was taken in the butter paper bags. Tagging was done to individual paper bags according to the treatments to avoid mechanical mixture. After that, the tagged paper bags were put in the hot air oven at 100˚F for few days until the mass gets constant.

Statistical analysis

The data recorded for all the parameters was statistically analysed (ANOVA) by following the completely randomized design (CRD) at 5% level of significance. The analysis has been done in Web Agri-Stat Package (WASP 2.0) developed by ICAR Research Complex, Goa.

Results and Discussion

Effect on days taken for sprout initiation

The numbers of days taken for sprout initiation in jamun stem cuttings was significantly influenced by different growing media and type of cuttings and their interactions. Shoot-tip cuttings (9.03 days) were early than others and Soilrite (10.31 days) was the best in early sprout initiation compared to other media (Table 1). In interaction, the minimum number of days of 8.37 was recorded for sprouting initiation in T_{12} (M_4 Soilrite + C_3 Shoot-tip cutting), which was on par with T_9 (M_3 Sand + C_3 Shoot-tip cutting), T_6 (M_2 Coco peat + C_3 Shoot-tip cutting) and T_3 (M_1Soil + C_3 Shoot-tip cutting) with 8.87, 9.23 and 9.67 days respectively. Whereas, the maximum number of days taken for sprout initiation was recorded in treatment T_1 (M_1 Soil + C_1 Hardwood cutting) with 16.00 days (Table 3). Earliest sprouting of cutting may be due to prevention of down-word translocation of carbohydrate and accumulation of higher level of endogenous auxins. In context to growing media, soilrite produced earliest sprouting, longer and thicker sprouts due to optimum nutrient uptake and enhanced availability of nutrients and growth promoting substances. Similar results were also reported by Murkute *et al*. (2009) [9] in trifoloiate orange and Fraternale *et al*. (2010) [6] in citrus.

Effect on number of sprouts per cutting

In the present study growing media and type of cuttings and their combinations exhibited significant effect on average number of sprouts per cutting. Highest number of sprouts was recorded in hardwood cuttings (8.67, 6.67 and 4.67) and soilrite (8.09, 6.00 and 4.01) as compared to other type of cuttings and growing media at 30, 60, and 90 days after planting, respectively (Table 1). In the interaction, the maximum number of sprouts per cutting (9.03, 7.03 and 5.03) was recorded in T_{10} - M_4 Soilrite + C_1 Hardwood cutting. Whereas, the minimum number of sprouts per cutting (6.90, 4.63 and 2.67) was recorded in T_{12} - M_4 Soilrite + C_3 Shoot-tip cutting at 30, 60 and 90 days after planting, respectively (Table 3), no sprouts was recorded in T_3 (M1Soil + C3 Shoot-tip cutting), T_6 (M_2 Coco peat + C_3 Shoot-tip cutting) and T_9 (M_3 Sand + C_3 Shoot-tip cutting) (Table 3). More number of sprouts per cutting at 30 and 60 DAP might be due to the facts that cuttings taken from jamun was observed to have maximum nutrient and the cuttings made had used these stored nutrients for good vegetative growth. The number of sprouts per cutting at 90 DAP was distinctively less as compared to 30 DAP as there was more harsh conditions during sprout growth. Hardwood cuttings were best as compared to other types of cutting, as hardwood cuttings had more stored photosynthates in it. Similarly findings were reported by Siddiqui and Hussain (2016) in Ficus, Murkute *et al*. (2009) [9] trifoliate orange in and Fraternale *et al*. (2010) [6] in citrus.

Effect on percent sprouted cuttings

In the present study growing media and type of cuttings and their combinations exhibited significant effect on sprout percentage. Highest percentage of sprouting was recorded in the hardwood cuttings (26.95%) compared to other type of cuttings and sand (15.79%) was best condition to record highest sprouting compared to other growing media (Table 1). In interaction, the highest sprouting percentage was recorded in treatment T_7 (M_3 Sand + C_1 Hardwood cutting) with 36.73 per cent whereas, the lowest sprouting percentage was observed in treatment T_2 (M_1 Soil + C_2 Semi-hardwood cutting) with 1.07 per cent (Table 3). Increase in sprouting percentage in hardwood cuttings may be due to better utilization of stored carbohydrate, nitrogen and other factor with the aid of growth regulator. Cuttings planted in sand and soilrite had more sprouting percentage due to good aeration in the root zone and better nutrient supply to the cuttings. The above findings are close in conformity with the finding of Singh *et al*. (1980) [13] in Alamanda, Siddiqui and Hussain (2016) in Ficus and Murkute *et al*. (2009) [9] in trifoliate orange.

Effect on number of leaves per cutting

In the present study growing media and type of cuttings and their combinations exhibited significant effect on average number of leaves per cutting. Highest number of leaves was recorded in (4.04 -hardwood cuttings, 6.12 - semi hard wood cutting, 7.51 - semi hard wood cutting) and rootex (3.69, 5.66 and 7.16) as compared to other type of cuttings and growing media at 30, 60, and 90 days after planting, respectively (Table 1). In the interaction, the maximum number of leaves per cutting (4.63, 6.70 and 8.01) was recorded in T_8 - M_3 Sand + C_2 Semi-hardwood cutting. Whereas, the minimum number of sprouts per cutting (6.90, 4.63 and 2.67) was recorded in T_{12} - M_4 Soilrite + C_3 Shoot-tip cutting at 30, 60 and 90 days after planting, respectively (Table 3). Semi hardwood cuttings produced more number of leaves as it had more stored food in it at 60 and 90 DAP. There was increase in number of leaves at 60 and 90 DAP which might be due to the growth favored by the nutrients present in media at root levels, resulting more number of leaves per cuttings. Cuttings planted in sand and soilrite had more sprouting percentage due to good aeration in the root zone and better nutrient supply to the cuttings. These findings are in agreement with earlier workers Sabbah *et al*. (1991), Wahab *et al*. (2001) [15] in guava, Amri *et al*. (2009) [3] in Dalbergia and Waheed *et al*. (2010) [16] in tea.

Effect on shoot length

In the present study growing media and type of cuttings and their combinations exhibited significant effect on average shoot length. Highest shoot length was recorded in hardwood cuttings (3.07, 4.46 and 6.19cm) and soilrite (2.49, 3.69 and 4.98cm) as compared to other type of cuttings and growing media at 30, 60, and 90 days after planting, respectively (Table 2). In the interaction, the maximum shoot length (3.75cm- T_{10} - M_4 Soilrite + C_1 Hardwood cutting, 4.87cm- T_{10} - M_4 Soilrite + C_1 Hardwood cutting and 6.40cm- T_7 - M_3 Sand + C_1 Hardwood cutting) was recorded at 30, 60 and 90 days after planting, respectively. Whereas, the minimum number of sprouts per cutting (6.90, 4.63 and 2.67) was recorded in T_{12} - M_4 Soilrite + C_3 Shoot-tip cutting at 30, 60 and 90 days after planting, respectively (Table 3). Hardwood cuttings were better than types of cutting as it had longer primary roots which resulted efficient nutrient uptake, sand and soilrite media had performed better than other media as these media were porous, hence, more growth of roots had taken place it was better towards inducing higher shoot length in cuttings. Similar findings have been reported by Fraternale *et al*. (2010) [6] in citrus and Singh *et al*. (2013) [12] in pant lemon.

Effect on fresh weight

In the present study growing media and type of cuttings and their combinations exhibited significant effect on average fresh weight of cuttings. The maximum fresh weight of cuttings was recorded in hardwood cuttings (13.30g) and soilrite (9.96g) as compared to other types of cuttings and media (Table 2). Hardwood cuttings were produced more fresh weight as compared to other types of cutting as the diameter was more in case of hardwood cuttings, the cuttings planted in the soilrite and sand media produced more average fresh weight than other media as these media provided efficient supply of nutrient. In interaction, the highest fresh weight at 90 DAP was recorded in the treatment T_{10} (M_4 Soilrite + C_1 Hardwood cutting) with 13.86g, whereas, the lowest fresh weight was recorded in T_9 (M_3 Sand + C_3 Shoot-tip cutting) with 6.71g (Table 4). Similar findings have been reported by Camellia *et al*. (2009) [5] in jatropha, Waheed *et al*. (2010) [16] in tea and Alikhani *et al*. (2011) [2] in pomegranate.

Effect on dry weight

In the present study growing media and type of cuttings and their combinations exhibited significant effect on average dry weight of cuttings. The maximum dry weight of cuttings was recorded in semi hardwood cuttings (7.51g) and soilrite (9.96g) as compared to other types of cuttings and media

(Table 2). The highest average dry weight had been recorded in the hardwood as the diameter of cuttings were more, the cuttings planted in the coco peat and soilrite media produced more average dry weight than other media as these media provided efficient supply of nutrient. In interaction, the highest dry weight of cuttings at 90 DAP was recorded in the treatment T_8 (M_3 Sand + C_2 Semi-hardwood cutting) with 8.01g whereas, lowest dry weight had been recorded in T_{12} (M_4 Soilrite + C_3 Shoot-tip cutting) with 6.03 g (Table 4). These findings are in confirmation with Malewar *et al*. (1998) [8] in jamun, neem and nilgiri, Yadav *et al*. (2012) [17] in acid lime, and Ahmad *et al*. (2016) [1] in dragon fruit.

Effect on number of primary and secondary root

In the present study growing media and type of cuttings and their combinations exhibited significant effect on average number of primary and secondary roots. Number of primary and secondary roots was more in the hardwood cuttings (48.41) and soilrite (41.75) as compared to other types of cuttings and media (Table 2). In interaction, the highest number of primary and secondary roots per cutting had been recorded in T_7 (M_3 Sand + C_1 Hardwood cutting) with 57.77, which was followed by T_{10} (M_4 Soilrite + C_1 Hardwood cutting) with 49.98 and the lowest number of roots was observed in the treatment T_{12} (M_4 Soilrite + C_3 Shoot-tip cutting) of about 32.97 roots. (Table 4) The highest number of primary and secondary roots had been recorded in the hardwood as the dry matter of cuttings were more, the cuttings planted in the sand and soilrite media produced more average number of primary roots than other media as these media provided efficient supply of nutrient. These findings are in confirmation with Fraternale *et al*. (2010) [6] in citrus and Kareem *et al*. (2013) [7] in guava.

Effect on length of longest root

In the present study growing media and type of cuttings and their combinations exhibited significant effect on length of longest root (Table 2). Overall, the longest length of primary root was recorded in the hardwood cutting and soilrite treated plants. It might be due to soilrite media significantly favoured length of longest root due to the assimilation and translocation of auxins compound in rooted cutting and well drained media is also promoted the better development of roots by penetration of roots. Length of longest root was more in the hardwood cuttings (12.66cm) and soilrite (12.78cm) as compared to others (Table 4). The highest length of longest root per cutting was recorded in T_{10} (M_4 Soilrite + C_1 Hardwood cutting) with 15.43cm whereas, the lowest length of primary roots was observed in the treatment T_2 (M_1 Soil + C_2 Semi-hardwood cutting) with 9.16 cm (Table 4). These findings are in confirmation with Malewar *et al*. (1998) [8] in jamun, neem and nilgiri and Fraternale *et al*. (2010) [6] in citrus.

Percentage of rooted cuttings

In the present study growing media and type of cuttings and their combinations exhibited significant effect on percentage of rooted cuttings cuttings. Percentage of rooted cuttings was more in the hardwood cuttings (34.85) and soilrite (23.32) as compared to others (Table 2). Overall, highest percentage of rooting was recorded in the hardwood cuttings compared to other type of cuttings and soilrite was best growing media to record highest rooting compared to other conditions. Soilrite media had performed better than other media as these media were porous, hence, more growth of roots had taken place it was better towards inducing higher shoot length in cuttings. In interaction, the highest rooting percentage was observed in treatment T_{10} (M_4 Soilrite + C_1 Hardwood cutting) with 44.87 per cent whereas, the lowest rooting percentage was observed in treatment T_{12} (M_4 Soilrite + C_3 Shoot-tip cutting) with 5.63 per cent (Table 4). These findings are in confirmation with Fraternale *et al*. (2010) [6] in citrus.

Table 1: Effect of types of cuttings and growing media on shoot parameters in jamun

Factor	Days taken for sprout initiation	Percentage of sprouted cuttings	Number of sprouts per cutting			Number of leaves per cutting		
			30 DAP	60 DAP	90 DAP	30 DAP	60 DAP	90 DAP
C_1 Hardwood cutting	13.29	26.95	8.67	6.67	4.67	4.04	5.77	7.25
C_2 Semi-hardwood cutting	12.01	8.05	7.90	5.90	3.90	3.84	6.12	7.51
C_3 Shot-tip cutting	9.03	0.78	1.73	1.16	0.67	0.63	1.10	1.51
SEm ± (Cutting)	0.26	0.34	0.11	0.08	0.08	0.08	0.12	0.16
CD (5%) (Cutting)	0.76	0.99	0.31	0.25	0.25	0.23	0.36	0.45
M_1 Soil	13.07	3.66	5.32	3.99	2.65	2.13	3.55	4.42
M_2 Cocopeat	11.44	13.38	5.43	4.10	2.76	2.53	3.97	4.98
M_3 Sand	10.96	15.79	5.54	4.21	2.87	2.99	4.31	5.16
M_4 Soilrite	10.31	14.88	8.09	6.00	4.01	3.69	5.66	7.16
SEm ± (Media)	0.30	0.39	0.12	0.10	0.10	0.09	0.14	0.18
CD (5%) (Media)	0.87	1.14	0.36	0.29	0.28	0.27	0.41	0.52

*Significant at 5 per cent level; C1- Hardwood cuttings, C2 - Semi-hardwood cutting, C3 - Shot-tip cutting, M_1 - Soil, M_2 - Cocopeat, M_3 – Sand and M_4 soilrite

Table 2: Effect of types of cuttings and growing media on shoot and root parameters in jamun

Factor	Shoot length (cm)			Fresh weight (g)	Dry weight (g)	Number of primary and secondary roots	Longest root length (cm)	Percentage of rooted cuttings
	30 DAP	60 DAP	90 DAP					
C_1 Hardwood cutting	3.07	4.46	6.19	13.30	7.25	48.41	12.66	34.85
C_2 Semi-hardwood cutting	2.31	3.40	4.84	8.74	7.51	40.57	11.30	14.15
C_3 Shot-tip cutting	0.32	0.60	0.90	3.38	1.51	8.24	2.37	1.41
SEm ± (Cutting)	0.05	0.07	0.10	0.24	0.16	0.93	0.24	0.40
CD (5%) (Cutting)	0.16	0.20	0.28	0.71	0.45	2.71	0.69	1.16
M_1Soil	1.45	2.06	3.27	7.02	4.42	27.07	6.69	8.46
M_2 Cocopeat	1.75	2.74	3.88	7.08	4.94	27.17	7.77	15.88
M_3 Sand	1.90	2.79	3.79	9.84	5.16	33.64	7.86	19.51
M_4 Soilrite	2.49	3.69	4.98	9.96	7.16	41.75	12.78	23.32
SEm ± (Media)	0.06	0.08	0.11	0.28	0.18	1.07	0.27	0.46
CD (5%) (Media)	0.18	0.23	0.32	0.82	0.52	3.13	0.80	1.34

S. No.	Treatment details	Days taken for sprout initiation	Percentage of Sprouted cuttings	Number of Sprouts per cutting			Number of leaves per cutting			Shoot length (cm)		
				30 DAP	60 DAP	30 DAP	60 DAP	90 DAP	90 DAP	60 DAP	90 DAP	90 DAP
1	T_1 M_1 C_1	16.10	9.90	8.34	6.34	4.34	3.65	4.92	6.12	2.48	3.60	5.73
2	T_2 M_1 C_2	13.43	1.07	7.62	5.62	3.62	2.73	5.73	7.15	1.89	2.57	4.07
3	T_3 M_1 C_3	9.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	T_4 M_2 C_1	12.51	29.93	8.58	6.58	4.58	3.86	5.61	7.62	2.75	4.67	6.33
5	T_5 M_2 C_2	12.57	10.20	7.71	5.71	3.71	3.74	5.77	7.21	2.50	3.57	5.30
6	T_6 M_2 C_3	9.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	T_7 M_3 C_1	12.40	36.73	8.71	6.71	4.71	4.35	6.22	7.49	3.31	4.70	6.40
8	T_8 M_3 C_2	11.60	10.63	7.91	5.91	3.91	4.63	6.70	8.01	2.40	3.67	4.97
9	T_9 M_3 C_3	8.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	T10 M_4 C_1	12.13	31.23	9.03	7.03	5.03	4.31	6.33	7.77	3.75	4.87	6.30
11	T11 M_4 C_2	10.43	10.30	8.34	6.34	4.34	4.23	6.26	7.67	2.44	3.80	5.03
12	T12 M_4 C_3	8.37	3.10	6.90	4.63	2.67	2.53	4.39	6.03	1.27	2.40	3.60
SEm ±		0.52	0.68	0.21	0.17	0.17	0.16	0.25	0.31	0.11	0.14	0.19
CD (5%)		1.51	1.98	0.62	0.50	0.49	0.46	0.72	0.91	0.31	0.39	0.56

*Significant at 5 per cent level; C1- Hardwood cuttings, C2 - Semi-hardwood cutting, C3 - Shot-tip cutting, M_1 - Soil, M_2 - Cocopeat, M_3 – Sand and M_4 soilrite

Table 3: Effect of Interaction of type of cutting and growing media on shoot parameters in jamun

S. No.	Treatment details	Days taken for sprout initiation	Percentage of Sprouted cuttings	Number of Sprouts per cutting			Number of leaves per cutting			Shoot length (cm)		
				30 DAP	60 DAP	30 DAP	60 DAP	90 DAP	90 DAP	60 DAP	90 DAP	90 DAP
1	T_1 M_1 C_1	16.10	9.90	8.34	6.34	4.34	3.65	4.92	6.12	2.48	3.60	5.73
2	T_2 M_1 C_2	13.43	1.07	7.62	5.62	3.62	2.73	5.73	7.15	1.89	2.57	4.07
3	T_3 M_1 C_3	9.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	T_4 M_2 C_1	12.51	29.93	8.58	6.58	4.58	3.86	5.61	7.62	2.75	4.67	6.33
5	T_5 M_2 C_2	12.57	10.20	7.71	5.71	3.71	3.74	5.77	7.21	2.50	3.57	5.30
6	T_6 M_2 C_3	9.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	T_7 M_3 C_1	12.40	36.73	8.71	6.71	4.71	4.35	6.22	7.49	3.31	4.70	6.40
8	T_8 M_3 C_2	11.60	10.63	7.91	5.91	3.91	4.63	6.70	8.01	2.40	3.67	4.97
9	T_9 M_3 C_3	8.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	T10 M_4 C_1	12.13	31.23	9.03	7.03	5.03	4.31	6.33	7.77	3.75	4.87	6.30
11	T11 M_4 C_2	10.43	10.30	8.34	6.34	4.34	4.23	6.26	7.67	2.44	3.80	5.03
12	T12 M_4 C_3	8.37	3.10	6.90	4.63	2.67	2.53	4.39	6.03	1.27	2.40	3.60
SEm ±		0.52	0.68	0.21	0.17	0.17	0.16	0.25	0.31	0.11	0.14	0.19
CD (5%)		1.51	1.98	0.62	0.50	0.49	0.46	0.72	0.91	0.31	0.39	0.56

*Significant at 5 per cent level; C1- Hardwood cuttings, C2 - Semi-hardwood cutting, C3 - Shot-tip cutting, M_1 - Soil, M_2 - Cocopeat, M_3 – Sand and M_4 soilrite

Table 4: Effect of Interaction of type of cutting and growing media on root parameters in jamun

S. No.	Treatment details	Fresh weight (gm)	Dry weight (gm)	Number of primary and secondary roots	Length of longest root (cm)	Percentage of rooted cuttings
1	T_1 M_1 C_1	12.75	6.12	43.03	10.91	20.50
2	T_2 M_1 C_2	8.31	7.15	38.17	9.16	4.87
3	T_3 M_1 C_3	0.00	0.00	0.00	0.00	0.00
4	T_4 M_2 C_1	12.87	7.62	42.87	12.03	32.43
5	T_5 M_2 C_2	8.37	7.21	38.65	11.26	15.20
6	T_6 M_2 C_3	0.00	0.00	0.00	0.00	0.00
7	T_7 M_3 C_1	13.73	7.49	57.77	12.26	41.60
8	T_8 M_3 C_2	9.09	8.01	43.16	11.31	16.93
9	T_9 M_3 C_3	6.71	0.00	0.00	0.00	0.00
10	T10 M_4 C_1	13.86	7.77	49.98	15.43	44.87
11	T11 M_4 C_2	9.20	7.67	42.29	13.44	19.60
12	T12 M_4 C_3	6.82	6.03	32.97	9.47	5.63
SEm ±		0.48	0.31	1.86	0.48	0.80
CD (5%)		1.41	0.91	5.42	1.39	2.32

*Significant at 5 per cent level; C1- Hardwood cuttings, C2 - Semi-hardwood cutting, C3 - Shot-tip cutting, M_1 - Soil, M_2 - Cocopeat, M_3 – Sand and M_4 soilrite

Conclusion

The hardwood cutting in combination with soilrite was superior to show more shooting and rooting parameters in jamun. The results would be very useful in standardization of an efficient protocol for multiplication of jamun through cuttings.

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