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The Standardization of method and time of propagation in jamun (*Syzygium cuminii.* Skeels) var. Konkan Bahadoli

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Abstract
The present investigation on the standardization of methods and time of propagation in jamun (*Syzygium cuminii.* Skeels) var. Konkan Bahadoli was conducted during 2018-19 in different months, viz. July, August, September, October and November with five different methods, i.e. Softwood grafting, Whip and tongue grafting, Hardwood cutting, Semi hard wood cutting and patch budding under mist chamber condition. The result revealed that among the propagation methods, softwood grafting during August observed the highest survival percentage (94.72%). Similarly after 90th the same treatment softwood grafting during August the maximum number of new shoots per plant(6.13), number of leaves/plants (15.34), leaf area (32.88 cm^2),carbohydrate content (6.57%) were recorded. Based on the experiment at result obtained that softwood grafting performed month of August was found to be the best for jamun propagation.

Keywords: Jamun, propagation, methods, month

Introduction
Jamun (*Syzygium cumini* Skeels.) is an indigenious and important minor crop in India belonging to family Myrtaceae (Baloda *et al.* 2016). Recently jamun attained major importance in arid zones under commercial exploitation It is widely grown in larger parts of India from Indo gangetic plains in the North to Tamil Nadu in the South (Singh and Srivastava, 2000) [15].

Jamun is native to India It is widely distributed in tropical and subtropical parts of India, Srilanka, Malyasia, Thailand, Australia, Philippines Burma, Ceylon, Nepal, Pakistan and Bangladesh. India ranks second next to Brazil in area and production in world (Bodkhe and Rajput 2010) [3]. Area (156 hectare) and production (1014 Tonnes/hectare) under tamilnadu condition during 2017-18.

The tree has a great economic importance since most of the parts like the bark, leaves, seed and fruits are used as an alternative medicine to treat various diseases. It is used in well known traditional medicines to control the blood sugar level in the patients suffering from diabetes. The tree is rich in phytochemicals like glycoside jambolin, anthocyanins, tannins, terpenoids, gallic acid and various minerals. These wide ranges of health promoting compounds make them a suitable candidate to be used as a nutraceutical reported by Chaudhary and Mukhopadhyay (2012) [5].

Jamun is propagated both sexually and asexually. However, at present, the majority of use the seed propagation and due to the presence of polyembryony and also true-to-type but it attains bearing later than vegetatively propagated plants. As this crop Seed propagation is not advisable, for commercial multiplication asexual methods for followed for earlier, yield and quality.

In added asexual techniques are easy way to preserve the certain characters of variety. Jamun can be propagated by different techniques viz. softwood grafting (Subash *et al*. 2016), patch budding (Sharma *et al*. 2016), cuttings (Abdullah *et al*. 2006). The time of propagation depends mainly on temperature, humidity and availability of planting material reported that Angadi *et al.* (2011) [10] maximum (100%) graft take was noticed in the months of October. Gowda *et al.* (2011) in jamun at june, Mutteppa *et al.* (2017) [11] in guava at January.

While, choosing a particular technique for propagation of jamun, the time and method of operation should be taken into consideration as the success of each method vary from region to region due to variation in agro climatic conditions. Any particular method which may be successful at one place may not prove useful at other. Similarly, a particular method successfully adopted will vary from place to place due to environmental factors such as

temperature, relative humidity etc. Therefore, the present study was conducted standardize the method and time of propagation in jamun var. konkan Bahadoli in Tamilnadu.

Materials and Methods

The experiment was carried in the mist chamber of Central farm nursery at Department of fruit crops, Horticultural collage and research insititute, Periyakulam during 2018-19 to find out best method and time of propagation in jamun. Experiment was laid out in factorial completely randomized design (FCRD) with 25 treatment and 3 replication. The experiment is situated in the tropical zones at latitude of 10.1283° N and longitude of 77.5998° E.. The temperature ranges from 25 °C to 38 °C and relative humidity was maintained between 80 to 90 (per cent). vegetative propagation namely Softwood grafting, Whip and tongue grafting, Patch budding, Hardwood cutting, Semi hardwood cuttings were as tried for present study and five months viz, July, August, September, October and November were selected for propagation.

The biometrical observation were recorded on five randomly selected plants of each replication to assess the morphological characters, i.e. number of days taken to bud sprouting, number of new shoots/plant, survival percentage of grafting/budding/cutting, leaf area (cm^2),carbohydrate content. The data regarding the number of days taken to sprouting calculated by observation of plants on alternate days from the days of planting and their mean value was used to calculated the days taken for first sprout. The number of shoots per plant, number of new leaves per plant were recorded of fully developed plants were recorded at 30,60,90 days after propagation The data on the percentage of survival were recorded after 90 days of planting the grafting/budding/cutting, carbohydrate content and leaf area calculated after 90 days of propagation. The data were then analyzed statistically as per method suggested by Panse and Sukhtame (2000).

Result and Discussion

1. Number of days taken to bud sprouting

Analysis of the data presented (Table 1) indicated that among different time and methods of propagation, minimum (13.79) taken to sprouting were recorded in hardwood cuttings.The effect of time of propagation was also significant with respect to taken to sprouting of jamun, the minimum days taken to sprout(19.02) was observed during August. Numer of days taken to bud sprouting of jamun was also influenced by the interaction of time and methods of propagation in jamun where minimum (12.55) number of days to sprout was observed in hardwood cutting during August.

The propagation operation should take place at the time when favorable temperature is expected and when the cambium tissue is in the active stage. Higher temperature is more favorable for callus formation which unite the scion buds with the stock The results are in conformity with those of Sivudu *et al.* (2014) [16] in mango, Singh and Parmar (1998) [14] in aonla, Chovatia and Singh (2000) [6] in jamun.

2. Number of shoots per plants

(Table 2) The result revealed that the number of shoots per plant with time and methods of propagation, maximum (5.12) and minimum (2.19) shoots where recorded in softwood grafting and patch budding. The effect of time of propagation was also significant with respect to taken to sprouting of jamun, the maximum (4.11) and minimum (3.57) shoots was observed during August and November. Numer of shoots at jamun was also influenced by the interaction of time and methods of propagation in jamun where maximum (6.13) and minimum (1.93) was observed in softwood grafting, patch budding during August and july.

Rani *et al.* (2015) [13] reported that The result may be due to favorable climactic parameters during monsoon helped in faster growths which act positively on the rootstock and scion shoot, which might had happened due to the longer time available for growth in meristamatic cells coupled with better physiological process like photosynthesis and lower respiration. This result is similar with Mandal *et al.* (2011) in mango. Rani *et al.* (2015) [13] in guava, Karna *et al*., (2017) [8] in mango.

3. Number of leaves per plant

(Table 3) the influence of time and methods of propagation on number of leaves per plants registered that the highest value (13.40) and lowest (5.70) leaves where recorded in softwood grafting and patch budding. The effect of time of propagation was also significant with respect to taken to sprouting of jamun, the highest (10.50) and lowest (8.55) leaves was observed during August and September. Number of leaves at jamun was also influenced by the interaction effect of time and methods of propagation in jamun where highest (15.34) and lowest (4.89) was observed in softwood grafting, patch budding during August and September.

The highest number of leaves might be due to photosynthetic accumulation in newly grafted plants which in turns increased the number of nodes and absorption of nodes and absorption of nutrients by leaf primordial. water is one of the driving forces for cell elongation and multiplication and the grafting operation done during summer and early monsoon periods got the favourable soil moisture, humidity and temperature which showed favorable effect on number of leaves on scion. These results are in consistence with those of Reddy *et al*. (2014) [16] in mango in which they noticed that softwood grafting was best method of propagation in respect of maximum number of leaves This might be due to the development of more sprouts, more meristamatic activity and better healing of grafts during these months. Similar results were obtained by Nachegowda and Vasanth (1996) [12] on sapota.

4. Survival percentage

(Table 4) The investigated result revealed that the maximum at survival percentage (92.24%) and minimum (42.48%) where recorded in softwood grafting and semi hard wood cutting. The effect of time of propagation was also significant with respect to taken to survival percentage of jamun, the maximum (70.17) and minimum(63.18) was observed during August and November Survival percentage of jamun was also influenced by the interaction effect of time and methods of propagation in jamun where maximum (94.72) and minimum (40.01) was observed in softwood grafting, semi hard wood cutting during August and November.

survival percentage may be due to presence of enough carbohydrate and other food material in the scion and rootstock and the accumulated food material is mobilized for new growth which in turns high meristamatic activity in scion. This may be due to moderate temperature (28 to 32 °C) and relative humidity (74 to 78%) This result was supported by Mulla *et al*. (2005) jamun, Bharad *et al.* (1999) in jamun and Giri and Lenka (2008) [7] in wood apple. Karna *et al*., (2017) [8].

5. Leaf area (cm^2)

Analysis of the data presented (Table 5) indicated that among different time and methods of propagation, maximum (30.04 cm^2) and minimum(24.90 cm^2) leaf area where recorded in softwood grafting and semihard wood cutting. The effect of time of propagation was also significant with respect to leaf area of jamun, the maximum (28.16) and minimum (25.15) was observed during August and October. Numer of days taken to bud sprouting of jamun was also influenced by the interaction effect of time and methods of propagation in jamun where maximum (32.88) and minimum (22.62) was observed in softwood grafting, semihard wood cutting. during August and October.

The highest leaf area might be due to the prevailing congenial weather condition which might refelected in better leaf growth. Sivudu *et al*. (2014) [16], Mulla *et al.* (2011) [10] jamun, Rani *et al*. (2015) [13] in Guava, Chander *et al.* (2016) [4] in jamun reported the same results.

6. Carbhohydrate content (%)

(Table 6) The result of carbohydrate are revealed among different time and methods of propagation, maximum (6.13%) and minimum(5.72%) carbohydrate where recorded in whip and tongue grafting and hardwood cutting. The effect of time of propagation was also significant with respect to carbohydrate content of jamun, the maximum (6.08%) and minimum (5.60%) was observed during July and september Carbohydrate content of jamun was also influenced by the interaction of time and methods of propagation in jamun where maximum (6.57%) and minimum (5.28%) was observed in softwood grafting, patch budding during August and October. It may be due to immaturity stage of shoot and if shoot age is increased, the carbohydrate content is decreased due to its maturity. The poor success is that the decrease in carbohydrates was partially responsible for the decrease in graft take, but at that time some other substances was low in supply and was the limiting factor at that time for graft success. This observation agreed with the finding of Rodrigues *et al.* (1960) in avocados, Karna *et al*. (2017) [8].

Table 1: Influence of time, method of propagation and their interaction effect of number of days taken to bud sprouting of jamun

Method of propagation	Time of propagation					
	July	August	September	October	November	Mean
Softwood grafting	20.17	18.26	21.40	22.32	20.53	20.53
Whip and tongue grafting	23.00	21.72	23.82	22.68	23.96	23.03
Patch budding	30.27	28.25	33.00	32.50	31.62	31.12
Hardwood cutting	13.61	12.55	13.83	14.00	14.98	13.79
Semi hardwood cutting	15.80	14.35	16.41	17.24	16.85	16.13
Mean	20.57	19.02	21.69	21.74	21.58	
	Methods		Time		Interaction (M X T)	
SE(d)	0.22		0.22		0.44	
CD(p=0.05)	0.44		0.44		0.99	

Table 2: Influence of time, method of propagation and their interaction number of shoots per plant in jamun

Method of propagation	Time of propagation					
	July	August	September	October	November	Mean
Softwood grafting	5.21	6.13	4.78	4.93	4.59	5.12
Whip and tongue grafting	4.10	4.35	3.91	3.82	3.76	3.98
Patch budding	1.93	2.72	2.35	1.96	2.03	2.19
Hardwood cutting	3.92	3.80	3.85	3.88	3.82	3.85
Semi hardwood cutting	3.08	3.56	3.68	3.77	3.65	3.54
Mean	3.64	4.11	3.71	3.67	3.57	
	Methods		Time		Interaction (M X T)	
SE(d)	0.03		0.03		0.07	
CD(p=0.05)	0.06		0.06		0.14	

Table 3: Influence of time, method of propagation and their interaction number of leaves per plant in jamun

Method of propagation	Time of propagation					
	July	August	September	October	November	Mean
Softwood grafting	13.15	15.34	12.53	13.89	12.10	13.40
Whip and tongue grafting	10.22	12.33	9.54	11.34	10.44	10.77
Patch budding	5.66	7.15	4.89	5.13	5.67	5.70
Hardwood cutting	9.68	9.36	8.56	8.45	8.57	8.92
Semi hardwood cutting	8.55	8.33	7.23	8.12	8.23	8.09
Mean	9.45	10.50	8.55	9.38	9.00	
	Methods		Time		Interaction (M X T)	
SE(d)	0.08		0.08		0.18	
CD(p=0.05)	0.16		0.16		0.37	

Table 4: Influence of time method of propagation and their interaction Survival percentage (%) in jamun

Method of propagation	Time of propagation					
	July	August	September	October	November	Mean
Softwood grafting	93.99	94.72	91.15	91.99	89.37	92.24
Whip and tongue grafting	89.65	88.86	85.96	86.90	84.04	87.08
Patch budding	67.53	68.62	65.20	65.07	60.73	65.43
Hardwood cutting	45.91	52.34	45.29	46.06	41.77	46.27
Semi hardwood cutting	40.08	46.33	41.61	44.41	40.01	42.48
Mean	67.43	70.17	65.84	66.88	63.18	
	Methods		**Time**		**Interaction (M X T)**	
SE(d)	0.51		0.51		1.15	
CD(p=0.05)	1.03		1.03		2.31	

Table 5: Influence of time, method of propagation and their interaction Leaf areas(cm^2) in jamun

Method of propagation	Time of propagation					
	July	August	September	October	November	Mean
Softwood grafting	30.43	32.88	29.91	28.61	28.40	30.04
Whip and tongue grafting	28.07	28.16	27.10	26.17	25.84	27.06
Patch budding	27.92	26.84	24.27	25.08	26.10	26.04
Hardwood cutting	26.22	26.79	25.21	23.30	26.53	25.61
Semi hardwood cutting	26.29	26.14	24.14	22.62	25.32	24.90
Mean	27.78	28.16	26.12	25.15	26.43	
	Methods		**Time**		**Interaction (M X T)**	
SE(d)	0.17		0.17		0.38	
CD(p=0.05)	0.34		0.34		0.77	

Table 6: Influence of time, method of propagation and their interaction carbohydrate content (%) in jamun

Method of propagation	Time of propagation					
	July	August	September	October	November	Mean
Softwood grafting	6.30	6.57	5.19	6.29	6.12	6.09
Whip and tongue grafting	6.13	6.26	6.13	6.10	6.05	6.13
Patch budding	5.82	6.01	6.01	5.28	5.72	5.77
Hardwood cutting	5.96	6.11	5.34	6.20	5.55	5.83
Semi hardwood cutting	6.21	5.38	5.32	6.17	5.53	5.72
Mean	6.08	6.07	5.60	6.01	5.79	
	Methods		**Time**		**Interaction (M X T)**	
SE(d)	0.04		0.04		0.09	
CD(p=0.05)	0.08		0.08		0.19	

Conclusion

Based on the experiment at result obtained that softwood grafting performed month of August was found to be the best for jamun propagation. Due to lack of standard propagation technique farmers generally prefer seedlings which exhibited. Hence the standardization of softwood grafting method of propagation will facilitate the large scale multiplication of genuine planting material for the benefit of farmer, In addition testing of quality grafted planting material increases the yield, production and better income to the farmers.

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