Int.J.Curr.Microbiol.App.Sci (2018) *7*(10): 2143-2151

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 10 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.710.246

Standardization of Propagation Techniques in Jamun

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Keywords

Jamun, T-budding, Cleft grafting, Propagation, Survival, Patch budding, Sprouting

Article Info

Accepted:
15 September 2018
Available Online:
10 October 2018

A B S T R A C T

The present study entitled Standardization of propagation techniques in jamun was carried out at the nursery of Department of Horticulture, Khalsa College, Amritsar during 2017-2018. It comprises of ten planting times commencing from May to February and three methods of propagation i.e. T- budding, patch budding and cleft grafting. The results of the study indicated that out of the propagation methods tried patch budding proved to be the best in terms of minimum days to sprouting (21.7), maximum success percentage (94.54%), maximum survival percentage (90.11), maximum average leaf area (17.07 cm^2), maximum leaf fresh weight (0.19g) and maximum leaf dry weight (14.89mg). Among planting time 1-15th August proved to be the most suitable in improving the root, shoot and leaf parameters. Maximum number of leaves/plant (8.56), stem thickness (0.75 cm) was recorded in cleft grafting propagation technique in jamun.

Introduction

Jamun (*Syzygium cumini* Skeels.) is known to be an indigenious and important minor crop in India. It belongs to family Myrtaceae and is also known as *Syzygium jambolanum* and *Eugenia cumini.* Other names are jambul, black plum, java plum, etc. (Baloda *et al.*, 2016). Jamun is native to India and its bordering countries like Burma, Ceylon, Nepal, Pakistan, Bangladesh, Sri Lanka, Indonesia and Andaman islands. India ranks second next to Brazil in area and production in world (Bodkhe and Rajput 2010). In India maximum number of jamun trees is found scattered throughout the tropical and subtropical region. It is a large evergreen tree attaining a height of 25-30 m and a stem girth of 3-4 m. It is a beautifully shaped tree and is grown for its delicious fruits, shade and windbreak on the bunds of roadside avenues (Shinde *et al.*, 2011). The fruit has sub-acid spicy flavour. Presence of various flavonoids, essential oils and molecules such as gallic acid, oxalic acid, malic acid, betulic acid, phytosterols, resins and tannins contribute to its jams, jellies, squashes, vinegar, juices, beverages, pickles and wine made from the jamun fruits. Jamun squash is a refreshing drink for quenching the thirst in summer season. It is also dried with salt and preserved as a digestive powder or churan. A large quantity of food syrup is much useful for curing diarrhoea. The berry fruit consumption also provides benefits during chemotherapy and radiation (Kannan and Puraikalan, 2013).

The volatile oil from the jamun seeds can be extracted and used as an effective medicine against heart and liver trouble (Vijayanand *et al.,* 2001). As this crop has gained importance due to its medicinal and nutritive value the orchardists are demanding an early bearing and dwarf tree with high yield potential. Seed propagation is not advisable as it results in late bearing. Asexual techniques are the easy ways to preserve the certain characters of variety. The main vegetative methods of propagation like patch budding, T- budding and soft wood grafting are performed in jamun (Shinde *et al.,* 2011). The time of budding depends mainly on temperature, humidity and availability of budding material (Nath *et al.,* 2000) found that the percent success of budding depends on the budding time.

There is great necessity of an appropriate propagation method. These methods need to be tested at different time period with their suitable rootstock thickness. Due to its medicinal nutritive value its demand is increasing day by day that will require selected plants of superior quality with desirable potential (which is only possible when desirable mother trees are used for the propagation). The research work on vegetative propagation of the crop is rather scanty. Therefore, the present investigation was made to assess the effect of different dates and method of budding and grafting on the success and growth of jamun.

Materials and Methods

The present studies on "Standardization of propagation techniques in jamun" were conducted in the year 2017-2018 at the nursery of Department of Horticulture, Khalsa College, Amritsar. Desi rootstock of uniform size and vigour having 0.5 to 1 cm in diameter were selected for budding and grafting. Ra-jamun tree were selected for scion material from Khalsa College, Amritsar. The bud sticks were defoliated immediately after collection from the trees. The scion shoots were collected from mother trees in the early morning hours (7 to 9 am) on the day of budding and grafting. Scions were wrapped in moist cloth after the separation from mother trees and carried in polythene cover to the site of experimental site. Healthy one year old shoots of the pencil thickness were selected. Scion shoots were dipped in 0.1 per cent Bavistin solution to make the scion material free from pest and diseases. Budding and grafting was performed on the day of separation of scion from mother tree.

Two methods of budding i.e. T-budding, patch budding and one method of grafting i.e. cleft grafting were performed on first fifteen days of the each month from May to February 2017 forming ten treatments and two sub treatments comprising of three methods. Plant protection measures were employed to prevent the disease and pest incidence. Grafts and buddlings were watered daily with required quantity of water. Side shoots arising from any portion of rootstock were removed regularly. Experiment was performed with Factorial Randomised block design. The data regarding the number of days taken to sprouting, survival percentage, root, shoot and leaf parameters were observed.

Results and Discussion

Percent success (%)

It is evident from the data that the highest per cent success (86.49%) was recorded during 1-15th August and among various methods of propagation the highest (40.82%) per cent success was recorded in patch budding while the minimum per cent success was (0.73%) during1-15th December and (35.10%) with cleft grafting. Interaction of time and methods of propagation also had a significant effect on per cent success of jamun. After 90 days from

propagation, the highest per cent success (94.54%) was recorded in patch budding during 1-15th August while the minimum (2.19%) was during 1-15th December with patch budding. It is also clear from the data that all the propagation methods tried proved unsuccessful in the months of January and February. Superiority of patch budding over other methods with respect to per cent success might be due to the larger bark and cambium tissues in patch budding operation. Highest success in patch budding is in accordance with the findings of Manohran *et al.,* (2000) in jamun and Kumar *et al.,* (2007) in guava.

This also might be due to the most favourable temperature and humidity for success. The minimum or below average percentage of successful bud-take was recorded in the budding performed during May, December, January and February. The low bud take percentage during this period might be due to immature bud wood and low sap flow. The present results are also in line with the research findings of Rani *et al.,* (2015) in guava. Ram and Akhilesh (2005) and Singh and Singh (2006) also reported the same in jamun (Table 1).

Number of days taken for bud sprouting

According to the data among different time and methods of propagation, minimum (21.87) number of days taken to sprouting were recorded in patch budding and the best time for the bud sprouting was 1-15th August. Number of days taken to sprouting of jamun was also influenced by the interaction of time and methods of propagation in jamun where minimum (21.7) number of days to sprout was observed in patch budding during 1-15th August. The interaction of time and methods of propagation showed a significant effect on average days taken for bud sprouting. The maximum days (42.97) were recorded in cleft grafting during 1-15th November while the minimum (21.7) were during 1-15th August with patch budding. The reason for early sprouting irrespective of planting time on propagating methods might be attributed to its better adaptability to meterological conditions existing at the time of propagation on better physiological conditions and more active buds. The emerging sprout is controlled by the apical dominance and rate of supply of substrates along with presence of appropriate environment in terms of temperature, moisture and oxygen the cell division takes place in the presence of phytohormones and energy liberated by hydrolysis of carbohydrates and polysaccharides occur through enzymatic pathways is utilized. Many other changes during the sprouting such as hydrolysis of starch involve several types of amylase. Findings are in conformity with the results obtained by Panday and Singh (2001) in mango, Giri and Lenka (2007) in jamun, El-Zaher (2008) and Selvi *et al.,* (2008) in jackfruit, Kudmulwar *et al.,* (2008) in custard apple, Shinde *et al.,* (2011) and Angadi and Karadi (2012) in jamun. Mahore *et al.,* (2014) also reported the same in jamun (Table 2).

Survival percentage (%)

Maximum survival percentage (39.50%) was observed in patch budding during 1-15th August. Survival percentage was also influenced by the interaction of time and methods of propagation in jamun where maximum survival percentage (90.11%) was observed in patch budding during 1-15th August. The results of the present study is also in agreement with the findings of Baloda *et al.,* (2016). As regards to the interaction of time and methods of propagation it exerted a significant effect on survival percentage of jamun. After 90 days from propagation, the highest survival percentage (90.11%) was recorded in patch budding during 1-15th August while the minimum (8.07%) was during 1-15th December with patch budding (Table 3).

Table.1 Influence of time and methods of propagation on percent success (%) in jamun

Methods of propagation	Time of propagation										
	1-15th May	1-15th June	1-15th July	1-15th August	1-15th September	1-15th October	1-15th November	1-15th December	1-15th January	1-15th February	Mean
T-budding	40.48	65.48	77.51	84.70	47.2	32.42	15.7	0	0	0	36.36
Patch budding	49.14	68.59	88.74	94.54	52.04	34.45	18.56	2.19	0	0	40.82
Cleft grafting	38.16	62.63	71.55	80.22	40.3	37.56	20.58	0	0	0	35.10
Mean	42.59	65.57	79.27	86.49	46.51	34.81	18.31	0.73	0	0	

C.D at 5% level
Method of propagation = 0.27
Time of propagation = 0.50
(Method ×time interaction) = 0.8

Table.2 Influence of time and methods of propagation on average days taken for bud sprouting in jamun

Methods of propagation	Time of propagation										
	1-15th May	1-15th June	1-15th July	1-15th August	1-15th September	1-15th October	1-15th November	1-15th December	1-15th January	1-15th February	Mean
T-budding	30.93	28.31	30.26	27.37	29.19	38.48	41.23	0	0	0	22.58
Patch budding	26.08	25.25	24.26	21.7	27.14	30.74	33.22	30.30	0	0	21.87
Cleft grafting	32.2	33.45	32.48	33.34	30.82	39.41	42.97	0	0	0	24.46
Mean	29.7	29.004	29.006	27.47	29.05	36.21	39.14	10.10	0	0	

C.D at 5% level
Method of propagation = 0.19
Time of propagation = 0.35
(Method ×time interaction) = 0.61

Table.3 Influence of time and methods of propagation on survival percentage (%) in jamun

Methods of propagation	Time of propagation										
	1-15th May	1-15th June	1-15th July	1-15th August	1-15th September	1-15th October	1-15th November	1-15th December	1-15th January	1-15th February	Mean
T-budding	50.71	68.34	79.19	83.83	48.59	18.19	7.11	0	0	0	35.54
Patch budding	60.63	70.63	85.04	90.11	50.30	20.67	10.33	8.07	0	0	39.50
Cleft grafting	45.07	61.96	48.19	58.55	44.67	19.19	12.55	0	0	0	29.02
Mean	52.13	66.98	70.80	77.33	47.85	19.35	10.00	2.69	0	0	

C.D at 5% level; Method of propagation = 0.15;
Time of propagation = 0.29; (Method × time interaction) = 0.50

Table.4 Influence of time and methods of propagation on stem thickness (cm) after 120 days of jamun

Methods of propagation	Time of propagation										
	1-15th May	1-15th June	1-15th July	1-15th August	1-15th September	1-15th October	1-15th November	1-15th December	1-15th January	1-15th February	Mean
T-budding	0.81	1.08	1.12	1.17	1.13	0.73	0.51	0	0	0	0.65
Patch budding	0.91	1.12	1.13	1.22	1.15	0.81	0.61	0.41	0	0	0.73
Cleft grafting	1	1.14	1.18	1.24	1.18	0.91	0.85	0	0	0	0.75
Mean	0.90	1.11	1.14	1.21	1.15	0.81	0.66	0.136	0	0	

C.D at 5% level; Method of propagation = 0.005
Time of propagation = 0.009; (Method × time interaction) = 0.01

Table.5 Influence of time and methods of propagation on the number of leaves per plant after 120 days of jamun

Methods of propagation	Time of propagation										
	1-15th May	1-15th June	1-15th July	1-15th August	1-15th September	1-15th October	1-15th November	1-15th December	1-15th January	1-15th February	Mean
T-budding	11.24	12.27	12.65	16.16	14.21	5.36	3.19	0	0	0	7.51
Patch budding	12.15	13.11	14.45	17.49	15.5	5.16	2.56	3.33	0	0	8.37
Cleft grafting	14.19	13.15	15.06	18.49	16.16	5.4	3.23	0	0	0	8.56
Mean	12.52	12.84	14.05	17.38	15.29	5.31	2.99	1.11	0	0	

C.D at 5% level; Method of propagation = 0.22
Time of propagation = 0.41; (Method × time interaction) = 0.71

Higher success in July-August might be because of the optimum temperature and relative humidity prevailing during the period and rapid sap flow in stock and scion which might have favoured the healing process and established the continuity of cambium and vascular tissues. In the cambial region of graft union the cells might have protected by relative humidity or moisture resulting in quick healing, more sprouting and growth of graft/bud by easily swelling of buds. The present results are in support with the findings of Gotur *et al.,* (2017 in guava and Baloda *et al.,* (2016) in jamun. Mahore (2014) also reported the same in jamun.

Stem thickness (cm)

The data regarding the influence of time and method of propagation on stem thickness depicted that there was a sharp increase in stem thickness of propagated jamun. After 120 days of propagation cleft grafting was significantly superior and exhibited stem thickness of (0.75 cm) followed by patch budding with (0.74cm). Both these were at par with each other. T budding resulted in minimum stem thickness of (0.65cm). Among propagation timings 1-15th August proved to be the best with maximum (1.21cm) shoot diameter and minimum (0.13cm) during 1-15th December. The growth stimulations might be due to the endogenous gibberellins levels which appear to be attributed to stimulations of more cell division and cell enlargement. This could be attributed to the vigorous growth of stock which led to an increase in the stem thickness. Similar results have been reported by Chovatia and Singh (2000) and Bharad *et al.,* (2006) in jamun. These results regarding maximum stem thickness in cleft grafted plants are in agreement with the findings of Somkumar *et al.,* (2009) where they reported that cleft grafting during 15th August in grape cv. Tas-A-Ganesh as scion resulted in thickest shoot. Visen *et al.,* (2010) in guava and Abbas *et al.,* (2013) in jamun also reported the same (Table 4).

Number of leaves per graft

It is evident from the data regarding the number of leaves per graft that the number of leaves per graft increased with the increase in stages of growth in different treatment combinations. At 120 days after propagation, significantly maximum leaves per graft (17.38 and 15.29) respectively were found on the timings of 1-15th August and 1-15th September while, it was recorded minimum (1.11) on 1-15th December. The treatment combination of date and method of propagation significantly maximum leaves per graft (18.49) were produced in combination of 1-15th August and with cleft while, it was observed minimum (2.56) in 1-15th Nov and patch budding treatment combination. The development of more sprouts, more meristematic probable reasons for enhanced more number of leaves might be due to activity and better healing of grafts during these months and also due to genetic characters of a variety and vegetative growth enhanced might have been due to activated physiological process by stimulating factor in the metabolism and growth of the plant. Findings showing maximum number of shoots and leaves during 1-15th August are in line with the result of Gurjar and Singh (2012) in aonla, where they observed that during rainy season well matured rootstock favoured with high atmospheric humidity along with fairly high temperature is found These findings are in agreement with the findings of Haldankar and Jadhav (2001) which showed that the maximum total number of leaves was observed when grafts were prepared during the month of August. The grafts produced the least number of leaves when grafting was done during December, November and January (Table 5).

Ram and Akhilesh (2005) in Aonla, Kudmulwar *et al.,* (2008) in custard apple, Singh and Singh (2006), Bodkhe and Rajput (2010),Gadekar *et al.,* (2010), Ghojage *et al.,* (2011), Mulla *et al.,* (2011) and Angadi and Karadi (2012) in Jamun also reported the same. The research findings of Aralikatti *et al.,* (2011) and El-Zaher (2008) in Jackfruit are also in line with the present results. The maximum number of shoots and leaves in cleft grafting might also be due to presence of 3-4 buds on scion wood used for cleft grafting instead of single bud on patch used for patch budding. Visen *et al.,* (2010) and Singh *et al.,* (2011) also reported that number of bud sticks on scion stick 3-4 buds was all direction ideal for cleft grafting. It might be due to the amount of chlorophyll content directly affected the survival rate, leaf formation and the leaf area accordingly. This also might be due to the favourable humidity and temperature under a controlled condition. Good results formed are in conformation with Mulla *et al.,* (2007) in jamun, Bao *et al.,* (2012) and Singh *et al.,* (2007) also reported the success in the months of August in guava. Saroj *et al.,* (2000), Tewari and Bajpai (2002) has also confirmed the same findings in aonla and reported the highest success in August. The results of the present study is also in agreement with the Rani *et al.,* (2015) in guava.

It can be concluded from the present study that the propagating period from 1-15th August and patch budding method was found to be the best for jamun propagation. At this period bud sprouting, success percentage, shoot diameter, number of leaves were significantly maximum. Due to lack of standard propagation technique the growers generally raise the plants through seeds which results in lack of production of true to type plants and are unable to get good profit from their produce. Hence the standardization of patch budding method of propagation will facilitate the production of planting material on commercial basis which will increase production on a large scale. On the other hand, increase in yield and improvement in fruit quality with this propagating method and time will help the growers to fetch good price in the market which will aid in raising their living standard and socio-economic condition.

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How to cite this article:

Harvinder Kaur and Amarjeet Kaur. 2018. Standardization of Propagation Techniques in Jamun. *Int.J.Curr.Microbiol.App.Sci.* 7(10): 2143-2151.
doi: https://doi.org/10.20546/ijcmas.2018.710.246