



Research Paper

Article history :

Received : 29.04.2013

Revised : 26.08.2013

Accepted : 08.09.2013

Standardization of softwood grafting of jackfruit under Tripura conditions

■ SUKHEN CHANDRA DAS

Author for Correspondence

Department of Horticulture, College of Agriculture, LEMBUCHERRA (TRIPURA) INDIA
Email : sukhenchandra@rediffmail.com

ABSTRACT : Tripura jackfruit (*Artocarpus heterophyllus* L.) is a popular fruit ranking first in total area and annual production in Tripura. Tripura is considered to be the home of jackfruit and it is reservoir of many year-round producing genotypes. Diverse forms of jack have been growing in hilly slopes and plains. At present most of the jackfruits are grown waste land, fallow land including in home gardens by farmers. Under the above circumstances standardization of softwood grafting for selection of superior genotypes including Baromaishya types (throughout the year flowering and fruiting) of Jackfruits. The experiment was carried out in the year 2009-11, in the College of Agriculture, Government orchard and farmers fields. Standardization of softwood grafting under Tripura condition like time (season) of grafting, length of scion and age of the rootstock. The investigation was carried out in different months (May to September). The result indicate that fifteen days (15 days) old rootstocks gave the highest success (87.68 %) and fifteen (15 cm) centimetre length precured scion gave the highest success (86.33 %). The maximum successes was found in 15th June (86.09 %) under open condition.

KEY WORDS : Jackfruit, Softwood grafting

HOW TO CITE THIS ARTICLE : Das, Sukhen Chandra (2013). Standardization of softwood grafting of jackfruit under Tripura conditions. *Asian J. Hort.*, 8(2) : 409-413.

Jack fruit (*Artocarpus heterophyllus* Lam.) belongs to the family Moraceae, is a fairly large sized tree bearing largest fruit among edible known fruits. It is regarded as “poor man’s fruit” in interior parts of Tripura. Jackfruit is minor fruit at national level but in Tripura, Jack fruit is one of the commercial fruit crops and has high demand in local market and exported to neighbouring country like Bangladesh and neighbouring state like Assam. Farming community of state earns lot of money from it, as it grows naturally and cultivation is easy, producing fruits even under adverse conditions. Area under jackfruit cultivation in Tripura is 7,636.00 ha with an annual production of 2,45,773.00 Mt (Anonymous, 2011). Soft-wood grafting under Tripura condition for uniform and quality planting material is done in the month of June-July with success rate of 80-87 per cent and rates are less in the cooler month like September to January. There is a tremendous potential for identification of superior genotypes and systematic cultivation with increasing area, production, productivity and processing in the state.

RESEARCH METHODS

Studies were conducted during the 2009-2011 at Department of Horticulture, College of Agriculture, Lembucherra and State government orchard, along with farmers field near by College. The data were generated in different parameters like season (time of grafting), length of the scion and age of the root-stock. The data were compiled and subjected to standard statistical processes. The softwood grafting” is found to be the best method, giving maximum success. This is easy and simple method and can be practiced throughout the year raised with 80-87 per cent success except winter months.

Material required:

Jackfruit seedling (root stock), Jackfruit scion, Polythene bag of size 25 x10 cm and 300 gauge, Polythene strip of 30 cm length, 2 cm breadth and sciatier and knife.

Preparation of plant material:

Raising of root stocks:

The seeds were collected from orchard and farmer

fields were dried. Medium sized, good shaped and heavy seeds were selected. Seeds were sown in 25 x 10 cm (300 gauge) polybags filled with a standard mixture of soil at a depth of 2 cm for quick and better germination. Polybags were punched at the bottom to drain off the excess water, likely to stagnate at the bottom and avoid the root decay at later growth stages of the seedlings. Watering was done regularly using a rose can. The seeds were germinated within 7 to 10 days. Care was taken to provide just enough moisture to the germinating seeds as well as young seedlings from torrential rains in monsoon and direct solar radiation. Seedlings of 15 to 210 days age were used in all the experiments except in a trial- “the effect age of rootstock on the success of grafting”. Side shoots/auxillary shoots which reduce the vigour of seedlings were removed regularly.

Preparation of root stocks and scions for softwood grafting :

Healthy and vigorously growing 15-210 days old seedlings which attained an average height of 30-60 cm with 10-12 mm thickness were used for grafting, except in a trial entitled-“the effect age of rootstock on the success of grafting” in which the average height differs (15- 60 cm) with the age of the rootstock. The terminal new growth having was used as a grafting. Two pairs of bottom leaves on the root stocks were retained and other were removed. The top portion of the root stock was decapitated at height of 15-20 cm from the ground level of grafting. Then a cleft of 5-6 cm deep was made. The pre-cured scion of 4-5 months old was selected and it was mended into a wedge shape of 5-6 cm length by chopping of little portion of wood and bark on either side and taking care to retain some bark on the remaining two sides. Length of the scion stick was 10-15 cm. The wedge of the scion was inserted into the cleft of root-stock and the graft-joint was secured firmly with a polythene strip of 30 cm length, 2.0 cm width and 100 gauge thickness. A white tube like polythene cap of 20 cm x 4 cm was inserted over the scion and kept in shed house for 15-20 days. Sprouting initiation taken place within 7-10 days, after completion of sprout initiation, polythene caps were removed from the grafted plants. The grafting was done in the month of June and July with success rates varied from 80-87 per cent and rates were very less in the cooler months like September to January.

Selection and preparation of scion shoots:

Selection of proper scion material is very crucial for getting high percentage of graft success. Scions of about 10-15 cm length with thickness of 5-7 mm were collected from four to five month old scion. The selected scion shoots were defoliated (precured) 10 days prior to grafting. Scion sticks were severed from mother trees and collected early in the morning, on the day of grafting. These scion sticks on

separation were wrapped in moist sphagnum moss.

RESEARCH FINDINGS AND DISCUSSION

The temperature and relative humidity play an important role in getting higher graft success. High minimum temperature and high relative humidity are most congenial for quick and high callus formation at the graft union which are the prerequisites for quick and stout joint development. In addition, less fluctuation between maximum and minimum temperature also contributes to high success of graft union and further growth of grafts (Hartmann and Kester, 1989). Therefore, it is necessary to provide congenial conditions for getting maximum graft success. The present investigations on propagation of jackfruit under open conditions were taken up and the results are discussed here.

Success percentage of grafts as influenced by age of rootstock under open conditions :

Results obtained as influenced by different age of rootstocks on success percentage of grafts. The perusal of data in (Table 1) reveals that the percentage of success as influenced by age of rootstock was found significant. The data indicated that there were significant differences among the treatments with respect to success percentage. Observation of success of grafting was noted from 30 to 120 days. The percentage of success was in the range of 55.33-87.68 per cent at the end of 210 days old rootstock. The highest percentage (87.68 %) of success was recorded in 15 days old rootstock (seedling) followed by 30 days old rootstocks (84.71%) and the least (55.33%) was observed in 210 days old rootstock. The results of the present investigation on the effect of age of rootstock on success of softwood grafting revealed that the age of rootstock influenced the success of softwood grafting. Sawke (1992) opined that the success percentage varies with age at which the rootstocks were grafted. It is also known that the physiological maturity of rootstocks play an important role in the success and growth of grafts in different crops as reported by several workers (Gowda and Melanta, 1989; Sawke, 1992 and Vishnuvardhan, 2002). Sawke (1992) and Vishnuvardhan (2002) stated that the percentage of success reduced with the advancement in age of seedling rootstocks. The findings of the present study are in accordance with results of Sawke (1992). Swamy and Melanta (1994) opined that graft union success varies with age of the rootstock in jack. Aralikatti *et al.* (2011) indicate that 210 days old rootstocks gave highest graft union in jack.

Success of grafting per cent as influenced by season under open conditions:

The data on success percentage of grafts as influenced by season of grafting are given in Table 2. The percentage of success recorded from 30 to 120 days after grafting revealed

that the season of grafting had a significant effect on the success of grafts under open conditions. It showed percentage of success from 30 to 120 days of observation (46.32–86.09 %). At the end of 120 days, 15th June has registered highest percentage of success (86.09 %) followed by 30th June (81.24%). The lowest percentage of success was recorded in grafts prepared 15th September (46.32%). Time of grafting plays an important role among different factors involved in softwood grafting. The success of grafting solely dependent upon the weather conditions and thus may vary from region to region within a season. The seasonal aspects could be ascribed to the influence of prevailing temperature, humidity, rainfall and to some extent light. Humidity is influenced mainly by rainfall. In view of the seasonal effects, it is aimed to find out the best and congenial period of grafting under open conditions. The results of present investigation revealed that the season of grafting significantly influenced the success of softwood grafting

under open conditions. The grafts prepared in 15th June recorded higher success which was followed by 30th June. This may be attributed to moderately high temperature coupled with high humidity, less fluctuations in maximum and minimum temperatures, adequate supply of healthy and matured scion sticks because the mother trees resume the active growth phase after the onset of monsoon with adequate supply of moisture and nutrients, fast cambial activity and high accumulation of carbohydrates in scion shoots. The poor success during 31st August may be attributed to reduced rates of division of cambial cells, their differentiation and consequent development in healing of stock-scion union due to decrease in the synthesis of endogenous auxins and mobilization of reserve food materials caused by reduced activity of hydrolyzing enzymes. A decrease in activity of hydrolyzing enzyme at low temperature has been reported by Nanda and Anand (1970). The results of investigation (Table 2) leads to the conclusion that the best period was

Table 1 : Percentage of success of softwood grafting at different age of rootstock under open condition

Treatments	Percentage of success (%)			
	30 DAG	60 DAG	90 DAG	120 DAG
T ₁ - 15 days old rootstocks	87.68	85.29	83.08	81.27
T ₂ - 30 days old rootstocks	84.71	83.60	81.60	79.07
T ₃ - 45 days old rootstocks	77.96	76.56	74.84	72.57
T ₄ - 60 days old rootstocks	76.58	74.00	71.80	70.35
T ₅ - 90 days old rootstocks	68.72	67.53	65.82	63.49
T ₆ - 120 days old rootstocks	64.86	63.66	61.68	57.25
T ₇ - 150 days old rootstocks	61.12	60.61	57.94	53.28
T ₈ - 180 days old rootstocks	58.57	57.46	54.82	48.32
T ₉ - 210 days old rootstocks	55.33	54.89	52.84	47.70
Mean	70.61	69.29	67.15	63.70
S.E.±	02.11	01.98	02.15	01.178
C.D (P=0.05)	06.33	05.94	06.45	05.35

DAG- Days after grafting

Table 2: Percentage of success of softwood grafting at different time (Season) of grafting under open condition

Treatments	Percentage of success (%)			
	30 DAG	60 DAG	90 DAG	120 DAG
T ₁ - 15 th May	51.01	49.76	47.63	45.19
T ₂ - 30 th May	64.60	62.82	60.89	58.90
T ₃ - 15 th June	86.09	85.03	83.68	82.12
T ₄ - 30 th June	81.24	79.73	78.57	76.96
T ₅ - 15 th July	80.56	78.77	76.95	75.03
T ₆ - 30 th July	65.97	64.87	62.58	60.92
T ₇ - 15 th August	57.96	56.19	53.93	52.33
T ₈ - 30 th August	53.60	51.76	50.15	48.25
T ₉ - 15 th September	46.32	45.29	43.77	42.06
Mean	65.26	63.80	62.02	60.20
S.E ±	03.36	02.65	01.77	01.32
C.D (P=0.05)	10.08	07.94	05.29	03.95

DAG- Days after grafting

Table 3: Success of softwood grafting at length (cm) of scion under open condition

Treatments	Percentage of success (%)				
	15 DAG	30 DAG	45 DAG	60 DAG	75 DAG
T ₁ 05 cm length precured scion	69.05	67.30	65.55	62.34	59.78
T ₂ 10 cm length precured scion	83.62	81.76	79.67	77.20	74.75
T ₃ 15 cm length precured scion	86.33	84.65	83.32	81.27	79.77
T ₄ 20 cm length precured scion	82.24	80.00	77.80	75.84	73.30
T ₅ 25 cm length precured scion	76.87	74.59	72.94	69.73	66.80
T ₆ 30 cm length procured scion	75.4	73.45	71.65	68.81	65.89
Mean	78.92	76.96	75.15	72.53	70.05
S.E. \pm	03.13	01.96	01.57	01.69	01.89
C.D. (P=0.05)	09.82	06.17	04.94	05.32	05.95

DAG- Days after grafting

noticed in July because of high relative humidity due to rains and fairly high minimum temperature with little fluctuations between minimum and maximum temperature. The moderately low success during August may be attributed to low temperature and moister percent. This might led to faster desiccation of scion sticks and drying up before graft take. Similar observations were reported by Sawke (1992).

Percentage of success as influenced by the length of scion under open conditions :

The results obtained as influenced by different length of scions in softwood grafts under open conditions. The percentage of success at the end of 75 days after grafting as influenced by different scion lengths are presented in Table 3. It was in the range of 69.05– 86.33 per cent, where the highest percentage (86.33 %) of success was recorded in fifteen centimeters length (15cm) of scion followed by ten centimetre(10 cm) long scion (83.62%) and least (69.05 %) was observed in five (05 cm) centimeter length of scion. Determining the length of scion shoot is a general practice from the point of convenience in handling during grafting operation. However, one may not be adequately aware about its effect on success as well as subsequent growth and development of softwood grafts. It is known that the different plant species vary in their anatomy and physiological functions. Growth of plant varies with species and varieties and influenced by the season in which it is initiated and completed, thus producing the scion shoots of varying lengths. The present study was undertaken to standardize the length of scion for softwood grafting, to maximize the success per cent and to obtain a uniform growth in grafts. The results from the present study (Table 3) indicated that the scions of varying lengths have exerted significant influence on the success and growth rate of softwood grafts. Maximum success percentage was observed in case of 15 and 10 cm long scions. Maximum success (at 75 days after grafting) was observed with 15 cm and lowest was registered in case of short scions of 5 cm. The present observations are in agreement with findings of Kanwar and Bajwa (1974)

who reported a slight increase in success and subsequent growth rate of mango grafts. Ram and Bist (1982) reported higher success and better growth rate of grafts with 10 cm than 5 cm long scions in mango. The higher success with medium scions (15-10 cm) may be ascribed to optimum area exposed to the atmosphere which might have maintained congenial physiological conditions favourable for quick healing of graft union.

Conclusion:

The study consisted of effect of age of rootstock, season and scion length on success of grafting. The investigation revealed that the younger rootstock (15 days) was better than the older rootstock and obtained higher success and growth of softwood grafts. Results on influence of season of grafting on success of softwood grafting showed that, June was found favourable with success range between 86.09 to 81.24 per cent over all the other treatments. The length of scions, exhibited significant influence on the percentage of sprouting and growth behaviour of grafts. Fifteen centimetre (15cm) long scion topped the highest success followed by ten centimetres (10 cm).

REFERENCES

- Anonymous (2011). Annual report. Director of Horticulture, Government of Tripura.
- Aralikatti, G., Mokashi, A.N., Hegde, R.V., Patil, R.V. and Angadi, S.G. (2011).** Softwood grafting in jackfruit. Proc. IInd International Symposium on Pomegranate and Minor, including Mediterranean Fruits (ISPMMF-2009): *Acta Hort.*, **890**:101-106.
- Gowda, B.J. and Melanta, K.R. (1989).** Vegetative propagation of cashew (*Anacardium occidentale* L.) by grafting. *The Cashew*, **3** (2): 13-14.
- Hartman, H.T. and Kester, D.E. (1979).** *Plant propagation principles and practices*. 4th Ed., Prentice Hall of India Ltd. 407 pp.
- Hartman, H.T. and Kester, D.E. (1989).** *Plant propagation principles and practices* fifth edition Prentice Hall of India Ltd., pp. 360-363.

Kanwar, J.S. and Bajwa, M.S. (1974). Propagation of mango by side grafting. *Indian J. Agric. Sci.*, **44** (5) : 270-272.

Nanda, K.K. and Anand, V.K.. (1970). Seasonal changes in auxin effects on rooting of stem cuttings of *Populus nigra* and its relationship with mobilization of starch. *Physl. Planta.*, **23** (1) : 99-107.

Ram, S. and Bist, L.D. (1982). Studies on veneer grafting of mango in Tarai. *Punjab J. Hort.*, **22** (1-2): 64-67.

Sawke, D.P.(1992). Standardization of soft wood grafting technique in cashewnut, Ph.D.Thesis, University of Agricultural Science,

Dharwad, KARNATAKA (INDIA).

Swamy, G.S.K. and Melanta, K.R. (1994). Effect of age of rootstocks on the success of softwood grafting in jackfruit. *Karnataka J. Agric. Sci.*, **7**(4):471-473.

Vishnuvardhan, L.(2002). Softwood and Epicotly grafting studies in cashewnut (*Anacardium occidentale* L.) under different propagation structures. Ph.D. Thesis, University of Agricultural Sciences, Bengaluru, KARNATAKA (INDIA).

8th
Year
★★★★★ of Excellence ★★★★★