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Effect of rootstock height and scion stick length on guava (*Psidium guajava* L.) growth

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Abstract
The experiment entitled "Effect of rootstock height and scion stick length on guava (*Psidium guajava* L.) Growth" at Fruit Research Station, Lalbaug, Junagadh Agricultural University, Junagadh during March-2021to July-2021. The experiment was laid out in Completely Randomized Design with factorial concept comprised of twenty treatment combinations and three repetitions. The first factor involves grafting height (15, 20, 25 and 30 cm) and second factor involves scion stick length (05, 7.5. 10, 12.5 and 15 cm) to study the effect of effect of rootstock height and scion stick length on success, growth and survival in guava grafts.

The minimum numbers of days taken to sprouting and early sprouting were achieved when wedge grafts prepared on 20 cm height of rootstock (L-49) and 10 cm length of scion stick (*Anjirio*) during last week of March to the first week of April. However, better results for growth and development parameters *viz.*, number of leaves, number of nodes and internodes, leaf area, incremental scion and rootstock length, graft height, girth above graft union, girth below graft union and number of shoots were found in the grafts prepared on 30 cm height of rootstock. As far as scion stick length is concern better results were recorded in the grafts prepared using 15 cm scion stick length reported positive results for same growth parameters. Interaction effect of rootstock height and scion stick length maximum incremental scion length (44.11 cm) was found in treatment with 30 cm rootstock height and 15 cm scion length.

On the basis of the results obtained from the present investigation, it can be concluded that minimum number of days taken to sprouting were achieved when wedge grafts of guava prepared on 20 cm height of rootstock (L-49) and 10 cm length of scion stick (*Anjirio*) during last week of March to the first week of April. Further, better results for success, growth and survival parameters were found in the grafts prepared on 30 cm height of rootstock. As far as scion stick length is concern better results were recorded in the grafts prepared using 10 cm scion stick length for success and survival; while grafts prepared using 15 cm scion stick length reported positive results for growth parameters.

Keywords: Guava, wedge grafting, rootstock height, scion stick length

Introduction
Guava (*Psidium guajava* L.) is the member of Myrtaceae family and is one of the most common fruit in India (Govaerts *et al*., 2008) [2]. It is well distributed in the tropical and subtropical regions of the world, especially in South America, Asia and Australia. The common guava is diploid (2n = 22), but natural and artificial triploid (2n =33) and aneuploid exists (Menzel, 1985) [10]. Triploids generally produce seedless fruits (Jaiswal and Amin, 1992) [5]. The genus *Psidium* has about 150 shrubs and *Psidium guajava* is well known and grown worldwide (Paull and Bittenbender, 2006) [22]. It is commonly known as "Apple of tropics" and "Poor man's apple" having high vitamin A and B and being exceptionally rich in vitamin C (Rai *et al*., 2010) [25]. The fruit is also a good source of pectin, calcium and phosphorus. Guava plants have been propagated through seeds for a long time. A seed propagated plant exhibits a great variation due to inevitable heterozygosity. Moreover, they come into bearing much later than vegetatively propagated plants. Though guava is propagated through budding (Gupta and Mehrotra, 1985; Kaundal *et al*., 1987) [3, 7], air-layering (Singh and Singh, 1970; Sharma *et al*., 1978; Manna *et al*., 2004) [29, 28, 9] stooling (Rathore, 1984; Pathak and Saroj, 1988) [26, 20] and inarching (Mukherjee and Majumdar, 1983) [12], these are still not commercially viable due to varying rate of success, absence of tap root system and cumbersome process. A technique of rapid multiplication method wedge grafting has a tremendous potential for multiplying guava plants in a short span.

The success of grafting and its survival play an important role in orcharding. Though, work on this method of grafting was carried out, the information regarding the height of rootstock and

length of scion stick at the time of grafting and subsequent effect is very meager. Rootstock height plays a most important role as from which height the grafting operation can be done for maximum success and its subsequent growth. Grafting at too low height can create the problem of rot disease at the point of union of the sapling after plantation. Scion stick length also play most important role in success and growth of grafted plant. The longer scion have more food materials reserved that enhanced early bud break and leaf opening and thereby, resulting maximum growth of the plant. The output of this research work will help nurserymen to make their nursery more economical by producing more numbers of good quality grafts.

Material and Method

The experiment entitled "Effect of rootstock height and scion stick length on success, growth and survival of wedge grafting in guava (*Psidium guajava* L.)" at Fruit Research Station, Lalbaug, Junagadh Agricultural University, Junagadh during March-2021 to July-2021. The experiment was laid out in Completely Randomized Design with factorial concept comprised of twenty treatment combinations and three repetitions. The first factor involves grafting height (15, 20, 25 and 30 cm) and second factor involves scion stick length (05, 7.5. 10, 12.5 and 15 cm) to study the effect of effect of rootstock height and scion stick length on success, growth and survival in guava grafts. About 6 to 8 months old seedling rootstocks of guava variety Lucknow-49 raised in poly bag at the Fruit Research Station, Lalbaug were used for the grafting. Among these seedlings healthy, vigorous, disease and pest free and homogeneous in size and growth (pencil thickness) were selected for the experiment. Then selected rootstocks were headed back at the time of grafting at different height i.e. 15, 20, 25 and 30 cm from the base of stock for propagation purpose as per treatments. The scion wood was obtained from young trees having healthy bud sticks. For this purpose 3-4 month old scion wood of guava cultivar *Anjirio* with apical growing portion was selected. The scion wood of pencil thickness with 3 to 4 buds was defoliated about 7-8 days prior to grafting. Apical portion of scion wood was also beheaded at the time of defoliation. These defoliated scion sticks were collected and stored in moist cloth bag with care until grafting. The healthy scion sticks were taken for further procedure and length of scion stick was 05, 7.50, 10, 12.50 and 15 cm. The cut was made according to the length during the time of grafting.

The wedge grafting was done on last week of March to first week of April during morning hours at Fruit Research Station, Lalbaug, JAU, Junagadh. In this method, "V" vertical cut of 3 cm length was given onto beheaded guava seedling rootstock so as to fit the wedge shape scion. Then the scion of comparative thickness was made like wedge by giving slanting cut of 3 cm length on opposite sides with the help of grafting knife. The wedge-shaped scion stick was inserted into the "V" shaped slit of the stock. The graft union should be as close as possible to ensure that the cambium layers of stock and scion were in perfect contact with each other. Then the graft union was tied tightly with the polythene strip. The grafted plants were kept under net house condition. The polythene wrapping was removed after complete graft union formation to avoid stem girdling.

Result and Discussion

Different rootstock height was found significant influence on days taken to sprouting. The minimum number of days (12.62) taken to sprouting were recorded in 20 cm rootstock height (H_2) and maximum number of days (16.96) taken to sprouting were observed in 15 cm rootstock height (H_1). This might be due to well established, vigorous shoot, root and more food reserved in rootstock seedlings. Furthermore, too young tissues are not fit for complete union. Also, absorption of water and nutrients by rootstock initiation and involved in rapid cell division of parenchymatous cells. Above result are in conformity with Patel and Amin (1976) [19], Nalage *et al.* (2010a) [15], Jagannath *et al.* (2012) [4] in mango, Patil *et al.* (1993) [21], Prajapati (2010) [24] in jackfruit and Parthiba *et al.* (2020a) [17].

Different scion stick length was found significant influence on days taken to sprouting. Minimum number of days taken to sprouting (13.76) was observed in 10 cm scion length (L_3). Whereas, maximum number of days taken to sprouting (16.69) was observed in5 cm scion length (L_1). The minimum days required in sprouting might be due to abundant supply of carbohydrate and defoliation which initiated bud activation resulted in early position to sprouting early. The results are confirmed with Amrita *et al*. (2019) [1] in Trifoliate orange, Nalage *et al.* (2010b) [14] in mango and Prajapati (2010) [24] in Jackfruit. Interaction of rootstock height and scion stick length exerted significant effect on days taken to sprouting. Minimum number of days taken to sprouting (11.11 days) was found in treatment 20 cm rootstock height and 10 cm scion length (H_2L_3) which was at par with treatment (H_2L_5) whereas, significantly the maximum number of days taken to sprouting (18.33) was recorded in treatment 15 cm rootstock height and 5 cm scion length (H_1L_1). The least time taken for sprouting might be due to abundant supply of carbohydrate and defoliation which initiated bud activation and they were in position to sprout early. These results are in conformity with the results of Prajapati (2010) [24] in jackfruit, Nalage and Padhiar (2017) [13] in mango who reported that scions of 10 cm length and rootstock of 20 cm height produced early sprouting.

Effect of rootstock height had influence on growth parameters *viz*., number of leaves (22.68), Number of nodes (11.05), number of internodes (10.05), leaf area (82.39 cm^2), incremental scion length of graft (13.72 cm), incremental rootstock length (10.06 cm), graft height (89.72 cm), girth above graft union (6.19 mm), girth below graft union (8.20 mm) and number of shoots per graft (4.00) were observed maximum values for almost all these parameters in 30 cm rootstock height (H_4) and minimum values found in 15 cm rootstock height (H_1). However, in case of leaf area, minimum values found in 20 cm rootstock height (H_2) and in case of number of leaves, girth above and below graft union H_2 and H_3 was found at par with H_4. Maximum values found in 30 cm rootstock height (H_4) might be due to fast healing of the wounds of the grafts at this height of rootstock, higher level of photosynthates and dry matter production, greater absorption of nutrient and water from the soil, higher amount of synthesized food material encouraging fast growth of the grafts. The present results is conformity with Kumar and Ananda (2004) [8], Nalage *et al.* (2010a) [15] and Karna and Varu (2018) [6] in mango, Muhammad *et al*. (2019) [11] in trifoliate orange, Thokchom and Singh (2018) [31] in mandarine. Effect of different scion stick length influenced on number of leaves per graft. Maximum number of leaves per

graft (22.59), number of nodes (9.78), number of internodes (8.78), leaf area (89.40 cm^2), incremental scion length of graft (22.52 cm), graft height (65.43 cm), girth above graft union (7.32 mm), girth below graft union (8.11 mm) and number of shoots per graft (3.75) was recorded in 15 cm scion length (L_5) and lowest values in 5 cm scion stick length (L_1) in almost all the parameters except for number of leaves per graft and girth below graft union, where found minimum value in 7.5 cm scion length (L_2).

The maximum values observed in 15 cm scion length in the present findings might be due to more food materials reserved in longer scion that enhanced early bud break and leaf opening resulting in maximum growth. Also, temperature and humidity during April to July were seemed to be congenial for growth and also sap flow condition might be higher during this period which led faster growth of scion shoots. This result observed were in line with earlier finding of Thokchom and Singh (2018) [31] in trifoliate orange, Seshadri and Rao (1985) [27] in Cashewnut, Nalage *et al.* (2010b) [14], Parasana *et al.* (2013) [16], Poonam *et al.* (2017) [23] in Mango, Prajapati (2010) [24] in Jackfruit, Parthiba (2020b) [17] and Turi *et al.* (2021) [30]. The interaction of rootstock height and scion stick length exerted significant effect on incremental scion length. The data revealed maximum incremental scion length (33.80 cm) was found in treatment 30 cm rootstock height and 15 cm scion length (H_4L_5) which was at par with treatment H_4L_4 (33.16 cm) whereas minimum incremental scion length (10.34 cm) was recorded in treatment 20 cm rootstock height and 5 cm scion length (H_1L_1). This result might be ascribed to its ability to build up more of the photosynthates and its subsequent partitioning thereby resulting into development of greater framework of grafted plant.

Table 1: Effect of rootstock height and scion stick length on number of leaves, number of nodes, number of internodes and leaf area at 120 DAG

Treatments	Number of leaves	Number of nodes	Number of internodes	Leaf area (cm^2)	Number of shoots
Rootstock height					
H_1	20.53	6.23	5.22	85.06	3.27
H_2	22.22	8.57	7.57	82.39	3.31
H_3	22.24	9.95	8.95	87.99	3.58
H_4	22.68	11.05	10.05	93.49	4.00
S.Em.±	0.27	0.11	0.11	1.49	0.04
C.D. at 5%	0.76	0.30	0.30	4.25	0.12
Scion stick length					
L_1	21.95	8.03	7.03	82.46	3.26
L_2	21.25	8.87	7.86	87.52	3.51
L_3	21.64	8.86	7.86	88.18	3.51
L_4	22.17	9.22	8.22	88.61	3.68
L_5	22.59	9.78	8.78	89.40	3.75
S.Em.±	0.30	0.12	0.12	1.66	0.05
C.D. at 5%	0.85	0.34	0.34	4.75	0.13
Interaction (H x L)					
S.Em.±	0.59	0.24	0.24	3.33	0.09
C.D. at 5%	NS	NS	NS	NS	NS

Table 2: Effect of rootstock height and scion stick length on incremental rootstock length, graft height, girth above and below graft union at 120 DAG

Treatments	Incremental rootstock length (cm)	Graft height (cm)	Girth above graft union (mm)	Girth below graft union (mm)
Rootstock height				
H_1	10.06	40.73	5.91	7.38
H_2	12.62	47.04	6.12	7.59
H_3	17.28	68.64	6.07	7.90
H_4	19.97	89.72	6.19	8.20
S.Em.±	0.38	0.65	0.06	0.11
C.D. at 5%	1.09	1.85	0.18	0.31
Scion stick length				
L_1	14.16	58.19	5.66	7.74
L_2	14.19	60.18	5.77	7.62
L_3	13.89	61.60	5.76	7.62
L_4	13.61	62.27	5.85	7.74
L_5	15.33	65.43	7.32	8.11
S.Em.±	0.43	0.72	0.07	0.12
C.D. at 5%	NS	2.07	0.20	0.35
Interaction (H x L)				
S.Em.±	0.85	1.45	0.14	0.24
C.D. at 5%	NS	NS	NS	NS

Table 3: Effect of rootstock height and scion stick length on days taken to sprouting and incremental scion length

Treatments	Days taken to sprouting	Incremental scion length
H_1L_1	18.33	10.34
H_1L_2	17.00	11.06
H_1L_3	16.33	14.38
H_1L_4	16.14	15.76
H_1L_5	17.00	17.05
H_2L_1	14.22	11.56
H_2L_2	13.29	12.82
H_2L_3	11.11	14.60
H_2L_4	13.14	15.33
H_2L_5	11.33	17.71
H_3L_1	17.33	20.38
H_3L_2	13.67	20.92
H_3L_3	12.61	22.19
H_3L_4	16.15	21.99
H_3L_5	14.00	21.52
H_4L_1	16.89	29.15
H_4L_2	14.48	30.97
H_4L_3	15.00	31.86
H_4L_4	15.33	33.16
H_4L_5	18.00	33.80
S.Em.±	0.42	0.61
C.D. at 5%	1.21	1.74

Conclusion

On the basis of the results obtained from the present investigation, it can be concluded that minimum number of days taken to sprouting were achieved when wedge grafts of guava prepared on 20 cm height of rootstock (L-49) and 10 cm length of scion stick (*Anjirio*) during last week of March to the first week of April. Further, better results for growth parameters were found in the grafts prepared on 30 cm height of rootstock. As far as scion stick length is concern better results were recorded in the grafts prepared using 15 cm scion stick length.

References

1. Amrita T, Dilip RK, Nesara B, Khamrang M, Sabastian KS. Influence of grafting height and scion length on healing of graft union and growth characteristics of Citrus reticulata cv. Nagpur mandarin grafted on Rough Lemon rootstocks. Int. J Curr. Microbiol. App. Sci. 2019;8(3):2066-2074.
2. Govaerts R, Sobral M, Ashton P, Barrie F, Holst BK, Landrum LL, *et al*. World checklist of Myrtaceae. Kew Publishing, London: Board of Trustees of the Royal Botanic Gardens, Kew; c2008. p. 455.
3. Gupta MR, Mehrotra NK. Propagation studies in guava (*Psidium guajava* L.) cv. Allahabad Safeda. J Res., PAU, Ludhiana. 1985;22:267-269.
4. Jagannath M, Bipul KM, Singh RR, Jaiswal US. Effect of grafting height and cultivars on the performance of softwood grafting in mango. Asian J Hort. 2012;7(1):171-174.
5. Jaiswal VS, Amin MN. Guava and Jackfruit in biotechnology of perennial fruit crops, Biotechnology in agriculture. Edited by Hammer Schlag FA and Litz RE. C.A.B. Int. Wallingford, U.K; c1992. p. 421-431.
6. Karna AK, Varu DK. Studies of grafting height on success of softwood grafting in mango (*Mangifera indica* L.). Int. J Pure App. Bio Sci. 2018;6(6):435-438.
7. Kaundal GS, Gill SS, Minhas PP. Budding techniques in clonal propagation of guava (*Psidium guajava* L.). Punjab Hort. J. 1987;27:208-211.
8. Kumar R, Ananda SA. Effect of method and height of grafting on the growth and proportion of saleable plants in spur type apples. Progressive Horticulture. 2004;36(1):12-15.
9. Manna A, Mathew B, Ghosh SN. Air layering in guava cultivars. J of Inter. Academicia, India. 2004;2:278-281.
10. Menzel CM. Guava: An exotic fruit with potential in Queensland. Queensland Agri. J. 1985;111(2):93-98.
11. Muhammad MK, Muhammad NK, Badshahe R. Response of grafting height on growth success of acid lime (*Citrus aurantifolia* Swingle) saplings. Agril. Research & Technology: Open Access J. 2019;21(5):194-200.
12. Mukherjee SK, Majumdar PK. Vegetative propagation of tropical and subtropical fruit crops. ICAR, New Delhi; 1983.
13. Nalage NA, Padhiar BV. Study on the effect of height of rootstock and length of scion stick on success of epicotyls grafting in mango (*Mangifera indica* L.) cv. Kesar. Inter. J of Chemical Studies. 2017;5(5):1589-1593.
14. Nalage NA, Magar SD, Bhosale SS, Mhetre DA. Study on the effect of length of scion stick on success of epicotyl grafting in mango (*Mangifera indica* L.) cv. Kesar. The Asian Journal of Horticulture. 2010b;5(2):506-509.
15. Nalage NA, Magar SD, Bhosale SS, Mhetre DA. Study on effect of height of rootstock on success of epicotyl grafting in mango (*Mangifera indica* L.) cv. Kesar. International Journal of Agricultural Sciences. 2010a;6(1):124-128.
16. Parasana JS, Leua HN, Ray NR. Effect of growing medias mixture on germination and seedlings growth of mango (*Mangifera indica* L.) cultivars under net house conditions. The Bioscan. 2013;8(3):897-900.
17. Parthiba Rana, Kanzaria DR, Patel HN, Chauhan NN. Success and growth of guava affected by grafting time. Trends in Biosciences. 2020a;13(14):1119-1122.
18. Parthiba Rana, Kanzaria DR, Patel HN, Chauhan NN.

Effect of growing conditions on success and growth of guava graftage. Trends in Biosciences. 2020b;13(14):11-12.
19. Patel MH, Amin RS. Possibilities of bench grafting on young seedling of mango *Mangifera indica* L. under Anand condition. Indian J Hort. 1976;33(2):156-161.
20. Pathak RK, Saroj PL. Studies on the propagation of guava species by stool layering. Fruit Res. Workshop, Subtropical and Temperate fruits, RAU, Pusa, Bihar; 1988.
21. Patil VS, Madalageri MB, Rao MM. Epicotyl grafting studies in jackfruit. Progressive Hort. 1993;25(1-2):85-86.
22. Paull RE, Bittenbender HC. The encyclopedia of fruit and nuts. Cambridge: Cambridge University Press; c2006. p. 41-54.
23. Poonam M, Sharma GL, Patel KL, Tirkey T, Dikshit SN. Effect of scion length, duration of defoliation and poly tube capping on success of wedge grafting in mango cv. Dashehari. Journal of Soils and Crops. 2017;27(2):6-11.
24. Prajapati I. Effect of height of rootstock and length of scion on success of epicotyl grafting in Jackfruit (*Artocarpus heterophyllus* Lam.) cv. Konkan Prolific. M.Sc. Thesis. Navsari Agricultural University, Navsari; 2010.
25. Rai MK, Asthana P, Jaiswal VS, Jaiswal U. Biotechnology advances in guava (*Psidium guajava* L.). Recent development and prospects for further research Trees. 2010;24:1-12.
26. Rathore DS. Studies on the propagation of guava (*Psidium guajava* L.) by stooling. Punjab Hort. J. 1984;24:75-78.
27. Seshadri KV, Rao RR. Modified method of epicotyl grafting in cashew for commercial propagation. Indian Cashew J. 1985;17(4):11-13.
28. Sharma KK, Jawanda JS, Gill SS. Propagation of guava (*Psidium guajava* L.) by mound layering. Punjab Hort. J. 1978;18:65-67.
29. Singh BP, Singh JJ. Studies on effect of source and plant growth regulators on performance of air layers of guava (*Psidium guajava* L.). J Res. PAU. 1970;12(1):23-25.
30. Turi Dhara, Kanzaria DR, Rajatiya Puri. A book 'Effect of grafting time and environmental conditions on Guava cv. L-49' published by LAP Lambert Academic publishing; c2021. p. 1-113.
31. Thokchom A, Singh D. Effect of grafting height and scion length on growth of *Citrus reticulata* cv. Nagpur Mandarin grafts. International Journal of Chemical Studies. 2018;6(2):2094-2097.