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EFFECTS OF BUDDING METHODS AND TIME INTERVALS ON BUD TAKE SUCCESS IN SEEDLESS GUAVA (*PSIDIUM GUAJAVA* L.)

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ABSTRACT

Two combinations of different budding time i.e. 21st June, 11th July, 31st July and 20th August and two different methods i.e. T-budding and chip budding were tried to investigate their effects on bud take success in seedless guava (Safeda cultivar), at Agriculture Research farm Jabban Dargai, Malakand Agency. Maximum days to sprouting (213.96), budding growth (48.13 cm), was observed on 21st June, whereas maximum plant survival (78.22%) was recorded on 11th July and maximum bud take success (60%) was noted on 31st July. Maximum bud take success (74.83%), plant survival (85.14%), budding growth (50.82 cm), was noted for T-budding since 31st July. T-budding showed significant results among most of the parameters observed. Hence for better bud take success Safeda seedling budded through T-budding on 31st July is recommended.

Keywords: guava, T-Budding, chip budding, bud take success.

INTRODUCTION

Guava (*Psidium guajava* L.) belongs to family Myrtaceae. It is also known as apple of the tropics. It is widely grown in tropics and sub tropics of the world giving two crops in a year. It is indigenous to tropical America, Peru, Cuba and Mexico where it is used to be grown as wild bush. Later on it was distributed throughout the world. The fruit is used in fresh as well as processed forms such as juices and jams. Guava fruit is highly nutritious especially very rich in Vitamin C. In 100 g edible portion it contains 80.8 g water, 0.9 g protein, 0.4 g fat, 0.6 g ash, 5.3 g fiber, 78 Kcal food energy, 22 mg Ca, 26 g P, 0.7 g Fe, 0.04 mg Thiamine, 0.04 mg Riboflavin, 1.0 mg Niacin and 18 mg Vitamin C (Pallat, 1970).

In Pakistan the area under Guava in 2002 was 64.3 thousand hectares with 538.5 thousand tons production, in which KP shared 3.3 thousand hectares with 32.7 thousand tons production (Agri. Stat. Pak. 2001-2002). In KP guava is mainly grown in forest area, like Kohat, Bannu, Dargai and Haripur. Some important varieties are Safeda, Surkha, Karala etc.

Guava is propagated both sexually and asexually. In sexual propagation seeds are sown immediately because they are sensitive to dry conditions and lose viability (Mitra and Bose, 1990). Since Guava is generally propagated from seeds, each plant symbolizes variation in genetic makeup and each individual plant thus has variation in quality, maturity and other vegetative and reproductive growth habits. Sexual propagation, no doubt, is the major source of genetic variation essential for the development of crops. Improvements achieved, however, must be maintained for economic benefits of farming community. Asexual propagation ensures conservation of an improved crop variety. In Horticultural crops, therefore, it is a generally accepted method of propagation. Lack of standardized method of Guava production has reflected in low quality of fruit, haphazard maturity and lower yields than the potential and its further exploitation for processing industry. Keeping in view the importance of Guava propagation asexually, this study was initiated at the Government Fruit nursery Farm Jabban, Dargai Malakand Agency with the following aim to;

- Study the most suitable and successful budding method in seedless Guava at most appropriate and suitable time interval.

METHODS AND MATERIALS

The material used in this experiment was uniform sized rootstock of "Safeda" cultivar and scion buds from seedless Guava. The seedlings were budded at height of ten cm from soil level. Ten buds per treatment were planted and replicated three times thus total 240 buds were planted for four different budding times and two budding methods. The experiment was carried out in Randomized Complete Block Design (RCBD) with two factors (budding method and timing interval), factorial arrangement replicated three times. There were eight treatments in each replication. Experiment was based upon following two factors i.e. budding method and different time interval.

Factor A	**Factor B**
Budding method	Time interval
a: T-budding	a: 21st June
b: Chip budding	b: 11th July
	c: 31st July
	d: 20th August

OBSERVATIONS

Data was recorded on different parameters and subjected to the statistical procedure given below i.e. Days to sprouting, budding growth (cm) while bud takes success (%) and survival percentage was determined using the following procedure.

% Bud take success = Total number of successful buds/ Total number of budded plants x 100

% Survival = Number of plants survived/ total number of bud take success x 100

Statistical procedure

All the data noted on plant growth parameters was subjected to analysis of variance (ANOVA) techniques to confirm differences among different treatments as well as their interactions. Least Significant Difference (LSD) test was used for mean differences where the results were significant. Computer statistical software MSTATC was applied for calculating both ANOVA and LSD (Steel and Torrie, 1980).

RESULTS

Data recorded on the above parameters is presented in Table 1. The results are briefly described as under.

Days to sprouting

The statistical analysis of data showed a significance variation of different budding dates, timing and their interaction for days to sprouting (Table-1). Early sprouting (174.0 days) of guava bud was observed on plants budded on 20th August, closely followed by plants budded on 31st July (194.73 days) and late sprouting (213.96 days) was recorded in plants budded at 21st June. Regarding the budding method early sprouting (194.29 days) was observed in chip budding as compared to T-budding (199.14 days). The interaction of both treatments was also significant. The early sprouting interactive value (168.00 days) was noted in plants propagated through T-budding on 20th August while the late sprouting interactive value (228.23 days) was recorded in plants propagated T-budding on 21st June.

Percent bud takes success (%)

The data pertaining percent bud take success showed that the different budding dates and methods as well as their interaction had a significant effect on percent bud take success. Maximum budding take success (60.00%) was recorded for the plants budded on 31st July, followed by the plants (58.11%) budded on 11th July, while minimum bud take success (46.55%) was obtained for plants budded on 20th August. The mean values of different methods of budding revealed that maximum bud take success (74.83%) was observed when plants were budded by T-budding, while the minimum bud take success (32.33%) was recorded in chip budding. The interaction of both factors showed that maximum bud take success (90.00%) was recorded when plants were produced through T-budding on 31st July, followed by the plants (83.11%) also produced through T-budding on 11th July, while the minimum bud take success (20.00%) was obtained when plants produced through chip budding on 20th August.

Percent plant survival (%)

The data regarding percent plant revealed that different budding methods, dates and their interaction had significant effect on percent plant survival. Maximum plant survival (78.22%) was recorded for plants budded on 11th July, followed by plant (76.12%) budded on 31st July, while the minimum plant survival (66.02%) was recorded in plants budded on 20th August. Turning to the influence of different budding methods on percent plants survival, it is deduced that maximum plant survival (85.4%) was obtained for T-budding while minimum plant survival (61.38%) was observed for chip budding. The interaction of different dates and methods showed that maximum plant survival (97.08%) was recorded for plants budded by T-budding on 31st July, followed by the plants (87.31%) also produced through T-budding on 11th July, while minimum plant survival (50.00%) was obtained for chip budding on 20th August.

Budding growth (cm)

The data pertaining to budding growth showed that budding dates, methods and their interaction had significant effect on budding growth. Mean values of budding growth revealed that maximum budding growth (48.13 cm) was recorded for plants budded on 21st June, followed by plants (46.65 cm) budded on 31st July, while the maximum budding growth (40.53 cm) for plants budded on 11th July. The maximum budding growth (50.82 cm) was recorded in plants propagated through T-budding, while minimum budding growth (37.64 cm) was produced through chip method.

Dates and methods interaction showed that maximum budding growth (53.13 cm) was recorded for plants budded by T-budding on 21st June, followed by plants (52.00 cm) also budded by T-budding but on 11th July, while minimum budding growth (29.06 cm) was obtained for chip budding on 11th July.

Stem thickness (mm)

The data pertaining to stem thickness showed that different budding dates, methods and their interaction had significant effect on stem thickness. Comparing the means of different budding dates in Table-1, it is concluded that maximum stem thickness (584.25 mm) was noted for plants budded on 21st June, followed by the plants (562.62 mm) budded on 11th July, while the minimum stem thickness (531.50 mm) was obtained for plants budded on 20th August. From the mean values of different budding methods, it is revealed that maximum stem thickness (603.86 mm) was recorded for plants produced through T-budding, while the minimum stem thickness (509.82 mm) was obtained when the plants were propagated through chip budding. The interaction of both factors showed that maximum stem thickness (638.11 mm) was observed in plants budded by T-budding on 21st June, followed by plants (614.14 mm) budded also by T-budding on 11th July, while the minimum stem thickness (497.00 mm) was noted for plants budded by chip budding on 20th August.

Number of leaves per plant

The data recorded for the number of leaves per plants showed that different budding dates and their interaction had significant effect, while budding methods had non-significant effect on number of leaves per plant.

Mean values of different budding showed that maximum number of leaves per plant (27.21) was noted for plants budded on 20th August, followed by the plants (27.16) budded on 11th July, while the minimum number of leaves per plant (24.13) was recorded for plants budded on 31st July. Turning to the influence of different budding methods on number of leaves per plant, it is concluded that maximum number of leaves per plant (25.96) were obtained when plants were budded by T-budding methods, while the minimum number of leaves per plant (25.90) were observed when plants were budded by chip budding. The interaction of dates and methods showed that maximum number of leaves per plant (28.26) were observed when plants were produced through T-budding on 20th August, followed by the plants (28.13) propagated through chip budding on 11th July, while the minimum number of leaves per plant (23.11) was observed when plants were budded by chip budding on 31st July.

Number of branches per plant

The data obtained for the number of branches per showed that different budding dates, methods and their interaction had non-significant effect on the number of branches per plant.

Comparing the means of different budding dates, it is concluded that maximum number of branches per plant (2.15) was noted for plants budded on 20th August, followed by the plants (2.00) budded on 31st July, while the minimum number of branches per plant (1.00) for plants budded on 21st June.

For the mean values of different budding methods, it is concluded that maximum number of branches per plant (2.00) was recorded for T-budding, while minimum number of branches per plant (1.33) was obtained for plants budded by chip budding. The interaction of both factors showed that maximum number of branches per plant (3.00) was obtained in plant budded by T-budding on 20th August, followed by the plants (2.66) budded by chip budding on 31st July, while the minimum number of branches (1.00) was noted for plants budded by T-budding and also in chip budding on 21st June.

Leaf area (cm²)

The data recorded for leaf area showed that different budding dates, methods and their interaction had significant effect on leaf area. Mean values of leaf area in Table-1 revealed that maximum leaf area (65.26 cm²) was noted for plants budded on 21st June, followed by plants (64.77 cm²) budded on 11th July, while minimum leaf area (55.71 cm²) for plants budded on 20th August.

The data for budding method showed that maximum leaf area (66.23 cm²) was obtained for T-budding, while the minimum leaf (55.98 cm²) was obtained for chip budding. Dates and methods interaction showed that maximum leaf area (75.28 cm²) was recorded for plant budded T-budding method on 21st June, followed by plants (72.32 cm²) also budded by T-budding on 11th July, while the minimum leaf area (54.18 cm²) was obtained for T-budding on 20th August.

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Table-1. Days to sprouting, bud take success, buddling growth, stem thickness, leaf area, number of leaves and branches per plant as affected by budding dates and time intervals.

Budding date	Days to sprouting	Bud take success (%)	Survival percentage (%)	Buddling growth (cm)	Stem thickness (mm)	No. of leaves per plant	No. of branches per plant	Leaf area (cm^2)
21st June	213.96 a	49.66 c	73.19 b	48.13 a	584.05 a	25.22 b	1.00	65.26 a
11th July	204.16 b	58.11 b	78.22 a	40.53 b	562.62 b	27.16 a	1.50	64.77 a
31st July	194.73 c	60.00 a	76.12 a	46.65 a	549.22 c	24.13 b	2.00	58.68 b
20th August	174.00 d	46.55 d	66.02 c	41.61 b	531.50 d	27.21 a	2.16	55.17 c
Significance	*	*	*	*	*	*	*	*
Budding method								
T-Budding	199.14 a	74.83 a	85.40 a	50.82 a	603.86 a	25.96	2.00	66.23 a
Chip Budding	194.29 b	32.33 b	61.38 b	37.64 b	509.83 b	25.90	1.33	65.98 b
Significance	*	*	*	*	*	*	*	*
Interaction								
21june x T-budding	228.23 a	53.11 d	75.17 d	53.13 a	638.11 a	24.28 bc	1.00	75.28 a
21june x chip budding	199.70 c	46.22 e	71.22 e	43.13 c	530.00 e	26.15 bc	1.00	55.23 e
11july x T-budding	209.10 b	83.11 b	87.31 b	52.00 a	614.14 b	26.20 ab	1.33	72.32 b
11july x chip budding	199.23 c	33.11 f	69.13 f	29.06 e	511.10 f	28.13 a	1.66	57.23 d
31 july x T-budding	191.23 d	90.00 a	97.08 a	50.17 ab	597.22 c	25.08 bc	2.66	63.15 c
31july x chip budding	198.23 c	30.00 g	55.16 g	43.13 c	501.22 g	23.17 c	1.33	54.21 e
20august x T-budding	168.00 f	73.11 c	82.04 c	48.00 b	566.00 d	28.26 a	3.00	54.18 e
20august x chip budding	180.00 e	20.00 h	50.00h	35.23 d	497.00 h	26.15 ab	1.33	57.24 d
Significance	*	*	*	*	*	*	*	*

*significance at $\alpha = 0.05$

DISCUSSIONS

Number of days to sprouting

Maximum number (213.96 days) of days to sprouting were taken by plants budded on 21st June, while minimum number of days to sprouting (174.00) were recorded in plants budded on 20th August. When the buds were dormant, their active growth started in spring. Therefore plants budded in June took more days to sprouting as compared to those which were budded in August. Likewise the significant effect of budding methods on number of days to sprouting showed that maximum number of days to sprouting (199.14) were observed in plants produced through T- budding while minimum number of days to sprouting (194.29) were recorded for chip budding.

Percent bud-take success (%)

Data regarding bud take success revealed that maximum bud sprouting (60.00%) was recorded for plants budded on 1st July and minimum sprouting percentage (46.55%) was noted in plants budded on 20th August. It is evident from the result that July budding increased the bud take success as compared to August. It might be due to favorable climatic conditions having optimum level of relative humidity and temperature effecting the sprouting of budded plants. Similarly, the effect of budding method on percent bud-take success showed that maximum bud sprouting (74.83%) was recorded for T-budding and minimum (32.33%) for chip budding. It is due to the fact that from June to August the plants have high cell sap and T-budding require high cell sap but chip budding losses their success in the presence of high cell sap. The results were in close conformity with the findings of Levin and Curtius (1993) who reported that chip budding in June-August was less successful because of high cell sap.

Percent plant survival (%)

Data regarding percent plant survival showed that budding method had significant effect the plant survival. Maximum plant survival (85.4%) was recorded for T-budding while minimum plant survival (61.3%) was observed in plants produced through chip budding. As T-budding requires more cell sap for union and thus scion is held more tightly in place as compared to chip budding . These results are in comparison with those of Levin and Cruitus (1993) who observed more compatible and favorable environmental conditions for T-budding. The interaction between dates and methods has significant effect on percent plant survival. Maximum plant survival (78.22 %) was recorded for the plants budded on 11th July and the minimum plant survival (66.02%) was observed when plants budded on 20th August. It is due to the fact that budding in July produce favorable environmental conditions for the healing process of bud wounds and resulted in the development of normal vascular tissues at the bud union which result in maximum plant survival. Similarly, budding late in the growing season contributed to unfavorable conditions for healing process which results in the poor development of normal vascular tissue at the bud union.

Buddling growth (cm)

The data pertaining to budding growth in Table-1 revealed that different budding dates and methods effect budding growth significantly. Maximum buddling growth (48.13cm) was noted when budding was done on 21st June, while the minimum budding growth (40.53) was recorded when the guava seedlings were budded on 11th July. The maximum buddling growth (48.13) can be attributed to the minimum number of branches (1.00) recorded on plants budded on 21st of June which enable the plants to have less number of branches which resulted in maximum buddling growth. These results are in alliance with that of Aulakh (1998) who reported that budding on 14th-29th June resulted in maximum buddling growth. Similarly the effect of different budding methods on buddling growth showed that maximum buddling growth (50.82cm) was observed in T-budding, while minimum buddling growth (37.64cm) was recorded in chip budding. It might be due to the stronger bud union and development of normal vascular tissues at the bud union which regulates the transport of water and nutrients and therefore enhance the active growth of scion with the starts of spring seasons.

Stem thickness (mm)

Statistical analysis of the data revealed that budding dates, methods and their interaction had significant effect on stem thickness. Maximum stem thickness (584.25mm) was recorded on plants budded on 21st June, while minimum stem thickness (531.50mm) was observed in plants budded on 20th August. Maximum stem thickness might be due to the maximum buddling growth in those plants budded on 21st June which contributed to the additional photosynthesis and increase in growth and development of the stem. These results are also in agreement with that of Aulakh (1998) who reported that budding on 14-29th June results in maximum stem thickness. Similarly the effect maximum stem thickness (614.14mm) was noted for T-budding, whereas the minimum stem thickness (509.83mm) were observed in plants propagated through chip budding. It is clear from the mean data that plants budded through T-budding have maximum budding growth which results in maximum stem thickness due to having more photosynthate as compared to plant propagated through chip budding.

Number of leaves per plant

As maximum number of leaves (27.16) was noted in plants budded on 21st August while minimum number of leaves (24.13) were found in plants budded on 31st July. This is due to the maximum number of branches in plants budded on 20th August which results in more number of leaves per plant as compare to plants budded on 31st July which has resulted less number of branches due to minimum buddling growth. Effect of different budding methods on number of leaves showed that maximum number of leaves (25.96) were recorded for T-budding and the minimum number of leaves (25.90) was observed in plants budded through chip budding . it is clear from the mean data that plants budded by T-budding have maximum number of branches resulted in more number of leaves per plant as compared to plants produced through chip budding.

Number of branches per plant

Maximum number of branches (2.16) were recorded in plants budded on 20th August and minimum number of branches (1.00) was noted in plants budded on 21st June. Number of branches was maximum (2.00) in T-budding and minimum (1.33) in chip budding. It is evident that the number of branches has direct relation with number of leaves per plant. Plants having more branches have more number of leaves and vice versa.

Leaf area (cm^2)

Maximum leaf area (65.27 cm^2) was noted in plants budded on 21st June while the minimum leaf area (54.77 cm^2) was recorded on 20thAugust .it is due to vigorous growth of plant as it is capable of absorbing more nutrients and prepare more photosynthate resulted in maximum leaf area. Similarly maximum leaf area (66.23 cm^2) was observed in T-budding while minimum leaf area (55.98 cm^2) was recorded in chip budding. It is due to stronger bud union and development of normal vascular tissues at the bud union which regulates the transport of water and nutrients and thereby increases the leaf area.

CONCLUSION AND RECOMMENDATION

Conclusions

Conclusions based on experimental results are as,

- Guava seedlings budded through T-budding showed good results in most of the plant growth parameters as compared to chip budding.

- In case of time interval most of the growth parameters showed good results at 31st July as compared to 21st June, 11th July and 20th August.

Recommendation

Based on the above conclusion, the following recommendation is made

- T-budding on 31st July is the best for better growth of Guava.

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