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Research Article

EFFECT OF PRUNING TIME ON GROWTH PARAMETERS OF GUAVA (*Psidium guajava* L.) GENOTYPES

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Abstract: The experiment was conducted during the year 2016 and 2017 at the Instructional-cum-Research Farm, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri. The present investigations were conducted on five pruning time *i.e.* 15th May, 15th June, 15th July, 15th August, 15th Sept. and no pruning (control) and seven different genotypes such as RHR-Guv-58, RHR-Guv-60, RHR-Guv-14, RHR-Guv-16, RHR-Guv-3, RHR-Guv-6 and Sardar. The results revealed that the maximum height of plant (2.42 m), number of shoots per plant (140.29), length of shoot (82.17 cm) and girth of shoot (1.86 cm) was recorded in G1 (Sardar). The significantly minimum time required for initiation of new shoots (24.00 days) was observed in Sardar with 15th May pruning time.

Keywords: *Guava, Pruning time, Growth, Sprouting shoot*

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Introduction

Guava (*Psidium guajava* L.) is the most valuable cultivated species of the Myrtaceae family popularly known as "poor man's fruit" or "apple of tropics" [1]. Guava fruit is commercially important in India, China, Indonesia, South Africa, Florida, Hawaii, Egypt, Yemen, Brazil, Mexico, Colombia, West Indies, Cuba, Venezuela, New Zealand, Philippines, Vietnam and Thailand [2] and is popular due to its round year availability, rich nutritional and medicinal value and affordable price, suitability for transportation, handling and consumer preference. It exceeds most other fruits in productivity, hardiness, adoptability and vitamin C content [3]. India under guava is 260.0 thousand ha with annual production 3826.0 thousand MT and average productivity of 14.71 MT/ha. The area under guava in Maharashtra is 12.49 thousand ha, while the production was 140.80 thousand MT with the productivity of 11.27 MT/ha [4]. Pruning technique is used to minimize the disease and insect pest attack, mostly fruit fly infestation. Pruning is very important horticultural operation leads to regulate the crop with season. It increases the yield and quality of fruit it evades the flowering and fruiting of crop and gives the better canopy structure. Guava trees bear terminally, that's why pruning influences more sprouting of shoots, flowering, fruiting and consequently increase in the yield of guava. The yield of winter season crop is less than rainy season crop. To overcome the problem of low yield during winter season pruning has been taken to regulate summer season flowering to minimize rainy season crop and increase that during the winter season [5]. Considering the above factors, the present experiment was undertaken with the following objective to study the effect of pruning time on growth parameters of guava.

Material and Methods

The experiment was conducted during the year 2016 and 2017 at the Instructional-cum-Research Farm, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri. The present investigations were conducted on seven different genotypes namely Sardar (G1), RHR-Guv-58 (G2), RHR-Guv-60 (G3), RHR-Guv-14 (G4), RHR-Guv-16 (G5), RHR-Guv-3 (G6) and RHR-Guv-6 (G7) with five pruning time *i.e.* 15th May (P1), 15th June (P2), 15th July (P3), 15th August (P4), 15th Sept (P5) and no pruning (P6-Control).

The genotypes were pruned 75 percent of current season growth of guava plants. The experiment was laid out in Factorial Randomized Block Design with forty-two treatments and was replicated two times. Observations on growth parameters were recorded. The statistical analysis of the data was done as per the standard procedure laid down by Panse and Sukhatme (1985) [6].

Results and Discussion

Height of plant (m)

The data on height of plant after the pruning operation are presented in [Table-1]. The significantly maximum height of plant (2.34 m) was observed in P6 (Control) treatment and minimum (2.06 m) in P5 treatment. The significantly maximum height of plant (2.42 m) was noticed in G1 genotype, which was followed by G3 genotype (2.24 m), whereas the minimum height (2.01 m) in G4 genotype. The data on height of plant was observed non-significant due to effect of interaction among the pruning time and different genotypes. The results indicated that the maximum height of plant was recorded in the G1 (Sardar) as compared to other genotypes. It might be due to the independent growth rate and habit of variety because Sardar plant having vigorous growth compare to other genotypes. It was also observed increases in height of plant in the pruned plants. Since guava is highly responsive to pruning. It might be due to pruning removes carbon-starved, fruiting exhausted shoots and promotes new leaf growth to build up carbohydrates reserves for the next flowering and allows the sprouting of lateral buds, which ultimately influence the plant height, plant spread, plant volume and other vegetative characters of plants during active growth phase of plant. Minimum plant height was recorded in 15th September pruning time treatment might be due to non-disturbance of metabolites with apical dominance in plant by continues growth of active period in rainy season[7-10].

East-west plant spread (m)

Data presented in [Table-2] showed that, the P6 treatment was observed significantly highest East-West plant spread (4.36 m) and lowest (3.84 m) in P2 treatment.

Highest East-West plant spread (5.86 m) was recorded by G1 genotype, which was superior over rest of genotypes, while the minimum in G7 genotype (3.49 m). The data on East-West plant spread was found to be non-significant due to interaction effect of different pruning time and genotypes.

Table-1 *Effect of pruning time and genotypes on height of plant (m) (Pooled data)*

Treats.	Guava genotypes							
Pruning time	G_1	G_2	G_3	G_4	G_5	G_6	G_7	Mean
P_1	2.57	2.27	2.11	1.98	2.15	2.03	2.23	2.19
P_2	2.32	2.24	2.24	1.94	1.87	2.28	2.12	2.14
P_3	2.36	1.91	2.35	2.13	2.12	2.16	1.98	2.15
P_4	2.27	2.22	2.06	2.00	2.04	2.04	2.28	2.13
P_5	2.34	2.02	2.29	1.84	1.89	1.98	2.09	2.06
P_6 (Control)	2.63	2.29	2.37	2.19	2.21	2.32	2.39	2.34
Mean	2.42	2.16	2.24	2.01	2.04	2.13	2.18	2.17
Year 2016 & 2017	Pruning time			Guava genotypes		Interaction (P×G)		
SE(m) ±	0.06			0.06		0.15		
CD 5%	0.16			0.17		NS		

Table-2 *Effect of pruning time and genotypes on East-West plant spread (m) (Pooled data)*

Treats.	Guava genotypes							
Pruning time	G_1	G_2	G_3	G_4	G_5	G_6	G_7	Mean
P_1	6.19	3.84	4.02	3.88	3.58	3.74	3.39	4.09
P_2	5.88	3.52	3.64	3.56	3.38	3.67	3.23	3.84
P_3	5.56	3.57	3.67	3.96	3.38	3.83	3.29	3.90
P_4	5.62	3.80	3.68	3.64	3.25	3.89	3.76	3.95
P_5	5.66	3.76	3.89	3.87	3.80	3.92	3.43	4.05
P_6 (Control)	6.27	4.04	4.13	4.20	3.86	4.23	3.82	4.36
Mean	5.86	3.76	3.84	3.85	3.54	3.88	3.49	4.03
Year 2016 & 2017	Pruning time			Guava genotypes		Interaction (P×G)		
SE(m) ±	0.09			0.09		0.23		
CD 5%	0.24			0.26		NS		

North-South plant spread (m)

Data presented in [Table-3] showed that, the maximum North-South plant spread (4.24 m) was noticed in P6 Control) treatment and minimum (3.90 m) in P2 treatment in pooled data. The G1 genotype was recorded significantly maximum North-South plant spread (5.74 m) minimum (3.34 m) in G7 genotype. As regarding interaction effects, North-South plant spread was found to be non-significant. The results indicated that the increase in plant spread (EW and NS) was observed in all pruning treatments and genotypes in pruned plants. This might be due to high growth rate of new emerged shoots after the pruning which leads to increase in plant spread. Pruning removes carbon- starved, fruiting exhausted shoots and promotes new leaf growth to build up carbohydrates reserves for the next flowering and allows the sprouting of lateral buds, which ultimately influence the plant spread, plant volume and other vegetative characters of plants during active growth phase of plant. The results of present studies are confirmed with Pilania *et al*. (2010) [10] and Hiremath *et al*. (2017) [8] reported significant increase in plant spread after pruning of guava plants.

Table-3 *Effect of pruning time and genotypes on North-South plant spread (m) (Pooled data)*

Treats.	Guava genotypes							
Pruning time	G_1	G_2	G_3	G_4	G_5	G_6	G_7	Mean
P_1	6.04	3.86	3.83	3.65	3.39	3.65	3.16	3.94
P_2	5.71	3.49	3.84	3.78	3.63	3.72	3.15	3.90
P_3	5.26	3.75	3.85	3.75	3.90	3.91	3.23	3.95
P_4	5.25	3.87	3.34	4.00	3.46	3.96	3.48	3.91
P_5	6.07	3.65	3.86	3.88	3.42	3.83	3.48	4.02
P_6 (Control)	6.10	4.03	4.05	4.07	3.82	4.11	3.54	4.24
Mean	5.74	3.77	3.79	3.86	3.60	3.86	3.34	3.99
Year 2016 & 2017	Pruning time			Guava genotypes		Interaction (P×G)		
SE(m) ±	0.10			0.11		0.26		
CD 5%	NS			0.29		NS		

Time required for initiation of new shoots (days)

The data on time required for initiation of new shoots are presented in [Table-4]. The minimum time required for initiation of new shoots (27.86 days) was observed in P1 treatment, while the maximum (44.79 days) in P5 treatment. Data regarding effect of genotypes indicated that, the minimum was recorded in G1 genotype (31.42 days) and maximum (37.46 days) in G3 genotype. Regarding interaction effect of pruning time and genotypes, significantly minimum (24.00 days) was noticed in P1G1 treatment combination. The results of conducted experiments revealed that the minimum days required for initiation of new shoots was noted in the pruning time of 15th May (P1) but later it was increased in number of days from June to September pruning time and also more or less in control treatments. The late commencement of initiation of new shoots in plant are subjected to time of pruning and active growth phase on the basis that such trees put forth new vegetative growth immediately after pruning and carbohydrates favour the flower bud formation or initiation, might have been utilized in the vegetative growth, thereby delaying in new shoots formation. In the present investigation delayed in sprouting was observed as there was delay in pruning time. The time of pruning also plays an important role in sprouting of buds. The earlier pruned trees required less days as compared to late pruning. The maximum days were required in September pruning, when the shoots were exposed to unfavorable climatic condition, whereas May pruning time favorable with monsoon climatic condition with active growth phase of plant leads to require minimum days for sprouting shoots. These results are similar with the findings of Nikumbhe *et al*. (2017) [11] and Sah *et al*. (2017) [12] who has obtained minimum days required for initiation of new shoots was in the pruned plants of guava compare to un-pruned plants.

Table-4 *Effect of pruning time and genotypes on time required for initiation of new shoots (days) (Pooled data)*

Treats.	Guava genotypes							
Pruning time	G_1	G_2	G_3	G_4	G_5	G_6	G_7	Mean
P_1	24.00	28.50	28.50	28.50	28.50	28.50	28.50	27.86
P_2	26.50	31.50	31.50	31.50	31.50	31.50	31.50	30.79
P_3	30.50	35.50	35.50	35.50	35.50	35.50	35.50	34.79
P_4	35.50	40.50	40.50	40.50	40.50	40.50	40.50	39.79
P_5	40.50	45.50	45.50	45.50	45.50	45.50	45.50	44.79
P_6 (Control)	31.50	41.00	43.25	41.00	42.50	43.00	43.00	40.75
Mean	31.42	37.08	37.46	37.08	37.33	37.42	37.42	36.46
Year 2016 & 2017	Pruning time			Guavagenotypes		Interaction (P×G)		
SE(m) ±	0.04			0.04		0.09		
CD 5%	0.10			0.11		0.26		

Number of sprouted shoots per plant

The data are displayed in [Table-5] indicated that, As regards the pooled results of pruning time, significantly maximum number of sprouted shoots (100.04) were recorded in P1 (15th May) treatment and the minimum (83.07) in P5 treatment. In case of genotypes maximum sprouted shoots (140.29) were noticed in G1 (Sardar) and minimum in G3 genotype (79.71). Number of sprouted shoots per plant was observed non-significant for interaction among the pruning time and different genotypes. It was also observed maximum number of sprouted shoots in the G1 (Sardar) as compared to other genotypes. It might be due to the independent growth rate and habit of variety because Sardar plant having more sprouting habit compare to other genotypes. The results of present aspect are found in line with those of Singh *et al*. (2012) [13], Thakre *et al*. (2016) [14] and Lakpathi and Rajkumar *et al*. (2018) [15] observed maximum number of sprouted shoots in pruned plants compared to un-pruned plants in guava.

Table-5 *Effect of pruning time and genotypes on number of sprouted shoots per plant (Pooled data)*

Treats.	Guava genotypes							
Pruning time	G_1	G_2	G_3	G_4	G_5	G_6	G_7	Mean
P_1	154.75	94.75	83.75	89.25	91.75	97.25	88.75	100.04
P_2	143.50	90.00	84.75	90.75	85.50	93.75	90.25	96.93
P_3	139.75	91.50	80.50	84.50	84.00	89.50	78.00	92.54
P_4	131.25	91.25	79.50	90.00	89.75	86.00	85.25	93.29
P_5	125.00	79.25	71.00	81.25	72.75	77.75	74.50	83.07
P_6 (Control)	147.50	92.75	75.75	91.25	83.00	80.25	76.25	92.39
Mean	140.29	89.92	79.21	87.83	84.46	87.42	82.17	93.04
Year 2016 & 2017	Pruning time			Guava genotypes		Interaction (P×G)		
SE(m) ±	2.17			2.35		5.75		
CD 5%	6.03			6.51		NS		

Length of sprouted shoot (cm)

The data related to the length of sprouted shoot are presented in the [Table-6]. Pooled results of pruning time revealed that, significantly highest length of shoot (82.86 cm) was observed significant in P6 (control) treatment and minimum in P5 treatment (41.75 cm). With respect to genotypes, significantly highest length of shoot (82.17 cm) was recorded in G1 (Sardar) and minimum in G4 genotype (45.04 cm). However, maximum length of sprouted shoot (113.00 cm) was noted in P6G1 treatment, while the minimum (35.00 cm) in P5G4 treatment combination. From the results, it is indicated that increases length of shoot was recorded in the pruned plants as compared to control ones. It might be due to the translocation of metabolites in new emerged shoot lead to increase in length of shoot of pruned plants during active growth phase of plant. The minimum length of shoot per plant might be due to non-disturbance in the apical dominance of the growing shoots. The results of present studies are found in line with those of Jadhav *et al.* (2002) [16] Mehta *et al.* (2012) [17] and Raut *et al.* (2016) [18] observed maximum length of shoot in pruned plants compared to un-pruned plants in guava.

Table-6 *Effect of pruning time and genotypes on length of sprouted shoot (cm) (Pooled data)*

Treats.	Guava genotypes							
Pruning time	G_1	G_2	G_3	G_4	G_5	G_6	G_7	Mean
P_1	81.50	50.00	46.50	42.75	39.25	45.25	50.50	50.82
P_2	80.75	47.50	45.50	38.25	41.00	44.25	48.25	49.36
P_3	78.75	45.50	42.00	38.75	42.00	39.50	41.50	46.86
P_4	72.75	40.50	37.75	40.75	40.25	41.50	39.75	44.75
P_5	66.25	43.25	39.00	35.00	37.00	36.00	35.75	41.75
P_6 (Control)	113.00	81.25	77.50	74.75	75.75	78.50	79.25	82.86
Mean	82.17	51.33	48.04	45.04	45.88	47.50	49.17	52.73
Year 2016 & 2017		Pruning time		Guava genotypes		Interaction (P×G)		
SE(m) ±		1.29		1.40		3.42		
CD 5%		3.58		3.87		NS		

Girth of shoot (cm)

The data in [Table-7] related on girth of shoot are revealed that the significantly maximum girth of shoot (2.12 cm) was observed in P6 (control) treatment and minimum (1.30 cm) in P5 treatment for pruning time. Pooled results of genotypes indicated that, significantly highest girth of shoot (1.86 cm) was recorded by G1 (Sardar) and minimum in G2 genotype (1.36 cm). However, maximum girth of shoot (2.35 cm) was noted in P6G1 and minimum in P5G7 (1.16 cm) treatment combination. The results showed that the increase in the girth of shoot was recorded in the genotype G1 (Sardar) as compared to other genotypes. It might be due to availability of higher stored food material in pruned plants, which put forth fast and vigorous growth of sprouted shoots of pruned plants during active growth phase of plant. Sardar plant having luxurious growth habit compares to other genotypes consequently increases of girth of shoot. The results are conformity with findings of Raut *et al.* (2016) [18] and Nikumbhe *et al.* (2017) [11] had often reported that an increase in shoot girth of guava.

Table-7 *Effect of pruning time and genotypes on girth of shoot (cm) (Pooled data)*

Treats.	Guava genotypes							
Pruning time	G_1	G_2	G_3	G_4	G_5	G_6	G_7	Mean
P_1	1.78	1.18	1.30	1.33	1.24	1.19	1.23	1.32
P_2	1.79	1.20	1.28	1.37	1.25	1.33	1.29	1.36
P_3	1.76	1.23	1.29	1.24	1.22	1.32	1.27	1.33
P_4	1.75	1.29	1.24	1.38	1.23	1.24	1.29	1.34
P_5	1.73	1.25	1.26	1.33	1.18	1.22	1.16	1.30
P_6 (Control)	2.35	2.00	2.12	2.13	2.08	2.11	2.06	2.12
Mean	1.86	1.36	1.41	1.46	1.37	1.40	1.38	1.46
Year 2016 & 2017		Pruning time		Guava genotypes		Interaction (P×G)		
SE(m) ±		0.03		0.03		0.08		
CD 5%		0.08		0.09		NS		

Conclusion

The results of present investigation, it is concluded that the maximum vegetative growth was noticed in Sardar after pruningas compared to other genotypes.

Application of research: Study on growth parameters of guava genotypes

Research Category: Horticulture

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Study area / Sample Collection: Instructional-cum-Research Farm, Department of Horticulture

Cultivar / Variety / Breed name: Guava genotypes

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