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Response of pruning time on vegetative growth and yield of Guava (*Psidium guajava* L.) selections

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Abstract: The present investigation was done on six pruning time's i.e 15th May, 15th June, 15th July, 15th August, 15th Sept and Control and seven different genotypes such as. Sardar, RHR-Guv-58, RHR-Guv-60, RHR-Guv-14, RHR-Guv-16, RHR-Guv-3 and RHR-Guv-6. The experiment was laid out in factorial randomized block design with fourty two treatments replicated two times. Growth characters were significantly influenced by different genotypes. The plant spread, number of sprouted shoots, girth of shoot, shoot length was recorded maximum in Sardar. The Minimum time required for initiation of new shoots was observed in 15th May pruning time and in Sardar and also in their interactions. As well as, with respect to marketable yield 15th July pruning time was found to be better.

Key words: *Psidium guajava,* Pruning time, Sprouting of shoot, Vegetative growth, Yield

Introduction

Guava (*Psidium guajava* L.) is one of the most common fruit in India. It is quite hardy and prolific bearer. Guava fruit is often called "poor man's apple" though the fruit is neither poor in its nutritive value and nor commercial value. It is nutrient rich and cheap and easily available to the common man in northern and central India. It exceeds most other fruits in productivity, hardiness, adoptability and vitamin C content (Singh *et al.,* 2012). Guava contributes 3.4% of total fruit area and 3.9 % of total fruit production in India during 2012-13 (Anon., 2014). Productivity of guava is low due to old and dense orchard, primarily small size of holding, preponderance of old and small orchard and poor management of input such as water, nutrients and pesticides (Singh *et al.,* 2005).The study of the pruning time effects on vegetative growth of guava which have paramount in flowering and fruiting of plant. Major objective of the present study was to determine the influence of pruning time and pruning effect on vegetative growth and yield of guava.

Materials and methods

Research work of Ph.D.was carried out at the "Instructional-cum-Research Orchard" of the Department of Horticulture, MPKV Rahuri, Dist. Ahmednagar, during the year 2012 and 2013. The soil of the experimental field was light to medium in texture with good drainage within the depth 0.2 to 0.4 m. The annual rainfall ranges from 307 to 619 mm with an average of 520 mm. Genotypes were planted with Spacing of 6x6 m in the year of 2006. Six years old guava plants were selected in the experiment. The treatment include, Factor A: Seven Genotypes of 7-8 years old *i. e.* Sardar (S_1),RHR-Guv-58 (S_2), RHR-Guv-60 (S_3), RHR-Guv-14 (S_4), RHR-Guv-16 (S_5), RHR-Guv-3 (S_6), RHR-Guv-6 (S_7). Factor B: Six pruning time i.e. 15th May (P_1), 15th June (P_2), 15th July (P_3), 15th August (P_4), 15th Sept (P_5) and Control (P_0).Methodology:In the experiment, 75% pruning of current season growth of guava trees were pruned at monthly intervals.

Results and Discussion

Height of plant (m): Data in Table1 showedthe height of plant with respective to pooled data was found to be non-significant due to the

Table-1: Effect of pruning time and genotypes on height of plant (m)

Treatments	Height of plant (Pooled data of 2 years- 2014 and 2015)							
	Guava genotypes							
Pruning Time	S1	S2	S3	S4	S5	S6	S7	Mean
P1	2.09	1.85	1.49	1.50	1.81	1.79	1.65	1.74
P2	1.73	1.63	1.60	1.50	1.62	1.67	1.80	1.65
P3	1.94	1.70	1.75	1.70	1.65	1.42	1.81	1.71
P4	1.54	1.57	1.57	1.58	1.54	1.64	1.69	1.59
P5	1.80	1.58	1.82	1.36	1.30	1.64	1.55	1.58
P0(Control)	2.13	2.33	2.58	1.99	2.06	2.38	2.30	2.25
Mean	1.87	1.78	1.80	1.60	1.66	1.76	1.80	1.75
Year 2013 & 2014	Pruning Time		Guava genotypes			Interaction (P×S)		
	Pooled		Pooled			Pooled		
SE(m) ±	0.10		0.116			0.285		
CD 5%	0.29		NS			NS		

Table-2a: Effect of pruning time and genotypes on East -West Plant spread (m)

Treatments	East -West Plant spread (Pooled data of 2 years- 2014 and 2015)							
	Guava genotypes							
Pruning Time	S1	S2	S3	S4	S5	S6	S7	Mean
P1	6.20	4.10	3.90	3.83	3.48	2.80	3.55	3.98
P2	4.88	3.30	3.36	3.70	4.71	3.56	3.11	3.80
P3	6.08	3.03	4.08	3.59	3.66	3.43	3.53	3.91
P4	5.78	3.15	3.60	3.65	4.60	3.67	3.13	3.94
P5	5.98	3.51	3.66	3.80	4.78	3.57	3.00	4.04
P0(Control)	6.04	3.30	3.36	4.13	4.55	3.36	4.09	4.12
Mean	5.82	3.40	3.66	3.78	4.30	3.40	3.40	3.97
Year 2013 & 2014	Pruning Time Pooled		Guava genotypes Pooled			Interaction (P×S) Pooled		
SE(m)±	0.189		0.205			0.501		
CD 5%	NS		0.567			NS		

Table-2b: Increase in spread (EW and NS) was observed in all pruning treatments and in all genotypes as compared to control

Treatments	North-South plant spread (Pooled data of 2 years- 2014 and 2015)							
	Guava genotypes							
Pruning Time	S1	S2	S3	S4	S5	S6	S7	Mean
P1	6.03	4.28	3.43	3.58	3.45	3.38	3.08	3.89
P2	5.68	2.88	3.51	4.05	4.05	3.73	3.30	3.88
P3	6.00	3.69	4.38	3.69	3.45	3.31	3.10	3.95
P4	5.03	4.81	3.21	3.03	3.35	4.08	3.63	3.87
P5	5.33	3.68	4.49	3.85	3.55	4.15	2.98	4.00
P0(Control)	5.72	3.17	3.03	3.76	3.62	4.19	3.77	3.89
Mean	5.63	3.75	3.67	3.66	3.58	3.81	3.31	3.91
Year 2013 & 2014	Pruning Time Pooled		Guava genotypes Pooled			Interaction (P×S) Pooled		
SE(m)±	0.192		0.207			0.508		
CD 5%	NS		0.575			NS		

Table-3: Effect of pruning time and genotypes on initial weight of pruned material

Treatments	Initial weight of pruned material (Kg) (Pooled data of 2 years- 2014 and 2015)							
	Guava genotypes							
Pruning Time	S1	S2	S3	S4	S5	S6	S7	Mean
P1	13.90	7.70	4.95	7.30	5.25	3.55	5.25	6.84
P2	11.25	7.75	4.95	8.05	5.25	5.38	6.85	7.07
P3	11.70	8.18	5.80	5.20	4.00	5.60	5.45	6.56
P4	11.35	7.70	5.05	5.31	4.80	4.80	5.40	6.34
P5	13.20	6.70	5.75	6.70	5.81	4.53	5.70	6.91
P0(Control)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mean	10.23	6.34	4.42	5.43	4.19	3.98	4.78	5.62
Year 2013 & 2014	Pruning Time Pooled		Guava genotypes Pooled			Interaction (P×S) Pooled		
SE(m)±	0.257		0.278			0.68		
CD 5%	0.713		0.770			1.88		

different genotypes. There is increase in height of plants after the pruning operation as compared to control one.

Plant spread (m):

North-South plant spread (cm): Data presented in Table 2b showed that North-South plant spread was non-significant due to various pruning time and also its interaction with genotypes. Pooled results also found to be non-significant to North-South plant spread. The maximum North-South plant spread was noted in S_1 (5.63 m) and least in S_7 (3.31) in pooled data.

Initial weight of pruned material (kg): The data indicated in Table 3 revealed that initial weight of pruned material during the year 2012 and 2013 was significantly influenced; the maximum initial weight of pruned material was recorded in P_2 (7.07 kg), S_1 (9.20 kg) and P_5S_1 (14.20 kg) treatment. Similarly, least was recorded in P_4 (6.34 kg) S_6 (3.98 kg) and P_1S_6 (13.90 kg) treatment combination.

Time required for initiation of new shoots (days): The data in Table 4 presented that Time required for initiation of new shoots was significantly influenced due to different time of pruning and genotypes; Pooled results revealed that maximum number of days required for initiation of new shoots was recorded in P_5 (49.29 days), S_6 (41.08 days) and least was recorded in P_1 i.e. (29.29 days), S_1 (35.33 days) treatment. The interaction effect between pruning time and genotypes was found to be non-significant during both years. 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.

Number of sprouted shoots per tree: The data in Table 7 with respective to the number of sprouted shoots per tree was significantly influenced due to pruning time, genotypes and their interaction. Pooled data, in which maximum number of sprouted shoots per tree was noted in P_0 (86.39), S_1 (81.92) and P_0S_1 (112.00) treatment combination. The results of conducted experiment shows that, growth of control trees was more due to continuous growth habit of guava plant and pruned trees put forth more number of shoots.

Length of sprouted shoot (cm): Table 8 showed pooled data, the significantly maximum length of sprouted shoot was observed in P_0 (91.71 cm), S_1 (81.58 cm) treatment and in P_0S_1 (120.00 cm). From the results, it is indicated that there is more length of shoot recorded in pruned trees as compared to control ones.

Girth of shoot (cm): The data in Table 9 presented that girth of shoot was found to be differed significantly by different pruning time, genotypes and interactions. Regarding pooled results, maximum girth of shoot was observed in P_0 (2.11 cm), S_1 (1.98) and in P_0S_1The results of conducted experiment which, shows that there in increase in the girth of shoot of pruned trees as compared control has less girth.

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

Treatments	Time required for initiation of new shoots (Pooled data of 2 years- 2014 and 2015)							
	Guava genotypes							
Pruning Time	S1	S2	S3	S4	S5	S6	S7	Mean
P1	25.00	30.00	30.00	30.00	30.00	30.00	30.00	29.29
P2	30.00	35.00	35.00	35.00	35.00	35.00	35.00	34.29
P3	35.00	40.00	39.88	40.00	40.00	42.50	40.00	39.63
P4	40.00	45.00	45.00	45.00	45.00	45.00	45.00	44.29
P5	45.00	50.00	50.00	50.00	50.00	50.00	50.00	49.29
P0(Control)	35.25	41.00	43.00	41.25	42.50	41.50	42.50	41.00
Mean	35.04	40.17	40.48	40.21	40.42	40.67	40.42	39.63
Year 2013 & 2014	Pruning Time		Guava genotypes			Interaction (P×S)		
	Pooled		Pooled			Pooled		
S (m) ±	0.312		0.337			0.826		
CD 5%	0.865		0.935			N S		

Table-5: Effect of pruning time and genotypes on number of sprouted shoots per tree

Treatments	No. of shoots sprouted per tree (Pooled data of 2 years- 2014 and 2015)							
	Guava genotypes							
Pruning Time	S1	S2	S3	S4	S5	S6	S7	Mean
P1	77.50	40.00	24.00	36.00	31.50	28.50	33.50	38.71
P2	76.50	31.50	23.50	29.50	25.50	29.50	31.50	35.36
P3	79.00	33.50	31.00	25.25	26.50	31.00	27.50	36.25
P4	83.00	32.00	28.00	31.00	35.50	27.00	26.00	37.50
P5	63.50	22.50	21.50	28.00	31.50	31.50	26.50	32.14
P0(Control)	112.00	89.25	80.25	74.00	85.00	77.75	86.50	86.39
Mean	81.92	41.46	34.71	37.29	39.25	37.54	38.58	44.39
Year 2013 & 2014	Pruning Time		Guava genotypes			Interaction (P×S)		
	Pooled		Pooled			Pooled		
SE(m)±	1.049		1.134			2.777		
CD 5%	2.909		3.142			7.697		

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

Treatments	Length of sprouted shoot (Pooled data of 2 years- 2014 and 2015)							
	Guava genotypes							
Pruning Time	S1	S2	S3	S4	S5	S6	S7	Mean
P1	86.50	50.50	50.00	46.50	55.00	50.00	57.50	56.57
P2	68.50	62.50	51.50	48.00	50.00	55.00	53.50	55.57
P3	76.00	55.50	57.50	47.50	53.50	46.50	47.00	54.79
P4	71.00	47.50	48.50	50.50	57.50	44.50	52.50	53.14
P5	67.50	52.50	37.50	28.00	32.50	31.00	34.00	40.43
P0(Control)	120.00	83.50	87.50	86.00	80.00	89.50	95.50	91.71
Mean	81.58	58.67	55.42	51.08	54.75	52.75	56.67	58.70
Year 2013 & 2014	Pruning Time		Guava genotypes			Interaction (P×S)		
	Pooled		Pooled			Pooled		
SE(m)±	1.161		1.254			3.072		
CD 5%	3.218		3.476			8.514		

Marketable Yield per plant free from fruit fly infestation (kg): The on marketable yield per plant free from fruit fly infestation are given in Table 8. Maximum yield per plant was recorded in P_3 (27.88 kg) treatment and minimum in P_5 (14.65 kg) treatment. As regards genotype, from the pooled mean, it was observed that significantly the maximum yield per plant was recorded in S_1 (20.81 kg) and least in S_7 (17.41 kg). As regards to interactions between different pruning time and different genotypes was found to be significant. In pooled results, the maximum yield was recorded in P_3S_1 (31.68 kg) and minimum yield was recorded in P_5S_7 (12.69 kg).

It might be ascribed as faster growth of new sprouted shoots of pruned trees due to the availability of stored carbohydrates to the plant. High growth rate of new emerged shoots after the pruning which leads to increase in plant spread as compared to control. The results of present studies are confirmed with those of Basu*et al.* (2007) who also reported significant increase height of plant and significant increase in guava plant spread after pruning as compared to control. In case of weight of fresh pruned material, higher weight might be due to the independent growth rate and habit of genotype which leads to increase in organic matter in plant due to which high initial pruned weight was obtained by pruning operation.

The maximum days were required in September pruning, when the shoots were exposed to unfavorable climatic condition of October heat and followed by winter, whereas May pruning time favorable with monsoon climatic condition. This observation is more or less in line with those of Gill (1994) and Singh *et al*. (2001) who has obtained delayed shoot initiation and flowering in pruned trees of guava. Dhaliwal *et al.* (2014) reported that pruned trees put forth shooting earlier than control in Kinnow.

With respective to Sprouting and length as well as girth of shoot, due to the translocation of metabolites and favours the more sprouting and vegetative growth of shoot in pruned plants. The results of present studies are found in line with those of Singh *et al*. (2001) observed maximum number of shoots in pruned trees compared to unpruned ones in guava. Dhaliwal *et al.* (2014) reported that pruned trees of Kinnow produce maximum number of shoots as compared to control one.Likewise, Dasarathi (1951) and Aravindakshan (1963) had also reported an increase in shoot growth in guava with the increased severity of pruning. In the present investigation seven genotypes were exposed to the pruning treatment for yield. Thus, it indicates to validate adoption of escape mechanism technique for minimizing fruit fly infestation in guava. Findings of the present studies in line with those Anon. (1979) and Rao and Khader (1980), who obtained the higher mean yields over seven years with pruning as compared to no pruning in mango.

Table-7: Effect of pruning time and genotypes on girth of shoot (cm)

Treatments	Girth of shoot (Pooled data of 2 years- 2014 and 2015)							
	Guava genotypes							
Pruning Time	S1	S2	S3	S4	S5	S6	S7	Mean
P1	1.85	1.10	1.25	1.00	1.20	1.15	1.05	1.23
P2	1.65	1.20	1.20	1.20	1.30	1.05	1.30	1.27
P3	1.90	1.08	1.13	1.25	1.20	1.30	1.15	1.29
P4	2.00	1.10	1.35	1.46	1.40	1.45	1.40	1.45
P5	2.10	1.00	1.25	1.10	1.05	1.05	1.00	1.22
P0(Control)	2.40	1.95	2.15	2.40	2.15	1.80	1.90	2.11
Mean	1.98	1.24	1.39	1.40	1.38	1.30	1.30	1.43
Year 2013 & 2014	Pruning Time Pooled		Guava genotypes Pooled			Interaction (P×S) Pooled		
SE(m)±	0.014		0.016			0.038		
CD 5%	0.040		0.043			0.106		

Table-8: Effect of pruning time and genotypes on yield per plant free from infestation (kg)

Treatments	Yield per plant free from infestation (Pooled data of 2 years- 2014 and 2015)							
	Guava genotypes							
Pruning Time	S1	S2	S3	S4	S5	S6	S7	Mean
P1	18.72	14.92	17.27	17.86	14.59	16.54	13.48	16.20
P2	18.18	18.50	20.39	21.84	16.69	19.01	18.43	19.01
P3	31.68	27.03	26.81	30.63	25.38	27.97	25.69	27.88
P4	22.10	21.06	21.06	20.14	21.52	19.83	19.80	20.79
P5	16.38	18.05	13.79	13.13	13.80	14.71	12.69	14.65
P0(Control)	17.77	14.77	16.40	17.37	14.81	16.20	14.38	15.96
Mean	20.81	19.06	19.29	20.16	17.80	19.04	17.41	19.08
Year 2013 & 2014	Pruning Time Pooled		Guava genotypes Pooled			Interaction (P×S) Pooled		
SE(m)±	0.051		0.055			0.135		
CD 5%	0.141		0.153			0.376		

Thus it can be generally concluded that maximum vegetative growth and number of sprouted shoots was noticed in Cv. Sardar after pruning. With respect to marketable yield 15th July pruning time was found to be better.

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