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Impact of Pruning Time on Shoot Initiation, Shoot Sprouting, Fruit Yield and Fruit Fly Incidence in Guava

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ABSTRACT

The research work 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 a factorial randomized block design with forty-two treatments replicated two times. The Minimum time required for initiation of new shoots was observed in 15th May pruning time and in Sardar and also in their interactions. Similarly, a maximum number of sprouted shoots per tree was noted in pruning time Control and Sardar genotype.

15th May time of pruning, genotype Sardar and interaction between them were found significantly better for total yield per plant, but marketable yield free from fruit fly infestation were significantly recorded higher in 15th July time of pruning and its interaction with Sardar, followed by RHR-Guv-14. Pruning time of 15th September was found to be better in the escape from fruit fly infestation but fruiting was minimum in September pruning as compared to other pruning time, followed by 15th August pruning time.

Key words: *Psidium guajava, Pruning time, Shoot sprouting, Fruit fly incidence, Fruit yield*

INTRODUCTION

Guava fruit is often called "poor man's apple" though the fruit is neither poor in its nutritive value and nor commercial value. The area under guava in the country during 2012-13 was 235.6 thousand ha producing 3198.3 thousand MT with the productivity of 13.6 MT/ha. Guava contributes 3.4 % of total fruit area and 3.9 % of total fruit production in India during 2012-13[2]. Guava is one of the richest natural sources of vitamin C contains 2 to 5 times more vitamin C than oranges and 10 times more than tomato. Compared to other fruits, the whole guava is a moderately good source of calcium, a fair source of phosphorus and a good source of iron. Guava is consumed in different ways. The fruit has sweet aroma wholly edible along with the skin. Seeds yield 3 to 13 per cent oil, which rich in essential fatty acid and can be used as a salad dressing[9], usually eaten raw both green and ripe (when it becomes fragrant).

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It is also stewed and used in shortcakes, puddings, sauce, ice cream, butter, marmalade, chutney and other products and pies. The fruits produced during the rainy season are severely attacked by the seasonal insect called fruit fly. Infestation of fruit flies ranges from 20 to 46 per cent with a crop loss of 16 to 40 per cent, which is the matter of serious concern[7]. The major objective of the present work is to study the incidence of the fruit fly with respective to the time of pruning.

MATERIALS AND METHODS

Research work 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 includes 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 per cent pruning of current season growth of guava trees were pruned at monthly intervals.

RESULT AND DISCUSSION

Time required for initiation of new shoots (days): The data in Table 1 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 (40.25 days) and least was recorded in P_1 i.e. (29.29 days), S_1 (34.75 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 fewer days as compared to late pruning. The maximum days were required in September pruning when the shoots were exposed to the 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[6] and Singh *et al.*[12] who has obtained delayed shoot initiation and flowering in pruned trees of guava. Pruned trees put forth shooting earlier than control in kinnow[5].

A number of sprouted shoots per tree: The data in Table 2 with respective to **t**he number of sprouted shoots per tree was significantly influenced due to pruning time, genotypes and their interaction. Pooled data, in which the maximum number of sprouted shoots per tree was noted in P_0 (83.57), S_1 (79.17) and P_0S_1 (108) treatment combination. The results of conducted experiment show that growth of control trees was more due to continuous growth habit of guava plant and pruned trees put forth more number of shoots. This might be due to the translocation of metabolites and favors a more sprouting in pruned matured shoots. The results of present studies are found in line with those of Singh *et al.*[12] observed maximum number of shoots in pruned trees compared to unpruned ones in guava. Pruned trees of Kinnow produce the maximum number of shoots as compared to control one[5].

Total yield per plant with fruit fly infestation (kg)

Pooled results reveal, maximum yield per plant was observed in S_1 (Sardar), that was at par with S_4 (RHR-Guv-14) treatment and minimum yield per plant was observed in S_5 (RHR-Guv-16). In the case of interaction effects between a different time of pruning and various genotype, as regards, pooled results, maximum yield per plant was recorded in P_2S_4, that was at par with P_1S_1 treatment combination and least yield per plant was observed in P_5S_7 treatment combination

(Table3). In the conducted experiment, maximum yield was recorded in P_2, P_1 treatment of pruning time and genotypes S_1, S_4 treatment had maximum yield per plant with fruit fly infestation. This might be due to the effect of pruning and availability of stored food material in pruned plant as compared to control. The effect of pruning causes shifting of metabolites in sprouted shoots which leads to increase in vegetative and reproductive growth in plants and due to which the number of fruit is increased in particular season and active growth phase of plant causes maximum yield.

Marketable Yield per plant free from fruit fly infestation (kg)

With respect to pruning time, yield per plant (kg) free from infestation were found to be significant. The maximum yield per plant was recorded in P_3 (15th July) which was superior to rest of treatments and minimum was recorded in P_5 (15th Aug.), similar trend was observed in the year 2013.

Highest yield per plant was noted in S_1 (Sardar) which was superior to rest of treatments and lowest was noted in S_7 (RHR-Guv-6) treatment in 2012. During the year 2013, the same trend was observed for maximum yield and that was at par with S_4 (RHR-Guv-14.) and least was noted in S_7 (RHR-Guv-6). As regards, effect of interaction between different pruning time and different genotypes, pooled results reveals, the maximum yield was recorded in P_3S_1 (31.76 kg) that was at par with P_3S_4 (31.22 kg) and minimum yield was recorded in P_5S_7 (12.77 kg) (Table 4). Results of conducted experiment showed that maximum yield per plant was recorded in P_3 treatment of pruning time case of genotypes S_1, S_4 treatments. This is might be due to the fewer incidences of fruit and sufficient availability of stored food of pruned trees less in control ones, indirectly climatic influence along with pruning time leads to increase the yield of crop free from fruit fly infestation.

Marketable yield is a major concern in production. It is revealed from the present studies the percent marketable yield was found to be increasing with the advance in time of pruning. The major cause of receiving unmarketable fruit is guava is attack of fruit fly. The fruit fly, a polyphagous pest have been identified one of the devasting pests and thus has a great economic importance. Harvesting of fruit was commenced after the 100 days of pruning the fruit on the May and June pruned trees were in development stage during rainy season. The infestation on fruit was more as the population of fruit fly is more as the season is favorable for pest. Study of life cycle of pest is one of the aspects of fruit production. Fruit fly infestation more than ETL during rainy season (August was reported by many workers). The population declines as larvae hibernate in the winter.

The total yield in early pruned trees was more it was also observed that the marketable yield was more in late pruned trees. This could be the major reason for minimizing infestation in late pruned trees and thereby increase the marketable yield. The marketable percent of fruit in unpruned trees was almost same that of trees pruned in May. The earlier fruiting in unpruned trees could be the reason for infestation of fruit fly. In the present investigation, seven genotypes were exposed to the pruning treatment for yield and quality. 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 [1] and the higher mean yields over seven years with pruning as compared to no pruning in mango[10]. Likewise, there is increase in the yield of moderately pruned trees as compared to compared to unpruned guava trees[11]. Reported that the fruit yield increased significantly with light pruning in guava and Valencia orange trees, respectively Bajpai *et al.*[3] and Bevington *et al.*[4]. On the contrary, obtained highest yield in guava with severe pruning, i.e., pruning 60 cm from tip[8].

Fruit fly infestation (%)

The effect of pruning time was found to be significant to the fruit fly incidence. In the year 2012, minimum fruit fly incidence was recorded in P_5 (15th Sept.) (8.93 %) which was

superior to rest of treatments and highest in P_1 (15th May) (48.09 %) treatment and similar trend was observed in 2013 and for pooled results. The effect of genotypes also found to be non-significant for incidence. With respect to interaction effect between pruning time and various genotypes, in that non-significant difference were found during 2012 and 2013 as well as pooled data (Table 5 and Fig. 1).

This is due to the change in the time of fruiting and harvesting by pruning operation. Fruit fly infestations were recorded maximum in rainy season compared to winter season crop. When the pruning is done in Aug-Sept, fruit will be available in Feb-March meanwhile incidence of fruit flies in too much less. Finding of present studies are found in consonance with that[11] reported that less incidence of fruit fly was recorded in pruned guava plants as compared to control ones. Similarly, the abundance of fruit fly was observed throughout the year, with two peaks in summer from May to August and during winter from November to January coinciding with availability of guava fruits. The maximum fruit damage (18.59%) occurred in August, and the second peak with 13.37% damage observed during a period of July[10].

Therefore, it can be concluded that pruning time was found to be important in escape from fruit fly infestation; with respect to marketable yield 15th July pruning time was found to be better and pruning time 15th September was observed better for fruit fly escape.

Table 1: Effect of pruning time and genotypes on time required for initiation of new shoots (days)

Treats.	**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	39.75	40.00	40.00	40.00	40.00	39.25
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)	33.50	41.50	41.50	40.50	42.00	41.50	41.50	40.29
Mean	34.75	40.25	40.21	40.08	40.33	40.25	40.25	39.45
The year 2013 & 2014	Pruning Time		Guava genotypes			Interaction (P×S)		
	Pooled		Pooled			Pooled		
S (m) ±	0.327		2012			2012		
CD 5%	0.907		0.35			0.86		

Table 2: Effect of pruning time and genotypes on number of sprouted shoots per tree

Treats.	**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	70.00	35.00	26.00	30.00	28.00	25.00	31.00	35.00
P2	80.00	35.00	20.00	30.00	25.00	27.00	30.00	35.29
P3	82.00	32.00	37.00	24.50	21.00	31.00	25.00	36.07
P4	75.00	27.00	24.00	30.00	35.00	32.00	27.00	35.71
P5	60.00	23.00	20.00	25.00	30.00	27.00	31.00	30.86
P0(Control)	108.00	81.00	85.00	72.50	79.00	80.00	79.50	83.57
Mean	79.17	38.83	35.33	35.33	36.33	37.00	37.25	42.75
The year 2013 & 2014	Pruning Time		Guava genotypes			Interaction (P×S)		
	Pooled		Pooled			Pooled		
SE(m)±	1.388		1.50			3.67		
CD 5%	3.849		4.15			10.1		

Table 3: Effect of pruning time and genotypes on yield per plant with fruit fly infestation (kg)

Treats.	Yield per plant with infestation (Pooled data of 2 years- 2014 and 2015)							
	Guava genotypes							
Pruning Time	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**Mean**
P1	40.97	33.65	38.95	40.28	32.91	38.43	30.39	36.51
P2	34.82	35.43	39.05	41.84	31.97	36.41	35.30	36.40
P3	39.18	33.43	33.16	37.89	31.39	34.60	31.78	34.49
P4	26.35	25.11	25.11	24.01	25.65	23.65	23.68	24.79
P5	18.88	20.80	15.89	15.13	15.72	16.96	14.63	16.86
P0(Control)	38.25	31.81	35.30	38.30	31.88	34.89	30.89	34.47
Mean	33.07	30.04	31.24	32.91	28.25	30.82	27.78	30.59
The year 2013 & 2014	Pruning Time		Guava genotypes			Interaction (P×S)		
	Pooled		Pooled			Pooled		
SE(m)±	0.163		0.176			0.430		
CD 5%	0.451		0.487			1.193		

Table 4: Effect of pruning time and genotypes on yield per plant free from infestation (kg)

Treats.	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	18.20	14.55	16.95	17.15	14.19	16.53	13.11	15.81
P2	17.89	17.88	20.04	21.38	16.27	18.76	18.07	18.61
P3	31.76	27.27	26.86	31.22	25.54	27.98	25.77	28.06
P4	21.83	20.80	20.80	19.86	21.14	19.37	19.10	20.41
P5	16.04	17.79	13.34	13.35	13.31	14.28	12.77	14.41
P0(Control)	17.33	14.33	16.05	17.37	14.36	15.90	14.03	15.62
Mean	20.51	18.77	19.01	20.05	17.47	18.80	17.14	18.82
The year 2013 & 2014	Pruning Time		Guava genotypes			Interaction (P×S)		
	Pooled		Pooled			Pooled		
SE(m)±	0.145		0.156			0.383		
CD 5%	0.402		0.434			1.062		

Table 5: Effect of pruning time and genotypes on Fruit fly infestation (%)

Treats.	Fruit fly infestation (Pooled data of 2 years- 2014 and 2015)							
	Guava genotypes							
Pruning Time	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**Mean**
P1	47.21	48.23	50.01	47.03	50.61	47.28	48.50	48.41
P2	40.80	39.34	39.48	40.22	40.00	40.42	39.25	39.93
P3	13.50	16.00	13.50	13.00	15.00	16.00	16.75	14.82
P4	11.00	12.75	13.00	11.50	12.00	13.25	14.25	12.54
P5	7.00	10.00	9.50	8.00	10.00	10.00	11.75	9.46
P0(Control)	46.88	47.50	48.50	46.09	46.50	47.02	47.55	47.15
Mean	27.73	28.97	29.00	27.64	29.02	28.99	29.68	28.72
The year 2013 & 2014	Pruning Time		Guava genotypes			Interaction (P×S)		
	Pooled		Pooled			Pooled		
SE(m)±	0.896		0.968			2.371		
CD 5%	2.484		NS			NS		

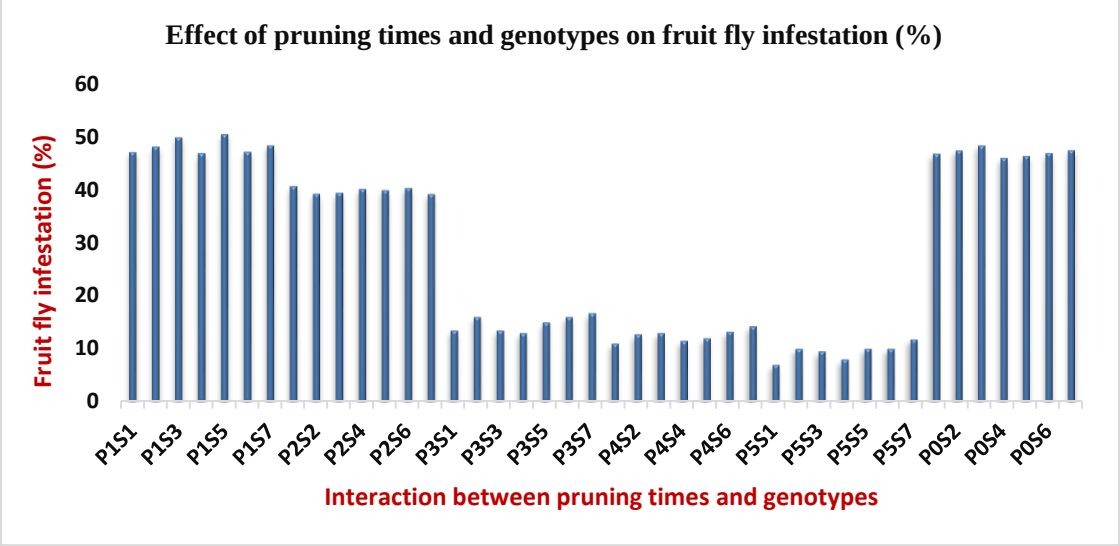

Fig. 1: Effect of pruning times and genotypes on fruit fly infestation (%)

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