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Influence of Different Levels of Pruning and Growth Regulators on Growth and Yield of Guava (*Psidium guajava* L.) cv. 'L-49'

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A B S T R A C T

The present experiment was laid out in Randomized Block Design with factorial concept (FRBD) consisting of thirteen treatments and three replications involving two factors, among them first factor contains two levels of pruning (75 cm and 100 cm) and second factor contains two levels of each growth regulators i.e. PBZ (500 and 1000 ppm), Ethephon (500 and 1000 ppm) and GA_3 (50 and 100 ppm) as well as absolute control. The results obtained from present investigation revealed that interaction effect of pruning and chemical spraying on number of fruits per shoot number of fruits per shoot (3.39), fruits per plant (343.97), maximum yield of fruits per plant (49.14 kg) were found significant in pruning at 75 cm and PBZ at 500 ppm (P_2S_1). Whereas, the maximum fruit weight (127.67 g) was recorded in pruning at 75 cm and GA_3 at 50 ppm (P_1S_5).

Introduction

Guava (*Psidium guajava* L.) belongs to family Myrtaceae, the apple of tropics and it is one of highest fruit in area and production after mango, banana, grapes and citrus. Guava is very important tropical as well as subtropical fruit crop of the world and is a potential crop of India. Due to its hardy, prolific bearing and highly remunerative nature, it surpasses many other fruit crops. More over this fruit can be grown satisfactorily even in adverse soil and climatic conditions.

Guava has gained considerable prominence on account of its high nutritive and medicinal values and also aroma and flavour. It is a rich source of vitamin C, pectin, moderately good source of iron, calcium and a fair source of phosphorus, besides very rich sources of dietary fiber. The presence of vitamin C and other phytonutrients such as carotenoids, iso-flavonoids and polyphenols in guava has led to it being an effective antioxidant. Apart from being relished as fresh fruit, guava is also extensively being used for making jelly and to a limited extent for juice, fruit jam and canning in sugar syrup or made into fruit butter. It freezes exceptionally well and the products are practically indistinguishable from fresh fruits (Gopikrishna, 1979). As guava plants exhibits extensive vegetative growth annually and are highly responsive to

canopy modification, there is always a scope to increase production and income from a unit land area by using various cultural techniques and application of certain chemicals which restricts the vegetative growth without affecting the fruit quality. Therefore, the present investigations are aimed to study the effect of pruning and growth regulators on growth, yield and quality of guava fruits.

Materials and Methods

The present investigation was carried out on "Effect of pruning and growth regulators on growth, yield and quality of guava (*Psidiumguajava* L.) cv. L-49" at Fruit Research Station, Sakkarbaug, Department of Horticulture, College of Agriculture, J.A.U., Junagadh during summer and *kharif* 2017,situated at 21.5 N latitude and 70.5 E longitude with an altitude of 60 meters above the mean sea level and 80 kilometers away from the Arabian Sea coast on western side at the foothill of mountain Girnar sierra.

Thirteen treatments involving two factors among these first factor contains two levels of pruning (75 cm and 100 cm) and second factor contains two levels of each PBZ (500 ppm and 1000 ppm), Ethephon (500 ppm and 1000 ppm) and GA_3 (50 ppm and 100 ppm) as well as absolute control. These are embedded in Randomized Block Design (Factorial concept) with three replications and 6m X 6m spacing of 15 years old plants.

Observation recorded are Plant height (m), Plant spread (m), No. of shoots/tree, Length of shoot (cm), No. of flower/shoot, No. of fruits/shoot, Fruit set (%), Fruit drop (%), Fruit weight (g), Fruit Length (cm), Fruit Circumference (cm), Seed weight, Seed: pulp ratio, Number of fruit/plant, Yield of fruit (kg/plant) and Yield of fruit (t/ha). The height of the plant was measured from the ground level to the tip of the main shoot, The horizontal distance of plant spread is taken from one end of the canopy to the other end was recorded in two directions *viz.* North – South and East – West with the help of meter tape and it was expressed in meter. Number of shoots/tree was counted from selected five branches. The average shoot per tree was calculated from data recorded. Length of shoot (cm) was recorded from five branches which were selected and labelled on each tree and five shoots were tagged. Observations on shoot length were recorded in centimetres at an interval of 30 days. Number of flower/shoot was recorded from tagged shoot and also those emerged newly on labelled branches were recorded. The average number of flower bud per shoot was calculated from the data recorded. Number of fruits/shoot was taken from tagged shoot and also those emerged newly on labelled branches where fruit are available were recorded. The average number of fruits per shoot was calculated from the data recorded. The fruits which have dropped prior to reach the maturity were counted and average to obtain effective fruit drop and depicted as percentage fruit drop. Five fruit were weighted and averaged to get the effective weight per fruit in gram.

The length of five fruits was measured vertically and averaged by Vernier calliper to obtain the length of fruit (cm). The width of five fruits was measured horizontally and averaged to obtain the circumference of fruit (cm). Seed weight was recorded after the separation of seeds from the individual ripe fruit. Seed: pulp ratio was taken account after the separations of seeds and pulp from the individual ripe fruit, weight of the seed and weight of the pulp were recorded. The number of fruit was counted from each treated tree. The average number of fruit per tree was calculated from data recorded. The final yield per tree in kg was obtained by sum up the yield of all the pickings.

Results and Discussion

Plant height

Minimum plant height (2.82 m) was noted in pruning at 100 cm (P_2) followed by P_1.In foliar spray of growth regulators minimum plant height (2.72 m) was obtained in PBZ at 500 ppm (S_1).The interaction effect of pruning and chemical spraying was found to be non-significant with respect to plant height (Table 1). Reduction in the tree height is due to the slow response for supply of food material absorbed by roots and transmission of the same to main trunk of such tree. These results were in conformity with the findings of Kumarand Rattanapal (2010) in guava.

Plant spread E-W and N-S (m)

The minimum plant spread was recorded in pruning at 100 cm (P_2) for both E-W (4.98 m) and N-S (4.29 m) direction. The minimum plant spread (4.63 m) was obtained in PBZ at 500 ppm (S_1).The interaction effect of pruning and chemical spraying was found to be non-significant with respect to plant spread (Table 1). It is well established fact that severely pruned trees reduces the canopy spread compared to unpruned trees. These results were in conformity with the findings of Kumarand Rattanapal (2010) in guava.

Number of flowers per shoot

The maximum number of flowers per shoot (3.96) was recorded in pruning at 75 cm (P_1).The maximum number of flowers per shoot (4.26) was recorded in PBZ at 500 ppm (S_1).The interaction effect of pruning and chemical spraying was found to be non-significant with respect to the number of flowers per shoot. Severely pruned trees of guava induce early emergence of bud sprouts, increases length of the shoot as well as the number of flowers per shoot (Table 1). Similar results were also reported by Jadhav *et al.,* (2002) in guava.

Number of fruits per shoot

The effect of pruning with respect to number of fruits per shoot noted significant result (Table 2). Maximum fruits per shoot (2.96) were observed in pruning at 75 cm (P_1) and it was found at par with P_2. Foliar application of PBZ, Ethephon and GA_3 significantly influence the number of fruits per shoot.

The maximum number of fruits per shoot (3.19) was recorded in PBZ at 500 ppm (S_1) it was found at par with S_4. Whereas, the minimum fruits per shoot (2.56) was recorded in GA_3 at 100 ppm (S_6).Increase in the number of fruits in pruned trees of guava might be due to the optimum balance between the vegetative and reproductive growth of the shoots. But when there is increase in the pruning intensity, then the number of fruits per shoot may be decreased.

This is due to loss of bearing area. Similar results were noted by Brar*et al.,* (2007) in guava. The interaction effect of pruning and chemical spraying with respect to number of fruits per shoot was found significant. The maximum number of fruits per shoot (3.39) was recorded in treatment together with pruning at 75 cm and PBZ at 500 ppm (P_1S_1) and it was found at par with P_1S_4. While, minimum number of fruits per shoot (2.14) noted in absolute control.

Fruit set (%)

The data regarding effect of pruning with respect to fruit set was noted significant result. Effect of PBZ, Ethephon and GA_3 with respect to fruit set was found non-significant. The interaction effect of pruning and chemical spraying with respect to fruit set was found non-significant (Table 1).

Fruit weight

The effect of pruning with respect to fruit weight was noted significant result. Maximum fruit weight (112.44 g) was noted in pruning at 75 cm (P_1) followed by P_1.Foliar application of PBZ, Ethephon and GA_3 significantly influence the fruit weight. The maximum fruit weight (121.50 g) was noted in GA_3 at 50 ppm (S_5). Whereas, minimum fruit weight (97.85 g) was noted in Ethephon at 1000 ppm (S_4) in (Table 2). It may be due to the increased light exposure and strengthened fruit sink activity by the pruning. Higher the pruning intensity lower will be the fruit weight. These findings are also agreement with Brar *et al.*, (2007) in guava. The interaction effect of pruning and chemical spraying with respect to fruit weight shows significant variation. The maximum fruit weight (127.67 g) was recorded in treatment together with pruning at 75 cm and GA_3 at 50 ppm (P_1S_5) and it was found at par with P_1S_2. While, minimum fruit weight (85.33 g) noted in absolute control.

Table.1 Effect of pruning and growth regulators on plant height, plant spread, number of flowers per shoot, fruit set (%) of guava

Sr. No	Treatments	Plant height (m)	Plant spread (m)		Number of flowers per shoot	Fruit set (%)
			E-W	N-S		
	Factor A – Pruning					
P_1	Pruning (75 cm)	2.98	5.20	4.29	3.96	75.41
P_2	Pruning (100 cm)	2.82	4.98	4.11	3.69	76.97
S.Em.±		0.04	0.07	0.06	0.08	1.7
C.D. at 5%		0.12	0.21	0.18	0.22	NS
Factor B – Chemical spraying						
S_1	Paclobutrazol – 500 ppm	2.72	4.63	4.05	4.26	75.16
S_2	Paclobutrazol – 1000 ppm	2.86	5.19	4.13	3.82	76.12
S_3	Ethephon – 500 ppm	2.94	5.09	4.33	3.77	78.57
S_4	Ethephon – 1000 ppm	2.81	4.92	4.06	4.17	71.45
S_5	GA_3 – 50 ppm	3.00	5.33	4.35	3.50	80.00
S_6	GA_3 – 100 ppm	3.03	5.38	4.29	3.40	75.80
S.Em.±		0.07	0.13	0.23	0.13	2.95
C.D. at 5%		0.21	0.37	NS	0.38	NS
C.V. %		6.19	6.06	6.09	8.49	9.58
Interaction						
P X S		NS	NS	NS	NS	NS
Absolute control		**3.12**	**5.48**	**4.63**	**3.19**	**67.02**
Control v/s Rest		*	*	NS	**	*

Table.2 Interaction effect of pruning and growth regulators on fruit weight, number of fruits, yield of fruits per plant and yield per hectare of guava

Tr. No. P x S	Treatments	Fruit weight (g)	Number of fruits per shoot	Number of fruits per plant	Yield of fruits per plant(kg)	Yield of fruits (t/ha)
P_1S_1	Pruning (75 cm) + PBZ (500 ppm)	102.17	3.39	343.97	49.14	13.63
P_1S_2	Pruning (75 cm) + PBZ (1000 ppm)	120.16	2.99	303.92	43.42	12.05
P_1S_3	Pruning (75 cm) + Ethephon (500 ppm)	114.67	2.89	293.83	41.98	11.65
P_1S_4	Pruning (75 cm) + Ethephon (1000 ppm)	98.28	3.18	323.52	46.22	12.82
P_1S_5	Pruning (75 cm) + GA_3 (50 ppm)	127.67	2.85	289.80	41.40	11.49
P_1S_6	Pruning (75 cm) + GA_3 (100 ppm)	111.67	2.50	254.23	36.32	10.08
P_2S_1	Pruning (100 cm) + PBZ (500 ppm)	99.88	3.00	305.43	43.63	12.11
P_2S_2	Pruning (100 cm) + PBZ (1000 ppm)	103.08	2.82	287.30	41.04	11.39
P_2S_3	Pruning (100 cm) + Ethephon (500 ppm)	108.67	2.97	302.25	43.18	11.98
P_2S_4	Pruning (100 cm) + Ethephon (1000 ppm)	97.42	2.78	282.50	40.36	11.20
P_2S_5	Pruning (100 cm) + GA_3 (50 ppm)	115.33	2.75	279.83	39.98	11.09
P_2S_6	Pruning (100 cm) + GA_3 (100 ppm)	106.85	2.63	268.17	38.31	10.63
-----	Absolute control	85.33	2.14	217	26.00	7.00
S.Em.±		2.7	0.10	10.00	1.43	0.39
C.D. at 5%		7.87	0.29	29.18	4.18	1.41
C.V. %		4.36	6.08	6.00	6.07	6.00

Number of fruits per plant

The effect of pruning with respect to number of fruits per plant noted significant result. The highest number of fruits per plant (301.54) was observed in pruning at 75 cm (P_1) followed by P_2. Foliar application of PBZ, Ethephon and GA_3 significantly influence the number of fruits per plant. The higher number of fruits per plant (324.7) was recorded in PBZ at 500 ppm (S_1), followed by S_4 (Table 2). Whereas, the lower number of fruits per plant (261.20) was observed in GA_3 at 100 ppm (S_6). The interaction effect of pruning and chemical spraying with respect to number of fruits per plant was found significant. The higher number of fruits per plant (343.97) was recorded in treatment together with pruning at 75 cm and PBZ-500 ppm (P_1S_1) and it was found at par with P_1S_4 significantly. While,

lower number of fruits per plant (217) noted in absolute control.

Yield of fruits per plant

The effect of pruning with respect to yield of fruits per plant noted significant result. Maximum yield of fruits per plant (43.08 kg) were observed in pruning at 75 cm (P_1) followed by P_2. Foliar application of PBZ, Ethephon and GA_3 significantly influence the yield of fruits per plant. The maximum yield of fruits per plant (46.38 kg) was recorded in PBZ at 500 ppm (S_1), followed by S_4 (Table 2). While, the minimum yield of fruits per plant (37.31 kg) was observed in GA_3 at 100 ppm (S_6). The interaction effect of pruning and chemical spraying with respect to yield of fruits per plant was found significant. The maximum yield of fruits per plant (49.14 kg) was recorded in treatment together with pruning at 75 cm and PBZ at 500 ppm (P_1S_1) and it was found at par with P_1S_4. While, the minimum yield of fruits per plant (26.00 kg) noted in absolute control. This is due metabolic activities have helped to increase the fruit size and fruit weight and thereby increase the fruit yield. Higher the pruning intensity lower will be the yield. The result was supported by Suleman *et al.,* (2006) in guava.

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