International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(4): 612-615

Received: 28-05-2019
Accepted: 30-06-2019

AB Parmar
Principal, Anand Agricultural University, Anand, Gujarat, India

HC Patel
Research Guide, Anand Agricultural University, Anand, Gujarat, India

JR Parmar
Participant, Anand Agricultural University, Anand, Gujarat, India

DD Patel
Participant, Anand Agricultural University, Anand, Gujarat, India

Correspondence
AB Parmar
Principal, Anand Agricultural University, Anand, Gujarat, India

Effect of pruning and plant growth regulators on growth, flowering and fruit yield of guava (*Psidium guajava* L.) cv. Allahabad Safeda

AB Parmar, HC Patel, JR Parmar and DD Patel

Abstract
A field experiment was conducted at the Horticultural Research Farm, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand during the years 2015-16 & 2016-17 with a view to study the "Effect of Pruning and Plant Growth Regulators on Growth, Flowering and Fruit Yield of Guava (*Psidium guajava* L.) cv. Allahabad Safeda". The results pertaining to growth parameters with respect to pruning, significantly the maximum incremental plant height (0.74, 0.75 and 0.75 m), incremental plant spread North -South(0.79, 0.82 and 0.80 m), East-West (0.82, 0.86 and 0.84 m),highest number of flowers per secondary branch (32.11, 32.81 and 32.46), fruit set percent per secondary branch (75.05, 79.85 and 77.45 %), fruit retention percent per secondary branch (81.70, 81.72 and 81.71 %), number of fruits per shoot (4.38, 4.29 and 4.33), maximum number of fruits per plant (140.56, 143.30 and 141.93), fruit yield per plant (42.21, 43.22 and 42.72 kg),fruit yield per hectare (11.73, 12.01 and 11.87 t),minimum days to initial flowering (48.81, 49.81 and 49.31) and minimum fruit drop percent per secondary branch (19.36, 18.28 and 18.82 %)recorded with treatment 25 % shoot pruning during the years 2015-16, 2016-17 and in pooled analysis, respectively. With respect to effect of plant growth regulators, application of GA_3 150 mg/l recorded the highest increased in incremental plant height (0.71, 0.73 and 0.72 m), incremental plant spread North - South **(**0.77, 0.81 and 0.79 m) and East-West (0.81, 0.84 and 0.83 m), number of flowers per secondary branch (31.99, 32.67 and 32.33), maximum fruit set percent per secondary branch (71.72, 80.34 and 76.13 %),fruit retention percent (80.34, 82.33 and 81.33 %), fruit yield per plant (39.37, 40.95 and 40.16 kg), fruit yield per hectare (10.94, 11.38 and 11.16 t) and minimum fruit drop percent (19.66, 17.67 and 18.67 %) in the years 2015-16, 2016-17 and in pooled analysis, respectively.

Keywords: Guava (*Psidium guajava* L.), pruning, GA3, NAA, growth, yield

Introduction
Guava (*Psidium guajava* L.) is one of most important fruit crops of the tropics and sub-tropics parts of the world. It belongs to the family 'Myrtaceae'. It was largely grown in warm tropical countries of the world. It is grown all over the tropical and subtropical regions and in all parts of India. Guava grows equally well under tropical and sub-tropical climatic conditions. Under tropical climate due to availability of sufficient heat and moisture, fruits produce almost continuously. Flowering and fruiting throughout the year may cause poor fruit quality and yield, particularly during rainy season crop (Ambebahar); maximum fruits infected with fruit fly. Mrigbahar is considered as best fruiting season because of lower infestation of fruit fly and good quality fruits. In order to avoid heavy crop load during rainy season, chemicals and cultural means are important tools for crop regulation to get quantum and quality yield (Singh. 2001) [12]. In India, most of the guava varieties produce medium to small inferior quality fruits having more number of seeds which are hard for chewing. Pruning practice and plant growth regulators play a vital role in growth, development, fruit retention, yield and quality reported in many fruit crops. Guava, being a current season bearing plant, responds well to pruning practices. Beneficial effects of pruning on growth, yield and fruit quality of guava have been reported by various workers (Jadhav *et al*., 2002, Dhaliwal and Kaur. 2003, Dhaliwal and Singh. 2004) [2, 6, 3]. During last 3-4 decades lot of research work in guava has been done on various aspects like crop improvement, use of micronutrients, integrated nutrient management etc. However, impact of plant growth regulators and pruning in regulation of flowering and fruiting of guava has not been fully exploited in context of middle Gujarat agro climatic conditions.

Considering all the above facts and with a view to have better growth, yield and quality of fruits, it was decided to carried out the experiment on 'Effect of Pruning and Plant Growth Regulatorson Growth, Flowering and Fruit Yield of Guava (*Psidium guajava* L.) cv. 'Allahabad Safeda' for research.

Materials and Methods

A field experiment was conducted at the Horticultural Research Farm, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand during the years 2015-16 & 2016-17 with a view to study the "Effect of Pruning and Plant Growth Regulators on Growth, Flowering and Fruit Yield of Guava (*Psidium guajava* L.) cv. Allahabad Safeda". For this experiment 54 (18 x 3) plants of guava var. Allahabad Safeda were uniformly selected considering their age and canopy. Treatments were repeated for three times on the 54 selected plants. The experiment comprised of eighteen treatment combinations involving two levels of pruning at 25 and 50% with Control (Unpruned plants) and their combinations with plant growth regulators *viz.*; GA_3 (100 and 150 mg l^{-1}), NAA (150 and 200 mg l^{-1}) and control (water spray and absolute control) were embedded in Complete Randomized Design (Factorial) with three repetitions. The guava plants were pruned in last week of May during the years 2015-16 and 2016-17. First foliar spray of plant growth regulators treatments was done at the time of flowering and second was applied after three weeks of first spray on guava plants as per the treatments. Observations were recorded on the basis of five secondary branches selected per plant. Uniform and healthy five secondary branches were randomly selected in each direction and tagged on each plant of guava. On each selected secondary branch five shoots were tagged. Data for individual year were analyzed and in order to study the average effect of different treatments over the years, the pooled analysis was also carried out as suggested by Gomez and Gomez (1996) [5]. Treatment means of all characters for individual as well as pooled analysis were compared by means of critical differences at 5% level of significance after employing "F" test.

Results and Discussion

Plant height, plant spread (E-W) and (N-S) affected by pruning and foliar application of PGR's treatments on guava cv. Allahabad Safeda at harvest during two years of study are presented in Table 1. The data found significant with different levels of pruning on incremental plant height, plant spread (E-W) and (N-S) during individual years as well as in pooled. Significantly the maximum incremental plant height (0.74,0.75 and 0.75 m), incremental plant spread North - South(0.79, 0.82 and 0.80 m) and East-West plant spread (0.82, 0.86 and 0.84 m) was recorded in 25% shoot pruning respectively during the years 2015-16, 2016-17 and in pooled data. The highest increased in incremental plant height (0.71, 0.73 and 0.72 m) was recorded with the foliar application of GA_3 150 mg/l during 2015-16, 2016-17and in pooled, respectively. The higher incremental plant spread North - South **(**0.77, 0.81 and 0.79 m) and East-West (0.81, 0.84 and 0.83 m) was found under GA_3 150 mg/l (S_2) in the years 2015-16, 2016-17 and in pooled data. Whereas GA_3 100 mg/l was remain at par with the GA_3 150 mg/l during the year 2015-16 and 2016-17. Maximum incremental plant height (0.91 m) was observed in treatment combination 25% shoot pruning with GA_3 150 mg/l which was found at par (0.83 m) with 25% shoot pruning with GA_3 100 mg/l during the year 2015-16. Interaction effect of pruning and PGRs levels with respect to incremental plant spread (N-S) were found non-significant during the years 2015-16 and 2016-17. However, in pooled analysis it was recorded highest (0.97 m) in 25% shoot pruning with GA_3 150 mg/l and was found at par with 25% shoot pruning with GA_3 100 mg/l (0.89 m). The interaction effect of different levels of pruning and plant growth regulators was found non-significant on plant spread (E-W) in both the years as well as in pooled data. It might be due to guava is highly responsive to pruning because it removes carbon starved and allows the sprouting of lateral buds, which ultimately influence plant height and gibberellins relates almost extensively to its stem elongation properties by two ways *viz*. direct effect on stem elongation by inducing cell wall loosening, by increasing cell wall extensibility, stimulating enzymatic activity for wall synthesis, reducing the rigidity of cell wall and by increasing cell division leading to more growth.

The data pertaining to days to initial flowering as influenced by different levels of pruning and plant growth regulators spray during both the years and in pooled analysis are presented in Table 2. Significantly minimum days to initial flowering (48.81, 49.81 and 49.31), minimum fruit drop percent per secondary branch (19.36, 18.28 and 18.82)and the highest number of flowers per secondary branch (32.11, 32.81 and 32.46), fruit set percent per secondary branch (75.05, 79.85 and 77.45), fruit retention per secondary branch (81.70, 81.72 and 81.71 %), number of fruits per plant (140.56, 143.30 and 141.93), fruit yield per plant (42.21, 43.22 and 42.72 kg) and fruit yield per hectare (11.73, 12.01 and 11.87 t) were recorded with treatment 25 % shoot pruning in the years 2015-16, 2016-17 and in pooled analysis, respectively. Whereas, 50 % shoot pruning was found at par in case of number of fruits per plant (136.14, 140.12 and 138.13) with 25 %shoot pruning during the years 2015-16, 2016-17 and in pooled. The analyzed data reflected that effect of different plant growth regulator treatments were found non-significant for flower initiation in both the years as well as in pooled data. The treatment GA_3 150 mg/l produced highest number of flowers per secondary branch (31.99, 32.67 and 32.33) which was remain at par with the treatments GA_3 100 mg/l (31.68, 32.22 and 31.95), NAA 200 mg/l (31.38, 31.97 and 31.68) and NAA 150 mg/l (30.95, 31.52 and 31.24) during the years 2015-16, 2016-17 and in pooled, respectively. The increase in number of fruit retention might be due to the fact that reduced number of fruits in rainy season due to pruning facilitates a better hormonal balance for synthesis of carbohydrates in the pruned shoots enabling them to bear more number of fruits in the following winter. Similar results were found by Dhaliwal *et al*. (2000) [4], Singh and Bal (2007) [11], Agnihotri *et al*. (2016) [1] in guava.

Maximum fruit set percent per secondary branch (71.72, 80.34 and 76.13) was recorded in GA_3 150 mg/l followed by GA_3 100 mg/l (71.64, 79.78 and 75.71), NAA 200 mg/l (71.02, 77.99 and 74.50) and NAA 150 mg/l (67.09, 75.65 and 71.37) in respective years i.e. 2015-16, 2016-17 and in pooled data. GA_3 150 mg/l proved to be the most effective treatment in reducing the fruit drop percent (19.66, 17.67 and 18.67) followed by GA_3 100 mg/l (20.38, 18.62 and 19.50 %), NAA 200 mg/l (21.80,19.55 and 20.67) during the years 2015-16, 2016-17 and in pooled data. Significantly maximum fruit retention percent (80.34, 82.33 and 81.33) recorded under GA_3 150 mg/l which was found at par with GA_3 100 mg/l (71.62, 81.38 and 80.50), NAA 200 mg/l (78.09, 80.45 and 79.27) in the years 2015-16, 2016-17 and in pooled data, respectively. Maximum number of fruits per plant was

recorded with the foliar spray of GA_3 150 mg/l (138.90 and 140.01) followed by NAA 150 mg/l (137.83 and 138.59) GA_3 100 mg/l (137.08 and 138.49) and NAA 200 mg/l (137.01 and 138.28) during the first year 2015-16 and in pooled data. Significantly maximum fruit yield per plant (39.37, 40.95 and 40.16 kg) and fruit yield per hectare (10.94, 11.38 and 11.16 t) were recorded with GA_3 150 mg/l treatment followed by GA_3 100 mg/l (39.18, 40.72 and 39.95 kg) and (10.88, 11.31 and 11.10 t), NAA 200 mg/l (39.16, 40.48 and 39.82 kg) and (10.88, 11.24 and 11.06 t), NAA 150 mg/l (38.96, 39.36 and 39.16 kg) and (10.82, 10.93 and 10.88 t) during 2015-16, 2016-17 and in pooled analysis, respectively. It might be due to the primitive effect of growth substances in greater retention of fruit may be attributed to reduction in fruit drop. There is correlation between fruit drop and endogenous hormonal status and existence of high level of internal auxin that prevent fruit drop. Since high level of endogenous hormones might help in building up endogenous hormone at appropriate level, potent to enough reduction in fruit drop. By the foliar application of growth regulators synthesis to sink and increased pollen viability and fertilization. These results are in accordance with the finding of Nkansah *et al*. (2012) [10]. The NAA has helped in fruit retention because auxin prevents the abscission and facilitated the ovary to remain attached with the shoot, resulting in lower fruit drop and ultimately higher fruit retention percent.

The interaction effect of pruning and plant growth regulators for the days to flower initiation, number of flowers per secondary branch, fruit set percent, number of fruits per plant, fruit yield per plant and fruit yield per hectare were found non-significant during both the years and in pooled analysis. Among the different treatment combinations minimum fruit drop percent (12.18) was found with interaction between 25 % shoot pruned plant and GA_3 150 mg/l followed by 25 % shoot pruning with GA_3 100 mg/l, 25 % shoot pruning with NAA 200 mg/l and 25 % shoot pruning with NAA 150 mg/l i.e. 13.32, 14.67 and 17.58 %, respectively in the pooled results. The interaction effect of pruning and spraying of different plant growth regulators on fruits retention percent was found non-significant during both the years but in pooled results it was found significant. Maximum fruits retention percent (87.60 and 86.47) was found in treatment combination of 25% shoot pruning with GA_3 150 mg/l and 25% shoot pruning with GA_3 100 mg/l, respectively in pooled results. The increase in no. of fruits at light pruning intensity might be due to the optimum balance between the vegetative and reproductive growth of shoots. The lesser number of fruits per shoot with the increase in pruning intensity may due to loss of bearing area. The significant increase in fruit yield per tree and per hectare is a cumulative effect of number of fruits as well as reduction in fruit drop vis-a-vis higher fruit weight by the direct and indirect effect of foliar spray of gibberellic acid (Nkansah *et al*. 2012) [10]. The increase in yield attributes particularly number of fruits per shoot and increased yield per plant which ultimately an increase in average yield per hectare. These results are in conformity with the earlier report by Mohammad *et al*. (2006) [9], Lal *et al*. (2013) [8] and Lal and Das (2017) [7] in guava.

Table 1: Effect of different levels of pruning and plant growth regulators on growth parameters at harvest

Treatments	Incremental plant height			Incremental plant spread (N-S)			Incremental plant spread (E-W)		
	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled
P_1	0.46	0.45	0.45	0.48	0.50	0.49	0.50	0.53	0.52
P_2	0.74	0.75	0.75	0.79	0.82	0.80	0.82	0.86	0.84
P_3	0.58	0.59	0.58	0.62	0.65	0.64	0.66	0.69	0.67
S.Em.±	0.01	0.01	0.01	0.014	0.015	0.010	0.012	0.014	0.009
CD at 5 %	0.03	0.03	0.02	0.04	0.04	0.03	0.04	0.04	0.03
S_1	0.69	0.68	0.68	0.73	0.74	0.73	0.74	0.78	0.76
S_2	0.71	0.73	0.72	0.77	0.81	0.79	0.81	0.84	0.83
S_3	0.56	0.58	0.57	0.61	0.64	0.62	0.64	0.68	0.66
S_4	0.62	0.63	0.62	0.66	0.69	0.68	0.71	0.73	0.72
S_5	0.47	0.49	0.48	0.53	0.54	0.53	0.57	0.58	0.57
S_6	0.46	0.48	0.47	0.48	0.52	0.50	0.49	0.55	0.52
S.Em.±	0.02	0.02	0.01	0.020	0.022	0.015	0.018	0.020	0.013
CD at 5 %	0.05	0.05	0.03	0.06	0.06	0.04	0.05	0.06	0.04
CV %	8.22	8.05	8.13	9.49	9.82	9.67	8.02	8.47	8.26
P x S	Sig.	NS	Sig.	NS	NS	Sig.	NS	NS	NS

Table 2: Effect of different levels of pruning and plant growth regulators on flowering and yield parameters

Treatments	Days to flower initiation			Number of flowers per secondary branch			Fruit set percent per secondary branch		
	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled
P_1	58.86	59.11	58.99	29.56	30.07	29.82	56.77	69.19	62.98
P_2	48.81	49.81	49.31	32.11	32.81	32.46	75.05	79.85	77.45
P_3	53.22	52.72	52.97	30.31	30.84	30.57	62.59	74.89	68.74
S.Em.±	1.478	1.092	0.919	0.533	0.556	0.385	2.092	1.867	1.402
CD at 5 %	4.24	3.13	2.59	1.53	1.59	1.08	6.00	5.35	3.95
S_1	53.02	51.56	52.29	31.68	32.22	31.95	71.64	79.78	75.71
S_2	53.91	54.16	54.04	31.99	32.67	32.33	71.92	80.34	76.13
S_3	52.70	54.31	53.50	30.95	31.52	31.24	67.09	75.65	71.37
S_4	52.26	52.85	52.55	31.38	31.97	31.68	71.02	77.99	74.50
S_5	54.53	54.78	54.65	29.30	29.81	29.55	54.36	68.75	61.55
S_6	55.37	55.62	55.49	28.65	29.25	28.95	52.80	65.37	59.09
S.Em.±	2.090	1.544	1.299	0.753	0.786	0.544	2.958	2.640	1.983
CD at 5 %	NS	NS	NS	2.16	2.25	1.53	8.49	7.57	5.59
CV %	11.69	8.60	10.25	7.37	7.55	7.46	13.70	10.61	12.06
P x S	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 3: Effect of different levels of pruning and plant growth regulators on yield parameters

Treatments	Fruit drop percent per secondary branch			Fruit retention percent per secondary branch			Number of fruits per shoot		
	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled
P_1	34.23	28.64	31.43	65.77	71.36	68.57	2.84	2.92	2.88
P_2	19.36	18.28	18.82	81.70	81.72	81.71	4.38	4.29	4.33
P_3	26.76	22.69	24.72	73.24	77.31	75.28	3.75	3.82	3.79
S.Em.±	0.940	0.715	0.591	1.284	1.334	0.926	0.103	0.102	0.073
CD at 5 %	2.70	2.05	1.66	3.68	3.83	2.61	0.30	0.29	0.20
S_1	20.38	18.62	19.50	79.62	81.38	80.50	3.96	4.04	4.00
S_2	19.66	17.67	18.67	80.34	82.33	81.33	3.97	4.05	4.01
S_3	23.00	21.17	22.09	77.00	78.83	77.91	3.73	3.80	3.76
S_4	21.80	19.55	20.67	78.09	80.45	79.27	3.92	3.67	3.79
S_5	35.74	28.78	32.26	66.48	71.22	68.85	3.23	3.31	3.27
S_6	40.11	33.43	36.77	59.89	66.57	63.23	3.12	3.20	3.16
S.Em.±	1.330	1.011	0.835	1.816	1.886	1.309	0.146	0.145	0.103
CD at 5 %	3.81	2.90	2.35	5.21	5.41	3.69	0.42	0.42	0.29
CV %	14.89	13.07	14.18	7.41	7.37	7.39	11.96	11.81	11.89
P x S	NS	NS	Sig.	NS	NS	Sig.	NS	NS	Sig.

Table 4: Effect of different levels of pruning and plant growth regulators on yield parameters

Treatments	Number of fruits per plant			Fruit yield per tree			Fruit yield per hectare		
	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled	2015-16	2016-17	Pooled
P_1	127.58	129.63	128.60	30.82	30.34	30.58	8.56	8.43	8.49
P_2	140.56	143.30	141.93	42.21	43.22	42.72	11.73	12.01	11.87
P_3	136.14	140.12	138.13	39.05	39.84	39.44	10.85	11.07	10.96
S.Em.±	2.063	2.334	1.557	0.744	0.583	0.473	0.207	0.162	0.131
CD at 5 %	5.92	6.69	4.39	2.13	1.67	1.33	0.59	0.46	0.37
S_1	137.08	139.91	138.49	39.18	40.72	39.95	10.88	11.31	11.10
S_2	138.90	141.12	140.01	39.37	40.95	40.16	10.94	11.38	11.16
S_3	137.83	139.36	138.59	38.96	39.36	39.16	10.82	10.93	10.88
S_4	137.01	139.56	138.28	39.16	40.48	39.82	10.88	11.24	11.06
S_5	129.49	133.67	130.99	33.78	32.97	33.38	9.38	9.16	9.27
S_6	128.24	132.49	130.95	33.71	32.29	33.00	9.36	8.97	9.17
S.Em.±	2.918	3.300	2.203	1.051	0.825	0.668	0.292	0.229	0.186
CD at 5 %	8.37	NS	6.21	3.02	2.37	1.88	0.84	0.66	0.52
CV %	6.50	7.19	6.86	8.44	6.55	7.55	8.44	6.55	7.55
P x S	NS	NS	NS	NS	NS	NS	NS	NS	NS

Conclusion

On the basis of two years investigation, it can be concluded that for getting higher yield the guava shoots should be pruned at 25 % level in the last week of May and plants sprayed with NAA 200 mg per litre at the time of flower initiation and second spray given after three weeks of first spray for Mrig bahar crop.

References

1. Agnihotri MK, Sarolia DK, Singh V, Shukla AK. Journal of Agriculture and Ecology. 2016; 1:85-90. http,//saaer.org.in
2. Dhaliwal GS, Kaur R. Haryana J hort. Sci. 2003; 32(1-2):21-24.
3. Dhaliwal GS, Singh G. Haryana Journal of Horticultural Sci. 2004; 33(3/4):175-177.
4. Dhaliwal GS, Rattanpal HS, Gill HS. Haryana J hort. Sci. 2000; 29(1-2):17-20.
5. Gomez AK, Gomez AA. John Willey and Sons., Inc., New York, 1996, 680.
6. Jadhav BJ, Mahurkar VK, Kale VS. Orissa J. Hort. 2002; 30(2):83-86.
7. Lal N, Das RP. International Journal of Currant Microbiol. App. Sci. 2017; 6(5):857-863. Doi, https//doi.org/10.20546/ ijcmas. 2017.605.096
8. Lal N, Das RP, Verma LR. The Asian J Hort. 2013; 8(1):54-56.
9. Mohammad S, Sharma JR, Kumar R, Gupta RB, Singh S. Haryana J hort. Sci. 2006; 35(3-4):211-212.
10. Nkansah GO, Amin JO, Mawuli A. Am. J Plant Physiol. 2012; 7(6):243-251.
11. Singh HJ, Bal JS. Hayrana J hort. Sci. 2007; 36(3&4):224-227.
12. Singh R. Indian J Hort. 2001; 58:33-40.