EFFECTS OF TIP PRUNING AND MULCHING ON FRUIT DEVELOPMENT AND YIELD OF GUAVA (*PSIDIUM GUAJAVA* L) CV. ALLAHABAD SAFEDA

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ABSTRACT

Effects of tip pruning (level of tip pruning of 10cm, 15cm, 20cm and control) and mulching (Black polythene mulch, Paddy straw mulch, and no mulch) of two and half years old guava cv. Allahabad Safeda. Among pruning treatments, tip pruning of 15cm with paddy straw mulch has recorded the highest number of fruits per tree at the time of harvest and yield per tree when compared to control. Tip pruning of 10cm with black polythene mulch has recorded higher fruit length, fruit breadth and fruit weight (mm) of guava cv. Allahabad Safeda.

KEYWORDS: Tip Pruning, Allahabad Safeda & Polythene Mulch has Recorded

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INTRODUCTION

Guava (*Psidium guajava* L.) is one of the most important fruit crops. The fruit belongs to the family Myrtaceae, which has 140 genera and 3000 species widely distributed throughout the tropical and sub-tropical regions of the world. It is native to Tropical America, stretching from Mexico to Peru and gradually became a crop of commercial significance in several countries like Brazil, Mexico, China, Malaysia, the Hawaiian Island, Cuba, and India. In India, it has been introduced in the early seventeenth century by the Portuguese and gradually became a crop of commercial significance all over the country. It stands fourth most important fruit crop in both area and production after mango, banana, and citrus. At present in India, it occupies nearly 2, 68, 000 ha area with a production of 36.67 lakh tonnes and productivity 13.7 MT ha⁻¹ (NHB, 2014). Though it is successfully grown all over the country, the important guava growing states are Maharashtra, Madhya Pradesh, Uttar Pradesh, Bihar, West Bengal, Punjab, Gujarat, Karnataka, Andhra Pradesh, and Telangana. It is grown in the districts of Telangana are Rangareddy, Khammam, and Medak with an area of 6000 ha with 90,000 tonnes of production with the productivity of 15 MT ha⁻¹ (NHB, 2014).

Guava is also known as “Apple of tropics” because of its richness in vitamins and minerals. It is a good source of thiamine, riboflavin, and vitamin-C. Besides this guava fruits also provide minerals like phosphorous, calcium and iron. The fruits are also used for jelly making and preparation of other kinds of preserved products. Guava fruits are climacteric, with a relatively short shelf life which is a rich source of ascorbic acid, pectin, sugars and certain minerals.

Pruning is a cultural practice which is quite helpful in reducing the tree size and improving the fruit quality as well. This gives an opportunity to increase the number of trees per unit area and subsequently the higher yield (Haropinderjit and Bal. 2007). Pruning is an unavoidable necessity of virtually all arboreal fruit crops. Tip pruning

can be used in a variety of circumstances to produce predictable and useful results for a variety of purposes. Pruning is an operation familiar to all arborists and horticulturists managing growth and reproductive habit of fruit trees (Thomas Davenport, 2006). Generally in guava pruning practice is being done for crop regulation. In guava, crop regulation encourages vegetative growth, but fruit size was decreased. Under such circumstances in guava, tip pruning was done on the fruit development stage. During the fruit development, an extension of the shoot growth acts as a sink and hinders the fruit development of guava. Tip pruning or Tip pinching removes the active sinks and the transpiring surface which greatly enhances the fruit development. Tip pruning is defined as pruning terminal stems anywhere from the apex to point down the stem that is no larger than 1cm diameter. Given adequate water and nutrition, tip pruning forces rapid initiation of lateral stem buds to form lateral shoots in a pattern determined by the location of the pruning cut (Thomas Davenport, 2006). In mango, custard apple tip pruning is done for the flowering program.

In India, studies have been conducted to standardize pruning in guava, however, pruning of guava is not yet been undertaken commercially due to the fact of being an evergreen fruit plant, guava does not extend much growth annually. Judicious pruning can be useful to make guava trees bear profitable crops year after year (Brar *et al.* 2007). The results of studies have indicated that whenever pruning has been attempted in guava, there has been noticed a vast improvement in yield and fruit quality, especially with light pruning (Gurdarshan, 2012). However, studies on tip pruning have not standardized.

Mulching is an important soil management practice of covering the soil surface around the base of plants to make conditions more favorable for growing and to conserve the available soil moisture. The other well-known effects of mulching are regulation of soil temperature, improvement of soil aeration, control of weed population and the increase in organic matter content. Due to the beneficial effects of mulching practice in fruit cultivation, it ensures the better quality fruit production with high yield and better return to the grower (Das *et al.* 2010). Under such scenario, mulching practices will ensure better yield and quality of the fruit. Numerous studies have standardized the time and intensity of pruning for crop regulation of guava. However, the combination of mulching and tip pruning has not been standardized in guava. Hence, the present study entitled **“Effects of tip pruning and mulching on fruit development, yield and quality of guava (*Psidium guajava* L.) cv. Allahabad Safeda”**

MATERIALS AND METHODS

The research was carried out in Fruit Research Station, Sangareddy district SKLTSHU, Telangana during 2016-17. Two and half years old, well grown, uniform statured trees of guava cv. Allahabad Safeda were selected for the experiment. Trees were spaced with 2.5 × 2.5m and planted in the square system. The experiment was laid in a randomized block design with factorial concept replicated thrice with twelve treatments. The observations are recorded on the number of fruits per tree at the time of harvest, yield per tree (kg/ tree), date of maturity of fruit, fruit length and fruit breadth (mm) (weekly data) and at the time of harvest of guava cv. Allahabad Safeda. The number of fruits per tree at the time of harvest calculated by counting all fruits at the time of harvest per each tree. The total weight of fruits harvested per each tree was recorded to obtain fruit yield per tree and expressed in kilograms. Date of maturity of fruit is calculated by counting the number of days taken for a fruit to mature from fruit set. In this fruit size, i.e. fruit length & breadth are measured weekly during fruit development stage with the help of vernier calipers and expressed in terms of millimeters. The weight of harvested fruits was recorded with the help of electronic balance and expressed as fruit weight in grams. The data were subjected to statistical analysis as per the procedure outlined by Sheoran (1998).

RESULTS AND DISCUSSIONS

YIELD PARAMETERS

The results of tip pruning and mulching on the number of fruits per tree at the time of harvest and yield per tree (kg) which was presented in the table1 & 2. A maximum number of fruits per tree at the time of harvest were recorded in the 15cm level of tip pruning and paddy straw mulch (85.66). The minimum number of fruits per tree at the time of harvest was recorded in control and no mulch (23.00). Maximum yield per tree was recorded in the 15cm level of tip pruning and paddy straw mulch (17.13). Minimum yield per tree was recorded in control and no mulch (4.60). Non- significant difference has observed among tip pruning and mulching with respect to the date of maturity of fruit is presented in table 3.

Table 1: Effect of Tip Pruning and Mulching on Number of Fruits per Tree Yield per Tree (kg) and Date of Maturity of Fruit of Guava cv. Allahabad Safeda

Treatments	Number of Fruits per Tree				Yield per Tree (kg)				Date of Maturity of Fruit			
	Mulching				Mulching				Mulching			
	M ₁	M ₂	M ₃	Mean	M ₁	M ₂	M ₃	Mean	M ₁	M ₂	M ₃	Mean
10cm	55.00	49.66	42.66	49.11 ^b	11.00	9.93	8.20	9.71 ^b	117.00	111.33	117.33	115.22
15cm	53.66	85.66	74.33	71.22 ^a	10.73	17.13	14.53	14.13 ^a	119.33	112.33	115.66	115.77
20cm	45.66	46.66	41.66	44.66 ^b	9.13	9.33	8.33	8.93 ^b	118.66	114.00	113.33	115.33
Control	32.00	20.33	23.00	25.11 ^c	6.40	4.06	4.60	5.02 ^c	116.33	119.00	122.00	119.11
Mean	46.58 ^{ab}	50.58 ^a	45.41 ^b		9.31 ^b	10.11 ^a	8.91 ^b		117.83	114.16	117.08	
Level of tip Pruning (P)	S(E)m±		CD @ 5%		S(E)m±		CD @ 5%		S(E)m±		CD @ 5%	
	1.60		4.69		0.31		0.90		2.03		NS	
Mulching (M)	1.38		4.06		0.26		0.78		1.76		NS	
P × M	2.77		8.13		0.53		1.57		3.52		NS	

Significant at (0.05 –p LOS), NS- Non- Significant, Means with similar alphabets denote did not differ significantly. Values are compared with respective C.D values.

FRUIT DEVELOPMENT

Fruit Length and Fruit Breadth

Fruit length and fruit breadth on 1st to 7th week after tip pruning and mulching was presented in table 4 &5. A significant difference was observed with respect to tip pruning and mulching from 1st to 7th week. The non-significant difference was observed in interaction effect from 1st week to 3rd week of fruit length and fruit breadth. Maximum fruit length (7th week) was recorded in a 10cm level of tip pruning and black polythene mulch (68.69). Minimum fruit length was recorded in control and no mulch (47.99). Maximum fruit breadth (7th week) was recorded in a 10cm level of tip pruning and black polythene mulch (68.67). Minimum fruit breadth was recorded in control and no mulch (45.73).

A significant difference was observed in interaction effect between tip pruning and mulching on fruit length and fruit breadth at the time of harvest of guava shown in table6&7. Maximum fruit length was recorded in a 10cm level of tip pruning and black polythene mulch (69.57). Minimum fruit length was recorded in control and no mulch (47.06). Maximum fruit breadth was recorded in a 10cm level of tip pruning and black polythene mulch (70.60). Minimum fruit breadth was recorded in control and no mulch (47.39).

FRUIT WEIGHT (g)

There was a significant difference among tip pruning and mulching with respect to fruit weight (g) was presented in table 8. Maximum fruit weight was recorded in a 10cm level of tip pruning and black polythene mulch (186.17). Minimum fruit weight was recorded in control and no mulch (57.64).

Table 2: Effect of Tip Pruning and Mulching on Fruit Size (Weekly Data) Fruit Length (mm) of Guava Cv. Allahabad Safeda

1 st week After Tip Pruning and Mulching					2 nd week After Tip Pruning and Mulching				3 rd week After Tip Pruning and Mulching				4 th week After Tip Pruning and Mulching			
Treatments	Mulching				Mulching				Mulching				Mulching			
	M ₁	M ₂	M ₃	Mean	M ₁	M ₂	M ₃	Mean	M ₁	M ₂	M ₃	Mean	M ₁	M ₂	M ₃	Mean
10cm	51.94	46.76	39.26	45.99 ^a	56.05	48.76	41.26	48.69 ^a	58.33	51.26	44.95	51.51 ^a	63.39	52.90	45.84	54.05 ^a
15cm	44.35	43.01	39.78	42.38 ^b	47.02	45.34	41.41	44.59 ^b	47.09	46.54	45.17	46.27 ^b	48.44	46.63	46.23	47.10 ^b
20cm	40.94	41.18	39.75	40.56 ^b	43.46	43.18	40.85	42.49 ^b	48.51	46.33	41.79	45.54 ^b	49.58	51.22	43.34	48.05 ^b
control	42.60	38.78	36.16	39.18 ^b	43.93	39.17	37.64	40.24 ^c	44.76	41.69	38.02	41.49 ^c	44.35	42.72	39.24	42.10 ^c
Mean	44.96 ^a	42.34 ^a	38.69 ^b		47.61 ^a	44.11 ^a	40.29 ^b		49.67 ^a	46.45 ^a	42.48 ^b		51.44 ^a	48.37 ^a	43.66 ^b	
	S(E)m±		CD @ 5%		S(E)m±		CD @ 5%		S(E)m±		CD @ 5%		S(E)m±		CD @ 5%	
	1.09		3.21		1.13		3.33		1.14		3.37		1.36		4.00	
Mulching (M)	0.95		2.78		0.98		2.89		0.99		2.92		1.18		3.47	
P × M	1.90		NS		1.97		NS		1.99		NS		2.36		NS	

Significant at (0.05 –p LOS), NS- Non- Significant, Means with similar alphabets denote did not differ significantly, Values are compared with respective C.D values table 2 cont.

Table 2 Continued

5 th Week After Tip Pruning and Mulching					6 th Week After Tip Pruning and Mulching				7 th Week After Tip Pruning and Mulching			
Treatments	Mulching				Mulching				Mulching			
	M ₁	M ₂	M ₃	Mean	M ₁	M ₂	M ₃	Mean	M ₁	M ₂	M ₃	Mean
10cm	65.33	55.84	48.11	56.43 ^a	67.66	57.84	50.11	58.54 ^a	68.69	58.57	50.99	59.41 ^a
15cm	50.33	48.57	48.20	49.03 ^b	52.32	50.57	50.20	51.03 ^b	53.28	51.54	51.23	52.01 ^b
20cm	51.92	54.20	45.99	50.70 ^b	53.92	55.54	47.99	52.48 ^b	55.07	56.42	48.99	53.49 ^b
Control	46.57	46.01	41.98	44.85 ^c	48.57	48.01	44.43	47.00 ^c	49.57	49.01	45.39	47.99 ^c
Mean	53.53 ^a	51.15 ^a	46.07 ^b		55.62 ^a	52.99 ^a	48.18 ^b		56.65 ^a	53.88 ^a	49.15 ^b	
Level of Tip Pruning (P)	S.E.m±		CD @ 5%		S.E.m±		CD @ 5%		S.E.m±		CD @ 5%	
	1.32		3.88		1.32		3.88		1.33		3.92	
Mulching (M)	1.14		3.36		1.14		3.36		1.15		3.39	
P × M	2.29		6.72		2.29		6.73		2.31		6.79	

Significant at (0.05 –p LOS), NS- Non- Significant, Means with similar alphabets denote did not differ significantly, Values are compared with respective C.D values.

Table 3: Effect of Tip Pruning and Mulching on Fruit Size (Weekly Data)
Fruit Breadth (mm) of Guava Cv. Allahabad Safeda

Treatments	1 st Week After Tip Pruning and Mulching				2 nd Week After Tip Pruning and Mulching				3 rd Week After Tip Pruning and Mulching				4 th Week After Tip Pruning and Mulching			
	Mulching				Mulching				Mulching				Mulching			
	M ₁	M ₂	M ₃	Mean	M ₁	M ₂	M ₃	Mean	M ₁	M ₂	M ₃	Mean	M ₁	M ₂	M ₃	Mean
10cm	50.16	46.90	38.46	45.18 ^a	54.00	49.08	40.46	47.85 ^a	57.67	51.08	42.63	50.46 ^a	62.33	52.90	44.84	53.36 ^a
15cm	41.44	39.45	39.32	40.07 ^b	43.44	41.45	41.32	42.07 ^b	45.44	43.42	43.59	44.15 ^b	47.41	45.63	45.38	46.14 ^b
20cm	42.52	44.22	34.97	40.57 ^b	44.67	46.07	37.06	42.60 ^b	46.73	48.07	39.00	44.60 ^b	48.52	50.22	41.05	46.60 ^b
control	37.51	35.74	33.52	35.59 ^c	39.39	37.74	35.58	37.57 ^c	41.57	39.68	37.37	39.54 ^c	43.42	41.72	39.58	41.57 ^c
Mean	42.91 ^a	41.58 ^a	36.57 ^b		45.37 ^a	43.58 ^a	38.60 ^b		47.85 ^a	45.56 ^a	40.64 ^b		50.42 ^a	47.62 ^b	42.71 ^c	
Level of tip pruning (P)	S.E.m±		CD @ 5%		S.E.m±		CD @ 5%		S.E.m±		CD @ 5%		S.E.m±		CD @ 5%	
	1.35		3.98		1.37		4.03		1.39		4.10		1.34		3.93	
Mulching (M)	1.17		3.45		1.18		3.49		1.21		3.55		1.16		3.41	
P × M	2.35		NS		2.37		NS		2.42		NS		2.32		6.82	

Significant at (0.05 –p LOS), NS- Non- Significant, Means with similar alphabets denote did not differ significantly. Values are compared with respective C.D values. Table 3 cont.

Table 3 Continued

Treatments	5 th Week After Tip Pruning and Mulching				6 th Week After Tip Pruning and Mulching				7 th Week After Tip Pruning and Mulching			
	Mulching				Mulching				Mulching			
	M ₁	M ₂	M ₃	Mean	M ₁	M ₂	M ₃	Mean	M ₁	M ₂	M ₃	Mean
10cm	64.67	54.90	46.84	55.47 ^a	66.67	56.57	48.84	57.36 ^a	68.67	58.57	50.84	59.36 ^a
15cm	49.16	47.63	47.38	48.06 ^b	51.41	49.63	49.38	50.14 ^b	53.41	51.63	51.38	52.14 ^b
20cm	50.52	52.22	43.06	48.60 ^b	52.52	54.19	45.06	50.59 ^b	54.58	56.07	47.00	52.55 ^b
control	45.42	42.99	41.58	43.33 ^c	47.42	45.32	43.58	45.44 ^c	49.57	47.32	45.73	49.57 ^b
Mean	52.44 ^a	49.43 ^a	44.71 ^b		54.50 ^a	51.43 ^a	46.71 ^b		56.56 ^a	53.40 ^a	48.74 ^b	
Level of tip pruning (P)	S.E.m±		CD @ 5%		S.E.m±		CD @ 5%		S.E.m±		CD @ 5%	
	1.38		4.05		1.36		4.01		1.37		4.03	
Mulching (M)	1.19		3.51		1.18		3.47		1.19		3.49	
P × M	2.39		7.02		2.37		6.96		2.38		6.98	

Significant at (0.05 –p LOS), NS- Non- Significant, Means with similar alphabets denote did not differ significantly. Values are compared with respective C.D values

Table 4: Effect of Tip Pruning and Mulching on Fruit Length, Fruit Breadth (mm) and Fruit Weight (g) of Guava Cv. Allahabad Safeda

Treatments	Fruit Length (at the Time of Harvest)				Fruit Breadth (at the Time of Harvest)				Fruit Weight(g)			
	Mulching				Mulching				Mulching			
	M ₁	M ₂	M ₃	Mean	M ₁	M ₂	M ₃	Mean	M ₁	M ₂	M ₃	Mean
10cm	69.57	59.75	51.99	60.44 ^a	70.60	60.75	52.93	61.43 ^a	186.17	122.99	86.72	131.96 ^a
15cm	54.31	52.53	52.23	53.02 ^{bc}	55.23	53.63	53.32	54.06 ^b	99.94	95.06	84.57	93.19 ^b
20cm	56.01	57.45	50.05	54.50 ^b	56.92	58.40	49.00	54.77 ^b	86.22	95.61	85.00	88.94 ^b
control	50.57	50.01	47.06	49.21 ^c	51.57	50.05	47.39	49.67 ^c	85.17	75.79	57.64	72.87 ^c
Mean	57.61 ^a	54.93 ^a	50.33 ^b		58.58 ^a	55.71 ^a	50.66 ^b		114.37 ^a	97.36 ^a	78.48 ^b	
Level of Tip Pruning (P)	S.E.m±		CD @ 5%		S.E.m±		CD @ 5%		S.E.m±		CD @ 5%	
	1.34		3.94		1.35		3.96		7.16		21.00	
Mulching (M)	1.16		3.41		1.17		3.43		6.20		18.19	
P × M	2.32		6.82		2.34		6.86		12.40		36.38	

Significant at (0.05 –p LOS), NS- Non- Significant, Means with similar alphabets denote did not differ significantly. Values are compared with respective C.D values

DISCUSSIONS

A significant increase in a number of fruits per tree at the time of harvest and yield per tree with the 15cm level of tip pruning and paddy straw mulch. There was an increase of 62% in yield with tip pruning when compared to control. Increase in a number of fruits per at the time of harvest and yield per tree might be due to the combined effect of tip pruning and mulching. The positive response to tip pruning treatments might be due to an optimum balance between the vegetative and reproductive growth of trees. Lightly pruned trees can efficiently supply auxin which has resulted in higher yield. Mulching treatments on yield might be due to better soil moisture conservation, regulating temperature, suppressing weed growth and water balance which helped to maintain more number of fruits per tree by reducing fruit drop at harvest and increased fruit retention. Increased nitrogen and phosphorous uptake under mulching also increased the fruit yield. Similar results were earlier noticed by, Bound and Summers (2001), Sheikh and Rao (2002), Ali and Gaur, 2007 in strawberry, Brar et al. (2007), Moniruzzaman et al. (2007), Das et al. (2010) in guava, Gupta and Gill (2015), Lakpathi et al. (2013), Adhikari and Tanka (2015) and Animesh et al. (2017).

Tip pruning of 10cm with black polythene mulch has significantly increased fruit length, fruit breadth (1st to 7th week and at the time of harvest) and fruit weight of guava cv. Allahabad Safeda. Similar results earlier reported by Bhanu Pratap et al. (2009) in mango, Animesh et al. 2017 in guava cv. Kazi, Ali and Gaur (2007) in strawberry cv. Sweet Charlie, Bal and Surjit (2011) in ber, (Sonkar et al. 2012), Ram et al. (2013), Lakpathi et al. (2013), Ali et al. (2014), Bhanukar et al. (2015) in kinnow mandarin and Iqbal et al. (2015) in Aonla cv. NA-7. Fruit length and breadth have increased after tip pruning, starting from 1st week to 7th week and at the time of harvest, which might due to when the tip portion has pruned at the time of fruit development stage whatever reserved food materials were translocated to for an increase in fruit size. These absorbed nutrients might have been utilized by the fruits as a result of which increase in size and weight of fruits (Sonkar et al. 2012). Tip pruning or Tip pinching removes the active sinks and a transpiring surface which greatly enhances the fruit development (Thomas Davenport, 2006). Increased absorption of nutrients and soil moisture with black polythene mulch has increased fruit size and fruit weight. Moreover mulching will increase water evaporation by reducing weed growth ultimately fruit size and weight increased (Das et al. (2010).

CONCLUSIONS

15cm level of tip pruning with paddy straw mulch had given a significantly highest number of fruits per tree at the time of harvest and yield per tree (kg). 10cm level of tip pruning with black polythene mulch had recorded highest fruit length, fruit breadth and fruit weight of guava cv. Allahabad Safeda.

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