

Original Research Article

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Pruning Severity in High Density Guava for Higher Returns

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ABSTRACT

The present experiment was carried out at Horticulture Research Centre, Patharchatta, Department of Horticulture, GBPUA&T, Pantnagar, India under high density planting of guava cv. Pant Prabhat. The study was conducted to find out the interaction effect of pruning severity and plant spacing on growth, yield and profit. The treatments consisted of two plant spacing and seven pruning severity viz., One leaf pair shoot pruning (P₁, OLP); Two leaf pairs shoot pruning (P₂, TLP); Three leaf pairs shoot pruning (P₃, THLP); Thinning out of non-fruiting shoots + One leaf pair shoot pruning (P₄, TNFS+OLP); Thinning out of non-fruiting shoots + Two leaf pairs shoot pruning (P₅, TNFS+TLP); Thinning out of non-fruiting shoots + Three leaf pairs shoot pruning (P₆, TNFS+THLP); Thinning out of non-fruiting shoots only (P₇, TNFS) and no pruning (P₀) as control. In this way there were eight treatments with sixteen combinations replicated four times each with two plants in one experimental unit. The annual increase in plant height, plant spread and plant volume were found maximum in unpruned plants (P₀), while, the stem diameter was found maximum with treatment P₄ (TNFS+OLP). The pruning severity had significantly decreased the per cent fruit set for rainy season crop and subsequently increased the per cent fruit set for winter season crop. The higher fruit yield was obtained with treatment P₄ (TNFS+OLP) followed by treatment P₁ (OLP). The unpruned plants (P₀) produced lowest fruit yield in winter season. The highest benefit: cost ratio was calculated with the treatment P₄ (TNFS+OLP) and 2.0 x 1.0 m plant spacing. Hence, for achieving higher winter season crop with maximum profit under high density plantation of guava, complete removal of non-fruiting shoots followed by one leaf pair shoot pruning of current seasons growth should be done during first week of May.

Keywords

Guava, High density, Pruning severity, Non-fruiting shoots, Winter season

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Introduction

Guava (*Psidium guajava* L.) is famous as “poor man’s fruit” and belongs to family

Myrtaceae (Prakash *et al.*, 2002). Guava occupies 5th position in terms of area after mango, citrus, banana and apple and also 5th position in production in India. It contributes

3.90 percent of the total production of fruits in India, which is around 4.236 million tonnes from an area of 0.276 thousand hectare and productivity is around 15.35 tonnes per hectare (NHB, 2019).

It has a very important fruit due to its nutrient content and is known as “The apple of tropics”. Guava is the third richest source of vitamin C (200-300 mg/100g of pulp), after Barbados cherry (*Malpighia emarginata*) (1000-4000 mg/100 g pulp) and Aonla (600 mg/100 g pulp) fruit (Gupta and Naik, 2008). Besides vitamin C, guava fruits are also rich source of vitamin A (250 IU/100g fruit pulp), pectin (0.5-1.8 %), riboflavin (B₂, 0.02-0.04 mg/100g pulp), and thiamine (B₁, 0.03-0.07 mg/100 g pulp) as compared to other fruits (Sharma, 2010; Pal *et al.*, 2017). In tropical and subtropical conditions of northern India, two major flowering seasons are common *i.e.*, summer (April-May) and rainy (July-August). The summer (April- May) flowering produces rainy season crop and rainy season (July- August) flowering produces winter season crop. In *tarai* conditions of India, guava trees produce 85-90% crop in rainy season and 8-10 % in winter season. This feature in guava cultivation is a major source of concern. Rainy season fruits are rough, insipid, poor in quality, less nutritive, easily affected by insect pests and have very short shelf life and due to these characteristics the guava fruits do not fetch remunerative prices. Whereas, the winter season fruits are superior in quality, free from diseases and pests and fetch more prices in the market. Winter season crop have better storage life and thus can be transported to destination offering remunerative prices (Singh *et al.*, 2001, Tyagi and Patel, 2004; Tiwari and Lal, 2007).

Guava is a pruning responsive crop and fruiting occurs in current season growth. Shoot pruning in high density orchards is prerequisite to maintain the desired canopy of

this fast growing guava plant (Lal *et al.*, 2000). The efficient training and pruning can maintain the proper canopy size of the guava tree, improve fruit quality and provide opportunity to increase the number of trees per unit area (Nautiyal *et al.*, 2016). Presently shoot pruning has emerged as eco-friendly alternative method for regulating the guava crop. It is free from all the demerits of existing methods. On the other hand, pruning may be helpful in reducing the tree size and improving the fruit quality (Lal *et al.*, 2007). Shoot pruning in high density orchards is prerequisite to maintain the desired canopy of this fast growing guava plant. The need exists for some refinement in shoot pruning technique where flowering and fruit setting can be regulated to attain higher winter season fruiting especially for high density plantation.

Materials and Methods

The study was conducted at Horticulture Research Centre, Patharchatta, Department of Horticulture, G. B. Pant University of Agriculture and Technology, Pantnagar, India. Five years old grafted, well trained guava trees of uniform growth (modified leader system) and planted under high density were selected for the study. The treatments consisted of two plant spacing (*i.e.* 2.0 m x 1.0 m and 2 m x 2 m spacing) and seven pruning severity [One leaf pair shoot pruning (P₁, OLP:); Two leaf pairs shoot pruning (P₂, TLP); Three leaf pairs shoot pruning (P₃, THLP); Thinning out of non-fruiting shoots + One leaf pair shoot pruning (P₄, TNFS+OLP); Thinning out of non-fruiting shoots + Two leaf pairs shoot pruning (P₅, TNFS+TLP); Thinning out of non-fruiting shoots + Three leaf pairs shoot pruning (P₆, TNFS+THLP); Thinning out of non-fruiting shoots (P₇, TNFS). with no pruning (P₀) as control (Plate 1). In this way there were eight treatments with sixteen combinations replicated four times each with two plants in one

experimental unit. The experiment was laid out in factorial randomized block design. During the month of February, in the first year, all the plants were topped to a uniform height of 1.75 m from the ground level. Emergence of new shoot began after 20-25 days of topping. The same procedure was followed in the month of February next year. Shoot pruning of current season's growth was done as per treatment, with the help of secateurs, in the last week of April during both the years of study. The observations on growth and yield attributes and economic analysis were recorded during both the seasons (Rainy and winter season). The data were analyzed according to the procedure of analysis for Factorial Randomized Block Design. The significance of variation among the treatments was observed by applying 'F' test and critical difference at 5 per cent probability was calculated to compare the mean values of treatments for all the characters.

Results and Discussion

Effect of pruning severity and plant spacing on plant growth

The interaction between plant spacing and pruning severity, non-significantly affected the plant height (Table 1). However, the maximum annual increment in plant height was observed with treatment combination S_2P_0 (2.0 x 2.0 m plant spacing and unpruned plants) during both the years. While minimum increment in plant height was found with treatment combination S_1P_4 (plant spaced at 2.0 x 1.0 m and TNFS+ OLP) during first and second year. The interaction of plant spacing and pruning severity gave significant effect on plant spread during both the years (Table 1). The maximum increment in plant spread was observed with treatment combination S_2P_0 (2.0 x 2.0 m plant spacing and unpruned plants) during both the years. The annual

increase in plant height and plant spread were found maximum in unpruned plants (P_0). As pruning severity increased, decrease in plant height and plant spread was observed.

The data presented in Table 2 shows that interaction among plant spacing and pruning severity non-significantly affected the stem diameter during both the years. The maximum annual increment in stem diameter was observed with treatment combination S_2P_4 (2.0x 2.0 m and TNFS+OLP) during both the years. The interaction between plant spacing and pruning severity non-significantly affected the plant volume (Table 2). The higher annual increase in plant volume was observed with treatment combination S_2P_0 (plant spacing 2.0 x 2.0 m and unpruned plant) during both the years. The lowest annual increment in plant volume was observed with treatment combination S_1P_4 (plant spacing 2.0 x 1.0 m and TNFS+OLP).

Therefore, data pertaining to plant growth suggested that wider spacing (2.0 x 2.0 m) gave higher increase in plant height, plant spread, stem diameter and plant volume. As spacing increased the plant growth increases significantly. It was due to more light penetration in wider spacing and subsequently accumulation of more photosynthetic reserves in plants. The annual increase in plant growth was recorded minimum in closed spacing due to less light penetration into foliage and restricted apical growth, ultimately reducing plant growth and vigour. While working in different plant spacing of guava crop, similar reports have also been reported (Lal *et al.*, 2007; Pilania *et al.*, 2010; Pratibha *et al.*, 2013; Pal and Lal, 2015). The annual increase in plant height, plant spread and plant volume were found maximum in unpruned plants (P_0) while the stem diameter was found maximum with treatment P_4 (TNFS+OLP) As pruning severity increased, decrease in plant growth except stem diameter was observed. The

shoot pruning severity overcomes apical dominance thus, increasing the activity of cytokinin which helps to promote growth in terms of stem diameter. In other hand, the stored carbohydrates in plants and available nutrients in soil have been utilized by plants, which might have been used for further growth of pruned shoots (Marini, 2014). Therefore, the severely pruned plants showed minimum annual increment in plant growth.

Effect of pruning severity and spacing on yield attributes

The data presented in Table 3 unveil that the severity of pruning and plant spacing significantly affected per cent fruit set for both the seasons (rainy and winter) during both the years. Among the plant spacing, 2.0 × 2.0 m plant spacing (S_2) gave higher per cent fruit set (34.30% and 35.49%) for rainy season crop during both the years, while, plant spaced at 2.0 × 1.0 m (S_1) gave maximum per cent fruit set (72.95% and 71.24%) for winter season crop during both the years.

The pruning severity had significantly decreased the per cent fruit set for rainy season crop during both the years and subsequently increased the per cent fruit set for winter season crop during both the years. The higher per cent fruit set (65.55% and 71.17%) was recorded with unpruned plants (P_0) for rainy season crops followed by treatment P_7 (TNFS). The minimum fruit set percentage (14.82 % and 15.42 %) was obtained with treatment P_4 (TNFS+OLP) in rainy season crop during both the years. However, for winter season crop, the maximum per cent fruit set (77.76% and 78.05%) was recorded with treatment P_4 (TNFS+OLP) followed by treatment P_6 (TNFS+THLP). The minimum fruit set percentage (59.61 % and 66.08 %) was recorded in treatment P_7 (TNFS) during both

the years. The data presented in Table 4 clearly showed that severity of pruning had significant effect on per cent fruit retention for both the seasons during both the years. The highest fruit retention percentage (51.03% and 45.08%) was recorded in unpruned plants (P_0), while, lowest (9.18% and 9.12%) was observed with treatment P_4 (TNFS+OLP) in rainy season crop during both the years. However, in winter season the highest fruit retention percentage (53.64%) was recorded with treatment P_3 (THLP) in the first year of experiment. During second year, the maximum per cent fruit retention was obtained in treatment P_6 (TNFS+THLP) followed by treatment P_4 (TNFS with OLP) in winter season crop.

A critical observation of data presented in Table 5 clearly indicates that pruning severity, plant spacing and their interaction (Fig 1) significantly affected the yield per hectare in both seasons (rainy and winter) during both the years of experiment. The highest fruit yield (q) per hectare (204.97 q/ha and 187.37 q/ha) was obtained with unpruned plants. While, lowest fruit yield (q) per hectare (43.35 q/ha and 40.54 q/ha) was obtained with treatment P_4 (TNFS+OLP) in rainy season during both the years. However, the reverse trend was observed in winter season crop. The higher fruit yield (q/ha) (207.71 and 189.50 q/ha) was obtained with treatment P_4 (TNFS+OLP) followed by treatment P_1 (OLP). The unpruned plants (P_0) produced lowest fruit yield (41.19 and 36.32 q/ha) in winter season during both the years of investigation.

It was observed that as increased the plant population, the fruit yield (q) per hectare also increased. The highest total annual yield (q) per hectare (251.06 and 230.04 q/ha) was found with treatment P_4 (TNFS+OLP) followed by unpruned plants (P_0) during both the year. However, the lowest total annual

yield (q) per hectare was obtained in treatment P₆ (TNFS+ THLP) in first year and P₂ (TLP) in the second year of experiment. Among the spacing, the plant spaced at 2.0 × 1.0 m (S₁) produced higher yield (q) per hectare in both seasons (i.e. rainy and winter) during both the years of experiment. These results are in accordance with the earlier findings (Tiwari and Lal, 2007; Pratibha *et al.*, 2013; Joshi *et al.*, 2014; Kumawat *et al.*, 2014; Thakre *et al.*, 2016; Joshi *et al.*, 2016; Nautiyal *et al.*, 2016).

Pruning severity with complete removal of non fruiting shoots significantly decreased the yield in rainy season crop and subsequently increased the yield in winter season crop. This type of trend might be due to response of plant hormones, stored carbohydrates and available nutrients in soil. Shoot pruning overcomes the apical dominance and increases the activity of cytokinin and

gibberellins, which promotes emergence of new shoots. Cytokinin content and its activity is very high in all growing shoots of pruned plants (Murray, 2010). Elevated growth of new vegetation occurs after pruning. It strongly reduces nutrient reserves, in particular of carbohydrates, from unpruned plant parts (Marini, 2014). Shoot pruning, thus, affects the physiological processes of photosynthesis and non-structural carbohydrate synthesis. Non-structural carbohydrate reserves, mainly starch provide the energy to drive re-growth of pruned plants for rainy season flowering (i.e. winter season fruiting). The stored carbohydrates in plants and available nutrients in soil, which might have been used for further growth of non-fruiting shoots, have been utilized for emergence of new shoots and subsequently for impressive morphometric growth and enhanced fruit quality of winter season crop (Bagachi *et al.*, 2008).

Table.1 Interaction effect of plant spacing and pruning severity on plant height and spread of guava cv. Pant Prabhat

Treatments	Symbols	Annual increase in plant height (m)				Annual increase in plant spread (m)			
		First year		Second year		First year		Second year	
		S ₁ *	S ₂ *	S ₁	S ₂	S ₁	S ₂	S ₁	S ₂
Unpruned	P0	1.723	1.803	1.640	1.780	1.148	1.203	1.098	1.145
OLP	P1	1.485	1.573	1.523	1.433	0.928	0.983	0.870	0.965
TLP	P2	1.535	1.598	1.463	1.500	0.963	0.980	0.888	0.933
THLP	P3	1.638	1.715	1.483	1.653	0.935	1.015	0.885	0.958
TNFS+OLP	P4	1.448	1.485	1.395	1.425	0.883	0.913	0.865	0.898
TNFS+ TLP	P5	1.525	1.543	1.420	1.448	0.960	0.973	0.870	0.900
TNFS+ THLP	P6	1.543	1.598	1.428	1.485	0.945	0.955	0.940	0.893
TNFS	P7	1.648	1.708	1.470	1.635	1.013	1.155	0.960	1.015
SEm±		0.019		0.042		0.029		0.038	
CD at 5%		NS		NS		NS		NS	
CV (%)		2.430		5.690		5.900		8.085	

*(S₁-2.0 X 1.0 m , S₂-2.0 X 2.0 m)

Table.2 Interaction effect of plant spacing and pruning severity on stem diameter and plant volume of guava cv. Pant Prabhat

Treatments	Symbols	Annual increase in stem diameter (cm)				Annual increase in plant volume (m ³)			
		First year		Second year		First year		Second year	
		S ₁ *	S ₂ *	S ₁	S ₂	S ₁	S ₂	S ₁	S ₂
Unpruned	P0	0.858	1.098	0.923	1.125	1.185	1.361	1.032	1.221
OLP	P1	1.360	1.610	1.383	1.653	0.667	0.796	0.549	0.700
TLP	P2	1.255	1.425	1.278	1.535	0.748	0.803	0.604	0.689
THLP	P3	1.155	1.305	1.213	1.380	0.747	0.925	0.607	0.794
TNFS+OLP	P4	1.335	1.740	1.368	1.743	0.589	0.647	0.603	0.601
TNFS+ TLP	P5	1.390	1.710	1.348	1.698	0.734	0.762	0.562	0.614
TNFS+ THLP	P6	1.218	1.543	1.310	1.653	0.726	0.764	0.664	0.625
TNFS	P7	1.083	1.170	1.163	1.245	0.882	1.191	0.711	0.880
SEm±		0.0615		0.0544		0.0493		0.0572	
CD at 5%		NS		NS		NS		NS	
CV (%)		9.309		7.910		11.677		15.991	

Table.3 Effect of plant spacing and pruning severity on per cent fruit set of guava cv. Pant Prabhat

Treatments	Symbols	Fruit set (%)			
		First year		Second year	
		Rainy season	Winter season	Rainy season	Winter season
Spacing					
2.0 X 1.0 m	S ₁	34.46 (35.28)	72.95(58.97)	35.21(35.76)	71.29(57.73)
2.0 X 2.0 m	S ₂	34.30 (35.25)	69.57(56.70)	35.49(36.02)	70.06(56.92)
SEm±		(0.40)	(0.90)	(0.33)	(0.52)
CD at 5%		(1.52)	(3.38)	(0.93)	(1.48)
Pruning severity					
Unpruned	P0	65.66 (54.14)	70.95(57.45)	71.17(57.56)	67.99(55.59)
OLP	P1	14.82 (22.61)	70.45(57.59)	15.05(22.78)	68.49(55.92)
TLP	P2	24.38 (29.54)	71.61(57.93)	25.18(30.10)	71.38(57.74)
THLP	P3	35.93 (36.81)	72.26(58.51)	36.62(37.21)	71.86(58.04)
TNFS+OLP	P4	14.82 (22.59)	77.76(61.90)	15.42(23.06)	78.05(62.20)
TNFS+ TLP	P5	22.68 (28.34)	70.78(57.40)	23.15(28.70)	68.92(56.16)
TNFS+ THLP	P6	33.93 (35.58)	76.63(61.25)	33.77(35.52)	72.63(58.53)
TNFS	P7	62.84 (52.47)	59.61(50.65)	62.46(52.22)	66.08(54.42)
SEm±		(0.80)	(1.78)	(0.65)	(1.04)
CD at 5%		(3.04)	(6.77)	(1.85)	(2.97)
CV (%)		(6.42)	(8.71)	(5.13)	(5.15)

#Figures in parenthesis indicate transformed value

Table.4 Effect of plant spacing and pruning severity on per cent fruit retention of guava cv. Pant Prabhat

Treatments	Symbol	Fruit retention (%)			
		First year		Second year	
		Rainy season	Winter season	Rainy season	Winter season
Spacing					
2.0 X 1.0 m	S ₁	17.80(24.08)	45.98(42.66)	17.01(23.60)	44.96(42.08)
2.0 X 2.0 m	S ₂	23.70(28.29)	55.03(47.93)	22.80(27.77)	52.00(46.16)
SEm±		(0.35)	(0.85)	(0.34)	(0.58)
CD at 5%		NS	NS	NS	NS
Pruning severity					
Unpruned	P0	51.03(45.60)	42.66(40.75)	45.08(42.15)	40.85(39.70)
OLP	P1	11.98(20.10)	53.38(46.95)	10.61(18.91)	47.27(43.43)
TLP	P2	15.91(23.43)	52.45(46.46)	14.85(22.60)	48.21(43.98)
THLP	P3	19.95(26.42)	53.64(47.09)	21.14(27.29)	49.77(44.85)
TNFS+OLP	P4	9.18(17.54)	52.94(46.71)	9.12(17.42)	53.53(47.05)
TNFS+ TLP	P5	12.01(20.20)	53.19(46.84)	13.19(21.18)	51.55(45.89)
TNFS+ THLP	P6	14.19(22.05)	52.52(46.52)	14.72(22.43)	55.96(48.47)
TNFS	P7	31.5(34.17)	43.28(41.07)	30.54(33.42)	40.68(39.60)
SEm±		(0.70)	(1.70)	(0.68)	(1.16)
CD at 5%		(1.99)	(4.84)	(1.95)	(3.33)
CV (%)		(7.55)	(10.62)	(7.56)	(7.49)

#Figures in parenthesis indicate transformed value

Table.5 Effect of plant spacing and pruning severity on yield (q/ha) of guava cv. Pant Prabhat

Treatments	Symbol	Yield (q/ha)					
		First year			Second year		
		Rainy season	Winter season	Total yield	Rainy season	Winter season	Total yield
Spacing							
2.0 X 1.0 m	S ₁	99.94	143.45	243.39	97.13	137.48	234.69
2.0 X 2.0 m	S ₂	73.30	103.64	176.94	71.13	91.87	163.00
SEm±		3.96	2.32	3.24	1.95	2.02	2.82
CD at 5%		NS	NS	NS	NS	NS	NS
Pruning severity							
Unpruned	P0	204.97	41.19	246.16	187.37	36.32	223.69
OLP	P1	51.88	171.68	223.56	43.97	149.27	193.24
TLP	P2	67.69	122.57	190.27	63.37	113.85	177.21
THLP	P3	89.40	102.63	192.03	92.19	94.30	186.49
TNFS+OLP	P4	43.35	207.71	251.06	40.54	189.50	230.04
TNFS+ TLP	P5	53.16	153.71	206.87	57.44	143.12	200.56
TNFS+ THLP	P6	61.46	118.25	179.71	64.20	124.01	188.21
TNFS	P7	121.06	70.61	191.67	123.98	67.05	191.03
SEm±		3.96	4.65	6.48	3.90	4.05	5.66
CD at 5%		11.29	13.27	18.46	11.12	11.56	16.13
CV (%)		12.94	10.66	8.72	13.12	10.01	8.06

Table.6 Total cost of production (per hectare) of high density planting of guava cv. Pant Prabhat planted at 2.0 x 1.0 m spacing (S₁) (average of both the years)

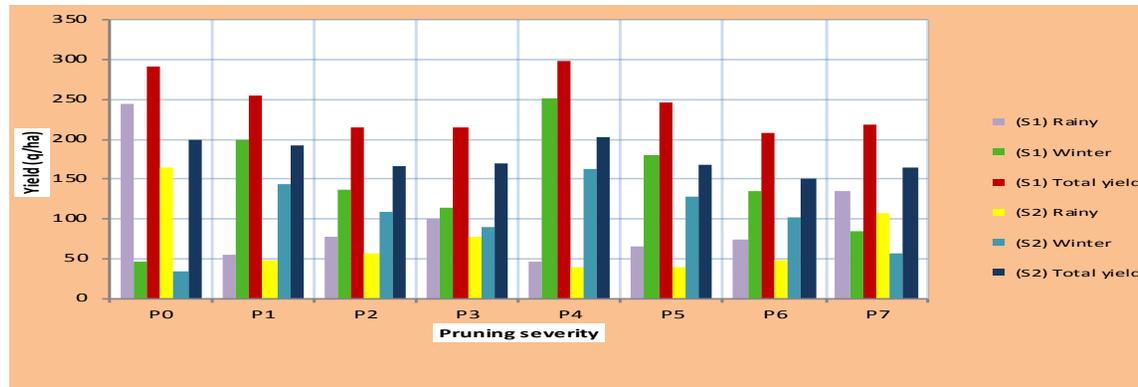
Treatments	Abbreviation	Operational cost ha/year (Rs.) [A]	Input cost (Rs.) [B]	Packaging and Transportation charge (Rs.) [C]	Total cost of production/ha/year (Rs.) [D=A+ B+C]	Treatment application cost/plant/year (Rs.)	Treatment application Cost/ ha [^] /year (Rs.) [X]	Total cost/ha/year (Rs.) (E= X+D)
P ₀	Unpruned	83250.00	42280.00	13000.00	138530.00	0.00	0.00	138530.00
P ₁	OLP	83250.00	42280.00	13000.00	138530.00	4.80*	24000.00	162530.00
P ₂	TLP	83250.00	42280.00	13000.00	138530.00	4.80*	24000.00	162530.00
P ₃	THLP	83250.00	42280.00	13000.00	138530.00	4.80*	24000.00	162530.00
P ₄	TNFS+OLP	83250.00	42280.00	13000.00	138530.00	6.25 [#]	31250.00	169780.00
P ₅	TNFS+TLP	83250.00	42280.00	13000.00	138530.00	6.25 [#]	31250.00	169780.00
P ₆	TNFS+THLP	83250.00	42280.00	13000.00	138530.00	6.25 [#]	31250.00	169780.00
P ₇	TNFS	83250.00	42280.00	13000.00	138530.00	3.85 ^{###}	19250.00	157780.00

(*52 plants/labour/day; [#] 40 plants/labour/day; ^{###} 65 plants/labour/day; Labour cost @ 250/day; [^] 5000 plants/ha)

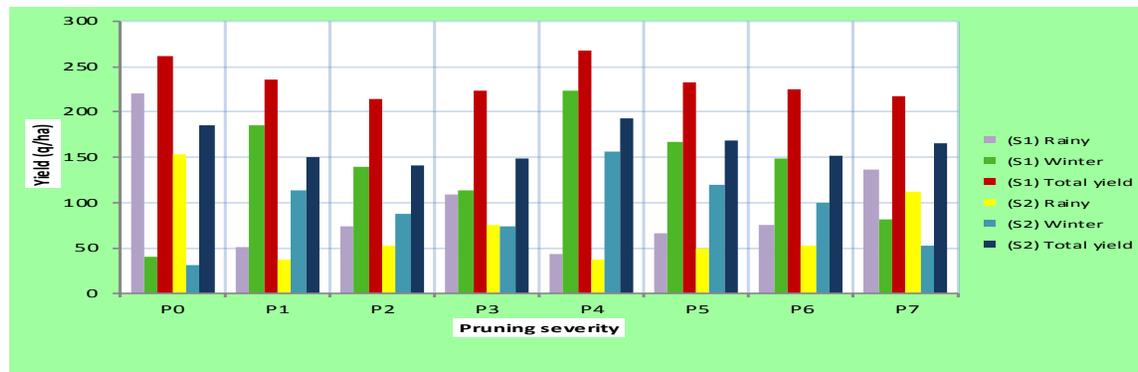
Table.7 Economic analysis of high density planting of guava cv. Pant Prabhat planted at 2.0 x 1.0 m spacing (S₁) (average of both the years)

Treatments	Abbre.	Total cost of production/ha/year (Rs.)	Avg. Yield (q/ha)			Gross return/ha/year (₹)			Net return/ha/year (Rs.)	Benefit: cost ratio
			Rainy	Winter	Total	Rainy (@ Rs. 12/kg)	Winter (@ Rs. 20/kg)	Total (Rs.)		
P ₀	Unpruned	138530.00	233.04	43.99	277.03	279648.00	87980	367628.00	215648.00	1.56
P ₁	OLP	162530.00	52.87	192.21	245.08	63444.00	384420	447864.00	268134.00	1.65
P ₂	TLP	162530.00	76.22	137.93	214.16	91464.00	275860	367324.00	187594.00	1.15
P ₃	THLP	162530.00	104.91	114.45	219.36	125892.00	228900	354792.00	175062.00	1.08
P ₄	TNFS+OLP	169780.00	45.33	237.74	283.07	54396.00	475480	529876.00	342146.00	2.02
P ₅	TNFS+TLP	169780.00	65.89	173.29	239.19	79068.00	346580	425648.00	237918.00	1.40
P ₆	TNFS+THLP	169780.00	74.81	141.58	216.39	89772.00	283160	372932.00	185202.00	1.09
P ₇	TNFS	157780.00	135.23	82.57	217.81	162276.00	165140	327416.00	152686.00	0.97

(#Treatments abbreviations:- P₁, OLP: One leaf pair shoot pruning; P₂, TLP: Two leaf pairs shoot pruning; P₃, THLP: Three leaf pairs shoot pruning; P₄, TNFS+OLP: Thinning out of non-fruiting shoots + One leaf pair shoot pruning; P₅, TNFS+TLP: Thinning out of non-fruiting shoots + Two leaf pairs shoot pruning; P₆, TNFS+THLP: Thinning out of non-fruiting shoots + Three leaf pairs shoot pruning; P₇, TNFS: Thinning out of non-fruiting shoots).

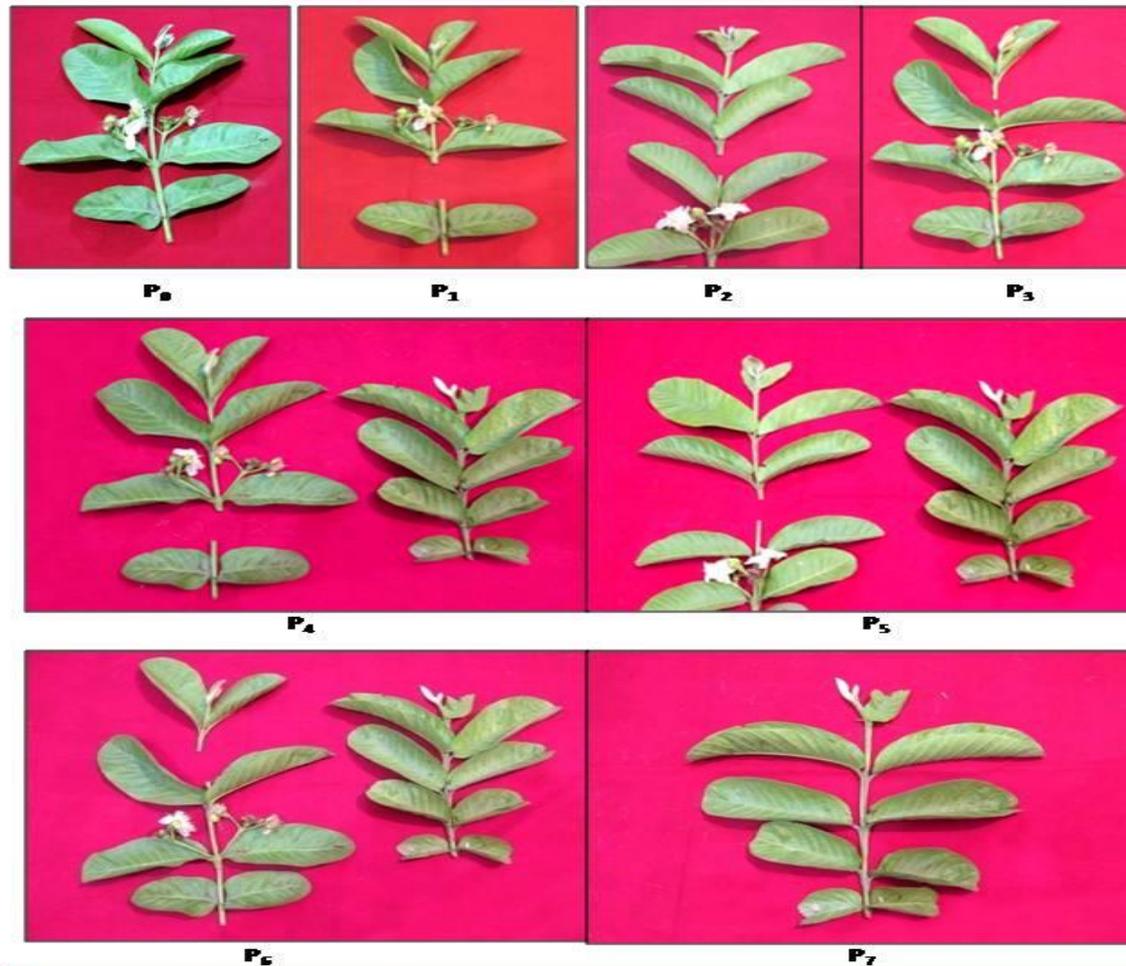


(A)



(B)

Fig 1: Interaction effect of plant spacing and pruning severity on yield (q/ha) of guava cv. Pant Prabhat during the years (A) 2014-15 and (B) 2015-16.



(P₀- Unpruned; P₁, OLP: One leaf pair shoot pruning; P₂, TLP: Two leaf pairs shoot pruning; P₃, THLP: Three leaf pairs shoot pruning; P₄, TNFS+OLP: Thinning out of non-fruiting shoots + One leaf pair shoot pruning; P₅, TNFS+TLP: Thinning out of non-fruiting shoots + Two leaf pairs shoot pruning; P₆, TNFS+THLP: Thinning out of non-fruiting shoots + Three leaf pairs shoot pruning; P₇, TNFS: Thinning out of non-fruiting shoots)

Plate 4 : Details of the treatments

Economic analysis of experiment

The cost of production per hectare per year (average of both the years) presented in the Table 6. The highest total cost of production (per hectare) of high density planting of guava planted at 2.0 x 1.0 m spacing (S₁) occurred Rs. 1,69,780.00 per ha per year with three treatments, P₄ (TNFS+OLP), P₅ (TNFS+TLP) and P₆ (TNFS+THLP). The cost of initial inputs (cost of fertilizers, irrigation water, machinery, chemicals and labour cost etc.) were equal to all treatments i.e. Rs. 1,38,530.00 per hectare per year. The treatment cost of unpruned plants (P₀) was nil due to untreated plants.

The maximum gross return and net return per hectare per year (Table 7) in close spaced plants (2.0 x 1.0 m plant spacing) were recorded with treatment P₄ (TNFS+OLP) followed by P₁ (OLP). While, minimum gross return and net return per hectare per year was obtained with treatment P₇ (TNFS). The maximum benefit: cost ratio (2.02:1) was obtained with treatment P₄ (TNFS+OLP) followed by P₁ (OLP). However, minimum benefit: cost ratio (0.97:1) was found with the treatment P₇ (TNFS).

In general, it was observed that maximum benefit: cost ratio was found with the treatment P₄ (TNFS+OLP) while minimum benefit: cost ratio was recorded with treatment P₇ (TNFS). This might be due to treatment P₄ gave highest yield during winter season which fetches higher market prices as compared to rainy season crop. Minimum benefit: cost ratio was found with treatment P₇ (TNFS) might be due to the lower winter season yield as well as total yield. It was also reported that it is desirable to take a sole winter crop instead of two to three crops in a year for higher returns (Singh *et al.*, 2000). It was observed that on the basis of yield and return during both the seasons, for regulating

the cropping pattern in guava, one leaf pair shoot pruning during first week of May, was found most suitable for maximum winter season yield with superior fruit quality (Tiwari and Lal, 2007). Further it was reported that the maximum cost: benefit was obtained with one leaf pair pruning of fruited shoots only due to higher production of quality fruits during winter season (Thakre *et al.*, 2016).

On the basis of above observations, it can be concluded that plant growth fruit yield and profitability of guava can be influenced by pruning severity. Fruit yield per hectare increased with increase in plant population per unit area. The maximum benefit: cost ratio was found with the treatment complete removal of non fruiting shoots followed by one leaf pair shoot pruning due to high winter season fruiting. Hence, for higher profitability in high density plantation of guava, complete removal of non fruiting shoots followed by one leaf pair shoot pruning of current season growth (i.e. retaining one leaf pair at the base of the newly emerged shoots) should be done during first week of May. This method is environmental friendly and completely organic because it has been performed without using any chemical and pruned leaves act as mulch, thereby, save water in summer months and after degradation in rainy season they are rich source of manure.

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