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Effect of pruning in guava planted at different spacings under Punjab conditions

Y. Kumar* and H.S. Rattanpal
Department of horticulture Punjab Agriculture University Ludhiana

ABSTRACT

Pruning had a significant effect on the tree height, tree spread and canopy volume were affected significantly by various pruning/spacing treatments severity of pruning results in decrease of tree height, tree spread and tree canopy volume and fruit yield. In rainy season, fruit yield was the highest in control trees at 6x5 m spacing, while in winter season maximum fruit yield per tree was obtained in pruning treatment by removal of 1/3rd vegetative growth at 6x5m spacing. However total fruit yield and yield t/ha of both rainy and winter seasons was maximum in pruning treatment by treatment by ½ removal of vegetative growth at 6x4m spacing. Fruit quality adjudged on the basis of high fruit weight (g), palatability rating, TSS (%), total sugars and vitamin –C (mg/100 fruit pulp) and low acidity was the best in pruning treatment by ½ removal of vegetative growth at 6x4m spacing.

Key words: Guava, pruning, planting distance.

INTRODUCTION

Guava (*Psidium guajava* L.), the apple of the tropics, is one of the most important cultivated species of family Myrtaceae. In Punjab and most of other parts of Northern India, guava flowers once in April-May for the rainy season crop and again in August-September for the winter season crop. It bears on current season's growth and flowers appear in the axils of new leaves therefore it responds well to pruning. The crop is highly suitable for high density planting. At present, guava is cultivated largely through a traditional system, under which it is difficult to achieve desired levels of production. Thus high density planting system along with pruning is the need of the hour. Guava trees produce heavy crop in rainy season and light crop in winter season. The rainy season crop is poor in quality and also attacked by many pests and diseases. On the other hand winter season crop is superior in quality, free from diseases and pests. Regulation of rainy season crop has been done by deblossiming, flower thinning, withholding irrigation and foliar application of NAA in the past. Recently, pruning has emerged as a commercial and alternative method for regulating the crop in guava (Lal *et al.,* 5; Tiwari *et al.,* 11; Lal *et al.,* 6). Thus, the pruning may be helpful in reducing the 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.

*Correspondence author's E-mail:

MATERIALS AND METHODS

The present investigations on "Pruning studies in guava planted at different spacings" were carried out in the New Orchard Department of Horticulture, Punjab Agricultural University, Ludhiana during 2005-06.Thirteen year old plants of Sardar guava were selected for research. In the month of April, the treatments consisted of pruning of current season growth at different intensities i.e. no pruning, pruning by removal of 1/2 vegetative growth, pruning by removal of 1/3rd vegetative growth and pruning by removal of 1/4th vegetative growth in the spacings of 6x4m, 6x5m, 6x6m, respectively were given. Each treatment was replicated thrice with single tree as an experiment unit in RBD design. All the selected trees were maintained under uniform cultural practices. The growth of the experimental trees was recorded in terms of tree height and tree spread. Height of the trees was measured with the help of measuring pole up to the maximum point of height ignoring only the off type shoots and expressed in meters. Tree spread the distance between points to which most of branches of a tree had grown in the North-South and East-West directions were measured in last week of September. The off type shoots were not considered in the measurement.

The tree canopy was calculated in (m^3) by formula given by Roose *et al.* (8).

$$V = \frac{4}{6} p\, hr^2$$

Where, h = height of tree (m)

$$r = \frac{\text{Sum of E-W and N-S directions (in meters)}}{4}$$

E-W = East - West; N-S = North-South

The fruiting characters of both rainy and winter season crops were recorded from July-Aug and September to December. The data were noted in terms of fruit number, yield per tree and yield efficiency. Yield was estimated from the average weight of 10 fruits and calculated in kilograms per tree.

Yield efficiency was determined by the following formula:

$$\text{Yield efficiency (\%)} = \frac{\text{Average fruit load on a tree (kg)}}{\text{Canopy volume (m}^3\text{)}} \times 100$$

Physical characters of both rainy and winter season crops were recorded in July-August and November-December, respectively. The length and diameter of ten randomly selected fruits from each treatment were recorded with the help of ordinary scale. The weight of ten randomly selected fruits were recorded on Pan balance and expressed in grams per fruit.

The data on quality characters of fruits were determined in terms of total soluble solids, acidity, palatability rating, and vitamin C. Total soluble solids content of juice was determined with the help of Bausch and Lomb hand refractometer in terms of degree Brix. The values of total soluble solids were corrected at 20°C with the help of temperature correction chart (AOAC, 1).

RESULTS AND DISCUSSION

The tree height, tree spread and canopy volume were affected significantly by various pruning/ spacing treatments severity of pruning results in decrease of tree height, tree spread and tree canopy volume in table 1. The mean tree height was found maximum (5.6m) in control trees of 6x6m spacing and was the minimum (4.7m) in pruning by removal of half the vegetative growth at spacing of 6x4m. The tree spread was significantly affected by various pruning treatments. The mean tree spread was found maximum (6.5 m) in control trees of 6x6m spacing and the minimum (4.8 m) in pruning by removal of half the vegetative growth at 6x4 m spacing. The data revealed that increase in severity of pruning and decreasing spacing resulted in corresponding decrease in the canopy volume of guava. The mean tree canopy was the maximum (118.8 m^3) in control trees of 6x6 m and was the minimum (57.1 m^3) under pruning treatment by removal of 1/2 the vegetative growth in 6x4 m spacing. It might be due to the fact that pruned trees were unable to make up the loss of growth caused by

Table 1. Vegetative Characters o tree and fruit yield of Sardar guava under different pruning intensities.

Treatments pruning/ spacing	Tree height (m)	Tree spread (m^3)	Tree canopy (m^3)	No. of fruits (R)	No. of fruits (W)	Yield (R)	Yield (W)	Yield efficiency (R)	Yield efficiency (W)	Yield (mean)	Yield t/ha
Pruning by removal of ¼th vegetative growth at 6x6 m spacing	5.4	5.2	78.0	347.0	502.0	54.9	84.3	70.3	50.8	60.5	38.6
Control at 6x6m spacing	5.6	6.5	118.8	416.0	375.0	64.1	61.1	54.0	51.5	52.7	34.7
Pruning by removal of 1/3rd vegetative growth at 6x5m spacing	5.3	5.2	75.2	336.0	545.0	55.1	94.3	72.8	107.8	89.9	49.6
Control at 6x5m spacing	5.5	5.9	102.5	436.0	361.0	86.2	57.4	88.5	58.6	73.5	47.8
Pruning by removal of ½ vegetative growth at 6x4m spacing	4.7	4.8	57.7	286.0	426.0	51.2	80.5	89.0	125.7	107.3	54.4
Control at 6x4m spacing	5.4	5.7	99.3	397.0	324.0	58.8	48.6	61.5	50.8	56.1	44.7
CD (p=0.05)	0.1	0.4	14.9	10.3	5.8	2.7	1.9	12.7	9.7	10.4	2.7

R= Rainy season crop; W= Winter season crop

severe pruning in this short period. Similar results of pruning on the above mentioned parameters in different ber cultivars were also reported by Kumar (4) and Bal *et al.* (2).In rainy season fruit number and yield was significantly affected by pruning/ spacing treatments. In general, data indicate spectacular differences in fruit number per tree between the pruned and control trees. Data pertaining the rainy season crop reveal that mean fruit number significantly decreased by increasing pruning intensity. The mean fruit number was found to be maximum (536/tree) in control trees at 6x6m spacing and was the minimum (286/tree) in pruning by removal of ½ vegetative growth at 6x4 m spacing. With increasing the pruning intensity and density in a decrease in fruit number and yield was observed. It is indicated from Table 1 that the mean plant yield was significantly decreased by all pruning treatments over unpruned trees of the same spacing. The tree yield was found maximum (86.2 kg/ tree) in control trees at wider spacing (6x5 m) and was found minimum (51.2 kg/tree) in pruning by removal of 1/2 vegetative growth at spacing of 6x4m. This decrease in the yield parameters was a consequence of pruning which reduced the fruiting area on one hand and promoted the vegetative growth at the expense of reproductive growth. In the winter season crop the mean fruit number was maximum (545/tree) in pruning by removal of 1/ 3rd vegetative growth at spacing of 6x5 m, which was significantly higher than all other treatments, whereas the minimum fruit number (324/tree) was recorded in control trees at closer spacing (6x4m). In the winter season crop the mean fruit yield was found maximum (94.3 kg/tree) in pruning by removal of 1/3rd vegetative growth at spacing of 6x5m,which was significantly higher than all other treatments, whereas it was minimum(48.6 kg/tree) in control trees closer spacing (6x4m). During winter season these rejuvenated plants regain the fruiting area, and resulted higher fruit number and yield. In guava it is well established that the decline in rainy season crop leads to increase in winter season crop. Similar results were reported by Lal *et al.* (6) and Sahay and Kumar (9) in guava. Yield efficiency were highest (89% in rainy season and 125.7% winter season) in severe pruning/ spacing treatment pruning by removal ½ vegetative growth at 6x4m spacing. The per hectare yield was the highest (54.4 t/ha) in pruning by removal of ½ vegetative growth at 6x4 m spacing, which was significantly higher than all the other treatments and was being followed by pruning by removal of 1/3rd vegetative growth at 6x5m spacing .The lowest yield (34.7 t/ha) was recorded in the control trees of 6x6m spacing, which indicated that closely spaced trees, consequently gave higher yield per unit area. The pruning of guava further higher the yield efficiency and per hectare yield as it decreased the canopy volume, reduced intermingled branches and encourages new growth leading to enhanced fruit yield. Similar results were demonstrated by Lal *et al.* (6) in guava. Table 2 pruning had significant effect on fruit size. Severe pruning leads to increased fruit size in both the season. The mean maximum fruit size was recorded in pruning by removal of 1/2 vegetative growth at spacing of 6x4m (6.8 cm length and 5.9 cm and diameter) respectively. The average minimum fruit size was observed (4.4cm length and 4.2cm diameter) in control trees at closer spacing (6x4m). In winter season, the maximum average fruit length of (7.0 cm length and 5.8cm diameter) in pruning by removal of 1/2 vegetative growth at spacing of 6x4m and minimum (5.5cm length and 4.5cm diameter) in control trees at closer spacing(6x4m). It might be due to the availability of metabolites and water in abundance to a relatively few ever fruits. The results obtained by Dubey (3), Singh and Dhaliwal (10) in guava are in agreement with the present investigation. Fruit weight, total soluble solids, Total sugars and vitamin C content were significantly improved by pruning/spacing treatment. It is quite obvious from the data that there was a progressive increase in fruit weight with the increase in severity of pruning. In rainy season the mean fruit weight was found maximum (179.1g) in pruning by removal of 1/ 2 vegetative growth at spacing of 6x4m and minimum (148.1g) in control trees at closer spacing (6x4m). Similarly in the winter season crop the mean fruit weight was found maximum (189.1g) in pruning by removal of 1/2 vegetative growth at spacing 6x4m, which was significantly higher than all other treatments, whereas the minimum fruit weight (150.0g) was recorded in control trees at closer spacing (6x4m). In rainy season crop it was found that maximum TSS (10.40%) was registered in fruits produced by trees in pruning treatment by removal of 1/2 vegetative growth at 6x4m spacing and it was significantly higher than all other pruning treatments and minimum TSS (9.30%) was recorded in control trees at closer spacing (6x4m). In the winter season crop maximum TSS (11.05%) was registered in fruits produced by trees pruning by removal of 1/2 vegetative growth at 6x4m spacing and minimum TSS (9.81%) was recorded in control trees at closer spacing (6x4 m). The total sugars were found maximum (7.9%) in pruning treatment by removal of 1/2 vegetative growth at spacing of 6x4m which is at par with pruning treatment by removal of 1/3rd of vegetative growth at 6x5m spacing. The mean total sugars were minimum (7.1%) in control trees at closer spacing of 6x4m. In the winter season crop the mean total sugars were found maximum (9.4%) in pruning treatment by removal of 1/2 vegetative growth at spacing of 6x4m, which was significantly higher than all other treatments, whereas the minimum

Table 2. Fruit size and quality of fruits of Sardar guava under different pruning intensenties.

Treatments pruning/ spacing	Fruit size (R)		Fruit size (W)		Fruit weight (g)		Total soluble solids		Total sugars (%)		Vitamin C (mg/100 g pulp)	
	Length (cm)	Length (cm)	Length (cm)	Diameter (cm)	R	W	R	W	R	W		
Pruning by removal of ¼th vegetative growth at 6x6 m spacing	5.5	5.7	5.7	5.8	158.1	168.1	9.81	10.17	7.5	8.5	128.0	178.7
Control at 6x6m spacing	5.5	5.8	7.0	5.7	154.1	163.0	9.42	10.40	7.7	8.1	130.4	188.0
Pruning by removal of 1/3rd vegetative growth at 6x5m spacing	6.1	5.9	6.1	6.0	163.1	173.1	10.17	10.51	7.8	8.8	133.4	187.0
Control at 6x5m spacing	4.5	4.4	5.9	4.9	161.0	159.0	9.48	10.17	7.3	7.5	121.0	173.0
Pruning by removal of ½ vegetative growth at 6x4m spacing	6.8	5.9	7.0	6.1	179.1	189.1	10.40	11.05	7.9	9.4	134.1	190.6
Control at 6x4m spacing	4.4	4.2	5.5	4.5	148.1	150.0	9.30	9.81	7.1	7.4	119.0	155.0
CD (P=0.05)	0.1	0.3	0.3	N.S	5.3	3.2	0.14	0.18	0.1	0.2	1.4	2.5

R= Rainy season crop; W= Winter season crop

total sugars (7.4%) were recorded in control trees of 6x4m spacing. A significant increase in ascorbic acid content of fruits with the enhanced severity of pruning was observed in rainy season crop and registered the highest ascorbic acid content of (134.1 mg/100g fruit pulp) in pruning treatment by removal of 1/2 vegetative growth at spacing of 6x4m,which was at par with pruning treatment by removal of 1/3rd vegetative growth at spacing of 6x5m,while minimum vitamin content was found in control trees at closer spacing of 6x4m i.e.(119.0 mg/ 100g fruit pulp). Similarly in the winter season crop the ascorbic acid content was estimated maximum (190.6 mg/100g fruit pulp) in trees pruning treatment by removal of 1/2 vegetative growth at spacing of 6x4m, while minimum content (155.0 mg/100g fruit pulp) was found in control trees at closer spacing 6x4m.Increase in the qualitative parameters is due to abundant availability of photosynthesis for limited number of fruits, while Lal *et al.* (7) reported that higher ascorbic acid content of winter season crop might be due to the prevalence of low temperature receives at the time of fruit ripening, which not only retarded the excessive loss of respiratory substances but also increased the translocation of photosythates from leaves to the fruits.

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