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Effect of pruning intensity on fruit yield and quality of guava (*Psidium guajava* L.) cv. Sardar

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Abstract

An experiment was conducted on fifteen-year-old guava (*Psidium guajava* L) plants of cultivar '*Sardar*' planted at 6.5 m x 6.5m at Punjab Agricultural University, Regional Station, Bathinda (Punjab), India. The pruning of plants was done in the first week of March, 2004 with three pruning intensities/levels viz. 15 cm, 30 cm and 45 cm from the shoot tips leaving the unpruned trees as a control. The fruit yield and quality characters were recorded for both rainy season (RS) and winter season (WS) crops. It was observed that the fruit set was significantly higher in pruned trees at 30cm and 45 cm levels as compared to unpruned and lightly pruned trees in WS crop. The maximum number of fruits (430 and 496) and yield (72.2 and 82.3 kg) per tree were recorded in the plants pruned at 15cm level followed by unpruned trees in both WS and RS crops respectively. In both crops, the size of fruits was maximum in trees pruned at 45 cm level followed by 15 cm level and minimum in unpruned trees. An ascending trend of fruit weight with increase in pruning intensity was observed i.e. the weight of fruits was recorded approximately 30 percent more (168.0, 168.1, 170.2g and 168.4, 169.8, 172.3g at 15, 30, 45cm pruning intensities for both RS and WS crops respectively as compared to unpruned {130.4 (RS) and 127.2g (WS)} guava trees. Total Soluble Solids (TSS) percentage was comparatively more (ranging between 10.4 to 11.1 and 10.8 to 11.5 in RS and WS crop, respectively) in the fruits of pruned trees and was least (9.7 and 10.2 in RS and WS crop, respectively) in unpruned trees. Although, acidity in fruits taken from all the pruned trees was at par but higher than the fruits from unpruned trees. The number of seeds in fruits of pruned trees at 15 cm level was significantly higher than fruits obtained from other pruned trees. On the basis of the present study it may be concluded that guava plants respond positively to lighter pruning intensities.

Key words: Guava pruning, quality, yield

Introduction

Pruning helps in maintaining the root to shoot ratio and improves fruit yield and quality. When the shoots are not pruned judiciously, the limited root system is not able to meet the nutrient requirements of the top. Extensive vegetative growth leads to unfruitfulness thereby decreasing the yield considerably with sub-optimal fruit quality. In India, studies have been conducted to standardize pruning in guava (Dalal et al., 2004, Dhaliwal and Kaur, 2003 and Gopi Krishan, 1981). 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. Guava is one of the major fruit crops of the arid irrigated region of North West India. In this region, till now no study has been conducted to standardize the pruning intensity for guava. Hence, the present studies were undertaken to study the effect of pruning intensity on fruit yield and quality of guava cv. *Sardar.*

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Material and methods

The present investigations were conducted during the year 2004-05 under the arid –irrigated region of Punjab state of India. Three pruning intensities viz. 15, 30 and 45cm from the shoot tips were compared with no pruning in fifteen-year-old grafted plants of guava cv. *Sardar.* There were three replications, with three trees per replication in a randomized block design. The percent fruit set was recorded one month after anthesis from four tagged shoots by dividing the number of flowers counted on the same branch and multiplied by 100, gave the percent fruit set. Average fruit weight was calculated by taking the mean of ten randomly selected fully mature fruits. Fruit yield per tree was calculated by multiplying the number of fruits with average fruit weight. Observations on the total soluble solids and acidity were recorded as per the standard methods (A.O.A.C.,1980)

Results and discussion

Fruit set

Data in Table 1 shows an increasing trend in per cent fruit set with an increase in the pruning intensity. Similar trend was observed in both the seasons. The unpruned trees have shown minimum fruit set of 62.5 per cent and 59.8 percent in rainy season (RS) crop and winter season (WS) crop, respectively. The increase in fruit set with the pruning intensity as compared to the unpruned trees indicates that pruning resulted in the production of new growing points on the pruned trees. Further, it also reduced flower drop, thus directly increasing the number of fruits per tree and resulting in higher fruit set. These results are in line with the findings of Awasthi and Mishra (1969) in jujube and Arora and Yamdagini (1985) in sweet lime. In guava, Dalal *et al.* (2004) have also reported highest fruit set with heavy pruning. However, the results are contrary to the findings of Lotter and Lotter (1990) who found a reduction in fruit set following summer pruning in guava.

Number of fruits

Present investigation reveals that the number of fruits was maximum (430 and 496 in both rainy as well as winter season, respectively) in the trees pruned at 15 cm (Table 1). The number of fruits was reduced significantly with an increase in pruning intensity (30 cm and 45 cm). Minimum number of fruits (270 and 403 in RS and WS, respectively) was found with the highest pruning level of 45 cm. The numbers of fruits in unpruned trees was at par with 15 cm pruning level in WS but 20 per cent higher in RS crop. The increase in number of fruits at light pruning intensity (15 cm) might be due to the optimum balance between the vegetative and reproductive growth of trees. The lesser number of fruits per tree with the increase in pruning intensity may be due to loss of bearing area on the trees. The present findings regarding the lesser number of fruits per tree at higher pruning intensities and maximum numbers of fruit in unpruned tree are in conformity to the findings of Bajpai *et al.* (1973). Similarily, Dalal *et al.* (2004) observed that with an increase in pruning intensity numbers of fruits per tree were reduced and the yield was maximum with medium pruning level.

Fruit yield

Substantial increment in yield per tree was obtained with 15 cm level of pruning (72.24 and 82.31 kg per tree) followed by 49.60 and 74.14 Kg at 30 cm level in RS and WS, respectively (Table 1). Minimum yield (45.2 kg) in rainy season was obtained with 45 cm pruning level. In winter season, minimum yield (62.2 kg) was obtained with unpruned trees. The decline in yield at higher pruning intensities may be due to the loss of bearing area on the trees. However, increase in yield at light pruning (15 cm) can be attributed to higher fruit size and weight. The present findings are in accordance with the findings of Dalal *et al.* (2004) who obtained maximum yield with medium pruning treatment in guava. Similarly, Bajpai *et al.* (1981) observed an increase in yield following light pruning in guava. Mishra and Pathak (1998) have reported 3.5 times increase in yield with 50 per cent pruning in L-49 guava. Gopi Krishana (1981) and Manica *et al.* (1982) have found that the fruit yield per tree decreased with an increase in the severity of pruning in Guava.

Fruit size

A progressive increment in fruit size was observed with an increase in the pruning intensity (Table 2). The length and the breadth of the fruits obtained from pruned trees were significantly higher than the fruits from unpruned trees. Maximum fruit length (7.05 cm both in RS and WS) was recorded in trees pruned at 45 cm level followed by 15 cm level (6.92 and 7.02 cm in RS and WS, respectively). Similarly, the highest fruit breadth was obtained with 45 cm pruning intensity (6.70 and 6.55 cm, for RS and WS, respectively) followed by 7.02 and 6.65 cm at 15 cm level of pruning in RS and WS crops, respectively. In both the seasons, minimum fruit size was recorded in unpruned trees. These results may attributed to the reduction in crop load on pruned trees which resulted in the diversion of more translocates to the remaining fruits thereby increasing the fruit size. These results are in line with the findings of Bajpai *et al.* (1973) and Lotter and Lotter (1990), who also observed an increase in fruit size with increasing pruning intensities in guava. In a similar study, Dalal *et al.* (2004) reported an increase in individual fruit size with pruning intensity in guava.

Fruit weight

The fruit weight increased significantly with all the pruning intensities over control (Table 2). However, the pruning levels do not show any edge over each other as far as fruit weight is concerned. The highest fruit weight was recorded (170.2 and 172.3 g in RS and WS, respectively) from the trees pruned at 45 cm level. Fruits obtained from unpruned tress exhibit minimum fruit weight of 130.4 and 127.2 g in RS and WS, respectively. The production of heavier fruits on pruned trees can attributed to the lesser crop load, higher nutrient supply to the lesser number of fruits and proper partitioning of translocates to the vegetative and fruit growth. Sundarajan and Muthuswamy (1966) and Bajpai *et al.* (1973) also obtained increment in fruit weight with increase in severity of pruning intensity in guava. Dalal *et al.* (2004) obtained maximum fruit weight under medium pruning intensity of 3.0 cm thick shoot from the tip. Dhaliwal and Kaur (2003) obtained highest average fruit weight with pruning intensity of 30 cm.

Table 1. Effect of Pruning intensity on fruit yield and quality of guava (*Psidium guajava* L) cv. Sardar

Pruning intensity (cm)	Fruit set (%)		No. of Fruits / Tree		Yield / Tree (kg)	
	RS	WS	RS	WS	RS	WS
0	62.5	59.8	360	495	46.4	62.2
15	64.0	61.2	430	496	72.2	82.3
30	64.9	70.1	296	430	49.6	74.1
45	65.6	71.6	270	403	45.2	69.0
C.D. (p=0.05)	NS	3.88	14.68	11.31	5.53	4.72

Table 2. Effect of Pruning intensity on quality characters of guava(*Psidium guajava*.L) cv. Sardar

Pruning intensity (cm)	Fruit Size				Fruit weight (g)		Seed Number		TSS (%)		Acidity (%)	
	Length (cm)		Breadth (cm)									
	RS	WS	RS	WS	RS	WS	RS	WS	RS	WS	RS	WS
0	5.70	5.60	5.47	5.20	130.4	127.2	261	290	9.7	10.2	.25	.26
15	6.92											
30	6.75	7.02	6.65	6.51	168.0	168.4	272	307	11.1	11.5	.29	.30
45	7.05											
		6.45	6.32	6.21	168.1	169.8	268	270	10.4	10.8	.28	.28
		7.05	6.70	6.55	170.2	172.3	259	275	11.0	11.3	.28	.28
C.D. (p=0.05)	0.45	0.23	0.18	0.10	6.3	5.48	9.16	7.20	NS	0.8	.026	0.017

RS-Rainy Season WS-Winter Season

Seed number

During both the cropping seasons, 15 cm pruning level has shown a significant increase in seed number over the other treatments (Table 2). In this treatment, maximum number of seeds (272 and 307 in RS and WS crops, respectively) was observed in both rainy as well as the winter season crops. This may be due to the fact that the microclimate of tree canopy with light pruning was more favourable for pollen germination on the stigma or pollen tube penetration through the style. Deep penetration of dry winds in the tree canopy, which is a common feature of this arid irrigated zone, may have created an unfavorable condition for pollen germination and resulted in fruits with lesser seed number with pruning of higher intensities. Teaotia and Singh (1971) observed reduction in seed number in guava fruits with an increase in the severity of pruning.

Total soluble solids (TSS)

Increase in TSS content was observed with all the pruning treatments (Table 2). Fruits from the trees pruned at 15 cm level showed maximum TSS (11.1 and 11.5 per cent in RS and WS, respectively). The trees pruned at 45 cm followed it. The minimum TSS content (9.7 and 10.2 per cent for RS and WS, respectively) was observed in unpruned trees. Although, 30 cm level could not exhibit significant increase in TSS over 15 cm and 45 cm level yet, the TSS with this treatment was higher than that of fruits obtained from unpruned trees. The increase in TSS content in all the pruning treatments may be ascribed to the higher leaf to fruit ratio in pruned trees as compared to the unpruned trees. The increase in fruit TSS following pruning has been earlier reported by Awasthi and Mishra (1969) in jujube and Bajpai *et al.* (1973) in guava. In guava, Dhaliwal and Kaur (2003) have also reported highest average TSS content of fruits obtained from the trees pruned to 30 cm level.

Acidity

Data related to the fruit acidity have shown that under the entire pruning treatments acidity was at par with each other yet, significantly higher than control (Table 2). Maximum acidity was recorded from fruits obtained from 15 cm level of pruning in both RS and WS crops. Similar results have been reported by Patil *et al.* (1996) in Jujube.

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