DOI : 10.5958/0974-0112.2018.00098.1

Indian J. Hort. 75(4), December 2018: 583-590

Pruning effects on Sardar guava planted in ultra high density orcharding under different rainfall scenarios

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ABSTRACT

The Eastern plateau and hills agro-climatic zone of India has been a traditional guava growing region particularly under rainfed conditions. Pruning once in May (pruning to 80% and 60% of canopy height), pruning once in October (pruning to 80% and 60% of canopy height) and pruning thrice a year in March, May and October to 50% shoot length were imposed on guava plants of cv. Sardar planted during 2007 under ultra high density orcharding at a spacing of 1 m × 2m. The treatments were imposed during all the three years of experimentation. The three consecutive distinguished rainfall scenarios observed from 2009 to 2011. During the year 2009, there was normal rainfall whereas during 2010 and 2011, there were deficit and excess rainfall, respectively. Result indicated that during all the three years, the maximum number of shoots was recorded with pruning thrice a year to 50% of shoot length (7.31, 7.19 and 8.32 during 2009-10, 2010-11 and 2011-12, respectively). Pruning in May or October did not result in marked change in the time of appearance of 1st flowering during 2009-10 and 2010-11. However, during 2011-12, pruning in May resulted in extension of the period of 1st flowering by one month. Pruning three times a year resulted in maximum number of flowers per plant (20.13) during winters of 2009-10. During first two years, the maximum total yield was recorded in case of pruning thrice a year to 50% shoot length (34.88 t/ha and 37.24 t/ha during 2009-10 and 2010-11, respectively). However, during the third year, it was highest in case of 80% pruning in October (29.51 t/ha). Hence, the study clearly indicated the efficacy of pruning in May for removal of rainy season crop particularly under the conditions of normal rainfall.

Key words: *Psidium guajava*, season pruning, ultra high density orcharding, extension of flowering period.

INTRODUCTION

The Eastern plateau and hills agro-climatic zone of India has been a traditional guava growing region particularly under rainfed conditions. The guava produced in this region is known for its high TSS and long keeping quality. However low productivity of guava plants in this region owing to low soil fertility, makes guava orcharding unprofitable under traditional system of planting (Mehta *et al.,* 8).

Guava tree bears flowers and fruits on the current season recently matured shoots either from lateral buds on older wood or shoot terminals (Thakre *et al.,* 16). Therefore, increase in the number of current season's shoots significantly influences productivity of the plant. Guava, being a current season bearing plant (Singh, 13), responds favourably to different pruning practices. This growth behaviour of guava provides opportunity for planting guava under high density planting by means of control of plant vigour by different pruning treatments and thereby harvesting the maximum yield per unit area. Various workers have reported beneficial effects of pruning on yield and fruit quality of guava (Dhaliwal *et al.,* 6; Singh and Singh, 14; Dhaliwal and Kaur, 5; Pratibha *et al*., 11). Ultra-high density orcharding is a system of planting the plants at a closer spacing (1m × 2m) in order to accommodate relatively larger number of plants per unit area (5000 plants/ha).

Guava plants produce fruits thrice a year (August-September, November-January, March-April) under the Eastern plateau and hill conditions of India. The fruits of rainy season crop are rough, insipid, poor in quality and attacked by several insect- pests and pathogens. On the other hand, winter and summer seasons crop is superior in quality, free from diseases and fetches high price as compared to rainy season crop (Prakash *et al*., 10). Pruning has successfully been used for reducing the rainy season crop and increasing winter season and summer season crop of guava (Singh *et al.,* 15; Pratibha *et al*., 11).

Under rainfed conditions of Eastern plateau and hill region, where the overall productivity of guava is markedly lower than the other regions, complete removal of rainy season crop can result in very low total productivity. In case of ultra high density orchards under these conditions, pruning strategy aims at rational removal of rainy season crop so that the profitability can be maximized and the growth rate of the plants are minimized. This can be achieved by regulating the time and

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intensity of pruning. Results of initial stages of the orchards indicated the maximum yield with pruning to 50% of the shoot length during March, May and September (Mehta *et al.,* 8). However, during the years 2009 to 2012, three distinct rainfall scenario were recorded which significantly influenced the pruning responses of the guava plants. The impact of altered weather conditions are resultant of alteration in plant phenophases as well as growth rates of plant parts. Keeping this in view, an attempt was made to develop a better understanding of pruning responses of guava plants in ultra high density planting under different rainfall scenarios.

MATERIALS AND METHODS

The experiment was undertaken at the experimental farm of ICAR - Research Complex for Eastern Region, Research Center, Ranchi, Jharkhand, India during 2009 to 2012. Soils of the region are acidic with low water holding capacity. The soil of the experimental site was with pH 4.8-5.2, organic carbon 0.37-0.45%, available nitrogen 250-290 kg/ha, available phosphorus 7.1-11.0 kg/ha and available potassium 150-165kg/ha. The climate of the region is sub-humid tropical. Monthly data on total rainfall and average temperature derived from the daily weather data recorded at the Automatic Weather Station installed at the experimental farm. During the year 2009, there was normal rainfall whereas during 2010 and 2011, there were deficit and excess rainfall, respectively (Fig. 1). The minimum average monthly temperature was recorded during 2009 whereas it was highest in 2010 during the months March to June. During July to December, the average temperature in 2010 and 2011 were similar.

Treatments on different time of pruning i.e. pruning once in May (pruning to 80% and 60% of canopy height), pruning once in October (pruning to 80% and 60% of canopy height) and pruning thrice a year in March, May and October to 50% shoot length were imposed on guava plants of cv. Sardar planted during 2007 under ultra high density orcharding at a spacing of 1 m × 2m. The treatments were imposed during all the three years of experimentation. In case of control, no pruning was done. The experiment was laid out in Randomized Block Design (RBD). A total of six treatment combinations were imposed in four replications with 12 plants per replication.

Data were recorded on per cent increase in trunk girth, dry weight of pruned wood, new shoot emergence, period of appearance of flower bud, percent light interception by the canopy, total yield per ha in different seasons. Data on trunk girth was recorded during 1st week of March and percent increase in trunk girth was calculated as per standard procedures. Data on new shoot emergence recorded during 1st week of November and data were recorded from the shoots which emerged on one year old shoots. In case of treatments with pruning thrice a year, sum of number of shoots emerged after each pruning. Data on % light interception by the canopy was recorded during 3rd weeks of May, September and February using a lux meter (PCE 172). The values of % light interception was calculated by using the formula:

$$\text{\% Light interception by plant canopy} = \frac{\text{Light intensity inside the canopy} \times 100}{\text{Light intensity in open space}}$$

For recording data on time of flower bud appearance, the stage of the flower with visible flower buds (stage E2:55 of BBCH scale as described by Singh *et al*. 2105) was considered. Weight of fruit was measured with analytical balance (Mettler Toledo, PB403-S). Total soluble solids were estimated in term of degrees Brix with the help of digital refractometer (ATAGO PAL-1, Japan, Range 0-53°Brix).

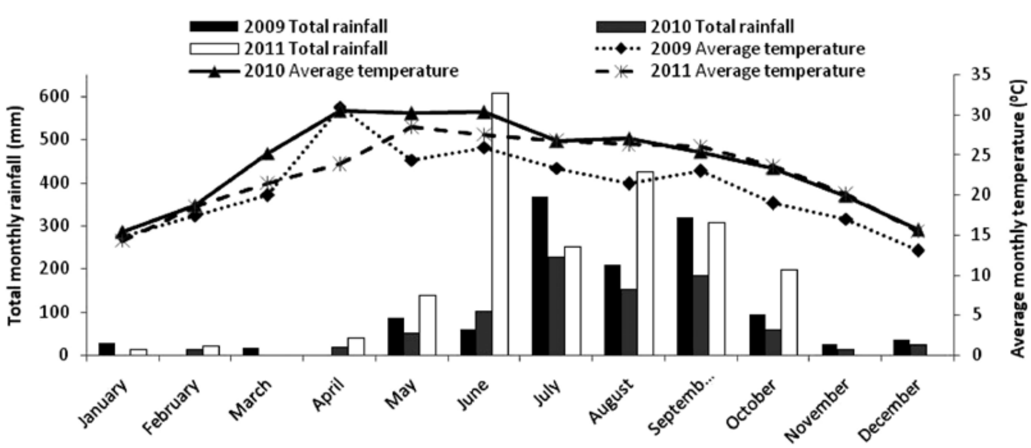

Fig. 1. Average monthly temperature and total monthly rainfall.

The experiment was laid out in Randomized Block Design and the data were subjected to analysis of variance (ANOVA). Mean separation was obtained with Fisher's LSD method at the 5% level of significance.

RESULTS AND DISCUSSION

Trunk girth has been used as an effective tool for measuring the plant vigour of guava (Chapman *et al.*, 2). Effect of pruning on per cent increase in trunk girth has been depicted in Fig. 2. During 2011-12, there was an in-general decrease in the value than that recorded during 2010-11. During 2010-11, the effects of different treatments were non-significant. However, during 2011-12, significantly lower values were recorded in case of pruning in October and pruning thrice a year to 50% of shoot length. This is in contrast to the fact that the amount of rainfall during 2010-11 was very less as compared to that in 2011-12. The difference in the growth rate of trunk girth can be attributed to differences in juvenility of the plants.

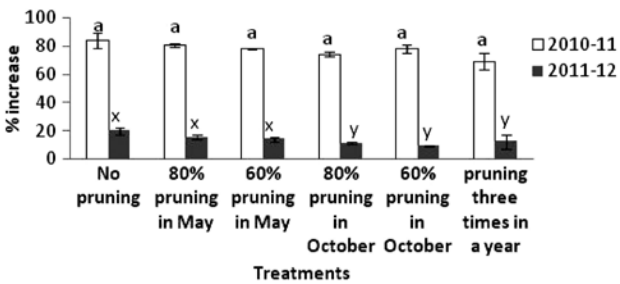

Fig. 2. Effect of shoot pruning on per cent increase in trunk girth of guava.

Data represent the mean ± standard error of three independent determinates. Mean within each type of bar that did not differ significantly at 5% level of significance when compared with Fisher's Least significant difference are followed by the same superscript letters.

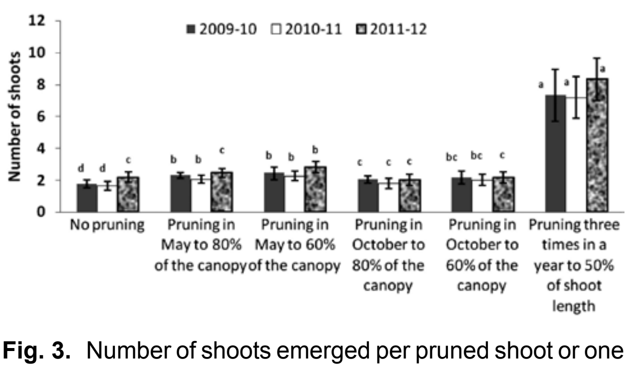

Fig. 3. Number of shoots emerged per pruned shoot or one year old shoot.

Data represent the mean±Standard error of three independent determinates. Mean within each type of bar that did not differ significantly at 5% level of significance when compared with Fisher's Least significant difference are followed by the same superscript letters

Data on number of shoots emerged per pruned shoot or one year old shoot is given in Fig. 3. Significant effects of the treatments were recorded during all the three years. During 2009-10 and 2010-11, all the treatments resulted in significantly higher number of shoots than that of control (1.76 and 1.65 during 2009-10 and 2010-11, respectively), whereas during 2011-12, significantly higher values than the control were recorded with pruning in May to 60% of canopy and pruning thrice to 50% of shoot length. During all the three years, the maximum number of shoots was recorded with pruning thrice a year to 50% of shoot length (7.31, 7.19 and 8.32 during 2009-10, 2010-11 and 2011-12, respectively).

The treatments differed significantly with respect to total biomass removal (dry wt.) during all the three years (Fig. 4) and pruning in October and pruning thrice to 50% of shoot length resulted in maximum biomass removal. Pruning to 80% of plant height resulted in the minimum biomass removal during all the three years.

Growth suppressing effects of pruning of guava has already been reported (Pratibha *et al.*, 11) which is mainly attributed to removal of stored assimilates as well as photosynthetic surfaces. This is evident from the higher values of pruned biomass removed in case of pruning in October or pruning thrice to 50% of shoot length.

Different pruning treatments significantly influenced % light interception by plant canopy (Table 1). During all the three years, pruning in May resulted in significant reduction in % light interception during May. During 2009-10 and 2010-11, Pruning in May to 60% of canopy resulted in significant reduction in the light reception in September whereas during 2011-12, the light interception in all the treatments

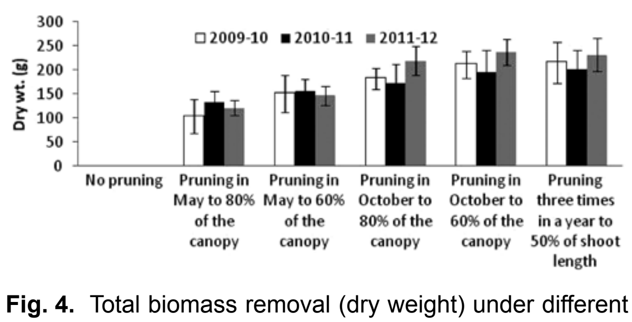

Fig. 4. Total biomass removal (dry weight) under different pruning treatments in guava.

Data represent the mean±Standard error of three independent determinates. Mean within each type of bar that did not differ significantly at 5% level of significance when compared with Fisher's Least significant difference are followed by the same superscript letters

Table 1. Effect of pruning on per cent light interception in ultra high density orchard of guava.

Treatment	2009-10			2010-11			2011-12		
	May	September	February	May	September	February	May	September	February
No pruning	53.4 ± 5.6[a]	76.1 ± 8.1[a]	44.9 ± 8.4[c]	57.6 ± 4.9[a]	69.4 ± 10.7[a]	36.4 ± 7.1[b]	48.4 ± 6.1[b]	74.3 ± 10.8[a]	46.8 ± 8.4[c]
Pruning in May to 80% of canopy	41.9 ± 6.4[b]	72.8 ± 6.3[b]	58.4 ± 9.6[b]	52.3 ± 4.1[b]	64.3 ± 6.9[a]	64.1 ± 10.1[a]	51.9 ± 4.3[b]	79.4 ± 11.4[a]	66.3 ± 8.3[b]
Pruning in May to 60% of canopy	34.1 ± 3.7[c]	73.7 ± 6.7[ab]	64.7 ± 9.1[a]	44.1 ± 3.8[c]	62.9 ± 8.3[b]	67.2 ± 9.8[a]	47.2 ± 4.6[b]	77.4 ± 10.6[a]	68.7 ± 9.1[ab]
Pruning in October to 80% of canopy	58.1 ± 6.4[a]	74.5 ± 7.6[a]	69.4 ± 8.3[a]	60.2 ± 7.3[a]	70.5 ± 10.1[a]	65.9 ± 7.1[a]	65.4 ± 7.9[a]	74.6 ± 11.8[a]	75.1 ± 8.6[a]
Pruning in October to 60% of canopy	52.1 ± 7.3[a]	72.9 ± 8.2[b]	64.5 ± 8.6[a]	56.9 ± 7.8[a]	65.4 ± 10.6[a]	68.3 ± 6.2[a]	59.1 ± 7.4[a]	74.2 ± 10.3[a]	81.4 ± 8.4[a]
Pruning three times in a year to 50% of shoot length	48.3 ± 5.2[ab]	79.2 ± 8.7[a]	68.7 ± 7.4[a]	54.8 ± 5.1[a]	70.6 ± 6.8[a]	70.1 ± 8.6[a]	59.6 ± 6.1[a]	82.8 ± 9.6[a]	78.7 ± 7.9[a]

Data represent the mean ± standard error of three independent determinates. Mean within each type of bar that did not differ significantly at 5% level of significance when compared with Fisher's Least significant difference are followed by the same superscript letters

was at par. The increase in the % light interception over that of control was more prominent in case of pruning in October and pruning thrice a year. This indicated pruning induced delay in the initiation of leaf senescence and leaf drop which generally starts during 3rd week of January in control plants. The different rainfall pattern and temperature variations as present in Fig. 1 influenced the phenology of the plant (Table 2) which could alter the light interception by the plant.

Effect of pruning on time of flower bud appearance in guava has been presented in Table 2. During 2009-10, the time of appearance of first flowering in case of control plants was between 1st week of April to 1st week of May, whereas in 2010-11 it was from 4th week of March to 1st week of May and in 2011-12, it was from 1st week of April to 3rd week of May. With respect to time of appearance of 2nd flowering in control, during 2009-10 it was recorded during 4th week of July to 4th week of August, whereas it was recorded from 3rd week of July to 2nd week of August and from 3rd week of June to 1st week of August during 2010-11 and 2011-12, respectively. The time of appearance of 3rd flowering in control was from 3rd week of December to 4th week of January during 2009-10 and from 2nd week of December to 2nd week of January during 2009-10. There was no 3rd flowering during 2011-12. Different pruning treatments markedly influenced the time of appearance of flower bud. Pruning in May or October did not result in marked change in the time of appearance of 1st flowering during 2009-10 and 2010-11. However, during 2011-12, pruning in May resulted in extension of the period of 1st flowering by one month. During 2009-10, pruning in May or October did not result in any marked shift in the time of appearance of first flowering whereas in case of pruning thrice to 50% of shoot length, it occurred during 3rd week of April to 2nd week of May. Delay in the initiation of flowering in response to pruning has also been reported by Singh *et al.* (15). Again, the flower and fruit still intact on trees on generative phase might have given the needed sink, causing the partitioning of the photosynthate for the growth (Aziz and Ghulamahdi, 1).

Data on fruit yield during different year is given in Table 3. With respect to yield of rainy season crop, significant effects of different treatments could be recorded during 2009-10 and 2011-12. Pruning to 80% of canopy in October resulted in the maximum yield of rainy season crop in 2009-10 and 2011-12 (16.86 t/ha and 25.58 t/ha, respectively). Significant effects of different treatments could be recorded on yield of winter season crop during all the years. Pruning to 60% of plant height in May resulted in the maximum yield of winter season crop during 2009-10 and 2011-12, whereas pruning thrice a year to 50% of shoot length resulted in the maximum yield of winter season crop during 2010-11. In case of yield of summer season crop, significant effects of different treatments could be recorded during 2009-10 and 2010-11, whereas no yield was found during summer of 2011-12. During 2009-10 and 2010-11, the maximum yield of summer season crop was recorded in case of pruning thrice a year to 50% of shoot length. During first two years, the maximum total yield was recorded in case of pruning thrice a year to 50% shoot length (34.88 t/ha and 37.24 t/ha during 2009-10 and 2010-11, respectively). However,

Table 2. Effect of pruning on time of flower bud appearance levels in ultra high density orchard of Sardar guava.

Treatments	2009-10			2010-11			2011-12		
	1st flowering	2nd flowering	3rd flowering	1st flowering	2nd flowering	3rd flowering	1st flowering	2nd flowering	3rd flowering
No pruning	1st week of April to 1st week of May	4th week of July to 4th week of August	3rd week of December to 4th week of January	4th week of March to 1st week of May	3rd week of July to 2nd week of August	2nd week of December to 2nd week of January	1st week of April to 3rd week of May	3rd week of June to 1st week of August	No flowering
Pruning in May to 80% of the canopy	1st week of April to 1st week of May	1st week of August to 4th week of August	3rd week of December to 1st week of February	4th week of March to 1st week of May	4th week of July to 4th week of August	2nd week of December to 3rd week of January	1st week of April to 3rd week of June	4th week of June to 1st week of August	No flowering
Pruning in May to 60% of the canopy	1st week of April to 1st week of May	1st week of August to 2nd week of September	3rd week of December to 1st week of February	4th week of March to 1st week of May	1st week of August to 1st week of September	3rd week of December to 1st week of February	1st week of April to 3rd week of June	4th week of June to 1st week of August	No flowering
Pruning in October to 80% of the canopy	1st week of April to 1st week of May	4th week of July to 4th week of August	1st week of January to 2nd week of February	4th week of March to 1st week of May	1st week of August to 1st week of September	1st week of January to 4th week of January	1st week of April to 3rd week of May	4th week of June to 1st week of August	No flowering
Pruning in October to 60% of the canopy	1st week of April to 1st week of May	4th week of July to 4th week of August	1st week of January to 2nd week of February	4th week of March to 1st week of May	1st week of August to 1st week of September	1st week of January to 2nd week of February	1st week of April to 3rd week of May	4th week of June to 1st week of August	No flowering
Pruning three times in a year to 50% of shoot length	3rd week of April to 2nd week of May	1st week of August to 2nd week of September	1st week of January to 2nd week of February	2nd week of April to 2nd week of May	4th week of July to 1st week of September	4th week of December to 4th week of January	2nd week of April to 1st week of June	3rd week of June to 1st week of August	No flowering

Table 3. Effect of pruning on guava yield (t/ha) in ultra high density orchard.

Treatments	Yield (t/ha)											
	2009-10				2010-11				2011-12			
	Rainy season	Winter season	Summer season	Total yield	Rainy season	Winter season	Summer season	Total yield	Rainy season	Winter season	Summer season	Total yield
No pruning	17.08 ± 1.69^{a}	6.92 ± 0.63^{b}	1.76 ± 0.55^{b}	25.76 ± 2.75^{b}	3.29 ± 0.41^{a}	22.06 ± 0.71^{a}	2.92 ± 0.26^{c}	28.26 ± 0.52^{b}	16.65 ± 2.21^{b}	1.73 ± 0.27^{b}	0.00	18.38 ± 2.45b
Pruning in May to 80% of canopy	12.71 ± 1.89^{ab}	10.12 ± 0.65^{a}	1.56 ± 0.22^{b}	24.39 ± 2.62^{b}	2.91 ± 0.46^{a}	22.56 ± 1.64^{a}	5.01 ± 0.51^{b}	30.48 ± 2.12^{b}	24.88 ± 4.01^{a}	2.49 ± 0.39^{a}	0.00	27.37 ± 4.01a
Pruning in May to 60% of canopy	9.21 ± 1.06^{b}	10.29 ± 0.71^{a}	1.34 ± 0.22^{b}	20.83 ± 1.75^{b}	3.07 ± 0.71^{a}	20.58 ± 0.71^{b}	4.09 ± 0.19^{b}	27.73 ± 0.97^{b}	20.12 ± 2.87^{ab}	2.66 ± 0.27^{a}	0.00	22.78 ± 2.89ab
Pruning in October to 80% of canopy	17.56 ± 1.18^{a}	6.48 ± 0.35^{b}	1.69 ± 0.22^{b}	25.73 ± 1.24^{b}	4.61 ± 0.85^{a}	12.11 ± 1.60^{c}	5.60 ± 0.48^{b}	22.32 ± 0.96^{bc}	28.58 ± 3.13^{a}	0.93 ± 0.04^{c}	0.00	29.51 ± 3.14a
Pruning in October to 60% of canopy	16.86 ± 0.68^{a}	5.62 ± 0.23^{bc}	1.37 ± 0.14^{b}	23.85 ± 0.90^{b}	3.18 ± 0.42^{a}	9.25 ± 1.15^{c}	3.55 ± 0.16^{bc}	15.98 ± 1.41^{c}	25.58 ± 2.29^{a}	1.00 ± 0.10^{b}	0.00	26.58 ± 2.21a
Pruning three times in a year to 50% of shoot length	16.48 ± 3.10^{a}	5.03 ± 0.75^{c}	13.37 ± 1.30^{a}	34.88 ± 4.58^{a}	4.92 ± 1.76^{a}	23.26 ± 0.88^{a}	9.07 ± 2.42^{a}	37.24 ± 3.83^{a}	17.90 ± 4.91^{b}	1.60 ± 0.20^{b}	0.00	19.50 ± 4.83b

*Data represent the mean ± standard error of three independent determinates. Mean within a column that did not differ significantly at 5% level of significance when compared with Fisher's Least significant difference are followed by the same superscript letter

during the third year it was recorded maximum in case of 80% pruning in October (29.51 t/ha). Data on fruit weight and TSS during different seasons is given in Table 4. As evident from the table, the treatments did not differ significantly with respect to their effect on fruit weight of summer and rainy season crop during all the three years except winter season crop. During winter of 2009-10, pruning to 80% of canopy height in May resulted in maximum average fruit weight. During 2010-11 it was recorded maximum in the case of 60% of canopy height in October, whereas during 2011-12 it was recorded in case of Control. During all the three years the treatments did not differ significantly with respect to their effects on TSS.

A relook at the weather conditions of 2010 indicates severe deficit rainfall during May to August coinciding with flowering, fruit set and fruit growth period of rainy season crop. Low rainfall and high temperature during flowering stage might have resulted in reduced bud sprouting as well as flower drop due to desiccation (Rathore and Singh, 12). The overall increase in the winter and summer crop of 2010 was obviously due to the higher accumulation of assimilates which as not utilized by the rainy season crop (Clair *et al.*, 4). The high temperature prevailing during September-October, 2010 might also have contributed towards higher rate of bud sprouting for the winter season crop. Chou *et al.* (3) found that cambial growth and leaf initiation in guava in Taiwan was accelerated by temperatures above 15°C up to a maximum of about 28°C. During 2011-12, the higher temperature and rainfall during April-August might have resulted in significant increase in bud sprouting, consequent flowering and fruit set of rainy season crop which ultimately resulted in markedly higher yield of rainy season crop.

It was also interesting to note the increase in the yield of rainy season crop in case of May pruned plants over that of control during 2011-12. A look at the flowering phenology during different years indicated prolonged flowering phase of rainy season crop during 2011-12. Even after the removal of flowers by May pruning, there was a period of flowering for nearly one month in May pruned plants which contributed significantly towards the higher yield during rainy season of 2011. The difference in the occurrence of phenophases in the pruned trees as compared to control may be due to changes in the internal physiology of the pruned plants resulting from the stress due to pruning, whereas, the control trees followed the normal phenological behavior (Singh *et al.,* 15). Phenological development of guava trees was greatly influenced by temperature conditions. Differences on phenology of guava

Table 4. Effect of pruning on average fruit weight (g) and TSS (ºB) in guava cv. Sardar under ultra-high density planting system.

Treatment	Average fruit weight (g)									TSS (ºB)								
	Rainy season			Winter season			Summer season			Rainy season			Winter season			Summer season		
	2009-2010	2010 - 2011	2011-2012	2009-2010	2010-2011	2011-2012	2009-2010	2010-2011	2011-2012	2009-2010	2010-2011	2011-2012	2009-2010	2010-2011	2011-2012	2009-2010	2010-2011	2011-2012
No pruning	113.72	99.22	139.19	126.68	108.25	140.12	119.76	102.06	-	8.41	9.28	7.58	10.44	9.38	9.10	10.13	15.88	-
Pruning in May to 80% of canopy	117.50	107.12	118.22	157.66	122.32	122.25	130.51	108.82	-	8.88	10.18	7.68	11.37	9.71	9.71	10.09	15.06	-
Pruning in May to 60% of canopy	119.32	105.36	117.32	142.03	119.45	121.29	131.85	110.02	-	8.89	10.18	7.45	11.55	9.80	9.96	10.72	14.48	-
Pruning in October to 80% of canopy	120.21	110.20	111.77	153.57	129.94	113.41	128.59	103.36	-	8.89	10.15	7.48	10.99	9.45	9.41	10.01	15.21	-
Pruning in October to 60% of canopy	118.40	115.23	117.56	150.74	130.01	119.82	131.38	106.77	-	9.30	10.24	7.14	10.46	9.43	9.53	10.52	15.75	-
Pruning three times in a year to 50% of shoot length	117.21	105.03	127.39	106.68	110.60	126.44	135.15	117.06	-	8.70	10.50	7.34	9.93	8.93	8.75	10.25	14.18	-
SEm	2.54	6.07	13.07	8.17	3.72	11.95	4.72	7.72	-	0.34	0.44	0.29	0.55	0.45	0.35	0.89	1.12	-
CD at 5%	NS	NS	NS	19.86	9.04	29.04	NS	NS	-	NS	NS	NS	NS	NS	NS	NS	NS	-

trees or pruning dates were attributed to the rate of accumulation of heat units. Guava trees require about 800 to 850 and from 1,950 to 2,000 heat units for stages pruning to flowering and flowering to beginning of harvest, respectively (Padilla-Ramirez *et al*., 9).

Obviously the in-general negligible yield of winter season crop and no yield of summer season crop of 2011-12 was attributed to exhaustion of assimilates by the rainy season crop. Pruning in May resulted in significant reduction in yield of rainy season crop and increase in the winter season crop during 2009-10 which was a year of normal rainfall. During 2010-11, which was a year of deficit rainfall, an in-general decrease in the rainy season crop and increase in the winter and summer season crop was recorded under each treatment. In contrast, during the year 2011-12, which was a year of extremely high rainfall, there was remarkable increase in the rainy season crop with drastic reduction in the winter season crop and no summer crop. During the year 2009-10, pruning in May resulted in significant reduction in the rainy season crop while during 2010-11, pruning in May did not result in significant decrease in the rainy season crop. Reduction in the rainy season crop with May pruning has been reported by many workers (Jadhao *et al*, 7; Singh *et al.,* 15). Non-significant effect of May pruning on rainy season crop of 2010-11 was attributed to drastic in-general reduction in the yield of rainy season crop.

Hence, the study clearly indicated the efficacy of pruning in May for removal of rainy season crop particularly under the conditions of normal rainfall. Under the conditions of acute deficit rainfall, the effects of pruning in May were nullified by natural regulation of rainy season crop. Again, under the conditions of heavy rainfall, pruning in May was neither effective in reduction of rainy season crop nor in increasing the winter and summer season crops. Hence, on the basis of average yield per year of three conservative years, cultivar Sardar with pruning of guava plants thrice a year viz. March, May and October to 50% of shoot length found promising without affecting the quality of the fruit.

ACKNOWLEDGEMENT

The authors are thankful to NABARD for providing financial assistance for conducting the research work.

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Received : May, 2017; Revised : October, 2018;
Accepted : November, 2018