Journal of Applied Horticulture, 17(1): 52-57, 2015

Effect of different spacing and pruning levels on growth, yield and fruit quality in fig (*Ficus carica* L.) cv. Poona

Ravindra Kumar[1], R. Chithiraichelvan[1], S. Ganesh[2], K.K. Upreti[3] and V.V. Sulladmath[1]

*[1]Division of Fruit Crops; [3]Division of Plant Physiology & Biochemistry, Indian Institute of Horticultural Research, Hessaraghatta Lake, Bangalore-560 089, Karnataka, India. [2]Faculty of Agriculture, Gandhigram Rural Institute (Deemed University), Gandhigram, Dindigul-624302, Tamilnadu, India. *E-mail: rkumar@iihr.ernet.in*

Abstract

Effects of tree spacing (5x2 m, 5x2.5 m, 5x3 m, 5x3.5 m and 5x4 m) and pruning (8 buds/cane, 6 buds/cane and 4 buds/cane) on growth, physiological parameters, fruit yield and quality were studied in fig cv. Poona during 3rd and 4th years of planting. Results indicated that the fig responded more to tree spacing than the pruning levels in terms of morpho-physiological characters and yield. With increase in in-row tree spacing from 5x2.5 m to 5x4 m, the vegetative growth parameters like leaf number, shoot length, internodal length, tree spread, tree height and tree circumference and the fruit yield both in terms of fruit number and fruit weight per tree declined under different pruning levels and closer tree spacing of 5x2.5 m recorded higher values. Physiological parameters like photosynthesis rate and leaf water potential remained at higher levels under closer spacing as compared to the wider spacing under different pruning levels. The increased pruning levels from 8 buds/cane to 4 buds/cane resulted in reduction of tree height while yield characters were marginally influenced by the pruning. The interaction effects between pruning and spacing levels were, however, non-significant. Under 5x2.5 m, the average fruit size and TSS recorded the highest values with no marked differences in acidity. The fruit yield calculated on per tree basis showed highest fruit number of 84.3-253.0 and 232.3-321.5 and fruit weight of 2.69-8.61 and 7.43-9.44 kg, respectively during 3rd and 4th year of planting under closer spacing of 5x2.5 m with 8 buds/cane pruning. The yield per hectare under various pruning levels recorded high values under the closer spacing of 5x2.5 m or 5x2.0 m with 8 buds/cane pruning. Overall results showed that 5x2.5 m tree spacing in combination with light pruning level of 8 buds/cane is ideal for achieving higher growth and yield in fig during 3rd and 4th year of planting.

Key words: Fig, growth characters, pruning, fruit quality, tree spacing, fruit yield, photosynthesis, leaf water potential

Introduction

Fig (*Ficus carica* L.) is one of the nutritionally important fruit crops being grown in sub-tropical and tropical regions of world. It is a hardy crop which is well adapted to varying conditions of soil and climate. Fig cultivation is mainly concentrated in many regions of California and Arabia besides in Italy, Turkey, Spain, Greece and Portugal. Although India has all favourable agro-climatic conditions for fig cultivation, its cultivation has not received much attention. Of late, many fruit growers in the states of Maharastra, Karnataka, Tamil Nadu and Andhra Pradesh have shown interest in its cultivation because of the high economic returns and low input requirements. India had 5500 ha of area under fig cultivation in 2012 with 19000 tonnes production (http:// faostat.fao.org) and area expansion under fig cultivation is taking place. However, productivity of fig in India is relatively low due to lack of scientific information on production and crop management aspects. Fig grows 5-6.6 meters in height with wider canopy cover. It produces two distinct crops every year, characterized by first crop as breba and the second, the preferred one as the main crop (Lodhi *et al.*, 1969). The breba generally comes on previous year produced shoots while current year shoots are sites for main crop. Thus in order to have better main crop, increase in the number of new shoots is a preferred option. Canopy management through pruning and tree spacing is considered viable option for encouraging new growth, as these are very effective in optimizing light utilization, improving aeration within the canopy and controlling of apical dominance (Schilletter and Richey, 2005; Marini, 2009). From the available information, it was found that pruning and the standardization of plant density per hectare has yielded promising results in other crops like guava (Kumar and Rattanpal, 2010), ber (Bajwa *et al.*, 1986), however, such information is lacking in commercially important and popular fig cultivar, Poona. In the present investigation, an attempt has been made to study the effects of different plant densities and pruning levels on changes in morpho-physiological characters, fruit yield and quality attributes with a view to standardize production packages for improving fig production.

Materials and methods

The study was conducted at the experimental farm of Indian Institute of Horticultural Research, Hessarghatta, Bangalore on the trees of commercially important Indian fig cv. Poona during 3rd and 4th year from planting for two consecutive seasons of the years 2010-2011 and 2011-2012. Trees were grown at five different spacings: T_1 = 5.0 x 2.0 m (1000 plants/ha); T_2 = 5.0 x 2.5 m (800 plants/ha); T_3 = 5.0 x 3.0 m (666 plants/ha); T_4 = 5.0 x 3.5 m (571 plants/ha) and T_5 = 5.0 x 4.0 m (500 plants/ha). Each spacing treatment had a row to row distance of 5.0 m. Trees under varied spacing were subjected to three levels of pruning; P_1 = 8 buds/cane, P_2 = 6 buds/cane and P_3 = 4 buds/cane by retaining required number of buds. The pruning was done during the 2nd week of September for both the years. The experiment was laid under factorial randomized block design with 4 replications under each treatment. Experimental trees received irrigation through drip. During the experimentation, the average minimum and maximum temperatures ranged between 13.2-20.3 °C and 26.2-30.6 °C, respectively and average relative humidity at 8.30 am and 1.30 pm were 66.7-84.5 % and 41.3-63.6 %, respectively. Standard package of practices recommended for fig cultivation were adopted for the maintenance of trees during the experimentation.

Periodical observations (at an interval of 25 days) were recorded on vegetative growth parameters such as leaf number; shoot length and internodal length after 60 days of pruning. Tree height, trunk circumference and tree spread (north to south and east to west) were recorded at fruiting stage. The data on physiological parameters like photosynthesis rate and leaf water potential were recorded on fully expanded leaves at 60 days after tree pruning. Leaf water potential was measured using Dew Point Micro Voltmeter (Wescor, USA) after cutting leaf disc of uniform diameter (1 cm) and values were expressed as -MPa. The photosynthesis rate was recorded *in situ* in 5 replicates using LICOR Portable Photosynthesis System (Model LI 6400XT, LiCor, USA) between 10-11 am. At fruit harvest, observations on fruit number and fruit weight per tree were recorded. Average fruit weight was worked out by dividing fruit weight per tree with the fruit number per tree under different treatments. Data was also computed on fruit yield on the basis of fruit number per hectare and fruit weight (quintals) per hectare. Besides, 10 fruits/tree were randomly sampled and were used for the analysis of fruit quality parameters such as total soluble solids (TSS) and titratable acidity (TA). TSS was recorded using Hand ERMA Refractrometer. TA was determined by AOAC (1990) method using phenolphthalein as indicator.

The data obtained were subjected to standard statistical analyses according to Steel and Torrie (1980) and means were compared by least significance difference (LSD) at 5% level for interpretation of results.

Results and discussion

Growth parameters: The shoot regeneration after pruning started after two weeks during both the 3rd and 4th year of planting under different tree spacing treatments and period of regeneration was long as compared with Deanna (Ravindra Kumar *et al*., 2014). The tree spacing had least influence on the days for initiation of new shoots in the pruned trees.

The leaf production, shoot length and inter-nodal length, in general, were higher during 4th year as compared to the 3rd year of planting under different pruning and spacing treatments (Table 1). The inter-nodal length was significantly higher under the closer spacing T2 (5x2.5 m). With increase in tree spacing (from T3 to T5), the inter-nodal length under various pruning levels declined gradually. Though the result of spacing for inter-nodal length was non-significant during 4th year but trends were same as during 3rd year. The results of leaf production, shoot length were non-significant for both the years. The inter-nodal length was significant due to greater shoot length under T2 during 3rd year (Table 1).

Tree spread (E-W or N-S), tree height and tree circumference, in general, recorded higher values during 4th year of planting as compared to the 3rd year under different pruning and spacing treatments (Table 1). The tree spread (E-W) and (N-S), recorded higher values in the trees grown under the closer spacing T2 (5x2.5 m) during 3rd year and 4th year, respectively. With increase in tree spacing (from T3 to T5), the average tree spread (E-W) and (N-S) declined gradually. Tree height showed significant differences during 4th year. It was higher under closer spacing T2 (5x2.5 m). The average tree height was significantly higher under the light pruning P1 (8 buds/cane) during 3rd year (Table 1). Most of the growth parameters values were higher under the closer spacing T2 (5 x 2.5 m) and light pruning P1 (8 buds/cane). It may be due to better interception of radiant energy as well as more efficient use of fertilizer and water due to greater root densities per unit area. Similar results have been reported under closer spacing by Mano and Hamada (2005) and Mano *et al*. (2011) in fig and Singh and Singh (2007) in aonla. The growth parameters were enhanced significantly by light pruning in ber (Bisla *et al*., 1988). Higher values for growth parameters were recorded under the closer spacing T2 (5x2.5 m), but not under the closest spacing T1 (5x2 m), which may be due to vigorous nature of the cv. Poona. Bacha *et al*. (2000) also reported that the effect of plant density on tree growth depended on cultivars as well as tree age. Kaufmann *et al*. (1972) in citrus reported that root densities increased with increase in tree densities.

Physiological parameters: Photosynthesis rate was influenced significantly by tree spacing during 4th year. It was found to be highest under the spacing T2 (5x2.5 m) (Table 2). With increase in tree spacing (from T3 to T5), photosynthesis rate declined consistently. A positive relationship was seen between the growth parameters like tree spread (N-S) and tree height with photosynthesis rate under the spacing treatments. This showed that increased rate of photosynthesis was associated with the increased tree vigour as observed under T2 spacing. As plants receive carbohydrates required for growth through photosynthesis, an increased photosynthesis rate observed under T2 spacing resulted changes in growth parameters in fig. Photosynthesis rate was not significantly influenced by the pruning levels. Leaf water potential which defines the water status of the plants was also not influenced significantly by the spacing, pruning and interaction (PxS) (Table 2). Maintenance of optimum soil moisture level is vital for sustaining photosynthesis rate and thus high leaf water potential values witnessed under T2 spacing may be one of the factors for high photosynthesis rate in such trees.

Fruit yield: Fruit number and fruit weight per tree were considerably influenced by tree spacing and pruning during the 3rd and 4th year of planting. Both yield attributes, recorded higher value during the 4th year than the 3rd year of planting under different spacing/pruning treatments. The yield attributes may be higher during 4th year due to increaseed bearing area associated with higher tree spread, height, trunk circumference and tree age. This also showed that the production efficiency of younger fig trees is although lower but their response to pruning and spacing treatments was high (Table 3).

Under different within row tree spacing during both the years, the fruit number and fruit weight per tree increased with decrease in pruning severity from P3 (4 buds/cane) to P1 (8 buds/cane). The maximum fruit number and fruit weight on tree basis during both the years were recorded under closer spacing of 5x2.5 m and in

Table 1. Effect of different spacing and pruning levels on growth parameters in fig cv. Poona

	3rd year from planting					4th year from planting			
Leaf number									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	12.51	14.21	12.87	13.20	T1	14.58	14.92	15.15	14.89
T2	16.36	15.72	15.65	15.91	T2	17.36	13.92	15.12	15.47
T3	14.18	14.12	13.78	14.03	T3	13.43	15.40	14.63	14.49
T4	12.39	13.24	16.54	14.06	T4	15.75	12.36	13.90	14.00
T5	15.65	12.03	10.49	12.72	T5	15.15	14.05	11.49	13.56
Mean	14.22	13.86	13.86		Mean	15.25	14.13	14.06	
	S: NS, P: NS, PxS: NS					S: NS, P: NS, PxS: NS			
Shoot length (cm)									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	41.83	34.77	45.98	40.86	T1	51.52	53.12	50.31	51.65
T2	63.88	63.47	55.24	60.86	T2	66.97	51.22	45.36	54.52
T3	44.06	46.27	49.43	46.59	T3	37.26	50.95	60.69	49.63
T4	60.72	38.35	40.41	46.49	T4	51.92	43.27	36.02	43.74
T5	30.21	53.06	32.61	38.63	T5	49.27	37.61	42.48	43.12
Mean	48.14	47.18	44.73		Mean	51.39	47.23	46.97	
	S: NS, P: NS, PxS: NS					S: NS, P: NS, PxS: NS			
Internodal length (cm)									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	2.78	2.63	3.10	2.84	T1	3.52	3.49	3.35	3.45
T2	3.94	3.81	3.42	3.72	T2	3.82	3.32	3.25	3.46
T3	3.03	2.89	3.18	3.03	T3	2.66	3.44	3.88	3.33
T4	3.49	2.82	2.83	3.05	T4	3.28	3.13	2.88	3.09
T5	2.23	3.08	2.43	2.58	T5	3.26	3.89	2.99	3.38
Mean	3.09	3.04	2.99		Mean	3.31	3.45	3.27	
	S: *, LSD (P=0.05): 0.73; P: NS, PxS: NS					S: NS, P: NS, PxS: NS			
Tree spread (E-W) (cm)									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	205.00	166.25	174.25	181.83	T1	208.75	213.75	187.50	203.33
T2	235.00	221.25	221.25	225.83	T2	242.50	201.25	216.25	220.00
T3	222.50	173.75	188.75	195.00	T3	230.00	218.75	180.00	209.58
T4	190.00	195.00	172.50	185.83	T4	206.75	201.25	217.50	208.50
T5	154.25	183.75	145.00	161.00	T5	207.50	165.00	181.25	184.58
Mean	201.35	188.00	180.35		Mean	219.10	200.00	196.50	
	S: *, LSD (P=0.05): 39.35; P: NS, PxS: NS					S: NS, P: NS, PxS: NS			
Tree spread (N-S) (cm)									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	186.25	212.50	202.50	200.42	T1	236.25	252.50	246.25	245.00
T2	262.50	222.50	213.75	232.92	T2	287.50	222.50	247.50	252.50
T3	197.50	185.00	198.75	193.75	T3	212.50	218.75	188.75	206.67
T4	160.00	211.25	205.00	192.08	T4	185.00	237.50	207.00	209.83
T5	203.75	183.75	125.00	170.83	T5	230.00	145.00	182.50	185.83
Mean	202.00	203.00	189.00		Mean	230.25	215.25	214.40	
	S: NS, P: NS, PxS: NS					S: *, LSD (P=0.05): 41.55; P: NS, PxS: NS			
Tree height (cm)									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	199.50	208.50	186.00	198.00	T1	245.00	233.75	204.25	227.67
T2	236.75	213.50	218.25	222.83	T2	288.00	250.50	261.25	266.57
T3	236.25	180.75	177.75	198.25	T3	218.00	222.25	217.25	219.17
T4	209.25	190.50	190.25	196.66	T4	204.25	215.75	228.00	216.00
T5	198.00	185.25	207.50	196.92	T5	242.00	213.25	191.75	215.66
Mean	215.95	195.70	195.95		Mean	239.45	227.10	220.50	
	S: NS, P: *, LSD (P=0.05): 17.92; PxS: NS					S: **, LSD (P=0.05): 24.69; P: NS, PxS: NS			
Trunk circumference (cm)									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	22.80	25.47	25.17	24.48	T1	30.00	34.50	29.25	31.25
T2	25.45	25.22	25.45	25.37	T2	34.75	31.00	34.00	33.25
T3	22.90	22.77	22.95	22.87	T3	30.00	32.00	29.25	30.42
T4	22.70	20.85	20.72	21.42	T4	28.25	30.50	32.00	30.25
T5	25.27	15.67	22.77	21.24	T5	31.75	24.75	28.25	28.25
Mean	23.82	21.99	23.41		Mean	30.95	30.55	30.55	
	S: NS, P: NS, PxS: NS					S: NS, P: NS, PxS: NS			

S-Spacing; P-Pruning; ** $P\leq0.001$; * $P\leq0.05$

Table 2. Effect of different spacing and pruning levels on physiological parameters in fig cv. Poona

	3rd year from planting					4th year from planting			
Photosynthesis rate (µmol/m²/s)									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	17.65	16.30	17.72	17.22	T1	16.98	17.16	17.48	17.21
T2	18.07	17.51	17.45	17.68	T2	17.74	16.73	17.42	17.29
T3	17.11	17.73	16.04	16.96	T3	17.07	16.66	16.27	16.66
T4	17.74	15.94	16.47	16.72	T4	16.24	16.32	16.28	16.28
T5	17.06	16.79	16.06	16.64	T5	16.21	16.91	15.51	16.21
Mean	17.53	16.85	16.75		Mean	16.85	16.75	16.59	
S: NS, P: NS, PxS: NS					S: *, LSD (*P*=0.05): 0.77; P: NS, PxS: NS				
Leaf water potential (-MPa)									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	1.36	1.46	1.47	1.43	T1	2.51	2.45	2.72	2.56
T2	1.46	1.36	1.43	1.42	T2	2.66	2.67	2.46	2.60
T3	1.32	1.37	1.64	1.44	T3	2.62	2.44	2.71	2.59
T4	1.36	1.46	1.57	1.46	T4	2.51	2.65	2.68	2.61
T5	1.51	1.54	1.40	1.48	T5	2.54	2.86	2.62	2.67
Mean	1.40	1.44	1.50		Mean	2.56	2.61	2.64	
S: NS, P: NS, PxS: NS					S: NS, P: NS, PxS: NS				

S-Spacing; P-Pruning; ** $P \leq 0.001$; * $P \leq 0.05$

tree subjected to P1 (8 buds/cane) pruning followed by under the closest spacing of 5x2 m. During both the years, the increased tree spacing (from T3 to T5) irrespective of pruning resulted in gradual decline in these yield characters. This showed that the cv. Poona performs better under the spacing of 5x2.5 m as compared to other spacing treatments, possibly because of higher tree vigour. Although during the 4th year, the results for fruit number were non-significant but general trend witnessed was the same as during 3rd year (Table 3). The fruit yield calculated on per tree basis showed highest fruit number of 84.3-253.0 and 232.3-321.5

Table 3. Effect of different spacing and pruning levels on fruit yield in fig cv. Poona

	3rd year from planting					4th year from planting			
Fruit number/tree									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	224.00	175.50	153.00	184.17	T1	299.25	254.00	204.75	252.66
T2	253.00	221.25	84.25	186.17	T2	321.50	272.00	232.25	275.25
T3	252.75	151.50	138.75	147.67	T3	273.25	207.25	237.00	239.16
T4	83.75	88.25	188.50	120.17	T4	198.00	256.50	201.50	218.66
T5	92.00	102.25	69.50	87.92	T5	250.75	171.50	181.50	201.25
Mean	161.10	147.75	126.80		Mean	268.55	232.25	211.40	
S: **, LSD (*P*=0.05): 54.25; P: NS, PxS: *, LSD (*P*=0.05):93.97					S: NS, P: *, LSD (*P*=0.05): 42.06; PxS: NS				
Fruit weight (kg)/tree									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	7.51	5.12	4.76	5.79	T1	8.79	7.16	5.70	7.22
T2	8.61	7.43	2.69	6.24	T2	9.44	8.34	7.43	8.41
T3	5.11	5.03	5.15	5.09	T3	7.75	5.87	6.81	6.81
T4	2.61	2.89	5.04	3.52	T4	5.58	7.21	5.80	6.19
T5	3.20	3.69	2.11	3.00	T5	7.22	4.15	4.74	5.37
Mean	5.41	4.83	3.95		Mean	7.76	6.55	6.10	
S: *, LSD (*P*=0.05): 2.14; P: NS, PxS: NS					S: *, LSD (*P*=0.05): 1.68; P: *, LSD (*P*=0.05): 1.31; PxS: NS				
Fruit number/ha									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	224000	175500	153000	184166.70	T1	299250	254000	204750	252666.70
T2	202400	177000	67400	148933.30	T2	257200	217600	185800	220200.00
T3	101731.50	100899	92407.50	98346.00	T3	181984.50	138028.50	157842	159285.00
T4	47821.25	50390.75	107633.50	68615.16	T4	113058	146461.50	115056.5	124858.70
T5	46000	51125	34750	43958.34	T5	125375	85750	90750	100625.00
Mean	124390.60	110983	91038.21		Mean	195373.50	168368.00	150839.70	
S: **, LSD (*P*=0.05): 44490.97; P: NS, PxS: NS					S: **, LSD (*P*=0.05): 41734.80; P: *, LSD (*P*=0.05): 32327.64; PxS: NS				
Fruit weight (quintals)/ha									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	75.09	51.18	47.62	57.96	T1	87.92	71.63	57.02	72.19
T2	68.89	59.42	21.59	49.96	T2	75.55	66.79	59.49	67.27
T3	34.02	33.49	34.33	33.95	T3	51.63	39.11	45.37	45.37
T4	14.92	16.55	28.77	20.08	T4	31.85	41.18	33.13	35.39
T5	16.02	18.45	10.55	15.01	T5	36.08	20.77	23.72	26.86
Mean	41.79	35.82	28.57		Mean	56.61	47.90	43.75	
S: **, LSD (*P*=0.05): 17.90; P: NS, PxS: NS					S: **, LSD (*P*=0.05): 13.17; P: *, LSD (*P*=0.05): 10.20; PxS: NS				

and fruit weight of 2.69-8.61 and 7.43-9.44 kg/tree, respectively during 3rd and 4th year of planting under closer spacing of 5x2.5 m and under light pruning of 8 buds/cane. The interaction effect of pruning and spacing for fruit number/tree was found significant during 3rd year. The results indicated that closer spacing with 5x2.5 m and light pruning with P1 (8 buds/cane) was relatively more beneficial for the Poona fig production. Though the fruit weight/ha was high under spacing 5x2 m, but the fruit weight/ha was 2nd highest under the spacing of 5x2.5 m and it was at par with spacing 5x2 m. Besides, most of the yield related parameters were higher under the spacing of 5x2.5 m (Table 3). The high fruit yield in the close spaced trees could be due to increased growth and other physiological parameters, like photosynthesis rate as a result of possible better interception of sunlight and efficient use of fertilizers and water. Increased fruit yield may be due to increased levels and availability of nutrients per unit area because of increased plant density. Mano and Hamada (2005) and Mano *et al*. (2011) also reported that closer spacing in fig was beneficial for growth and yield. Also high fruit yield in the trees subjected to light pruning may be consequence of increased bearing area with decrease in pruning severity. Bajwa *et al*. (1988), Bisla *et al*. (1991) and Sharma *et al*. (1980) reported that the fruit yield was affected with the pruning severity in ber as also observed in the present study.

Fruit quality: The average fruit weight in general was higher during 3rd year as compared to the 4th year of tree growth under various pruning and spacing treatments. The average fruit weight in the 4th year was recorded significantly higher under spacing of 5x2.5 m. During 3rd year, the results were found non-significant (Table 4). The TSS was significantly higher under the close spacing of 5x2.5 m. The fruit acidity remained unaffected by the tree spacing and pruning in both the years. Further, TSS and acidity in fruits under various pruning and spacing levels were, in general, higher during the 4th year than 3rd year of tree growth (Table 4). This is in consistent to the findings of Bacha *et al*. (2000) that the fruit size and TSS were increased by increasing plant density, while other physical and chemical properties were not affected with increasing planting density.

In the conclusion, it was found that maintenance of 5x2.5 m tree spacing in combination with light pruning of 8 buds/cane was optimum for achieving high growth and yield in fig cv. Poona.

Acknowledgment

We thank Director, Indian Institute of Horticultural Research, Bangalore for providing necessary facilities.

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Table 4. Effect of different spacing and pruning levels on fruit quality parameters in fig cv. Poona

	3rd year from planting					4th year from planting			
Average fruit weight (g)									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	32.25	28.33	29.08	29.89	T1	29.50	28.25	27.16	28.30
T2	33.41	33.66	32.33	33.13	T2	29.66	32.41	30.50	30.86
T3	33.83	33.58	36.50	34.64	T3	28.50	28.25	28.24	28.33
T4	30.00	31.91	26.58	29.50	T4	28.16	28.41	29.08	28.55
T5	34.66	35.50	33.08	34.41	T5	28.83	24.33	25.75	26.30
Mean	32.83	32.60	31.51		Mean	28.93	28.33	28.15	
	S: NS, P: NS, PxS: NS					S: *, LSD (P=0.05): 2.68; P: NS, PxS: NS			
Total soluble solids (^{0}B)									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	16.87	17.23	16.16	16.75	T1	19.91	19.76	19.81	19.83
T2	18.76	18.01	18.16	18.31	T2	22.41	22.00	21.00	21.80
T3	18.21	17.48	17.53	17.74	T3	20.83	20.33	20.25	20.47
T4	18.13	17.68	16.73	17.51	T4	19.61	19.23	19.76	19.53
T5	17.17	17.55	17.45	17.39	T5	19.36	19.58	19.41	19.45
Mean	17.83	17.59	17.21		Mean	20.42	20.18	20.05	
	S: NS, P: NS, PxS: NS					S: **, LSD (P=0.05): 0.95; P: NS, PxS: NS			
Acidity (%)									
	P1	P2	P3	Mean		P1	P2	P3	Mean
T1	2.54	2.67	2.57	2.59	T1	2.76	2.70	2.70	2.72
T2	2.54	2.49	2.52	2.52	T2	2.65	2.71	2.71	2.68
T3	2.57	2.52	2.54	2.54	T3	2.77	2.65	2.71	2.71
T4	2.70	2.43	2.50	2.54	T4	2.64	2.64	2.76	2.68
T5	2.67	2.56	2.64	2.62	T5	2.64	2.77	2.77	2.73
Mean	2.60	2.53	2.55		Mean	2.69	2.69	2.73	
	S: NS, P: NS, PxS: NS					S: NS, P: NS, PxS: NS			

S-Spacing; P-Pruning; ** $P\leq0.001$; $^{*}P\leq0.05$

Acidity(%): Actual value ranged from 0.18 to 0.23. So, statistical analysis was done with angular transformation.

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Received: June, 2014; Revised: July, 2014; Accepted: August, 2014