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Leaf to Fruit Ratio Affects Fruit Yield and Quality of Low Chilling Peach Cv. Flordasun

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ABSTRACT

A study was conducted to standardize leaf to fruit ratio (LFR) during year 2011 and 2012 to observe its effect on fruit yield and quality of low chilling peach cv. Flordasun. All the LFR treatment advanced the harvest date by 4 to 11 days compared to control and earliest harvesting was recorded in 55:1 followed by 45:1 LFR. The fruit yield decreased linearly with increasing LFR and lowest yield was recorded in 55:1 LFR. The increase in LFR improved the fruit weight, fruit length, fruit diameter and pulp weight parameters were recorded highest in 55:1 followed by 45:1 LFR. While, pulp: stone ratio was recorded maximum in 45:1 followed by 35:1 and 55:1 LFR. Quality in terms of Total Soluble Sugar (TSS), ascorbic acid, total and reducing sugar were recorded highest in 55:1 followed by 45:1 LFR. On the other hand, lowest acidity and higher TSS: acid ratio was recorded in 45:1 followed by 35:1 and 55:1 LFR. Thus, 45:1 followed by 55:1 LFR were found suitable for cv. Flordsun under mid hill situation of north east India.

Keywords: Leaf to fruit ratio, Peach, Maturity, Yield, Fruit weight, Fruit quality.

INTRODUCTION

Peach (*Prunus persica* (L) Batsch.) is a potential fruit crop in terms of adaptability in India. It grows well at an altitude of 1000-2000 m above msl. Its commercial production is confined between 30° and 40° N and S latitudes. Introduction of early ripening low chilling peach cultivars paved the way for its commercial cultivation in non-traditional area. Among low chilling cultivars, Flordasun produces quality fruits under mid hill situation of northeast India particularly Meghalaya (Patel et al. 2007). But profuse bearing habit of cv. Flordasun, results in excessive crop load of undersized fruits with impaired fruit quality, limb breakage, exhaustion of tree reserves and reduce cold hardiness.

Peaches have a habit to set a large number of fruits under optimum growing condition and thereby reduce the possibility of getting commercial fruit size with quality fruit at harvest (Faust 1989; Costa and Vizzotto 2000; Southwick and Glozer 2000). Thinning practice is followed to adjust number of fruits per tree with high quality at harvest. Fruit size is dependent on the leaf to fruit ratio and their association with canopy size and bearing capacity (Westwood 1978). The indexes for estimating thinning amount were reported to be leaf to fruit ratio, total number of fruits per tree, fruit size and the distance between fruits within a branch (Mitra et al. 1991). In peach, end of fruit growth stage II (pit hardening) or beginning of stage III is the appropriate time for manual fruit thinning (Weinberger 1941). Fruit thinning by hand was found reliable way to improve fruit size (Costa and Vizzotto 2000) and quality fruits were obtained by hand-thinning of fruits at pit-hardening stage under Punjab conditions (Chanana et al.1998). But thinning response is closely related to type of cultivar, agro-climate, soil and other management practices. No information is available on appropriate thinning practice to be followed to maintain optimum leaf to fruit ratio in cv. Flordasun for quality fruit production under mid hills situation of North East India. Therefore, the aim of the present study was to observe the effects of leaf to fruit ratio on fruit yield and quality of low chilling peach cv. Flordasun.

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MATERIALS AND METHODS

The experiment was carried out for two years at ICAR Research Complex for NEH Region, Umiam, Meghalaya during the year 2011 and 2012. The experimental site is situated at an elevation of 900 meters abovemsl and lies between 25° 40' to 25° 21'N latitude and 90° 55'15 to 91°55'16 E longitude and comes under mid hill altitude. The climate of the site is sub temperate range of 5.4°C to 31.7°C and average annual rainfall of 2596.9 mm. The experimental material consisted of nine year old thirty six plants of cv. Flordasun, planted at a uniform distance of 4.5m under square system. The two trees per replication were selected based on their uniformity in size, vigor and crop load. The experiment was laid out in Randomized Block Design with three replication of six treatments viz., 15:1, 25:1, 35:1, 45:1 and 55:1 leaf to fruit ratio were carried out at pit hardening stage and an unthinned control. Fifty randomly selected fruits were sampled from each tree for fruit quality testing when fruit colour changed from green to yellowish. Observations recorded on fruit yield (kg/tree), fruit weight (g), fruit length (mm), fruit diameter (mm), fruit firmness (kg/cm^2), pulp weight (g), stone weight (g) and pulp:stone ratio (%). Fruit qualities in terms of total soluble solids (%), acidity (%), TSS: acid ratio, ascorbic acid (mg/100g), reducing sugar (%) and total sugars (%) were also recorded. TSS content was determined using a digital hand refractometer. Acidity was calculated by titrating fruit juice against 0.1 N/NaOH and expressed as malic acid. Ascorbic acid, reducing and total sugars were analysed according to Ranganna (2004). The data was statistically analysed and pooled results of two year was presented as per method of analysis of variance using RBD as described by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Harvest dates

The results (Table 1) showed earliness in harvest date of cv. Flordasun by 4-11 days compared with control in all leaf to fruit ratio (LFR) treatments imposed. The fruits of treatment 55:1 LFR (25th Apr) followed by 45:1 (26th Apr) were harvested earliest compared with others. These results are in line with Chananaet al. (2002) who reported that the thinning advanced the fruit maturity in peach.

Yield and fruit characteristics

Data (Table 1) showed the significant difference among the LFR treatments for yield and fruit characteristics in cv. Flordasun. The fruit yield decreased linearly with increasing LFR. The maximum fruit yield was recorded in control (31.42 kg/tree) while minimum in 55:1 LFR (17.54 kg/tree). However, the LFR 35:1 and 45:1 showed at par yield (22.96 and 21.33 kg/tree respectively). These results are in line with Chananaet al. (1998),Costa and Vizzotto (2000), Samuel and Goregory (2008) who reported that yield per tree decreased linearly with increasing spacing between fruits. The fruit weight showed increasing trend with LFR varied from 15:1 to 55:1. The highest fruit weight was recorded in treatment 55:1 LFR (49.21 g) followed by 45:1 (48.84 g) while lowest in control (39.28 g). Fruit size (length and diameter) is importantcommercial trait which influenced consumer preference. The fruit length and diameter was recorded significantly highest in treatment 55:1 LFR (48.21 mm and 47.62 mm,respectively) followed by 45:1 (47.56 mm and 46.77 mm, respectively) compared with all other treatments while, minimum in control (38.49 mm and 37.72 mm respectively). From the results, it was observed that 55:1 LFR produced highest pulp weight and stone weight (44.62 g and 4.11g respectively) followed by 45:1 (44.01 g and 4.03 g respectively). However, the maximum pulp to stone ratio was recorded in LFR of 45:1 (10.86%) followed by 35:1 (10.76%) and 55:1 (10.73%) and lowest in control (8.81%). The above results are in harmony with those obtained by Chanana et al. (1998) indicating that hand thinning increased the fruit weight in peach. Similarly, Samuel and Goregory (2008) also reported that fruit diameter decreased linearly with increasing spacing of peach.

The fruit firmness decreased linearly with increasing LFR. The unthinned (control) tree produced firm fruits (0.1462 kg/cm^2) followed by 15:1 and 25:1 LFR (0.1435 kg/cm^2 and 0.1412 kg/cm^2,respectively). However, minimum fruit firmness was recorded in 55:1 (0.1325 kg/cm^2) followed by 45:1 (0.1354 kg/cm^2). The result showed decreasing trend with increase in LFR. The reduction in fruit firmness might be due to larger fruit size that in tune decreases the strength of cell

Table 1: Effect of leaf to fruit ratio on yield and fruit characteristics of peach cv. Flordasun

Treatments	Date of harvest	Fruit yield (kg/tree)	Fruit weight (g)	Fruit length (mm)	Fruit diameter (mm)	Fruit firmness (kg/cm^2)	Pulp weight (g)	Stone weight (g)	Pulp : stone ratio
15:1	02-May	26.31	42.87	42.12	41.81	0.1435	38.41	3.77	10.19
25:1	01-May	24.37	46.10	45.06	44.22	0.1412	41.87	3.95	10.71
35:1	29-Apr	21.33	46.92	45.78	44.86	0.1389	42.94	3.86	10.76
45:1	26-Apr	20.12	48.84	47.56	46.77	0.1354	44.01	4.03	10.86
55:1	25- Apr	17.54	49.21	48.21	47.62	0.1325	44.62	4.11	10.73
Control	07-May	31.42	39.28	38.49	37.72	0.1462	34.86	3.99	8.81
SE m +		0.43	0.38	0.63	0.55	0.002	0.32	0.07	0.05
CD(P=0.05)		1.34	1.21	1.98	1.74	0.006	1.02	0.22	0.15

wall and lesser cohesion between the cells. These findings were in agreement with the findings of Saini and Kaunda (2003) in peach cv. Partap.

Fruit quality

The significant variation was observed among all the LFR treatments in respect of fruit quality. The result depicted in Table 2 revealed that the highest TSS was recorded in LFR of 55:1 (12.17%) followed by 45:1 (12.03%) and 35:1 (11.96%) showing at par values while, lowest in control (10.11%). However, lowest acidity and highest TSS: acid ratio were recorded in LFR of 45:1 (0.64% and 18.80, respectively) followed by 35:1 (0.67% and 17.85, respectively) and 55:1 (0.69% and 17.64, respectively). The ascorbic acid content was recorded highest in 55:1 (6.57 mg/100g) followed by 45:1 (6.34 mg/100g) while lowest in control (5.69 mg/100g). The sugars in terms of total and reducing sugar content were recorded highest in 55:1 (6.21% and 1.81% respectively) followed by 45:1 (6.13% and 1.79% respectively) and 35:1 (6.06% and 1.72% respectively). The improvement in quality traits of fruit might be due to reduced crop load due to thinning, resulting in more synthesis, transport and accumulation of nutrients in the remaining fruits. These results are in line with Saini and Kaunda (2003) and Chanana et al. (1998) who reported highest value for TSS and total sugar with hand thinning.

CONCLUSIONS

In light of the result obtained and discussed above, it could be concluded that 45:1 followed by 55:1 leaf to fruit ratio was optimum for improving fruit characteristics. Although control (unthinned) trees gave higher yield, the quality of such fruits was much inferior.

Table 2: Effect of leaf to fruit ratio on fruit quality of peach cv. Flordasun

Treatments	TSS (%)	Acidity (%)	TSS : acid ratio	Ascorbic acid (mg/100g)	Total sugars (%)	Reducing sugars (%)
15:1	11.25	0.76	14.80	5.78	5.82	1.61
25:1	11.58	0.72	16.08	5.91	6.00	1.65
35:1	11.96	0.67	17.85	6.14	6.06	1.72
45:1	12.03	0.64	18.80	6.34	6.13	1.79
55:1	12.17	0.69	17.64	6.57	6.21	1.81
Control	10.11	0.96	12.48	5.69	5.71	1.69
SE m +	0.07	0.01	0.09	0.10	0.05	0.01
CD(P=0.05)	0.21	0.05	0.28	0.31	0.15	0.03

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