Effect of pruning levels on vegetative character, flowering behavior, fruit quality and yield of peach cv. Pratap

M. RIZWAN, P. N. SINGH, S. K SINGH, A. NARAYAN and A. VISEN

Department of Horticulture, College of Agriculture, G. B. Pant University of Agriculture and Technology, Pantnagar-263145 (U. S. Nagar, Uttarakhand),

ABSTRACT: The present investigation were comprised of T_0: Unpruned control (no pruning), T_1: Light pruning (removal of 1/3 portion of branch from apical end), T2: Medium pruning (removal of 1/2 portion of branch from apical end) and T3 Heavy pruning (removal of 2/3 portion of branch from apical end). Pruning was done in the month of January after leaf fall. Date of first leaf emergence slightly affected by pruning level; whereas date of first leaf senesce was remain unaffected. Flowering attributes like date of pink bud stage, date of start of flowering, date of end of flowering, duration of flowering, date of 50 % flowering and date of full bloom showed one to four days differences. Higher level of pruning was very effective for increasing the fruit length, fruit breadth, fruit weight, fruit volume, total sugars, non-reducing sugars, TSS and ascorbic acid; whereas reducing sugar percentage decreases slightly. Highest specific gravity was recorded in medium pruning. Fruit yield increase with lesser extent of pruning.

Key words: Flowering, fruit quality, peach, pruning, yield.

The peach is a important temperate fruit cultivated in India and is mainly cultivated in the states of Himachal Pradesh, Jammu and Kashmir and Uttarakhand (Chundawat and Sen, 2002). It is highly valuable, due to fancy colour and pleasant taste, and is also good source of sugar, vitamins and essential nutrients. At commercial level production, to maintain a shape with good source and sink ratio, it is important to use standard cultural tactic. Pruning is a practice to make a tree more productive orchard with quality fruit. Pruning will not only restore balance between shoot and root system, but will also maintain growth and vigour of shoots by allowing only fewer growing points to grow vigorously and regulate the crop (Dubey *et al*., 2001). Moderate pruning of one year old shoot found to be have more flowering, hence pruduced more yield (Kumar *et al*., 2010). Thakur and Rana (2012) reported that fruit set and yield were highest with treatment where minimum pruning intensity viz., 20% thinning out and ¼ heading back was applied peach on trees. Peach responds to different pruning intensities and plant spacing. The pruning techniques have to be, therefore, standardized in terms of severity keeping in view to obtain higher yield with quality fruit.

MATERIALS AND METHODS

The present investigation was conducted during the year 2012-13 on 5 years old peach trees cv. Pratap of uniform vigour and size were selected at Horticultural Research Center, of G.B. Pant University of Agriculture and technology, Pantnagar, Udham Singh Nagar, Uttarakhand, India. It is situated at 29 ^{0}N latitude, 79.3 ^{0}E longitude and at an altitude of 243.8 m above the mean sea level in the tarai region of Shivalik range of Himalaya. The treatments were comprise of three pruning levels. These were compared with unpruned control: T_0 trees. Pruning was done on one year old shoots /branches. Pruning intensities were light pruning: T_1 (removal of 1/3 portion of branch from apical end), medium pruning: T_2 (removal of 1/2 portion of branch from apical end) and heavy pruning: T_3 (removal of 2/3 portion of branch from apical end). The pruning was performed on first week of January 2013. Each treatment was replicated three times in a Randomized Block Design. Date of first leaf emergence, date of first leaf senescence, date of pink bud stage, date of start of flowering and date of end of flowering were recorded by visual observation of each selected tree. Total numbers of buds on ten tagged shoots for each treatment were counted on selected trees. Duration of flowering was calculated by taking date of start of flowering and last date towards end of flowering. Date of 50 % flowering was recorded when 50 % flower buds opened on each branch. Date of 100 % flowering was recorded when 100 % flower buds opened on each branch. The total yield per tree was calculated by number of fruits per tree multiplied

with average fruit weight at harvesting time. Date of fruit set was recorded when tagged shoots of each treatment started fruit setting by visual observation. Date of fruit maturity is recorded when fruits are ready for harvesting. Average fruit length and fruit breadth were measured with the help of digital Vernier Calipers and expressed in millimeters (mm). Fruit weight was measured with the help of physical balance and noted in grams (g). Average fruit volume was recorded by water displacement method and expressed in terms of millimeters (ml). Specific gravity of the fruit was determined by dividing the fruit weight with its volume. Total soluble solids of the fruits were determined with the help of hand refractometer and values are corrected at 20°C. Percentage of total sugar and reducing sugar were determined by method suggested by AOAC (1980). The amount of non-reducing sugars were calculated by subtracting reducing sugars from total sugars and multiplying the difference by factor 0.95 as suggested by AOAC (1980) and expressed as percentage non-reducing sugars. The ascorbic acid was determined by reduction of 2, 6-dichlorophenol indophenols dye bye ascorbic acid as procedure given by AOAC (1980). The statistical analysis was done according to procedures described by Snedecor and Cochran (1987).

RESULTS AND DISCUSION

The data presented in Table 1 on the date of first leaf emergence and date of first leaf senescence clearly indicate that pruning levels had not any major effect on the date of first leaf emergence as well as date of first leaf senescence. First leaf emergence occur in treatment T_2 and T_3 (2 February) followed by treatment T_0 and T_1 (4 February) with the difference of only two days. Leaf fall starts together in all treatments on first week of December (7 December). These findings are in conformity with the earlier findings of Thakur and Rana, 2012. Early pink bud (12 February) was appear in pruning treatments T_1, T_2 and T_3. Late pink bud stage (14 February) was observed in treatment T_0. First flowering occurs in treatment T_0 and T_1 (15 February) followed by treatment T_2 and T_3 (17 February) with the difference of only two day. The data reveals a minor delay in flowering. This finding is in accordance with Thakur and Rana, 2012. Pruning levels had not any major effect on the date of end of flowering. Firstly flowering end occur in treatment T_0 (26 February), followed by T_1 (27 February), with the difference of only one day then progressed by treatment T_2 and T_3 (28 February) with the difference of only one day. Pruning levels had not any major effect on the duration of flowering (Table 1). Maximum duration of flowering (12 days) was recorded in treatment T_1 (Light pruning) followed by treatment T_2 and T_3 (11 days), with only difference of one day. Minimum flower duration (10) was recorded in treatment T_0 (Unpruned control). The data reveal that pruning induces longer flowering duration. This finding is accordance with the finding of Singh *et al*, 2010, in mango cv. Mallika. Date of 50 % flowering was recorded earlier (21 February) in treatment T_1. The late 50 % flowering (23 February) was recorded in treatment T_0. Full bloom was recorded earlier (23 February) in treatment T_1 and two days after T_1 (25 February) in treatment T_0.

Maximum value for fruit length (63.17 mm) was observed in treatment T_3, which is statistically *at par* with treatment T_2, having value of 60.95 mm (Table 1). Fruit weight was significantly increased with increase in intensity of pruning (Table 2). Maximum fruit breadth (53.56 mm) was recorded under the treatment T2, which is statistically *at par* with the treatment T_3, having value 52.31 mm. Minimum fruit breadth (44.02 mm) was recorded under treatment T0. These findings are in conformity with the Sharma and Chauhan, 2004 and Satyaprakash and Nautiyal, 1996. Maximum fruit weight (67.18 g) was recorded under the pruning treatment T_3. Fruit weight was recorded minimum (49.90 g) under treatment T_0. These results are in conformity with earlier results showed by Thakur and Rana, 2012. Maximum fruit volume (181 ml) was recorded under treatment T_3 (Heavy pruning). Minimum fruit volume (150 ml) was recorded under treatment T_0 (Unpruned control). Increasing pruning severity decreases the number of

Table 1: Effect of pruning levels on flowering attributes in 'Pratap' cultivar of peach

Treatments	Date of first leaf emergence	Date of first leaf senescence	Date of pink bud stage	Date of start of flowering	Date of end of flowering	Duration of flowering (Days)	Date 50 % flowering	Date of Full bloom
T_1:Light pruning	4 Feb	7 Dec	12 Feb	15 Feb	27 Feb	12	21 Feb	23 Feb
T_2:Medium pruning	2 Feb	7 Dec	12 Feb	17 Feb	28 Feb	11	22 Feb	24 Feb
T_3:Heavy pruning	2 Feb	7 Dec	12 Feb	17 Feb	28 Feb	11	22 Feb	24 Feb
T_0:Unpruned (control)	4 Feb	7 Dec	14 Feb	18Feb	24 Feb	10	23 Feb	25 Feb

flower buds and consequently the number of fruits, as a result linear increase in fruit size was observed with decreasing order of fruiting sites and increased uptake of nutrients especially N and K by peach trees (Hassan, 1990). The Specific gravity of fruit is affected significantly by pruning treatments. Maximum value (0.379) was found under the treatment T_2. Minimum value (0.332) was recorded under treatment T_0. The higher value of specific gravity in fruits subjected under shoot pruning is due to the higher fruit weight and size (length and breadth). Maximum (6.98 kg/tree) yield war recorded with T0, which was followed by T_1 (5.95 kg/tree). Lowest (5 kg/tree) yield was recorded in T_3.

Different pruning treatments were significantly effective for increase the content of total soluble solids (T.S.S). The highest value of TSS (11.18 0B) is recorded under the treatment T_3 (Heavy pruning). The lowest value of TSS (8.99 0B) was recorded under treatment T_0 (Table 3). The present results are in accordance with the earlier finding of Satyaprakash and Nautiyal, 1996. Higher TSS in heavy pruning treatments may be attributed to increased leaf to fruit ratio and consequently more synthesis of carbohydrates other metabolites and their translocation to the fruit tissues (Daulta and Singh, 1986). Different pruning treatments were significantly effective for increase the content of total sugars (Table 3). The highest total sugar (10.08 %) was recorded with the treatment T_3. The lowest total sugars (8.24 %) was recorded under treatment T0, which is statistically *at par* with the treatment T_1 having value (8.35 %). The present results are in harmony with the earlier finding of Schneider *et al.,* 1958. Pruning produces vigorous shoot growth and reason for this that there has been a reduction in top growth but there is full complement of root producing a flow of sap capable of supplying more tissue than is now available. Increase in size of leaves or leaf bearing parts increase the amount of plant food manufactured and thus to nourish the developing fruit (Sharma and Chauhan, 2004). Maximum reducing sugar (5.42 %) was recorded under the treatment T_0 which is statistically *at par* with the treatment T_1 having value 5.16 %. The minimum reducing sugar (4.7 %) was recorded under the treatment T_3, which is statistically *at par* with the treatment T_2 having value 4.8 %. These findings are in accordance with the earlier findings of Daulta and Singh, 1986. Increase of pruning intensity significantly increased the non- reducing sugars. The maximum reducing sugars (5.05 %) was found under treatment T_3. Minimum reducing sugars (2.67 %) was observed under treatment T0, which is statistically *at par* with the treatment T_1 (Light pruning) having value 3.18 %. These findings are in accordance with the earlier findings of Daulta and Singh, 1986. It is clear from the data presented in the Table 3 that the ascorbic acid content was significantly increased by the different pruning levels. Plant density had significant influence on ascorbic acid content of fruits. The data reveal that maximum ascorbic acid (8.82 mg/100g) content was found with the treatment T_3. Minimum value for ascorbic acid (7.26

Table 2: Effect of pruning levels on physical parameters of fruit in 'Pratap' cultivar of peach

Treatments	Fruit length (mm)	Fruit breadth (mm)	Fruit weight (g)	Fruit volume (ml)	Specific gravity	YIELD (Kg/tree)
T_1:Light pruning	53.12	52.11	57.66	159.40	0.361	5.94
T_2:Medium pruning	60.95	53.56	61.86	162.40	0.379	5.52
T3:Heavy pruning	63.17	52.31	67.18	181.40	0.370	5
T_0:Unpruned (control)	45.70	44.O2	49.94	150.20	0.332	6.98
S.Em.	1.42	2.60	1.51	2.24	0.578	0.378
CD at 5%	4.39	8.01	4.65	6.90	0.178	1.16

Table 3: Effect of pruning levels on quality in 'Pratap' cultivar of peach

Treatments	TSS (%)	Total sugar (%)	Reducing sugar (%)	Non-reducing sugar (%)	Ascorbic acid mg/100g
T_1:Light pruning	9.67	8.35	5.16	3.18	7.66
T_2:Medium pruning	10.29	9.66	4.80	4.60	8.31
T_3:Heavy pruning	11.18	10.08	4.70	5.05	8.82
T_0:Unpruned (control)	8.99	8.24	5.42	2.67	7.26
S.Em.	0.191	0.227	0.133	0.254	0.110
CD at 5%	0.590	0.701	0.411	0.784	0.340

mg/100g) was recorded with treatment T_1. The trend for ascorbic acid content seems to increase from control to higher pruning levels. Higher level of vitamin C might be due to higher sugar content, as ascorbic acid is synthesized from sugar. The finding is also is also in accordance with the reports of Kumar *et al*, 2010; Gill and Bal, 2006.

Based on above, it can be concluded that pruning is helpful to control excess vegetative growth as well as getting better qualities fruits. Trees gave higher yields with low level of pruning, but the quality of such fruits has less commercial value.

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