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Influence of Pruning Intensities and Nitrogen Application On Growth and Yield of Senile Peach (*Prunus persica* L. Batsch) Orchards

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ABSTRACT
The present experiment was conducted to assess the effect of pruning intensity and nitrogen application on growth and yield of senile peach cv. Early White Giant was conducted in the farmer's field at Nerikotli Village in Rajgarh area of Sirmour district of Himachal Pradesh during the year 2015-2016. The experiment was conducted in RBD consisting of 10 treatments viz. T_1-Dehorning at 1.5 m + 100% RD of NPK, T_2-Dehorning at 1.5 m + 150% N + RD of PK,T_3-Dehorning at 1.5 m + 200% N + RD of PK, T_4-Dehorning at 1.25 m + 100% RD of NPK,T_5-Dehorning at 1.25 m + 150% N + RD of NPK,T_6-Dehorning at 1.25 m + 200% N + RD of NPK,T_7-Dehorning at 0.75 m + 100% RD of NPK,T_8-Dehorning at 0.75 m + 150% N + RD of NPK,T_9-Dehorning at 0.75 m + 200% N + RD of NPK and T_{10}-Normal Pruning with RD of NPK and was replicated thrice. The results of the present investigation revealed that among different dehorning levels and nitrogen applications, the best results in terms of increase in tree height, plant spread, tree circumference and leaf area were obtained with treatment T_9 where dehorning level was 0.75 m and double dose of nitrogen coupled with recommended dose of phosphorus and potassium was applied. Whereas, the maximum fruit yield was resulted from dehorning level of 1.25 m and recommended dose of nitrogen, phosphorus and potassium.
Keywords: Dehorning, peach, pruning and yield.

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INTRODUCTION

The peach *Prunus persica* (L.) Batsch is one of the most important stone fruits grown in the world. Peach and its mutant, nectarine is grown more widely on commercial basis in the temperate and sub-tropical regions of the world. Peach is cultivated in India on an area of 40,640 ha having production of 2,89,864.8tonnes annually [1].Peach is highly valued as table fruit due to its attractive colour and taste. Performance of peach tree depends heavily on proper annual pruning and cultural management practices. If the trees are not pruned annually, the volume of fruiting wood reduces each year and the fruiting shoots move higher and higher, getting out of reach. The old peach plantations in major peach growing areas of Himachal Pradesh have shown tremendous decline in production during the recent years. The peach plants after attaining 20 years of productive life become senile and exhibit unfruitfulness symptoms in comparison to young orchards. Therefore rejuvenation of old senile peach orchard can prove to be a cost effective and beneficial to the farmers as the orchard gets new lease of life for many years. On the other hand, orchard replacement is not desirable as it is quite cumbersome and involves long juvenile period. Therefore, the rejuvenation of declining trees is easy, time saving and cost effective strategy. The appropriate combination of rejuvenation pruning and nitrogen treatments need to be standardized for regaining growth. The rejuvenation technology involves the heading back of exhausted trees showing marked decline in the quantity and quality of produce up to 1.0 to 1.5 m height above ground level during dormant season. This will facilitate production of new shoots below the cut points and allow the development of fresh canopy of healthy shoots. Profusely emerging shoots in the inner canopy are also pruned out to promote branching. The multiple shoots developed as a result of second pruning are capable of producing flower buds. Keeping in view these facts, experiment were conducted

in order to study the effect of different levels of pruning and nitrogen levels on growth and yield of peach cv. Early White Giant.

MATERIAL AND METHOD

The experiment was laid out at an elevation of 1811 m above mean sea level and is located 31.11^0 N latitudes and 77.16^0 E longitudes at Nerikotli village in Rajgarh area of Sirmour District of Himachal Pradesh. Twenty two years old rejuvenated plants of Peach cultivar 'Early White Giant', trained to open centre leader system were selected for the present study. The experimental trees were subjected to heavy pruning i.e. dehorning at different levels. (1.5m**,** 1.25mand0.75m). Similarly the nitrogen applications were kept at variable levels viz., 100, 150 and 200 per cent of the recommended dose of nitrogen. The experiment was laid out in Randomized Block Design and each treatment was replicated thrice. The recommended doses for peach were 100 Kg FYM, 700 g N, 350 g P_2O_5 and 700 g K_2O on per plant basis. Full dose of nitrogen was applied in the form of urea in two splits, first half of nitrogen during first week of January and second half of nitrogen was applied in the third of March just after fruit set. During December, 2014 i.e. one year after rejuvenation, corrective pruning and recommended dose of fertilizers were applied.

The growth parameters such as tree height, plant spread, tree circumference and leaf area were recorded. The height of the tree was measured in meter (m)with the help of graduated flag staff from the soil surface to the top of a tree, once before the start of the growing season and again after the termination of the growth and increase in height was expressed in percentage. The spread of the tree was measured in meter (m) in two directions i.e. East-West and North-South once before the start of the growing season and again at the end of growing period. Tree circumference was recorded at 30 cm above the ground level with the help of measuring tape once before the start of the growth and again after the completion of the growth. . The results of increase in the tree circumference over the growing season were expressed in percentage. Trunk cross-sectional area (TCSA). The weight of pruned wood was recorded at the time of pruning each year to estimate the effect of pruning and nitrogen levels on the tree growth. The pruning weight was expressed in kg per tree. After harvest, the analysis of fruit yield was done using standard procedures [8]. The two years data were pooled and statistically analyzed with the standard procedure[4]. The level of significance for different variables was tested at 5% value of significance.

RESULTS

Growth parameters:

Tree growth parameters were significantly influenced by different levels of pruning and nitrogen levels (Table 1). The maximum increase in tree height (36.47%) was recorded with treatment T_9 (Dehorning at 0.75 m + 200 % N + RD of PK) which was statistically at par (35.29 % and 34.91 %) with treatments T_8 (Dehorning at 0.75 m + 150% N + RD of PK) and T_6 (Dehorning at 1.25 m + 200% N + RD of PK) respectively. The minimum increase in tree height (20.35%) was recorded with treatment T_{10} (Normal Pruning with RD of NPK) which was statistically at par with treatment T_1 (Dehorning at 1.5 m + 100% RD of NPK), recording 20.99 per cent increase in tree height.

It is evident from the data presented in Table 1, the highest per cent increase in tree circumference (2.05 %) was recorded with treatment T_9 (Dehorning at 0.75 m + 200 % N + RD of PK) which was statistically at par with treatment T_8 (Dehorning at 0.75 m + 150% N + RD of PK), recording 2.04 per cent increase in tree circumference. The lowest per cent increase in tree circumference (1.76 %) was recorded with T_{10} (Normal Pruning with RD of NPK) which was statistically at par (1.79 %) with treatments T_1 (Dehorning at 1.5 m + 100% RD of NPK).

The data pertained in Table 2, showed that the treatment T_9 (Dehorning at 0.75 m + 200 % N + RD of PK) had highest plant spread (2.79 m) which was significantly higher than other treatments. However, the treatmentT_{10} (Normal Pruning with RD of NPK) recorded lowest plan spread (1.67 m) which was significantly lower than all other treatments. Similarly, in the present study different pruning intensities and nitrogen application significantly increased the leaf area in comparison to control. Dehorning at 0.75 m + 200% N + RD of PK resulted in maximum leaf area (65.7 cm^2) which was significantly higher than other treatments. However, minimum value of leaf area (46.7 cm^2) was recorded in the plants which was normally pruned with RD of NPK which was lower than all other treatments.

The highest TCSA (3.1 m^2) was observed with T_1 (Dehorning at 1.5 m + 100% RD of NPK) which was significantly higher than all other treatment**.** The lowest TCSA (1.1 m^2) was observed with T_8 (Dehorning at 0.75 m + 150% N + RD of PK) which was statistically at par (1.2 m^2) with T_4 (Dehorning at 1.25 m + 100% RD of NPK).

The data on pruning wood weight showed that highest pruned wood weight (5.08 kg/tree) was obtained from treatment T_9 (Dehorning at 0.75 m + 200% N + RD of PK) which was statistically at par (5.05 kg/tree) with treatment T_7 (Dehorning at 0.75 m + 100% RD of NPK) and lowest pruned wood (0.57 kg/tree) was recorded with treatment T_4 (Dehorning at 1.25 m + 100% RD of NPK).

Yield:

The data presented in Table 3 revealed that different treatments had significant effect on fruit yield of tree. In the first year, highest fruit yield (5.0 kg/tree) was recorded with T_8 (Dehorning at 0.75 m + 150% N + RD of PK) which was statistically at par with T_3 (Dehorning at 1.5 m + 200% N + RD of PK) and T_{10} (Normal Pruning with RD of NPK), both recording same fruit yield (4.5 kg/tree).The lowest fruit yield (1.1 kg/tree) was recorded with T_1 (Dehorning at 1.5 m + 100% RD of NPK) which was statistically at par with T_4 (Dehorning at 1.25 m + 100 % RD of NPK) recording 1.2 kg/tree fruit yield. However, during second year, highest fruit yield (15.3 kg/tree) was recorded with T_4 (Dehorning at 1.25 m + 100 % RD of NPK) and the lowest fruit yield (4.7 kg/tree) was recorded with T_{10} (Normal Pruning with RD of NPK) which was statistically at par with treatment T_3 (Dehorning at 1.5 m + 200 % N + RD of PK).

Table 1: Effect of pruning and nitrogen application on the per cent increase in tree height and tree circumference of rejuvenated peach cv. Early White Giant

Treatment code	Treatment Details	Tree height	Circumference
T_1	Dehorning at 1.5 m + 100% RD of NPK	12.84 (20.99)	2.20 (1.79)
T_2	Dehorning at 1.5 m + 150% N + RD of PK	16.14 (23.68)	2.30 (1.82)
T_3	Dehorning at 1.5 m + 200% N + RD of PK	29.19 (32.57)	2.65 (1.91)
T_4	Dehorning at 1.25 m + 100% RD of NPK	19.14 (25.92)	2.64 (1.91)
T_5	Dehorning at 1.25 m + 150% N + RD of PK	30.33 (33.40)	2.73 (1.93)
T_6	Dehorning at 1.25 m + 200% N + RD of PK	32.79 (34.91)	2.89 (1.97)
T_7	Dehorning at 0.75 m + 100% RD of NPK	30.64 (33.20)	2.84 (1.96)
T_8	Dehorning at 0.75 m + 150% N + RD of PK	33.43 (35.29)	3.15 (2.04)
T_9	Dehorning at 0.75 m + 200% N + RD of PK	35.37 (36.47)	3.18 (2.05)
T_{10}	Normal Pruning with RD of NPK	12.11 (20.35)	2.12 (1.76)
$CD_{(0.05)}$		3.06	0.05

Figures in parentheses are transformed values

Table 2: Effect of pruning and nitrogen application on plant spread, leaf area, TCSA and pruned wood weight of rejuvenated peach cv. Early White Giant

Treatment Code	Treatment Details	Plant spread (m)	Leaf area (cm^2)	TCSA (m^2)	Pruned weight (kg/tree)
T_1	Dehorning at 1.5 m + 100% RD of NPK	1.87	48.5	3.1	3.42
T_2	Dehorning at 1.5 m + 150% N + RD of PK	2.27	50.8	1.4	1.72
T_3	Dehorning at 1.5 m + 200% N + RD of PK	2.28	55.3	1.6	1.12
T_4	Dehorning at 1.25 m + 100% RD of NPK	1.88	51.5	1.2	0.57
T_5	Dehorning at 1.25 m + 150% N + RD of PK	2.34	52.9	2.5	1.27
T_6	Dehorning at 1.25 m + 200% N + RD of PK	2.53	59.8	2.3	2.55
T_7	Dehorning at 0.75 m + 100% RD of NPK	2.40	56.9	2.4	5.05
T_8	Dehorning at 0.75 m + 150% N + RD of PK	2.67	57.2	1.1	0.82
T_9	Dehorning at 0.75 m + 200% N + RD of PK	2.79	65.7	1.7	5.08
T_{10}	Normal Pruning with RD of NPK	1.67	46.7	1.6	1.60
$CD_{(0.05)}$		0.02	1.6	0.1	3.42

Table 3: Effect of pruning and nitrogen application on the fruit yield of rejuvenated peachcv. Early White Giant

Treatment code	Treatment	Yield (kg/tree)	
		One year after rejuvenation	Two year after rejuvenation
T_1	Dehorning at 1.5 m + 100% RD of NPK	1.1	12.4
T_2	Dehorning at 1.5 m + 150% N + RD of PK	2.2	9.8
T_3	Dehorning at 1.5 m + 200% N + RD of PK	4.5	5.0
T_4	Dehorning at 1.25 m + 100% RD of NPK	1.2	15.3
T_5	Dehorning at 1.25 m + 150% N + RD of PK	3.0	12.5
T_6	Dehorning at 1.25 m + 200% N + RD of PK	4.0	6.5
T_7	Dehorning at 0.75 m + 100% RD of NPK	3.0	10.0
T_8	Dehorning at 0.75 m + 150% N + RD of PK	5.0	7.5
T_9	Dehorning at 0.75 m + 200% N + RD of PK	4.0	6.0
T_{10}	Normal Pruning with RD of NPK	4.5	4.7
$CD_{(0.05)}$		0.5	0.9

DISCUSSION

The highest increase in tree height, spread, tree circumference and leaf area with dehorning at 0.75 m + 200 % N + RD of PK in present study may be due to heavy dehorning coupled with doubled dose of nitrogen fertilizer which boosted the vegetative growth of the trees to a greater extent. The maximum increase in shoot length was recorded in plants which are heavily pruned trees[6]and [9]. It might possibly be attributed to the higher amount of photosynthates and the nutrients which in turn enhance cell division and formation of more tissues resulting into more vegetative growth. Tree growth in terms of height, spread and circumference were found to be directly associated with the N content in leaves[2].The enhancement of vegetative growth is attributed with the higher dose of nitrogen in Hacihaliloglu apricot [3].The similar trends in increasing annual shoot growth, pruning wood weight and leaf area was reported with heavy pruning and increased dose of nitrogen [11]. These findings are also in conformity in an experiment where dormant pruned trees had the highest trunk cross- sectional area (TCSA) [5].Increased leaf area of tree may be due to the reduced number of vegetative buds which are likely to develop into new shoots thereby, reducing the competition for carbohydrates and other metabolites. Similar results have been reported with respect to increased leaf area with increasing pruning severity of plant [10].The quantity of pruned wood removed is directly proportional to the severity of dehorning. Higher amount of pruning wood was removed under heavily dehorned trees coupled with double dose of nitrogen. It might possibly be attributed due to vigorous vegetative growth [13] and [12]. Fruit yield per tree decreased with the increasing level of dehorning and nitrogen applications, as a decreased fruit yield was found under plants which are severely pruned trees [7]. The reduction in fruit yield could be due to less number of floral buds available in severely pruned plants and hence, fruiting area was reduced. On the basis of results, it is clear that best results in terms of tree height, circumference, plant spread and leaf area was obtained with dehorning level of 0.75 m and double dose of nitrogen coupled with recommended dose of phosphorus and potassium. However, the best results in terms of fruit yield were obtained from plants which were treated with dehorning level of 1.25 m and recommended dose of nitrogen, phosphorus and potassium.

REFERENCES

1. Anonymous (2017). Major food and agricultural commodities and producers–countries by commodities. www.faostat.fao.org.
2. Arora RL, Tripathi S and Singh R. (1999). Effect of nitrogen on leaf mineral nutrient status, growth and fruiting in peach. *Indian Journal of Horticulture***56**(4): 286- 294
3. Asma BM, Colak S, Akca Y and Genc C. (2007). Effect of fertilizer rate on the growth, yield and fruit characteristics of dried apricot (cv. Hacihaliloglu). *Asian Journal of Plant Sciences* **6**(2): 294-297
4. Gomez, K. A. and Gomez, A. A. (1984). In: Statistical Procedure for Agricultural Research 2nd ed. New York: Willey Interscience, 304-309 pp.
5. Ikinci A, Kuden A and AK BE. (2014). Effect of summer and dormant pruning time on the vegetative growth, yield, fruit quality and carbohydrate contents of two peach cultivars. *African Journal of Biotechnology***13**(1): 84-90
6. Kaundal GS, Singh S, Kanwar GS and Chanana YR. (2002). Effect of pruning techniques on growth, production, quality and nutrient status of peach cv. Pratap. *Journal of Research* **39**(3): 362-367
7. Pant P, Nautiyal MC and Singh CP. (2015). Effect of different pruning levels on fruit yield and quality of promising peach [*Prunus persica*(L.) Batsch] cultivars. *Progressive Horticulture***47**(1)

8. Ranganna S. (1995). Handbook of Analysis of Quality Control for Fruit and Vegetable Products, Tata McGraw-Hill Publ. Co., New Delhi, India.
9. Rathi DS, Dimri DC, Nautiyal MC and Kumar A. (2003). Pruning response to shoot growth, fruit set and yield in peach. *Indian Journal of Horticulture***60**(2): 151-153
10. Sharma DP and Chauhan JS. 2004. Response of pruning intensities and fertilizer treatment on yield, fruit quality and photosynthetic efficiency of peach. *ActaHorticulturae***662**: 237-241
11. Singh D. 1992.Effect of pruning intensities under different levels of nitrogen on growth, yield and quality of peach (*Prunus persica* (L.) Batsch.) cv. July Elberta. Ph.D. Thesis. Dr. YS Parmar University of Horticulture and Forestry, Solan, HP, India
12. Suklabaidya A. (2012). Effect of orchard management practices on growth, fruiting and yield of senile plum trees. Ph.D. Thesis. Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan, HP, India
13. Thakur KK. (2012). Effect of rejuvenation pruning and nitrogen levels on growth, yield and quality of apricot (*Prunus armeniaca* L.) cv. New Castle. M.Sc. Thesis. Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan, HP, India.

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