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EFFECTS OF PRUNING AND NITROGEN FERTILIZATION FOR THE REJUVENATION AND PHYSICOCHEMICAL CHARACTERISTICS OF FRUITS OF DECLINING APRICOT TREES (*PRUNUS ARMENIACA* L. CV. NEW CASTLE)

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Abstract

Effects of pruning and nitrogen fertilization for the rejuvenation and physicochemical quality of fruits, bearing on declining apricot trees (*Prunus armeniaca* L. cv. New Castle) were assessed. Studies were conducted from 2011 to 2015 on the 25 years old senile and declining apricot trees. Ten treatments comprised of a factorial combination of three pruning levels/severity (heading back of main scaffolds at 20, 40 and 60%) with three levels of nitrogen doses (500, 625 and 750g N/tree). For the first time in the year 2011, the experimental trees received the treatments during its dormant period (winter). In the successive years, all the treatments were followed by corrective pruning facilitate rapid restoration of growth and production of the orchard. The factorial treatment combination of heavy pruning (60%) with the lowest doses of nitrogen level (500g/tree) increased the qualities of fruits in terms of weight, volume, firmness, total soluble solids, sugars and acidity content. Whereas, the ascorbic acid content was facilitated by heavy pruning (60%) with the highest doses of nitrogen level (750g/tree) in all the following years.

Introduction

Temperate fruit orchards (especially the stone fruits orchard) over 20 years old are unfruitfulness for lesser production of new shoots because of the improper sunlight penetration and overcrowded dense canopy (Anonymous 2017, Thind and Mahal 2019). Such orchards fail to produce the requisite amount of new annual extension growth (the emerged shoots are tender and weak) and are unfavourable for flowering and fruiting (Singh *et al.* 2012, Usha *et al*. 2015). The overcrowded orchard also becomes the host of the insects and pests population, and the incidence of diseases occurred drastically (Singh *et al.* 2012, Usha *et al*. 2015). The fundamental problem of old temperate stone fruit orchards has a higher proportion of 'shade' to 'sun' leaves. The maximum photosynthesis rate of sun-leaves of trees occurred at 60% of full sunlight (Schaffer *et al.* 1994). The declines in productivity of the old and dense orchard are because of poor photosynthetic efficiency coupled with several other factors (Singh 2005).

In Himachal Pradesh, the land resources are limited because of undulated hilly topography, so many of the farmers and orchardist impels to uproot the old plantations for a new one (Anonymous 2003) owing to replant problems. Such impoverish new plantations are time-consuming and expensive with no returns for many years (since fruit trees have long juvenile phase before attaining bearing stage) which leads to drastic economic losses (Usha *et al.* 2015). Replant problem is an antagonistic relationship which develops in the newly established orchard from the previous orchard plantation resulted from the changes in soil ecology and cultural practices and is also the guardianship to a host of diseases and pests (Halbrendt 2017). Both biotic

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(fungi, bacteria, actinomycetes, nematodes, and their interactions) and abiotic (nutrient imbalance, soil structure, soil drainage, pH, lack or excess of moisture and phytotoxins) factors are the principal reasons behind replant problem (Utkhede and Smith 1994).

Rejuvenation treatments consisting of pruning and nitrogen fertilization for retrieving growth in old and senile fruit trees are economical and beneficial to farmers and orchardists (Sharma 2006). This technique can convert/restore the unproductive trees into productive trees in shortest possible duration by sustaining the life of farmers/orchardists without affecting his economy (Baba *et al.* 2011). Before the selection of trees/orchard to be rejuvenated, it is necessary to examine the health and conditions, its location, the value of the trees and intact of the bark to wood without exposing any portion (Douglas 2012). Sadeghi (2002) reported that the principal and the capability to the very key to the success of rejuvenation pruning is the presence of numerous dormant buds in the old parts of trees which grow as vegetative buds and even revitalize the tree if provoked by proper pruning. Rejuvenation pruning is usually performed during the dormant season in winter or immediately after harvesting to achieve maximum per cent of vitality and vigour to trees (Radha and Mathew 2007). In general, plants require an adequate amount of nitrogen application for its growth and development because it is the main constituent of the dry matter of the cell protoplasm (about 40-50%) (Togun *et al*. 2003). The physicochemical properties of fruits are the standards which determine the quality of fruit crops and firmly correlated with the amount of nitrogen application during fertilization (Jullien 2001). Moreover, nitrogen application affects the sink function of bearing fruits by controlling the carbohydrate accumulation in fruits (Gyllapsy *et al*. 1993). The most common source of nitrogen fertilization is urea (Etehadnejad and Aboutalebi 2014) for its fast absorption by plants, highly water-soluble, non-polarity and low phytotoxicity properties (Etehadnejad and Aboutalebi 2014). Suklabaidya (2012) and Sadeghi (2002) had also reported a significant interaction between pruning and nitrogen fertilization to improve the fruit quality in plum and olive, respectively.

Considering the demerits of replant's problem, the importance of pruning and nitrogen fertilization in plant regeneration metabolism, the present research work aimed to formulate for standardizing the combination of pruning and nitrogen fertilization for rejuvenation of declining apricot trees to regain growth and improve the quality of the fruits.

Materials and Methods

The present research was carried in the experimental orchard of Department of Fruit Science, College of Horticulture, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan (HP), India during 2011 to 2015. The soil conditions are alluvial loamy with pH 6.62, organic carbon 1.58% and available N, P and K of 318.64, 16.62 and 172 kg ha^{-1}, respectively.

The selected experimental trees were 25 years old declining apricot trees (*Prunus armeniaca* L. cv. New Castle) grafted on wild apricot and planted at a distance of 5 × 5m (plant to plant). The investigation started with the heading back of the main trunk (2m from the ground level) of the declining apricot trees during the dormant period in the first week of February 2011 followed by standard pruning of the main scaffold branches (20, 40 and 60%) in the following years. Nitrogen doses (500, 625 and 750g N/tree) were applied and maintained the same in all the years. The different factorial rejuvenation treatment combinations given to the experimental trees during the present investigation were, P_1N_1 = 20% heading back of scaffolds + 500 g N/tree; P_1N_2 = 20% heading back of scaffolds + 625 g N/tree; P_1N_3 = 20% heading back of scaffolds + 750 g N/tree; P_2N_1 = 40% heading back of scaffolds + 500 g N/tree; P_2N_2 = 40% heading back of scaffolds + 625 g N/tree; P_2N_3 = 40% heading back of scaffolds + 750 g N/tree; P_3N_1 = 60% heading back of scaffolds + 500 g N/tree; P_3N_2 = 60% heading back of scaffolds + 625 g N/tree; P_3N_3 = 60%

heading back of scaffolds + 750 g N/tree; P_0N_0 (control) = Heading back at secondary branches level + 500 g N/tree.

For physicochemical analysis, physiological mature fruits of uniform shape, size, colour, free from bruises and diseases were harvested during the early morning hours and brought to the departmental laboratory. Measurement of fruit size in term of length and breadth was carried out by digital vernier calliper and expressed in mm. Fruits were weighed individually in semi-analytical balance and expressed in g/fruit. Measurement of fruit volume was carried out by water displacement method and expressed in a cubic centimetre (cm^3) whereas fruit firmness was measured with the help of 'Penetrometer' (Model FT-327, QA Supplies, Norfolk, VA, USA) and expressed in terms of kg cm^{-2} force. Measurement of the total soluble solids (TSS) was carried out using the digital refractometer (hand-held) and expressed in ^{o}Brix whereas the determination of titratable acidity (%) followed the procedures described by Instituto Adolfo Lutz (2008). Estimation of total sugar, reducing sugar and ascorbic acid content of apricot fruits were estimated by the method described in AOAC (2016). Non-reducing sugar content of the fruits was calculated by subtracting the value of reducing sugar from the value of total sugar content. The present investigation was performed in the factorial Randomized Block Design (FRBD) with ten treatments having three replications using different pruning levels and nitrogen fertilization doses as sources of variation. Differences between treatments were determined with Analysis Of Variance (ANOVA) by using SAS 9.2 (SAS Institute, Cary, NC, USA) and Critical Difference (CD) and standard error of mean were calculated. Whenever significant differences were observed, means were separated using Least Significant Difference (LSD) test at the 5% level of significance.

Result and Discussion

Pruning and nitrogen fertilization treatment of the present study significantly affected the physical characteristics of fruits that contribute to the physical appearance of apricot fruits (Table 1 and 2). Results showed that the P_3N_1 (60% heading back of scaffolds + 500 g N/tree) treatment expressed the largest means size (32.31mm length; 32.41mm breadth), weight (26.15 g) and volume (23.43cm3) of the fruits of all the years. The improvement in fruit's physical characteristics (size, weight and volume) may be that nitrogen application induces the formation of the vigorous stem which resulted in bearing of large size fruits in fruit crops (Eyduran *et al.* 2008). Another possible reason which strongly supported this phenomenon is nitrogen application in the plant might result in division and elongation of the cell (Nehra *et al*. 1982) which further resulted in the increase of fruit weight (Mu *et al*. 2017). Besides, the pruning treatments which removed the excess floral buds stimulated a balance linking vegetative and reproductive growth resulting the improvement of the fruit's size (Marini and Peck 2015). Similar results of increased in physical characteristics in temperate stone fruit with increased severity of pruning and optimal nitrogen application have earlier been stated by Suklabaidya (2012).

Apricot fruit flesh firmness increased irrespective of increased in pruning severity but decreased with an increased level of nitrogen doses (Table 2). The treatment P_3N_1 expressed the maximum means fruit firmness (5.32kg cm^{-2}) over the other treatments. The possible reasons could be due to the translocation of more metabolites to the fruits in heavily pruned trees (Suklabaidya 2012) and diminishing of cell wall thickness with excess nitrogen application which consequently resulted into decrease of flesh texture (Jia *et al*. 2006). The undesirable reduction in fruit firmness with an increased level of nitrogen doses has been earlier reported in peach by Hernandez-Fruentes *et al.* (2002).

Table 1. Effect of pruning and nitrogen fertilization for the rejuvenation and on the size of fruit, bearing on declining apricot trees.

Treatments	Fruit length (mm)					Fruit breadth (mm)				
	1st year	2nd year	3rd year	4th year	Mean	1st year	2nd year	3rd year	4th year	Mean
P_1N_1	29.90^{bcd}	27.11^{cdefg}	29.47^{d}	32.65^{bcde}	29.78	30.39^{cf}	27.78^{defh}	30.15^{ghi}	33.14^{cde}	30.37
P_1N_2	29.01^{a}	27.34^{cdefg}	29.82^{d}	30.85^{def}	29.24	29.11^{igh}	28.67^{bcd}	31.19^{efgh}	30.96^{hi}	29.98
P_1N_3	30.81^{cde}	27.86^{cde}	31.19^{bc}	32.45^{bcde}	30.56	31.02^{bc}	28.29^{defg}	31.68^{cdefg}	32.67^{cdef}	30.92
P_2N_1	30.93^{b}	28.91^{ac}	32.46^{ab}	33.58^{abc}	31.46	30.95^{cd}	29.08^{bc}	32.64^{abcde}	33.63^{bc}	31.58
P_2N_2	29.31^{ab}	27.48^{cdfg}	32.58^{ab}	32.39^{cde}	30.42	30.33^{cg}	27.55^{efh}	32.73^{abc}	33.42^{bcd}	31.01
P_2N_3	30.62^{bcd}	28.32^{bcd}	32.62^{ab}	33.06^{bcd}	31.15	30.68^{ce}	28.39^{de}	32.71^{abcd}	33.14^{cde}	31.23
P_3N_1	31.93^{b}	29.60^{a}	33.25^{a}	34.48^{a}	32.31	31.98^{a}	29.72^{a}	33.37^{a}	34.56^{a}	32.41
P_3N_2	31.62^{b}	29.43^{ab}	33.03^{ab}	33.86^{ab}	31.97	31.70^{ab}	29.45^{ab}	33.08^{ab}	33.96^{ab}	32.05
P_3N_3	29.61^{ac}	27.16^{cdefg}	31.96^{bc}	32.31^{cde}	30.24	29.67^{igh}	27.27^{efh}	32.13^{bcdef}	32.38^{fg}	30.36
P_0N_0	30.15^{bcd}	27.61^{def}	30.86^{bcd}	31.53^{cdef}	30.02	30.22^{ch}	27.81^{defh}	31.07^{efghi}	31.65^{h}	30.19
SED	0.29	0.28	0.31	0.30		0.25	0.21	0.35	0.22	

Table 2. Effect of pruning and nitrogen fertilization for the rejuvenation and on the physical structure of fruit, bearing on declining apricot trees.

Treatments	Fruit weight (g)					Fruit volume (cm^3)					Fruit firmness (kg cm^{-2})				
	1st year	2nd year	3rd year	4th year	Mean	1st year	2nd year	3rd year	4th year	Mean	1st year	2nd year	3rd year	4th year	Mean
P_1N_1	17.47^{e}	17.10^{g}	20.71^{d}	22.31^{c}	19.40	15.15^{e}	14.80^{h}	17.92^{e}	19.99^{e}	16.97	4.56^{f}	3.79^{g}	4.69^{de}	3.72^{c}	4.19
P_1N_2	19.47^{d}	18.93^{f}	22.40^{bc}	22.99^{bc}	20.95	17.12^{d}	16.63^{f}	19.79^{d}	20.64^{d}	18.55	4.43^{g}	3.65^{h}	4.64^{def}	3.69^{cd}	4.10
P_1N_3	19.56^{d}	19.06^{ef}	22.23^{c}	23.96^{c}	21.20	17.28^{d}	16.66^{f}	19.53^{d}	21.68^{bc}	18.79	4.32^{h}	3.53^{i}	4.45^{ef}	3.67^{cd}	3.99
P_2N_1	20.91^{c}	20.49^{cd}	23.77^{b}	23.40^{b}	22.14	18.52^{c}	18.24^{d}	21.01^{bc}	20.92^{cd}	19.67	4.98^{c}	4.63^{d}	4.93^{abcd}	3.96^{c}	4.63
P_2N_2	19.56^{d}	18.00^{g}	22.17^{c}	22.43^{bc}	20.54	17.18^{d}	15.62^{g}	20.05^{cd}	20.63^{de}	18.37	4.88^{d}	4.51^{e}	4.84^{bcde}	3.94^{c}	4.54
P_2N_3	20.16^{cd}	19.78^{de}	23.36^{b}	23.52^{cb}	21.71	17.91^{cd}	17.10^{e}	20.88^{c}	21.27^{bc}	19.29	4.76^{e}	4.39^{f}	4.78^{bcde}	3.89^{c}	4.46
P_3N_1	25.81^{a}	25.60^{a}	25.64^{a}	27.54^{a}	26.15	23.13^{a}	23.21^{a}	22.50^{a}	24.86^{a}	23.43	5.54^{a}	4.94^{a}	5.52^{a}	5.28^{a}	5.32
P_3N_2	22.81^{b}	22.64^{b}	23.97^{b}	24.27^{b}	23.42	20.41^{b}	20.36^{b}	21.76^{ab}	21.87^{b}	21.10	5.32^{b}	4.86^{b}	5.40^{ab}	5.05^{ab}	5.16
P_3N_3	21.51^{c}	21.00^{c}	23.85^{b}	23.37^{b}	22.43	19.21^{bc}	18.65^{c}	21.49^{ab}	21.07^{cd}	20.11	5.24^{b}	4.72^{c}	5.23^{abc}	4.54^{b}	4.93
P_0N_0	16.37^{f}	15.88^{h}	21.27^{cd}	22.87^{bc}	19.10	14.05^{e}	13.56^{i}	19.35^{d}	20.55^{de}	16.88	4.21^{i}	4.38^{f}	4.15^{f}	3.19^{d}	3.98
SED	0.31	0.30	0.38	0.23		0.33	0.10	0.31	0.20		0.02	0.02	0.15	0.17	

Table 3. . Effect of pruning and nitrogen fertilization for the rejuvenation and on the chemical composition (TSS, total and reducing sugar) of the fruits, bearing on declining apricot trees.

Treatments	TSS (°B)					Total sugar (%)					Reducing sugar (%)				
	1st year	2nd year	3rd year	4th year	Mean	1st year	2nd year	3rd year	4th year	Mean	1st year	2nd year	3rd year	4th year	Mean
P_1N_1	12.42^{b}	15.51^{c}	14.64^{bc}	15.47^{c}	14.51	6.33^{ed}	7.16^{e}	6.43^{de}	7.38^{d}	6.83	2.45^{e}	2.96^{de}	2.46^{d}	3.04^{bc}	2.73
P_1N_2	11.92^{e}	15.18^{e}	14.24^{cd}	15.23^{cd}	14.14	6.21^{df}	6.95^{f}	6.36^{e}	6.38^{e}	6.48	2.46^{de}	2.87^{de}	2.82^{bc}	2.71^{bcd}	2.72
P_1N_3	11.20^{f}	13.35^{d}	15.11^{ab}	16.13^{a}	13.95	5.92^{h}	6.03^{h}	5.90^{f}	6.36^{e}	6.05	1.95^{g}	2.25^{g}	2.08^{def}	2.12^{cde}	2.10
P_2N_1	12.38^{bc}	14.40^{g}	14.22^{cd}	15.21^{cd}	14.05	7.32^{b}	7.72^{c}	8.61^{b}	8.65^{b}	8.08	2.98^{a}	3.08^{d}	3.20^{b}	3.21^{b}	3.12
P_2N_2	12.16^{cd}	14.75^{fe}	14.31^{cd}	15.33^{c}	14.14	7.15^{c}	7.47^{d}	7.85^{c}	8.16^{c}	7.66	2.54^{c}	2.94^{de}	2.74^{c}	2.80^{bc}	2.76
P_2N_3	12.08^{de}	13.67^{h}	14.53^{bc}	15.42^{c}	13.93	6.58^{d}	7.16^{e}	7.44^{d}	7.50^{d}	7.17	2.53^{cd}	2.98^{de}	2.34^{de}	2.33^{cde}	2.55
P_3N_1	12.98^{a}	16.53^{a}	15.59^{a}	16.40^{a}	15.37	7.78^{a}	8.17^{a}	9.68^{a}	10.01^{a}	8.91	3.08^{a}	3.58^{a}	3.67^{a}	3.73^{a}	3.52
P_3N_2	11.77^{e}	16.00^{b}	15.56^{a}	16.16^{a}	14.87	7.29^{b}	8.03^{b}	8.54^{b}	8.82^{b}	8.17	2.89^{b}	3.41^{b}	3.22^{b}	3.28^{b}	3.20
P_3N_3	12.22^{bcd}	15.35^{i}	15.14^{ab}	16.21^{a}	14.73	6.38^{e}	7.82^{c}	6.31^{e}	7.17^{d}	6.92	2.49^{cd}	3.17^{c}	2.25^{def}	2.66^{bcd}	2.64
P_0N_0	11.75^{e}	14.68^{f}	13.56^{d}	14.75^{d}	13.69	6.18^{fg}	6.46^{g}	5.37^{g}	6.08^{e}	6.02	2.24^{f}	2.74^{f}	2.18^{def}	2.34^{bcde}	2.38
SED	0.07	0.05	0.22	0.15		0.04	0.03	0.04	0.11		0.03	0.04	0.08	0.12	

Table 4. . Effect of pruning and nitrogen fertilization for the rejuvenation and on the chemical composition (NRS, acidity and ascorbic acid) of the fruits, bearing on declining apricot trees.

Treatments	NRS (non-reducing sugar) (%)					Acidity (%)					Ascorbic acid (mg/100 g)				
	1st year	2nd year	3rd year	4th year	Mean	1st year	2nd year	3rd year	4th year	Mean	1st year	2nd year	3rd year	4th year	Mean
P_1N_1	3.88^{h}	4.20^{c}	3.77^{c}	4.12^{c}	3.99	1.69^{e}	0.78^{f}	0.92^{bc}	0.86^{c}	1.06	4.76^{e}	5.67^{d}	8.41^{fg}	10.31^{g}	7.29
P_1N_2	3.75^{i}	4.08^{cd}	3.36^{cd}	3.49^{d}	3.67	1.62^{f}	0.68^{g}	0.86^{bc}	0.74^{d}	0.98	7.96^{d}	8.67^{c}	8.87^{f}	10.36^{fg}	8.97
P_1N_3	3.97^{f}	3.78^{e}	3.63^{c}	4.03^{cd}	3.85	1.57^{f}	0.72^{g}	0.84^{bc}	0.85^{c}	1.00	8.02^{d}	9.00^{c}	9.34^{e}	10.57^{ef}	9.23
P_2N_1	4.34^{d}	4.64^{ab}	5.14^{b}	5.17^{b}	4.82	1.87^{c}	0.94^{e}	0.94^{b}	1.12^{b}	1.22	9.91^{c}	10.67^{bc}	9.60^{e}	12.53^{d}	10.68
P_2N_2	4.61^{b}	4.53^{ab}	4.85^{b}	5.09^{b}	4.77	1.81^{d}	0.83^{f}	0.92^{bc}	1.08^{b}	1.16	12.97^{a}	13.67^{a}	12.58^{c}	13.28^{c}	13.13
P_2N_3	4.05^{e}	4.18^{cd}	4.84^{b}	4.91^{b}	4.50	1.73^{e}	0.89^{e}	0.93^{bc}	1.09^{b}	1.16	13.21^{a}	14.33^{a}	13.57^{b}	13.48^{c}	13.65
P_3N_1	4.70^{a}	4.59^{ab}	5.71^{a}	5.97^{a}	5.24	2.08^{a}	1.27^{a}	1.26^{a}	1.31^{a}	1.48	10.01^{c}	11.33^{ab}	10.20^{d}	10.86^{e}	10.60
P_3N_2	4.40^{c}	4.62^{ab}	5.05^{b}	5.26^{b}	4.83	1.98^{b}	1.18^{b}	0.98^{b}	1.16^{b}	1.33	12.95^{a}	14.33^{a}	14.74^{a}	15.51^{b}	14.38
P_3N_3	3.89^{gh}	4.65^{a}	3.86^{c}	4.28^{c}	4.17	1.95^{b}	1.09^{c}	1.00^{b}	1.11^{b}	1.29	14.10^{a}	15.33^{a}	15.14^{a}	16.16^{a}	15.18
P_0N_0	3.94^{fg}	3.72^{e}	3.03^{cd}	3.55^{d}	3.56	1.49^{g}	1.02^{d}	0.79^{bc}	1.08^{b}	1.10	4.18^{e}	5.33^{d}	8.38f^{g}	10.05^{g}	6.99
SED	0.02	0.03	0.11	0.16		0.02	0.02	0.05	0.03		0.63	0.76	0.15	0.16	

Irrespective of different treatments, TSS and sugars content of apricot fruit increased with the increase in pruning severity with an optimal dose of nitrogen fertilization (Table 3 and 4). The maximum mean TSS and sugars (total, reducing and non-reducing) content were registered maximum in P_3N_1 treatment with the mean value of 15.37^{o}B, 8.91, 3.52 and 5.24%, respectively. The increase in TSS and sugars content with pruning severity may be because of encouraging more vegetative growth (leaf: fruit) which consequently leads to the synthesis of more carbohydrates and other metabolites ultimately translocating to the fruit tissues (Marini and Peck 2015). Earlier researchers have also reported desirable increase in TSS and sugars content in the severely pruned tree (Kumar *et al.* 2010, Suklabaidya 2012), and in the optimal levels of nitrogen fertilization (Mohit *et al.* 2017) in various temperate stone fruits.

Titratable acidity content decreased with the increase in pruning intensity and nitrogen doses (Table 4). This might be due to deposition of a higher quantum of acid that synthesized in leaves during fruit development (Porika *et al.* 2015). Similar results of an increase in pruning intensity influencing decrease in acidity level has also been observed earlier by Kumar *et al.* (2010). More or less similar results were reported in pomegranate by Ramezanian *et al.* (2009). Conversely, Garhwal *et al.* (2014) reported that increased in acidity content with an increased level of nitrogen might be due to the synthesis and translocation of more organic acids in the fruits during development.

The P_3N_3 treatment resulted the maximum mean fruit ascorbic acid (15.18 mg/100 g) content which is in the highest level of a factorial combination of pruning intensities and nitrogen doses (Table 4). The increase in ascorbic acid content with pruning intensities might be since it allows more sunlight penetration in the tree canopy (Ferree *et al.* 1992) and results in ascorbic acid production in plants (Smirnoff 2000) which ultimately increased the ascorbic acid content in fruits (Massot *et al.* 2012). This finding is in agreement with the results reported by Ming *et al.* (2011) who recorded significantly increase in ascorbic acid content in the apple with an increased level of pruning intensity. In case of the influence of nitrogen fertilization, Mozafar (1993) has reported a contrast result of nitrogen fertilization increasing the foliage growth which results in reduced light intensity and production of low ascorbic acid in plants. The present research findings are in contrast with that of Mozafar (1993) because pruning severity has a dominant effect on the impact of nitrogen fertilization but corroborates with the results observed by Radi *et al.* (1997) in apricot, Rai *et al.* (2002) in litchi and Singh *et al.* (2017) in guava who reported that increased level of nitrogen fertilization resulted in the production of more ascorbic acid content in fruits.

It may be concluded from the present study that physicochemical characteristics of the fruit bearing on declining apricot trees can significantly restore and improve with the factorial combination of pruning intensities and nitrogen fertilization. Severe pruning (60% heading back of scaffolds) restored and improved weight, volume, firmness, TSS, sugars and acidity content of fruits when coupled with nitrogen fertilization at the rate of 500g/tree. Whereas, the treatment combination of severe pruning with 750g/tree nitrogen fertilization has a positive impact on the ascorbic acid content of the fruits.

References

Anonymous 2003. Report of survey conducted by the Department of Horticulture, Navbahar, Shimla, Himachal Pradesh, India-171002.

Anonymous 2017. *In-situ* plantation and moisture conservation techniques for replantation of old orchards of stone fruits under rainfed conditions of Himachal Pradesh. Index for RKVY success stories. Rashtriya Krishi Vikas Yojana (RKVY), Ministry of Agriculture and Farmer Welfare, Government of India, p-7. Retrieved from: https://rkvy.nic.in/Uploads/SucessStory/HIMACHAL%20PRADESH/2017/ 2017042232In-situ%20plantation%2018.03.17.pdf

AOAC 2016. Official Methods of Analysis. 20th edition, Association of Official Analytical Chemists, Gaitherburg, Washington DC, p-3172.

Baba JAP, Akbar PI and Kumar V 2011. Rejuvenation of Old and Senile Orchards: A Rev. Ann. Hort. **4**(1): 37-44.

Douglas SM 2012. PP078 (8/01) Pruning: An Introduction to Why, How, and When. *In*: Plants: Fruits, Vegetables, Flowers, and House Plants (Fact Sheets). The Connecticut Agricultural Experiment Station, New Heaven. Retrieved from: www.ct.gov/caes.

Etehadnejad F and Aboutalebi A 2014. Evaluating the effects of foliar application of nitrogen and zinc on yield increasing and quality improvement of apple cv. 'Golab Kohanz'. Indian J. Fund. Appl. Life Sci. **4**: 125-129.

Eyduran SP, Eyduran E and Agaoglu YS 2008. Estimation of fruit weight by cane traits for eight American blackberries (*Rubus fruticosus* L.) cultivars. Afr. J. Biotechnol. **7**: 3031-3038.

Ferree D, Clayton-Greene K and Bishop B. 1992. Influence of orchard management system on canopy light distribution and net photosynthesis of apple trees. J. Hort. Sci. **68**: 377-392.

Garhwal PC, Yadav PK Sharma BD, Singh RS and Ramniw AS. 2014. Effect of organic manure and nitrogen on growth yield and quality of kinnow mandarin in sandy soils of hot arid region. Afr. J. Agric. Res. **9**: 2638-2647.

Gyllapsy E, Bergervoel CK and Jullien D. 1993. Sink-source relation in fruit vegetables as affected by N fertilizer. Sci. Hort. **58**: 87-94.

Halbrendt JM 2017, October 24. Orchard Establishment - Important Steps to Replant Success. Penn State Extension, College of Agricultural sciences, The Pennsylvania State University. Retrieved from: https://extension.psu.edu/orchard-establishment-important-steps-to-replant-success.

Hernandez-Fuentes AD, Colinas MTL, Cortes JF, Saucedo CV, Sanchez PG and Alcazar JR 2002. Effect of fertilization and storage conditions on postharvest quality of Zacatecas type peach (*Prunus persica* L. Batsch). Acta Hort. **594**: 507-515.

Instituto Adolfo Lutz 2008. Métodos físico-químicos para análise de alimentos /coordenadores Odair Zenebon, Neus Sadocco Pascuet e Paulo Tiglea -- São Paulo: Instituto Adolfo Lutz, p. 1020.

Jia HJ, Mizuguchi K, Hirano K and Okamoto G 2006. Effect of fertilizer application level on the pectin composition of Hakuho peach (*Prunus persica* Batsch) during maturation. Hort. Sci. **41**(7): 1571-1575.

Jullien D 2001. Fruit size and composition in fresh tomato fruits: Effects of fertilizer application. Retrieved from: http://www.Plantnutrition.org.

Kumar M, Rawat V, Rawat JMS and Tomar YK 2010. Effect of pruning intensity on peach yield and fruit quality. Sci. Hort.**125**: 218-221.

Marini PR and Peck G 2015. Physiology of Pruning Fruit Trees. Virginia Cooperative Extension Publication, pp. 422-425. Retrieved from: http://pubs.ext.vt.edu/422/422-025/422-025.html.

Massot C, Stevens R, Genard M, Longuenesse JJ and Gautier H 2012. Light affects ascorbate content and ascorbate-related gene expression in tomato leaves more than in fruits. Planta. **235**: 153-163.

Ming XL, Shuan BG, Dan YY, Gui-jun G and She-ni D 2011. Effects of renewal pruning on mountain apple tree's nutrition and growth. Acta Hort. Sinica. **38**: 139-144.

Mohit, Verma ML and Thakur J 2017. Effect of different nitrogenous fertilizers on Fruit Quality and Yield of apricot (*Prunus armeniaca* L.). J. Pharmacogn. Phytochem. **6**(2): 217-220

Mozafar A 1993. Nitrogen fertilizers and the amount of vitamins in plants: a review. J. Plant Nutr. **16**: 2479-2506.

Mu Q, Huang Z, Chakrabarti M, IllaBerenguer E, Liu X, Wang Y, Ramos A and van der Knaap E 2017. Fruit weight is controlled by cell size regulator encoding a novel protein that is expressed in maturing tomato fruits. PLoS Genet. **13**(8): 1-26.

Nehra DS, Kairon MS, Aggarwal SK and Singh V 1982. Effect of sowing dates, spacing and nitrogen levels on ancilliary characters and seed cotton yield. Indian J. Agron. **27**(4): 347-352.

Porika H, Jagadeesha M, and Suchithra M 2015. Effect of pruning severity on quality of grapes cv. Red Globe for summer season. Adv. Crop Sci. Technol. **S1**(004): 1-2.

Radha T and Mathew L 2007. Fruit crops Vol. 3: Horticulture Science Series. New India Publishing Agency, New Delhi. 160 pp.

Radi M, Mahrouz M, Jaouad A, Gaouji A, Tacchini M, Aubert S and Amiot MJ 1997. Effect of mineral fertilization (NPK) on the quality of apricot. Acta Hort. **448**: 508-508.

Rai M, Dey P, Gangopadhyay KK, Das B, Nath V, Reddy NN and Singh HP 2002. Influence of nitrogen, phosphorus and potassium on growth parameters, leaf nutrient composition and yield of litchi (*Litchi chinensis*). Indian J. Agric. Sci. **72** (5): 267-70.

Ramezanian A, Rahemi M and Vazifehshenas MR 2009. Effect of foliar application of calcium chloride and urea on quantitative and qualitative characteristics of pomegranate fruits. Sci. Hort. **121**: 171-175.

Sadeghi H 2002. Planting, maintaining and harvesting of olives, Agricultural Education emission Press, Karaj, Iran.

Schaffer B, Whiley AW and Crane JH 1994. Mango. *In*: Handbook of Environmental physiology of fruit crops. Vol. 2. Sub-tropical and tropical crops, Schaffer B. and Andersen P.C. (Ed.), CRC Press, Boca Raton, pp. 165-197.

Sharma RP 2006. Current scenario of temperate fruit in Himachal Pradesh. *In*: Temperate Horticulture Current Scenario", Kishore, D.K., Satish, K., Sharma, and Pramanick, K.K. (Ed.), New India Publishing Agency, New Delhi, India.

Singh G, Nath V, Pandey SD, Ray PK and Singh HS 2012. The Litchi. Food and Agriculture Organisation of the United Nations (FAO), New Delhi, India, pp. 143-159.

Singh RK, Prasad VM, Mishra S, Shabi M and Deepanshu 2017. Studies on the effect of foliar application of nitrogen and phosphorus on growth, flowering and fruiting of Guava (*Psidium guajava* L.) cv. Allahabad Safeda. J. Pharm. Innov. **6**(11): 771-774.

Singh VK 2005. Towards an understanding of the factors affecting productivity of fruit crops. *In*: "Development in Physiology, Biochemistry and Molecular Biology of Plant. Vol. 1. Bose, B. and Hemantaranjan, A. (Ed.), New India Publishing Agency, New Delhi, pp.181-201.

Smirnoff N 2000. Ascorbate biosynthesis and function in photoprotection. Philos. Trans. R. Soc. London [Biol]. **355**: 1455-1464.

Suklabaidya A 2012. Effect of orchard management practices on growth, fruiting and yield of senile plum trees. (Unpublished Ph. D. Thesis), Dr Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan, India. Retrieved from: http:// krishikosh. Egranth. ac. In /handle/ 1/ 67725.

Thind SK and Mahal JS 2019. Package of practices for cultivation of fruits. Punjab Agriculture University (PAU) Printing Press, Ludhiana, India. 58 pp.

Togun AO, Akanbi WB and Dris R 2003. Influence of compost and nitrogen fertilizer on growth, nutrient uptake and fruit yield of tomato (*Lycopersicon esculentum*). Crop Res. **98**: 40-56.

Usha K, Thakre M, Goswami AK and Nayan DG 2015. Fundamental of Fruit production, Division of Fruits and Horticultural Technology. Indian Agricultural Research Institute, New Delhi, India. 228 pp.

Utkhede RS and Smith EM 1994. Biotic and abiotic causes of replant problems of fruit trees. Acta Hort. **363**: 25-32.

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