Plant Archives Vol. 25, Supplement 1, 2025 pp. 2960-2972 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.supplement-1.408

COMPARATIVE STUDY OF DIFFERENT PRUNING METHODS ON GROWTH, YIELD, AND FRUIT QUALITY IN NECTARINE

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(Date of Receiving : 03-11-2024; Date of Acceptance : 31-12-2024)

ABSTRACT

The present study was carried to investigate the effects of various pruning intensities applied on nectarines cv. Snow Queen. The results of the experiment one revealed that heading back of shoots by 2/3rd of their length coupled with 20% of thinning out of shoots resulted in higher growth, floral and fruit quality attributes of nectarine. However, maximum fruit yield was recorded under control (20.37 and 18.43 kg/plant). Moreover, lightly pruned plants showed significantly highest plant height than medium and severely pruned trees.
***Keywords* :** Nectarine, Pruning, Quality, Yield

Introduction

Nectarines (*Prunus persica* L.Batsch var. *nucipersica*) have recently been introduced as a crop in the Kashmir Valley. Belonging to the family Rosaceae and sub-family Prunoideae, nectarine trees are nearly indistinguishable from peach trees in terms of their general appearance. The habitat, leaves, flowers, and fruit of both species exhibit significant similarities. The primary distinction lies in the fruit skin: nectarines have smooth, fuzz-free skin, whereas peaches possess a fuzzy surface. This phenotypic difference is attributed to a single recessive gene responsible for the smooth skin in nectarines, contrasted with the dominant gene that causes the fuzz in peaches. Nectarines are considered an advantageous alternative to peaches due to their attractive color and smooth skin, making them appealing in the market. Although the international market for nectarines has expanded significantly over the past 25 years, however, commercial production data for nectarines specifically remains scarce.

The fruit is the most widely distributed temperate fruit globally, thriving between latitudes 30° and 40° N. In India, It is predominantly cultivated in the mid-hill zones of the Himalayas across Jammu and Kashmir, Himachal Pradesh, Punjab, and Uttarakhand. Nectarine, renowned for its juicy, high-quality fruit rich in carotene and thiamine, has gained prominence in the market. Its cultivation has surged due to its early market access and economic viability, often planted as filler in apple, mango, and pear orchards. The attractive appearance of nectarine and higher market prices has accelerated its cultivation, making it a valuable addition to the fruit market.To obtain high-quality fruits in the market, various horticultural techniques such as pruning and fruit thinning are employed to enhance fruit size, color, and sugar concentration. Nectarines tend to produce a large number of flowers, which, under favorable environmental conditions, can result in an excessive fruit set per tree. This overproduction can hinder the attainment of commercially desirable fruit size and quality at harvest (Faust, 1989).

To prevent over-cropping, it is essential to regulate the number of fruits per tree through flower and fruit thinning. These practices are crucial for optimizing fruit size, improving color, shape, and quality, promoting return bloom, and maintaining tree growth and structure (Byers *et al*., 2003). The enhancement in fruit weight and size is attributed to increased vegetative growth, which improves the availability of assimilates for fruit development. Studies have shown that fruit weight and soluble solids concentration decrease with an increasing fruit load (Bussi *et al*., 2005).

Pruning, a key horticultural operation, maximizes economic yield and produces high-quality fruits by restoring the balance between the shoot and root systems. It maintains shoot growth and vigor by limiting the number of growing points, thereby regulating the crop. The performance of nectarine trees heavily depends on proper annual pruning. Different intensities of pruning and fruit thinning are essential for improving nectarine production (Sefick and Ridley, 1988). The main objective of pruning nectarines is to produce shoots of 40 to 60 cm in length, as these are the bearing shoots where flower bud development is most prolific. Shoots of this size also develop the appropriate thickness for flower bud development. Nectarine require heavy and regular pruning because fruiting occurs laterally on last year shoot which bears only once in its life time and becomes barren afterwards. Hence, they require a heavy pruning to strike a balance between vegetative growth and fruitfulness, otherwise fruiting area on the shoots gets far away, which becomes unmanageable. The nectarines are generally pruned in two ways, i.e. heading back and thinning out. In terms of pruning both nectarines and peaches can be treated in the same way as their flowering and fruiting habits are the same. If the trees are not pruned annually, the volume of fruiting wood reduces each year (Yadav, 2007). Pruning increases fruit size in nectarine because excess flower buds are removed and pruning encourages the growth of new shoots with high quality flower buds. Pruning improves light penetration into the canopy for flower bud development, fruit set, growth, and red colour development. Pruning also makes the canopy more open and improves pest control by allowing better spray penetration into the tree, air movement throughout the canopy is increased, which improves drying conditions and thus reduces severity of many diseases. Moreover, the pruning operation encourages the initiation of multiple shoots which bear flowers and fruits. The severity of pruning varies depending upon the vigour of the shoot. Several researchers have used the terms light, moderate and severe pruning by removing one quarter, half and three quarter length of a shoot, respectively (Shukla *et al*., 2007).

Traditionally, thinning of blossoms or fruit-lets had been carried out manually and is still in practice. However, through this practice only a small portion of an orchard may be best thinned at the optimum time. In comparison with other methods, hand thinning is more expensive and time consuming one (Jackson and Looney 1999). Therefore, the trend has shifted towards chemical thinning using different agents such as plant growth regulators like Ethrel, NAA, thidiazuron and chemicals like urea, thiourea, ammonium thiosulphate etc. Plant growth regulators like NAA and Ethrel have been reported to give best results in growth, yield and quality of nectarine, when sprayed at post bloom stage (Rajiv *et al*., 2017 and Rimpika *et al*. 2017). Thinning of peaches and nectarines with different concentrations of urea at closed pink stage, full bloom and the early fruit let stage reduced fruit set and increased fruit weight (Zilkah*et al*. 1988 and Meitei *et al*. 2013).

Under optimal conditions, most fruit trees tend to set more fruit than necessary for a full crop. Fruit thinning is performed to prevent limb breakage, increase fruit size, enhance color and overall quality, and stimulate floral initiation for the following year's crop. To achieve high-quality fruit production and maintain optimal crop load, regulated thinning operations are essential in nectarine cultivation. However, research on this aspect in nectarines is currently lacking. Therefore, the present investigation was conducted to improve the growth, yield, and quality of nectarines through varying pruning intensities and enhance the efficiency of thinning in nectarines using growth regulators and chemicals.

Materials and Methods

Orchard Location and Planting Material: The experimental orchard is situated at an elevation of 1611 m above mean sea level and lies at 34° 09' N latitude and 74° 52' E longitude. The experiment involved four-year-old nectarine plants of cultivars Snow Queen, Silver King, and Red Gold on peach rootstock, spaced 3 x 3 meters, and trained to an open center system. Uniformly vigorous plants were kept under uniform cultural practices during the entire course of investigation.

Experiment details: The effect of different pruning intensities on growth, yield and quality was studied on nectarines cv. Snow Queen. The experimental plants were subjected to variable pruning intensities during the month of December (Table-1).

Analysis

Collection of fruit sample: The fruit samples from each experiment were collected when they had attained full maturity. Fruits were collected randomly from all sides of the tree and a sample of two kilo gram was kept for physico- chemical analysis. Deformed, diseased, blemished and bruised fruits were discarded from this lot in the laboratory for obtaining uniform fruits for analysis.

Observations recorded: Plant girth was measured using a measuring tape at the end of both growing seasons, with the difference computed as the percentage increase in girth. The trunk cross-sectional area (TCSA) was calculated by measuring the girth above the bud union and applying the formula: TCSA (cm^2) = (Trunk girth of scion $(cm)^2$) / (4π). Plant height was measured from the soil surface to the top of the tree with a graduated flag staff, once before the experiment in December and again after the growing season. Leaf area was determined by randomly selecting five fully developed leaves from all four directions of each tree, measuring their area using an automatic Leaf Area Meter, and averaging the values. Annual shoot extension growth was assessed by measuring the length of four randomly selected shoots from each tree's periphery at the end of the growing period.

Flowering characteristics included recording the date of initial bloom, when approximately 10% of flowers were open, and the date of full bloom, when over 80% of flowers were open, both using March 1st as a reference date. Percent fruit set was calculated by counting the number of flowers on four marked branches per tree and the number of fruits set after 20 days, using the formula: Fruit set (%) = (Number of fruit set x 100) / Number of flowers. The date of fruit maturity was noted from full bloom to harvest, considering size, color, and TSS.

Physical and chemical fruit characteristics such as length, breadth, weight, firmness, color, soluble solids concentration, titratable acidity, SSC/Acidity ratio, and total sugars were measured using standard techniques and instruments. Yield characters included yield per tree, recorded by weighing the fruits at harvest, and yield efficiency, determined by the ratio of yield to trunk cross-sectional area. Nutrient status of the fruits was analyzed by washing, drying, and crushing fruit samples, followed by determining total nitrogen using the Micro-Kjeldahl method, phosphorus using the Vanadomolybdate color reaction method, potassium using a flame photometer, and calcium and magnesium using Atomic Absorption Spectrophotometer. Data from the investigation was analyzed using Randomized Complete Block Design (RCBD) and interpreted according to Gomez and Gomez (1984), with observations taken over two consecutive years (2022 and 2023).

Results

Effect of different pruning intensities on growth, yield and quality of nectarines cultivar Snow Queen

Annual shoot extension growth: The perusal of data presented in Table 2 indicates that the annual shoot extension growth during 2022 and 2023was significantly influenced by different pruning intensities. Maximum annual shoot extension growth (56.25 and 57.11 cm) was recorded with T_1+2/3rdHB+20% TO (T_9) which was statistically at par with T_1+2/3rdHB+10%TO (T_8), whereas, minimum annual shoot extension growth (43.13 and 42.16 cm) was recorded under corrective pruning T_1 which was statistically at par with T_4 during 1st and 2nd year of study respectively. Pruning intensity T_5 (T_1+20% TO) and T_2 (T_1+$^1/_3$rd HB) exhibited an increase in shoot extension growth in ascending order measuring (45.51, 44.69 cm and 51.14, 50.21 cm), during both the years of study.

Plant height: The data on the effect of different pruning intensities had significant effect on plant height during 2022 and 2023 as shown in Table 2. It is evident from the data that lightly pruned plants showed significantly highest plant height than medium and severely pruned trees. Highest plant height (261.86 and 270.25 cm) was recorded with T_5 (T_1+20%TO). However, corrective pruning (T_1) and T_1+10 % TO (T_4) were statistically at par with respect to plant height i.e. (259.56 and 267.85 cm) and (258.53 and 266.37) during 2022 and 2023 respectively. Minimum plant height (246.51 and 253.39 cm) was recorded under severe pruning intensity T_1+$^2/_3$rdHB+20%TO (T_9).

Plant girth: All the pruning treatments significantly increased plant girth over corrective pruning during both the years of investigation Table 2 Highest plant girth (26.85 and 29.39 cm) was recorded with(T_7) T_1+$^1/_3$rd HB+20%TO followed by T_6(T_1+$^1/_3$rd HB+10%TO), however, lowest (18.02 and 20.07 cm) was found under corrective pruning (T_1). Rest of the treatments also showed the increasing trend over corrective pruning (T_1) during 2022 and 2023, respectively.

Trunk cross sectional area: It is apparent from the data presented in Table 2 that significant variation occurred for trunk cross sectional area with different pruning intensities during 2022 and 2023. Maximum trunk cross sectional area (57.42 and 68.76 cm^2) was obtained with T_7 ($T_1+^1/_3{}^{rd}$ HB+20%TO) followed by $T_1+^1/_3{}^{rd}$ HB+10%TO (T_6), however, all other treatments recorded an increased in trunk cross sectional area. Minimum trunk cross sectional area (25.86 and 32.06 cm^2) was recorded under corrective pruning during both the years of study.

Leaf area: It is evident from the data that leaf area was significantly affected by different pruning treatments during both the years as presented in Table 2 Among different treatments, maximum leaf area (38.23 and 38.45 cm^2) was recorded underT_9 (T_1+ $^2/_3{}^{rd}$ HB+20%TO) treatment followed by T_1+ $^2/_3{}^{rd}$ HB+10%TO (T_8), however follows similar in other treatments$T_1+^1/_3{}^{rd}$ HB (T_2) and T_1+ 1/3rd HB +10% TO (T_6) were statistically at par in their effect on leaf area (35.28 and 35.13 cm^2 and 35.62 and 34.68 cm^2). Minimum leaf area (33.23 and 33.22 cm^2) was observed under corrective pruning (T_1) during 2022 and 2023, respectively.

Productive characters

Date of initial bloom (10%): The perusal of the data indicates that all treatments had a significant influence on initial bloom. It is evident from the Table 3 that with the increase in the severity of pruning, initial bloom was delayed during both the years of study. Trees receiving sever pruning (T_1+2/$_3{}^{rd}$ HB+20%TO) took 18 and 24 days to reach the initial bloom stage as compared to corrective pruning T_1 (15 and 21 days) during 2022 and 2023, respectively. However, as the severity of pruning increases there occurs delay in initial bloom.

Date of full bloom (80%): The data presented in Table 3 depicted that the full bloom was significantly influenced by different pruning intensities during both the years of study. Significantly the full bloom stage was recorded earlier (18.67 and 22.33 DARD) in corrective pruning (T_1) and the late (22.67 and 26.67 DARD) in $T_1+^2/_3{}^{rd}$ HB+20%TO(T_9) during 2022 and 2023 respectively.

Initial fruit set: Data present in Table 4 revealed significant influence of different pruning intensities on per cent fruit set during 2022 and 2023.Among different treatments, maximum fruit set (77.25% and 75.15%) was obtained with corrective pruning (T_1) which was followed by T_4 (T_1+10% TO), however, minimum fruit set (64.58% and 61.36%) was recorded under T_9 ($T_1+^2/_3{}^{rd}$ HB+20% TO).

Days taken to maturity: All the pruning intensities had a significant influence on number of days taken to maturity as presented in Table 4. Data reveals that with increasing the pruning severity, fruit maturity was delayed. Significantly maximum number of days (80.67 and 82.67 DAFB) were taken by plants subjected to $T_1+^2/_3{}^{rd}$ HB+20%TO (T_9) treatment which was followed by $T_1+^2/_3{}^{rd}$ HB+10%TO (T_9) (80.33 and 82.33 DAFB) and the minimum in corrective pruning (T_1) (76.33 and 78.33 DAFB) during 2022 and 2023, respectively.

Fruit yield: Different pruning intensities had a significant effect on fruit yield during 2022 and 2023 Table 4. Among all treatments, maximum fruit yield per tree (18.43 and 19.78 kg/tree) was obtained with corrective pruning (T_1) followed by T_1+10% TO (T_4), which was statistically at par with treatment T_1+20% TO (T_5). Minimum fruit yield per tree (11.73 and 12.07 kg/tree) was recorded under $T_1+^2/_3{}^{rd}$ HB+20% TO (T_9) during both the years of study.

Yield efficiency: Yield efficiency was significantly influenced by different pruning intensities during both the year of study. Data presented in Table 4 revealed that, highest yield efficiency (0.71 and 0.62 kg cm^{-2}) was obtained with corrective pruning (T_1) followed by T_1+10% (T_4) thinning out among different pruning treatments. Minimum yield efficiency (0.23 and 0.23 kg cm^{-2}) was found in treatment T_9($T_1+^2/_3{}^{rd}$ HB+20% TO) during 2022 and 2023, respectively.

Fruit quality

Physical characteristics: The data on physical characteristics of fruit in terms of average fruit length, fruit diameter, fruit weight, fruit firmness and fruit colour as influnenced by different pruning intensities, are presented below:

Fruit length: The data presented in Table 5 showed the significance of different pruning treatments on fruit length during 2022 and 2023. Maximum fruit length (5.21 and 5.24 cm) was recorded with $T_1+^2/_3{}^{rd}$ HB+20% TO (T_9) followed by $T_1+^2/_3{}^{rd}$ HB+10% TO (T_8). Similarly, other treatments i.e. $T_1+^1/_3{}^{rd}$ HB+ 20% TO (T_7) and $T_1+^1/_3{}^{rd}$ HB+20%TO (T_6) were statistically at par with each other. Among different treatments, minimum fruit length (4.06 and 4.04 cm) was recorded with corrective pruning (T_1) during both the years of study.

Fruit diameter: Different pruning intensities had a significant influence on fruit diameter during both the years of study Table 5. Highest fruit diameter (5.02 and 5.08 cm) was observed with $T_1+^{2/}{}_3{}^{rd}$ HB+20%TO (T_9) which is statistically at par with $T_1+^{2/}{}_3{}^{rd}$ HB+10%TO (T_8). Minimum (3.86 and 3.81 cm) fruit diameter was observed under corrective pruning (T_1) during 2022 and 2023, respectively.

Fruit weight: It is self-explanatory from the data presented in Table 5 that the fruit weight was significantly increased by different pruning treatments as compared to corrective pruning (T_1). Similar, trend was observed during 2022 and 2023, in term of fruit weight. Maximum average fruit weight (71.24 and 71.66 g) was recorded with treatment T_1+$^{2/}{}_3{}^{rd}$ HB+20% TO (T_9), followed by T_1+$^{2/}{}_3{}^{rd}$ HB+10%TO (T_8) during both the year of study, which was statistically at par with T_1+$^{2/}{}_3{}^{rd}$ HB, but superior to all other treatments. Minimum fruit weight of 42.19 and 41.34 g was recorded with corrective pruning (T_1).

Fruit firmness: The data presented in Table 5 revealed significant influence of different pruning intensities on fruit firmness during 2022 and 2023. Maximum fruit firmness (8.92 and 8.86 kg cm^{-2}) was obtained with corrective pruning (T_1) which was statistically at par with treatment T_1+10%TO (T_4) and minimum (8.23 and 8.12 kg cm^{-2}) was recorded with treatment T_1+$^{2/}{}_3{}^{rd}$ HB+20%TO (T_9) during both the years of study.

Fruit colour: The data regarding influence of different pruning intensities on fruit colour during both years of study is presented in Table 6. Maximum values (29.85 and 30.33) of 'a' i.e. redness was found under T_1+$^{2/}{}_3{}^{rd}$ HB+20% TO (T_9), which was followed by T_1+$^{2/}{}_3{}^{rd}$ HB+10% TO (T_8), it indicates that nectarine fruits were mostly red in colour during 2022 and 2023.

As hue angle values are inversely proportional to colour content. Minimum hue angle (23.03 and 22.11) was estimated in fruits from trees pruned with T_1+$^{2/}{}_3{}^{rd}$ HB+20%TO (T_9) which was followed by T_1+$^{2/}{}_3{}^{rd}$ HB+10%TO (T_8). Maximum value of hue angle (33.77 and 33.41) was recorded in corrective pruning (T_1).

Chemical characteristics: Data related to total soluble solids, titratable acidity, SSC/acidity and total sugars during both the years are presented below:

Soluble solids concentration, SSC (%): Different pruning intensities significantly increased fruit soluble solids concentration during 2022 and 2023, Table 7. Among different treatments, maximum SSC (13.03 and 13.33 %) was observed with T_1+$^{2/}{}_3{}^{rd}$ HB+20%TO (T_9), however, it was statistically at par with T_1+$^{2/}{}_3{}^{rd}$ HB+10%TO(T_8), followed by T_1+$^{2/}{}_3{}^{rd}$ HB (T_3). Minimum fruit SSC (11.21 and 11.11 %) was observed under corrective pruning (T_1) during both the years of study.

Titratable acidity: The data presented in Table 7 revealed significant effects of different pruning treatments on titratable acidity. Minimum fruit titratable acidity (0.51 and 0.50 %) was recorded with T_1+$^{2/}{}_3{}^{rd}$ HB+20%TO (T_9) which was statiscally at par with T_1+$^{2/}{}_3{}^{rd}$ HB+10%TO (T_8) during first and second year of study respectively. Maximum fruit titratable acidity (0.61 and 0.62 %) was recorded with corrective pruning (T_1) during both the years of study.

SSC/ acidity ratio: It is clear from the data presented in Table 7 that fruit SSC/acidity was ratio significantly influenced by different pruning intensities during both the years of study. Higher SSC/ acidity ratio (25.56 and 26.48) was recorded under treatment T_9 (T_1+$^{2/}{}_3{}^{rd}$ HB+20%TO) which was statistically at par with treatment T_8 (T_1+$^{2/}{}_3{}^{rd}$ HB+10%TO). However, the minimum SSC/acidity ratio (18.48 and 18.02) was observed under corrective pruning (T_1) which was statistically at par with treatment T_4 (T_1+10% TO) during 2022 and 2023, respectively.

Total sugars: It is evident from the data depicted by Table 7 that different pruning intensities had significant effect on total sugars content of fruits during both the years of study. Total sugars content was highest (9.51 and 9.56 %) in fruits from plants under(T_9) treatment following by (T_8) which was followed by (T_3), (T_7) and (T_6). However, total sugar content influenced by (T_9) and (T_8) was statistically at par with each other during previous and following year of investigation. Lowest total sugars content (8.21 and 8.22 %) was recorded in corrective pruning (T_1), respectively.

Fruit nutrient status: The data regarding macronutrient of nectarine fruits (N, P, K, Ca and Mg) are presented in Table 8.

Fruit nitrogen: Different pruning treatments significantly influenced the nitrogen content of fruits. The perusal of data revealed that fruit nitrogen content increased significantly with the increase in pruning intensities during 2022 and 2023 mentioned in Table 8. Significantly highest nitrogen content (0.75 and 0.76%) was recorded under T_1+$^{1/}{}_3{}^{rd}$ HB+20%TO (T_7) followed by T_1+$^{1/}{}_3{}^{rd}$ HB+10%TO (T_6). However, in corrective pruning (T_1) minimum fruit nitrogen content (0.63 and 0.62 %) was recorded among rest of the treatments during both the years of study.

Fruit phosphorus: It is evident from the data that the effect of different pruning intensities on Phosphorus content of fruit was significant during 2022 and 2023 Table 8. However, maximum fruit phosphorus content (0.054 and 0.057 %) was obtained under T_1+$^{1/}{}_3{}^{rd}$ HB+20% (T_7) which was statiscally at par with T_1+$^{1/}{}_3{}^{rd}$ HB+10% (T_6). Minimum fruit Phosphorus content (0.044 and 0.045 %) was recorded under corrective pruning (T_1) during both the years of study.

Fruit potassium: The data presented in Table 8, depicts that pruning intensities had a significant effect on fruit potassium content during both the years of study. Highest fruit potassium content (0.85 and 0.86 %) was noticed in treatment T_1+$^{1/}{}_3{}^{rd}$ HB+20% (T_7)

which is significantly at par with treatment $T_1+^{1/}{}_3{}^{rd}$ HB+10% (T_6). Minimum fruit potassium content (0.74 and 0.72 %) was observed in corrective pruning (T_1) during 2022 and 2023, respectively.

Fruit calcium: All the pruning regimes had a significant influence on fruit calcium content of nectarine during 2022 and 2023 as is evident from the Table 8. Markedly maximum fruit calcium content (0.071 and 0.073%) was recorded with corrective pruning (T_1) which was statistically at par with treatment T_1+10% TO (T_4). However, minimum calcium content (0.053 and 0.052%) was registered under $T_1+^{2/}{}_3{}^{rd}$ HB+20% (T_9) during both the years of study.

Fruit magnesium: As is obvious from the data depicted in Table 8, fruit magnesium content under different pruning intensities showed significant variation among each other. Maximum fruit magnesium content (0.034 and 0.035%) was recorded under corrective pruning (T_1) followed by treatment (T_4). However T_1 and T_4 were statistically at par with each other. The lowest fruit magnesium content (0.021 and 0.020%) was found under $T_1+^{2/}{}_3{}^{rd}$ HB+20% (T_9) during both the years of study.

Discussion

Increased pruning intensity positively influenced vegetative growth, evidenced by enhanced annual shoot extension growth and leaf area. The highest annual shoot growth (56.25, 57.11, 55.36, and 56.47 cm) was observed with severe pruning (2/3rd heading back combined with 20% or 10% thinning out), while the lowest (43.13 and 42.16 cm) was seen with corrective pruning across both years of study. Severe pruning invigorating effect on shoot growth can be attributed to increased availability of photosynthates and nutrients, promoting cell division and tissue formation. Awasthi and Singh (1990) support these findings, noting that altered hormonal (auxin, cytokinin, gibberellins) and nutrient translocation patterns in plants undergoing severe pruning contribute to this growth. Mika (1986) further explained that cytokinin translocation from roots to shoots stimulates bud development and auxin synthesis, followed by increased gibberellin levels, promoting vascular system development and nutrient transport.

The uptake of nitrogen, phosphorus, and potassium also increased in severely pruned plants, contributing to the observed annual shoot growth, as supported by Faust (1989) and Thakur and Rana (2012). These results align with Sharma (1995), Bussi *et al*. (2005), and Hassani and Rezaee (2007), who found that severe pruning led to longer shoots in various peach and nectarine cultivars.

Pruning treatments significantly affected plant height, with maximum height (261.86 and 270.25 cm) recorded in nectarine with 20% thinning out, followed by 10% thinning out. Minimum height (247.21 and 254.29 cm) was observed in severely and medium-pruned plants. The reduction in plant height with severe pruning is likely due to the direction of assimilates and nutrients towards new shoot growth, potentially leading to overall dwarfism (Faust, 1989). Mika (1986) noted that despite longer annual shoots; severely pruned trees remain smaller due to the inability to replace the removed parts. These findings are consistent with Khan *et al*. (1992), Singh *et al*. (1997), Thakur and Rana (2012), and Dalkilic *et al*. (2014) in various peach and nectarine cultivars.

Plant girth and trunk cross-sectional area were highest (26.85, 29.39 cm and 57.42, 68.76 cm²) in medium-pruned plants (1/3rd heading back combined with 20% or 10% thinning out) compared to lightly and severely pruned plants in 2022 and 2023. The increased girth in medium-pruned plants is due to less translocation of assimilates and nutrients towards new shoot growth compared to severe pruning, as reported by Fukuda *et al*. (2002) in peach cultivar Shimizuhakuto. These results concur with Singh (1992), Thakur (1993), Kaundal *et al*. (2002), and Thakur and Rana (2012) in various peach and nectarine cultivars.

Maximum leaf area (38.23 and 38.45 cm^2) was also observed in severely pruned plants than light and medium pruned ($2/3^{rd}$ HB+20%TO and $2/3^{rd}$ HB+10%TO) during both the years of study. Singh (1992) and Thakur (1993), revealed that with the increase in pruning intensity, there is a maximum distribution of light in the interior portion of the tree canopy that increase the photosynthetic activity of leaves as a result of which mesophyll cell size, total chlorophyll content and over all leaf area gets increased and due to severe pruning, there is less competition for carbohydrates and other metabolites among few buds which also resulted in increased leaf area. The present findings are inconformity with the findings of Hassan (1990), Li *et al*. (1994), Singh *et al.* (1997) and Thakur and Rana (2012), who obtained rapid foliar development and increased leaf area in severely pruned trees than light and medium pruned by reducing the number of fruiting shoots in different varieties of peaches and nectarines, respectively.

Pruning intensityhas a significant effect on initial bloom and full bloom of nectarine. Early flowering was recorded in corrective pruning and light pruned plants which took 15.00 and 21.00 DARD to reach the initial bloom stage as compared to severe pruning (18.00 and 24.00 days). However, the full bloom stage (18.67 and 22.33 DARD) was recorded significantly earlier in corrective pruning and late in severe pruning (22.67 and 26.67 DARD) during 2022 and 2023, respectively. Late flowering recorded in severely and medium pruned plants may be due to the fact that in severe pruning we are giving numerous small cuts, which render high production of ethylene and cytokinin*i.e.*, four times more as compared to light and corrective pruning, which causes early flowering in corrective and light pruned plants (Faust, 1989). Gough (1983) observed that the reason for pruning affecting date of bloom may be related to the autumnal migration of carbohydrates or nitrogenous compounds. As in light pruning we are removing less wood which means we are removing less carbohydrates stored in those branches. A colder season also may have resulted in a greater protraction of bloom, there by magnifying differences in blooming time among treatments. The results are also in line with Grochowska*et al.* (1984), Singh *et al.* (1997) and Rather (2006), who recorded that the vigorously growing shoots of pruned trees are overloaded with growth promoting hormones namely auxins and gibberellins which delayed early flower initiation.

Maximum initial fruit set (77.25 and 75.15%) was recorded under corrective pruning followed by light pruning during both the years of study. Pruning severity greatly influenced the fruit set, which could be attributed to the fact that, there is active utilization of carbohydrates, nutrients and water by the newly growing vegetative shoots (Rathi*et al.*, 2003) which resulted in reduction of fruit set in severely pruned plants as compared to light and medium pruned. These results are in agreement with those of Thakur (1993), Deeb (1999) and Thakur and Rana (2012), who reported decreased fruit, set with the increase in pruning severity in peach and nectarine trees.

Different pruning intensities exerted significant effect on fruit yield and yield efficiency during both the years of study. Highest fruit yield (18.43 and 19.78 kg/plant) and yield efficiency (0.71 and 0.62 kg/cm^2 TCSA) was obtained in plants with corrective pruning and lowest yield (11.73 and 12.07 kg/plant) and yield efficiency was recorded in severely pruned plants. The highest yield and yield efficiency was observed in lightly pruned plants due to retention of more number of fruiting buds and lowest in severely pruned plants which could be attributed due to the reduced number of floral buds and fruiting area, respectively. Similar increases in yield and yield efficiency due to light pruning have also been reported by Kanwar and Nijjar (1983) and Singh (1992). These results are also strongly supported by the findings of Prakash and Nautiyal (1994), Yongko *et al.* (2000), Radivojevic *et al.* (2002), Robinson *et al.* (2006), Kumar *et al.* (2010), Mohamed *et al.* (2011) and Thakur and Rana (2012) in different peach and nectarine cultivars respectively.

Significant improvement in fruit physical parameters (length, diameter, weight, firmness and colour) was recorded under different pruning intensities. Maximum fruit length (5.21 and 5.24 cm), fruit diameter (5.02 and 5.08 cm), fruit weight (73.86 and 73.66 g), and fruit colour in terms of hue angle (23.03 and 22.11 ^{o}H) was observed with 2/3rd HB+20% TO followed by 2/3rd HB+10% TO. The increased size and weight of fruits in case of severe pruning that have actually led to the moderate crop on the plants which in turn got enough food materials for their optimum growth and development, however, pruning also decreased the number of flower buds and consequently the fruit size and weight got increased. Similar results of increase in size and fruit weight with increasing severity of pruning have also been reported by Mahajan and Dhillon (2002), and Hassani and Rezaee (2007). Another reason for the increased fruit size with the increase in pruning severity might be due to the increased uptake of nutrients especially nitrogen and potassium by peach trees. Our results are also in conformity with the findings of Kanwar and Nijjar (1983), Badiyala and Awasthi (1989), Endin and Gracin (1989), Hassan (1990), Singh (1992) and Thakur (1993) who reported that with increase in severity of pruning fruit size and weight also increased.

Fruit firmness significantly decreased with the increasing level pruning intensity. Highest fruit firmness (8.92 and 8.8.86 cm^2) was recorded under corrective and light pruning intensity and minimum (8.23 and 8.12 cm^2) in severe pruning intensity. The present results are in congruence with those of Saini and Kaundal (2003) who found that fruits from severe pruned plants had large size, low calcium concentration and less firmness than the fruits from corrective and light pruned plants. The Reduction in fruit firmness might be due to the larger fruit size that decreases the strength of cell wall and creates lesser cohesion between the cells (Saini and Kaundal, 2003; and Deshmukh *et al.*, 2012). Inverse relationship between pruning intensities and fruit firmness was also observed by Sharma *et al.* (1993) and Thakur (1993).

Pruning intensity had a significant influence on colour development of nectarine fruits and was measured as Hunter colour values (L,*a and H). Hue angle is considered to be an important parameter, which determines the visible impression of fruit colour and its value was recorded the highest in fruit peel harvested from the corrective and medium pruned (33.77, 33.41 and 28.03, 27.06 °H) trees and its lowest value was found in severely pruned (23.03 and 22.11 °H) (2/3rd HB+20%TO) plants. This might be due to the reason that increased pruning severity causes more sunlight penetration into the tree canopy and hence improves fruit skin colour. Pruning done by a few large thinning cuts, which does not stimulate much new growth facilitates good light penetration into the interior part of tree and improves fruit colour. This may be due to long exposure of fruit for sunlight which accelerate higher accumulation of total carotenoid pigment in the fruit peel. Anthocyanin biosynthesis is light dependent process because the enzymes involved in the biosynthetic pathway of anthocyanin such as phenylalanine ammonia-lyase (PAL) and uridinediphosphate-galactose-flavonoid 3-Ogalactosyltransferase (UFGalT) are light inducible (Iglesias and Alegre, 2009). Increasing the light intensity within the tree canopy stimulates anthocyanin synthesis by accelerating the activity of UFGalT and PAL. Similar results were also obtained by Thakur and Rana (2012) in nectarine cultivars Snow Queen, Silver King, Spring Bright and Summer Bright.

Fruit maturity was enhanced with the increase in pruning severity, maximum number of days (80.67 and 82.67 DAFB) were taken by plants subjected to severe pruning and the minimum in corrective pruning (76.33 and 78.33 DAFB). Early maturity in light and medium pruned trees may be due to the early flowering in light and medium pruned plants. These results are in accordance with those of Kanwar and Nijjar (1983), who also reported that fruit maturity was enhanced by heavy pruning as compared to light and medium pruning intensities.

In the present investigation, fruit chemical parameters comprising of soluble solid concentration, titratable acidity and total sugars were appreciably influenced by different pruning intensities. Maximum soluble solids concentration (13.03 and 13.33%), total sugars (9.51 and 9.56%) and minimum titratable acidity (0.51 and 0.50%) was recorded with 2/3rd HB+20%TO followed by 2/3rd HB+10%TO during both the years of study. These findings are also in conformity with Singh (1982) and Thakur (1993) in July Elberta peach. Similar observations were recorded by Daulta and Singh (1986) and Badiyala and Awasthi (1989). The increased soluble solid concentration (SCC) and total sugars in the fruits with the increasing severity of pruning might be associated with the increase in leaf fruit ratio, uptake of nutrients from the soil and consequently increased photosynthetic activities of the plants, more synthesis of carbohydrates and other metabolites and their translocation to the fruit tissues leads to increased soluble solids concentration in fruits. Severe pruning also results in more accumulation of total sugars than medium and light pruning intensities. The current results are in agreement with Kumar *et al.* (2010), Thakur and Rana (2012) and Pant *et al.* (2015).

Pruning had a significant effect on Titratable acidity of fruits. Highest acidity (0.61 and 0.62 %) was found in corrective pruned plants compared to light and severely pruned (0.51 and 0.50 %). The increased Titratable acidity in the corrective pruning plants may be due to lower rate of reduction of starch to sugars, more competition of nutrients among the fruits and lesser availability of light in interior canopy. Mahajan and Dhillon (2002), Kumar *et al.* (2010), Thakur and Rana (2012) and Pant *et al.* (2015) were of the opinion that increased fruit size and moisture content in nectarine and peach fruits resulted in a significant reduction in fruit acidity.

The SSC: acid ratio increased with the increasing pruning intensity. The maximum SSC: acid ratio (25.56 and 26.48) was found in severely pruned plants and minimum (18.48, 18.02 and 23.17, 22.88) was observed in corrective and medium pruned plants. The increased sugar acid ratio might be due to the increased pruning severity which attributes to increased sugar content and reduced level of titratable acidity. Results of present investigation are in agreement with Kaundal *et al.* (2002), and Thakur and Rana (2012), that with the increase in pruning severity SSC: acid ratio increased in different cultivars of peach and nectarines.

Present study revealed that nutrient status of fruit was significantly influenced by different pruning regimes. Highest fruit N (0.75 and 0.76 %) was recorded in medium pruned trees T_7 (T1+ 1/3rd HB+20 % TO) and lowest (0.63 and 0.62 %) was found in light pruned trees T_1 (corrective pruning). Dormant pruning stimulates growth of new shoots and decreases total yield which is associated with a higher concentration of minerals in the fruits because minerals absorbed by the roots is readily available to the few fruits produced. Several studies have shown that both dormant and summer pruning influence the mineral content of leaves and fruit Bunemann and Struklec (1980), Olszewski and Stowik (1982).

The fruits harvested from severely pruned plants had significantly higher nitrogen content than medium and lightly pruned plants during both the years of investigation. It might be due to the fact that severe pruning reduced the yield and increased the mineral content in remaining fruits and leaves (Mika, 1986). These results are also in agreement with the findings of Kainth *et al.* (2011) and Kumar and Thakur (2012) studied the effect of pruning severity in peach, apple, nectarine and plum.

The fruit phosphorus content was significantly influenced by different pruning severities. Higher phosphorus content (0.054 and 0.057 %) was observed in medium and heavy pruning intensities as compared to light pruning (0.044 and 0.045 %). Schneider and Correll (1966) recorded higher fruit phosphorus with severe pruning. Fruit potassium increased significantly with the increase in pruning severity. Higher fruit potassium content (0.85 and 0.86 %) in the medium pruned trees might be due to the less accumulation of dry matter and vigorous growth, which resulted in increased potassium uptake. Kanwar (1979), and Singh (1992) have shown that heavy pruning resulted in increased fruit potassium content. However, potassium contents were in optimum range in all the pruning severities during both the years of study.

Fruit calcium (0.053 and 0.052 %) and magnesium (0.021 and 0.020%) concentration in the fruits was decreased with an increase in pruning severity as compared to control where calcium and magnesium was found highest (0.071, 0.073 and 0.034, 0.035 %) during both the years of study. As these two elements can be easily attracted and withdrawn from the available pool by actively growing shoot tips of pruned plants, although calcium deposited in leaves cannot be redistributed to fruits. The reduced calcium content in nectarine from severely pruned trees is also correlated to size of the fruits. Since pruning increases fruit size considerably and the Ca concentration in larger fruits is more diluted than in smaller fruits. These results are in agreement with the findings of Tawfik and Abdel-Aziz (1969) who reported that dormant pruning decreases fruit Ca ad Mg contents. Mika (1986) reported low Ca content in fruits of severely pruned peach trees can be due to their faster extension growth. According to Faust (1989) an abundant supply of carbohydrates to the root system is necessary for uptake of calcium. In fast growing plants the partitioning of carbohydrates is affected, as roots receive insufficient amount of carbohydrates. The decrease in fruit Ca and Mg due to increasing severity of pruning could be attributed due to higher K levels in the fruits of heavily pruned trees. Similarly, Kanwar (1979), Singh (1982) and Singh (1992) also reported decrease in fruit Ca with the increase in severity of pruning.

Table 1: Different pruning intensities applied on nectarines cv. Snow Queen

S. No.	Treatment
T_1	Corrective pruning (Removal of dead, diseased and criss-cross branches)
T_2	T_1+heading back (removing 1/3rd of the branch)
T_3	T_1+heading back (removing 2/3rd of the branch)
T_4	T_1+thinning out 10% of the one-year-old branches
T_5	T_1+thinning out 20% of the one-year-old branches
T_6	T_1 + heading back (removing 1/3rd of the branch) + thinning out10% of the one-year-old branches
T_7	T_1 + heading back (removing 1/3rd of the branch) + thinning out 20% of the one-year-old branches
T_8	T_1 + heading back (removing 2/3rd of the branch) + thinning out 10% of the one-year-old branches
T_9	T_1+ heading back (removing 2/3rd of the branch) + thinning out 20% of the one-year-old branches

The experiment was laid out in Randomized Complete Block Design (RCBD) with nine treatments and three replications.

Table 2: Effect of different pruning intensities on growth characteristics of nectarine cv. Snow Queen during 2022 and 2023

Treatments	**Annual shoot extension growth (cm)**		**Plant height (cm)**		**Plant girth (cm)**		**Trunk Cross sectional area (cm^2)**		**Leaf area (cm^2)**	
	2022	**2023**	**2022**	**2023**	**2022**	**2023**	**2022**	**2023**	**2022**	**2023**
T_1 Corrective pruning	43.13	42.16	258.53	266.37	18.02	20.07	25.86	32.06	33.23	33.22
T_2 T_1+ 1/3rd Heading Back	51.14	50.21	250.16	257.39	24.48	26.86	47.71	57.43	35.28	35.13
T_3 T_1+ 2/3rd Heading Back	54.48	55.14	244.47	250.88	21.49	23.71	36.77	44.76	37.14	36.51
T_4 T_1+ 10 % Thinnning out	44.31	43.67	259.56	267.85	19.53	21.64	30.36	37.34	33.78	33.17
T_5 T_1+ 20 % Thinnning Out	45.51	44.69	261.86	270.25	20.35	22.52	32.99	40.37	34.18	33.77
T_6 T_1 + 1/3rd Heading Back + 10 % Thinnning Out	52.23	51.11	252.20	260.02	25.62	28.08	52.28	62.78	35.62	34.68
T_7 T_1 + 1/3rd Heading Back + 20 % Thinnning Out	53.18	52.54	253.72	261.37	26.85	29.39	57.42	68.76	36.43	35.56
T_8 T_1 + 2/3rd Heading Back +10% Thinnning Out	55.36	56.47	246.51	253.39	22.54	24.81	40.46	49.01	37.54	38.16
T_9 T_1+ 2/3rd Heading Back + 20% Thinnning Out	56.25	57.11	247.21	254.29	23.61	25.93	44.42	53.55	38.23	38.45
CD $_{(p\leq0.05)}$	**1.36**	**1.51**	**1.41**	**1.62**	**0.57**	**0.61**	**2.05**	**2.32**	**0.86**	**0.82**

HB = Heading Back, TO = Thinning Out

Table 3: Effect of different pruning intensities on days to flowering of nectarine cv. Snow Queen

Treatments		*Date of initial Bloom (About 10%)		* Date of full Bloom (Above 80%)	
		2022	2023	2022	2023
T_1	Corrective pruning	15.00	21.00	18.67	22.33
T_2	T_1+ 1/3rd Heading Back	16.00	22.00	20.33	24.00
T_3	T_1+ 2/3rd Heading Back	17.33	23.33	22.00	26.00
T_4	T_1+ 10 % Thinnning out	15.33	21.33	19.00	22.67
T_5	T_1+ 20 % Thinnning Out	15.67	21.67	19.33	23.33
T_6	T_1 + 1/3rd Heading Back + 10 % Thinnning Out	16.67	22.33	20.67	24.67
T_7	T_1 + 1/3rd Heading Back + 20 % Thinnning Out	17.00	22.67	21.33	25.33
T_8	T_1 + 2/3rd Heading Back +10% Thinnning Out	17.67	23.67	22.33	26.33
T_9	T_1+ 2/3rd Heading Back + 20% Thinnning Out	18.00	24.00	22.67	26.67
$CD_{(p\leq0.05)}$		**0.91**	**0.79**	**0.82**	**1.02**

HB = Heading Back, TO = Thinning Out

*Reference Date: 1st March

Table 4: Effect of different pruning intensities on fruit set (%), maturity and yield parameters of nectarine cv. Snow Queen

Treatments	Initial fruit set (%)		Fruit maturity (DAFB to Harvesting)		Fruit yield (kg tree^{-1})		Yield efficiency (Kg cm^{-2})	
	2022	2023	2022	2023	2022	2023	2022	2023
T_1 Corrective pruning	77.25	75.15	76.33	78.33	18.43	19.78	0.71	0.62
T_2 T_1+ 1/3rd Heading Back	73.16	70.22	78.33	80.00	15.16	16.48	0.32	0.29
T_3 T_1+ 2/3rd Heading Back	67.54	64.46	80.33	82.00	12.41	13.32	0.32	0.30
T_4 T_1+ 10 % Thinnning out	75.52	73.31	76.67	78.67	17.21	18.68	0.57	0.50
T_5 T_1+ 20 % Thinnning Out	74.39	72.24	77.67	79.67	16.48	17.61	0.50	0.44
T_6 T_1 + 1/3rd Heading Back + 10 % Thinnning Out	71.71	69.56	78.67	80.33	14.74	15.44	0.27	0.25
T_7 T_1 + 1/3rd Heading Back + 20 % Thinnning Out	69.13	67.47	79.33	80.67	13.66	14.81	0.23	0.22
T_8 T_1 + 2/3rd Heading Back +10% Thinnning Out	66.23	63.25	80.33	82.33	12.02	12.62	0.28	0.26
T_9 T_1+ 2/3rd Heading Back + 20% Thinnning Out	64.58	61.36	80.67	82.67	11.73	12.07	0.23	0.23
$CD_{(p\leq0.05)}$	**1.25**	**1.30**	**1.19**	**1.25**	**1.19**	**1.34**	**0.045**	**0.033**

Table 5: Effect of different pruning intensities on fruit physical characteristics of nectarine cv. Snow Queen during 2022 and 2023

Treatments	Fruit length (cm)		Fruit diameter (cm)		Fruit weight (g)		Fruit firmness (kg cm^{-2})	
	2022	2023	2022	2023	2022	2023	2022	2023
T_1 Corrective pruning	4.06	4.04	3.86	3.81	42.19	41.34	8.92	8.86
T_2 T_1+ 1/3rd HB	4.81	4.73	4.62	4.52	57.66	56.88	8.54	8.46
T_3 T_1+ 2/3rd HB	5.09	4.99	4.91	4.82	68.07	67.21	8.36	8.21
T_4 T_1+ 10 % TO	4.31	4.34	4.10	4.12	46.21	45.48	8.83	8.75
T_5 T_1+ 20 % TO	4.41	4.46	4.21	4.25	48.58	47.45	8.76	8.68
T_6 T_1 + 1/3rd HB + 10 % TO	4.92	4.85	4.69	4.63	60.58	60.33	8.45	8.32
T_7 T_1 + 1/3rd HB + 20 % TO	4.99	4.96	4.79	4.73	63.27	62.22	8.42	8.37
T_8 T_1 + 2/3rd HB +10% TO	5.11	5.15	4.91	5.02	70.67	70.28	8.31	8.26
T_9 T_1+ 2/3rd HB + 20% TO	5.21	5.24	5.02	5.08	71.24	71.16	8.23	8.12
$CD_{(p\leq0.05)}$	**0.13**	**0.19**	**0.12**	**0.20**	**4.67**	**4.72**	**0.14**	**0.18**

HB = Heading Back, TO = Thinning Out

Table 6: Effect of different pruning intensities on Fruit colour of nectarine cv. Snow Queen during 2022 and 2023

Treatments		Fruit colour ($L^*a\,^oH$)					
		2022			2023		
		L*	a	^oH	L*	a	^oH
T_1	Corrective pruning	30.85	22.02	33.77	30.20	22.11	33.41
T_2	T_1+ 1/3rd Heading Back	27.03	24.73	29.18	25.91	24.88	28.79
T_3	T_1+ 2/3rd Heading Back	24.32	27.66	25.21	23.44	28.24	24.34
T_4	T_1+ 10 % Thinnning out	30.48	22.21	32.73	29.14	22.31	32.21
T_5	T_1+ 20 % Thinnning Out	29.44	22.66	31.75	28.21	22.78	31.11
T_6	T_1 + 1/3rd Heading Back + 10 % Thinnning Out	26.36	25.48	28.03	25.49	25.63	27.06
T_7	T_1 + 1/3rd Heading Back + 20 % Thinnning Out	25.34	25.87	27.28	24.33	26.34	26.11
T_8	T_1 + 2/3rd Heading Back +10% Thinnning Out	23.29	28.77	24.11	22.56	29.73	23.13
T_9	T_1+ 2/3rd Heading Back + 20% Thinnning Out	23.08	29.85	23.03	21.95	30.33	22.11
$CD_{(p\leq0.05)}$		**1.24**	**1.84**	**1.06**	**1.33**	**2.41**	**1.26**

HB = Heading Back, TO = Thinning Out

Table 7 : Effect of different pruning intensities on fruit chemical characteristics of nectarine cv. Snow Queen during 2022 and 2023

Treatments		SSC (%)		Titratable acidity (%)		SSC/Acidity ratio		Total sugars (%)	
		2022	2023	2022	2023	2022	2023	2022	2023
T_1	Corrective pruning	11.21	11.11	0.61	0.62	18.48	18.02	8.21	8.22
T_2	T_1+ 1/3rd Heading Back	12.11	12.15	0.55	0.56	22.03	21.70	8.67	8.73
T_3	T_1+ 2/3rd Heading Back	12.77	12.83	0.52	0.53	24.42	24.09	9.21	9.27
T_4	T_1+ 10 % Thinnning out	11.34	11.25	0.60	0.61	18.80	18.54	8.32	8.36
T_5	T_1+ 20 % Thinnning Out	11.61	11.47	0.59	0.58	19.59	19.68	8.41	8.52
T_6	T_1 + 1/3rd Heading Back + 10 % Thinnning Out	12.24	12.31	0.54	0.55	22.82	22.39	8.75	8.85
T_7	T_1 + 1/3rd Heading Back + 20 % Thinnning Out	12.35	12.43	0.53	0.54	23.17	22.88	8.88	8.98
T_8	T_1 + 2/3rd Heading Back +10% Thinnning Out	12.86	13.16	0.52	0.51	24.74	25.82	9.44	9.47
T_9	T_1+ 2/3rd Heading Back + 20% Thinnning Out	13.03	13.33	0.51	0.50	25.56	26.48	9.51	9.56
$CD_{(p\leq0.05)}$		**0.37**	**0.32**	**0.016**	**0.015**	**0.92**	**0.88**	**0.21**	**0.23**

HB = Heading Back, TO = Thinning Out

Table 8 : Effect of different pruning intensities on fruit nutrient status of nectarine cv. Snow Queen during 2022 and 2023

Treatments		N (%)		P (%)		K (%)		Ca (%)		Mg (%)	
		2022	2023	2022	2023	2022	2023	2022	2023	2022	2023
T_1	Corrective pruning	0.63	0.62	0.044	0.045	0.74	0.72	0.071	0.073	0.034	0.035
T_2	T_1+ 1/3rd Heading Back	0.70	0.71	0.048	0.050	0.83	0.84	0.064	0.065	0.023	0.022
T_3	T_1+ 2/3rd Heading Back	0.67	0.66	0.052	0.053	0.79	0.81	0.052	0.051	0.028	0.029
T_4	T_1+ 10 % Thinnning out	0.63	0.64	0.046	0.047	0.76	0.75	0.070	0.072	0.033	0.033
T_5	T_1+ 20 % Thinnning Out	0.64	0.65	0.047	0.048	0.77	0.76	0.069	0.068	0.032	0.032
T_6	T_1 + 1/3rd Heading Back + 10 % Thinnning Out	0.72	0.73	0.053	0.056	0.84	0.85	0.066	0.067	0.026	0.026
T_7	T_1 + 1/3rd Heading Back + 20 % Thinnning Out	0.75	0.76	0.054	0.057	0.85	0.86	0.067	0.068	0.025	0.025
T_8	T_1 + 2/3rd Heading Back +10% Thinnning Out	0.68	0.69	0.049	0.051	0.80	0.81	0.054	0.053	0.022	0.021
T_9	T_1+ 2/3rd Heading Back + 20% Thinnning Out	0.69	0.70	0.050	0.052	0.81	0.82	0.053	0.052	0.021	0.020
$CD_{(p\leq0.05)}$		**0.016**	**0.013**	**0.004**	**0.005**	**0.032**	**0.026**	**0.005**	**0.007**	**0.004**	**0.003**

HB = Heading Back, TO = Thinning Out

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