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Effects of Chemical Thinning Agents on the Growth, Fruit Set, Yield and Quality of the Nectarine Cultivar 'Silver King'

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The investigation was conducted at the Research Farm of the Division of Fruit Science, SKUAST-Kashmir, Shalimar campus, during 2016 and 2017 to evaluate the effects of chemical thinning agents on vegetative growth, fruit set, yield, and fruit quality of the nectarine cultivar 'Silver King.' The chemicals tested, were Naphthalene Acetic Acid (NAA), Urea, and Ethephon and were applied

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after petal fall. The findings revealed that NAA (30 ppm) significantly enhanced vegetative parameters such as plant height, shoot elongation, and leaf area. Both NAA and ethephon effectively reduced fruit set and overall yield while improving fruit quality traits, including fruit size, weight, and coloration. Additionally, ethephon (150 ppm) accelerated fruit maturation by 7–8 days. These results indicate that chemical thinning, particularly with NAA and ethephon, holds potential for optimizing fruit quality and marketability in the 'Silver King' nectarine cultivar.

Keywords: Nectarine 'Silver King'; Thinning agents; Chemical thinning; Naphthalene Acetic Acid (NAA); Urea; Ethephon.

1. INTRODUCTION

Nectarines (*Prunus persica* L. Batsch var. *nucipersica*), a relatively recent introduction to the Kashmir Valley, have gained substantial popularity due to their attractive appearance, smooth epidermis, and high market value. However, similar to peach trees, nectarine trees tend to produce an excessive number of flowers, which can lead to overcrowded branches and reduced fruit size if not properly regulated. Traditionally, thinning has been carried out manually by removing surplus blossoms or fruitlets by hand. Although effective, manual thinning is highly labor-intensive, time-consuming, and economically impractical on a commercial scale (Jackson & Looney, 1999). As a result, there has been a transition toward chemical thinning as a more efficient and cost-effective alternative. Chemical thinning agents, including plant growth regulators such as naphthalene acetic acid (NAA) and ethephon, along with other chemicals like urea, thiourea, and ammonium thiosulfate, have become indispensable in contemporary horticultural practices. These agents effectively manage fruit load while significantly reducing labor requirements and operational costs. These chemical agents are applied at specific stages of fruit development to regulate fruit load and optimize key quality attributes such as size, color, and sugar content. Research has shown that the application of chemical thinners during critical developmental stages, including the closed pink stage, full bloom, and early fruitlet stages, can effectively reduce fruit set, leading to increased individual fruit weight and overall fruit quality (Zilkha et al*.,* 1988; Meitei et al*.,* 2013). For example, urea applied at these stages helps to mitigate excessive fruit production and promotes the development of larger, higher-quality fruits.

Plant growth regulators such as NAA and ethephon, in particular, have demonstrated significant benefits in nectarine production. When applied post-bloom, these agents not only reduce fruit set but also enhance important attributes such as fruit size, coloration, and sugar concentration. Ethephon, for instance, can accelerate fruit maturation, allowing growers to harvest and market their produce earlier, thereby gaining a competitive edge (Rajiv et al., 2017; Rimpika et al., 2017). NAA, specifically, has been shown to stimulate vegetative growth, which in turn supports more efficient fruit development by ensuring a more balanced nutrient distribution to the developing fruits. The use of chemical thinning agents also offers the advantage of reducing physiological stress on the trees, mitigating risks such as limb breakage from excessive fruit load. By controlling fruit numbers early in the development process, trees can allocate more resources to fewer fruits, resulting in higher-quality harvests. This practice not only improves the marketability of the produce by enhancing fruit size and visual appeal but also contributes to the long-term health and productivity of the trees.

2. MATERIAL AND METHODS

The study was carried out in the Research Farm of the Division of Fruit Science at SKUAST-Kashmir, Shalimar campus during the year 2016 and 2017. The experimental orchard is situated at an elevation of 1611 m above mean sea level and lies at 34º 09’ N latitude and 74º 52’ E longitude. Kashmir has a temperate climate with severe winters from December to March, often dropping below freezing and covered in snow. The valley's altitude ranges from 1500 to 2500 meters above sea level. It experiences a mean maximum temperature of 24.5°C and a minimum of 1.2°C, with a relative humidity of 43.9 per cent. Precipitation averages 650 mm, primarily falling between March and May. The study used four-year-old Nectarine plants of the cultivars Snow Queen, Silver King, and Red Gold, grafted onto peach seedling rootstocks. Planted at a distance of 3 x 3 meter and trained in an open centre system. The plants were chosen for their uniform vigour and maintained under consistent cultural practices throughout the research.

Table 1. Treatment details

S.No.	Treatment	Concentration	Time of application
T_1	Control	No thinning	The sprays were performed one week after petal fall
T_2	Naphthalene acetic acid	10 ppm	
T_3	Naphthalene acetic acid	20 ppm	
T_4	Naphthalene acetic acid	30 ppm	
T_5	Ethephon	50 ppm	
T_6	Ethephon	100 ppm	
T_7	Ethephon	150 ppm	
T_8	Urea	0.2%	
T_9	Urea	0.4%	
T_{10}	Urea	0.6%	

Experimental plants were pruned each year during December by thinning out all the weak, thin, very vigorous and diseased shoots. Among the remaining healthy shoots, only one year old shoots, well distributed throughout the tree canopy, was retained and headed back to 10-12 nodes. These plants were subjected to growth regulators/chemical treatments and hand thinning as per details given in Table 1.

To evaluate the effects of chemical thinning on *Silver King* nectarines, solutions of Naphthalene Acetic Acid (NAA), urea, and ethephon were prepared by dissolving the specified quantities of each chemical in 100 mL of water, with a few drops of Teepol added to reduce surface tension. Each solution was prepared in 5-liter volumes and applied using a knapsack sprayer to achieve uniform coverage of the developing fruits, ensuring no runoff. Spraying commenced with lower concentrations to prevent excessive dilution, and the sprayer was thoroughly rinsed before applying higher concentrations. The treatments were conducted on clear, calm mornings to minimize environmental variability. Upon fruit maturity, two kilograms were randomly harvested from different sections of the tree for physico-chemical analysis. Any malformed or damaged fruits were excluded from the samples to maintain consistency and accuracy in the assessment.

Observations recorded during the study was Plant Girth (cm), Trunk Cross Section Area (cm^2), Plant Height (cm), Leaf Area (cm^2), Annual Shoot Extension Growth (cm), Date of Initial Bloom (about 10% flowering), Date of Full Bloom (above 80% flowering), Percent Fruit Set (%), Date of Fruit Maturity, Fruit Length (cm), Fruit Breadth (cm), Fruit Weight (g), Fruit Firmness (kg/cm2), Fruit Colour (hunter colour lab), Soluble Solids Concentration, SSC (%), Titratable Acidity (%), SSC/Acidity Ratio, Total Sugars (%), Yield (kg/tree), Yield Efficiency (kg/TCSA) Fruit Nutrient Status and Statistical Analysis.

3. RESULTS AND DISCUSSION

The present study investigated the effects of chemical treatments on vegetative growth, fruit set, yield, and fruit quality of nectarine. The application of naphthalene acetic acid (NAA) at 30 ppm significantly enhanced vegetative growth parameters, including annual shoot elongation (52.21 and 52.72 cm), plant height (273.78 and 283.61 cm), trunk girth (23.76 and 26.51 cm), trunk cross-sectional area (44.95 and 55.97 cm^2), and leaf area (36.54 and 37.36 cm^2), compared to other treatments during the years 2016 and 2017. Urea, applied at various concentrations, also improved annual shoot elongation (50.67 and 50.82 cm) and leaf area (35.76 and 35.62 cm^2).The enhanced vegetative growth observed with NAA treatments may be attributed to improved allocation of photosynthates and nutrients, which facilitated cellular division and increased cell wall elasticity. Moreover, fruit thinning resulted in a reduced crop load, allowing for more vigorous shoot development. These findings align with the results of previous studies by Zilkha et al. (1989), Devnath and Kundu (2001), Taghipour et al. (2012), and Rimpika et al.(2017), which also reported augmented vegetative growth in nectarine following NAA and urea applications.

In contrast, ethephon exhibited a suppressive effect on vegetative growth, as evidenced by its inhibitory influence on leaf expansion and cell enlargement. Similar results were documented by Hamad and Mohammad (1990), who reported that ethrel application reduced vegetative growth in apple trees. The study also found that different chemical thinners (ethephon, NAA, and urea), when applied one week after petal fall, significantly impacted fruit set. Ethephon at 150 ppm and NAA at 30 ppm resulted in a lower fruit set (53.38, 52.43%, and 54.21, 53.15%) compared to the control (75.54, 72.42%). This may be due to NAA's stimulation of ethylene production, leading to the abscission of young fruits. Ethephon's fruit thinning effect is attributed to the activation of specific genes that stimulate cell wall-degrading enzymes like EG (endo-β-1,4-glucanase) in the separation zone. Urea also exhibited thinning effects, resulting in a lower fruit set compared to the control, corroborating the findings of Zilkha et al. (1988). These outcomes are consistent with prior studies by Basak (2006), Taghipour et al. (2012), and Meitei et al. (2013), which reported that the application of NAA, ethephon, and urea effectively reduced fruit set in peaches and nectarines.

The study revealed that the application of various thinning treatments significantly reduced the average fruit yield per plant, with values of 12.43 kg and 12.12 kg in 2016 and 2017, respectively, compared to the control, which produced 18.14 kg and 19.16 kg per plant. Among the treatments, the highest yield efficiency (0.72 and 0.55 kg cm^{-2}) was recorded in the control (T1), followed by T8 (urea at 2%). Conversely, the lowest yield efficiency (0.29 and 0.22 kg cm^{-2}) was observed in T4 (NAA at 30 ppm) during both years of the study. The reduction in overall yield observed with thinning treatments is consistent with the findings of Sharma et al. (2003), Rimpika et al. (2017), and Rajput et al. (2017), who reported that fruit thinning with ethephon and NAA resulted in decreased yield but contributed to the production of superior-quality fruits. This reduction in crop load allows for improved resource allocation to the remaining fruits, thereby enhancing their size, weight, and other quality attributes. The study demonstrated that thinning treatments significantly influenced fruit size, weight, and firmness. Applications of ethephon at 150 ppm and NAA at 30 ppm notably enhanced fruit length, diameter, and weight. This improvement can be attributed to an increased source-to-sink ratio, greater leaf area, and expanded canopy surface area, facilitating more efficient nutrient partitioning toward the remaining fruits after thinning. These findings are in agreement with earlier studies by Vego et al. (2010), Taheri et al. (2012), and Rimpika et al. (2015), which reported that the application of NAA and ethephon improved fruit size and weight in peaches and nectarines. However, fruit firmness was reduced in plants treated with ethephon, likely due to ethylene-induced activation of cell wall-degrading enzymes, such as pectinases and cellulases, leading to a decline in fruit firmness. These observations are consistent with the results of Sharma et al. (2003) and Devlal et al. (2017), who also reported reduced fruit firmness following ethephon application in stone fruit crops. Additionally, the study revealed that thinning treatments improved the skin color of the fruits. Ethephon-treated fruits showed better color development, measured by a lower hue angle, possibly due to enhanced ripening and ethylene-induced anthocyanin pigmentation. These results align with the observations of Whale et al. (2012) and Chandel and Singh (2015), who reported improved fruit color in nectarine and peach.

The chemical thinning treatments also reduced the time from fruit set to maturity, with ethephon (100 ppm and 150 ppm) advancing fruit maturity by 7 to 8 days compared to the control. This earlier maturity could be due to increased ethylene production during the final growth phase. These results are in line with those of Sandhu and Singh (2001), who found that ethephon application advanced peach fruit maturity. Soluble solid concentration, titratable acidity, and sugar content were influenced by the chemical thinning treatments. Ethephon and NAA significantly increased the soluble solids and sugar content while reducing acidity. This may be due to the enhanced translocation of organic metabolites from leaves to fruits, promoting ripening and sugar accumulation. These findings are consistent with previous research by Sharma et al. (2001), Taheri et al. (2012), and Chandel and Singh (2015). The increase in soluble solids and sugar content can also be attributed to a reduced fruit load, resulting in more carbohydrates being available for the remaining fruits.

The study demonstrated that the application of different chemical treatments had distinct effects on the macronutrient composition of nectarine fruits over the two-year period. The highest nitrogen content (0.70% and 0.72%) was observed in fruits from trees treated with NAA at 30 ppm, followed closely by urea at 0.6 per cent, whereas the lowest nitrogen content (0.61% and 0.60%) was recorded in the untreated control.

Table 2. Effect of chemical thinning on growth characteristics of nectarine cv. Silver King during 2016 and 2017

Treatments		Annual shoot extension growth (cm)		Plant height (cm)		Plant girth (cm)		Trunk Cross sectional area (cm^2)		Leaf area (cm^2)	
		2016	**2017**	**2016**	**2017**	**2016**	**2017**	**2016**	**2017**	**2016**	**2017**
T_1	Control	44.21	43.74	260.26	268.12	18.36	20.41	26.84	33.16	32.12	31.68
T_2	Naphthalene acetic acid @ 10 ppm	45.44	44.62	262.72	270.79	19.15	21.38	29.20	36.41	32.76	32.24
T_3	Naphthalene acetic acid @ 20 ppm	50.14	50.27	271.87	281.68	21.81	24.05	37.87	46.05	35.15	34.51
T_4	Naphthalene acetic acid @ 30 ppm	52.21	52.72	273.78	283.61	23.76	26.51	44.95	55.97	36.54	37.36
T_5	Ethephon @ 50 ppm	46.79	45.81	265.24	272.60	19.77	21.82	31.11	37.91	33.54	33.34
T_6	Ethephon @ 100 ppm	47.61	46.33	266.64	274.45	20.12	22.46	32.23	40.20	33.71	33.66
T_7	Ethephon @ 150 ppm	48.17	47.05	267.21	276.67	20.44	22.83	33.30	41.53	33.83	33.78
T_8	Urea @ 0.2%	45.27	44.23	262.37	270.42	18.81	20.84	28.18	34.58	32.44	32.14
T_9	Urea @ 0.4%	49.15	49.26	268.15	278.13	20.77	23.18	34.37	42.78	34.39	34.28
T_{10}	Urea @ 0.6%	50.67	50.82	270.84	280.63	21.46	24.32	36.67	47.09	35.76	35.62
$CD_{(p \le 0.05)}$		**1.29**	**1.15**	**1.72**	**1.61**	**0.54**	**0.61**	**1.76**	**2.18**	**0.66**	**0.61**

Table 3. Effect of chemical thinning on days to flowering characteristics of nectarine cv. Silver King during 2016 and 2017

Treatments		*Date of initial bloom (About 10%)		*Date of full bloom (Above 80%)	
		2016	**2017**	**2016**	**2017**
T_1	Control	17.00	24.33	23.33	33.00
T_2	Naphthalene acetic acid @ 10 ppm	16.00	23.33	22.00	33.33
T_3	Naphthalene acetic acid @ 20 ppm	16.67	23.67	22.67	33.33
T_4	Naphthalene acetic acid @ 30 ppm	16.00	24.67	24.00	34.00
T_5	Ethephon @ 50 ppm	15.00	24.00	21.67	33.33
T_6	Ethephon @ 100 ppm	15.33	22.67	22.67	33.67
T_7	Ethephon @ 150 ppm	15.33	23.67	23.00	33.33
T_8	Urea @ 0.2%	15.67	23.67	22.33	34.00
T_9	Urea @ 0.4%	15.00	23.00	23.33	33.67
T_{10}	Urea @ 0.6%	15.33	23.67	22.33	33.33
$CD_{(p \le 0.05)}$		**NS**	**NS**	**NS**	**NS**

**Reference Date: 1st Week of March*

Table 4. Effect of chemical thinning on fruit set (%), fruit maturity and yield characteristics of nectarine cv. Silver King during 2016 and 2017

Treatments		Initial fruit set (%)		Fruit maturity (DAFB to Harvesting)		Fruit yield (kg tree^{-1})		Yield efficiency (Kg cm^{-2})	
		2016	2017	2016	2017	2016	2017	2016	2017
T_1	Control	75.54	72.42	85.33	87.33	19.16	18.14	0.72	0.55
T_2	Naphthalene acetic acid @ 10 ppm	72.23	69.37	84.00	86.33	17.48	16.72	0.60	0.46
T_3	Naphthalene acetic acid @ 20 ppm	62.75	60.06	82.00	83.67	15.03	14.25	0.40	0.31
T_4	Naphthalene acetic acid @ 30 ppm	54.21	53.15	79.33	81.00	13.02	12.34	0.29	0.22
T_5	Ethephon @ 50 ppm	63.06	60.67	80.33	82.67	14.76	14.36	0.46	0.36
T_6	Ethephon @ 100 ppm	58.26	56.44	78.33	79.67	13.24	13.04	0.40	0.31
T_7	Ethephon @ 150 ppm	53.38	52.43	77.33	78.33	12.43	12.12	0.36	0.28
T_8	Urea @ 0.2%	73.12	70.61	84.33	86.67	18.76	17.04	0.67	0.49
T_9	Urea @ 0.4%	69.41	66.29	83.00	85.00	17.17	16.55	0.55	0.44
T_{10}	Urea @ 0.6%	66.73	63.21	82.33	84.33	16.28	15.58	0.45	0.33
$CD_{(p\leq0.05)}$		**1.79**	**1.71**	**1.14**	**1.01**	**1.52**	**1.60**	**0.05**	**0.03**

Table 5. Effect of chemical thinning on physical fruit characteristics of nectarine cv. Silver King during 2016 and 2017

Treatments		Fruit length (cm)		Fruit diameter (cm)		Fruit weight (g)		Fruit firmness (kg cm^{-2})	
		2016	2017	2016	2017	2016	2017	2016	2017
T_1	Control	4.12	4.07	3.91	3.83	44.59	45.01	9.17	9.06
T_2	Naphthalene acetic acid @ 10 ppm	4.31	4.26	4.12	4.03	49.63	50.04	9.02	8.91
T_3	Naphthalene acetic acid @ 20 ppm	4.92	5.01	4.74	4.78	61.15	62.12	8.63	8.55
T_4	Naphthalene acetic acid @ 30 ppm	5.23	5.22	5.00	5.01	72.62	71.45	8.22	8.12
T_5	Ethephon @ 50 ppm	4.94	4.82	4.68	4.59	62.65	63.26	8.53	8.42
T_6	Ethephon @ 100 ppm	5.06	5.01	4.90	4.83	67.44	68.37	8.41	8.33
T_7	Ethephon @ 150 ppm	5.25	5.24	5.05	5.03	73.62	72.61	8.16	8.04
T_8	Urea @ 0.2%	4.27	4.23	4.08	4.01	48.24	47.63	9.08	8.96
T_9	Urea @ 0.4%	4.48	4.45	4.25	4.24	51.02	50.42	8.91	8.84
T_{10}	Urea @ 0.6%	4.68	4.66	4.44	4.38	53.40	52.56	8.77	8.66
$CD_{(p\leq0.05)}$		**0.21**	**0.24**	**0.15**	**0.16**	**4.94**	**5.31**	**0.17**	**0.15**

Table 6. Effect of chemical thinning on fruit colour of nectarine cv. Silver King during 2016 and 2017

Treatments		Fruit colour (L*a H)					
		2016			2017		
		L*	A	ºH	L*	A	ºH
T_1	Control	34.25	23.72	32.06	33.54	23.68	32.19
T_2	Naphthalene acetic acid @ 10ppm	32.27	25.07	30.06	31.36	24.65	30.51
T_3	Naphthalene acetic acid @ 20ppm	28.27	29.58	24.82	27.38	29.43	25.17
T_4	Naphthalene acetic acid @ 30ppm	25.66	32.12	22.52	24.58	31.39	23.51
T_5	Ethephon @ 50ppm	27.34	30.53	24.27	25.29	30.33	24.56
T_6	Ethephon @ 100ppm	26.65	31.64	23.30	25.67	32.33	23.07
T_7	Ethephon @ 150ppm	24.35	32.50	22.01	23.37	33.16	22.14
T_8	Urea @ 0.2%	33.35	24.44	30.77	32.42	24.23	31.21
T_9	Urea @ 0.4%	31.26	26.35	28.15	30.29	25.29	29.35
T_{10}	Urea @ 0.6%	30.21	27.58	26.54	29.34	27.33	27.25
$CD_{(p \leq 0.05)}$		**1.15**	**2.15**	**2.16**	**2.32**	**1.86**	**1.79**

Table 7. Effect of chemical thinning on fruit chemical characteristics of nectarine cv. Silver King during 2016 and 2017

Treatments		SSC (%)		Titratable acidity (%)		SSC/Acidity ratio		Total sugars (%)	
		2016	2017	2016	2017	2016	2017	2016	2017
T_1	Control	11.15	11.07	0.60	0.61	18.48	18.25	8.33	8.30
T_2	Naphthalene acetic acid @ 10 ppm	11.32	11.23	0.58	0.59	19.41	19.14	8.48	8.42
T_3	Naphthalene acetic acid @ 20 ppm	11.88	11.83	0.53	0.53	22.46	22.47	9.03	9.05
T_4	Naphthalene acetic acid @ 30 ppm	12.71	12.81	0.50	0.50	25.76	25.80	9.37	9.49
T_5	Ethephon @ 50 ppm	12.06	12.03	0.54	0.54	22.51	22.42	9.08	9.12
T_6	Ethephon @ 100 ppm	12.27	12.26	0.51	0.52	24.07	23.73	9.17	9.21
T_7	Ethephon @ 150 ppm	12.77	13.11	0.50	0.49	26.04	25.72	9.45	9.53
T_8	Urea @ 0.2%	11.26	11.17	0.59	0.60	19.21	18.63	8.42	8.38
T_9	Urea @ 0.4%	11.47	11.38	0.57	0.58	20.02	19.74	8.62	8.56
T_{10}	Urea @ 0.6%	11.76	11.69	0.55	0.54	21.28	21.70	8.77	8.68
$CD_{(p \leq 0.05)}$		**0.40**	**0.41**	**0.021**	**0.022**	**1.11**	**1.09**	**0.19**	**0.24**

Table 8. Effect of chemical thinning on fruit nutrient status of nectarine cv. Silver King during 2016 and 2017

Treatments		N (%)		P (%)		K (%)		Ca (%)		Mg (%)	
		2016	**2017**	**2016**	**2017**	**2016**	**2017**	**2016**	**2017**	**2016**	**2017**
T_1	Control	0.61	0.60	0.042	0.041	0.71	0.70	0.068	0.069	0.022	0.021
T_2	Naphthalene acetic acid @ 10 ppm	0.62	0.61	0.043	0.042	0.73	0.72	0.067	0.066	0.022	0.022
T_3	Naphthalene acetic acid @ 20 ppm	0.66	0.67	0.047	0.049	0.78	0.79	0.063	0.064	0.027	0.028
T_4	Naphthalene acetic acid @ 30 ppm	0.70	0.72	0.051	0.054	0.83	0.85	0.061	0.060	0.029	0.030
T_5	Ethephon @ 50 ppm	0.63	0.64	0.046	0.047	0.76	0.77	0.063	0.062	0.026	0.025
T_6	Ethephon @ 100 ppm	0.66	0.67	0.048	0.049	0.77	0.78	0.062	0.061	0.027	0.028
T_7	Ethephon @ 150 ppm	0.68	0.69	0.049	0.051	0.82	0.84	0.060	0.059	0.028	0.029
T_8	Urea @ 0.2%	0.62	0.62	0.042	0.042	0.72	0.71	0.067	0.068	0.023	0.023
T_9	Urea @ 0.4%	0.65	0.64	0.044	0.045	0.74	0.73	0.066	0.067	0.024	0.025
T_{10}	Urea @ 0.6%	0.69	0.71	0.050	0.053	0.79	0.80	0.065	0.064	0.025	0.026
$CD_{(p \leq 0.05)}$		**0.017**	**0.013**	**NS**	**NS**	**0.027**	**0.034**	**NS**	**NS**	**NS**	**NS**

Phosphorus content exhibited no statistically significant variation among treatments; however, fruits from trees treated with NAA at 30 ppm recorded the highest phosphorus levels (0.051% and 0.054%). Potassium content was significantly influenced by the treatments, with the highest levels (0.83% and 0.85%) detected in fruits from trees treated with NAA at 30 ppm, while the control group exhibited the lowest potassium levels. Calcium content remained unaffected by the treatments, with control plants showing the highest calcium concentrations (0.068% and 0.069%). Similarly, magnesium content was not significantly impacted by the treatments, although the highest magnesium levels (0.029% and 0.030%) were observed in fruits from NAA-treated trees, and the lowest (0.022% and 0.021%) were found in the control group.

4. CONCLUSION

The results indicate that chemical thinning, particularly with NAA and ethephon, holds potential for optimizing fruit quality and marketability in the 'Silver King' nectarine cultivar.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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