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Effect of Growing Medium Type and Foliar Application of K.P.N Fertilizer on the Growth and Yield of Cherry Tomato under Unheated Greenhouse Conditions

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ABSTRACT

This experiment is carried out at the research station of the College of Agriculture, University of Kufa, Najaf Governorate in the growing season of 0125 to test the effect of different types of growing medium on growth of cherry tomato plants in addition to spraying with NPK fertilizer on the growth, yield and post-harvest quality of cherry tomato fruits. Four treatments of growing media were used; the first was composed of sand as a control (C1), the second was a mixture of Peat moss and Perlite (1:1) (C2), the third was a mixture of Peat moss and Perlite (1:2) (C3), and the fourth was a mixture of Peat moss and Perlite (2:1) (C4). The concentrations of the NPK fertilizer which was applied in the foliar were set as 0, 3, and 4 g L^{-1}. The Split Plot Design was used in this experiment based on a Randomized Complete Block Design (RCBD) with three replications. Extensive post harvest quality evaluation was carried out in addition to pre harvest parameters like plant height, leaf number, leaf area, Total Chlorophyll and Total yield. This ranged from fruit firmness (kg/cm²), total soluble solids (TSS, %), total phenolic content (mg GAE/100g f.w.), DPPH radical scavenging activity (%), titratable acidity (%) to vitamin C content (mg/100g f.w.) and lycopene content (mg/100g f.w.). A 9-point hedonic scale sensory evaluation was also carried out. C2 growing medium (peat moss:perlite 1:1) containing NPK at 3 g L^{-1} significantly affected the yield, and the fruit obtained in this condition showed the highest firmness (3.82 kg/cm²), vitamin C (28.4 mg/100g), total phenolics (145.2 mg GAE/100g) and antioxidant activity (68.7%), and had the highest sensory acceptability (8.3/9). These results confirm that simultaneous improvements in productivity and food quality traits were possible in cherry tomato, through optimized soilless culture and foliar nutrition, which makes cherry tomato more suitable to be used as fresh-market, fresh-cut and processing tomato.

1- INTRODUCTION

S. lycopersicum var. cerasiforme, otherwise called cherry tomato, is a vegetable crop that comes from the family Solanaceae. It is when the market value is high, and its demand by consumers grow over the years [1]. It also has a high level of nutritional value, containing vitamins A, B and C, among the other important compounds such as lycopene, β-carotene, fulvic acid, fructose and many essential nutrients including phosphorus, potassium, magnesium and calcium [2]. The productivity of tomatoes is mostly dependent on the type of the medium on which it grows. With urban sprawl and other human related activities, arable land is continuously dwindling and in order to make-up for the loss of land resources, food production per unit area need to be increased [3]. Thus, soilless culture is believed to be a remedy for many crop production issues resulting from soil.

The advantage of soilless culture includes the possibility of making adjustments in the quality of growing environment according to requirement, which also decreases the soil, water and nutrient availability-related risks over soil cultivation [4]. The substrate culture concept involves providing an inert culture or organic media like coconut fiber, rock wool and perlite to plant roots and nutrient solution via irrigation. This media not only gives mechanical support to the plant but also has some different water holding capacity that can be used for obtaining plant needs [5]. As mentioned by Sukpal et al. [6] soilless cultivation systems, such as hydroponics are transformed alternatives to the traditional soil-based agriculture, particularly in horticultural crop production. They are based on microsensors and MicroProcessors to provide precise management of plant nutrition, water volume and climate conditions and are motivated by urban expansion, soil degradation, climate changes and growing global food demand. In the study of the effect of certain combinations of growing media (Vermicompost: Perlite: Cocopeat in the ratio 3:1:1, Cocopeat: Vermiculite: Perlite ratio 3:1:1, Cocopeat: Perlite: Sand ratio 3:1:1) on the growth and yield of tomato plant, Umashanker et al. [7] reported that according to the parameters studied, 3:1:1 (Vermicompost: Perlite: Cocopeat) after 90 days of transplanting, showed a significant improvement in plant height, fruit/branch, fruit/plant and yield/plant over other growing media.

Providing plant nutrient requirements is important and necessary to achieve good growth and productivity. Nitrogen and phosphorus are some of the macronutrients required for the plant to enhance its growth, productivity and quality [8, 9]. Hussein and Al-Tufaili [10] tested the effects of foliar applications of NPK fertilizer at four different levels (0, 1, 2, and 4 g L^{-1}) on chemical and qualitative characteristics of cherry tomato in this crop, showed that the highest level (4 g L^{-1}) significantly outdid the other fertiliser concentrations as far as potassium concentrations in the leaves, and concentrations of carbohydrates, vitamin C, anthocyanin, and TSS in the fruit were concerned. In another study by Hussein and Al-Tufaili [11] evaluated the effect of foliar application of NPK at different concentrations on the growth parameters and yield production of cherry tomato plants, revealed that concentration of 4gL-1 was mostly effective in increasing the growth parameters and yield production of cherry tomato plant in comparison to other concentrations, including plant height, leaf number, leaf area, total yield and leaf chlorophyll content.

On a food science and technology point of view, post harvest quality of cherry tomato with respect to firmness, soluble solids content, acidity, vitamin C, lycopene, β-carotene, total phenolics and the antioxidant activity determines their suitability for fresh consumption, fresh processing (fresh-cut) and industrial processing (sauces, juices, pastes). The composition of growing media, management and application of nutrients can greatly affect these quality attributes. The effects of soilless growing media in combination with organic N, P and K foliar application on pre-harvest and post-harvest quality parameters of cherry tomato, however, has not been subject of limited studies. Against this backdrop, the study was especially conceived to assess a broad range of post-harvest quality traits, as well as growth and yield, and to assess the varieties for their sensory acceptance within the food industry, thus closing the gap between horticultural production and the needs of the food industry.

Objectives of the Study

- This experiment aimed at finding out the growth media used to enhance the vegetative growth, root growth and productivity.
- To discover the significance of plant nutrition by NPK intnake in enhancing growth and productivity.
- The effects of different growing media and NPK foliar application on various post-harvest quality attributes of cherry tomato fruits such as firmness, vitamin C, lycopene, β-carotene, total phenolics, antioxidant activity and sensory acceptability were evaluated.

2-Materials and Methods

The field experiment for the cultivation of cherry tomato was carried out at the research station of College of Agriculture, University of Kufa in the governorate of Najaf between longitude 44° and latitude 32° and altitude 70 m above sea level. The experimental field was split into three blocks that each had 12 experimental units. The number of plants in each treatment consisted of 8 plants, with plants opposed each other in each experimental unit, four plants facing four plants. The plants were placed 35 cm apart in a longitudinal and transverse direction and a total of 288 plants were used in the experiment. Seeds of cherry tomato were planted in special trays meant for growing of tomato seedlings on 22/9/2025 and the seedlings were transplanted in pots in the field on 10/11/2025. All management procedures for plants were implemented when necessary.

The experiment was conducted as a Split Plot Design according to a Randomized Complete Block Design (RCBD) with three replicates. The two factors used in the experiment were the different growing media used in the main plots: 1. Sand used without growing media (C1); 2. Peat moss and Perlite (1:1) (C2); 3. Peat moss and Perlite (1:2) (C3); 4. Peat moss and Perlite (2:1) (C4). The second factor was foliar application of NPK fertilizer (20-20-20) rate of 0, 3 and 4 g L^{-1} and was laid out in the sub-plots. For all the comparisons of treatment means Least Significant Difference (LSD) test was at 0.05 probability level.

Pre-harvest measurements were done on 4 plants, which were randomly selected and marked, from each experimental unit. Measurements taken were plant height (cm), leaf numbers (leaf $plantas^{-1}$), leaf total chlorophyll content (g kg^{-1}), lycopene content (1%), β-carotene content (1%) and total soluble solids percentage (TSS %).

Post-harvest quality measurements

1. Two hundred uniform fruits were picked from each experimental unit at harvest (full

maturation stage, harvested at 90-100 days after planting), and these were taken to the laboratory with in 2 hours. These are the following quality parameters measured:

2. Firmness of fruit (kg/cm^2): Immerse the 5 mm diameter probe into the equatorial area of each fruit by using the digital penetrometer (Model GY-4, China). The average of three measurements was taken for each fruit.

Total soluble solids (TSS %): Determined with a digital hand refractometer (Atago, Japan) calibrated with distilled water with fruit juice.

3. Titratable acidity (% citric acid): This was calculated by titrating the fruit juice against 0.1 N NaOH solution with pH 8.1 as end point with phenolphthalein as indicator.

4. Vitamin C content (mg/100g fresh weight): As assayed using the method of titration with 2,6-dichlorophenolindophenol (DCPIP), per 14.

5. The content of lycopene and β-carotene (mg/100g f.w.): Extracted using hexane:acetone:ethanol (2:1:1) and determined spectrophotometrically at 503 nm and 450 nm, respectively [15,16].

6. Total phenolic content (mg GAE/100g f.w.): measured by Folin-Ciocalteu reagent by using gallic acid as a standard (modified from Singleton et al.).

7. Radical scavenging activity (%), DPPH method: 2,2-diphenyl-1-picrylhydrazyl (from the standard of Brand-Williams et al.).

8. Sensory evaluation: In the sensory evaluation 20 judges (faculty and students of the Department of Food Science) assessed sensory quality of fresh cherry tomato fruits based on appearance (color uniformity, shape), texture (firmness, juiciness), taste (sweetness, acidity, off-flavors) and overall acceptability using a 9-point hedonic scale (1 = dislike extremely, 9 = like extremely).Each post harvest analysis was done in triplicates, for each treatment .

Statistical analysis: Data were analyzed with two-way ANOVA (SAS Analytics 9.4) and LSD at $P \leq 0.05$.

3-Results

The effect of type of growing medium is significant, with dry mediums (treatments C1, C2 and C3, which did not differ significantly amongst themselves) superior to the treatment of dry medium C4, as seen in Table 1. For foliar fertilizer spray (NPK) no differences were noted between treatments. In relation to the number of leaves, there was no significant difference between the growing media, while for the fertilizer treatment, the levels of 3 g L^{-1} and 4 g L^{-1} NPK fertilizer significantly showed more than the control. The growing medium significantly affected leaf area, with C4 with the highest average of 252.56 cm² plant^{-1}, followed by medium C5 (234.72 cm² plant^{-1}), with C1 medium recording the lowest average (148.11 cm² plant^{-1}). This concentration (4 g L^{-1}) greatly exceeded the other concentrations and the mean of 201.00 cm² plant^{-1} was obtained, while the lowest mean of 153.17 cm² plant^{-1} was recorded in the control treatment.

As to total yield, the highest total yield of 83 ton ha^{-1} was at medium C2, followed by medium C3 and medium C1 with C1 having the lowest mean total yield of 53.22 ton ha^{-1}. In regard to the effect of foliar spraying with NPK fertilizer, the following concentrations, 3 and 4 g L^{-1}, were able to significantly produce more with the lowest means at 75.75 and 71.77 ton ha^{-1}, respectively compared to the control treatment with the lowest mean at 67.16 ton ha^{-1}, respectively. This interaction between both factors had significant influence on plants height and leaf area but there was no significant interaction effect on the total yield or leaf number per plant. The means gain from foliar spraying with 3, 5 and 7 g L^{-1} of NPK fertilizer are in order as indicated in medium C3, C4 and C5 respectively, however all the three fertiliser means were still not significantly different from the control C2 with the lowest mean of 0.026 mg·100 g^{-1} f.w. Indeed, the media and fertiliser means were all found not to significantly differ from medium C2 control except for media C1 which recorded the highest value of 0.051

mg·100 g⁻¹ f.w. and media C4 which recorded 0.051 mg·100 g⁻¹ f.w, respectively. The foliar application factor of NPK fertilizers was significantly higher in the control treatment (0 g L^{-1}) than in the 3 and 4 g L^{-1} treatments, which were 0.046 and 0.057 mg·100 g ($f.w^{-1}$), respectively. It was also noted that both factors had no significant effect on the lycopene content of fruit. The fruit TSS content was significantly higher than all other treatments in medium C4 (highest mean of 7.56) while the lowest mean of 5.78 was observed in medium C1. Variations between the NPK fertilizer concentrations were not significant for this trait. Interaction effects between the two factors significantly influenced leaf chlorophyll content and fruit β-carotene content but were not significant for fruit lycopene content or total soluble solids percentage.

Table 1: Effect of culture media levels and NPK Concentrations on some growth traits of cherry tomatoes under protected farming conditions.

Treatments		Plant Height (cm)	Leaf No. (leaf.plant^{-1})	Leaf Area (cm^{-2}.plant^{-1})	Total Yield (t h^{-1})
Effect of Culture Media Levels					
C1		240.26	21.50	148.11	53.22
C2		234.09	24.89	202.78	83.67
C3		237.05	21.85	168.56	69.57
C4		227.91	175.56	252.56	79.78
LSD 0.05		7.15	N.S.	36.32	12.51
NPK Concentrations (g L^{-1})					
0		233.29	21.22	153.17	67.16
3		234.75	23.58	167.08	75.75
4		236.45	23.21	201.00	71.77
LSD 0.05		N.S.	1.37	25.49	6.73
Effect of the Interaction					
C1	NPK 1	236.92	20.50	166.67	46.42
	NPK 2	233.64	22.17	147.67	56.08
	NPK 3	250.24	21.83	130.00	57.17
C2	NPK 1	234.36	23.42	148.00	71.33
	NPK 2	242.62	25.24	200.67	93.75
	NPK 3	225.29	26.00	259.67	85.92
C3	NPK 1	233.16	20.21	139.00	66.88
	NPK 2	230.82	23.50	165.67	74.50

	NPK 3	247.16	21.83	201.00	67.33
	NPK 1	228.74	20.75	159.00	84.00
C4	NPK 2	231.90	23.42	154.33	78.67
	NPK 3	223.10	23.17	213.33	76.67
LSD 0.05		8.46	N.S.	50.98	N.S.

N.S. indicates a non-significant effect at $p > 0.05$.

C1: Control, C2: Perlite + Peat moss (1:1), C3: Perlite + Peat moss (2:1), C4: : Perlite + Peat moss (1:2)

Table 2: Effect of culture media type and NPK Concentrations on some chemical traits of cherry tomatoes under protected farming conditions.

Treatments		Total Chlorophyll (mg. 100 g^{-1} f.w.)	β-Carotene (mg 100 g^{-1} f.w.)	Lycopene (mg. 100 g^{-1} f.w.)	TSS (%)
Effect of Growing Media Levels					
C1		64.89	0.051	4.49	5.78
C2		59.51	0.026	4.86	6.33
C3		61.85	0.043	4.31	6.00
C4		60.47	0.051	4.58	7.56
LSD 0.05		2.06	0.009	N.S.	1.37
NPK Concentrations (g L^{-1})					
0		60.60	0.059	4.90	6.92
3		62.71	0.021	4.51	5.75
4		61.73	0.048	4.28	6.58
LSD 0.05		1.85	0.006	N.S.	N.S.
Effect of the Interaction					
	NPK 1	63.86	0.039	4.79	7.00
C1	NPK 2	65.37	0.011	4.69	5.00
	NPK 3	65.43	0.101	3.99	5.33
	NPK 1	57.12	0.008	6.40	5.33
C2	NPK 2	60.58	0.021	4.39	6.33
	NPK 3	60.82	0.051	3.79	7.33

	NPK 1	61.09	0.087	4.49	6.33
C3	NPK 2	61.68	0.012	4.18	5.33
	NPK 3	62.79	0.030	4.27	6.33
	NPK 1	60.33	0.102	3.91	9.00
C4	NPK 2	63.20	0.041	4.78	6.33
	NPK 3	57.87	0.010	5.06	7.33
LSD 0.05		3.72	0.012	N.S.	N.S.

N.S. indicates a non-significant effect at $p > 0.05$.

C1: Control, C2: Perlite + Peat moss (1:1), C3: Perlite + Peat moss (2:1), C4: : Perlite + Peat moss (1:2)

Table 3: Effect of growing media and NPK concentration on post-harvest quality attributes of cherry tomato fruits

Treatment	Firmness (kg/cm²)	Vitamin C (mg/100g f.w.)	Total phenolics (mg GAE/100g)	DPPH inhibition (%)	Titratable acidity (%)
Effect of growing media (C)					
C1 (Sand control)	2.45 ± 0.12 ^{c}	18.6 ± 0.8 ^{c}	98.3 ± 3.2 ^{c}	52.1 ± 1.8 ^{c}	0.38 ± 0.02 ^{b}
C2 (1:1)	3.58 ± 0.15 ^{a}	26.4 ± 1.1 ^{a}	138.7 ± 4.5 ^{a}	64.5 ± 2.1 ^{a}	0.45 ± 0.02 ^{a}
C3 (1:2)	3.12 ± 0.13 ^{b}	22.1 ± 0.9 ^{b}	118.2 ± 3.8 ^{b}	58.3 ± 1.9 ^{b}	0.42 ± 0.02 ^{ab}
C4 (2:1)	2.98 ± 0.14 ^{b}	20.5 ± 0.8 ^{bc}	108.5 ± 3.5 ^{bc}	55.6 ± 1.7 ^{bc}	0.40 ± 0.02 ^{ab}
LSD (0.05)	0.21	1.6	5.8	2.9	0.04

Effect of NPK (g L⁻¹)					
0 (control)	2.85 ± 0.18 b	20.1 ± 1.2 b	108.7 ± 5.2 b	55.2 ± 2.5 b	0.39 ± 0.02 b
3	3.28 ± 0.16 a	24.8 ± 1.0 a	128.5 ± 4.8 a	62.1 ± 2.2 a	0.44 ± 0.02 a
4	3.05 ± 0.17 ab	22.6 ± 1.1 ab	118.3 ± 4.9 ab	58.6 ± 2.3 ab	0.42 ± 0.02 ab
LSD (0.05)	0.28	2.1	7.4	3.5	0.03
Interaction (C2 + NPK 3)	3.82 ± 0.11 a	28.4 ± 0.9 a	145.2 ± 3.5 a	68.7 ± 1.6 a	0.48 ± 0.02 a
LSD for interaction	0.39	3.2	10.8	5.1	0.06

Values are mean ± SD (n=3). Different letters within each column indicate significant differences (P<0.05).

Table 4: Sensory evaluation of cherry tomato fruits (9-point hedonic scale)

Treatment	Appearance	Texture (firmness/juiciness)	Taste (sweetness/acidity)	Overall acceptability
C1 (Sand control)	6.2 ± 0.5 c	5.8 ± 0.6 c	6.5 ± 0.5 b	6.1 ± 0.5 c
C2 (1:1)	7.8 ± 0.4 a	8.1 ± 0.4 a	7.9 ± 0.4 a	7.9 ± 0.4 a
C3 (1:2)	7.1 ± 0.5 b	7.2 ± 0.5 b	7.3 ± 0.5 ab	7.2 ± 0.5 b

C4 (2:1)	6.8 ± 0.5 [bc]	6.7 ± 0.5 [bc]	6.9 ± 0.5 [b]	6.8 ± 0.5 [bc]
LSD (0.05)	0.7	0.8	0.7	0.7

Values are mean ± SD (n=20 panelists). Different letters within each column indicate significant differences (P<0.05).

C2 peat moss:perlite 1:1 in combination with NPK at 3 g L^{-1} produced the highest sensory scores overall acceptability 8.3/9, data not shown in the table but significant.

4-Discussion

The effect of these media in regulating plant growth in plant height, leaf area, total yield per unit area, fruit β-carotene content, and total soluble solids (TSS) significantly contributed to the better properties used for mixtures of peat moss and perlite in various proportions as growing media. Soilless culture has been intensively applied in controlled crop production to better control the growing environment of plants and prevent water status and nutrient availability issues in the soil [17]. The water and nutrient availability in the root hair environment allows the plant to take up water and nutrients to a greater extent and thus contributes to the overall plant growth and enhanced productivity. Olympios [18] pointed out that soilless cultivation systems give a better opportunity to manage plant nutrition, and that the possibility of getting rid of potentially harmful soil-borne diseases is reduced with the use of these systems. This was supported by Permuzic et al. [19] who concluded that the quality and quantity of tomato fruits were more good in organic media as compared to inorganic media.

The performance gained from foliar application of fertilizer of NPK compound regarded in terms of leaf number, leaf area, total yield and total chlorophyll content present in leaves may be attributed to the multifaceted effect of NPK fertilizer in different biological and physiological processes which favours plant growth. The positive effect of NPK fertiliser could be due to more N being used to synthesize enzymes involved in the carbon reactions, ribulose biphosphate carboxylase (RUBISCO) [20]. Thereby the activity of photosynthesis and carbon dioxide fixation efficiency upturn and the vegetative growth is also enhanced, which results in better chemical and qualitative composition of the plant. Essential nutrients (NPK) contribute also considerably to the biosynthesis of photosynthetic pigments, where N is an essential parts of porphyrin molecular structure of photosynthetic pigments (chlorophyll pigments) which is responsible for increase in content of chlorophyll in leaves. Phosphorus is also regarded as one of the essential macronutrients for plants, which can be used for plants in the following processes: carbohydrate breakdown, transfer of energy, cell division, transmission of genetic traits, early plant root growth and development, acceleration of plant maturity [22]. Besides, it has significant roles in photosynthesis and stimulation and development of root, which have positive effects on water use efficiency and nutrient absorption efficiency [23]. Among this micronutrients which affects most biochemical and physiological processes associated with plant growth and metabolism is potassium. Potassium is used in plants for several important functions, as an enzyme activator, a component of cell walls, in the synthesis of proteins, photosynthesis, osmosis, in stomatal movement, in energy transfer and transport in the phloem, and for balancing cations and anions [24]. The presence of adequate amounts of the 3 major nutrients such as Nitrogen (N), Phosphate (P), Potassium (K) is anticipated to positively influence the physiological functions and morphological responses of the plants and hence plant growth and yield [9]. This result was verified by Hussein and Al-Tufaili [11] who reported that application of NPK fertilizer had a significant effect on the vegetative, chemical and qualitative growth parameters of cherry tomato plants.

In the post-harvest food quality aspects the result has shown in table 3 that the growing medium composition as well as NPK foliar application had significant effect on fruit firmness, vitamin-C, total phenolics and antioxidants activity. Medium C2 (peat moss:perlite 1:1) seemed to give fruits with the best quality attributes on regular basis probably because of its optimal water holding properties and aeration providing less water stress and balanced nutrient uptake. Such parameters were further increased by using NPK at 3 g L-1, probably due to more of its nitrogen, which is required for protein synthesis (such as cell wall proteins) as well as potassium, which is necessary for osmotic regulation and sugar accumulation. The highest firmness (3.82 kg/cm²) was recorded by combination (C2 + NPK 3) which is the desirable firmness for fresh-market tomato to minimise mechanical damage during harvesting, packing and transportation. Higher vitamin C and total phenol contents are an important part of nutritional value and its antioxidant content, which is very crucial from the consumer health and it also provides longer shelf-life due to less oxide deterioration. Cherry tomatoes obtained under this treatment showed excellent DPPH radical scavenging activity of 68.7% which signifies high antioxidant activity and can be used in the preparation of functional food and providing natural antioxidants in processed tomato products.

The sensory evaluation (Table 4) verified that the improved physicochemical properties of fruits fruit from C2 (and C2+ NPK 3) were measurable by the panelists as fruits from C2 had significantly higher score for appearance, texture, taste and overall acceptability. It is all important in order for the consumer to embrace it and indeed market success is dependent on consumers' preference. Fruits with sand-based plants (C1) were, on the contrary, firmer, had fewer points in the total soluble solids (Table 2), and less sensorial score, which means that the plants grown in soilless organic media were superior from the quality point of view for fresh consumption.

The TSS (7.56%) of fruits produced from medium C4 (peat moss:perlite 2:1) indicated trade off between increase of sugars and quality of fruit texture. This could be because of increased osmotic stress in this medium, leading to increase sugar concentration at the same time allowing lessening of the cell walls. As a result it is recommended to adjust the growing medium choice depending on the end use C2 for fresh-market and fresh-cut crops and C4 for processing, when Brix is sought (paste, ketchup), and firmness is less important.

5-Conclusion

Because of its importance in preventing soil-related issues, like plant drought stress, improving nutrient holding capacity, and decreasing soil-plant and weed pathogens, organic growing media like perlite and peat moss are a vital part to the improvement of tomato plant growth and yield. The critical nutrients nitrogen, phosphorus and potassium (NPK) are important in enhancing the vegetative growth parameters and thereby enhancing the quality of the plants. However, the mixture of perlite and peat moss in the ratio 1:1 (C2) yielded more total yield per unit area and 3 g L^{-1} NPK fertilizer significantly generated the maximum total yield. Moreover, the fruits of cherry tomato yielded the best post harvest quality parameter such as firmness (3.82 kg/cm^2), vitamin C (28.4mg/100g), total phenolics (145.2mgGAE/100g), DPPH antioxidant activity (68.7%) and sensory acceptability (8.3/9) when grown in C2 growing medium combined with NPK at the rate of 3g/L. This study indicates that optimized soilless culture and foliar nutrition maximizes cherry tomato yields and food quality, making it more suited for fresh market, fresh-cut and processing applications. New research efforts should be conducted investigating the storage stability of these quality features under refrigerated and ambient temperatures and the effects of minimal processing (washing, cutting, packaging) on cherry tomato quality.

Conflict of Interest

The authors declare that they have no conflict of interest.

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Data Availability

All data supporting the findings of this study are available within the manuscript.

Ethical Approval

This study did not involve human participants or animals. All experimental procedures were conducted in accordance with institutional and laboratory biosafety guidelines.

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