Journal of Plant Production

Journal homepage & Available online at: www.jpp.journals.ekb.eg

Growth, Yield and Its Component of Coriander (*Coriandrum sativum* L.) in Response to The Addition of Compost, Ascorbic Acid and Salicylic Acid under Aswan Governorate Conditions, Egypt

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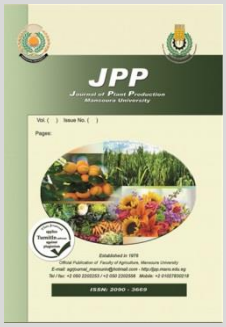

ABSTRACT

The present experiment was carried out at the Experimental Farm, Faculty of Agriculture and Natural Resources, Aswan University, Aswan, Egypt, during the seasons of 2019/2020 and 2020/2021. This study aimed to determine the effect of compost, ascorbic and salicylic acids on the growth and yield and its components of coriander (Coriandrum sativum L.) plants. Compost was applied to the soil before planting at 0, 6 and 12 m3/fed, while ascorbic acid and salicylic acid treatments were added as a foliar spray at 100 or 200 ppm individually or combined. The obtained results proved that utilizing compost increased plant height, number of branches/plant, herb dry weight/plant, number of umbels/plant, the weight of 1000 seeds/plant, fruit yield/plant, fruit yield/plot, fruit yield/fed, volatile oil %, shoots' total phenolics, fruits' total nitrogen and total chlorophyll in leaves. The most increments of these traits were recorded by adding compost at 12 m3/fed. Spraying plants with either ascorbic or salicylic acid individually or together improved the growth, yield, and yield attributes. It can be said that spraying with ascorbic acid at 200 ppm has the advantage of improving growth, yield and its components compared to the other treatments. In addition, the combined treatments resulted in increasing all examined coriander traits. The highest growth and yield parameters were obtained in coriander's plants treated with compost at 12 m3/fed combined with 200 ppm ascorbic acid

Keywords: *Coriandrum sativum*, Coriander, Compost, Ascorbic acid, Salicylic acid.

INTRODUCTION

Coriander (*Coriandrum sativum* L.) is an annual crop belonging to the family Apiaceae. It is a native of the Mediterranean region as one of the most important spices, vegetables, and medicinal plants. Every plant parts as fruit, leaves and roots are used, however the main purpose of the growing is getting fruits, which are used in the production of coriander oil and the food industry (Khromtsev and Vinogradov, 2016; Vinogradov *et al*., 2018). Also, fresh herb is rich in vitamin A, C, and B2 and is very popular for their usefulness in soups, seasoning, salads, and chutney (Lokesh *et al*., 2018).

Antioxidants are naturally found in plants in very low quantities and have a major role in regulating physiological processes such as nutrient uptake, stomata closure, and protein and chlorophyll synthesis (Sarangthem and Singh, 2003; Khandaker *et al.*, 2011). Foliar addition with salicylic acid improved the growth and development and enhanced the plant growth parameters. Antioxidants improve some physiological processes in the plant and inhibit others according to their level, plant species, and development stage. Also, ascorbic acid is an antioxidant as well as an enzyme cofactor, which contribute to many physiological processes in cell wall growth and expansion, photosynthesis, resistance to environmental stresses, and ethylene, anthocyanin, gibberellins and proline synthesis (Saha *et al.*, 2020). From the results of Ali *et al*. (2017), it could be concluded that the addition of compost at 24 m3/fed with ascorbic acid at 100 ppm as a foliar spray to fennel plants resulted better growth and higher fruit yield and volatile oil.

Organic composts contain most of the nutrients in the available forms as nitrates, phosphates, calcium, and potassium (Shirkhodaei *et al*., 2014). Several investigators showed that organic materials improved soil physical and chemical properties that are important for yield and yield attributes of different medicinal and aromatic plants (Khattab and Gomaa, 2004; Ismail, 2008; Shoor *et al*., 2010; Rekaby, 2013; Abdou *et al*., 2014; Abdou *et al*., 2015). There was a positive response of coriander when organic fertilization is added. In this respect, Singh (2012) reported that the application of organic compost (7.5 ton/ha)+ 25% recommended NPK produced the maximum yield and yield components of coriander. Özyazici (2021) studied the effect of organic and inorganic fertilization on coriander and concluded that, although chemical fertilization achieved the greatest results in productivity when considering the soil fertility and environment, organomineral fertilization can be used instead of chemicals one. Also, Machado *et al*. (2022) pointed out that applying ammonium nitrate with organic compost is a strategy to decrease inorganic nitrogen

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DOI: 10.21608/jpp.2022.177560.1192

application. Recently, attention has been turning to reducing chemical fertilizers or dispensing them completely to decrease pollution and preserve the environment, especially in producing medicinal and aromatic plants. Therefore, this investigation was carried out to study the effect of compost, ascorbic acid, and salicylic acid on coriander plants' growth, yield, and components under Upper Egypt conditions.

MATERIALS AND METHODS

The present experiment was conducted during the two seasons of 2019/2020 and 2020/2021 at the Experimental Farm, Faculty of Agriculture and Natural Resources, Aswan University, Aswan, Egypt. The main purpose of this research is to study the effect of organic compost fertilization, ascorbic acid, and salicylic acid on the growth and production of coriander. This experiment was arranged in a completely randomized block in split-plot design with four replications; the main plots were assigned as compost levels, while ascorbic acid, salicylic acid, and their mixture concentrations as sub-plots. Seeds of coriander were obtained from the Medicinal and Aromatic Plants Department, ARC, Egypt. Seeds were sown on the 5th of November for each season in 2.4×1.8 m plot containing 5 rows, 30 cm apart in hills, 60 cm apart on one side; where each plot contained 35 plants. The physical and chemical properties of the soil under study are shown in Table (1), while the chemical analysis of the used organic compost is illustrated in Table (2). Ascorbic acid and salicylic acid were obtained from Al-Gomhoria Company, Assiut, Egypt. Organic compost was added during the preparation soil before sowing seeds in the two seasons at three levels: i.e., control (recommended fertilization), 6 m3/fed and 12 m3/fed.

Table 1. Physical and chemical analysis of the soil under study.

Physical properties	**Soil Texture**		**Sand %**		**Silt %**		**Clay %**		
	Sandy		94.68		2.26		3.06		
Chemical properties	pH	EC, dSm^{-1}	Soluble cations meq/ L				Soluble anions meq/ L		
			Na^{+}	K^{+}	Ca^{++}	Mg^{++}	CO^{-3}	HCO^{-3}	Cl^{-}
	8.20	0.26	17.70	7.50	2.07	0.50	0.00	4.66	2.34

Table 2. The chemical properties of the compost under study.

Character	**Value**
pH	6.95
EC (m.mhos/cm.)	1.90
Organic matter (%)	38.0
Organic carbon (%)	18.9
C: N Ratio	12: 1
Total nitrogen (%)	1.25
Total phosphorus (%)	1.15
Total potassium (%)	1.10
Fe (ppm)	2390
Mn (ppm)	240
Zn (ppm)	45
Cu (ppm)	12

Meanwhile, antioxidants were added as foliar spray; salicylic acid and ascorbic acid, each at concentrations of 100 and 200 ppm, and the mixture at 100 + 100 and 200 + 200 ppm of the two antioxidants as well as the control (water spray). Foliar spraying was carried out three times with two weeks interval, starting in mid-January. The other agricultural practices were carried out as usual. The coriander crop was harvested at physiological maturity on the 5th of May for the two seasons. Five coriander plants were selected randomly from each plot, and observations were recorded on plant height, number of branches, herb dry weight/plant, number of umbels/plant, 1000 seed weight (g), fruit yield/plant (g), fruit yield/plot (kg) and fruit yield (kg/fed). At the Laboratory of Medicinal and Aromatic plants department, Faculty of Agriculture, Beni-Suef University, the essential oil in the fruits of coriander plants was extracted and determined according to Guenther (1961). Also, according to Bouayed *et al. (2011)*, total phenolic compound contents were determined using Folin–Ciocalteau's phenol reagent and reading of the absorbance at 760 nm. Phenolic contents expressed as (GAE/100 g FW) mg of gallic acid equivalents were measured from a freshly prepared calibration curve (GAE, n = 6 concentrations from 0 to 50 mg/L). The total nitrogen content (%) in fruits of coriander was determined according to Page *et al*. (1982). In addition, total chlorophyll content (SPAD unit) was measured in the fresh leaves of plants using SPAD- 502 meter as reported by Markwell *et al*. (1995). The obtained data were tabulated and statistically analyzed according to Little and Hills (1978).

RESULTS AND DISCUSSION

Vegetative growth traits:

The results in Table (3) showed that supplying coriander plants with organic compost at 6 and 12 m3/fed led to significant increases in the plant height, number of branches/plant, and the herb dry weight compared to the control. It is proved that the addition of organic compost at 12 m3/ fed resulted in the highest values of plant height (120.96 cm), the number of branches/plant (9.39), and the herb dry weight/plant (40.11g) in the mean of seasons compared to the other treatments. Regarding the effect of antioxidants, the same table pointed out that spraying coriander plants with ascorbic acid and/ or salicylic acid caused a significant improvement in these traits compared with untreated plants. It is clear that spraying ascorbic acid at 200 ppm showed the maximum values of these traits compared to the other treatments in the mean of both seasons. There were significant effects of interactions of organic compost and antioxidants on the vegetative growth traits of coriander. However, the most effective treatment on the plant height was to supply compost at 12m3/fed combined with salicylic acid and ascorbic acid at 100 + 100 ppm.

Meanwhile, the highest values of the branches/plant and the herb dry weight were recorded with compost at 12m3/fed plus foliar sprays with ascorbic acid at 200 ppm compared to the other combination treatments. The improvement in plant growth is a natural response to

fertilization, especially under limited nutrients in the soil (Angeli *et al.*, 2016). Our results observed that organic compost at 12m3/fed was the most effective way to improve coriander's vegetative growth traits. Numerous studies showed the vital role of organic fertilization in increasing plant growth parameters, as Badran and Safwat (2004); Tanious (2008); Rekaby (2013); Ali *et al.* (2016); Serri *et al.* (2021); Machado *et al.* (2022). Also, the present study showed that the tested antioxidants improved the growth characteristics of coriander, particularly ascorbic acid alone at 200 ppm or with salicylic acid at 100 + 100 ppm as a foliar spray. Different studies noticed the important role of ascorbic acid in improving plant growth parameters, as Ali *et al.* (2003); Badran *et al.* (2013); Eshak (2013); Ali *et al.* (2016).

Table 3. Effect of organic compost, ascorbic and salicylic acids application on the plant height (cm), number of primary branches/ plant, and herb dry weight/ plant (g) of coriander as an average the two seasons of 2019/2020 and 2020/2021.

Antioxidant levels (ppm)		Compost levels (A) Control	6 m^3/ fed	12m^3/ fed	Mean (B)
(B)		Plant height (cm)			
Control		87.30	104.40	114.87	102.19
Salicylic acid	100	107.40	113.37	118.80	113.19
	200	115.03	119.53	121.53	118.70
Ascorbic acid	100	117.27	120.77	122.27	120.10
	200	124.63	122.70	124.03	123.79
Salicylic + Ascorbic acids	100 + 100	120.57	122.93	124.40	122.63
	200 + 200	115.10	117.77	120.83	117.90
Mean (A)		112.47	117.35	120.96	
LSD 5%		A= 1.655	B= 2.244	AB= 3.938	
		Number of branches/ plant			
Control		6.33	7.13	8.30	7.26
Salicylic acid	100	7.23	7.77	8.97	7.99
	200	8.57	9.23	9.50	9.10
Ascorbic acid	100	7.57	9.33	9.53	8.81
	200	8.73	9.67	10.37	9.59
Salicylic + Ascorbic acids	100 + 100	8.70	10.03	9.90	9.54
	200 + 200	8.47	9.37	9.17	9.00
Mean (A)		7.94	8.93	9.39	
LSD 5%		A= 0.325	B= 0.255	AB= 0.516	
		Herb dry weight/ plant (g)			
Control		25.50	31.90	35.33	30.91
Salicylic acid	100	28.50	36.03	37.53	34.02
	200	32.73	38.17	40.43	37.11
Ascorbic acid	100	35.73	40.50	42.00	39.41
	200	37.97	41.77	43.70	41.14
Salicylic + Ascorbic acids	100 + 100	34.77	39.60	42.50	38.96
	200 + 200	33.33	38.03	39.30	36.89
Mean (A)		32.65	38.00	40.11	
LSD 5%		A=1.001	B=0.939	AB=1.792	

Yield and its components:

Data in Table (4) revealed that number of umbels/plant, the weight of 1000-seeds, and the fruit yield/plant of coriander were significantly increased due to the use of organic compost and antioxidant treatments compared to control in the seasons. Moreover, it seems that the highest values of the number of umbels/plant (41.22), the weight of 1000-seeds (9.31 g), and fruit yield/plant (27.82 g) were recorded with organic compost treatment at 12m^3/fed. The effects of salicylic acid and ascorbic acid treatments on these traits were significant. It reveals that the highest values of the number of umbels/plant (42.10), the weight of 1000-seeds (9.58 g), and fruit yield/plant (27.97 g) were a result of spraying ascorbic acid at 200 ppm. Meanwhile, the lowest values of these characters were due to unsprayed plants, followed by salicylic acid at 100 ppm in the mean of seasons. The interaction effects between the two studied factors on the number of umbels/plant, the weight of 1000-seeds, and fruit yield/plant were statistically significant. The highest values of these traits were detected due to the use of compost at 12m^3/fed + 200 ppm ascorbic acid compared to those obtained by the other treatments in the mean of seasons.

Data in Table (5) suggest that coriander fruit yield/plot, fruit yield/fed, and oil yield % significantly increased with organic compost levels compared to the control. Moreover, organic compost at 12m^3/L recorded higher increases in these characteristics compared to the other treatments in the mean of seasons. Results in the same table showed that fruit yield/plot, fruit yield/fed, and oil yield % of coriander plants significantly differed with antioxidant levels in the mean of seasons. In addition, spraying ascorbic acid at 200 ppm, followed by 100 ppm, gave the highest values in this connection compared to the other treatments. Generally, the interaction between compost rates and antioxidant concentrations significantly increased the fruit yield/plot, fruit yield/fed and oil yield % of coriander compared to the control in the mean of seasons. The best interaction treatments were due to applying compost at 12 m^3/fed plus ascorbic acid at 200 ppm. The positive effects of organic compost application on yield and yield components seem to result from better coriander growth owing to favorable physical, chemical, and biological soil characteristics. These results are that of Radwan and Farahat (2002); Abou-Aly and Gomma (2002); Azzaz *et al.* (2009); Mathukia *et al.* (2020). Also, the positive effects of ascorbic acid and salicylic acid in the fruit yield and its components were recorded by Hemdan (2008); Kenawy (2010); Gahory (2012); Rekaby (2013); Ali *et al.* (2016); Machado *et al*. (2022).

Table 4. Effect of organic compost, ascorbic and salicylic acids application on the number of umbels/ plant, the weight of 1000-seeds (g), and fruit yield/ plant (g) of coriander as an average the two seasons of 2019/2020 and 2020/2021.

Antioxidant Levels (ppm)		Compost levels (A) Control	6 m^3/ fed	12m^3/ fed	Mean (B)
(B)		Number of umbels/ plant			
Control		28.63	35.20	37.20	33.68
Salicylic acid	100	35.73	34.97	41.20	37.30
	200	38.50	39.77	42.80	40.36
Ascorbic acid	100	36.63	39.53	42.20	39.46
	200	40.50	41.43	44.37	42.10
Salicylic + Ascorbic acids	100 + 100	37.57	41.70	40.97	40.08
	200 + 200	36.60	38.03	39.80	38.14
Mean (A)		36.31	38.66	41.22	
LSD 5%		A=0.766	B=1.815	AB=3.002	
		Weight of 1000-seeds (g)			
Control		6.60	7.40	8.23	7.41
Salicylic acid	100	7.47	8.47	8.77	8.23
	200	8.47	9.10	9.47	9.01
Ascorbic acid	100	8.13	8.77	9.30	8.73
	200	9.00	9.40	10.33	9.58
Salicylic + Ascorbic acids	100 + 100	7.77	9.03	9.73	8.84
	200 + 200	7.57	8.17	9.30	8.34
Mean (A)		7.86	8.62	9.31	
LSD 5%		A=0.149	B=0.308	AB=0.515	
		Fruit yield/ plant (g)			
Control		17.67	20.33	23.30	20.43
Salicylic acid	100	17.67	22.37	26.47	22.62
	200	19.97	23.50	27.90	23.79
Ascorbic acid	100	21.17	25.00	28.17	24.78
	200	23.50	28.03	32.37	27.97
Salicylic + Ascorbic acids	100 + 100	18.87	24.03	28.80	23.90
	200 + 200	18.47	22.77	27.77	23.00
Mean (A)		19.81	23.72	27.82	
LSD 5%		A=0.407	B=0.584	AB=1.016	

Table 5. Effect of organic compost, ascorbic and salicylic acids application on the fruit yield/ plot (g), fruit yield/ fed (kg), and oil yield % of coriander as an average the two seasons of 2019/2020 and 2020/2021.

Antioxidant levels (ppm)		Compost levels (A) Control	6 m^3/ fed	12m^3/ fed	Mean (B)
(B)		Fruit yield/ plot (g)			
Control		624.40	710.50	815.50	716.80
Salicylic acid	100	662.80	782.80	926.30	790.67
	200	698.80	822.50	976.50	832.61
Ascorbic acid	100	774.20	875.00	985.80	878.33
	200	822.50	981.20	1132.80	978.83
Salicylic + Ascorbic acids	100 + 100	660.30	841.20	1008.00	836.50
	200 + 200	646.30	796.80	971.80	805.00
Mean (A)		698.49	830.00	973.83	
LSD 5%		A=19.913	B=25.173	AB=44.727	
		Fruit yield/ fed (kg)			
Control		609.10	690.10	793.80	697.68
Salicylic acid	100	636.00	761.40	900.70	766.04
	200	677.20	800.30	949.30	808.94
Ascorbic acid	100	751.70	852.10	959.00	854.28
	200	800.30	955.80	1088.60	948.24
Salicylic + Ascorbic acids	100 + 100	638.30	828.50	1001.50	822.75
	200 + 200	628.60	774.40	891.00	764.64
Mean (A)		677.30	808.95	940.57	
LSD 5%		A=32.204	B=37.110	AB=67.180	
		Oil percentage			
Control		0.284	0.290	0.312	0.295
Salicylic acid	100	0.291	0.322	0.330	0.314
	200	0.293	0.335	0.340	0.323
Ascorbic acid	100	0.308	0.345	0.345	0.333
	200	0.324	0.350	0.382	0.352
Salicylic + Ascorbic acids	100 + 100	0.314	0.322	0.350	0.328
	200 + 200	0.303	0.302	0.342	0.316
Mean (A)		0.303	0.324	0.343	
LSD 5%		A=0.006	B=0.007	AB=0.012	

Chemical compositions:

Data in Table (6) pointed out that there were significant differences in the total phenolic compound in shoots, total nitrogen in fruits, and total chlorophyll content in leaves of coriander plants under the effect of organic compost and antioxidant treatments. Furthermore, the highest values of total phenolic compounds (139.35 mg GAE/100 g FW), total nitrogen (2.31 %) as well as total chlorophyll content (33.38 SPAD) were recorded by applying organic compost at 12m^3/ fed compared to the control in the mean of seasons. Also, the same table pointed out that these traits were significantly different under the effect of antioxidant treatments. The highest values of phenolic compounds (130.21 mg GAE/100 g FW), total nitrogen (2.32 %), and total chlorophyll content (34.26 SPAD) as a result of applying ascorbic acid at 200 ppm, while the lowest values the control plants, followed by that treated by salicylic acid at 100 ppm in the mean of seasons. Moreover, the interaction of organic compost at 12m^3/ fed with 200 ppm ascorbic acid gave the highest values of these chemical compositions with significant differences between them. Machado *et al.* (2022) revealed that the total phenolic compound in shoot was lower in coriander plants that fertilized with inorganic fertilizer than those that were applied with compost. These results agreed with Li *et al.* (2008); Machado *et al.* (2020). Organic compost and antioxidants may increase nitrogen intake and improve assimilation ability (Okumoto, 2016).

Moreover, Noroozlo *et al.* (2019) revealed that foliar application of bio stimulators could positively affect the leaf chlorophyll content of lettuce. Our results revealed that chlorophyll contents in coriander leaves increased due to organic compost and antioxidant treatment. These results were contrary to those of Machado *et al.* (2022), who reported that plants grown with inorganic fertilizer had a higher total chlorophyll content than those grown only with organic compost.

Table 6. Effect of organic compost, ascorbic and salicylic acids application on the total phenolics in shoots (mg GAE/100 g FW), total nitrogen (%) in fruits, and total chlorophyll content in leaves (SPAD) of coriander as an average the two seasons of 2019/2020 and 2020/2021.

Antioxidant levels (ppm)		Compost levels (A)			Mean (B)
		Control	6 m^3/ fed	12m^3/ fed	
(B)		Total phenolics in shoots (mg GAE/100 g FW.)			
Control		58.10	68.10	90.63	72.28
Salicylic acid	100	75.70	91.37	125.57	97.54
	200	84.50	101.50	133.97	106.66
Ascorbic acid	100	81.33	113.60	155.70	116.88
	200	87.90	122.40	180.33	130.21
Salicylic + Ascorbic acids	100 + 100	86.57	115.37	153.90	118.61
	200 + 200	80.93	107.23	135.37	107.84
Mean (A)		79.29	102.80	139.35	
LSD 5%		A=4.336	B=4.609	AB=8.501	
		Total nitrogen % in fruits			
Control		1.85	2.02	2.11	1.99
Salicylic acid	100	1.94	2.25	2.30	2.16
	200	2.07	2.34	2.34	2.24
Ascorbic acid	100	2.14	2.33	2.38	2.28
	200	2.23	2.35	2.39	2.32
Salicylic + Ascorbic acids	100 + 100	2.12	2.34	2.34	2.25
	200 + 200	2.12	2.19	2.34	2.20
Mean (A)		2.07	2.25	2.31	
LSD 5%		A=0.033	B=0.041	AB=0.073	
		Total chlorophyll content in leaves (SPAD)			
Control		26.53	28.67	29.70	28.30
Salicylic acid	100	28.53	31.87	32.27	30.89
	200	28.97	33.10	33.47	31.84
Ascorbic acid	100	33.93	33.93	35.20	32.86
	200	35.17	35.17	37.43	34.26
Salicylic + Ascorbic acids	100 + 100	31.30	31.30	33.37	31.43
	200 + 200	29.13	30.73	32.23	30.70
Mean (A)		28.91	32.11	33.38	
LSD 5%		A=0.741	B=0.655	AB=1.273	

CONCLUSION

The current study's findings proved the beneficial effects of compost, ascorbic acid, and salicylic acid treatments on the growth and productivity of coriander. The best results were exposed by the combined treatment between compost at 12m3/fed as a soil amendment before planting with ascorbic acid at 200 ppm as a foliar spray. This was indicated by considerable improvement in vegetative and flowering growth (plant height, number of branches, and dry herb weight), yield parameters (weight of 1000 seeds, fruit yield, and volatile oil %) and biochemical aspects (total phenolics in shoots, total nitrogen in fruits and total chlorophylls in leaves).

ACKNOWLEDGMENT

The authors would like to express their gratitude to all staff members of the Department of Horticulture, Faculty of Agriculture and Natural Resources, Aswan University, and their deepest gratitude and greatest appreciation to Dr. Mahmoud A. H. Abdou, Professor of Ornamental Plants, Horticulture Department, Faculty of Agriculture, Minia University for his support and help

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استجابة النمو والمحصول ومكوناته في نباتات الكزبرة لإضافة الكمبوست وحمض الأسكوربيك وحمض السالسليك تحت ظروف محافظة أسوان مصر

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الملخص

أجريت هذه التجربة بمزرعة كلية الزراعة والموارد الطبيعية – جامعة أسوان خلال موسمي 2020/2019 و 2021/202 بهدف دراسة تأثير الكمبوست وكلا من حمض الأسكوربيك وحمض السالسليك على النمو والمحصول ومكوناته لنبات الكزبرة. أضيف الكمبوست للتربة قبل الزراعة بمعدل 6 أو 12 م^3/فدان بالإضافة إلى الكنترول (التسميد المعدني الموصى به)، بينما أضيف كل من حمض الأسكوربك وحمض السالسليك رشاً على الأوراق بتركيز 100 أو 200 جزء من المليون كل علي حده أو خليط منهما. وقد أوضحت النتائج أن إضافة الكمبوست تؤدي إلى زيادة في صفات طول النبات وعدد الأفرع/نبات والوزن العشب الجاف/نبات وعدد النورات/نبات ووزن 1000 ثمرة ومحصول الثمار/نبات ومحصول الثمار/قطعة تجريبية ومحصول الثمار/فدان والنسبة المئوية للزيت الطيار والفينولات الكلية في العشب والنيتروجين الكلي في الثمار ومحتوى الكلوروفيل الكلي في الأوراق. وكانت أعلى زيادة في هذه القياسات نتيجة إضافة الكمبوست بمعدل 12 م^3/ فدان . إضافة كل من حمض الأسكوربيك وحمض السلسليك كلٌ على حده أو خليطهما أدى الى تحسين صفات النمو والمحصول ومكوناته، وإن كان إضافة حمض الأسكوربيك منفرداً بمستوى 200 جزء في المليون كان له ميزة في هذا التحسين مقارنة بباقي المعاملات. وقد أدى التفاعل بين حمض الأسكوربيك وحمض السلسليك مع الكمبوست إلى تحسين الصفات المدروسة ونتجت أعلى القيم عند إضافة الكمبوست بمعدل 12 م^3/ فدان مع 200 جزء في المليون من حمض الأسكوربيك.