Minia J. of Agric. Res. & Develop.
Vol. (39), No. 1, pp. 63-74, 2019

FACULTY OF AGRICULTURE

EFFECT OF COMPOST, POTASSIUM SILICATE AND AMINO ACIDS ON IRIS PLANTS CV. WEDGEWOOD

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Received: 26 May (2019) **Accepted: 1July (2019)**

ABSTRACT

Bulbs of *Iris tingitana* L., cv. Wedgewood plants were cultured on Nov. 5^{th} in a sandy soil which was amended with compost at 0, 2, 4 and 6%(g/g). Plants were foliar sprayed 3 times with tap-water (control), mixed amino acids (AA) at 0.5, 1 and 2 g/l or potassium silicate (KS) at 1, 2 and 3 ml/l. Compost and foliar treatments had positive significant effects on vegetative growth traits (leaf area and its fresh and dry weights) flower traits (peduncle length and its fresh and dry weights and flower fresh and dry weights) as well as, mother plant bulb and new developing bulblets fresh weights. Generally, most of these traits were increased with 4% (g/g) compost. It was noticeable that amino acids at 0.5 g/l was more effective than the other concentrations. Also, 2 ml/l of potassium silicate had a more pronounced effect than the other concentrations. It could be concluded that amendment of the sandy soil with 4% (g/g) compost and treating plants with either 0.5 g/l of amino acids or 2 m/l potassium silicate enhanced vegetative growth, flowering and bulbs productivity of Iris plants.

Key words: Iris, compost, silicon, amino acids.

INTRODUCTION

Iris is perennial bulbous or rhizomatous plants belongs to the Iridaceae Family. It has been used as ornamental plants in landscape of the gardens and parks because of its colorful very beautiful flowers (Kandemir and Engin, 1998). Iris takes a prominent economic position because of its continuous increase demands for foreign and local markets owing to the mauve shades of colours (Wilson, 2011).

Compost is the result of a managed decomposition process transforming organic material into complex organic substances. These substances are responsible for many of important characteristics of high quality, healthy soils including their ability to hold plant-available nutrients and moisture (Paulin and O'Malley, 2008). Also, it improves soil biological properties, drainage, pH, and reduces the negative impact of chemical based pesticides and fertilizers in the ecosystems (Zheljazkov and Warman, 2004). Many investigators recorded the positive effect of the compost as an organic fertilization on the vegetative growth, flowering, bulb productivity and chemical composition of different flowering bulb species (Khanam *et al.,* 2017).

Silicon is the most abundant element in the earth's crust as represents 27.7% of its weight (Datnoff *et al.,* 2001). Numerous investigations indicated that silicon may be beneficial for some horticultural crop species. Silicon application has been affected plant morphology and quality traits of many floriculture crops. However, those influences not only species and cultivar specific but also, depend on the form of applied Si (Neto *et al.,* 2015).

Amino acids are considered as precursors and elements of proteins and other N compounds such as nucleic acids which are important for stimulation of cell growth. Moreover, they can serve as a source of carbon and energy, as well as protect the plants against abiotic stress they maintain satisfactory pH value within the plant cell (Raskin, 1992). Amino acids stimulate the physiological functions of plants in the periods of great activity such as sprouting and flowering, as well as, the development of roots, flowers and bulbs (Phillips, 1971). Amino acids would enhance proteins biosynthesis as well as protect plant cells from senescence and death, preventing the free radicals from oxidation of lipids (Popko *et al*., 2014). The influence of amino acids on the vegetative growth, flowering, bulbs productivity and chemical constituents of different ornamental as well as some vegetable crops bulb has been widely examined by Afifipour and Kosh-Khui (2015).

MATERIALS AND METHODS

A pot experiment was carried out during two consecutive seasons (2016/17 and 2017/18) at Nursery of Ornamental Plants, Faculty of Agriculture, Minia University. The target of this study was to investigate the efficiency of compost, potassium silicate and amino acids application on vegetative growth, flowering and bulb productivity of *Iris tingitana* L., cv. Wedgewood plants. On both seasons, bulbs with an average weight of 12-15 g were cultured on Nov. 5^{th} in 20-cm plastic pots filled with 3.5 kg air-dried sandy soil as its physical and chemical properties are shown in Table (1).

Compost El-Neel which its physical and chemical properties are shown in Table (2) at 0, 2, 4 and 6% (g/g) was thoroughly mixed with the sandy soil during preparing to cultivation. The commercial amino acids was used at 0.5, 1 and 2 g/l (Shoura Chem. Comp.). However, Canada Silicate was purchased from

Egyptian Canadian for Agric. Technol. and Agric. Consultancy as a source of potassium silicate was applied at 1, 2 and 3 ml/l. Potassium silicate and amino acids were applied by hand sprayer till run off 3 times. The first treatment was applied after 6 weeks from planting, the second dose before flowering stage and the third one after cut flowering.

The experiment was arranged in a complete randomized block design in a split plot arrangement with 3 replicates. The main plots (A) included compost levels (0, 2, 4 and 6% (g/g), while subplots (B) comprised amino acids (0.5, 1 and 2 g/l), potassium silicate (1, 2 and 3 ml/l) and a control treatment which was treated with tap water. Therefore, there were 28 treatments each one consisted of 24 pots divided into 3 replicates. At the flowering time which commenced on Mar. 1st four plants were randomly selected to assess the leaf area (cm^2) and their fresh and dry weight (g) after drying at 70° C. The other four plants were used to assess the flower and bulb characteries, Leaf area (cm^2) was estimated as an average area of the 1st four leaves above the ground surface. However, leaf fresh weight was assessed using all leaves. At full opening time, peduncle length and its fresh and dry weights as well as the flower fresh and dry weights were estimated. After drying out all the leaves, bulbs were dug out then the number of new developing bulblets and their fresh weights (g) as well as the mother bulb fresh weight (g) were assessed. The means were compared using the LSD method at 5% (Gomez and Gomez, 1984).

Table (1): Physical and chemical properties of the experimental soil

Soil texture	Organic matter%	pH	EC (dSm^{-1})	Cations (meq/l)			K ppm	Anions (meq/l)			
				Ca	Mg	Na		Cl	CO_3	HCO_3	SO_4
sandy	0.22	8.14	0.11	0.18	0.14	0.20	5.0	0.15	0.00	0.17	0.22

Table (2): Physical and chemical properties of the used compost

Properties	Value	Properties	Value
Dry weight of $1m^3$	450 kg	C/N ratio	14.1-18.5
Fresh weight of $1m^3$	650-700 kg	NaCl %	1.10-1.75
Moisture (%)	25-30	Total P %	0.50-0.75
pH (1:10)	7.5-8	Total K %	0.8-1.0
EC (m mhose/cm)	2-4	Fe ppm	150-200
Total N %	1-1.4	Mn ppm	25.56
Organic matter %	32-34	Cu ppm	75-150
Organic carbon %	18.5-19.7	Zn ppm	150-225

RESULTS

1- Leaf area:

Table (3) shows that leaf area was gradually increased from 53.01 cm^2 (for plant grown in soil without compost) to 85.08 cm^2 at 4% compost then decreased ($p \geq 0.05$) at 6% in the 1st season. Compared to the other foliar application treatments, control plants had ($p \geq 0.05$) the lowest value (62.42 cm^2) however, plants treated with 2 ml/l KS had the highest one (80.72 cm^2). The differences among AA concentrations were not significant in the 1st season unlike the 2nd one where the lowest concentration had the highest significant value (89.57 cm^2). Under the same AA or KS application, leaf area was gradually and significantly increased by increasing compost addition up to 4% then it was non-significantly decreased in the 1st season unlike the 2nd one depending on the foliar application. In the 1st season plants grown in soil with either 4 or 6% compost and treated with 2 ml/l KS had the highest leaf area of (90.68 and 90.01 cm^2), respectively. In the 2nd season plants grown in soil with 4% compost and treated with the lowest concentration of KS (1 ml/l) had significantly the highest value (125.41 cm^2) followed by these grown in the same growing media and treated with 0.5 g/l AA (113.91 cm^2) (Table, 3).

2- Leaf fresh and dry weights:

Leaf fresh and weights were affected ($p \geq 0.05$) with compost and foliar application. Moreover, the interaction between the two factors had a significant effect on these traits (Table, 4). As both traits had a similar trend only that the dry weights will be discussed. All compost concentrations significantly increased leaf dry weights compared to non-compost-fertilized plants (1.91 and 2.06 g/plant for both seasons, respectively). But, once compost percentage increased to 6% leaf dry weights were decreased to 2.73 and 2.91 g/plant for both seasons, respectively which indicated that 4% was superior treatment. Although foliar applications significantly improved leaf dry weights, it should be noticed that there were no significant differences among AA concentrations or KS concentrations in both seasons. Overall, in the 1st season, the lowest leaf dry weights (1.64 g) being for non-compost treated plants that were sprayed with tap water. Meanwhile, the heaviest weight (3.16 g) was assessed for plants treated with 4% of compost and 1ml/l of KS. In the 2nd season, leaf dry weight (2.00 g/plant) was of plant grown in soil without compost and treated with 0.5 g/l AA as were higher than that of the control plants (1.70 g/plant) which had lowest value. Meanwhile, the highest value was for plants treated with 4% compost and foliar sprayed with (1 and 3 ml/l of KS for the 1st and 2nd seasons, respectively) (Table ,4).

3- Peduncle length:

Compost application at 4% significantly increased the peduncle length from 17.68 to 25.80 cm in the 1st season (Table, 5). However, at 6% it was reduced to 23.31 cm which still

($p \geq 0.05$) higher than that of the 2%-treated ones. In both seasons, control plants had significantly the shortest peduncle length whereas, the tallest ones (25.36 and 29.46 cm, respectively) were for plants treated with 2 ml/l. The interaction between the two factors had a significant effect on that trait. In the 1st seasons, there were no significant differences between plants grown in non-amendment soil due to either AA or KS application except of the treatment 2 ml/l KS which had the longest one (21.80 cm) whereas, the equivalent value for control plants was 14.90 cm. The application of 4% compost yielded the longest peduncle (28.75 and 31.00 cm) without significant difference between them when plants treated with 2 g/l AA and 2 ml/l KS, respectively. Symmetric observations were estimated in the 2nd season.

Table (3): Effect of compost and foliar application of amino acids and potassium silicate on leaf area (cm^2) of Iris plants during two seasons.

F.A.T. (B)	First season (2016/2017) Compost (%) (A) 0	2	4	6	Mean (B)	Second season (2017/2018) Compost (%) (A) 0	2	4	6	Mean (B)
Control	47.03	58.42	73.62	70.62	62.42	43.89	55.76	65.90	58.40	55.99
AA 0.5g/l	56.02	78.82	90.05	82.10	76.74	70.12	83.87	113.91	90.38	89.57
AA 1g/l	45.71	72.63	88.35	77.80	71.12	60.46	79.92	89.56	87.13	79.27
AA 2g/l	48.23	63.72	82.08	74.20	67.06	62.73	75.23	89.04	79.16	76.54
KS 1ml/l	57.41	74.06	83.68	76.87	73.01	60.26	78.51	125.41	86.46	87.66
KS 2ml/l	66.48	75.68	90.68	90.01	80.72	73.84	88.32	108.63	94.23	91.26
KS 3ml/l	50.17	70.99	87.14	79.33	71.91	69.29	83.79	111.12	86.09	87.57
Mean (A)	53.01	70.62	85.08	78.70		62.94	77.92	100.51	83.12	
LSD 5 %	A:5.06		B:8.16		AB:16.32	A: 7.07		B: 4.93		AB: 9.87

AA: Amino acids KS: Potassium silicate F.A.T.: Foliar application treatments

- Peduncle dry weight:

There was an increase ($p \geq 0.05$) in peduncle dry weight following compost addition however, the 6%-treatment significantly reduced it compared with 4% treatment (0.71 g and 0.83 g, respectively) in the 1st season. The control plants had the lightest weights (Table 5). All KS treatments yielded higher weights than the control plants with a significant difference among themselves however, 0.5 g/l AA had the highest value (0.80 g). Dry weights were significantly affected with the interaction between the two factors. Control plants grown in a compost-free soil had the lowest value (0.25 g) but, plants grown in the same soil and treated with 0.5 g/l AA and 2 ml/l KS had values of (0.56 and 0.61 g, respectively) with no significant differences between themselves. Under the same foliar application treatment plants grown in soil with 4% compost had significantly heavier peduncle dry weights than these on 0 or 2% of compost. Nevertheless, in some cases increasing compost to 6% non significantly reduced this parameter (Table, 5). With slightly difference observations of the 2nd season were similar to that of the 1st one.

Table (4): Effect of compost and foliar application of amino acids and potassium silicate on leaf fresh and dry weights (g/plant) of Iris plants during two seasons.

	First season (2016/2017)					Second season (2017/2018)				
F.A.T. (B)	Compost (%) (A) 0	2	4	6	Mean (B)	Compost (%) (A) 0	2	4	6	Mean (B)
Leaf fresh weight										
Control	7.05	8.38	9.87	9.23	8.63	7.81	8.78	11.53	8.09	9.05
AA 0.5g/l	9.71	11.27	14.82	12.79	12.15	9.49	12.57	17.79	15.01	13.72
AA 1g/l	7.85	10.63	13.30	13.38	11.29	8.51	12.32	14.02	13.78	12.16
AA 2g/l	8.60	10.29	13.87	12.31	11.27	7.90	11.45	14.94	13.91	12.05
KS 1ml/l	7.27	12.29	16.45	14.40	12.60	8.757	10.80	16.49	15.10	12.79
KS 2ml/l	11.14	12.12	16.13	15.09	13.62	13.84	14.85	17.47	17.92	16.02
KS 3ml/l	8.09	11.74	14.35	15.28	12.37	9.50	10.86	16.68	13.55	12.65
Mean (A)	8.53	10.96	14.11	13.21		9.40	11.66	15.56	13.92	
LSD 5 %	A: 1.18		B: 2.04		AB: 4.09	A: 1.65		B: 1.43		AB: 2.85
Leaf dry weight										
Control	1.64	2.11	2.51	2.27	2.13	1.70	1.99	2.41	2.85	2.24
AA 0.5g/l	1.79	2.75	2.89	2.89	2.58	2.00	2.89	3.13	3.62	2.91
AA 1g/l	1.82	2.38	3.10	3.00	2.58	2.14	2.98	3.27	3.36	2.94
AA 2g/l	1.98	2.10	2.99	2.61	2.42	1.90	2.70	3.60	2.97	2.79
KS 1ml/l	2.14	2.40	3.16	2.72	2.61	2.18	2.52	3.21	2.54	2.61
KS 2ml/l	2.00	2.23	3.15	2.89	2.57	2.28	3.01	3.54	2.72	2.89
KS 3ml/l	1.97	2.16	3.10	2.72	2.49	2.24	2.52	3.90	2.26	2.73
Mean (A)	1.91	2.30	2.99	2.73		2.06	2.66	3.29	2.91	
LSD 5 %	A: 0.29		B: 0.40		AB: 0.81	A: 0.46		B: 0.57		AB: 1.13

AA: Amino acids KS: Potassium silicate F.A.T.: Foliar application treatments

Table (5): Effect of compost and foliar application of amino acids and potassium silicate on peduncle length (cm) and peduncle dry weight (g) of Iris plants during two seasons.

	First season (2016/2017)					Second season (2017/2018)				
F.A.T. (B)	Compost (%) (A) 0	2	4	6	Mean (B)	Compost (%) (A) 0	2	4	6	Mean (B)
Peduncle length										
Control	14.90	15.90	19.60	16.80	16.80	15.80	16.30	26.82	25.33	21.06
AA 0.5g/l	17.50	18.13	22.98	21.75	20.09	20.50	26.08	32.20	26.98	26.44
AA 1g/l	17.25	19.40	25.35	23.10	21.28	21.25	27.09	29.75	29.18	26.82
AA 2g/l	17.93	23.50	28.75	25.63	23.95	23.93	25.50	30.93	29.46	27.46
KS 1ml/l	19.38	22.95	26.75	25.48	23.64	19.38	27.78	32.00	29.10	27.07
KS 2ml/l	21.80	23.35	31.00	25.27	25.36	21.80	31.23	32.87	31.94	29.46
KS 3ml/l	15.00	24.67	26.18	25.17	22.76	25.00	26.68	30.50	28.65	27.71
Mean (A)	17.68	21.13	25.80	23.31		21.09	25.81	30.72	28.66	
LSD 5 %	A: 1.47		B: 2.06		AB: 4.11	A: 2.20		B: 1.99		AB: 3.97
Peduncle dry weight										
Control	0.25	0.32	0.44	0.42	0.36	0.26	0.37	0.85	0.57	0.51
AA 0.5g/l	0.56	0.76	1.08	0.80	0.80	0.71	0.79	0.99	0.88	0.84
AA 1g/l	0.44	0.58	0.83	0.64	0.62	0.69	0.72	0.99	0.78	0.80
AA 2g/l	0.32	0.53	0.78	0.69	0.58	0.59	0.73	0.90	0.88	0.78
KS 1ml/l	0.45	0.70	0.93	0.72	0.70	0.63	0.86	0.87	0.86	0.81
KS 2ml/l	0.61	0.61	1.01	0.91	0.79	0.94	0.96	1.17	1.02	1.02
KS 3ml/l	0.51	0.55	0.75	0.78	0.65	0.59	0.72	1.05	0.86	0.81
Mean (A)	0.45	0.58	0.83	0.71		0.63	0.74	0.97	0.84	

LSD 5 %	A: 0.10	B: 0.12	AB: 0.24	A: 0.09	B: 0.08	AB: 0.16

AA: Amino acids KS: Potassium silicate F.A.T.: Foliar application treatments

5- Flower fresh and dry weights:

Flowers fresh and dry weights were varied (p≤0.05) due to both factors. Moreover, there were significant interactions between them. Table (6) shows that in both season plants grown in soil without compost had significantly the lightest flower dry weights (0.30 and 0.32 g, respectively) meanwhile, the highest values (0.42 and 0.38 g, respectively) resulted from plants grown in soil with 4% of compost. Increasing compost level to 6% significantly reduced this character in the 1st season. Plants treated with AA had similar flower dry weights which were higher than those of the control plants in both seasons. However, KS at 2 ml/l was significantly better than the highest concentration only in the 2nd season. Overall, control plants grown in compost-free soil had significantly the lowest flower dry weights (0.19 g) in both seasons. Meanwhile, the highest value was for plant grown in soil with 4% compost. Plants grown in this amended soil and treated with 0.5 g/l AA had the highest flower dry weights (0.47g in the 1st season). Increasing compost level to 6% caused a non-significant reduction in flower dry weight under the same foliar application treatment (Table, 6).

Table (6): Effect of compost and foliar application of amino acids and potassium silicate on flower fresh and dry weights (g) of Iris plants during two seasons.

	First season (2016/2017)					Second season (2017/2018)				
F.A.T.	Compost (%) (A)				Mean	Compost (%) (A)				Mean
(B)	0	2	4	6	(B)	0	2	4	6	(B)
Flower fresh weight										
Control	1.05	1.49	2.15	1.60	1.57	1.58	1.82	2.25	1.93	1.90
AA 0.5g/l	1.59	1.68	2.31	1.96	1.89	1.95	2.56	3.16	3.01	2.67
AA 1g/l	1.48	1.54	1.95	1.93	1.73	1.91	2.14	2.81	2.63	2.37
AA 2g/l	1.43	1.69	1.89	1.84	1.71	1.82	2.01	2.66	2.33	2.20
KS 1ml/l	1.46	1.68	2.38	1.92	1.86	1.48	2.09	3.07	2.74	2.35
KS 2ml/l	1.62	1.78	2.62	2.30	2.08	2.31	2.77	3.11	2.98	2.79
KS 3ml/l	1.60	1.77	1.91	1.85	1.78	2.01	2.11	3.07	2.40	2.39
Mean (A)	1.46	1.66	2.17	1.91		1.86	2.21	2.88	2.57	
LSD 5 %	A:0.19		B: 0.13		AB: 0.26	A: 0.37		B: 0.33		AB: 0.67
Flower dry weight										
Control	0.19	0.27	0.41	0.33	0.30	0.19	0.27	0.38	0.33	0.29
AA 0.5g/l	0.31	0.33	0.47	0.40	0.38	0.33	0.40	0.47	0.41	0.40
AA 1g/l	0.30	0.35	0.40	0.38	0.36	0.35	0.38	0.40	0.40	0.38
AA 2g/l	0.30	0.34	0.40	0.39	0.36	0.34	0.39	0.40	0.35	0.37
KS 1ml/l	0.32	0.34	0.42	0.41	0.37	0.34	0.41	0.42	0.39	0.39
KS 2ml/l	0.35	0.39	0.43	0.40	0.39	0.39	0.40	0.43	0.40	0.41
KS 3ml/l	0.33	0.34	0.39	0.41	0.37	0.27	0.33	0.38	0.41	0.35
Mean (A)	0.30	0.34	0.42	0.39		0.32	0.37	0.42	0.38	
LSD 5 %	A:0.04		B: 0.04		AB: 0.07	A: 0.03		B: 0.02		AB: 0.05

AA: Amino acids KS: Potassium silicate F.A.T.: Foliar application treatments

8- Mother bulb fresh weight:

The fresh weight of the mother bulbs was significantly increased by increasing compost level up to 4% achieving 6.84 g and then significantly decreased (6.15 g/bulb). Only, there were significant differences among KS treatments in the 1st season nevertheless; they produced significantly heavier bulbs compared to the control plants (4.95 g/bulb). The highest concentration of AA had lower bulb fresh weight (5.99 g) compared to the lowest concentration (6.34 g). Overall, under the same rate of compost there were no significant differences among 1 and 2 ml/l of KS treatment however, the fresh weights were slightly decreased at 3 ml/l. Increasing AA concentration did not significantly affect this trait under the same level of compost (Table, 7). In the 2nd season, a similar trend was observed with slight increase in the fresh weights of most cases.

9

Table (7): Effect of compost and foliar application of amino acids and potassium silicate on the mother bulb and bulblets fresh weights (g/plant) of Iris plants during two seasons.

	First season (2016/2017)					Second season (2017/2018)				
F.A.T. (B)	Compost (%) (A) 0	2	4	6	Mean (B)	Compost (%) (A) 0	2	4	6	Mean (B)
Mother bulb fresh weight										
Control	4.41	4.55	6.06	4.78	4.95	4.90	6.06	6.73	6.65	6.09
AA 0.5g/l	5.70	5.99	7.09	6.57	6.34	5.06	6.97	8.20	7.23	6.87
AA 1g/l	5.23	6.16	6.77	6.31	6.12	6.29	6.35	7.09	7.00	6.68
AA 2g/l	5.17	6.06	6.64	6.10	5.99	5.74	6.74	7.38	6.78	6.66
KS 1ml/l	5.41	5.45	7.38	6.51	6.19	6.01	6.85	7.52	7.01	6.85
KS 2ml/l	5.72	5.95	7.56	6.48	6.43	5.82	6.61	8.41	7.21	7.01
KS 3ml/l	5.66	6.27	6.38	6.30	6.15	5.31	6.34	7.88	7.30	6.71
Mean (A)	5.33	5.78	6.84	6.15		5.59	6.56	7.60	7.03	
LSD 5 %	A:0.28		B: 0.26		AB: 0.52	A: 0.30		B: 0.32		AB: 0.64
Bulblets fresh weight										
Control	3.76	8.56	11.72	10.19	8.56	8.09	8.73	10.69	8.87	9.09
AA 0.5g/l	9.33	9.50	12.82	11.90	10.89	8.04	11.13	12.43	11.81	10.85
AA 1g/l	7.64	8.60	11.66	10.32	9.56	6.84	11.39	12.03	11.93	10.55
AA 2g/l	3.97	8.44	13.76	9.42	8.90	8.07	10.40	12.32	10.76	10.39
KS 1ml/l	6.87	9.65	11.94	11.02	9.87	7.62	11.11	12.66	12.01	10.85
KS 2ml/l	10.27	10.57	13.00	11.40	11.31	8.68	11.33	14.21	13.90	12.03
KS 3ml/l	8.20	8.76	11.34	10.36	9.66	7.74	10.07	13.20	12.07	10.77
Mean (A)	7.15	9.15	12.32	10.66		7.87	10.59	12.50	11.62	
LSD 5 %	A:1.02		B: 1.24		AB: 2.48	A: 1.76		B: 0.87		AB: 1.74

AA: Amino acids KS: Potassium silicate F.A.T.: Foliar application treatments

Bulblets fresh weight:

In the 1st season, compost at 4% significantly raised it to 12.32 g however, this value was significantly reduced to 10.66 g at 6% compost. The control plant had significantly the lowest weights (8.56 g). Plants treated with 2 ml/l KS had significantly the highest weights (11.31and 12.03 g in both seasons, respectively). Control plants without compost application had the minimum value (3.76 g) with non significant difference compared with those of 2 g/l AA-treatment. In most cases, under the same foliar application treatment, plants grown in soil with 4% compost had higher values than those treated with 2 or 6%. In soil amended with 4% compost plants treated with 2 g/l AA or 2 ml/l KS had the highest weights (13.76 and 13.00 g, respectively). Similar results were observed in the 2^{nd} season but the treatment of 2 g/l AA had lower bulblets fresh weight than the 2 ml/l KS (Table, 7).

DISCUSSION

Results showed that compost had significant effects on all investigated vegetative growth, flowering and bulb productivity parameters. In most cases, the increments of estimated parameters at 2% compost were slightly higher than with non-compost fertilized plants, Compost at 4% had more pronounced effects than 6%. This poor growth of iris plants which received the lowest level of compost compared with the higher levels could be because of the lack of nutrients (Wu and Sardo, 2010), that causes slow release of nutrients from organic compost which may fail to match crop demand.

The improvement of iris vegetative growth characters due to compost application was coincided with improvement of flowering traits. It should be noticed that most of flowering characters were slightly decreased when compost levels increased from 4 to 6%. However, all estimated parameters of 6%-treated plant were significantly higher than those of 2%-treated ones. Similar observations were recorded for mother and new developing bulblets fresh weight. Compost is ideally made from a mixture of organic materials that are blended to achieve an appropriate C/N ratio (Paulin, and O'Malley, 2008). Plant growth enhancement could be achieved by improving soil physical, chemical and pH (Zheljazkov and Warman, 2004). Our obtained results regarding the enhancement of Iris vegetative growth traits following compost addition are similar to those observed by Abdou *et al.* (2013 and 2018), on *G. grandiflorus*, Naznin *et al.* (2015) and Karim *et al.* (2017) on tuberose.

Laane (2018) suggested that plants accumulate supplemental Silicon to improve their stress resistance or alter their morphology. Results showed that leaf areas and their dry weights were significantly increased by 2 ml/l KS treatment. Moreover, flower characters as well as bulb production were significantly affected following KS treatment. Kamenidou *et al.* (2008) and Mattson and Leatherwood (2010) concluded that depending on the source and concentration of Si, improve several traits of ornamental species which may accumulate Si as a strategy for stress tolerance.

All investigated Iris plant traits were significantly affected by AA with significant differences among the concentrations. The improvements of Iris vegetative growth were coincided with enhancement of flower dry weights by 26.67%, once plants treated with 0.5 g/l AA compared to non-treated plants however, at 2 g/l these increments were lower. The promotion effect of AA on other ornamental bulbs has been observed by Afifipour and Kosh-Khui (2015) on *G. grandiflours*. The AA contributes to the synthesis of growth hormones; which might increase cell division and enlargement (Shekari and Javanmardi, 2017). In addition, they may play a vital role in plant metabolism and protein assimilation which are required for cell formation and consequently increase the fresh and dry matter.

So far, it could be concluded that the growth, flowering and bulbs production of Iris plants grown in sandy soil under the experimental condition could be significantly improved by compost addition at 4% g/g and treating the plant with the commercial AA at either 0.5 g/l or 2 ml/l of potassium silicate.

REFERENCES

Abdou, M. A. H.; Aly, M. K. & Ahmed, A. S. A. (2013): Effect of compost, biofertilization and some vitamins addition on *Gladiolus grandiflorus* J. Plant Prod., Mansoura Univ., 4: 1751-1761.

Abdou, M. A. H.; Badran, F. S.; Ahmed, E. T.; Taha, R. A. & Abdel-Mola, M. A. M. (2018): Effect of compost and some natural stimulant treatments on: I. vegetative growth and flowering aspects of (*Gladiolus grandiflorus* cv. Peter pears) plants. Scientific J. of Flowers & Ornamental Plants, 5: 105-114.

Afifipour, Z. & Kosh-Khui, M. (2015): Efficacy of spraying a mixture of amino acids on the physiological and morphological characteristics of tuberose (*Polianthes tuberosa* L.). Int. J. of Hort. Sc., 2: 199-204.

Datnoff, L.E.; Snyder, G.H. & Korndörfer, G.H., (2001): Silicon in Agriculture. Elsevier Publisher, London.

Gomez, K.A. & Gomez, A.A. (1984): Statistical Procedures for Agricultural Research (3rd ed.), John Wiley and Sons, N.Y., Singapore,680 pp.

Kamenidou, S.; Cavins, T. J. & Marek, S. (2008): Silicon supplements affect horticultural traits of greenhouse-produced ornamental sunflowers. Hort. Sci., 43: 236-239.

Kandemir, N.& Engin, A. (1998): An investigation morphologic, anatomic and ecologic on *Iris nectarifera* Güner (Iridaceae). p; 283-299. 14th Ulusal Biology Cong., 7-10 Sep., 1998. Plant Ecology and Plant Sytematic Section, Samsun.

Karim, K. B.; Kumar, N. V.; Raghupati, B. & Pal, A. K. (2017): Effect of biostimulants on growth and floral attributes of tuberose (*Polianthes tuberosa*, L.) cv. Prajwal. Int. J. Current Microbiol. & App. Sci., 6: 2557-2564.

Khanam, R.; Kundu, D. & Patra, S. (2017): Integrated nutrient management on growth, quality, yield and soil fertility of gladiolus in lower Gangetic plain of India. Int. J. of Current Microbiol. & App. Sci., 6: 453-459.

Laane, H. M. (2018): The effects of foliar sprays with different silicon compounds. Plants, 7: 45-67.

Mattson, N. S. & Leatherwood, W. R. (2010): Potassium silicate drenches increase leaf silicon content and affect morphological traits of several floriculture crops grown in a peat-based substrate. Hort. Science, 45: 43-47.

Naznin, A.; Hossain, M. M.; Ara, K. A.; Hoque, A.; Islam, M. & Hasan, T. (2015): Influence of organic amendment and biocontrol agent on yield and quality of tuberose. J. of Hort., 2: 1-8.

Neto, A. E. F.; Boldrin, K. V. F. & Mattson, N. S. (2015): Nutrition and quality in ornamental plants. Ornamental Hort., 21: 139-150.

Paulin, B. & O'Malley, P. (2008): Compost Production and Use In Horticulture. Dep.t of Agri. and Food, Western Australia, Perth. Bulletin 4746.

Phillips, I. D. J. (1971): Introduction to the Biochemistry and Physiology of Plant Grow Hormones. Mc. Growth- Hill Bock Company.

Popko, M.; Wilk, R. & Gorecki, H. (2014): New amino acid biostimulators based on protein hydrolysate of keratin. Przemysl Chemiczny, 93: 1012-1015.

Raskin, I. (1992): Role of salicylic acid in plant. Ann. Rev.of Plant. Biol., 43: 439-463.

Shekari, G., & Javanmardi, J. (2017): Effects of foliar application pure amino acid and amino acid containing fertilizer on broccoli (*Brassica oleracea* L. var. italica) transplant. Adv. Crop Sci. Tech., 5: 1-4.

Wilson, C. A. (2011): Subgeneric classification in Iris re-examined using chloroplast sequence data. Taxon., 60: 27-35.

Wu, J., & Sardo, V. (2010): Sustainable versus organic agriculture. In: Sociology, Organic Farming, Climate Change and Soil Science. p; 41–76. Lichtfouse, E., Ed., Springer, Dordrecht.

Zheljazkov, V. D. & Warman, P. R. (2004): Source-separated municipal solid waste compost application to Swiss chard and basil. J. of Environ. Quality, 33: 542-552.

تأثير الكمبوست وسيليكات البوتاسيوم والأحماض الأمينية علي نباتات الأيرس

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تم زراعة نباتات الأيرس صنف Wedgwoodفي الخامس من نوفمبر في أصص بلاستيكية قطر 20 سم مملوءة بـ 3.5 كجم تربة رملية جافة هوائياً والتي تم إمدادها بالكمبوست بمعدل صفر، 2، 4، 6٪ (وزن/وزن). تم رش النباتات 4 مرات بالمياه المقطرة (مقارنة)، خليط من الأحماض الأمينية بمعدل 0,5، 1، 2 جم/لتر أو سيليكات البوتاسيوم بمعدل 1، 2، 3 مل/لتر. كان للتسميد بالكمبوست ومعاملات الرش أثراً ايجابياً معنوياً علي صفات النمو الخضري (مساحة الورقة ووزنها الطازج والجاف) صفات الازهار (طول الشمراخ الزهري ووزنه الطازج والجاف ووزن الزهرة الطازج والجاف) بالإضافة الي وزن البصلة الأم والأبصال الجديدة . وعموما ، معظم هذه الصفات انخفضت عند 6٪ كمبوست مقارنة بنسبة 4٪. ولوحظ ان الأحماض الأمينية عند 0.5 جم كانت أكثر فعالية من التركيزات الأخرى وايضا 2 مل من سيليكات البوتاسيوم كان ملحوظا عن التركيزات الأخرى. وبذلك يمكن التوصية بأن إمداد التربة الرملية بالكمبوست بمعدل 4٪ ومعاملة النباتات بـ 0.5 جم/لتر من الأحماض الأمينية أو 2 مل/لتر من سيليكات البوتاسيوم لتحسين صفات النمو الخضري والزهري وانتاج الأبصال لنباتات الأيرس .