Effect of Foliar Application of Potassium Silicate and Amino Acids on Growth, Yield and Fruit Quality of 'keitte' Mango Trees

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ABSTRACT: This study was carried out during the two successive seasons 2016 and 2017 on seven years old 'keitte' mango trees (*mangifera indica L.*) budded on succary rootstock, grown in a sandy soil under drip irrigation system in a private orchard located at El-Shagaa Village El-Nubaria, Beheira Governorate, Egypt. The aim of this research was to investigate the effect of foliar application of potassium silicate at (5, 10 and15 cm^3/l) and amino acids at (2.5, 5 and 7.5 cm^3/l) single or mixed on growth, yield and fruit quality of 'keitte' mango trees at two application time; the first application time was taken place at beginning growth season in march, while the second application was after fruit set. The experimental design was randomized complete block design with four replicates. Results indicated that foliar application of potassium silicate and amino acids significantly increased vegetative growth of 'keitte' mango by 15 cm^3/l potassium silicate plus 7.5 cm^3/l amino acids was increased vegetative growth as shoot length and shoot thickens and number of leaves/shoot but leaf area increased by spring 5 cm^3/l potassium silicate plus 5 cm^3/l amino acids. on the other hand potassium silicate at 15 cm^3/l plus amino acids at 7.5 cm^3/l treatment, significantly increased fruit weight, yield kg/ tree and total yield (ton/feddan). However, foliar application of amino acids at 10 cm^3 /l treatment significantly increased fruit length (cm). Amino acids at 7.5 cm^3/l treatment significantly increased fruit length/ diameter ratio as compared with control. Foliar application of potassium silicate at 10 cm^3/l + amino acids at 7.5 cm^3/l treatment was increased total soluble solids at the second season but decreased fruit juice acidity (%) as compared with the control. Moreover, spraying 'keitte' mango trees potassium silicate at 10 cm^3/l plus amino acids at 7.5 cm^3/l treatment increased vitamin C on fruit juice at both season.

Key words: 'keitte' mango, potassium silicate, amino acids, growth, yield, fruit quality,

INTRODUCTION

Keitte mango (*mangifera indIca L.*) is one of the most important tropical fruit crops grown in Egypt. Mango quality depends strongly on orchard management, such as foliar application of potassium silicate and amino acids single or mixed is being studied on many fruit crops as a way to increase vegetative growth, number of fruit /per tree, fruit length, width and yield. Several studies have, also, been reported using the foliar application of potassium silicate and amino acids single or mixed for improving leaf photosynthetic rate, fruit quality and yield (Khan *et al*, 2012; Abd El-Rahman, 2015 and Amr and Alaa, 2017)

Potassium silicate and amino acids are known to play important roles in membrane structure and biosynthesis spraying of 'keitte' mango trees growing. Foliar application of potassium silicate once, twice or thrice at 0.05 to 0.2% was accompanied with enhancing all growth characters, leaf pigments, initial fruit setting %, fruit retention %, yield and fruit quality rather than no application.

Carrying out two sprays of 0.1% potassium silicate at growth start and just after fruit setting was responsible for improving yield and fruit quality of 'Keitte' mango trees (Abd El-Rahman, 2015).

Yield decline is suggested to be a major problem that faces 'Keitte' mango trees grown under Egypt conditions. The great reduction of panicles and the highest dropping of fruits and flowers due to the unsuitable environmental conditions are considered the main reasons for yield decline. Recently, public health and environmental safety encouraged the use of plant extract as a complete replacement of chemicals for improving the production of fruit crops (Ahmed *et al*., 2014).

Poor cropping is considered to be a serious and major problem that faces 'Keitte' mango growers in Egypt. There are many factors responsible for lowering yield such as unsuitable environmental conditions. Fruiting in such mango is obviously affected by various biotic and abiotic stresses. Various studies showed that using silicon was beneficial for counteracting the adverse effects of water stress on vegetative growth, yield and fruit quality of the plants (Epstein, 1999; Matichenkov *et al.,* 2000; Norrie *et al*., 2002). It is also shown that silicon increases drought tolerance in plants by maintaining plant water balance, photosynthesis activity, and erectness of leaves and structure of xylem vessels under higher transpiration rates. Also, it is responsible for encouraging water transport and root growth under unfavorable conditions and antioxidants defense system (Neumann and Zur- Nieden, 2011).

Plant growth and development are greatly affected by various biotic and abiotic stress factors. Detection of compounds of reducing these stresses is of great important. Previous studies emphasized the beneficial effects of salicylic acid in reducing abiotic stress sensitivity in plants. It was also, shown to influence a number of physiological processes including flowering, ion uptake and transport, photosynthesis rate and stomatal conductance (Elade, 1992; Raskin, 1992; Lee *et al*., 1995; Rao *et al.,* 2000; Shah, 2003; Harvath *et al*., 2007 and Szepesi *et al*., 2009).

The importance of amino acids for the plant is connected to the primary and secondary metabolism. They synthesize many important compounds for the fruit quality and production. The balance of the phenolic compounds is very important for the composition of the fruit, like the mango. The anthocyanin, the main pigment for fruit coloring is produced from the phenylalanine amino acid. The asparagine amino acid and glutamate connect the two important metabolic cycles of the plant, the carbon and nitrogen cycles, and they have an influence both on sugars and proteins. The glycine is an amino acid that inhibits the apparent photorespiration done by C^3 plants like the mango trees, it fosters the photosynthesis efficiency with a higher sugar content and yield (Taiz and Zeiger, 2002).

The aim of this research was to investigate the effect of foliar application of potassium silicate at (5, 10 and15 cm^3 / l) and amino acids at (2.5, 5 and 7.5 cm^3 / l) single or mixed on growth, yield and fruit quality of 'keitte' mango trees.

MATERIALS AND METHODS

This study was carried out during the two successive seasons 2016 and 2017 on seven years old "keitte"mango trees (*mangifera indIca L.*) budded on succary rootstock, planted at 3 x 4 meters apart (350 tree/feddan) grown in a sandy soil under drip irrigation system in a private orchard located at El-Shagaa Village El-Nubaria, Beheira governorate, Egypt. The physiochemical analysis of experimental soil was indicated in (Table 1).

Table (1). Physical and chemical analysis of experimental soil

Depth (cm)	Texture	pH	EC dS/m	$CaCo_3$ (%)	Soluble anions (mg / l)				Soluble anions (mg / l)		
					Ca^{++}	Mg^{++}	K^+	Na^+	Hco^-_3	Cl^-	$So^=_4$
0-30	Sandy loam	7.73	1.64	5.65	2.30	1.70	3.78	0.45	3.22	4.80	5.20
30-60	Sandy loam	7.67	1.59	6.42	2.15	1.30	3.54	0.40	3.02	4.35	5.63

Sixty four uniform trees more or less were selected for this study and all of them were subjected to the same cultural practices during both successive seasons. The treatments were as follows:

T1: Spraying with amino acid at 2.5 cm^3 /l.
T2: Spraying with amino acid at 5 cm^3 /l.
T3: Spraying with amino acid at 7.5 cm^3 /l.
T4: Spraying with potassium silicate at 5 cm^3 /l.
T5: Spraying with potassium silicate at 10 cm^3 /l.
T6: Spraying with potassium silicate at 15 cm^3 /l.
T7: Spraying with potassium silicate at 5 cm^3 /l + amino acid at 2.5 cm^3 /l.
T8: Spraying with potassium silicate at 5 cm^3 /l + amino acid at 5.0 cm^3 /l.
T9: Spraying with potassium silicate at 5 cm^3 /l + amino acid at 7.5 cm^3 /l.
T10: Spraying with potassium silicate at 10 cm^3 /l + amino acid at 2.5 cm^3 /l.
T11: Spraying with potassium silicate at 10 cm^3 /l + amino acid at 5.0 cm^3 /l.
T12: Spraying with potassium silicate at 10 cm^3 /l + amino acid at 7.5 cm^3 /l.
T13: Spraying with potassium silicate at 15 cm^3 /l + amino acid at 2.5 cm^3 /l.
T14: Spraying with potassium silicate at 15 cm^3 /l + amino acid at 5.0 cm^3 /l.
T15: Spraying with potassium silicate at 15 cm^3 /l + amino acid at 7.5 cm^3 /l.
T16: Control.

Foliar application potassium silicate and amino acids single or mixed treatments, potassium silicate concentration (5, 10 and15 cm^3 /l) amino acids concentration (2.5, 5,and 7.5 cm^3 /l), single or mixed was applied 5 litter/tree two times at season intervals starting from the first March, on growth, while the second application was after fruit set in the same season.

The previous treatments were applied and arranged in a randomized complete block design. Each treatment included four replicates with one tree for each replicate. The effect of the previous treatments was investigated via evaluating their influence on the following parameters:

1. Vegetative growth:

At the end of growing seasons, the selected shoots were measured for the average of number of leaves per shoot, shoot length (cm) was measured by using hand caliber; the thickness (cm) of the shoot was measured with the help of vernier caliper and leaf area according to this formula, leaf area (cm^2) = 0.70 (length of leaf × width of leaf) – 1.06 (Ahmed and Morsy, 1999).

2. Yield:

The fruit yield on each replicate resulting from the applied treatments were expressed as number of fruits per tree and weight of fruits as kg per tree which was attained at harvest stage. This was determined 120-130 days after flowering in both seasons of the study. Also, yield produced as ton/feddan was expressed by multiplying the weight of fruits/tree x number of trees / feddan.

3. Fruit physical parameters:

At the end of growing seasons, the selected fruits were measured for the average of fruit length (cm), fruit diameter (cm) using hand caliber, fruit shape index (L/D) calculated mathematically as a ratio and volume of fruit (cm^3) was estimated by water displacement method.

4. Fruit quality:

Samples of 5 fruits per tree from each replicate was collected randomly at 20^{th} August during both seasons, and then transferred quickly to the laboratory to determine chemical fruit characteristics as the following parameters: Total soluble solids of fruit juice (TSS %) using hand refractometer according to (Chen and Mellenthin, 1981). Total acidity was determined in fruit juice according to (AOAC, 1985) using titration with 0.1N sodium hydroxide. Acidity was expressed as a percent of citric acid in fruit juice. Vitamin C (Ascorbic acid) was determined in the juice by titration with 2, 6 dichlorophenol-indo-phenol (AOAC, 1985) and calculated as mg /100 ml of juice.

5. Statistical analysis:

Data of the measured parameters were subjected to computerized statistical analysis using COSTAT package for analysis of variance (ANOVA) and means of treatments were compared using LSD at 0.05 level of possibility according to (Snedecor and Cochran, 1980).

RESULTS AND DISCUSSION

Effect of foliar application of potassium silicate and amino acids single or mixed treatments on growth, yield and fruit quality of 'kiette' mango trees are presented in Tables (2-5).

1. Vegetative growth characters:

The results concerning the effect of foliar application with potassium silicate and amino acids, single or mixed treatments, on number of leaves per shoot, shoot length, shoot thickness and leaf area of "keitte" mango trees during both seasons 2016 and 2017 are listed in Table (2). The average values of both experimental seasons indicated that all treatments significantly ($P \leq 0.05$) increased shoot length and shoot thickness as compared with control. While, no significant differences were recorded among foliar applications treatments during both seasons. Leaf area for potassium silicate was higher than control while, amino acids single or potassium silicate single was lowest than control. Generally, foliar application potassium silicate and amino acids single or mixed at the trees; brought about the highest increment in number of leaves per shoot (53.01 and 54.66), shoot length (39.71 and 39.31cm), shoot thickness (1.43 and 1.53 cm) and leaf area (3.69 and 3.74 cm^2), respectively, as compared with control treatment (37.01 and 38.01number of leaves per shoot), (30.71 and 31.36 cm shoot length), (0.76 and 0.73 cm shoot thickness), (3.50 and 3.43 cm^2 leaf area), consecutively during both 2016 and 2017 seasons. Generally, foliar application of potassium silicate and amino acid single or mixed of the trees gave the highest increment in shoot length between treatments, the lowest value in shoot length as T3, T6 and T1 compared the control treatments in both seasons. The above results of foliar application of potassium silicate were supported by the findings of (Abd El-Rahman, 2015) on "Keitte " mango trees (Abdel Gawad, 2017) on 'Hindi Khasa' mango trees; and (El-Gioushy, 2016) on Orange trees; they all found that foliar application of potassium silicate treatments, significantly increased vegetative growth characters as compared with the control. This increase was found that the uptake of nitrogen, potassium, phosphorus and zinc was substantially higher in plants sprayed with silicon (Satisha *et al.,* 2017). On the other hand, the same trends of these results of amino acid (Wassel *et al*., 2015) on 'wonderful' pomegranate trees. El-Kosary *et al. (*2011) on some mango cultivars found that amino acid treatment, significantly increased number of growth cycle comparing with other treatments. Abd El-Gawad *et al*. (2017) found that foliar application of potassium silicate on potato was enhancing all growth characters, leaf area rather than no application.

2. Fruit yield parameters:

The effect of various applied treatments on fruit yield parameters as number of fruits/tree, fruit weight, yield per kg/tree and yield per ton/ feddan of 'keitte' mango trees was calculated and tabulated in Table (3). The results indicated that all treatments significantly ($P \leq 0.05$) increased number of fruits/tree, fruit weight, yield per tree and yield per feddan compared with control treatment during both 2016 and 2017 seasons, while no significant differences were recorded between foliar applications of single treatments compared with control treatment during both seasons. Also, foliar application of potassium silicate at 15 cm^3/l and amino acids at 7.5 cm^3 /l increased all fruit yield parameters, the result indicated that increase of fruit yield parameters were number of fruits/tree (21.7 and 20.7), fruit weight (850 and 934 g), yield per tree (18.4 and 19.3 kg) and yield per feddan (9.2 and 9.2 ton), respectively, as compared with control treatment consecutively during both 2016 and 2017 seasons. These results of potassium silicate are in line with findings of (Norrie *et al.*, (2002) on grape; Gad El-Kareem *et al.* (2014) on 'Zaghloul' date palms trees; Costa *et al.* (2015) on ‘Palmer’ mango trees; El-Hosieny (2015) on mango trees; who indicated that salicylic acid improved yield quantitively, qualitatively and significantly enhancing the yield. These results of amino acid are in harmony with findings of Belel *et al.* (2016) on 'Flame seedless' grapevines; Khattab *et al.* (2016) on 'Ewais' and 'Fagry Kelan' mango trees and Amr and Alaa (2017) on 'Keitte ' mango trees. They are found that the amino acid increased the fruit yield parameters.

3. Fruit physical parameter:

It is clear from the result in Table (4) that foliar application of potassium silicate and amino acids single or mixed on fruit physical parameter of 'Keitte' mango trees. The results indicated that all treatments, significantly ($P \leq 0.05$) increased of fruit physical parameter as compared to the control treatment plants. A gradual increase fruit physical parameter was observed with foliar application of potassium silicate15 cm^3/l + amino acid 7.5cm^3/l on fruit length (14 and19.1cm), fruit volume (967.3 and 997.3 cm^3) at both season and fruit diameter (11.2 cm) at the first season. Followed by trees treated with foliar application of potassium silicate15 cm^3/l + amino acid 2.5cm^3/l on fruit shape (l/d ratio) (1.64 and1.76) at both season and fruit diameter (9.81 cm) at the second season. The above results of foliar application of potassium silicate were supported by the findings of (Abd El-Rahman, 2015) on ''Keitte '' mango trees; Abdel Gawad (2017) on 'Hindi Khasa' mango trees; and El-Gioushy (2016) on orange trees; they all found that foliar application of potassium silicate treatments significantly increased fruit physical parameter as compared with the control. This increase was found that the uptake of nitrogen, potassium, phosphorus and zinc was substantially higher in plants sprayed with silicon (Satisha *et al.*, 2017). On the other hand, the same trends of these results of amino acid (Taiz and Zeiger, 2002) on grapes; (Abd El-Razek and Saleh, 2012) on 'Florida Prince' peach trees; (Khattab *et al.,* 2016) on 'Fagry Kelan' mango trees who found that amino acid treatment significantly increased fruit physical parameter as compared with control. These effects strengthened the role of the applied amino acids in the metabolism of plants. also, help in the nutrient transport and as reserve of nitrogen, besides being important in the pollination and fruit set, inhibits the precocious flower and fruit fall and it is important in the process of production of enzyme that catalysis synthesis reaction, important for the synthesis, synthesize many important compounds for the fruit quality and production. And the other hand they The balance of the phenolic compounds is very important for the composition of the fruit, like the mango and two important metabolic cycles of the plant, the carbon and nitrogen cycles, and they have an influence both on sugars and proteins (Taiz and Zeiger, 2002).

4. Fruit quality parameters:

The results given in Table (5) represent the effect of foliar application of potassium silicate and amino acids single or mixed treatments, on T.S.S, acidity and vitamin C in fruit juice of 'keitte' mango trees. The results indicated that all treatments significantly ($P \leq 0.05$) increased T.S.S and vitamin C, but decrease acidity as compared with control treatment during both 2016 and 2017 seasons, while no significant differences were recorded between foliar application of single treatments and control treatment during both seasons. Also, foliar application of potassium silicate at 15 cm3/l and amino acids at 7.5 cm^3 /l increased Vitamin C at both season, but foliar application of potassium silicate at 15 cm^3/l and amino acids at 5 cm^3 /l increased T.S.S at the first season 2016 foliar application of potassium silicate at 10 cm^3/l and amino acids at 7.5 cm^3 /l increased T.S.S at the second season and decreased acidity at the both seasons. These results of potassium silicate are The above results of foliar application of potassium silicate were supported by the findings of (Ahmed *et al.,* 2013a and b) on 'Hindy Bisinnara' mango trees, (Faissal *et al.,* 2014) on 'Keitte ' mango trees, thy found that foliar application of potassium silicate was increase T.S.S percentage, vitamin C in fruit juice and decrease fruit juice acidity. On the other hand, the results of foliar application of amino acid are harmony with findings of (Taiz and Zeiger, 2002) on grapes, (Rahdari *et al.,* 2012) on pistachio, and (Morales, 2015) on mango trees, thy found that foliar application of amino acids was increase T.S.S (%), vitamin C in fruit juice and decrease fruit juice acidity.

Table (2). Average values of vegetative growth parameters of 'keitte' mango trees as affected by foliar application of potassium silicate and amino acids treatments during 2016 and 2017 seasons

Treatments	No. of leaves/shoot		Leaf area (cm^2)		Shoot length (cm)		Shoot thickness (cm)	
	2016	2017	2016	2017	2016	2017	2016	2017
T1	42.33	43.01	138.59	142.96	29.61	29.13	0.86	0.83
T2	43.66e	44.01	137.11	146.32	27.33	27.56	0.93	0.91
T3	43.66	43.01	116.91	125.26	25.66	26.26	0.81	0.73
T4	47.01	46.01	167.47	155.47	28.63	28.96	1.16	1.13
T5	45.66	44.66	151.25	163.17	29.91	28.43	0.71	0.71
T6	45.33	45.33	119.57	129.99	35.43	34.26	0.81	1.16
T7	44.66	44.33	142.84	148.88	34.41	35.11	0.81	0.81
T8	42.01	43.33	138.67	143.42	33.81	33.73	0.66	0.53
T9	41.66	45.33	144.79	154.64	35.86	35.16	1.01	1.16
T10	45.33	46.33	137.71	150.66	36.71	36.63	0.71	0.71
T11	43.66	45.01	151.87	159.05	36.81	37.61	0.61	0.51
T12	45.33	44.33	147.09	146.11g	34.61	36.91	0.76	0.73
T13	48.01	46.01	192.03	197.41	36.66	38.56	1.23	1.31
T14	50.33	47.66	203.58	210.88	37.73	37.83	1.16	1.26
T15	53.01	54.66	240.33	250.657	39.71	39.31	1.43	1.53
control	37.01	38.01	130.95	137.49	30.73	31.36	0.76	0.73
$LSD_{0.05}$	2.69	3.21	9.67	7.20	0.85	0.63	0.18	0.14

Table (3). Average values of yield parameters of 'keitte' mango trees as affected by foliar application of potassium silicate and amino acids treatments during 2016 and 2017 seasons

Treatments	Number of fruits/tree		Fruit weight (g)		Yield (kg/tree)		Yield (ton/fedan)	
	2016	2017	2016	2017	2016	2017	2016	2017
T1	16.30	16.30	656.60	708.00	10.70	11.60	5.30	5.60
T2	12.30	17.00	658.70	693.30	8.10	11.70	4.10	5.80
T3	17.00	16.00	705.30	768.70	11.90	12.20	5.90	6.10
T4	15.00	16.00	755.00	833.30	11.30	13.20	5.60	6.50
T5	14.30	15.60	684.70	803.00	9.90	12.60	4.90	6.50
T6	20.70	15.60	6830	735.70	14.10	11.50	7.10	5.90
T7	13.70	15.00	7370	864.30	10.10	12.90	5.10	6.50
T8	17.70	17.30	764.00	822.00	13.50	14.20	6.70	6.90
T9	17.70	13.00	757.70	828.70	13.50	10.80	6.70	5.60
T10	18.30	14.70	786.30	829.70	14.30	12.20	7.20	5.80
T11	15.70	16.70	660.00	683.30	10.40	11.40	5.20	5.80
T12	17.00	13.30	832.00	918.60	14.10	12.30	7.10	5.90
T13	13.70	13.30	680.30	778.70	9.90	10.40	4.70	5.50
T14	14.70	15.60	746.30	764.00	10.90	11.90	5.50	6.20
T15	21.70	20.70	850.00	934.00	18.40	19.30	9.20	9.20
control	13.00	13.00	697.70	685.70	9.10	8.90	4.50	6.30
$LSD_{0.05}$	3.40	2.40	54.90	52.80	2.60	1.60	1.30	1.60

Table (4). Average values of fruit physical parameters of 'keitte' mango trees as affected by foliar application of potassium silicate and amino acids treatments during 2016 and 2017 seasons

Treatments	Fruit length (cm)		fruit diameter (cm)		Fruit shape (L/D ratio)		Fruit volume (cm^3)	
	2016	2017	2016	2017	2016	2017	2016	2017
T1	13.50	13.70	9.10	8.61	1.41	1.40	682.30	683.30
T2	11.60	13.10	8.90	8.71	1.41	1.54	647.00	652.70
T3	12.90	13.30	8.90	9.11	1.40	1.46	681.30	669.70
T4	13.70	13.90	9.30	8.41	1.41	1.67	577.00	614.00
T5	12.00	12.2	8.70	8.91	1.29	1.55	637.70	655.00
T6	13.70	13.90	7.40	9.11	1.58	1.71	525.30	560.00
T7	13.80	14.00	8.90	8.61	1.45	1.46	663.00	728.30
T8	12.90	13.10	8.50	8.52	1.45	1.69	684.00	715.30
T9	12.50	12.70	7.40	9.13	1.57	1.59	653.70	673.00
T10	13.20	13.40	8.60	8.51	1.54	1.60	767.30	831.00
T11	12.60	12.80	8.9	8.62	1.34	1.48	866.30	850.00
T12	12.90	13.20	10.20	9.33	1.35	1.42	938.30	976.70
T13	13.90	14.30	9.70	9.81	1.64	1.75	751.00	791.30
T14	13.90	14.30	9.70	9.12	0.99	1.45	798.30	959.30
T15	14.00	19.10	11.20	8.53	1.33	1.39	967.30	997.30
T16	13.00	13.20	8.70	8.82	1.47	1.46	635.00	632.30
$LSD_{0.05}$	0.56	1.26	0.39	1.32	0.11	0.27	40.07	32.12

Table (5). Average values of fruit quality parameters of 'keitte' mango trees as affected by foliar application of potassium silicate and amino acids treatments during 2016 and 2017 seasons

Treatments	T.S.S (%)		Acidity (%)		Vitamin C (mg/100ml juice)	
	2016	2017	2016	2016	2016	2017
T1	21.00	19.30	0.53	0.45	42.23	43.26
T2	21.70	19.70	0.58	0.54	42.20	42.40
T3	18.70	18.30	0.49	0.45	41.90	43.23
T4	18.70	19.00	0.46	0.46	43.23	44.50
T5	21.30	18.00	0.55	0.57	47.46	47.43
T6	21.30	21.00	0.48	0.46	46.30	46.43
T7	22.70	16.30	0.56	0.55	42.70	43.56
T8	22.00	20.00	0.47	0.45	46.63	46.66
T9	17.30	19.30	0.63	0.55	45.03	44.73
T10	21.30	20.70	0.68	0.53	47.93	48.03
T11	23.00	20.30	0.64	0.64	49.06	48.90
T12	22.00	24.30	0.72	0.74	46.63	46.76
T13	21.00	20.00	0.68	0.63	48.13	47.93
T14	24.30	22.70	0.64	0.64	48.56	48.66
T15	23.30	23.00	0.53	0.54	50.33	49.93
T16	17.00	17.70	0.76	0.77	46.03	43.70
$LSD_{0.05}$	1.79	1.73	0.03	0.05	1.38	1.18

CONCLUSION

This study led to conclude that foliar application of potassium silicate and amino acids the affected on total yield. Moreover, yields potassium silicate plus amino acids was greater than the other treatments Single. Potassium silicate with amino acids was affected of all characters under this study especially Potassium silicate concentrate at 15 cm^3/l with amino acids concentrate at 7.5 cm^3/l ($P \leq 0.05$) increased shoot length (cm), shoot thickness (cm), Leaf area ($cm^{3)}$, fruit length (cm), fruit weight (g), fruit volume (cm^3), total soluble solids(%), and vitamin C (mg/100ml juice) in both seasons.

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الملخص العربي

دراسة تأثير الرش الورقي بسيليكات البوتاسيوم والاحماض الامينية على النمو والمحصول وجودة ثمار المانجو صنف كيت

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أجريت هذه الدراسة خلال موسمى ٢٠١٦ و ٢٠١٧ على أشجار المانجو صنف''كيت'' مطعومة على أصل مانجو سكري عمرها سبع سنوات منزرعة فى تربة رملية تروى بنظام الرى بالتنقيط بمزرعة خاصة فى قرية الشجاعة منطقة النوبارية بمحافظة البحيرة – مصر بهدف دراسة تأثير الرش الورقي بسيليكات البوتاسيوم بتركيز (٥، ١٠، ١٥سم^{٣}/لتر) والأحماض الأمينية بتركيز (٢,٥، ٥، ٧,٥ سم^{٣}/لتر) منفردة او مجتمعين معا على النمو الخضرى والصفات الفيزيائية للثمار وكميه المحصول وجودة الثمار فى ميعادين الأول فى شهر مارس مع بداية موسم النمو والثاني بعد العقد مباشرة. وكان التصميم الإحصائى المستخدم هو القطاعات العشوائية الكاملة وقد أظهرت النتائج وجود فروق معنوية لكل المعاملات مقارنة بمعاملة الكنترول وأن معاملة الرش باستخدام سيليكات البوتاسيوم مع الاحماض الامينية أظهرت فروق معنوية عن معاملة أحدهما منفردا، ولقد أدت المعاملات الى زيادة معنوية فى النمو الخضرى مثل (عدد الاوراق لكل فرع–طول وسمك الفرع– والمساحة الورقية) ومن ناحية أخرى فإن رش اشجار المانجو بسيليكات البوتاسيوم بتركيز ١٥ سم^{٣}/ لتر مع الاحماض الامينية بتركيز ٧,٥ سم^{٣}/لتر ادى الى زيادة معنوية فى وزن الثمار والمحصول (كجم/شجرة) والمحصول الكلى (طن/الفدان) وكذلك الصفات الفيزيائية للثمار مثل طول وقطر وحجم وشكل الثمرة. كما ان الرش الورقى لسيليكات البوتاسيوم بتركيز ١٠سم^{٣}/لتر+ الاحماض الامينية بتركيز٧.٥ سم^{٣}/لتر ادت الى زيادة معنوية فى صفات جودة الثمار مثل نسبة المواد الصلبة الذائبة الكلية فى الموسم الثانى وانخفاض فى نسبة حموضة العصير مقارنة بمعاملة الكنترول. بالإضافة الى ذلك وجد ان رش اشجار المانجو صنف الكيت سيليكات بوتاسيوم بتركيز ١٥سم^{٣}/لتر + الاحماض الامينية بتركيز ٧.٥ سم^{٣}/لتر ادت الى زيادة معنوية فى محتوى عصير الثمرة من فيتامين ج خلال موسمي الدراسة.