Effect of Spraying Potassium Silicate on Productivity and Nutritional Status of Sadek and Zebda Mango CVs Grown Under Newly Reclaimed Soil in Aswan, Egypt

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Abstract: During 2017 and 2018 seasons, mango CVs. Sadek and Zebda were treated with potassium silicate one, twice or thrice at 0.0 to 0.4%. One spray was carried out at the last week of Feb. Two sprays were conducted at last week of Feb. and Last week of Mar. Three sprays were conducted on the last week of Feb. and one month intervals. The merit was adjusting the best concentrations and frequencies of application of potassium silicate (25% Si + 10% K_2O) responsible for improving fruiting in such CVs. Using K- silicate once, twice or thrice, at 0.1 to 0.4% materially was accompanied with improving growth, photosynthetic pigments, nutrient, yield and fruit quality characteristics relative to the control. Increasing concentrations of K. silicate from, 0.2 to 0.4% and frequencies of application from twice to thrice had no considerable promotion on aforementioned parameters. Mango cv. Sadek recorded higher values of all the investigated parameters than other cv. namely Zebda. For promoting, yield and fruit quality of Sadek and Zebda mango cvs, it is suggested to spray the trees twice with K- silicate at 0.2%. Planting Sadek mango cv was preferable than cultivating mango cv Zebda under upper Egypt conditions according to its higher yield and better fruit quality.

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1. Introduction

Abiotic stress caused by higher temporarily on mango cvs Sadek and Zebda grown under Aswan environmental conditions resulted in poor yield and uneven colourations. Many efforts were done for findings out the recent and – non – traditional horticultural practices. These practices were the application of silicon as an essential antioxidant required for the trees grown under unfavourable environmental conditions.

Silicon, (Si) the second most abundant element in the earth crust, has not yet received the title of essential nutrient for higher plants, as its role in plant biology is poorly understood (**Epstein, 1999).**

However, various studies have demonstrated that Si application increased and enhanced plant growth considerably **(Alvarez and Datnoff, 2001)**.

Beneficial effects of Si are more prominent when plants were subjected to title le stresses including biotic and abiotic stresses **(Aziz *et al.*, 2002; Rodrigues *et al.*, 2003; Ma, 2004 and Tahir, *et al.*, 2006).** Silicon is also known to increase drought tolerance in plants by maintaining plant water balance, photosynthetic activity, erectness of leaves and structure of xylem vessels under high transpiration rates (**Melo *et al.*, 2003 and Hattori *et al.*, 2005**). Silicon is responsible for improving water economy (**Gang *et al.*, 2003**) and leaf water potential under water stress conditions (**Matoh *et al.*, 1991**). The previous authors suggested that a silicon cuticle double layer formed on leaf epidermal tissue is responsible for this higher water potential. The results of **Lux *et al.*, (2003)** and **Hattori *et al.*, (2005)** suggested that Si plays an important role in water transport and root growth under drought conditions. **Bowen *et al*, (1992)** stated that Si inhibits powder mildew in grapes.

Sauvas *et al.*, (2002) stated that the favorable effects of silicon on crops seem to originate from reinforcement of the cell walls due to deposition of Si in form of silica morphous ($SO_2.H_2O$). The mechanical strength provided by Si to the plant fungi, tissues increases their resistance to several bacterial, 471, insects and diseases and decreased the occurrence of the physiological disorders. Si was implicated to ameliorate the adverse effects of aluminum, manganese and salinity toxicity.

Silicon was found by many authors to reduce the severity of powders mildew disease on fruit crops (**Reynolds *et al.*, 1996 and Yildirim *et al.*, 2002**). This is attributed to its acts as a physiological barrier in cell walls preventing the penetration of fungal hypha into host tissues.

Treating different mango cvs with silicon, (**Gad El Kareem, 2012; Abdelaal and Oraby-Mona, 2013; Ashour, 2013, Ahmed *et al.*, 2013b; Wassel *et al.*, 2015; Abd El- Wahab, 2015, Mohamed *et al.*, 2015 and El-Sayed *et al.*, 2016**) had an obvious promotion on yield and fruit quality. Previous studies showed that treating date palm cvs (**Ahmed *et al.*, 2013; Omar, 2015; Gad El- Kareem *et al.*, 2014; Youssef, 2017 and Fawaz- Doaa, 2018**) and citrus (**Ibrahim and Al- Wasfy, 2014; El- Khawaga and Mansour, 2014 and El- Giuoshy, 2016**) resulted in increasing the yield and the effect of silicone on fruiting was varied according to varietal and climatic differences (**Baita *et al.*, 2010; Abou- Rayya *et al.*, 2012 and Fahmy 2016 and 2018**).

The target of this study was examining the effect of different concentrations and frequencies of potassium silicate application on growth characteristics, vine nutritional status, yield and fruit quality of mango cvs Sadek and Zebda grown under Upper Egypt conditions.

2. Materials and Methods

This study was carried out during 2017 and 2018 seasons on thirty 9- years old Sadek and the same number of 9- years old Zebda mango trees both onto Succary mango rootstock. The trees of both mango cvs are grown in a private mango orchard located at Wady El- Nokra, Aswan Governorate. The uniform in vigour Sadek and Zebda mango trees (30 trees for each cv.) were planted at 5x6 meters apart. The soil texture of the tested orchard is sandy-loam and well drained with a water table depth not less two meters. Surface irrigation system was followed using Nile water.

Soil analysis was done according to the procedures that outlined by **Chapman and Pratt (1965)** and the obtained data are shown in Table (1).

Table (1): Analysis of the tested soil

Constituents	Values
Sand %	74.9
Silt %	10.1
Clay %	15.0
Texture	Sandy loam
CaCO3 %	2.01
pH (1: 2.5 extract)	7.8
O.M. %	0.31
Total N %	0.08
P (Olsen, ppm)	1.9
K (ammonium acetate, ppm)	195

The selected trees of both mango cvs received the usual and common agricultural and horticultural practices that already applied in the orchard except those dealing with the application of any silicon compounds.

The experiment included two factors (A & B). the first factor (A) occupied the two mango cvs a_1) Sadek and a_2) Zebda. The second factor (B) ranked the following ten treatments from different concentrations and frequencies of silicon application.

1- Control. (sprayed with water trees)
2- Spraying K silicate at 0.1% once at the last week of Feb. (1 g/L)
3- Spraying K silicate at 0.1% twice at the last week of Feb. (1 g /L). and again at one month later.
4- Spraying K silicate at 0.1% thrice at the last week of Feb. (1 g/L) and at one month interval.
5- Spraying K silicate at 0.2% once at the last week of Feb. (2 g/L)
6- Spraying K silicate at 0.2% twice at the last week of Feb. 2 g /L)
7- Spraying K silicate at 0.2% thrice at the last week of Feb. (2g/L)
8- Spraying K silicate at 0.4% once at the last week of Feb. (4g/L)
9- Spraying K silicate at 0.4% twice at the last week of Feb. (4g/L)
10- Spraying K silicate at 0.4% thrice at the last week of Feb. (4g /L)

Each treatment was replicated there times, one tree per each. Spraying of K- silicate (25% Si and 10% K_2O) was done using triton B as a wetting agent till runoff.

Randomized complete block design (RCBD) in split pot arrangement was followed where the two mango cvs and the ten silicon treatments occupied the main and sub plots, respectively.

During both seasons, the following measurements were recorded:

1- Vegetative growth aspects namely length and thickness of shoot (cm); leaf area (cm^2) (**Ahmed and Morsy, 1999**) and number of leaves/ shoot in the Spring growth cycle.
2- Photosynthetic pigments namely chlorophylls a & b, total chlorophylls and total carotenoids (mg/ g F.W. (according to **Von Wettstein, 1957 and Hiscox and Isralstam, 1979**).
3- Percentages of N, P, K, Mg and Ca and the leaf content of Mn, Fe, Zn (as ppm) in the leaves taken from non fruiting shoots (**Summer, 1985**) were determined according to the procedures of (**Peach and Tracey, 1968; Cottenie *et al.*, 1962 and Carter, 1993**).
4- Number of fruits/tree and yield / tree (kg) at harvesting date.
5- Physical and chemical characteristics of the fruits namely percentages of fruit flesh and seed weight, weight (g.), height diameter and thickness (cm) of fruit, percentages of T.S.S. total sugars and total acidity (as citric acid / 100 ml / juice) and vitamin C (as mg/ 100 ml juice) (**Lane and Eynon, 1965 and A.O.A.C., 1995**).

Statistical analysis was done using the procedure of **Mead *et al.*, (1993)**. Treatment means were compared using New L.S.D. at 5%.

3. Results and Discussion

1- Vegetative growth aspects:

Data in Tables (2 & 3) clearly show that planting Sadek mango cv was significantly superior than the other mango cv. Zebda in stimulating the four growth aspects namely length and thickness of shoot, leaf area and number of leaves /shoot during both seasons.

Treating both mango cvs with K- silicate once, twice or thrice at 0.1 to 0.4 significantly stimulated all growth aspects relative to the control. The promotion was related to the increase in concentrations and frequencies of application of K-silicate. Increasing number of sprays from twice to thrice and concentrations from 0.2 to 0.4 % had no significant promotion on the investigated parameters.

Treating Sadek mango trees three times with K-silicate at 0.4% gave the maximum values. The untreated Zebda mango trees produced the minimum values. These results were true during both seasons.

2- Photosynthetic pigments and nutrients:

Data in Tables (4 to 9) obviously reveal that mango cv. Sadek recorded the highest values of chlorophylls a & b, total chlorophylls, total carotenoids, N, P, K, Mg, Ca, Fe, Mn and Zn than the other mango cv Zebda. Significant differences were observed among the two mango cv on these pigments and nutrients. These results were true during both seasons.

Subjecting both mango cvs with K- silicate once, twice, thrice at 0.1 to 0.4 % had significant enhancement on all photosynthetic pigments and nutrients relative to the control. There was a gradual promotion on these leaf chemical components with increasing concentrations and frequencies of application of K- silicate. Significant differences on these aspects were observed among all treatments except among the higher two concentrations namely 0.2 and 0.4% and frequencies of application namely twice and thrice. All leaf chemical component were maximized on the trees treated with K- silicate thrice at 0.4%. Similar trend was noticed during both seasons.

Treating mango cv Sadek with K- silicate thrice at 0.4% maximized all the chemical components. The lowest values were recorded on untreated mango cv. Zebda. These results were true during both seasons.

3- Yield/ tree:

Table (10) shows that mango cv. Sadek significantly had higher yield expressed in weight and number of fruits/tree than the other mango cv. Zebda. These results were true during both seasons.

Treating mango cvs with K- silicate once, twice or thrice at 0.1 to 0.4% significantly improved the yield over the control. The promotion was clearly associated with increasing concentrations (0.0 to 0.4%) and frequencies of applications (once to thrice) of K- silicate. Meaningless promotion on the yield was observed when K- silicate concentrations were increased from 0.2 to 0.4% and frequencies of application from twice to thrice, therefore from economical point of view, it suggested to use 0.2% of K-silicate twice. These results were true during both seasons.

The interaction between mango cvs and concentrations and frequencies of application of K-silicate had significant effect on the yield. From economical point of view, it is suggested to use K-silicate twice at 0.2% in mango cv Sadek. The untreated mango cv Zebda gave the lowest values. Numerically point of view, the yield of the previous promised treatment reached 58.8 and 38.8 kg while the untreated Zebda mango trees produced 18.7 and 17.9 kg during both seasons, respectively. Similar trend was noticed during both seasons.

4- Fruit quality:

It is clear from the data in Tables (11 to 15) that mango cv Sadek had better physical and chemical fruit characteristics than mango cv Zebda. The promotion on fruit quality in mango cv. Sadek was appeared in terms of increasing weight, height, diameter and thickness of fruit, fruit flesh %, T.S.S.%, total sugars and vitamin C and decreasing, fruit seed % and total acidity %.

There was a gradual promotion on fruit characteristics with increasing concentrations and frequencies of application of K- silicate. Increasing concentrations and frequencies of application of K-silicate from 0.2 to 0.4% and twice to thrice, respectively had no significant promotion on both physical and chemical characteristics of the fruits. These results were true during both seasons.

The best results with regard to physical and chemical fruit characteristics were observed on mango cv. Sadek subjected to potassium silicate twice at 0.2 % from economical point of view. Unfavourable effects on fruit quality were observed in untreated mango cv. Zebda. Similar trend was noticed during both seasons.

Table (2): Effect of different concentrations and frequencies of application of potassium silicate on length and thickness of shoot of Sadek and Zebda mango trees during 2017 and 2018 seasons.

Mango cvs (A) / K- silicate treatments (B)	Shoot length (cm.)						Shoot thickness (cm.)					
	2017			2018			2017			2018		
	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)
b_1 Control	35.1	34.0	**34.6**	36.3	33.8	**35.0**	0.49	0.41	**0.45**	0.47	0.44	**0.46**
b_2 K Silicate 0.1% once.	37.0	35.5	**36.3**	38.0	35.8	**36.9**	0.53	0.44	**0.48**	0.55	0.50	**0.53**
b_3 K Silicate 0.1% twice	39.1	37.0	**38.1**	40.0	37.3	**38.6**	0.56	0.47	**0.52**	0.59	0.53	**0.56**
b_4 K Silicate 0.1% thrice	39.3	37.3	**38.3**	40.3	37.6	**38.9**	0.57	0.47	**0.52**	0.60	0.53	**0.57**
b_5 K Silicate 0.2% once.	41.9	39.0	**40.5**	42.9	39.3	**40.1**	0.61	0.51	**0.56**	0.64	0.56	**0.60**
b_6 K Silicate 0.2% twice	44.0	41.0	**42.5**	45.9	41.4	**43.1**	0.64	0.54	**0.59**	0.68	0.59	**0.63**
b_7 K Silicate 0.2% thrice	44.1	41.3	**42.7**	46.0	41.5	**43.5**	0.65	0.55	**0.60**	0.69	0.60	**0.64**
b_8 K Silicate 0.4% once.	42.0	39.0	**40.5**	43.0	39.3	**38.2**	0.62	0.52	**0.57**	0.64	0.56	**0.60**
b_9 K Silicate 0.4% twice	44.0	41.0	**42.5**	46.0	41.5	**43.4**	0.65	0.55	**0.60**	0.68	0.59	**0.65**
b_{10} K Silicate 0.4% thrice	44.2	41.4	**42.8**	46.1	41.6	**43.7**	0.66	0.56	**0.62**	0.69	0.60	**0.65**
Mean (A)	41.1	38.7		42.5	38.9		0.60	0.50		0.62	0.55	
New L.S.D. at 5%	A	B	**AB**	A	B	**AB**	A	B	**AB**	A	B	**AB**
New L.S.D. at 5%	**1.4**	**1.3**	**1.8**	**1.3**	**1.2**	**1.7**	**0.03**	**0.02**	**0.03**	**0.03**	**0.03**	**0.04**

Table (3): Effect of different concentrations and frequencies of application of potassium silicate on the leaf area and number of leaves / shoot of Sadek and Zebda mango trees during 2017 and 2018 seasons.

Mango cvs (A) / K- silicate treatments (B)	Leaf area (cm)						No. of leaves / shoot					
	2017			2018			2017			2018		
	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)
b_1 Control	55.5	50.0	**52.7**	57.0	49.9	**53.4**	37.0	35.0	**36.0**	35.0	36.0	**35.0**
b_2 K Silicate 0.1% once.	58.8	52.5	**55.0**	60.0	52.8	**56.6**	40.0	38.0	**39.0**	40.0	39.0	**39.0**
b_3 K Silicate 0.1% twice	60.1	55.0	**57.0**	62.1	55.3	**58.5**	43.0	41.0	**42.0**	44.0	42.0	**43.0**
b_4 K Silicate 0.1% thrice	60.3	55.6	**57.3**	62.3	55.4	**58.7**	44.0	41.0	**42.0**	45.0	43.0	**44.0**
b_5 K Silicate 0.2% once.	62.9	57.9	**60.2**	65.0	58.3	**62.1**	48.0	44.0	**46.0**	49.0	45.0	**47.0**
b_6 K Silicate 0.2% twice	65.0	61.3	**63.4**	67.3	61.4	**64.0**	52.0	47.0	**49.0**	52.0	48.0	**50.0**
b_7 K Silicate 0.2% thrice	65.3	61.4	**63.2**	67.5	61.5	**64.5**	53.0	48.0	**51.0**	53.0	49.0	**51.0**
b_8 K Silicate 0.4% once.	63.0	58.0	**60.5**	65.0	58.4	**61.5**	49.0	44.0	**46.0**	49.0	45.0	**47.0**
b_9 K Silicate 0.4% twice	65.0	61.4	**63.2**	67.4	61.4	**64.0**	53.0	47.0	**50.0**	52.0	48.0	**50.0**
b_{10} K Silicate 0.4% thrice	65.4	61.6	**63.7**	67.6	61.6	**64.7**	54.0	48.0	**52.0**	53.0	49.0	**51.0**
Mean (A)	62.0	57.4		64.1	57.6		47.3	43.3		47.2	44.4	
New L.S.D. at 5%	A	B	**AB**	A	B	**AB**	A	B	**AB**	A	B	**AB**
	1.8	**1.9**	**2.7**	**1.9**	**1.7**	**2.4**	**3.0**	**2.0**	**2.8**	**3.0**	**2.0**	**2.8**

Table (4): Effect of different concentrations and frequencies of application of potassium silicate on chlorophylls a & b of Sadek and Zebda mango trees during 2017 and 2018 seasons.

Mango cvs (A) / K- silicate treatments (B)	Chlorophyll a (mg/ g F.W.)						Chlorophyll b (mg/ g F.W.)					
	2017			2018			2017			2018		
	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)
b_1 Control	4.1	3.3	**3.7**	4.0	3.5	**3.7**	1.1	0.9	**1.0**	0.9	1.0	**0.9**
b_2 K Silicate 0.1% once.	4.5	3.6	**4.0**	4.6	3.8	**4.2**	1.3	1.1	**1.2**	1.2	1.2	**1.2**
b_3 K Silicate 0.1% twice	4.9	4.6	**4.7**	5.1	4.1	**4.6**	1.6	1.4	**1.5**	1.5	1.5	**1.5**
b_4 K Silicate 0.1% thrice	5.0	4.1	**4.5**	5.2	4.2	**4.7**	1.7	1.5	**1.6**	1.6	1.6	**1.6**
b_5 K Silicate 0.2% once.	5.5	4.4	**4.9**	5.8	4.6	**5.2**	2.1	1.7	**1.9**	1.8	1.9	**1.8**
b_6 K Silicate 0.2% twice	5.9	4.7	**5.3**	6.3	5.0	**5.6**	2.3	2.0	**2.1**	2.1	2.2	**2.1**
b_7 K Silicate 0.2% thrice	6.0	4.8	**5.4**	6.3	5.1	**5.7**	2.4	2.1	**2.2**	2.2	2.3	**2.2**
b_8 K Silicate 0.4% once.	5.5	4.5	**5.0**	5.9	4.7	**5.3**	2.1	1.8	**1.9**	1.9	2.0	**1.9**
b_9 K Silicate 0.4% twice	6.0	4.7	**5.4**	6.4	5.1	**5.7**	2.4	2.1	**2.2**	2.2	2.3	**2.2**
b_{10} K Silicate 0.4% thrice	6.1	4.8	**5.4**	6.5	5.2	**5.8**	2.5	2.2	**2.3**	2.3	2.4	**2.3**
Mean (A)	5.4	4.4		5.6	4.6		2.0	1.7		1.8	1.2	
New L.S.D. at 5%	A	B	**AB**	A	B	**AB**	A	B	**AB**	A	B	**AB**
New L.S.D. at 5%	**0.3**	**0.2**	**0.3**	**0.2**	**0.2**	**0.3**	**0.2**	**0.2**	**0.3**	**0.2**	**0.2**	**0.3**

Table (5): Effect of different concentrations and frequencies of application of potassium silicate on total chlorophylls and total carotenoids of Sadek and Zebda mango trees during 2017 and 2018 seasons.

Mango cvs (A)	Total chlorophylls (mg/ g F.W.)						Total carotenoids (mg/ g F.W.)					
	2017			2018			2017			2018		
K- silicate treatments (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)
b_1 Control	5.2	4.5	**4.8**	4.9	4.5	**4.7**	1.4	1.0	**1.2**	1.1	1.0	**1.1**
b_2 K Silicate 0.1% once.	5.8	4.7	**5.2**	5.8	5.0	**5.4**	1.8	1.2	**1.5**	1.4	1.2	**1.6**
b_3 K Silicate 0.1% twice	6.5	5.4	**5.9**	6.6	5.6	**6.1**	2.2	1.5	**1.9**	2.3	1.5	**1.9**
b_4 K Silicate 0.1% thrice	6.7	5.6	**6.1**	6.8	5.8	**6.3**	2.3	1.6	**2.0**	2.4	1.6	**2.0**
b_5 K Silicate 0.2% once.	7.6	6.1	**6.8**	7.6	6.5	**7.0**	2.7	1.8	**2.3**	2.8	1.9	**2.8**
b_6 K Silicate 0.2% twice	8.2	6.7	**7.4**	8.4	7.2	**7.8**	3.0	2.0	**2.5**	3.1	2.2	**2.7**
b_7 K Silicate 0.2% thrice	8.4	6.9	**7.6**	8.5	7.4	**7.9**	3.1	2.2	**2.7**	3.2	2.3	**2.8**
b_8 K Silicate 0.4% once.	7.6	6.3	**6.9**	7.8	6.7	**7.2**	2.8	1.9	**2.4**	2.9	2.0	**2.5**
b_9 K Silicate 0.4% twice	8.4	6.8	**7.6**	8.6	7.4	**8.0**	3.1	2.2	**2.7**	3.2	2.3	**2.8**
b_{10} K Silicate 0.4% thrice	8.6	7.0	**7.8**	8.8	7.6	**8.2**	3.2	2.2	**1.9**	3.3	2.4	**2.9**
Mean (A)	7.3	6.0		7.4	6.4		2.4	1.8		2.6	1.8	
New L.S.D. at 5%	A	B	**AB**	A	B	**AB**	A	B	**AB**	A	B	**AB**
\	**0.4**	**0.3**	**0.4**	**0.3**	**0.3**	**0.4**	**0.3**	**0.3**	**0.4**	**0.3**	**0.3**	**0.4**

Table (6): Effect of different concentrations and frequencies of application of potassium silicate on the leaves on the percentages of n and P in the leaves of Sadek and Zebda mango trees during 2017 and 2018 seasons.

Mango cvs (A)	Leaf N %						Leaf P %					
	2017			2018			2017			2018		
K- silicate treatments (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)
b_1 Control	1.59	1.51	**1.55**	1.56	1.49	**1.52**	0.12	0.10	**0.11**	0.11	0.09	**0.10**
b_2 K Silicate 0.1% once.	1.69	1.56	**1.62**	1.71	1.55	**1.63**	0.15	0.12	**0.13**	0.14	0.12	**0.13**
b_3 K Silicate 0.1% twice	1.80	1.62	**1.71**	1.81	1.63	**1.72**	0.18	0.15	**0.17**	0.18	0.16	**0.17**
b_4 K Silicate 0.1% thrice	1.81	1.63	**1.72**	1.82	1.64	**1.73**	0.19	0.15	**0.14**	0.19	0.17	**0.15**
b_5 K Silicate 0.2% once.	1.90	1.69	**1.82**	1.92	1.71	**1.81**	0.22	0.18	**0.20**	0.23	0.20	**0.22**
b_6 K Silicate 0.2% twice	1.99	1.75	**1.87**	1.99	1.78	**1.88**	0.25	0.20	**0.23**	0.26	0.23	**0.24**
b_7 K Silicate 0.2% thrice	2.00	1.76	**1.88**	2.00	1.79	**1.89**	0.25	0.21	**0.23**	0.27	0.24	**0.26**
b_8 K Silicate 0.4% once.	1.91	1.70	**1.80**	1.93	1.71	**1.82**	0.22	0.18	**0.20**	0.24	0.21	**0.22**
b_9 K Silicate 0.4% twice	2.00	1.76	**1.88**	2.00	1.78	**1.89**	0.25	0.20	**0.22**	0.27	0.24	**0.26**
b_{10} K Silicate 0.4% thrice	2.01	1.77	**1.89**	2.01	1.74	**1.90**	0.25	0.21	**0.23**	0.28	0.25	**0.26**
Mean (A)	1.8	1.67		1.88	1.68		0.21	0.17		0.22	0.19	
New L.S.D. at 5%	A	B	**AB**	A	B	**AB**	A	B	**AB**	A	B	**AB**
	0.06	**0.05**	**0.07**	**0.07**	**0.06**	**0.08**	**0.03**	**0.02**	**0.03**	**0.04**	**0.03**	**0.04**

Table (7): Effect of different concentrations and frequencies of application of potassium silicate on the percentages of K and Mg in the leaves of Sadek and Zebda mango trees during 2017 and 2018 seasons.

Mango cvs (A)	Leaf K %						Leaf Mg %					
	2017			2018			2017			2018		
K- silicate treatments (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)
b_1 Control	1.11	1.07	**1.09**	1.09	1.06	**1.07**	0.52	0.47	**0.49**	0.78	0.49	**0.48**
b_2 K Silicate 0.1% once.	1.16	1.13	**1.15**	1.17	1.11	**1.14**	0.56	0.51	**0.54**	0.57	0.52	**0.55**
b_3 K Silicate 0.1% twice	1.22	1.18	**1.20**	1.23	1.16	**1.19**	0.60	0.55	**0.67**	0.61	0.56	**0.58**
b_4 K Silicate 0.1% thrice	1.23	1.19	**1.21**	1.24	1.17	**1.21**	0.61	0.60	**0.61**	0.61	0.57	**0.59**
b_5 K Silicate 0.2% once.	1.31	1.25	**1.28**	1.32	1.22	**1.27**	0.67	0.66	**0.66**	0.65	0.61	**0.63**
b_6 K Silicate 0.2% twice	1.38	1.30	**1.34**	1.39	1.30	**1.35**	0.70	0.72	**0.71**	0.69	0.65	**0.67**
b_7 K Silicate 0.2% thrice	1.39	1.31	**1.35**	1.40	1.31	**1.36**	0.71	0.73	**0.72**	0.70	0.65	**0.68**
b_8 K Silicate 0.4% once.	1.32	1.25	**1.28**	1.33	1.22	**1.27**	0.68	0.66	**0.67**	0.66	0.62	**0.64**
b_9 K Silicate 0.4% twice	1.39	1.30	**1.35**	1.40	1.30	**1.35**	0.72	0.72	**0.72**	0.70	0.66	**0.68**
b_{10} K Silicate 0.4% thrice	1.40	1.31	**1.36**	1.41	1.21	**1.36**	0.64	0.73	**0.71**	0.71	0.66	**0.69**
Mean (A)	1.29	1.23		1.30	1.21		0.66	0.64		0.67	0.60	
New L.S.D. at 5%	A	B	**AB**	A	B	**AB**	A	B	**AB**	A	B	**AB**
	0.04	**0.05**	**0.07**	**0.05**	**0.5**	**0.07**	**0.02**	**0.03**	**0.04**	**0.03**	**0.03**	**0.04**

Table (8): Effect of different concentrations and frequencies of application of potassium silicate on the percentage of Ca and leaf content of Fe (as ppm) of Sadek and Zebda mango trees during 2017 and 2018 seasons.

Mango cvs (A)	Leaf Ca %						Leaf Fe (ppm)					
	2017			2018			2017			2018		
K- silicate treatments (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)
b_1 Control	2.49	2.68	**2.59**	2.45	2.71	**2.58**	51.1	52.2	**51.7**	50.8	53.6	**52.2**
b_2 K Silicate 0.1% once.	2.61	2.78	**2.70**	2.59	2.81	**2.70**	53.0	55.0	**54.0**	54.2	55.9	**55.1**
b_3 K Silicate 0.1% twice	2.71	2.88	**2.80**	2.69	2.90	**2.80**	56.0	57.0	**56.5**	57.2	57.4	**57.6**
b_4 K Silicate 0.1% thrice	2.72	2.89	**2.81**	2.70	2.91	**2.81**	56.1	57.5	**56.8**	57.3	58.0	**57.7**
b_5 K Silicate 0.2% once.	2.81	3.00	**2.91**	2.80	3.05	**2.93**	60.0	60.0	**60.0**	61.2	61.0	**61.1**
b_6 K Silicate 0.2% twice	2.91	3.10	**3.00**	2.90	3.16	**3.03**	63.0	61.9	**62.5**	64.2	63.0	**63.6**
b_7 K Silicate 0.2% thrice	2.92	3.11	**3.01**	2.91	3.17	**3.04**	63.3	62.0	**62.7**	64.5	63.3	**63.9**
b_8 K Silicate 0.4% once.	2.82	3.00	**2.91**	2.80	3.06	**2.93**	60.5	59.9	**60.2**	61.7	61.1	**61.4**
b_9 K Silicate 0.4% twice	2.92	3.10	**3.01**	2.90	3.17	**3.04**	63.3	62.0	**62.7**	64.5	63.0	**63.8**
b_{10} K Silicate 0.4% thrice	2.93	3.11	**3.02**	2.91	3.18	**3.05**	61.0	62.1	**61.6**	64.6	63.4	**64.0**
Mean (A)	2.78	2.97		2.76	3.01		58.8	53.0		60.02	54.23	
New L.S.D. at 5%	A	B	**AB**	A	B	**AB**	A	B	**AB**	A	B	**AB**
	0.09	**0.08**	**0.11**	**0.10**	**0.09**	**0.12**	**2.0**	**1.8**	**2.5**	**1.8**	**1.9**	**2.7**

Table (9): Effect of different concentrations and frequencies of application of potassium silicate on the leaf content of Mn and Zn (as ppm) of Sadek and Zebda mango trees during 2017 and 2018 seasons.

Mango cvs (A)	Leaf Mn (ppm)						Leaf Zn (ppm)					
	2017			2018			2017			2018		
K-.0ilicate treatments (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)
btrol	44.0	51.1	**50.05**	48.9	52.0	**50.45**	49.0	50.0	**49.5**	47.9	49.9	**48.9**
b_2 K Silicate 0.1% once.	51.0	53.1	**52.05**	50.9	54.0	**52.45**	51.0	51.5	**51.25**	49.9	51.6	**50.75**
b_3 K Silicate 0.1% twice	53.3	55.0	**54.15**	53.9	55.9	**54.9**	53.0	53.0	**53**	52.0	57.4	**54.7**
b_4 K Silicate 0.1% thrice	53.6	55.3	**54.45**	54.0	56.2	**55.1**	53.3	53.2	**53.25**	52.5	58.0	**55.24**
b_5 K Silicate 0.2% once.	56.0	57.1	**56.55**	57.0	58.0	**57.5**	55.5	55.0	**55.25**	55.0	55.3	**55.15**
b_6 K Silicate 0.2% twice	58.0	59.0	**58.5**	59.5	60.0	**59.75**	57.5	56.6	**57.05**	58.0	57.0	**57.25**
b_7 K Silicate 0.2% thrice	58.3	59.2	**58.75**	60.0	60.3	**60.15**	58.0	56.7	**57.35**	58.3	57.1	**57.7**
b_8 K Silicate 0.4% once.	56.1	57.2	**61.15**	57.0	58.0	**57.5**	55.6	55.1	**55.35**	55.5	55.3	**55.4**
b_9 K Silicate 0.4% twice	58.1	59.1	**58.6**	59.6	60.0	**59.8**	57.6	56.7	**57.15**	58.6	57.0	**57.8**
b_{10} K Silicate 0.4% thrice	58.5	59.3	**58.9**	60.7	60.4	**60.55**	58.1	56.8	**57.45**	58.7	57.2	**57.95**
Mean (A)	55.19	56.54		56.15	57.48		54.87	54.46		54.54	55.58	
New L.S.D. at 5%	A	B	**AB**	A	B	**AB**	A	B	**AB**	A	B	**AB**
	1.9	**1.4**	**2.0**	**1.6**	**1.5**	**2.0**	**1.5**	**1.4**	**2.0**	**1.4**	**1.5**	**2.0**

Table (10): Effect of different concentrations and frequencies of application of potassium silicate on the yield of Sadek and Zebda mango trees during 2017 and 2018 seasons.

Mango cvs (A)	No. of fruit / tree						Yield/ tree (kg.)					
	2017			2018			2017			2018		
K- silicate treatments (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)
b_1 Control	115.0	101.0	**108.0**	94.8	95.0	**94.5**	26.6	18.7	**22.7**	22.7	17.9	**20.3**
b_2 K Silicate 0.1% once.	133.0	113.0	**123.0**	105.0	108.0	**106.5**	33.4	22.6	**28.0**	27.2	22.0	**24.7**
b_3 K Silicate 0.1% twice	151.0	125.0	**138.0**	115.0	121.0	**119.5**	40.9	27.0	**34.0**	33.5	26.6	**30.1**
b_4 K Silicate 0.1% thrice	152.0	126.0	**139.0**	119.0	122.0	**120.5**	41.3	27.3	**34.3**	33.9	27.0	**30.5**
b_5 K Silicate 0.2% once.	174.0	140.0	**157.0**	151.0	135.0	**143**	51.2	32.6	**41.9**	47.0	32.1	**39.5**
b_6 K Silicate 0.2% twice	186.0	155.0	**170.5**	164.0	149.0	**156.5**	58.8	38.8	**48.8**	55.9	38.1	**47.0**
b_7 K Silicate 0.2% thrice	188.0	157.0	**172.5**	165.0	150.0	**157.5**	59.8	39.4	**49.6**	56.4	38.6	**47.5**
b_8 K Silicate 0.4% once.	175.0	141.0	**158.0**	151.0	136.0	**143.0**	57.6	33.0	**45.3**	47.1	32.5	**39.8**
b_9 K Silicate 0.4% twice	187.0	156.0	**171.5**	165.0	150.0	**157.5**	59.3	39.2	**49.3**	56.4	38.6	**47.5**
b_{10} K Silicate 0.4% thrice	190.0	158.0	**174.0**	166.0	151.0	**158.5**	60.6	39.8	**50.2**	56.9	39.0	**48.0**
Mean (A)	165.1	137.2		171.5	130.8		49.0	31.8		2.0	2.5	
New L.S.D. at 5%	A	B	**AB**	A	B	**AB**	A	B	**AB**	A	B	**AB**
	11	**10**	**14**	**9.0**	**12.0**	**16.8**	**2.0**	**2.4**	**3.4**	**2.0**	**2.5**	**3.5**

Table (11): Effect of different concentrations and frequencies of application of potassium silicate on fruit weight and height of Sadek and Zebda mango trees during 2017 and 2018 seasons.

Mango cvs (A)	Av fruit weight (g.)						Av. Fruit height (cm)					
	2017			2018			2017			2018		
K- silicate treatments (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)	a_1 Sadek	a_2 Zebda	Mean (B)
b_1 Control	231.0	185.0	**208.0**	241.0	188.0	**198.0**	11.4	11.1	**11.24**	11.6	10.4	**11.0**
b_2 K Silicate 0.1% once.	251.0	200.0	**225.5**	261.0	204.0	**232.5**	11.9	11.5	**11.7**	12.1	11.4	**11.8**
b_3 K Silicate 0.1% twice	271.0	216.0	**243.5**	284.0	220.0	**252.0**	12.5	12.0	**12.5**	12.7	12.0	**12.4**
b_4 K Silicate 0.1% thrice	272.0	217.0	**244.5**	285.0	221.0	**253.0**	12.6	12.1	**12.4**	12.8	12.1	**12.5**
b_5 K Silicate 0.2% once.	294.0	233.0	**263.5**	311.0	238.0	**274.5**	13.0	12.5	**12.8**	13.4	12.4	**12.9**
b_6 K Silicate 0.2% twice	316.0	250.0	**283.0**	341.0	256.0	**597.0**	13.5	13.0	**13.3**	13.9	13.0	**13.5**
b_7 K Silicate 0.2% thrice	318.0	251.0	**284.5**	342.0	257.0	**299.5**	13.6	13.1	**13.4**	14.0	13.1	**13.5**
b_8 K Silicate 0.4% once.	295.0	234.0	**264.5**	312.0	239.0	**275.5**	13.1	12.6	**12.9**	13.4	12.5	**13.0**
b_9 K Silicate 0.4% twice	317.0	251.0	**284.0**	342.0	257.0	**299.5**	13.6	13.1	**13.4**	14.0	13.1	**13.6**
b_{10} K Silicate 0.4% thrice	319.0	252.0	**285.5**	343.0	258.0	**300.5**	13.7	13.2	**13.5**	14.1	13.2	**13.7**
Mean (A)	15.0	14.0		16.1	15.5		12.9	12.4		13.2	12.3	
New L.S.D. at 5%	A	B	**AB**	A	B	**AB**	A	B	**AB**	A	B	**AB**
	1	**1**	**1.4**	**1**	**1**	**1.4**	**0.4**	**0.4**	**1.5**	**0.5**	**0.3**	**0.4**

Table (12): Effect of different concentrations and frequencies of application of potassium silicate on fruit diameter and thickness of Sadek and Zebda mango trees during 2017 and 2018 seasons.

Mango cvs (A)	Av. Fruit diameter cm						Av. Fruit thickness cm					
	2017			2018			2017			2018		
K- silicate treatments (B)	a_1 Sadek	a_2 Zebda	Mean B	a_1 Sadek	a_2 Zebda	Mean B	a_1 Sadek	a_2 Zebda	Mean B	a_1 Sadek	a_2 Zebda	Mean B
b_1 Control	6.7	5.6	**6.2**	6.5	5.5	**6.0**	5.4	2.6	**5.0**	5.5	4.7	**5.2**
b_2 K Silicate 0.1% once.	7	6	**6.5**	6.9	5.9	**6.4**	5.7	5	**5.3**	5.9	4.9	**5.4**
b_3 K Silicate 0.1% twice	7.4	6.4	**6.9**	7.4	6.5	**6.9**	6	5.4	**5.7**	6.2	5.5	**5.8**
b_4 K Silicate 0.1% thrice	7.5	6.5	**7.0**	7.5	6.6	**7.1**	6.1	5.5	**5.8**	6.3	5.6	**5.9**
b_5 K Silicate 0.2% once.	7.9	7	**7.5**	8	7.1	**7.5**	6.3	5.8	**6.1**	6.6	5.9	**6.3**
b_6 K Silicate 0.2% twice	8.5	7.4	**7.9**	8.5	7.5	**8.0**	6.6	6.2	**6.4**	7	6.3	**6.7**
b_7 K Silicate 0.2% thrice	8.6	7.5	**8.0**	8.6	7.7	**8.2**	6.7	6.3	**6.5**	7.1	6.4	**6.8**
b_8 K Silicate 0.4% once.	8	7.1	**7.6**	8	7.1	**7.5**	6.4	5.9	**6.2**	6.7	6	**6.3**
b_9 K Silicate 0.4% twice	8.6	7.5	**8.1**	8.6	7.5	**8.1**	6.7	6.3	**6.5**	7.1	6.4	**6.7**
b_{10} K Silicate 0.4% thrice	8.6	7.6	**8.2**	8.7	7.7	**8.2**	6.8	6.4	**6.6**	7.2	6.5	**6.9**
Mean (A)	7.88	6.96		7.87	6.91		6.21	5.74		6.56	5.82	
New L.S.D. at 5%	A	B	**AB**	A	B	**AB**	A	B	**AB**	A	B	**AB**
	0.3	**0.3**	**0.4**	**0.3**	**0.3**	**0.4**	**0.3**	**0.2**	**0.3**	**0.3**	**0.3**	**0.4**

Table (13): Effect of different concentrations and frequencies of application of potassium silicate on the percentages of flesh and seed of Sadek and Zebda mango trees during 2017 and 2018 seasons.

Mango cvs (A)	Fruit flesh %						Seed weight %					
	2017			2018			2017			2018		
K- silicate treatments (B)	a_1 Sadek	a_2 Zebda	Mean B	a_1 Sadek	a_2 Zebda	Mean B	a_1 Sadek	a_2 Zebda	Mean B	a_1 Sadek	a_2 Zebda	Mean B
b_1 Control	66.1	65.1	**65.6**	67.0	67.0	**67.0**	7	7.11	**7.06**	7.11	6.99	**7.05**
b_2 K Silicate 0.1% once.	67.1	66.6	**66.9**	68.0	68.0	**68.0**	6.8	6.8	**6.80**	6.79	6.82	**6.81**
b_3 K Silicate 0.1% twice	68.2	68.1	**68.2**	69.0	69.1	**69.1**	6.5	6.6	**6.55**	6.59	6.51	**6.55**
b_4 K Silicate 0.1% thrice	68.3	68.2	**68.3**	69.1	69.2	**69.2**	6.47	6.59	**6.53**	6.58	6.48	**6.53**
b_5 K Silicate 0.2% once.	70.0	70.0	**70.0**	70.9	71.0	**71.0**	6.22	6.4	**6.31**	6.38	6.22	**6.30**
b_6 K Silicate 0.2% twice	71.5	71.5	**71.5**	72.5	72.1	**72.3**	6	6.18	**6.09**	6.16	6.00	**6.08**
b_7 K Silicate 0.2% thrice	71.7	71.6	**71.7**	72.6	72.5	**42.5**	5.97	6.17	**6.07**	6.16	5.97	**6.07**
b_8 K Silicate 0.4% once.	70.0	70.2	**70.1**	71.0	71.1	**71.1**	6.2	6.39	**6.30**	6.36	6.19	**6.28**
b_9 K Silicate 0.4% twice	71.6	71.6	**71.6**	72.6	72.2	**42.6**	5.99	6.17	**6.06**	6.15	5.94	**6.07**
b_{10} K Silicate 0.4% thrice	71.7	71.7	**71.7**	72.7	72.3	**72.8**	5.96	6.16	**5.83**	6.14	5.94	**6.04**
Mean (A)	69.6	69.5		70.54	70.43		6.31	5.80		6.44	6.28	
New L.S.D. at 5%	A	B	**AB**	A	B	**AB**	A	B	**AB**	A	B	**AB**
	1.0	**1.1**	**1.5**	**0.9**	**1.0**	**1.4**	**0.14**	**0.10**	**0.14**	**0.10**	**0.09**	**0.12**

Table (14): Effect of different concentrations and frequencies of application of potassium silicate on the percentages of T.S.S. and total sugars of the fruits of Sadek and Zebda mango trees during 2017 and 2018 seasons.

Mango cvs (A) / K- silicate treatments (B)	T.S.S. %						Total sugars %					
	2017			2018			2017			2018		
	a_1 Sadek	a_2 Zebda	Mean B	a_1 Sadek	a_2 Zebda	Mean B	a_1 Sadek	a_2 Zebda	Mean B	a_1 Sadek	a_2 Zebda	Mean B
b_1 Control	16.1	17.2	**16.7**	15.4	15.4	**16.5**	14.1	13.7	**13.9**	13.8	14.0	**13.9**
b_2 K Silicate 0.1% once.	16.5	17.6	**17.1**	16.4	16.4	**16.9**	15.1	14.1	**14.6**	14.9	14.5	**14.7**
b_3 K Silicate 0.1% twice	17.1	18.1	**17.6**	17.2	17.2	**17.5**	16.1	14.5	**15.3**	15.7	15.0	**15.4**
b_4 K Silicate 0.1% thrice	17.2	18.2	**17.7**	17.3	17.3	**17.6**	16.2	14.6	**15.4**	15.8	15.1	**15.5**
b_5 K Silicate 0.2% once.	17.6	18.6	**18.1**	17.8	17.8	**18.0**	17.3	15.0	**16.2**	16.4	15.5	**16.0**
b_6 K Silicate 0.2% twice	18.0	19.0	**18.5**	18.2	18.2	**18.4**	18.2	15.5	**16.9**	16.9	16.0	**16.5**
b_7 K Silicate 0.2% thrice	18.1	19.1	**18.6**	18.3	18.3	**18.5**	18.3	15.6	**17.0**	17.0	16.1	**16.6**
b_8 K Silicate 0.4% once.	17.7	18.7	**18.2**	17.9	17.9	**18.1**	17.3	15.1	**16.2**	16.5	15.6	**16.1**
b_9 K Silicate 0.4% twice	18.1	19.1	**18.6**	18.3	18.3	**18.5**	18.3	15.6	**17.0**	17.0	16.1	**16.6**
b_{10} K Silicate 0.4% thrice	18.2	19.2	**18.7**	18.4	18.4	**18.6**	18.4	15.7	**17.1**	17.1	16.2	**16.7**
Mean (A)	17.5	16.7		15.7	15.7		15.1	14.9		16.1	15.4	
New L.S.D. at 5%	A	B	**AB**	A	B	**AB**	A	B	**AB**	A	B	**AB**
	0.3	**0.3**	**0.4**	**0.3**	**0.5**	**0.7**	**0.3**	**0.3**	**0.4**	**0.4**	**0.3**	**0.4**

Table (15): Effect of different concentrations and frequencies of application of potassium silicate on total acidity % and vitamin C of the fruits of Sadek and Zebda mango trees during 2017 and 2018 seasons.

Mango cvs (A) / K- silicate treatments (B)	Total acidity %						Vitamin C (mg/ 100 gm FY.)					
	2017			2018			2017			2018		
	a_1 Sadek	a_2 Zebda	Mean B	a_1 Sadek	a_2 Zebda	Mean B	a_1 Sadek	a_2 Zebda	Mean B	a_1 Sadek	a_2 Zebda	Mean B
b_1 Control	0.381	0.394	0.388	0.390	0.395	0.393	44.9	43.1	44.0	44.1	44.1	44.1
b_2 K Silicate 0.1% once.	0.360	0.379	0.370	0.375	0.377	0.376	46.8	45.3	46.1	47.0	46.3	46.7
b_3 K Silicate 0.1% twice	0.350	0.360	0.355	0.361	0.358	0.360	49.0	48.0	48.5	49.2	49.0	49.1
b_4 K Silicate 0.1% thrice	0.348	0.358	0.353	0.358	0.355	0.357	49.1	48.3	48.7	49.3	49.3	49.3
b_5 K Silicate 0.2% once.	0.330	0.340	0.335	0.340	0.337	0.339	51.5	50.5	51.0	51.8	51.3	51.6
b_6 K Silicate 0.2% twice	0.312	0.318	0.315	0.320	0.315	0.318	54.0	52.9	53.5	54.1	54.0	54.1
b_7 K Silicate 0.2% thrice	0.311	0.317	0.314	0.319	0.311	0.315	54.0	53.0	53.5	54.2	54.3	54.3
b_8 K Silicate 0.4% once.	0.328	0.339	0.334	0.339	0.336	0.338	51.6	50.6	51.1	51.7	51.4	51.6
b_9 K Silicate 0.4% twice	0.310	0.317	0.314	0.190	0.319	0.255	54.1	53.0	53.6	54.2	54.1	54.2
b_{10} K Silicate 0.4% thrice	0.309	0.316	0.313	0.316	0.310	0.313	54.2	53.1	53.7	54.2	54.5	54.4
Mean (A)	0.334	0.344		0.331	0.341		50.9	49.8		51.0	50.8	
New L.S.D. at 5%	A	B	**AB**	A	B	**AB**	A	B	**AB**	A	B	**AB**
	0.009	**0.011**	**0.015**	**0.009**	**0.010**	**0.014**	**1.0**	**2.0**	**2.8**	**NS**	**1.9**	**2.7**

4. Discussion

Previous studies showed that the favourable effects of silicon on growth, nutritional status of the trees and fruiting seem to originate from its positive action on enhancing the tolerance of plants to biotic and abiotic stresses and drought tolerance. This is attributed to its essential role in maintaining plant water balance (**Gang *et al,* 2003**), photosynthetic activity, erecting the structure of xylem vessels. Previous studies explained these benefits to the formation of silica cuticle double layers formed on leaf epidermal tissues. Silicon also is responsible for water transport and root development as well as increasing the tolerance of plants to powdery mildew. The mechanical strength provided by silicon to the plant tissues increases their resistance to diseases and insects and is responsible for reducing the adverse effects of heavy metal; toxicity (**Matoh *et al,* 1991; *Lux et al.,* 2003; Rodrigues *et al.,* 2003; Ma, 2004; Hattori *et al.,* 2005 and Tahir *et al.,***

2006).

These results are in harmony with these obtained by **Gad El- Kareem (2012); Abdelaal and Oraby – Mona (2013) Ashoor (2013); Ahmed *et al.,* (2015); Wassel *et al.,* (2015); Abd El-Wahab (2015) and Mohamed *et al.,* (2015).**

Varying climatic, the other environmental conditions, genetic factors and acclimatization process could explain the present results (**Hulme, 1971 and Bally *et al.,* 2008**).

The results regarding the great variation among the two investigated mango cvs on growth, tree nutritional status, yield and fruit quality are in harmony with those obtained by **Baita *et al.,* (2010), Abou- Rayya *et al.,* (2012) and Fahmy (2016) and (2018).**

Conclusion

For promoting, yield and fruit quality of Sadek and Zebda mango cvs, it is suggested to spray the trees twice with K- silicate at 0.2%. Planting Sadek mango cv was preferable than cultivating mango cv Zebda under upper Egypt conditions according to its higher yield and better fruit quality.

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