Assiut J. Agric. Sci., (47) No. (6-1) 2016 (164-172) *ISSN: 1110-0486*
Website: http://www.aun.edu.eg/faculty_agriculture *E-mail: ajas@aun.edu.eg*

Response of Navel Orange Trees to Potassium Silicate Application

Randa El-Sayed Youness Habasy

Citriculture Res. Dept. Hort. Res. Instit. A.R.C. Giza, Egypt

Received on: 20/11/2016 **Accepted for publication on:**13/12/2016

Abstract

This study was conducted during 2014 and 2015 seasons to test the effect of different concentrations (0.05 & 0.1 & 0.2%) and frequencies of application (twice or thrice) of potassium silicate on fruiting of Navel orange tree s grown under Bani-Suef environmental conditions.

Carrying out two or three sprays of potassium silicate at 0.05 to 0.2% had material promotion on all vegetative growth aspects, leaf pigments and nutrients, fruit setting %, yield and both physical and chemical characteristics of the fruits over the check treatment. The promotion was related to the increase in both concentrations and frequencies of application of potassium silicate. All the investigated characteristics were unaffected by increasing concentrations of potassium silicate from 0.1 to 0.2% and frequencies of application from twice to thrice.

Carrying out two sprays of potassium silicate at 0.1% on the middle of March and April gave the best results with regard to yield and fruit quality of Navel orange trees grown under Bani-Suef conditions.

Keywords: *Navel oranges, potassium silicate, concentrations, frequencies, yield, fruit quality.*

Introduction

Many attempts have been conducted to improve the yield and fruit quality of Navel orange trees grown under Bani-Suef region conditions by using new cultural practices especially silicon spraying. It is an important antioxidant preventing reactive oxygen species (ROS) from destrying plant cells (Epstein, 1999; Mengel*et al*., 2001 and Alvarez and Datnoff, 2001).

Various studies showed that using silicon was beneficial for counteracting the adverse effects of all stresses (biotic and abiotic) on growth and nutritional status of the plants. It is also known that silicon increases drought tolerance in plants by maintaining plant water balance, photosynthesis activity, erectness of leaves and structure of xylem vessels under higher transpiration rates. Also, it is responsible for encouraging water transport, cell division and root development under unfavorable conditions and antioxidants defense system (Kanto, 2002; Aziz *et al*., 2002 and Ma and Takahashi, 2002).

A remarkable promotion was observed on growth aspects, nutritional status of the trees, yield and fruit quality in different fruit crop species due to applications of silicon (Gad El-Kareem, 2012; Al-Wasfy, 2012 and 2013; Abdelaal and Oraby-Mona, 2013; El-Khawaga and Mansour, 2014; Ibrahimand Al-Wasfy, 2014; Abd El-Wahab, 2015; Aly, 2015; Mohamed *et al*., 2015 and Mahmoud, 2016).

The objective of this study was examining the effect of different concentrations and frequencies of application of potassium silicate on vegetative growth characteristics,

leaf pigments and nutrient content, fruit setting, yield as well as physical and chemical properties of the fruits of Navel orange trees grown under Bani-Suef environmental conditions.

Materials and Methods

This study was initiated during 2014 and 2015 seasons on 21uniform in vigour 20-years old Navel orange trees onto sour orange rootstock. The selected trees are grown in a private citrus orchard located at Abo-Saleh Island near Bani-Suef city, Bani-Suef Governorate. The selected trees are planted at 5x5 meters apart. The texture of the soil is clay and the water depth is not less than two meters. Soil analysis was done according to the procedures that outlined by Wilde *et al*., (1985).

Table 1. Analysis of the tested soil

Content	Value
Sand %	7.5
Silt %	12.5
Clay%	80.0
Texture	Clay
O.M. %	2.23
pH(1: 2.5 extract)	7.8
EC (1: 2.5 extract) dsm^{-1})	0.89
Calcium carbonate %	1.50
Total N%	0.08
Available P (Olsen, ppm)	4.1
Available K (ammonium acetate , ppm)	449.9

The twenty-one selected trees were subjected to common horticultural practices that already applied in the orchard. Surface irrigation system was followed using Nile irrigation water.

This experiment included the following seven treatments:

1. Control (trees sprayed with water) (25% Si + 10%K_2O).
2. Spraying potassium silicate twice at 0.05%.
3. Spraying potassium silicate thrice at 0.05%.
4. Spraying potassium silicate twice at 0.1%.
5. Spraying potassium silicate thrice at 0.1%.
6. Spraying potassium silicate twice at 0.2%.
7. Spraying potassium silicate thrice at 0.2%.

Each treatment was replicated three times, one tree per each. Spraying of potassium silicate (25% Si + 10%K_2O) was done twice at the middle of March and again at the middle of April or thrice at the middle of March, April and May during the two seasons. Triton B as a wetting agent at 0.05% was added to each solution and spraying was done till runoff (20L/tree). Was followed

randomized complete blocks design (RCBD) with three replications for each treatment.

At the end of each season, the following parameters were measured:

1- Shoot length (cm), shoot thickness (cm) and leaf area $(cm)^2$ (Ahmed and Morsy, 1999) in the Spring growth cycle.
2- Total carbohydrates % in the leaves of spring growth cycle (1^{st} week of Sept.) (Smith *et al*., 1956).
3- Chlorophylls a & b, total chlorophylls and as well as total carotenoids in the leaves of spring growth cycle (1^{st} week of Sept.) as mg/100 g F.W.(Arnon, 1949 and Von-Wettstene, (1957). Total chlorophylls in the fresh leaves were recorded by summation of chlorophylls a & b.
4- In the first week of Sept. twenty leaves per tree of spring growth cycle in the non-fruiting shoots (Summer, 1985) were taken and dried for determination N, P, K and Mg content (according to Evenhuis and Dewaard, 1980).
5- Percentages of initial setting and fruit retention.
6- Fruit quality characteristics namely fruit weight (g.) and dimensions (height and diameter in cm), peel weight % and fruit thickness (cm) and percentages of T.S.S., total acidity (as g citric acid/100 ml juice), total and reducing sugars (Lane and Eynon, 1965 and A.O.A.C, 2000) as well as vitamin C (mg/100 ml juice) and T.S.S./Acid.

Statistical analysis was done-and the new L.S.D. test at 5% was used to differentiate among the various treatment means (Mead *et al.,* 1993).

Results and Discussion

1- Vegetative growth characteristics:

It is clear from the data in Table (2) that spraying Navel orange trees twice or thrice with potassium silicate at 0.05 to 0.2% had significant increased the main shoot length, shoot thickness and leaf area in the spring growth cycle rather than the control treatment. There was a gradual promotion on these growth traits with increasing concentrations of potassium silicate from 0.0 to 0.2 % and frequencies of application from twice to thrice. Negligible promotion on such three growth aspects was observed among 0.1 and 0.2% and twice or thrice applications of potassium silicate. The highest values of leaf area (27.8 & 29.3 cm^2) were recorded on the trees that received three sprays of potassium silicate at 0.2%. The lowest values of leaf area (24.1 & 24.2 cm^2) were observed on untreated trees. These results took similar trend during both seasons.

2- Leaf chemical composition:

It is obvious from the data in Tables (2&3) that total carbohydrates %, chlorophylls a & b, total chlorophylls, total carotenoids as well as percentages of N, P, K and Mg in the leaves were significantly enhanced in response to application of potassium silicate at 0.05 to 0.2% applied twice or thrice over the check treatment.

The promotion on these pigments, total carbohydrates% and various nutrients were in proportional to the increase in both concen-

trations and frequencies of application. Increasing concentrations of potassium silicate from 0.1 to 0.2% and frequencies of application from twice to thrice had meaningless promotion on these chemical traits.

The maximum values of total chlorophylls (7.1 & 7.4 mg/100g F.W.), N (1.93 & 1.95%), P (0.24 & 0.25%), K (1.65 & 1.69) and Mg (0.92 & 0.89%) were recorded on the trees that received three sprays of potassium silicate at 0.2%. The untreated trees produced the minimum values. These results were true during both seasons.

3- Percentages of initial fruit setting and fruit retention and yield:

It is evident from the data in Table (4) that subjecting the trees to potassium silicate twice or thrice at 0.05 to 0.2% had significant promotion on the percentages of initial fruit setting and fruit retention and yield expressed in weight and number of fruits/tree relative to the control treatment. The promotion was associated with increasing concentrations and frequencies of application of potassium silicate. Increasing concentrations of potassium silicate from 0.1 to 0.2% and frequencies application from twice to thrice failed to show significant stimulation on such parameters.

Therefore, from economical point of view, it is suggested to use potassium silicate twice at 0.1%. Under such promised treatment yield per tree reached 73.4 and 74.2kg while the yield of untreated trees reached 55.5&55.3kg during both seasons, respectively. The percentages of increment on the yield due to application of the promised treatment over the control treatment reached 32.3 & 34.2% during both seasons, respectively. These results were true during both seasons.

4- Physical and chemical characteristics of the fruits:

Datain Tables (4&5&6) noticeably reveal that treating Navel orange trees twice or thrice with potassium silicate at 0.05 to 0.2% significantly was accompanied with improving quality of the fruits in terms of increasing weight, height and diameter of fruit, T.S.S.%, T.S.S./acid, total and reducing sugars% and vitamin C content and decreasing fruit peel weight and thickness and total acidity over the control treatment. The promotion on fruit quality was related to the increase in concentrations and frequencies of application of potassium silicate. Meaningless promotion on both physical and chemical characteristics of fruits were observed among the higher two concentrations. Therefore, from economical point of view, it is suggested to use potassium silicate twice at 0.1%. The untreated trees produced unfavourable effects on fruit quality. Similar results were announced during both seasons.

Discussion

The essential roles of silicon (Si) on improving growth, tree nutritional status and yield of Navel oranges might be attributed to the effect of Si in enhancing the tolerance of the trees to all stresses, uptake and transport of water and different nutrients, root development and antioxidant defense systems (Aziz *et al*., 2002 and Ma, 2004) as well as the

effect of Si in increasing activates of enzymes such as glutathione-peroxidase, antioxidant activities, protecting plants from death and aging and biosynthesis of carbohydrates. Also, it reduces reactive oxygen species (Ma and Takahashi, 2002).

These results are in agreement with those obtained by El-Khawaga and Mansour, (2014) on Navel orange trees, Ibrahiem and Al-Wasfy, (2014) on Valencia orange trees and, Aly, (2015) on Balady mandarin trees. Recently the results of Mahmoud, (2016) who worked on Balady mandarin trees emphasized the present effect of silicon.

Conclusion

Treating Navel orange trees grown under BanySuef region conditions twice at the middle of March and April with potassium silicate at 0.1% gave the best results with regard to yield and fruit.

Table 2. Effect of different concentrations and frequencies of application of potassium silicate on some vegetative growth characteristics, total carbohydrates %, chlorophylls a and b in the leaves of Navel orange tress during 2014 and 2015 seasons.

Potassium Silicate treatment	Shoot length (cm)		Shoot thickness (cm)		Leaf area $(cm)^2$		Total carbohydrates %		Chlorophyll a (mg/100g F.W)		Chlorophyll b (mg/100g F.W)	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Control	5.11	5.15	0.12	0.13	24.1	24.2	13.9	14.0	3.8	4.0	1.1	1.0
K- silicate twice at 0.05%	5.41	5.49	0.17	0.18	25.9	26.3	14.4	14.7	4.2	4.4	1.4	1.3
K- silicate thrice at 0.05%	5.45	5.50	0.18	0.19	26.1	26.5	14.5	14.8	4.3	4.5	1.5	1.4
K- silicate twice at 0.1%	5.69	5.71	0.21	0.22	27.5	28.8	15.0	15.5	5.0	5.1	1.7	1.9
K- silicate thrice at 0.1%	5.70	5.72	0.22	0.23	27.7	29.0	15.1	15.6	5.1	5.2	1.8	2.0
K- silicate twice at 0.2%	5.70	5.71	0.22	0.22	27.6	28.9	15.1	15.6	5.1	5.2	1.8	2.0
K- silicate thrice at 0.2%	5.71	5.73	0.23	0.23	27.8	29.3	15.2	15.7	5.2	5.3	1.9	2.1
New L.S.D at 5%	**0.11**	**0.12**	**0.03**	**0.03**	**0.6**	**0.7**	**0.4**	**0.4**	**0.3**	**0.3**	**0.3**	**0.3**

Table 3. Effect of different concentrations and frequencies of application of potassium silicate on total chlorophylls, total carotenoids and percentages of N, P, K and Mg in the leaves of Navel orange tress during 2014 and 2015 seasons.

Potassium Silicate treatment	Total chlorophylls (mg/100g F.W)		Total carotenoids (mg/100g F.W)		Leaf N %		Leaf P %		Leaf K %		Leaf Mg %	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Control	4.9	5.0	1.1	1.2	1.71	1.67	0.15	0.14	1.47	1.51	0.82	0.79
K- silicate twice at 0.05%	5.6	5.7	1.5	1.6	1.81	1.79	0.18	0.19	1.55	1.60	0.86	0.83
K- silicate thrice at 0.05%	5.8	5.9	1.6	1.7	1.83	1.80	0.19	0.20	1.56	1.61	0.87	0.84
K- silicate twice at 0.1%	6.7	7.0	2.0	2.2	1.91	1.93	0.22	0.23	1.63	1.66	0.91	0.87
K- silicate thrice at 0.1%	6.9	7.2	2.1	2.3	1.92	1.94	0.23	0.24	1.64	1.67	0.92	0.88
K- silicate twice at 0.2%	6.9	7.2	2.1	2.3	1.92	1.94	0.23	0.24	1.64	1.67	0.91	0.88
K- silicate thrice at 0.2%	7.1	7.4	2.2	2.3	1.93	1.95	0.24	0.25	1.65	1.69	0.92	0.89
New L.S.D at 5%	**0.4**	**0.4**	**0.3**	**0.3**	**0.05**	**0.05**	**0.02**	**0.02**	**0.04**	**0.04**	**0.02**	**0.02**

Table 4. Effect of different concentrations and frequencies of application of potassium silicate on the percentages of initial fruit setting and fruit retention, yield as well as weight and height of fruits of Navel orange tress during 2014 and 2015 seasons.

Potassium Silicate treatment	Initial fruit setting %		Fruit retention %		No. of fruits/tree		Fruit weight (g.)		Yield/tree (kg.)		Fruit height (cm)	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Control	3.59	3.53	1.60	1.59	310.0	310.0	179.0	178.5	55.5	55.3	8.11	8.05
K- silicate twice at 0.05%	3.89	3.79	1.69	1.68	340.0	338.0	190.0	190.0	64.6	64.2	8.22	8.20
K- silicate thrice at 0.05%	3.90	3.80	1.70	1.69	342.0	343.0	191.5	192.0	65.5	65.9	8.23	8.21
K- silicate twice at 0.1%	4.11	4.09	1.77	1.80	367.0	369.0	200.0	201.0	73.4	74.2	8.33	8.32
K- silicate thrice at 0.1%	4.12	4.10	1.78	1.81	368.0	370.0	201.0	202.0	74.0	74.7	8.34	8.33
K- silicate twice at 0.2%	4.12	4.10	1.78	1.81	368.0	370.0	201.0	202.0	74.0	74.7	8.35	8.33
K- silicate thrice at 0.2%	4.13	4.11	1.79	1.82	370.0	372.0	202.0	203.0	74.7	75.1	8.36	8.34
New L.S.D at 5%	**0.05**	**0.07**	**0.04**	**0.04**	**6.0**	**5.0**	**4.1**	**4.2**	**1.2**	**1.4**	**0.06**	**0.07**

Table 5. Effect of different concentrations and frequencies of application of potassium silicate on some physical and chemical characteristics of the fruits of Navel orange tress during 2014 and 2015 seasons.

Potassium Silicate treatment	Fruit diameters (cm)		Fruit peel weight %		Fruit peel thickness (cm)		T.S.S. %		Total acidity %		T.S.S/ acid	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Control	7.15	7.17	36.3	37.0	0.37	0.38	13.5	13.9	1.661	1.670	8.1	8.3
K- silicate twice at 0.05%	7.25	7.31	35.0	34.9	0.34	0.33	14.3	14.7	1.620	1.629	8.8	9.0
K- silicate thrice at 0.05%	7.26	7.32	34.8	34.8	0.33	0.32	14.4	14.8	1.618	1.627	8.9	9.1
K- silicate twice at 0.1%	7.41	7.44	33.0	32.9	0.30	0.31	15.5	15.9	1.580	1.590	9.8	10.0
K- silicate thrice at 0.1%	7.42	7.46	32.9	32.7	0.29	0.30	15.6	16.0	1.573	1.582	9.9	10.1
K- silicate twice at 0.2%	7.43	7.46	32.9	32.7	0.29	0.30	15.6	16.0	1.579	1.588	9.8	10.1
K- silicate thrice at 0.2%	7.44	7.48	32.8	32.5	0.28	0.29	15.7	16.1	1.572	1.587	10.0	10.1
New L.S.D at 5%	**0.05**	**0.06**	**0.4**	**0.4**	**0.3**	**0.3**	**0.3**	**0.3**	**0.018**	**0.019**	**0.2**	**0.2**

Table 6. Effect of different concentrations and frequencies of application of potassium silicate on some chemical characteristics of the fruits of Navel orange tress during 2014 and 2015 seasons.

Potassium Silicate treatment	Total sugars %		Reducing sugars %		Vitamin C content (mg/100 ml juice)	
	2014	2015	2014	2015	2014	2015
Control	10.3	10.5	3.66	3.71	41.9	42.0
K- silicate twice at 0.05%	10.6	10.9	3.75	3.80	44.0	43.9
K- silicate thrice at 0.05%	10.7	11.0	3.76	3.81	44.3	44.0
K- silicate twice at 0.1%	11.2	11.5	3.84	3.90	46.9	47.0
K- silicate thrice at 0.1%	11.3	11.6	3.85	3.92	47.0	47.7
K- silicate twice at 0.2%	11.3	11.6	3.85	3.92	47.3	47.3
K- silicate thrice at 0.2%	11.4	11.7	3.86	9.93	47.4	47.4
New L.S.D at 5%	**0.3**	**0.3**	**0.4**	**0.4**	**1.3**	**1.4**

References:

Abdelaal, A.A.M. and Oraby-Mona, M.M (2013). Using silicon for increasing the tolerance of mango cvEwaise transplants to drought. World Rural Observations 5(2): 36-40.

Abd El-Wahab, H.A.M. (2015). Response of Succary mango trees to foliar application of silicon and boron. M.Sc. Thesis Fac. of Agric. Minia Univ. Egypt.

Ahmed, F. F. and Morsy, M. H. (1999). A new method for measuring leaf area in different fruit crops.Minia of Agric. Res. & Develop. Vol. (19) pp. 97-105.

Alvarez, J. and Datnoff, E. (2001). The economic potential of silicon for integrated management and sustainable rice production. Crop. Prot. 20:53-48.

Al Wasfy, M.M. (2012). Trails for improving water use efficiency and improving productivity in Williams banana orchards by spraying salicylic acid. Minia J. of Agric. Res. & Develop. Vol. 32 No. 2. pp. 139-160.

Al Wasfy, M.M. (2013). Response of Sakkoti date palms to foliar application of Royal jelly, silicon and vitamins B. J. of Amer. Sci. 9(5): 315-321.

Aly, A.S.M. (2015). Effect of spraying Balady mandarin trees with silicon and salicylic acid M. Sc. Thesis Fac. of Agric. Minia Univ. Egypt.

Arnon, D.L. (1949). Copper enzymes in isolated chlorophyll polyphenol oxidase in Beta vulgaris. Plant Physio, 24:1-15.

Association of Official Agricultural Chemists (A.O.A.C.) (2000). Official Methods of Analysis (A.O.A.C), 12th Ed., Benjamin Franklin Station, Washington D.C., U.S.A. pp. 490-510.

Aziz, T.; Gill, M.A. and Rahmatullah, A. (2002). Silicon nutrition and crop production. Pak. J. Agric. Sci. 39(3): 181-187.

El-Khawaga, A.S. and Mansour, A.G.M. (2014). Promoting productivity of Washington Navel orange trees by using some crop seed sprout extracts, silicon and glutathione. Middle East Journal of Applied Sciences, 4(3): 779-785.

Epstein, E. (1999). Silicon. Annl. Rev: Plant. Physiol. Plant Mol-Bio.50:641-664 .

Evenhuis, B. and Dewaard P.W. (1980): Principles and Practices in Plant Analysis . F.A.O., Soil Bull. 38: 172- 163.

Gad El- Kareem, M.R. (2012). Improving productively of Taimour mango trees by using glutathione, silicon and vitamin B. Minia J. of agric. Res. & Develop 32(7): 1105-1121.

Ibrahim, H.I.M. and Al- Wasfy, M.M. (2014). The promotive impact of using silicon and selenium with potassium and boron on fruiting of Valencia orange trees grown under Minia region conditions. World Rural Observations 6(2) :28-36.

Kanto, T. (2002). Research of silicate in improvement of plant defense against pathogens in Japan. Abstract of Second Silicon in Agriculture Conference p. 22-26.

Lane, J. H. and Eynon, L. (1965). Determination of reducing sugars by means of Fehlings solution with methylene blue as indicator A.O.AC. Washington D.C.U.S.A. pp.490-510.

Ma, J.F. (2004). Role of silicon in enhancing the resistance of plants to biotic and abiotic stresses. Soil Scr. Plant Nutr.50:11-18.

Ma, J.F. and Takahashi, E. (2002). Soil,

Fertilizer and Plant. Silicon Research in Japan. Elsevier Science, Amsterdam, The Netherlands p 1-200.

Mahmoud, Kh. M. H. (2016). Response of Baladymandarian trees to foliar application of boron and silicon. Ph.D. Thesis Fac. of Agric. Minia Univ. Egypt.

Mead, R.; Currnow, R. N. and Harted, A. M. (1993). Statistical Methods in Agricultural and Experimental Biology. 2nd Ed. Chapman and Hall, London pp. 10-44.

Mengel, K.E.; Kirkby, E.A.; Kosegarten, H. and Appel, T. (2001): Principles of Plant Nutrition .5th Ed. Kluwer Academic publishers Dordecht p. 1-311.

Mohamed, M.A.A; El- Sayed, M.A. and Abd El- Wahab, H.A.M. (2015). Response of Succary mango trees to foliar application of silicon and boron. World Rural observation 7(2):93-98.

Smith, F.; Gilles, M. A.; Hamilton, J.K. and Godes, P.A. (1956). Colorimetric methods for determination of sugar and related substance. Annal., Chem., 28, pp 350-356.

Summer, (1985). Diagnosis and Recommendation Integrated system (DKIS) as a guide to orchard fertilization Hon. Abst. 55(8):7502.

Von-Wettstein, D. (1957). Chlorophyll-letale und der submikroskopischeFormwechsel der Plastiden. Experimental Cell Research, 12(3): 427-506.

Wilde, S. A.; Corey, R. B.; Layer, J. G. and Voigt, G. K. (1985). Soils and Plant Analysis for Tree Culture. 3rdEd, Oxford and (BH publishing Co., New Delhi. India, pp. 529 - 546.

Assiut J. Agric. Sci., (47) No. (6-1) 2016 (164-172) *ISSN: 1110-0486*
Website: http://www.aun.edu.eg/faculty_agriculture *E-mail: ajas@aun.edu.eg*

استجابة أشجار البرتقال أبوسرة للرش بسيليكات البوتاسيوم

راندا السيد يونس هباسي

قسم بحوث الموالح– معهد بحوث البساتين – مركز البحوث الزاعية – الجيزة – مصر

الملخص

أجريت هذه الدراسة خلال موسمى ٢٠١٣، ٢٠١٤ لاختبار تاثير تركيزات مختلفة (٠,٠٥، ٠,١، ٠,٢%) وعدد مرات الرش (مرتان وثلاث مرات) لمادة سيليكات البوتاسيوم علي الاثمار فى أشجار البرتقال ابو سرة النامية تحت الظروف البيئية لمحافظة بنى سويف.

كان هناك تحسن واضح فى جميع الصفات الخضرية والصبغات والعناصر الغذائية فى الورقة والنسبة المئوية لعقد الثمار وكمية المحصول والخصائص الطبيعية والكيميائية للثمار عند رش مادة سيليكات البوتاسيوم مرتين أو ثلاث مرات بتركيز ما بين ٠,٠٥ إلي ٠,٢% وذلك بالمقارنة بمعاملة الكونترول. وكان التحسن فى هذه الصفات مواكبا للزيادة فى التركيز وعدد مرات الرش المستخدمة ولم تتأثر جميع الصفات تحت الدراسة بزيادة التركيز المستخدم من ٠,١ إلي ٠,٢% ولا عدد مرات الرش من اثنين إلي ثلاث مرات.

أمكن الحصول علي أفضل النتائج بخصوص كمية المحصول وخصائص الجودة للثمار فى أشجار البرتقال أبو سرة النامية تحت ظروف منطقة بنى سويف وذلك عند رش الأشجار مرتين فى منتصف مارس وأبريل بمادة سيليكات البوتاسيوم بتركيز ٠,١%.

الكلمات الدالة: *أشجار البرتقال ابو سرة – سيليكات البوتاسيوم – التركيزات– عدد مرات الرش – كمية المحصول – خصائص الجودة للثمار.*