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Influence of Spraying Kaolin, Silicon and Calcium on Productivity and Quality of Sultani Fig

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DURING the 2019 and 2020 seasons, Sultani fig trees were sprayed two times (at 1st week of April and 1st week of May) with two levels of potassium silicates (1 and 2 %), two levels of Calcium nitrate (1 and 2 %) and kaolin at 5 %. The study focused on the effect of foliar application of kaolin, silicon and Calcium on vegetative growth, tree nutritional status, number of fruits per tree yield and fruit quality.

Results showed that applications of 1% or 2% potassium silicate, 1% or 2% calcium nitrate and 5% kaolin were very effective in enhancing the main shoot number, main shoot length, main shoot thickness, number of leaves/shoot, leaf area and percentages of N, P, K, Ca and yield as well as fruit quality relative to the check treatment. The promotion was associated with using 5% kaolin, 1% calcium nitrate, 1% potassium silicate, 2% calcium nitrate and 2% potassium silicate in ascending order. Using potassium silicates and Calcium nitrate was preferable to using kaolin in this respect.

Treating Sultani fig trees two times (1st week of April), and (1st week of May) with 2% potassium silicate was suggested to be beneficial for promoting yield quantitively and qualitatively.

Keywords: Potassium silicates, Calcium nitrate, Kaolin, Leaf area, Fruit quality, Sultani fig.

Introduction

Sultani variety is the most widely grown. It is also called Fayoumi, Ramadi and Barshoumy. As such, Sultani fig cultivar may be considered the local standard variety in Egypt. Other local cultivars received much less attention in comparison with Sultani cv.Yield decline of Sultani fig trees grown under sandy soil conditions is considered to be a serious and major problem that faces fig trees growers. Many efforts have been established to discover the best horticultural practices responsible for solving this problem. Recently, using kaolin, potassium silicate and calcium nitrate had beneficial effects increasing the tolerance of plants to unfavorable environments Epstein and Bloom (2003) and Rao et al. (2003).

At present, many efforts were done to enhance the yield of various figs CVs using recent horticultural practices.

Potassium silicate(K2SiO3) foliar application has been used for disease control in various crops Goussain et al. (2005), Liang et al. (2006), Bucket al. (2008), Rezende et al. (2009), Rodrigues et al. (2010), Jayawardana et al. (2015) and Deshmukh et al. (2017). These treatments do not increase plant growth or yield; however, certain variations may have been observed due to indirect effects arising from the lower infestation of disease-causing agents, or due to the presence of some agents within silicates material spray formulationsAl-Wasfy (2014).

Kaolin, $Al_2Si_2O_5(OH)_4$, is an inert mineral that reflects likely damaging ultraviolet

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and infrared radiation and transports photosynthetically active radiation, resulting in lower leaf temperature and increased photosynthesis efficiency Glenn and Puterka (2005). Its external application in leaves resulted in positive reactions to abiotic stresses in apple, pomegranate and the olive tree Melgarejo et al. (2004) and Khaleghi et al. (2015). In vineyards kaolin particle film caused cooler canopy temperatures, lower rates of stomatal conductivity under conditions ofunlimited soil moisture, protection of photosystem II structure and function in leaves exposed to heat and sunlight, and modulated content berries of total soluble solids and total anthocyanin Shellie and Glenn, (2008), Song et al. (2010), Glenn (2012), Ou et al. (2012), Shellie,(2015) and Dinis et al. (2016).

Calcium nitrate provides both calcium and nitrogen, which are the nutrients that plants use to survive.Calcium is essential for certain plants toproduce healthier fruit with a longer shelf life. Calcium is also an essential factor in the development of plant cell walls, and the proper supply of calcium in the plant can help to ensure that the cell walls are solid, to protect the plant from disease and stress. Calcium may also be used as amacronutrient as a foliar application. Spraying (Ca^{2}+) has a positive influence on certain parameters of fruit production (Asgharzade and Babaeian, 2012). Calcium has been shown to play a positive role in rising yield, fruit firmness, TSS rise and prolonging the shelf life of fruit. Calcium leads to the blocking of metabolic disturbances, reduced breathing rates, delayed growth and degradation of fruit tissues (Magee et al., 2002).

Plich and Wojcik (2002) Shown the spraying of the cv. Stanley and CV. Dąbrowicka Prune (Prunus domestica L.) with calcium led to a significant improvement in fruit firmness during harvest and slowed softening during long-term storage at low temperatures. Also, the foliar application of Calcium chloride increased the yield and quality of strawberry plants. (azemi, (2013). Moreover, Walid et al. (2015) Shown the spraying of the "Anna" apple with Ca at 0.2% as calcium chloride improved vegetative growth, leaf mineral, yield, chemical and physical fruit characteristics.

The main goals of this study were examining the effect of kaolin, silicon and calcium to improve the growth and productivity of Sultanifig cv.

Materials and Methods

This study was conducted intwoconsecutive seasons of 2019 and 2020 on twenty four 18 years old Sultani fig is grown in theExperimental farm of Sohag Fac. of Agriculture located in El-Kawther region, Sohag Governorate, Egypt.

This experiment was an attempt to improvethe growth and productivity of Sultani by spraying kaolin, potassium silicate and calcium nitrateunder the environmental conditions of Sohag Governorate, Egypt. trees were spaced at 4 x 4 m and grown in sandy soil; the trees irrigated by using a drip system. In winter trees were pruned into an equal number of bearing units. the trees were selected nearly uniform in their vigor, size, shape.

Soil is classified as sandy calcareous soil in texture with water table depth not less than two meters deep. The results of orchard soil analysis according to Chapman and Pratt, (1965) are given in Table 1.

TABLE 1. Analysis of the tested soil.

Constituents	Values
Sand %	79.5
Silt %	13.1
Clay %	7.1
Texture	Sandy calcareous
O.M. %	0.55
pH (1:2.5 extract)	8.11
E.C. (1:2.5 extract) (mmhos/1cm/25C°)	1.22
$CaCO_3$ %	8.2
Available N %	0.02
Available K (ammonium acetate, ppm)	10.1
Available P (Olsen method, ppm)	1.6

The present experiment consisted from the following sixtreatments

- Control (spray water only).
- Spraying kaolin at 5 %.
- Sprayingpotassium silicate at 1%.
- Sprayingpotassium silicate at 2%.
- Sprayingcalcium nitrateat 1%.
- Sprayingcalcium nitrate at 2%.

Each treatment was replicated four times, one tree per each. The selected trees received the common horticultural practices that had already been applied in the fig trees except for those dealing with current treatments (kaolin, silicon and calcium). kaolin ($Al_2Si_2O_5(OH)_4$), potassium silicate (25 % Si and 10 % K_2O) and calcium nitrate (17% Ca and 15% N) were sprayed two times during each season at (1st week of April and1st week of May).

The following parameters were evaluated in all the treatments:

- *The number of new current shoots:* that appeared during spring from buds of each bearing unit was also identified.
- *shoots length (cm), shoot thickness(cm) and thenumber of leaves/shoot*: Ten shoots per tree were marked to record shoot length (cm), shoot thickness (cm) in the third node and the number of leaves per shoot at the end of the growing seasons on the last week of Sep.
- *Leaf area:* Leaf area was estimated at the end of each growing season on the last week of September according toAhmed and Morsy (1999).
- *Leaf mineral content:* Leaf samples were collected, washed and dried at 70EC until constant weight and then milled to determining the following nutrient elements (Percentage as dry weight), N, P, K andCa were identified using the methods outlined by Wilde et al. 1985.
- *Yield per tree.* The yield was determined per tree (number and weight of fruits) of both Boni-crop (picked during May and June) and Main-crop (throughJuly and August). The total number of fruit and total weight per tree were calculated.
- *Fruit quality:* Fruit samples were taken fromthe Main-cropon the last week of July to determine fruit weight (g), fruit height and diameter (cm). Total acidity was estimated as citric acid mg/100g fruit by titration with sodium hydroxide at 0.1N and phenolphthalein as an indicator according to A.O.A.C. (1985), total soluble solids (TSS) percentage was appreciated by using the hand refractometer, TSS/acid ratio was obtained from the values of total soluble solids divided by the values of total acids. Total anthocyanin content (mg/100 g fresh weight): Fruit skin and flesh anthocyanin content was measured calorimetrically at 535 nm according to Fuleki and Francis (1968). Total sugars %, reducing sugars % and ascorbic acid (as mg ascorbic acid / 100 gm F.W.) (according to A.O.A.C, 1985).

Statistical analysis

The design for this trial was a randomized completely block design (RCBD) with four replications. Data were analyzed with the analysis of variance (ANOVA) procedure of the XLSTAT programversion 2020.5: XLSTAT 2020.5.1. Treatments means were compared by Duncan's multiple range tests at 5% level of probability in the average of two seasons of study (mean with a different letter(s) are significantly different) (Steel and Torrie, 1980).

Results and Discussion

Vegetative growth

It is clear from the obtained data in Table 2&4 that the applications of potassium silicate and calcium nitrate significantly were accompanied by improving the main shoot number, main shoot length, main shoot thickness, number of leaves/shootand leaf area comparing with the check treatment. But the application of kaolin is not affected to improve these vegetative growth characters. Application of 1% potassium silicate, 1% calcium nitrate, 2 % potassium silicate and 2 % calcium nitrate significantly improved the main shoot number, main shoot length, main shoot thickness, number of leaves/shoot and leaf area. The shoot number did not alter significantly due to all foliar applications in the first season of study.Applications of potassium silicate and calcium nitrate were superior to the application of 5 % kaolin. The maximum values of the main shoot number, main shoot length, main shoot thickness,number of leaves/shoot and leaf area were recorded in the trees that received two sprays of 2 % potassium silicate and 2 % calcium nitrate. Significant differences on such vegetative growth characters were observed among treated and untreated trees. Treatments of Kaolin and control produced the minimum values. Similar results were announced during the two seasons. The beneficial effects of silicon, calcium and kaolin on enhancing cell division, the biosynthesis of organic foods and the resistance of the trees to different disorders explain the present results (Samiullah et al., 1988 and Epstein & Bloom, 2003).

Results presented here agreed with those Goussain et al. (2005), Liang et al. (2006), Buck et al. (2008), Rezende et al. (2009), Rodrigues et al. (2010), Jayawardana et al.,(2015) and Deshmukh et al. (2017) on silicon, Wójcik and Lewandowski, (2003), Asgharzade and Babaeian, (2012) and Walidet al., (2015) on calcium and Shellie, (2015). and Diniset al., (2017) on kaolin emphasized the present results.

Leaf mineral content

As shown in Table 3 most of the applied treatments were enhanced nutrient status in leaves of Sultani fig cv.

Nitrogen: Concerningthe effect of potassium and calcium treatments on leaf nutrients content, all treatments of potassium and calcium enhanced leaf nitrogen content and the considerable nitrogen content was obtained when Calcium nitrate was applied at 2%. But the treatment with 5% kaolin had no effect of increased N content.

Phosphorus: All treatments markedly increased leaf Phosphorus content comparing with controlexcepted kaolin spray, while the high level of Phosphorus resulted in foliar applied Calcium nitrate at 2 % in the first season. But, No significant promotion on P % in the second season

Potassium: All treatments markedly increased leaf potassium content comparing with control, while the high level of potassium resulted in foliar applied of potassium silicate at 2 %. But, No significant promotion on K % in the second season.

Calcium: Concerning with calcium status in leaves, the study showed that all treatments markedly increased leaf calcium content comparing with control, whereas the highest levels of calcium in leaves recorded with Calcium nitrate at 2 % in two seasons. The positive action of silicon, Calcium and kaolin on enhancing the resistance of the trees to different unfavorable conditions as well their essential role in enhancing water uptake could explain the present results (Samiullah et al., 1988 and Epstein, 1999).

TABLE 2. Effect of kaolin Potassium silicate and Calcium nitrate applications on some vegetative growth parameters of fig trees cv Sultani.

Treatments	Shoot number		Shoot length(cm)		Shoot thickness(cm)		No. leaves/shoot	
	2019	2020	2019	2020	2019	2020	2019	2020
Control	42.50 a	41.00 b	41.33 b	37.33 c	2.55 d	2.50 d	15.00 bc	13.33 b
5 % Kaolin.	43.16 a	41.33 b	42.00 b	39.66 c	2.60 d	2.56 d	14.00 c	13.33 b
1% Potassium silicate	44.67 a	44.00 ab	57.33 a	54.66 b	2.81 c	2.68 c	16.66 a	15.00 ab
2% Potassium silicate	45.67 a	47.33 a	62.33 a	61.33 a	2.82 c	2.76 bc	15.33 b	16.00 a
1% Calcium nitrate	45.33 a	45.00 ab	60.33 a	58.66 ab	2.94 b	2.86 b	16.66 a	14.33 ab
2% Calcium nitrate	47.00 a	47.33 a	65.00 a	63.33 a	3.05 a	3.11 a	15.33 b	15.33 a

Means followed by the same letter/s within each column didn't significantly differ at 5% level.

TABLE 3. Effect of kaolin Potassium silicate and Calcium nitrate applications on leaf nutrients content of fig cv Sultani.

Treatments	Nitrogen%		Phosphorus %		Potassium%		Calcium%	
	2019	2020	2019	2020	2019	2020	2019	2020
Control	1.15 d	1.13 d	0.29 c	0.35 a	1.54 b	1.67 a	1.65 d	1.64 e
5 % Kaolin.	1.25 d	1.32 c	0.32 c	0.37 a	1.64 ab	1.59 a	1.81 c	1.78de
1% Potassium silicate	1.41 c	1.42 bc	0.35 bc	0.36 a	1.73 ab	1.76 a	1.88 bc	1.85cd
2% Potassium silicate	1.55 bc	1.47 bc	0.41 a	0.40 a	1.83 a	1.77 a	1.95 bc	1.97 c
1% Calcium nitrate	1.63 b	1.57 ab	0.40 ab	0.32 a	1.66 ab	1.66 a	2.03 b	2.15 b
2% Calcium nitrate	1.81 a	1.72 a	0.43 a	0.39 a	1.69 ab	1.68 a	2.18 a	2.36 a

Means followed by the same letter/s within each column didn't significantly differ at 5% level.

Results presented here agreed with those Goussain et al. (2005), Liang et al. (2006), Buck et al. (2008), Rezende et al. (2009), Rodrigues et al. (2010), Jayawardana et al. (2015) and Deshmukh et al. (2017) on silicon, Wójcik & Lewandowski (2003), Asgharzade & Babaeian, (2012) and Walid et al. (2015) on calcium and Shellie, (2015) and Dinis et al. (2017) on kaolin emphasized the present results.

The number of fruits and yield/ tree

It is noticed from the data in Table 4 that the total yield per tree expressed in weight and number of fruits (Boni+ Main) per tree were significantly improved in response to foliar spray with kaolin, potassium silicate and calcium nitrate comparing to the check treatment. Application of 1% calcium nitrate, 2 % calcium nitrate, 1% potassium silicate, and2 % potassium silicate, in ascending order. The maximum values of yield and number of fruits (Boni+ Main) per tree were obtained due to using 2 % potassium silicate. Spraying 1%of potassium silicateoccupied the second position in this respect. The lowest values were recorded with using control and5% kaolin treatments. These results were true during both seasons. The previous beneficial effects of silicon, calcium and kaolin on growth, wood ripening and trees nutritional status surely reflected on promoting the yield. These treatments do not increase plant growth or yield; however, certain variations may have been observed due to indirect effects arising from the lower infestation of disease-causing agents, or due to the presence of some agents within silicates material spray formulations (Al-Wasfy, 2014). Results presented here agreed with those Goussain et al. (2005), Liang et al. (2006), Buck et al. (2008), Rezende et al. (2009), Rodrigues et al. (2010), Jayawardana et al., (2015) and Deshmukh et al. (2017) on silicon, Wójcik and Lewandowski (2003), sgharzade & Babaeian (2012) and Walidet al. (2015) on calcium and Shellie, (2015) and Dinis et al. (2017) on kaolin emphasized the present results.

Physical parameters of fig fruit

Data in Table 5 indicated that most treatments have a positive impact on fruit weight, fruit height (cm), fruit diameter (cm) and fruit shape index.

Fruit weight: Control treatment produced the lowest value of fruit weight in comparison to other treatments. Meanwhile, spraying 2 % of potassium silicate resulted in producing the highest value of fruit weight. Moreover, data in Table 5 indicated that increasing concentration of calcium nitrate or potassium silicate separately led to increasing fruit weight.

Fruit height, Fruit diameter and Fruit shape index: From Table 5 fruit height and fruit diameterwere significantly improved in response to all treatment comparing to the check treatment. Meanwhile, there were no significant difference between application treatment with kaolin, silicon and calcium. Generally, all treatments improved fruit height and fruit diameter and not fruit shape index in comparing with control treatment.

The beneficial effects of silicon, calcium and kaolin on growth, fruit cell division and tree nutritional status surely reflected on enhancing the formation of organic foods and explain the present results. Results presented here agreed with those Goussain et al. (2005), Liang et al. (2006), Buck et al. (2008), Rezende et al. (2009), Rodrigues et al. (2010), Jayawardana et al. (2015) and Deshmukh et al. (2017) on silicon, Wójcik& Lewandowski (2003), Asgharzade & Babaeian, (2012) and Walidet al. (2015) on calcium and Shellie (2015). and Dinis et al. (2017) on kaolin emphasized the present results.

TABLE 4. Effect of kaolin Potassium silicate and Calcium nitrate applications on Leaf area, Number of fruits/ tree and yield per tree of fig fruits cv Sultani.

Treatments	Leaf area (cm^2)		No. of fruits/tree (Boni crop)		No. of fruits/tree (main crop)		Yield/tree (kg) (Boni crop + main crop)	
	2019	2020	2019	2020	2019	2020	2019	2020
Control	102.58 d	103.83 c	3.01 b	2.66 b	160.33c	156.00 d	4.68 d	4.20 d
5 % Kaolin.	107.89 cd	109.03 bc	3.00 b	3.00 b	165.00 c	162.67 d	4.95 c	4.50 c
1% Potassium silicate	111.84 bc	112.43 abc	4.00 a	3.66ab	180.0 ab	175.33ab	5.93 b	5.59 b
2% Potassium silicate	120.03 a	121.08 a	3.66 ab	4.33 a	183.33 a	180.66 a	6.90 a	6.63 a
1% Calcium nitrate	116.00 abc	114.95 ab	3.33 ab	3.33ab	174.00b	165.33cd	5.17 c	5.17 c
2% Calcium nitrate	120.80 a	119.62 a	3.33 ab	3.66ab	173.67b	169.67bc	5.8 b	5.73 b

Means followed by the same letter/s within each column didn’t significantly differ at 5% level.

TABLE 5. Effect of kaolin Potassium silicate and Calcium nitrate applications on physical characteristics of fig fruits cv Sultani.

Treatments	Fruit weight (gm)		Fruit height (cm)		Fruit diameter(cm)		Fruit shape index	
	2019	2020	2019	2020	2019	2020	2019	2020
Control	28.65 d	26.46 d	3.67 b	3.47 b	3.67 b	3.52 b	0.990 a	0.980 a
5 % Kaolin.	29.45 cd	27.15 cd	3.97 a	3.77 a	3.93 a	3.78 a	1.010 a	0.990 a
1% Potassium silicate	32.26 bc	31.24 bc	3.97 a	3.77 a	3.93 a	3.78 a	1.010 a	0.997 a
2% Potassium silicate	37.47 a	35.83 a	4.09 a	3.89 a	4.03 a	3.87 a	1.015 a	1.010 a
1% Calcium nitrate	30.66bcd	30.67 bc	4.07 a	3.86 a	4.01 a	3.85 a	1.016 a	1.010 a
2% Calcium nitrate	33.53 b	33.08 b	3.99 a	3.79 a	3.97 a	3.82 a	1.01 0a	0.990 a

Means followed by the same letter/s within each column didn't significantly differ at 5% level.

Chemical parameters of fig fruit

Generally, data in Tables 6 & 7 indicated that, the majority of applied treatments had a positive impact on measured fruit chemical parameters. Whereas, TSS, TSS/acid ratio, total anthocyanin,reducing sugar %,total Sugar % andascorbic acid were increased and decreased acidity, by applying kaolin, calcium nitrate andpotassium silicate treatments.

Total Soluble Solids content (TSS): Data in Table 6 showed that all applied treatments resulted in increasing TSS content compared with control treatment excepted kaolin treatment. It is worth mentioning that there no significant differences among 1 or 2 % calcium nitrate and1 or 2 % potassium silicate foliar application treatments when they are applied. In both seasons.

Total acidity: From Table 6 it was noticed that all treatments had a positive impact on decreasedtitratableacidity. While, control treatment produced the highest value of total acidity. However, increasing the concentration of calcium nitrate from 1 to 2% and potassium silicate from 1 to 2% led to a decrease in the acidity value.

TSS/acid ratio : Data in Table 6 showed that all applied treatments resulted in increasing in TSS/acid ratio compared with control treatment. It is worth mentioning that there no significant differences between 1 or 2 % calcium nitrate and1 or 2 % potassium silicate foliar application treatments in both seasons.

Total anthocyanin: Applying 2 % potassium silicate produced the highest value of total anthocyanin. The lowest value was recorded using control treatments. These results were true during both seasons.

Ascorbic acid: all applied treatments produced increment in ascorbic acid content in comparison to control treatment. Also, applied 2 % potassium silicate produced the highest value of ascorbic acid content.The lowest value was recorded using control treatments. These results were true during both seasons.

Reducing sugar % and Total Sugar % : Applying 2 % potassium silicate produced the highest value of Reducing sugar % and Total Sugar %.The lowest value was recorded using control treatments. These results were true during both seasons .

The beneficial effects of silicon, calcium and kaolin on growth and tree nutritional status surely reflected on enhancing the formation of plant pigments and organic foods that were responsible for building sugars and other organic foods could explain the present results. Results presented here agreed with those Goussain et al. (2005), Liang et al. (2006), Buck et al. (2008), Rezende et al. (2009), Rodrigues et al. (2010), Jayawardana et al. (2015) and Deshmukh et al. (2017) on silicon, Wójcik and Lewandowski, (2003), Asgharzade & Babaeian, (2012) and Walid et al. (2015) on calcium and Shellie (2015) and Dinis et al. (2017) on kaolin emphasized the present results.

As a conclusion, for promoting Vegetative growth, Leaf mineral content, as well as yield quantitively and qualitatively of Sultani fig cv.,which grows under the conditions of reclaiming land at Sohag region, it is suggested to foliar application of 2% of Potassium silicate at twice times (1st week of April and 1st week of May).

TABLE 6. Effect of kaolin Potassium silicate and Calcium nitrate applications on some chemical characteristics of fig fruits cv Sultani.

Treatments	TSS		Acidity %		TSS/acid ratio		Total anthocyanin (mg/100gm F.W.)	
	2019	2020	2019	2020	2019	2020	2019	2020
Control	20.01 b	20.04 b	0.223 a	0.226 a	90.38 ab	88.87 b	40.10 d	41.23 b
5 % Kaolin.	20.06 b	20.30 b	0.240 a	0.216 ab	85.18 b	93.75 b	46.70 c	47.03 ab
1% Potassium silicate	21.15 a	21.38 a	0.195 b	0.194 b	108.46 a	110.20 a	53.51b	45.88 ab
2% Potassium silicate	21.30 a	21.32 a	0.192 b	0.192 b	110.93ab	111.04 a	63.88a	65.10 a
1% Calcium nitrate	21.13 a	21.16 a	0.213 b	0.216 a	99.20 ab	97.96 ab	50.99bc	51.71 ab
2% Calcium nitrate	21.16 a	21.19 a	0.199 b	0.206 ab	106.33 a	102.86 a	55.88b	54.84 ab

Means followed by the same letter/s within each column didn’t significantly differ at 5% level.

TABLE 7. Effect of kaolin Potassium silicate and Calcium nitrate applications on chemical characteristics of fig fruits cv Sultani.

Treatments	Reducing sugar %		Total Sugar %		Ascorbic acid (mg/100gm F.W.)	
	2019	2020	2019	2020	2019	2020
Control	9.97 d	9.880 c	10.11 e	10.28 e	19.71 e	19.67 e
5 % Kaolin.	10.14 cd	9.980 c	10.34 de	10.57 de	21.84 d	22.50 d
1% Potassium silicate	10.36 ab	10.35 b	11.07 ab	11.18 ab	24.50 b	24.34 bc
2% Potassium silicate	10.55 a	10.51 a	11.38 a	11.38 a	26.63 a	26.69 a
1% Calcium nitrate	10.27 bc	10.25 b	10.59 cd	10.82 cd	23.19 c	23.27 cd
2% Calcium nitrate	10.28 bc	10.25 b	10.80 bc	10.96 bc	24.85 b	25.23 ab

Means followed by the same letter/s within each column didn’t significantly differ at 5% level.

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Conflicts of interest

No conflicts of interest to declare

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تأثير رش الكاولين، السيلكون والكالسيوم على إنتاجية وجودة التين السلطاني

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اجريت هذه الدراسة خلال موسمي ٢٠١٩ و٢٠٢٠وذلك لدراسة تأثير رش أشجار التين السلطاني بمعدل مرتان (في الأسبوع الأول من أبريل والأسبوع الأول من مايو) بالرش الورقي بسيليكات البوتاسيوم بتركيز ١ و٢ ٪، نترات الكالسيوم بتركيز ١و٢ ٪ والكاولين بتركيز ٥ ٪. ركزت الدراسة على تأثير هذه المواد على بعض خصائص النمو والإثمار لأشجار التين السلطاني.

تأثرت صفات النمو الخضري، الحالة الغذائية للأشجار، كمية محصول الشجرة وكذلك الخصائص الطبيعية والكيمائية للثمار إيجابياً باستخدام سيليكات البوتاسيوم، نترات الكالسيوموالكاولين وذلك بالمقارنة بعدم الرش. وكانت صفة الحموضة الكلية تميل إلى الانخفاض بصورة واضحة عند تطبيق هذه المعاملات وكان التحسن فيصفات النمو الخضري، الحالة الغذائية للأشجار، كمية محصول الشجرة وكذلك الخصائص الطبيعية والكيمائية للثمارمتوافقاً مع زيادة التركيز المستخدم من سيليكات البوتاسيوم ونترات الكالسيوموتم الحصول على أفضل النتائج عند استخدامالكاولين، نترات الكالسيوم وسيليكات البوتاسيوم مرتبة ترتيباً تصاعدياً. كما تفوق استخدام كل من سيليكات البوتاسيوم ونترات الكالسيوم عن استخدام الكاولين في تعزيز هذا الصفات.

يقترح رش سيليكات البوتاسيوم مرتان (في الأسبوع الأول من أبريل والأسبوع الأول من مايو) بتركيز ٢ ٪ وذلك لتحسين صفات النمو الخضري، الحالة الغذائية للأشجار، كمية محصول الشجرة وكذلك الخصائص الطبيعية والكيمائية للثمار في أشجار التين السلطانى.