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Efficacy of Kaolin and Screen Duo Spraying on Fruit Sunburn, Yield and Fruit Quality of Keitt Mango Fruits

Baiea, M. H. M. [1]; S. F. EL-Gioushy[2] and H. E. M. El-Badawy[2]

[1]Horticultural Crops Technology Dept., National Research Centre, Dokki, Giza, Egypt. (mh.baiea@nrc.sci.eg)

[2]Hort. Dept., Faculty of Agric., Benha Univ., Egypt. (sherif.elgioushy@fagr.bu.edu.eg) (hamed.albadawy@fagr.bu.edu.eg).

ABSTRACT

This study was carried out during two successive seasons (2016 and 2017) on six years old Keitt mango trees grafted on Succary seedlings as rootstocks and planted at 2×3 meters in sandy soil under drip irrigation system in Kafr El-Sohbi village, Qalubia Governorate, Egypt., To study the influence of kaolin and screen duo foliar application on fruit sunburn, yield and fruit quality. Hence, the foliar applications treatment were kaolin (aluminum silicate) at 25,50 and 75g/L and screen duo at 6,12 and 18 cm^3/L sprayed once at mid of June and also sprayed twice at mid of both June and July during both seasons of study as well as, control (tap water spray). The influence was evaluated through the response of the different measurements as yield, sunburned fruit measurements, fruit quality and fruit skin color parameters with kaolin and screen duo concentrations and times of spray (once or twice). The obtained results revealed that the response to screen duo was more pronounced and differences between its three concentrations were significant in most cases as compared each other from one hand and the highest one (18 cm^3/L.) was the most effective in most cases from the other hand. Referring the specific effect of times of spray (once or twice) data display obviously that the highest values in most cases were significantly in concomitant to fruits sprayed twice during both seasons of study. Anyhow, it could be concluded that, spraying screen duo at 12 and/or 18 cm^3/L twice in summer months (at mid of both June and July) had a positive effect to prevent fruit sunburn damage and improved yield and fruit quality of Keitt mango fruits.

Keywords: Keitt mango, kaolin, screen duo, sunburn, yield and fruit quality.

INTRODUCTION

Mango (*Mangifera indica* L.) is a very delicious tropical fruit belongs to family Anacardiaceae, it is also considered as the queen of the fruits as it is very popular world-wide. Mango fruit is an abundant source of vitamins, minerals and is famous for its excellent flavor, attractive fragrance and nutritional value. Keitt mango cultivar grown successfully under the Egyptian conditions and its yield production comes in the late season ripening (The fruit generally has typically ripened from August until September in Florida, often into October as well, making it one of the more valied late-season varieties.), especially in the newly reclaimed areas. However, due to the growth habit of Keitt mango as it carry low leaves when compared with another species, and the high temperature and sunlight in Egypt, the fruits exposed to certain physical and physiological disorders which diminish the fruit quality and marketability.

Sunburn injury is common to take place on fruits due to high solar radiation levels and air temperatures, low relative humidity, and high elevations as well as due to the low leaves number that minimized the protection of small newly formed fruits. The incidence and severity of sunburn depends upon climatic factor, cultivars, hormonal, nutritional and soil moisture. Fruit production losses due to sunburn may be 6 to 30 percentage depending on seasons and the type of fruit. Grower must follow best management practices to minimize sunburn and grow tolerant cultivars, efficient irrigation, appropriate canopy management, cover or intercropping, over tree sprinkler, shade netting, fruit bagging, suppressants (Kaolin or calcium carbonate) and chemical protectants (Narayan and Sahu, 2017).

Kaolin (a clay) is a natural material which main constituent is kaolinite ($Al_2Si_2O_5(OH)_4$). Kaolin clay treatments have been successfully applied in different fruit species to minimized fruit sunburn and improve yield and fruit quality (Kerns and Wright, 2000; Colavita *et al.,* 2011 and Alvarez *et al.,* 2015). Kaolin-based particle films can reduce insect, heat, and ultraviolet stress in horticultural crops because of their ability to modify the microenvironment of the plant canopy as a result of the reflective nature of the particles (Glenn, 2012), kaolin was significantly effective for reducing apple fruits temperature, the products effectiveness is often expressed in terms of damaged fruit, (Alvarez *et al.,* 2015). Glenn, (2009) mentioned that, kaolin foliar spray on apple tree to reflect sunlight, led to lower the temperature of fruit surface, reducing sun injuries as well as improving yield and fruit quality. Ennab *et al.* (2017) concluded that, kaolin foliar applications at 3 and 4% decreased leaf heat and fruit surface temperature and was more effective to control sunburned fruits of Balady mandarin trees.

Screen Duo® (commercial Kaolin clay) has two modes of action for the protection of crop plants against abiotic stress. The first is a visible particle film that reflects harmful UV and IR light, reducing the temperature of the plant. The second is a naturally occurring compound, found in all crop plants, that triggers the innate stress response mechanism. When Screen Duo® is applied to plants, a visible, bluish-grey film results. For best performance a thorough, uniform, and consistent coverage is essential throughout the stress period. Screen duo may increase plant vigor, total yield and quality in many crops. Under high ambient temperatures, screen duo reduces canopy temperature, reducing heat, light and water stress. The reduction of stress results in increased fruit quality e.g. Total Soluble Solids (TSS/Brix) and fruit size. Other benefits include improved color and reduced russet, fruit drop, sunburn and cracking. Best results are obtained from the 'Season Long' treatment program. Screen Duo® reflects damaging UV and IR radiation and heat, while still allowing photosynthesis and the uptake of nutrients and crop protection products. (Zaky *et. al.,* 2018)

Therefore, the aim of this study is to investigate the efficacy of spraying kaolin and Screen Duo® on fruit sunburn, yield and fruit quality of Keitt mango fruits and find alternative methods for the bagging traditional way which labor expensive.

MATERIALS AND METHODS

This study was carried out during two successive seasons (2016 and 2017) on six years old Keitt mango trees grafted on Succary seedlings as rootstocks and planted at 2×3 meters in sandy soil under drip irrigation system in Kafr El-

Sohbi village, Qalubia Governorate, Egypt. The soil of the experimental field was sandy in texture with pH 7.3. Soil mechanical and chemical analysis were determined according to Black *et al.,* (1982) and presented in Table (1).

Table 1. Soil mechanical and chemical analysis of the used soil.

Physical analysis		Chemical analysis			
		Cations meq/L		Anions meq/L	
Coarse sand	18.3%	Ca^{++}	8.9	CO_3^{--}	Zero
Soil Ph	36.8%	Mg^{++}	3.15	HCO_3^{-}	4.5
Silt	27.5%	Na^{+}	4.20	Cl^{-}	6.35
Clay	18.4%	K^{+}	1.18	SO_4^{--}	8.10
Texture class	Sandy				
Soil Ph	7.3	Available N		23.9 mg/kg	
E.C. ds/m	1.87	Available P		12.6 mg/kg	
Organic matter	0.92	Available K		183 mg/kg	

Experiment layout:

The complete randomized block design with three replications was employed for arranging the seven investigated foliar application treatments, whereas each replicate was represented by three trees. Consequently, 126 healthy fruitful Keitt mango trees were carefully selected, as being healthy and disease free. Chosen trees were divided according to their growth vigor into three categories (blocks) each included seven similar trees for receiving the investigated treatments.

All trees were subjected to the same horticultural practices (irrigation, fertilization, weeds &pest control) adopted in the region according to the recommendation of the Ministry of Agriculture. In addition, 63 trees were sprayed once at mid of June in each season. Moreover, the other 63 trees were sprayed twice at mid of June and mid of July.

The following 14 foliar application treatments were included in this experiment:

T1 – control (tap water spray) sprayed once at mid of June.
T2 – Koalin (aluminum silicate) at 25g/L sprayed once at mid of June.
T3 - Koalin (aluminum silicate) at 50 g/L sprayed once at mid of June.
T4- Koalin (aluminum silicate) at 75 g/L sprayed once at mid of June.
T5- Screen duo at $6cm^3$/L. sprayed once at mid of June.
T6- Screen duo at $12cm^3$/L. sprayed once at mid of June.
T7- Screen duo at $18cm^3$/L. sprayed once at mid of June.
T8 – control (tap water spray) sprayed twice at mid of both June and July.
T9- Koalin (aluminum silicate) at 25g/L sprayed twice at mid of both June and July.
T10 - Koalin (aluminum silicate) at 50 g/L. sprayed twice at mid of both June and July.
T11- Koalin (aluminum silicate) at 75 g/L. sprayed twice at mid of both June and July.
T12- Screen duo at $6cm^3$/L. sprayed twice at mid of both June and July.
T13- Screen duo at $12cm^3$/L. sprayed twice at mid of both June and July.
T14- Screen duo at $18cm^3$/L. sprayed twice at mid of both June and July.

The following characteristcs were measured:

Yield:

In each season, at harvest time (first of November), the numbers of fruits per tree and fruit yield per tree were counted for each treatment. All fruits were picked and weighted for each tree in different treatments, tree yield in kilograms was estimated by multiplying the number of fruits per tree and the average fruit weight.

Fruit quality:

Fruit physical properties:

In this regard average fruit weight (g.); dimensions (length, diameter and thickness in cm.); fruit shape index (length: diameter) and Fruit firmness was determined using Shatilon's instrument for measuring firmness (Lb/Inch) were the fruit physical characteristics investigated in this regard.

Fruit chemical properties:

Fruit juice, total soluble solids percentage (TSS %) was determined using hand refractometer. Total acidity as grams of citric acid per 100 ml fruit juice, total soluble solids/acid ratio was also estimated. Ascorbic acid (vitamin C) content was determined using 2, 6 dichlorophenol indophenol indicator for titration according to A.O.A.C. (1995).

Sunburned fruit measurements:

- Number of sunburned fruits /tree.
- Weight of sunburned fruits /tree.
- Sunburned fruit weight % as comparing with weight of yield = sunburned fruits weight per tree (Kg) / weight of yield per tree (Kg) x 100.

Fruit skin color parameters:

Color is a matter of perception and subjective interpretation. By analyzing the color conditions and adding adjectives such as “bright”, “dull” and “deep”, we can describe the color as a little more precisely. So, any given color is located as point of three-dimensional space (Fig 1). When color is classified, it can be expressed in terms of their hue (color), lightness (brightness) and chroma (vividness, or saturation). The world of color is a combination of these three aspects (McGuire, 1992).

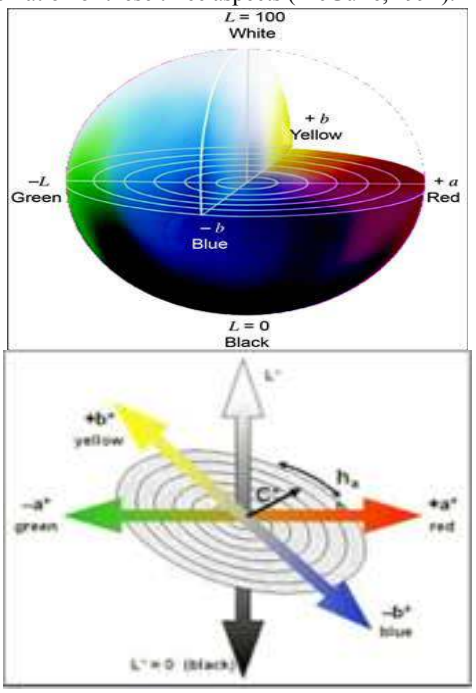

Fig. 1. CIE Lab color space; *L* is always positive and represents brightness: a > 0 represents red component, a<0 green component, b>0 represents, Yellow component and b < 0 blue component

Statistical analysis:

All data obtained during both seasons were subjected to analysis of variance according to Snedecor and Cochran (1989). In addition, significant differences among means were differentiated according to the Duncan, multiple test range (Duncan, 1955) where capital letters were used for distinguishing means of different treatments for each investigated characteristic.

RESULTS DISCUSSION

Some fruiting aspects in response to foliar application with kaolin, screen duo and times of spray (once or twice) of Keitt mango fruits during 2016&2017 experimental seasons.

Data obtained during both 2016 & 2017 experimental seasons regarding the number of fruits/tree, fruit weight and yield per tree as productivity measurements to specific effect Kaolin, screen duo and times of spray (once or twice) and interaction effect of their combination are presented in Table (2). Herein, the differences in most cases were relatively not so pronounced to be taken into consideration from the statistical standpoint. Such trend was true during both experimental seasons for all the above-mentioned fruiting measurements.

Anyhow, these results are in agreement with those obtained by Kerns and Wright, (2000); Glenn, (2009); Colavita *et al.,* (2011); Alvarez *et al.,* (2015) and Zaghloul *et al.,* (2017).

Effect of kaolin, screen duo sprayed once or twice on number of sunburned fruits per tree, sunburned fruits weight and sunburned fruit weight /weight of yield (%) of Keitt mango fruits.

Data obtained during both seasons revealed that number of sunburned fruits per tree, sunburned fruits weight and sunburned fruit weight/weight of yield (%) responded specifically to kaolin, screen duo concentrations are presented in Table (3). Herein, sprayed trees with screen duo at (6, 12 and 18cm^3/L) twice decreased all the above-mentioned parameters during 2016 and 2017 experimental seasons. In addition, all kaolin concentration succeeded in decreasing the aforementioned three parameters with significant differences in all cases when compared with control.

Table 2. Effect of kaolin and screen duo sprayed once or twice on number of fruits/tree, fruit weight (g), and yield/tree (Kg) of Keitt mango fruits during two experimental seasons 2016&2017.

Parameters	No. of fruits/tree			Fruit weight (g)			Yield/tree (Kg)		
2016									
Times of spray Treatments	Once	Twice	Mean	Once	Twice	Mean	Once	Twice	Mean
Control	17.86 a	17.89 a	17.88 A	556.4 d	561.2 abcd	558.8 A	9.94 a	10.05 a	9.99 A
Kaolin at 25 g/L.	17.92 a	17.92 a	17.92 A	540.0 f	537.3g	538.7 E	9.67 a	9.63 a	9.65 A
Kaolin at 50 g/L.	17.96 a	18.08 a	18.02 A	545.0 ef	563.9 ab	554.4 BC	9.78 a	10.20 a	9.99 A
Kaolin at 75 g/L.	17.89a	18.03 a	17.96 A	558.0 cd	562.9 abc	560.4 A	9.97 a	10.13 a	10.05 A
Screen duo at 6 cm^3/L.	18.14 a	18.24 a	18.19 A	548.0 e	566.9 a	557.5 AB	9.93 a	10.34 a	10.13 A
Screen duo at 12 cm^3/L.	18.21 a	18.29 a	18.25 A	556.2 d	540.3 fg	548.3 D	10.12 a	9.87 a	10.00 A
Screen duo at 18cm^3/L.	18.25 a	18.30 a	18.27 A	560.9 bcd	543.5 ef	552.2 CD	10.25 a	9.93 a	10.09 A
Mean	18.03 A	18.11 A		552.1 A	553.7 B		9.95 A	10.02 A	
2017									
Control	18.94 a	18.91 a	18.92 A	527.0 c	530.3 bc	528.7 A	9.99 a	10.01 a	10.00 A
Kaolin at 25 g/L.	19.17 a	19.20 a	19.18 A	517.0 de	497.0 h	507.0 E	9.92 a	9.55 a	9.73 A
Kaolin at 50 g/L.	19.08 a	19.23 a	19.16 A	527.0 c	501.3 gh	514.2 CD	10.05 a	9.65 a	9.85 A
Kaolin at 75 g/L.	19.06 a	20.54 a	19.80 A	534.3 b	514.1 e	524.2 B	10.20 a	10.58 a	10.39 A
Screen duo at 6 cm^3/L.	19.19 a	19.14 a	19.17 A	543.4 a	499.2 h	521.3 B	10.43 a	9.54 a	9.99 A
Screen duo at 12 cm^3/L.	19.24 a	19.32 a	19.28 A	527.3 c	507.1 f	517.2 C	10.15 a	9.80 a	9.97 A
Screen duo at 18cm^3/L.	19.26 a	19.35 a	19.31 A	520.3 d	504.5 fg	512.4 D	10.03 a	9.76 a	9.89 A
Mean	19.13 A	19.38 A		528.1 A	507.6 B		10.11 A	9.84 A	

Values within each column followed by the same letter/s are not significantly different at 5% level.

Table 3. Effect of kaolin and screen duo sprayed once or twice on number of sunburned fruits/tree, sunburned fruit weight (Kg) and sunburned fruit weight/ weight of yield (%) of Keitt mango fruits during two experimental seasons 2016&2017.

Parameters	No. of sunburned fruits/tree			Sunburned fruit weight (Kg)/tree			Sunburned fruit weight/ weight of yield (%)		
2016									
Times of spray Treatments	Once	Twice	Mean	Once	Twice	Mean	Once	Twice	Mean
Control	5.67 a	4.67 ab	5.17 A	3.17 a	2.64 a	2.90 A	31.75 a	25.82 b	28.78 A
Kaolin at 25 g/L.	3.67 bc	1.33 efg	2.50 B	2.00 b	0.72 def	1.36 B	20.61 bc	7.41 fg	14.01 B
Kaolin at 50 g/L.	3.33 cd	1.00 fgh	2.17 BC	1.84 bc	0.56 efg	1.20 BC	18.77 cd	5.54 fgh	12.15 BC
Kaolin at 75 g/L.	2.33 de	0.67 fgh	1.50 CD	1.32 cd	0.38 efg	0.85 CD	13.22 de	3.88 fgh	8.55 CD
Screen duo at 6 cm^3/L.	1.67 ef	0.33 gh	1.00 DE	0.92 de	0.19 fg	0.56 DE	9.46 ef	1.97 gh	5.72 DE
Screen duo at 12 cm^3/L.	1.00 fgh	0.33 gh	0.67 E	0.56 efg	0.18 fg	0.38 E	5.69 fgh	1.97 gh	3.83 E
Screen duo at 18cm^3/L.	1.00 fgh	0.00 h	0.50 E	0.57 efg	0.00 g	0.29 E	5.29 fgh	0.00 h	2.64 E
Mean	2.67 A	1.19 B		1.48 A	0.67 B		14.97 A	6.655	
2017									
Control	6.00 a	6.00 a	6.00 A	3.18 a	3.21 a	3.19 A	31.66 a	33.33 a	32.49 A
Kaolin at 25 g/L.	4.00 b	1.00 de	2.50 B	2.07 b	0.49 de	1.28 B	20.74 b	5.36 de	13.05 B
Kaolin at 50 g/L.	3.33 bc	0.67 de	2.00 BC	1.76 bc	0.34 de	1.05 BC	17.64 bc	3.28 de	10.46 BC
Kaolin at 75 g/L.	2.33 bcd	1.00 de	1.67 BCD	1.25 bcd	0.51 de	0.88 BCD	12.13 bcd	4.89 de	8.51 BC
Screen duo at 6 cm^3/L.	2.00 cd	0.67 de	1.33 BCD	1.07 cd	0.33 de	0.71 BCD	10.50 bcde	3.52 de	7.01 BC
Screen duo at 12 cm^3/L.	1.33 de	0.00 e	0.67 D	0.70 de	0.00 e	0.35 D	6.97 cde	0.00 e	3.48 C
Screen duo at 18cm^3/L.	1.67 cde	0.00 e	0.83 CD	0.86 cde	0.00 e	0.43 CD	8.91 cde	0.00 e	4.45 C
Mean	2.95 A	1.33 B		1.56 A	0.70 B		15.51 A	7.20 B	

Values within each column followed by the same letter/s are not significantly different at 5% level.

Data obtained during the assigned two seasons displayed that the specific effect of each investigated factor had been reflected directly on their combinations. Herein, the least number of sunburned fruits per tree, sunburned fruits weight and sunburned fruit weight/weight of yield (%) was usually in concomitant to those fruits sprayed with screen duo at 12 and/or 18 cm^3/L twice spray. In addition, the response of abovementioned parameters to screen duo at 6 cm^3/L + twice spray came statistically in the second rank during 2016&2017 experimental seasons.

The obtained results are in harmony with those attained by Glenn *et al.,* (2002); Jifon and Syvertsen, (2003); Gindaba and Wand, (2005); Wand *et al.,* (2006); Colavita, (2011); EL-Gioushy *et al.,* (2017); Ennab *et al.* (2017); and Zaghloul *et al.,* (2017).

Effect of Kaolin, screen duo sprayed once or twice on some fruit quality properties of Keitt mango fruits.

Data obtained on fruit quality (fruit length, fruit diameter, fruit shape index, fruit thickness and fruit firmness) and (V.C mg/100 ml F.W, T.S.S%, acidity % and T.S.S/acidity ratio) in response to specific effect and interaction effect to the two investigated factors during 2016 and 2017 experimental seasons are presented in Tables (4,5 and 6).

Table 4. Effect of kaolin and screen duo sprayed once or twice on fruit length (cm), fruit diameter (cm) and fruit shape index of Keitt mango fruits during two experimental seasons 2016&2017.

Parameters	Fruit length (cm)			Fruit diameter (cm)			Fruit shape index		
				2016					
Times of spray Treatments	Once	Twice	Mean	Once	Twice	Mean	Once	Twice	Mean
Control	11.80 k	11.84 j	11.82 G	8.94 i	9.01 h	8.98 F	1.320 abc	1.314 bc	1.317 CD
Kaolin at 25 g/L.	11.89 i	11.93 h	11.91 F	9.01 h	9.06 fgh	9.04 E	1.320 abc	1.316 abc	1.318 BCD
Kaolin at 50 g/L.	11.92 h	11.96 g	11.94 E	9.04 gh	9.12 cde	9.08 D	1.319 abc	1.312 c	1.315 D
Kaolin at 75 g/L.	12.01 f	12.07 e	12.04 D	9.08 efg	9.13 cd	9.11 CD	1.323 abc	1.322 abc	1.322 ABCD
Screen duo at 6 cm^3/L.	12.07 e	12.18 c	12.13 C	9.10 def	9.16 bc	9.13 BC	1.326 abc	1.329 ab	1.328 ABC
Screen duo at 12 cm^3/L.	12.13 d	12.26 b	12.20 B	9.11 def	9.21 ab	9.16 B	1.332 a	1.332 a	1.332 A
Screen duo at 18cm^3/L.	12.18 c	12.30 a	12.24 A	9.19 ab	9.23 a	9.21 A	1.325 abc	1.333 a	1.329 AB
Mean	12.00 B	12.08 A		9.07 B	9.13 A		1.324 A	1.323 A	
				2017					
Control	11.92 k	11.97 j	11.94 G	9.01 i	9.06 gh	9.04 G	1.322 b	1.321 b	1.322 B
Kaolin at 25 g/L.	11.97 j	12.13 h	12.05 F	9.05 h	9.08 f	9.07 F	1.323 b	1.336 ab	1.329 AB
Kaolin at 50 g/L.	12.02 i	12.22 f	12.12 E	9.07 fg	9.14 e	9.11 E	1.325 ab	1.338 ab	1.331 AB
Kaolin at 75 g/L.	12.12 h	12.27 d	12.20 D	9.14 de	9.16 d	9.15 D	1.326 ab	1.340 a	1.333 AB
Screen duo at 6 cm^3/L.	12.17 g	12.30 c	12.23 C	9.14 de	9.20 c	9.17 C	1.331 ab	1.337 ab	1.334 A
Screen duo at 12 cm^3/L.	12.24 e	12.37 a	12.31 B	9.19 c	9.32 a	9.26 B	1.333 ab	1.327 ab	1.330 AB
Screen duo at 18cm^3/L.	12.31 bc	12.33 b	12.32 A	9.25 b	9.31 a	9.28 A	1.331 ab	1.324 ab	1.328 AB
Mean	12.11 B	12.23 A		9.12 B	9.18 A		1.327 A	1.332 A	

Values within each column followed by the same letter/s are not significantly different at 5% level.

Table 5. Effect of kaolin and screen duo sprayed once or twice on fruit thickness (cm), fruit firmness (Lb/Inch) and vitamin C (mg/100ml. F.w.) of Keitt mango fruits during two experimental seasons 2016&2017.

Parameters	Fruit thickness (cm)			Fruit firmness (Lb/Inch)			V.C. (mg/100ml. F.w.)		
				2016					
Times of spray Treatments	Once	Twice	Mean	Once	Twice	Mean	Once	Twice	Mean
Control	7.91 c	7.94 c	7.93 C	3.88 j	3.92 i	3.90 E	40.49 h	41.62 fg	41.05 E
Kaolin at 25 g/L.	7.80 d	7.75 d	7.78 D	3.94 h	4.10 d	4.02 D	40.92 gh	41.40 fg	41.16 E
Kaolin at 50 g/L.	7.78 d	7.77 d	7.77 D	4.00 g	4.12 b	4.06 B	41.71 efg	42.24 def	41.97 D
Kaolin at 75 g/L.	7.74 d	7.77 d	7.76 D	4.00 g	4.14 a	4.07 B	42.59 cd	42.72 cd	42.66 C
Screen duo at 6 cm^3/L.	7.98 c	8.10 b	8.04 B	4.01 g	4.06 e	4.04 C	42.48 de	43.04 cd	42.76 BC
Screen duo at 12 cm^3/L.	8.12 ab	8.17 ab	8.14 A	4.03 f	4.10 cd	4.07 B	42.73 cd	43.95 ab	43.34 B
Screen duo at 18cm^3/L.	8.18 ab	8.21 a	8.19 A	4.07 e	4.12 bc	4.09 A	43.33 bc	44.62 a	43.97 A
Mean	7.93 A	7.96 A		3.99 B	4.08 A		42.04 B	42.80 A	
				2017					
Control	7.79 efg	7.83 de	7.81 D	3.92 i	3.96 h	3.94 E	40.94 i	41.72 gh	41.33 E
Kaolin at 25 g/L.	7.85 d	7.78 efg	7.82 D	3.97 h	4.11 c	4.04 D	41.47 hi	42.32 efg	41.89 D
Kaolin at 50 g/L.	7.81 def	7.76 fg	7.79 D	4.03 f	4.14 b	4.09 B	42.06 fgh	42.29 efg	42.18 CD
Kaolin at 75 g/L.	7.81 def	7.75 g	7.78 D	4.05 ef	4.19 a	4.12 A	42.73 def	42.55 def	42.64 C
Screen duo at 6 cm^3/L.	8.04 c	8.10 b	8.07 C	4.01 g	4.05 e	4.03 D	42.88 de	43.69 bc	43.28 B
Screen duo at 12 cm^3/L.	8.10 b	8.16 a	8.13 B	4.05 e	4.10 cd	4.07 C	43.15 cd	43.78 bc	43.46 B
Screen duo at 18cm^3/L.	8.18 a	8.18 a	8.18 A	4.08 d	4.15 b	4.12 A	43.98 b	44.76 a	44.37 A
Mean	7.94 A	7.94 A		4.01 B	4.10 A		42.46 B	43.01A	

Values within each column followed by the same letter/s are not significantly different at 5% level.

It is quite clear that all the above-mentioned fruit quality measurements responded specifically to Kaolin and screen duo concentrations. However, the grade of response varied not only from one fruiting measurement to another but also the rate of differences in each investigated measurement exhibited by screen duo was more pronounced than the analogous ones resulted by Kaolin. However, the three screen duo concentrations (6, 12 and 18 cm^3/L) increased significantly all the above-mentioned fruit quality measurements as compared to differential kaolin concentrations and control (water spray). Such trend was true during 2016 and 2017 experimental seasons with only one exception in fruit juice total acidity which its trend took the other way around. Anyhow, the response of fruiting measurements to the specific effect of screen duo concentration pointed out clearly that the greatest values of such measurements were significantly in closed relationship to the highest screen duo concentration (18 cm^3/L). Moreover, screen duo spray at (12 cm^3/L) concentration ranked statistically 2nd, followed by (6cm^3/L) concentration. However, the lightest increase over control was always in concomitant to Kaolin concentrations. Hence, the increase in most fruit quality measurements over control was significantly in such parameters with 75g/L Kaolin sprayed of Keitt mango trees. Moreover, differences between lower Kaolin concentration and control were few to be taking into consideration during both seasons.

Concerning the interaction effect of different concentrations among screen duo, Kaolin and number of spray times (once or twice) on the differential investigated fruit quality parameters of Keitt mango fruits. Data presented in Tables (4, 5 and 6) revealed that each investigated factor reflected directly a significantly increase over control (water spray). Consequently, the combination of screen duo at 12 and/or 18 cm^3/L+ twice spray exhibited statically the greatest values of such measurements during both 2016 and 2017 experimental seasons.

Meanwhile, screen duo at 6 cm^3/L+ sprayed twice ranked statistically the second. The highest increase over control was always in concomitant to the lowest concentration of Kaolin sprayed once during 2016 and 2017 experimental seasons.

The present result goes partially in the line with Glenn *et al.,* (2001); Glenn *et al.,* (2003) Glenn and Puterka (2005); Glenn (2009) and Weerakkody *et al.,* (2010).

Table 6. Effect of kaolin and screen duo sprayed once or twice on T.S.S (%), Acidity (%) and T.S.S/Acid ratio of Keitt mango fruits during two experimental seasons 2016&2017.

Parameters	T.S.S (%)			Acidity (%)			T.S.S/Acid ratio		
	2016								
Times of spray Treatments	Once	Twice	Mean	Once	Twice	Mean	Once	Twice	Mean
Control	13.58 k	13.64 k	13.61 G	0.740 b	0.767 a	0.753 A	18.39 g	17.83 g	18.11 F
Kaolin at 25 g/L.	14.29 j	14.63 h	14.46 F	0.693 d	0.713 c	0.703 B	20.65 f	20.58 f	20.61 E
Kaolin at 50 g/L.	14.50 i	14.71 h	14.61 E	0.707 cd	0.700 cd	0.703 B	20.55 f	21.09 f	20.82 E
Kaolin at 75 g/L.	15.12 g	15.32 f	15.22 D	0.670 e	0.647 fg	0.658 C	22.61 e	23.80 d	32.20 D
Screen duo at 6 cm^3/L.	15.50 e	16.09 c	15.80 C	0.663 ef	0.643 gh	0.653 C	23.52 de	25.08 c	24.30 C
Screen duo at 12 cm^3/L.	15.78 d	16.48 b	16.13 B	0.633 gh	0.627 hi	0.630 D	24.96 c	26.39 b	25.67 B
Screen duo at 18cm^3/L.	16.05 c	16.79 a	16.42 A	0.613 i	0.610 i	0.612 E	26.32 b	27.70 a	27.01 A
Mean	14.98 B	15.38 A		0.674 A	0.672 A		22.43 B	23.21 A	
	2017								
Control	13.90 m	13.98 m	13.94 G	0.767 b	0.790 a	0.778 A	18.18 h	17.75 h	17.97 F
Kaolin at 25 g/L.	14.26 l	14.92 j	14.59 F	0.703 cd	0.703 cd	0.703 B	20.33 g	21.25 fg	20.79 E
Kaolin at 50 g/L.	14.53 k	15.25 i	14.89 E	0.717 c	0.690 de	0.703 B	20.32 g	22.14 ef	21.23 E
Kaolin at 75 g/L.	15.47 h	15.74 g	15.60 D	0.687 de	0.693 de	0.690 C	22.60 de	22.71 de	22.66 D
Screen duo at 6 cm^3/L.	15.89 f	16.47 d	16.18 C	0.677 e	0.640 fg	0.658 D	23.55 d	25.83 bc	24.69 C
Screen duo at 12 cm^3/L.	16.17 e	17.04 b	16.60 B	0.643 f	0.597 h	0.620 E	25.22 c	28.82 a	27.02 B
Screen duo at 18cm^3/L.	16.65 c	17.19 a	16.92 A	0.623 g	0.577 i	0.600 F	26.81 b	30.01 a	28.41 A
Mean	15.27 B	15.80 A		0.688 A	0.670 B		22.43 B	24.07 A	

Values within each column followed by the same letter/s are not significantly different at 5% level.

Effect of Kaolin, screen duo sprayed once or twice on fruit skin color measurements (L, C and H) of Keitt mango fruits during 2016&2017 experimental seasons.

In this regard L^* =indicates lightness, C^* represents chroma and h is the hue angle (L^*= lightness, C^*= chroma and H^* = hue angle) are the color skin measurements of Keitt mango fruits in response to differential treatments. Data obtained during both 2016 & 2017 experimental seasons are presented in Table (7).

Regarding to the specific effect of differential investigated foliar spray treatments, it is quite clear that all the above-mentioned measurements response to different spray treatments. Moreover, the superiority of Kaolin or screen duo could be explained on the base of their physiological role. However, Kaolin foliar spray at 25g/L gave the greatest values of lightness during the first and second season, respectively. Meanwhile, water sprayed (control) gave the lowest values in lightness parameters (46.12 and 47.62) during 2016 &2017 experimental seasons, respectively. Moreover, it is quite evident that the response of C^* = chroma parameters followed the same trend previously discussed with (L^*) lightness parameters. Meanwhile, the superiority of kaolin at 25 g/L was clearly during both experimental seasons, followed discendingly by screen duo at 12cm^3/L which ranked statically second. Moreover, the highest chroma values (32.79 and 33.37)

were noticed in Keitt mango fruits treated with kaolin at (25 g / L) in the 1st and 2nd season, respectively. On the other hand, results in (Table 7) cleared an evident increase in skin color (Hue angle values) appeared a noticeable increase of the intensity of color. The highest hue parameters values (114.8 and 115.1) during the 1st and 2nd seasons respectively, were found in Keitt mango fruits sprayed with screen duo at (6 cm^3/ L).

Referring the specific effect of times of spray (once or twice) Table (7) display obviously that the highest lightness and chroma values were significantly in concomitant to fruits sprayed once during both seasons of study, Meanwhile, the highest Hue angle values were significantly in concomitant to fruits sprayed twice during 2016 &2017 experimental seasons.

Table 7. Effect of kaolin and screen duo sprayed once or twice on Lightness (L*), chroma (C*) and hue angle (H*) of Keitt mango fruits during two experimental seasons 2016&2017.

Parameters	L* (Lightness)			C* (chroma)			H* (hue angle)		
				2016					
Times of spray Treatments	Once	Twice	Mean	Once	Twice	Mean	Once	Twice	Mean
Control	45.50 g	46.74 fg	46.12 E	21.63 h	22.81 gh	22.22 F	111.8 de	113.5 cd	112.7 ABC
Kaolin at 25 g/L.	59.92 a	49.56 e	54.74 A	38.72 a	26.86 d	32.79 A	98.32 h	116.5 bc	107.4 D
Kaolin at 50 g/L.	54.65 b	45.03g	49.84 D	26.08 de	23.45 g	24.76 D	107.2 fg	120.7 a	113.9 AB
Kaolin at 75 g/L.	48. 79 ef	51.87 d	50.33 CD	25.10 ef	26.39 de	25.75 CD	118.6 ab	104.5 g	111.5 BC
Screen duo at 6 cm^3/L.	52.26 cd	50.69 de	51.48 BC	34.09 b	23.95 fg	29.02 B	113.9 cd	115.8 bc	114.8 A
Screen duo at 12 cm^3/L.	50.73 de	54.10 bc	52.42 B	30.01 c	23.15 g	26.58 C	107.2 fg	107.3 fg	107.2 D
Screen duo at 18cm^3/L.	46.60 g	51.80 d	49.20 D	25.73 de	21.40 h	23.56 E	109.1 ef	112.9 cd	111.0 C
Mean	51.21 A	49.97 B		28.77 A	24.00 B		109.4 B	113.0 A	
				2017					
Control	47.20 g	48.04 g	47.62 E	22.56 g	23.70 f	23.13 E	114.0 d	115.9 bc	115.0 A
Kaolin at 25 g/L.	59.51 a	50.17 f	54.84 A	38.88 a	27.86 d	33.37 A	99.20 h	114.5 cd	106.8 E
Kaolin at 50 g/L.	55.14 b	44.37 h	49.75 D	25.64 e	23.96 f	24.80 D	106.9 g	120.0 a	113.4 B
Kaolin at 75 g/L.	49.75 f	53.13 cd	51.44 C	26.12 e	26.60 e	26.36 C	117.3 b	106.2 g	111.8 C
Screen duo at 6 cm^3/L.	52.16 de	51.85 de	52.01 C	33.56 b	24.00 f	28.78 B	113.2 de	116.9 b	115.1 A
Screen duo at 12 cm^3/L.	52.68 cd	53.77 bc	53.23 B	30.51 c	22.54 g	26.53 C	105.9 g	106.1 g	106.0 E
Screen duo at 18cm^3/L.	47.50 g	50.98 ef	49.24 D	24.32 f	20.98 h	22.65 E	108.6 f	111.9 e	110.3 D
Mean	51.99 A	50.33 B		28.80 A	24.24 B		109.3 B	113.1 A	

Values within each column followed by the same letter/s are not significantly different at 5% level.

Concerning to the interaction effect of Kaolin, screen duo and number of times spray on color measurements (L, C and H) of Keitt mango fruits. Data presented in Table (7) revealed that all the treatments increased the values of skin color measurements over control (water sprayed). The increase was significant with comparing control to all treatments during both seasons of study. Anyhow, it could be noticed obviously that the highest lightness values were statistically coupled with Kaolin at 75g/L + twice spray during both experimental seasons. On the contrary, the least lightness values of Keitt mango fruits was markedly in significant relationship to control. Such trend was true during two experimental seasons. On the other hand, H* values responded to any investigated treatment. Consequently, kaolin at 50g/L + twice spray exhibited statistically the greatest values of (H*) during both 2016 & 2017 experimental seasons. In addition, other combinations were in between the a foresaid two extremes. However, the previous benefits of anti-sunburn compounds were cited by Reiley and Shry (1997); Bose *et al.,* (2001); Roberts *et al.,* (2002); Skirvin (2004); Radha and Mathew (2007) and Peter (2008).

DISCUSSION

Sunburn (solar injury) causes important economic losses in a large number of fruit species such as apple, mango, grapevine, pomegranate and olive, as well as income loss to farmers (Schrader *et al.,* 2003). In addition, with the continued depletion of the stratospheric ozone layer, the levels of UV-B radiation (280 to 320 nm) reaching the earth's surface are increasing, together with global warming, indicate a probability of increasing incidence of sunburn in the future (Kerr and McElroy, 1993). Fruits are more prone to sunburn compared with the leaves, mainly because they are not capable with efficient mechanisms of using and/or dissipating solar radiation (Blanke and Lenz, 1989). As a result, fruit surface temperature may increase as high as 10 to 15 °C higher than air temperature (Parchomchuk and Meheriuk, 1996). Therefore, the inadequacy of resistance mechanisms and the high susceptibility of fruit to sunburn would suggest the need for external intervention to suppress sunburn in fruit, and growers looking for the ways to escape from sunburn.

The use of reflective particles on fruits has been suggested as a tool to diminish its thermic charge because it reduces the incident radiation that can be absorbed by the fruits (Glenn *et al.,* 2002; 2003, 2009; Wünsche *et al.,* 2004 a,b) and thus reduce the incidence of sunburn (Glenn *et al.,* 2002; Gindaba and Wand, 2005; Wand *et al.,* 2006; Colavita, 2011). The nature of particles generally comprises minerals of high reflectivity. Among the numerous culture practices developed to control sunburn in various crops using kaolin, particle film applications by spraying canopies with a suspension of

different types of clay along with kaolin leaving a film on the leaves and fruits, which reflect sunlight this led to lower the temperature of leaf surface and fruits thereby reducing sunburn and improving fruit quality (Glenn and Puterka, 2005; Glenn, 2009 and Weerakkody *et al.,* 2010). Kaolin and screen duo are alternatives of relative low cost, safe use, low erosion, reduced particle size and water diffusion ability (Glenn *et al.,* 2003). When the effectiveness of the products is expressed in terms of damaged fruit, it is influenced by the sensitivity of the variety, growing conditions and application method (Glenn *et al.,* 2002; Erez and Glenn 2004).

Moreover, kaolin foliar spray was found to enhance water use efficiency and reducing the adverse effects of water deficit on pistachio and pomegranate trees (Azizi *et al.,* 2013 and El-Khawaga and Mansour (2014). Pre-harvest kaolin foliar application in summer months especially with 4% which that was most effective treatment for increasing yield, reduce fruit disorders and enhancing fruit quality of Balady mandarin at harvest time, (Zaghloul *et al.,* 2017). Kaolin particles film was also successful in sunburn reduction in Ruby Red grape fruit leaves (Jifon and Syvertsen, 2003), and Anna Apple (Aly *et al.,* 2010). Zaky *et al.,* (2018) concluded that applying Surround® 6% in mid-June resulted in the lowest percentage of sunburn to mandarin fruits and percentage of injured fruits were decreased by treatments (Surround ® 6 and 3 & Screen Duo ® once and twice) in comparison with control in both seasons of study

CONCLUSION

In light of this study it could be concluded that, spraying screen duo at 12 and/or 18 cm/L twice in summer months (i.e. during June and July) had a positive effect to minimize fruit sunburn damage and improved yield and fruit quality of Keitt mango fruits.

REFERENCES

A.O.A.C. (Association of Official Agricultural Chemists), 1995. Official Methods of Analysis. pp. 490-510 14th

Alvarez, H.L., C.M. Di Bella , G.M. Colavita, P. Oricchio and J. Strachnoy,2015. Comparative effects of kaolin and calcium carbonate on apple fruit surface temperature and leaf net CO_2 assimilation. Journal of Applied Horticulture, 17(3): 176-180.

Aly, M., N. Abd El-Megeed and R.M. Awad, , 2010. Reflective particle films affected on, sunburn, yield, mineral composition and fruit maturity of Anna apple (*Malus domestica*) trees . *Res. J. Agric.& Biol. Sci.*, 6 (1): 84-92.

Azizi, A., H. Hokmabadi, S. Piri and V. Rabie. 2013. Effect of kaolin application on water stress in pistachio cv. Ohadi. Journal of Nuts. 4 (4): 9 14.

Black, C. A.; D .O. Evans, L. E. Ensminger, J. L. White, F. E. Clark and R. C. Dinauer, 1982. Methods of soil analysis. Soil Sci., Soc. of Am. Inc. Publ., Madison, Wisconsin, U. S.A.

Blanke, M.M. and F. Lenz, 1989. Fruit photosynthesis. Plant, Cell and Environ. 12(1): 31 – 46.

Bose, T.K., S.K. Mitra and D. Sanyal, 2001. Fruits-Tropical and Sub-Tropical. Naya Udyog, pp: 100-105.

Colavita, G.M., V. Blackhall and S. Valdez, 2011. Effect of kaolin particle films on the temperature and solar injury of pear fruits. Acta Hort., 909: 609-615.

Duncan, D. B., 1955. Multiple ranges and multiple F. test. Biometrics, 11: 1-42.

EL-Gioushy, S. F., M. H. M., Baiea, M.A. Abdel Gawad-Nehad and O.A. Amin, (2017). Influence of $CaCO_3$ and green miracle foliar application on preventing sunburn injury and quality improvement of Keitt mango fruits. Middle East Journal of Agriculture Research, 06 (4): 1098-1110.

El-Khawaga, A. S. and A. E .Mansour. 2014. Enhancing the efficiency of irrigation water use by using some anti-transpirants in Wonderful pomegranate orchards. Middle East J. Agric. Res., 3 (3): 694 700.

Ennab, H. A., S. A. El-Sayed and M. M. Abo El-Enin. 2017. Effect of kaolin applications on fruit sunburn, yield and fruit quality of Balady mandarin (*Citrus reticulata*, Blanco). Menoufia J. Plant Prod., 2: 129 138.

Erez, A. and D.M. Glenn, 2004. The effect of particle film technology on yields and fruit quality. *Acta Hort*., 636: 505-507.

Gindaba, J. and S.J. Wand, 2005. Comparative effects of evaporative cooling, kaolin particle film, and shade net on sunburn and fruit quality in apples. *HortScience,* 40(3): 592-596.

Glenn, D. M. 2009. Particle film mechanisms of action that reduce the effect of environmental stress in Empire apple. J. Amer. Soc. Hort. Sci., 134 (3):314 321.

Glenn, D.M. and G.J. Puterka, 2005. Particle films: A new technology for agriculture. Hort. Rev. (Amer. Soc. Hort. Sci.) 31:1- 44.

Glenn, D.M., 2012. The mechanisms of plant stress mitigation by kaolin based particle films and applications in horticulture and agricultural crops. Hort. Science, 47(6), 710-711.

Glenn, D.M., A. Erez, G.J. Puterka and P. Gundrum, 2003. Particle films affect carbon assimilation and yield in Empire apple. J. of Amer. Soc. Hort. Sci., 128: 356-362.

Glenn, D.M., E. Prado, A. Erez, J.R. McFerson and G.J. Puterka, 2002. A reflective processed kaolin particle film affects fruit temperature, radiation reflection and solar injury in apple. *J. Amer. Soc. Hort. Sci*., 127: 188-193.

Glenn, D.M., G.J. Puterka, S.R. Drake and T.R. Boughs, 2001. Particle film and application, influences apple leaf physiology, fruit yield and fruit quality. J. of Amer. Soc. for Hort. Sci., 126: 175-181.

Jifon, J.L. and J.P. Syvertsen, 2003. Kaolin particle film application can increase Photosynthesis and water use efficiency of Ruby Red Grapefruit leaves. J. Amer. Soc. Hort. Sci., 128, 107-112.

Kerns, D.L. and G.C. Wright, 2000. Protective and yield enhancement qualities of kaolin on lemons. Citrus and Deciduous Fruit and Nut Research Report(publ. az1178), College of Agriculture and Life Sciences, the University of Arizona, Tucson, Arizona, 85721.

Kerr, J.B. and C.T. McElroy,1993. Evidence for large upward trends of UV-B radiation linked to ozone depletion. Science, 262: 1032- 1034.

McGuire, R.G., 1992. Reporting of objective color measurements. HortScience, 27, 1254-1255.

Narayan, L. and N. Sahu, 2017.Management strategies of sun burn in fruit crops-A Review. Int.J.Curr.Microbiol.App.Sci 6(6): 1126-1138.

Parchomchuk, P. and M. Meheriuk, 1996. Orchard cooling with pulsed over-tree irrigation to prevent sunburn and improve fruit quality of 'Jonagold' apples. HortScience, 31(5): 802-804.

Peter, K.V., 2008. Basics of Horticulture. New India Publ. Ageny., pp: 50-60.

Radha, T. and L. Mathew, 2007. Fruit crops. New India Publ. Ageny., pp: 60-70.

Reiley, E. and C.L. Shry, 1997. Introductory Horticulture, 5th Ed. Delmar Publishers, Inc., pp: 50-60.

Roberts, J., S. Downs and P. Parker, 2002. Fruit crops. New India Publ. Ageny. pp: 60-70. Plant Growth and Development. Oxford Univ. Press, pp: 221-274.

Schrader, L., J. Zhang and J. Sun, 2003. Environmental stresses that cause sunburn of apple. Acta Hort., 618: 397-405.

Skirvin, R.M., 2004. Introduction to Horticulture. 5th Ed. Published by Stipes Publishing L.L.C. 204 W, Ave Univ. Champaign IL., pp: 1-425.

Snedecor, W. and W.G. Cochran, 1989. Statistical Methods, 8th ed. Iowa State Univ. Press Ames. Iowa. U.S.A.

Wand, S.J.E., K.I. Theron, J. Ackerman and S.J.S. Marais, 2006. Harvest and post-harvest apple fruit quality following applications of kaolin particle film. *South African orchards. Scientia Hort*., 107: 271-276.

Weerakkody, P., J. Jobling, M.M. Infante and G. Rogers, 2010. The effect of maturity, sunburn and the application of sunscreens on the internal and external qualities of pomegranate fruit grown in Australia. Scientia Horticulturae. 124:57- 61.

Wünsche, J.N., J. Bowen, I. Ferguson, A. Woolf and T. McGhie, 2004a. Sunburn on apples - causes and control mechanisms. *Acta Hort.,* (ISHS) 636: 631-636.

Wünsche, J.N., L. Lombardini and D.H. Greer, 2004b. 'Surround'particle film applications-Effects on whole canopy physiology of apple. *Acta Hort*., 636: 565-571.

Zaghloul, A. E., Hassan A. Ennab, Mervat A. El-Shemy, 2017. Influence of kaolin sprays on fruit quality and storability of Balady mandarin. Alexandria science exchange journal, 38(4): 661-670.

Zaky, M. A., A. A. El-Baowab and S. A. Mohamed, 2018. Impact of spraying some chemical substances on controlling sunburn of Balady mandarin fruits. Egypt. J. Hort., 45(2):1-8.

كفاءة الرش بالكاولين والإسكرين دو على لسعة الثمرة بالشمس والمحصول وصفات جودة ثمار المانجو كيت

محمد حمدان محمد بعيه[1]، شريف فتحى الجيوشى[2] و حامد الزعبلاوي محمود البدوي[2]

[1] قسم تكنولوجيا الحاصلات البستانية - المركز القومى للبحوث- الدقى- مصر

[2] قسم البساتين- كلية الزراعة- جامعة بنها- مصر

أجريت هذه الدراسة خلال موسمين متعاقبين (2016 و 2017) على أشجار المانجو الكيت عمر 6 سنوات والمطعومة على شتلات بذرية لأصل السكرى والمنزرعة على مسافات 2×3م في تربة رملية تحت نظام الري بالتنقيط بقرية كفر الصهبى، محافظة القليوبية، مصر، لدراسة تأثير الرش بالكاولين والإسكرين دو على لسعة الثمرة بالشمس والمحصول وصفات جودة الثمار. ومن ثم، تمت معاملات الكاولين (سيليكات الألومنيوم) بتركيز 25،50،75جرام/لتر والإسكرين دو بتركيز 6،12،18 سم^3/لتر رشاً مرة واحدة في منتصف يونيو والرش مرتين في منتصف يونيو ومنتصف يوليو خلال موسمى الدراسة وكذلك الرش بماء الصنبور (المقارنة). تم تقييم التأثير من خلال استجابة القياسات المختلفة للمحصول ولسعة الثمرة بالشمس وقياسات لون قشرة الثمرة وجودة الثمرة للتركيزات المختلفة للكاولين والإسكرين دو وعدد مرات الرش (مرة أو مرتين). وقد أوضحت النتائج المتحصل عليها أن الاستجابة كانت أكثر وضوحاً مع معاملات الإسكرين دو وكانت الفروق بين تركيزاته الثلاثة معنوية في معظم الحالات بالمقارنة مع بعضها البعض، وكانت معاملة 18 سم^3/لتر الأكثر فعالية في معظم الحالات. أما بالنسبة لتأثير عدد مرات الرش (مرة أو مرتين) أظهرت النتائج أن أعلى القيم معنوية كانت متلازمة في معظم الحالات مع الرش مرتين خلال موسمى الدراسة. وعلى أية حال، يمكن إستنتاج أن رش الإسكرين دو بتركيز 12 أو 18سم^3/لتر مرتين في أشهر الصيف (في منتصف يونيو ويوليو) كان لها أثر إيجابي فى منع ضرر لسعة الشمس على الثمرة وتحسين المحصول وجودة ثمار المانجو كيت.