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EFFECT OF IRRIGATION INTERVALS AND ANTITRANSPIRANT (KAOLIN) ON SUMMER SQUASH (*Cucurbita pepo* L.) GROWTH, YIELD, QUALITY AND ECONOMICS.

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ABSTRACT

In recent years, deficit irrigation has been widely investigated as a valuable and sustainable production strategy in Egypt. Hence, the present investigation was conducted in a clay loam soil at a private farm near Mansoura city, Dakahlia Governorate, Egypt, during the two summer seasons of 2008 and 2009 to investigate the effects of three irrigation intervals (8, 12 and 16 days, from first irrigation), spraying kaolin at (0, 3 and 6 %) as antitranspirant at 25, 40 and 55 days from planting and their interactions on growth, yield, fruit quality and water use efficiency of summer squash cv. Eskandrani. Results indicated that irrigation every 8 days throughout growing season resulted in highest foliage weight, leaves weight per plant, mean fruit weight, total fruit yield/fed., marketable yield/fed. and seasonal applied water in both summer seasons. On the contrary, increasing irrigation intervals from 8 up to 16 days caused significant increases in leaves dry matter percentage, total soluble solids and dry matter percentage in fruit and water use efficiency in both seasons. On the other hand, all studied characters except leaves dry matter percentage, dry matter percentage in fruit and seasonal applied water were significantly increased with increasing kaolin levels in both seasons. The interaction effect between irrigation intervals and kaolin levels was significant for all the studied parameters in both seasons. The highest net return was observed with plants watered every 8 days and received kaolin at 6% concentration followed by watered every 12 days and received kaolin at 6% concentration that had higher benefit: cost ratio. From the economic and nutritional point of view, it could be concluded that irrigation every 12 days intervals combined with spraying kaolin at 6% concentration to summer squash cv. Eskandrani might gave the chance for increasing water use efficiency and produce satisfactory and good marketable fruit yield under similar conditions of this work.

Keywords: *Cucurbita pepo,* summer squash, irrigation, kaolin, antitranspirant.

INTRODUCTION

Summer squash (*Cucurbita pepo* L.) is one of the most popular vegetable crops in Egypt. Water supply is one of the most important factors which may greatly affect on the yield and quality of summer squash (Ahmet *et al.*, 2004). Increasing irrigation frequency caused significant increases in plant water consumption and yield, whereas, an excessive irrigation level had a negative effect on irrigation use efficiency. On the other hand, water deficit produced smaller fruits and lower yields (Ertek *et al*., 2004; Al-Harbi *et al*., 2005; Al-Omran *et al*., 2005; Ibrahim and Selim, 2007). Usually, the medium level of irrigation was better than excessive or inadequate irrigation for early squash harvests ((Ertek *et al*., 2004; Ibrahim and Selim, 2007).

Deficit irrigation will play an important role in farm-level water management strategies, with consequent increases in the out put generated per unit of water used in agriculture. In Egypt, it is necessary to produce the maximum yield and profit from unit area by using available water efficiently because the existing agricultural land and irrigation water are rapidly diminishing. Therefore, it is essential to balance water requirements, water consumption and yield of summer squash.

Consequently, it is important to find ways by which available water could be economically utilized. One way, to achieve this goal, is to reduce the transpiration rate. Using antitranspirants such as kaolin may reduce transpiration rate from the plant; consequently reduce the amount of used water and improved the water use efficiency while it did not reduce carbon assimilation (Nakano and Uehara, 1996; Glenn and Puterka, 2005; Cantore *et al.*, 2009).

Kaolin is non-toxic aluminosilicate ($Al_4Si_4O_{10}(OH)_8$) clay mineral. Kaolin spray was found to decrease leaf temperature by increasing leaf reflectance and to reduce transpiration rate more than photosynthesis in plants grown at high solar radiation levels (Nakano and Uehara 1996). Studies conducted on tomato and potato have shown that foliar applications of kaolin particle films reduce plant stress, which is important for optimum plant growth, yield and quality (Anwar, 2005; Pace *et al.*, 2007; Cantore *et al.*, 2009).

The aim of this study is to investigate the effect of the irrigation intervals, kaolin levels and their interactions on growth, yield, quality and economics of summer squash.

MATERIALS AND METHODS

Two field experiments were performed at a private farm in Shoha village, Mansoura district, Dakahlia Governorate, Egypt, during the two summer seasons of 2008 and 2009. Physical and chemical properties of the experimental soil were determined according to the standard procedures as described by Page (1982) and Klute (1986), and are presented in Tables (1 and 2).

Table (1): Some physical and chemical properties of the experimental soil surface layer (at the depth of 0-30) before planting during 2008 and 2009 seasons

Properties	Values		Properties	Values	
	2008	2009		2008	2009
Sand (%)	27.9	27.6	pH*	7.8	7.6
Silt (%)	31.8	31.9	EC (dSm^{-1}) **	0.8	0.8
Clay (%)	40.3	40.5	Total N (%)	0.14	0.15
Texture class	Clay-loam	Clay-loam	Available P (ppm)	11.3	11.6
$CaCO_3$	3.1	3.5	Exchangeable K (ppm)	301	292
OM (%)	2.2	2.4			

*** pH: (1:2.5 soil extract). ** EC: soil paste**

Table (2): The soil moisture constants (% by weight) and bulk density of the experimental soil during summer 2008 and 2009 seasons

Constants depth (cm)	Field capacity (%)		Wilting point (%)		Available water (%)		Bulk density (gm/cm^3)	
	2008	2009	2008	2009	2008	2009	2008	2009
0 – 15	43.15	42.41	23.01	22.40	20.14	20.01	1.20	1.22
15 – 30	41.05	41.00	22.72	21.76	19.08	19.24	1.25	1.27
30 - 45	40.06	40.09	21.59	21.00	18.47	19.09	1.34	1.33

A split plot design with three replicates was used. The main plots were assigned to three irrigation intervals (8, 12 and 16 days). Sub plots were devoted to the three levels of the foliar applied kaolin (0, 3 and 6%). Each sub plot area was 16 m^2 and contained 4 rows; 80 cm wide and 5 m long. Each treatment was separated by two guard ridges. Squash seeds " cv. Eskandrani" were sown on one side of the ridges with 40 cm between hills on 4 and 6 April in both summer seasons, respectively.

Three irrigation treatments were applied at 8, 12 and 16 days from the first irrigation which was 10 days after seed sowing. The number of irrigation events was 11, 7 and 5 for the irrigation treatments (8, 12 and 16 days) respectively.

Kaolin water suspensions were sprayed at 25, 40 and 55 days after planting. Plants were sprayed with a fine mist of kaolin using a hand pressure sprayer till run-off, with care being taken to cover all plant parts; no surfactants or other wetting agents were needed. The control plants were sprayed with distilled water.

Plants were fertilized with ammonium sulfate (20.6% N) at a rate of 75 N kg/fed., calcium super phosphate (16% P_2O_5) at rate of 40 kg P_2O_5/fed. and potassium sulfate (48% K_2O) at rate of 48 kg K_2O/fed. that were divided in two equal portions. The first portion of calcium super phosphate was added during seed bed preparation and the second portion was added with the first portion of N and K fertilizers which added at the fourth week after seed sowing, and the second portion of N and K fertilizers was added at the eighth week after seeds sowing. Other agricultural practices were conducted according to recommendations.

After 50 days from planting, five plants from each sub plot were randomly taken for measuring the vegetative growth parameters, *i.e.*, foliage weight, leaves fresh weight and leaves dry mater percentage.

At the harvesting time, fruits of each plot were harvested by hand every 2–3 days, and were classified as marketable fruits (3-4 cm in diameter and 13–16 cm in length) and non-marketable fruits (misshapen large and small fruits) in each harvest, thereafter, marketable and total fruit yield were determined as ton/fed.. The first six harvests were considered as the early yield. Also, mean fruit weight was determined by dividing the total weight of the harvested fruits on the total number of fruits.

At the seventh harvest, samples of five fruits were taken at random from each sub plot to determine total soluble solids and dry matter percentage. Total soluble solid was determined with a refractomater.

Water consumptive use computed as the difference in the soil moisture content before and after irrigation according to the following equation by Israelson and Hansen (1962): $Cu = D \times Bd \times 4200 \times (\theta_2 - \theta_1)/100$, Where Cu is the water consumptive use m^3/fed., D is the soil depth, Bd is the soil bulk density (g cm^{-3}), θ_1 is the soil moisture content before irrigation (% by weight), θ_2 is the soil moisture content after irrigation or after 48 hours (% by weight).

Seasonal applied water is the sum of the figures computed for each irrigation application. Water use efficiency was computed for the different treatments by dividing the fresh marketable fruit yield (kg/fed.) by seasonal applied water (m^3/fed.) (Stanhill, 1986).

The data were statistically analyzed as split plot design according to Snedecor and Cochran (1982). Comparisons among means of treatments were tested using LSD values at 5% level.

Economic comparison: Net return and benefit cost ratio for each treatment were evaluated based on average of tow seasons. Income calculated on the basis of current local market price of summer squash during 2009. Treatments cost was estimated according to the following prices: cost of water at L.E. 0.7/m^3, and price of kaolin at L.E. 0.05/kg.

RESULTS AND DISCUSSION

Vegetative growth:

Data listed in Table (3) show that decreasing irrigation intervals caused significant increases in foliage weight per plant and leaves weight per plant whereas, leaves dry matter percentage was significantly increased by increasing irrigation intervals from 8 up to 16 days in both seasons. These results are in agreement with those obtained by Farrag and El-Nagar (2005) on cucumber, Ibrahim and Selim (2007) on summer squash and Bafeel and Moftah (2008) and Abd El-Aal *et al.* (2008) on eggplant.

Concerning the effect of kaolin levels on growth parameters, the data of Table (3) show that there were significant differences in both seasons. Increasing kaolin levels increased significantly foliage weight per plant and leaves weight per plant and reduced leaves dry matter percentage in both seasons. It could be suggested that foliar spray with Kaolin led to reduce the transpiration rate, and this in turn led to keep higher water content in the plant tissues and hence might favor the plant metabolism, the physiological processes, photosynthetic rate, carbohydrate metabolism and many other important functions that directly affect plant growth (Bafeel and Moftah, 2008; Cantore *et al.*, 2009).

The interaction between irrigation intervals and kaolin levels had significant effects on all vegetable growth parameters in both summer seasons (Table 3). Plants watered every 8 days intervals and sprayed with 6% kaolin gave the highest values for foliage weight per plant and leaves weight per plant, but it gave the lowest values for leaves dry matter percentage in comparison with other treatments in both seasons (Table 3). These results may be due to the effect of supplemental irrigation treatment on increasing the absorption of some nutrient elements (Ibrahim and Selim 2007), which improved photosynthetic capacity operation in leaf, and this in turn led to enhance the plant growth. Moreover, using antitranspirant decreases the loss in moisture content through transpiration (Nakano and Uehara 1996).

Table (3): Effect of irrigation intervals, kaolin levels and their interactions on some summer squash vegetative growth characters during summer 2008 and 2009 seasons

Treatments		Foliage weight / plant (g)		Leaves weight / plant (g)		Leaves dry matter (%)	
Irrigation intervals (days)	Kaolin levels (%)	2008	2009	2008	2009	2008	2009
8		1462	1513	1151	1162	15.1	14.9
12		1378	1446	1075	1095	15.7	15.6
16		1273	1242	942	971	16.7	16.6
LSD (5%)		26	28	23	25.1	0.2	0.2
	0	1298	1314	1016	1014	16.5	16.6
	3	1370	1402	1038	1077	15.8	15.6
	6	1446	1484	1114	1136	15.1	14.8
LSD (5%)		35	37	32	34	0.3	0.4
8	0	1415	1463	1108	1105	15.5	15.6
	3	1461	1508	1151	1162	15.0	14.8
	6	1510	1567	1195	1219	14.7	14.3
12	0	1298	1348	1015	1033	16.5	16.6
	3	1378	1456	1077	1099	15.6	15.5
	6	1459	1533	1132	1152	14.9	14.7
16	0	1180	1131	926	904	17.6	17.7
	3	1270	1242	885	970	16.7	16.6
	6	1369	1352	1014	1038	15.8	15.4
LSD (5%)		61	65	47	58	0.5	0.6

Fruit quality:

Data in Table (4) indicate that increasing irrigation intervals from 8 up to 16 days caused significant decreases in mean fruit weight in the two summer seasons. These findings are in agreement with those of Ertek *et al*. (2004), Farrag and El-Nagar (2005), Ertek *et al*. (2006), Ibrahim and Selim (2007), Nimah (2007), Sensoy *et al.* (2007), Abd El-Aal *et al.* (2008), Dogan *et al.* (2008), Cabello *et al.* (2009) and Zeng *et al.* (2009). Whereas, increasing irrigation intervals caused significant increases in total soluble solids and dry matter percentage in fruit. A similar effect of irrigation on TSS was also observed by Sensoy *et al.* (2007) and Zeng *et al.* (2009). For dry matter percentage in fruit, similar results were obtained by Ayas and Demirtaş (2009) on cucumber. However, these results did not agree with the report by Farrag and El-Nagar (2005) on cucumber.

Also, it is evident from the data in Table (4) that supplementing plants with kaolin had significant effects on average fruit weight and TSS compared with control in both summer seasons. These results are in good line with those reported by Abd El-Aal *et al.* (2008) on eggplant. Meanwhile, dry matter percentage in fruit was significantly decreased in both summer seasons. However, Cantore *et al.* (2009) found Kaolin treatment did not affect total soluble solids content and tomato fruit dry matter.

Moreover, the interaction between irrigation intervals and kaolin levels had significant effects on fruit quality characters in both seasons (Table 4). The highest values of mean fruit weight were obtained from the highest level of irrigation with application of kaolin at 6% concentration, while the lowest values were recorded with 16 days irrigation intervals combined with kaolin at 6% concentration in comparison with other treatments. The increases in this trait might be resulted from high growth parameters at the same treatments (Table 3), in turn, enhanced photosynthetic assimilation and absorption of various nutrients, and resulted in the increasing in mean fruit weight. As regard to TSS, the highest values were obtained from plants watered every 16 days and received higher level of kaolin (6% concentration). This result may be attributed to the decrement in the water content of the plant which caused a remarkable increase in the cell sap concentration. For dry matter percentage in fruit, the highest values were obtained from plants watered every 16 days without kaolin. This result may be due to the low soil moisture which resulted in decreasing water in plant and fruits.

Table (4): Effect of irrigation intervals, kaolin levels and their interactions on fruit quality characters of summer squash during summer 2008 and 2009 seasons

Treatments		Mean fruit weight (g)		TSS (%)		Dry matter percentage in fruit (%)	
Irrigation intervals (days)	Kaolin levels (%)	2008	2009	2008	2009	2008	2009
8		148	153	5.6	5.7	6.06	5.98
12		137	142	6.3	6.5	6.30	6.34
16		126	128	6.8	7.2	6.54	6.57
LSD (5%)		3	4	0.2	0.2	0.19	0.21
	0	127	130	5.7	5.9	6.63	6.66
	3	139	142	6.3	6.5	6.25	6.26
	6	146	151	6.7	7.0	6.02	5.97
LSD (5%)		5	6	0.2	0.2	0.26	0.29
8	0	140	146	5.0	5.1	6.26	6.19
	3	149	154	5.6	5.8	6.07	5.98
	6	155	159	6.2	6.3	5.86	5.76
12	0	127	130	5.7	5.9	6.62	6.68
	3	139	144	6.3	6.5	6.21	6.31
	6	144	151	6.7	7.0	6.06	6.02
16	0	113	114	6.5	6.8	7.00	7.11
	3	128	128	6.8	7.2	6.48	6.49
	6	138	142	7.1	7.6	6.15	6.12
LSD (5%)		9	11	0.3	0.3	0.41	0.44

Yield and its components:

Data presented in Table (5) reveal that decreasing irrigation intervals caused significant increases in total fruit yield and marketable yield in the two summer seasons. These findings are in agreement with those of Ertek *et al*. (2004), Al-Harbi *et al*. (2005), Al- Omran *et al*. (2005) and Ibrahim and Selim (2007) on summer squash, Farrag and El-Nagar (2005), Ertek *et al*. (2006) and Nimah (2007) on cucumber and Sensoy *et al.* (2007), Dogan *et al.* (2008), Cabello *et al.* (2009) and Zeng *et al.* (2009) on melon. On the other hand, increasing irrigation intervals from 8 up to 12 days caused significant increase in early yield whereas, further irrigation intervals increase up to 16 days caused significant decreases in both seasons. The same trend was found by Ertek *et al.* (2004) and Ibrahim and Selim (2007) who found that the medium level of irrigation was better than excessive or inadequate irrigation for early squash harvests.

Table (5): Effect of irrigation intervals, kaolin levels and their interactions on early, total and marketable summer squash yield during summer 2008 and 2009 seasons

Treatments		Early yield (ton/fed.)		Total yield (ton/fed.)		Marketable yield (ton/fed.)	
Irrigation intervals (days)	Kaolin levels (%)	2008	2009	2008	2009	2008	2009
8		5.62	5.72	19.05	18.66	18.22	17.88
12		5.85	6.02	18.12	17.73	17.25	16.90
16		5.26	5.24	16.70	16.51	15.06	15.03
LSD (5%)		0.13	0.15	0.23	0.26	0.29	0.32
	0	5.31	5.37	17.35	16.91	16.05	15.78
	3	5.61	5.69	17.93	17.64	16.87	16.62
	6	5.82	5.92	18.59	18.36	17.61	17.41
LSD (5%)		0.19	0.23	0.34	0.36	0.38	0.43
8	0	5.31	5.40	18.45	17.84	17.51	17.16
	3	5.68	5.81	18.96	18.67	18.26	17.89
	6	5.87	5.96	19.73	19.48	18.90	18.58
12	0	5.73	5.88	17.35	16.91	16.46	16.01
	3	5.89	6.03	18.12	17.74	17.21	16.93
	6	5.94	6.15	18.89	18.55	18.09	17.76
16	0	4.88	4.82	16.26	15.97	14.18	14.16
	3	5.26	5.24	16.70	16.52	15.14	15.03
	6	5.64	5.65	17.14	17.05	15.85	15.90
LSD (5%)		0.32	0.36	0.60	0.62	0.71	0.74

Data in Table (5) also show that spraying kaolin caused significant increases in early, total and marketable yield in both seasons. The maximum values were obtained from 6% kaolin treatments in both seasons, but there are insignificant differences between 3% and 6% kaolin in early yield in first season. It could be suggested that spraying with antitranspirant led to form a layer on the foliage surface, which in turn decreased transpiration rate, and hence led to keep more water in plant tissues that would reflect favorable effect on plant metabolism, photosynthetic rate and increased outward transportation of photosynthesis from the foliage to the fruits (Pace *et al.*, 2007; Bafeel and Moftah, 2008; Cantore *et al.,* 2009). Moreover, these results are in harmony with Abdel Nasser (1993) on squash, Del Amor *et al.* (2006)

on sweet pepper, Abd El-Aal *et al.* (2008) on eggplant and Cabello *et al.* (2009) on tomato who found that antitranspirants improved the water status and the yield of water-stressed plants.

The interaction between irrigation intervals and kaolin levels had significant effects on early yield/fed., total yield/fed. and marketable yield/fed. in both seasons (Table 5). Decreasing irrigation intervals enhances early yield/fed., total yield/fed. and marketable yield/fed. in response to kaolin spray, especially when high kaolin level is applied. These results may be due to the role of kaolin to keep more water content in plant tissue, and the role adequate availability of irrigation water that maintained adequate available soil moisture in the root zone throughout the crop growth period, this in turn reflected in higher growth parameters (Table 3) contributing to higher yields in these treatments.

Seasonal applied water (SAW):

Data collected in Table (6) indicate that decreasing irrigation intervals caused significant increases in SAW values in both seasons. The increases in SAW may be due to the fact that frequently watered plants used more water because they found it much more easily without suffering from water deficit. Israelson and Hansen (1962) stated that if other conditions were equal, roots of plants in wet soil will extract more water than the roots of plants growing in dried soil. Ertek *et al*. (2004) and Ibrahim and Selim (2007) also found similar findings.

Moreover, negative SAW response to kaolin levels was observed in both seasons (Table 6). These results are in agreement with those obtained by Abdel Nasser (1993) who found that the antitranspirant decreased water use. Decreasing water use would result in conserving soil moisture for a longer time during the critical stages of plant growth. Del Amor *et al.* (2006) also found that water uptake was reduced by 12.4% in those sweet pepper plants with the antitranspirant application compared with non-sprayed plants at the end of the experiment (150 days).

Regarding the interaction effect, results in Table (6) show significant effect among the different combinations. The lowest values of SAW were obtained in plants grown under the lowest level of irrigation with application of antitranspirant kaolin in both seasons. Kaolin treatments seemed to enhance plant water status considerably, particularly in water-stressed plants, in turn, decreasing seasonal applied water. This may be due to the role of Kaolin in reducing the absorption of radiant energy and thereby reduce leaf temperature and transpiration rate (Nakano and Uehara 1996).

Water use efficiency (WUE):

Data presented in Table (6) indicate that the values of WUE were significantly increased with decreasing frequent irrigation in both seasons. The present data imply that high soil moisture increased the amount of water required to produce the unit value of fruits yield. Treatments with higher amount of seasonal consumptive use of water had generally lower WUE values. Gallego *et al*. (1993), Ertek *et al*. (2004), Al-Harbi *et al*. (2005), Al-Omran *et al*. (2005), Ibrahim and Selim (2007), Bafeel and Moftah (2008), Zotarelli *et al.* (2008), Cabello *et al.* (2009) and Zeng *et al.* (2009) came to similar trends.

Table (6): Effect of irrigation intervals, kaolin levels and their interactions on seasonal applied water and water use efficiency (WUE)) during summer 2008 and 2009 seasons

Treatments		Seasonal applied water (m^3/fed.)		WUE (kg fruits / m^3 water)	
Irrigation intervals (days)	Kaolin levels (%)	2008	2009	2008	2009
8		1831	1832	9.95	9.76
12		1349	1354	12.81	12.50
16		1106	1116	13.63	13.48
LSD (5%)		17	18	0.18	0.16
	0	1453	1464	11.31	11.04
	3	1429	1436	12.12	11.88
	6	1404	1402	12.95	12.82
LSD (5%)		18	21	0.23	0.22
8	0	1850	1856	9.46	9.25
	3	1825	1829	10.01	9.78
	6	1819	1811	10.39	10.26
12	0	1380	1391	11.93	11.51
	3	1355	1362	12.70	12.43
	6	1311	1310	13.80	13.56
16	0	1130	1145	12.55	12.37
	3	1108	1118	13.67	13.44
	6	1081	1086	14.66	14.64
LSD (5%)		34	36	0.35	0.31

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Moreover, it is evident from the data in Table (6) in both summer seasons that increasing kaolin levels increased WUE significantly. High WUE of kaolin treated plants may be attributed to the increase in marketable yield production and to the decrease in water use through the reduction of transpiration. The increased WUE by antitranspirants has been also reported by Abdel Nasser (1993) on squash and Bafeel and Moftah (2008) on eggplant.

The interaction between the two studied factors had significant effects on WUE in both seasons (Table 6). The favorable effect of kaolin treatments was more pronounced at lower levels of irrigation regimes because, higher levels of water treatments improvement in marketable yield was less than the percentage increase in seasonal applied water, particularly without kaolin.

Economic comparison:

The highest net return was observed with plants watered every 8 days and received kaolin at 6% concentration followed by watered every 12 days and received kaolin at 6% concentration in comparison with other treatments (Table 7). This means that the gain from higher yield is greater than the associated irrigation cost in this case. Whereas, treatment of 12 days irrigation intervals with spraying kaolin at 6% concentration had higher economic efficiency in terms of benefit: cost ratio (7.2). Thus, this treatment proved to be economical for summer squash production.

Table (7): Estimation of net return and benefit / cost ratio for all treatments of the interaction between irrigation intervals (Ii) and kaolin (Ka) levels (based on average of tow seasons)

Treatments		Seasonal applied water (SAW) (m^3/fed.)	Treatments cost (L.E. / fed.)			M yield (ton/ fed.)	Gross return (L.E. / fed.)	Net return (L.E. / fed.)	Benefit / cost ratio
Irrigation intervals (days)	Ka levels (%)		SAW cost	Ka cost	Total cost				
8	0	1853	1297.1	0	1297.1	17.34	8668	7370	5.7
	3	1827	1278.9	90	1368.9	18.08	9038	7669	5.6
	6	1815	1270.5	180	1450.5	18.74	9370	7920	5.5
12	0	1386	969.9	0	969.9	16.24	8118	7148	7.4
	3	1359	951.0	90	1041.0	17.07	8535	7494	7.2
	6	1311	917.4	180	1097.4	17.93	8963	7865	7.2
16	0	1138	796.3	0	796.3	14.17	7085	6289	7.9
	3	1113	779.1	90	869.1	15.09	7543	6674	7.7
	6	1084	758.5	180	938.5	15.87	7937	6998	7.5

Treatments cost was estimated according to the following prices: cost of water at L.E. 0.7/m^3, and price of kaolin at L.E. 0.05/kg.
M yield: Marketable yield as average of two seasons.

Conclusion

From the economic and nutritional point of view, the treatment of 12 days irrigation interval with spraying kaolin at 6% concentration was the best combination and it is recommended for summer squash cv. Eskandrani grown under similar field conditions in order to get higher economical yield and to save water.

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تأثير فترات الري ومضاد النتح (الكاؤلين) على نمو ومحصول وجودة واقتصاديات الكوسة

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إهتمت جمهورية مصر العربية – في الآونة الأخيرة – بكيفية الإدارة المزرعية المثلى لمياه الري؛ وذلك نظراً لندرة مياه الري وزيادة التوسع في استصلاح الأراضي. وتعتبر الكوسة من محاصيل الخضر الصيفية التي ينخفض محصولها وتقل جودتها عند التعرض للإجهاد المائي، ويرجع ذلك أساساً إلى ارتفاع محتوى ثمارها من المياه. لذلك نفذت تجربتان حقليتان في تربة طينية طميية بمزرعة خاصة بمركز المنصورة بمحافظة الدقهلية خلال الموسمين الصيفيين 2008، 2009م؛ لدراسة تأثير ثلاث فترات للري (كل 8 ، 12 و16يوماً، تبدأ بعد أول رية) ، والرش بثلاثة تركيزات من الكاؤلين (صفر ، 3 و 6٪) عند 25 ، 40 و55 يوم من الزراعة، وكذلك التفاعل بينهما على النمو والمحصول وجودة الثمار وكفاءة استخدام نباتات الكوسة (صنف الاسكندراني) لمياه الري.

أوضحت النتائج أن ري النباتات كل 8 أيام خلال موسم النمو أدى إلى زيادة كل من الوزن الطازج لعرش النبات ووزن الأوراق للنبات ومتوسط وزن الثمرة والمحصول الكلي للفدان ومحصول الفدان الصالح للتسويق والماء الكلي المضاف للفدان خلال موسم الزراعة في كلا الموسمين. وعلى العكس من ذلك، أدت زيادة الفترة بين الريات من 8 حتى 16 يوم إلى حدوث زيادة معنوية في نسبة المادة الجافة في الأوراق ونسبة المادة الجافة في الثمرة ومحتوى الثمرة من المادة الصلبة الذائبة الكلية وكفاءة استخدام المياه في كلا الموسمين.

ومن ناحية أخرى أدت زيادة مستويات الكاؤلين المضافة إلى حدوث زيادة معنوية في جميع الصفات المدروسة فيما عدا صفات نسبة المادة الجافة في الأوراق ونسبة المادة الجافة في الثمرة والماء الكلي المضاف للفدان والتي انخفضت بزيادة مستويات الكاؤلين في كلا الموسمين.

أثر التفاعل بين عاملي الدراسة (الري والرش بالكاؤلين) معنويا على جميع الصفات المدروسة في كلا الموسمين. حققت معاملة الري كل 8 أيام مع الرش بالكاؤلين بتركيز 6٪ أعلى صافي عائد، ويليها معاملة الري كل 12 يوم مع الرش بالكاؤلين بتركيز 6٪ والتي تفوقت عليه نسبة الفائدة: التكلفة.

من وجهة النظر الاقتصادية والغذائية، يمكن التوصية بري نباتات الكوسة (صنف الاسكندراني) كل 12 يوم (تبدأ بعد أول رية) مع الرش بمعلق الكاؤلين بتركيز 6٪ عند 25 ،40 و55 يوم من الزراعة؛ من أجل تحسين كمية ونوعية المحصول مع زيادة كفاءة استخدام النباتات لماء الري تحت مثل ظروف هذه الدراسة.

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