Effect of three irrigation regimes on yield and some fruit characteristics of two mango cultivars.

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ABSTRACT: The present work was carried out during the two seasons 2009 and 2010 to study the effect of three irrigation regimes 100% ، 85 % and 70 % of Et_c on yield and some physical and biochemical fruit characteristics at harvest of two mango cultivars namely Ewais and Sediek. Mango tree are growing in newly reclaimed area (sandy soil)-Behera governorate, Egypt. The results showed that the irrigation regime 85 % of Et_c increased the number of retained fruits per tree, yield / tree (kg), fruit weight (g) & volume (cc), percentages of pulp weight, fruit moisture, TSS % and TSS /acid ratio of mature fruits on harvest day. Oppositly the irrigation regime 85 % of Et_c caused a substantial decrease in percentages of peel weight, seed weight % and pulp firmness (lb / $inch^2$), percentages of fruit dry matter content and total acidity of fruit juice on harvest day in the two studied cvs. and in the two seasons compared with irrigation regimes 100 or 70 % of Et_c, where there is insignificant difference between the irrigation regime 100 and 85% of Et_c . On the other hand, irrigation regime 70 % of Et_c caused a decrease in total yield per a tree due to suffering the mango trees from water deficit stress. However the decrease of given amount of irrigation to be 70 % of Et_c had improved the fruit quality in both studied mango cultivars and in the two studied seasons.

Key words: Irrigation regimes, mango trees, yield, physical and chemical of fruits.

INTRODUCTION

Mango (*Mangifera indica* L.) family Anacardiaceae occupies the third place in Egypt after citrus and grapes regarding the cultivated acreage (222838 fed.) and yearly yield production (598084 tons) in year 2011*.

The mismanagement in both water and nutrients regime led to substantially low yield production. Ideally, irrigation should replace crop evapotranspiration to avoid mild stresses and achieve a maximum rate of vegetative growth and fruit yield production, **Phene et al., (1990).** For realizing a successful growth and development of mango trees, a proper irrigation is required, **Mirjat et al., (2011).**

Preliminary research are by **Larson et al., (1989)** suggests that irrigation at 7 days intervals increases the fruit size, earliness and yield. **Whiley and Schaffer (1997)** reported that reduced plant water potentials during the first four to six weeks of fruit set can affect fruit retention and yield.

In Giza governorate, Egypt. **Ibrahim (2005)** found that the given amounts of irrigation water to Zebda Mango cv. were 6162, 5124, 4122 and 2876 m^3/ fed., in the first season and 5626, 4691, 3740 and 2833 m^3/ fed., in the second season. These water amount are equivalent to 120 (control), 100, 80 and 60 % Et_o respectively.

Singh et al., (2007) found that the average annual value of water requirement of mango trees ranged from 2.1 L /day/plant to 345 L /day/ plant. Therefore the objective goal of the present work is to study the effect of different irrigation regimes on yield, some physical and biochemical fruit characteristics at harvest in Sediek and Ewais Mango cultivars, cultivated in the newly reclaimed desert areas.

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MATERIALS AND METHODS

The present study was carried out during the two successive seasons 2009, 2010 on mango trees ***Mangifera indica*** L., cultivars Ewais and Sediek. The trees of the two studied cultivars are grafted on seeded rootstocks, the trees are 12 years old and grown in sandy soil (newly reclaimed), Behera governorate. The trees of Sediek cultivar are planted 5 × 3 meters apart, while those of Ewais cultivar are planted 6 × 4 meters apart. All trees are irrigated using drip irrigation system .The chosen trees for the experimentation were in each cultivar similar in vigor and subjected to the same cultural practices. The experimentation was done on fifteen trees (3 replicates each has 5 trees for each cultivar). A complete randomized blocks design was followed in analyzing the sample.

The applied experimentations were as follows:

1. Determination of water requirement.

1.1. Determination of the potential evapotranspiration (Et_o).

Potential evapotranspiration (Et_o) was calculated from climatic data of the experimented location depending on the use of the modified Penman–Monteith equation according to **Allen et al., (1998).** The main phenological growth stages of mango trees were determined and the values of potential evapotranspiration (Et_o) for each stage was recorded in the Central Laboratory for Agriculture Climate (CLAC), Agriculture Research Center, Ministry of Agriculture. A Crop coefficient (k_c) which was between 0.2 to 1.2 was used for the calculation the Et_c according to **Okyereh(2009).**

1.2. Water consumption (Et_c).

Water consumption is determined according to the following formula reported by **Doorenbos and Pruitt (1977)** using Et_c value as follows.

$$Et_c = Et_o \times K_c \quad \text{..... (1).}$$

1.3. Amount of applied irrigation water (IW).

Amount of applied irrigation water (IW) were calculated by using the equation elucidated by **Karmeli and Keller (1975)** as follows.

$$IR = \frac{S_e \times S_i \times Et_o \times K_c \times K_r}{E_a} \times \frac{1}{1-L_r} \quad \text{..... (2)}$$

Since:

IR= Daily irrigation requirements.
$S_e \times S_i$ = plant area (plant distance on lateral × between laterals).
Et_o= Reference evapotranspiration (mm /day).
K_c = Crop coefficient.
K_r =Reduction coefficient Gc/0.85.
Gc = Ground cover (area of tree canopy).
E_a = Efficiency of irrigation system (80 -90 %).
L_r = leaching requirements= Eci/ Ecd
Eci = Electrical conductivity of irrigation water.
Ecd = Electrical conductivity of drainage water.

The three selected irrigation treatments were designed as follows.

100 % of Et_c.
85 % of Et_c.
70 % of Et_c.

Which were periodically given to the soil. The total amount of irrigation water (m^3 / feddan) was calculated in each treatment in the seasons (table 1).

The biochemical analysis of soil samples which were collected from soil layer at depth from 0 – 90 cm deep in the soil was 92.83, 3.7 and 3.47 % of sand, silt and clay respictevily, the soil was category as sandy soil. The wilting point (PWP), filed capacity (FC) and available water (AW) were 9.20 %, 16.17 % and 6.97% respectively.

Table (1) Total amounts of given irrigation water (m^3/ fed. /year) for the three different treatments of Sediek and Ewais cvs. of Mango trees in seasons 2009 and 2010.

Treatments	100% Et_c.	85% Et_c.	70% Et_c.	100% Et_c.	85% Et_c.	70% Et_c.
Character	The total amount of water m^3/feddan.					
Months	Season 2009			Season 2010		
January	123.5	104.9	86.4	132.8	112.9	93
February	134.1	114	93.9	135.4	115.1	94.8
March	337.4	286.8	236.2	341.6	290.4	239.1
April	439.6	373.7	307.7	495.9	421.5	347.2
May	738.8	628	517.2	742.2	630.9	519.5
June	825	701.2	577.5	790.4	671.8	553.3
July	748.4	636.2	523.9	808.5	687.3	566
August	665.7	565.8	466	784.7	667	549.3
September	621.4	528.2	435	635.6	540.3	444.9
October	344.4	292.7	241.1	365.9	311	256.1
November	193	164.1	135.1	192.8	163.9	134.9
December	81.1	68.9	56.8	75.8	64.4	53.1
Total	5252.3	4464.5	3676.6	5501.7	4676.4	3851.2
Safe water	---	787.8	1575.7	----	825.3	1650.5

2. Measurements:

The trees were evaluated regarding the following topics:

2.1. The yield.

90 fruits were collected at maturity stage from 15 trees such that 6 fruits per a tree. The harvested fruits were divided into three replicates in each studied mango cultivar. The yield of fruits per a tree was estimated according to the equation: Number of retained fruits per a tree × average fruit weight at maturity.

2.2. Physical and biochemical fruit characteristics at harvest.

Samples of 18 fruits replicated (five time) such that 18 mature fruit were collected from each tree (5 × 6 × 3 replicated) in each irrigation treatment. The maturity stage was determined at fruit age 113 and 123 day in Sediek and Ewais cvs. Respectively according to **Tandon and Kalra, 2001; Tawfik, 2003 and khalefa 2006**.

2.2.1. Physical fruit characteristics.

Fruit weight (g), fruit volume (ml), peel, pulp and seed weight (%) and flesh firmness was measured in lb / inch^2 using a pressure tester (Digital force - Gouge Model F G V – 0.5 A to F G V – 100 A. Shimpo instruments).

2.2.2. Biochemical fruit characteristics.

2.2.2.1. The fruit pulp moisture % and dry matter %. The fruit moisture content was determined by drying 10 g of the fruit pulp at 70 °C to constant weight. The following equation was applied; hence the dry matter was calculated.

$$\textbf{Fruit moisture \%} = \frac{\text{Fresh weight} - \text{dry weight} \times 100}{\text{Fresh weight}}$$

$$\textbf{Fruit dry matter \%} = \frac{\text{Dry weight} \times 100}{\text{Fresh weight}}$$

2.2.2.2. Fruit total soluble solids (TSS percentage) and total fruit acidity percentage: 10 of fruit pulp in each cv. was mixed with 50 ml distilled water. TSS percentage was measured in the filtrate using hand refractometer. Fruit total acidity equivalent to citric acid /100 g fresh pulp was measured in the filtrate by titration. **TSS/acid ratio** in the fruit was calculated and recorded.

2.2.2.3. Fruit total sugar content was determined colorimetrically in fruit dry weight (g / 100 g dr. wt.) according to the method of **Smith et al., (1956).**

Statistical analysis.

The results were statistically analyzed using F-value test, and the means were compared by the L.S.D at the level of 5% probability according to **Snedecorand Cochran (1980). (COSTAT, v.4)** was the computer program that used to calculate the obtained results.

3- RESULTS AND DISCUSSION

3.1. The yield.

Results in table (2) indicated that irrigation at 85 % of Et_c, gave the highest number of fruits in both Ewais and Sediek cvs., which attained 112, 102 and 63, 60 fruit / tree in both cultivars and seasons 2009 and 2010 respectively retained the fruit number was followed descendingly by those irrigated with 100 % of irrigation regime and then followed by 70 % of Et_c which had the least significant number of retained fruits per tree which attained 58, 48 and 26, 27 fruit/tree of Ewais and Sediek cvs. in the two seasons 2009 and 2010 respectively.

The irrigation regime at 100 % Et_c gave the highest fruit weight attained 628.97, 471 gm. and 258.03, 235.53 gm. in Sediek and Ewais cvs in the seasons 2009 and 2010 respectively followed descendingly by that which under the effect of 85 %, and then 70 % Et_c which had the least significant fruit weight attaining 422.4, 357.42 gm. and 201.83, 194.37 gm. of Sediek and Ewais cvs., in the two seasons 2009 and 2010 respectively. The results demonstrated also that the low fruit number per tree in Sediek cultivar was adversely proportional to the high fruit weight and vice versa in the Ewais cultivar.

The irrigation regime at 85 % Et_c gave the highest estimated yield of fruits tha attained 34.7, 26.3 and 27.27, 22.94 kg / tree in Sediek and Ewais cvs in seasons 200

and 2010 respectively, followed descendingly by 100 %, and 70 % Et_c, which had the least significant weight of estimated yield fruits per tree (kg) in the two seasons 2009 and 2010 respectively.

Although Sediek cv. had the lower total number of fruits than Ewais cv. but it had the higher yield per tree than Ewais cv. because of it showed higher fruit weight in comparison with Ewais cv.

The significant increase of the estimated yield per a tree under the effect of 85 % of Et_c irrigation treatment compared with those under 100 % of Et_c or 70 % of Et_c could be attributed to the significant increase of both number of retained fruits as well as fruit weight compared with those 70 % Et_c . It seems that irrigation regime 85 % of Et_c is more suitable for fruit production of both cultivars Ewais and Sediek than that under 100 % Et_c or 70 % Et_c.

The results are in agreement with those of **Ibrahim (2005)** who found that yield of mango Zebda cv., was the highest at treatments 80 and 100 % Et_o. On the other hand the treatments 60 and 120 % Et_o gave the lowest yield. **Cotrim et al., (2011)** found that number of fruits / plant and average fruit weight of mango Tommy Atkins cv. was insignificantly effected by irrigation treatments 30, 40, 60, 80 and 100% of Et_c possibly due to the high heterogenecy of production between plants of the same treatment. According to **Azevedo et al., 2003** and **Silva, et al., 2009** the yield of mango Tommy Atkins cv. was higher (11%) at treatment (90 % Et_o) than that was obtained in the control treatment of irrigation 100 % Et_o.

We can come to the conclusion that the irrigation treatment at 85 % of Et_c gave the highest number of fruits and yield /tree (kg), while irrigation treatment at 70 % of Et_c gave the lowest number of fruits and yield /tree (kg). Sediek cv. had the lower total number of fruits than Ewais cv. but it had higher yield per tree than Ewais cv. because it had the highest fruit weight compared with Ewais cv.

Table (2) Effect of different irrigation regimes on fruit number and yield per tree (Kg) of Sediek and Ewais Mango cultivars at harvest in 2009 and 2010 seasons.

Characteristics / Cultivars		Number of fruits / tree	Average fruit weight (g).	Estimated yield / tree (kg).	Number of fruits / tree	Average fruit weight (g).	Estimated yield / tree (kg).
	Treatments	2009			2010		
Sediek	100 % of Et_c (control)	36	628.97	22.63	37	471	17.41
	85 % of Et_c.	63	550.94	34.7	60	438.3	26.3
	70 % of Et_c.	26	422.4	10.98	27	357.42	9.66
	L.S.D (5%)	2.82	22.15	1.31	1.99	39.53	1.12
Ewais	100 % of Et_c (control)	80	258.03	20.6	70	235.53	16.45
	85 % of Et_c .	112	243	27.27	102	225	22.94
	70 % of Et_c.	58	201.83	11.68	48	194.37	9.35
	L.S.D (5%)	11.53	20.54	4.33	10.19	12.51	2.62

3.2. Physical and biochemical characteristics of fruits at harvest.

3.2.1. Physical characteristics of fruits.

Data in tables (3 and 4) and fig. (1) showed that the decrease of given irrigation regime led to a significant decrease in fruit fresh weight at maturity (harvest day), in both studied cvs. and in the two studied seasons. Thus, the maximum fruit fresh weight was obtained under the effect of irrigation treatment 100 % of Et_c. (5252 m^3/ fd. and 5501.7 m^3 / fd.) in Sediek and Ewais cvs. in seasons 2009 and 2010 respectively. The major percentage of the fruit weight in both studied cvs. was for the fruit pulp (80.2 % and 80.7 % in Sediek cv. and 74.2 % and 74.7 % in Ewais cv. in

seasons 2009 and 2010 respectively). Peel % and seed % of fruit weight were the minor percentages (12.1- 7.7 %).

The reduction in irrigation water regime to be 70% of Et_c increased the pulp firmness of mango fruits compared with those irrigated with 100% Et_c. Therefore, we can assume that reduction of irrigation treatment up to 70 % of Et_c should delay the ripening processes through inhibition of some enzymes.

The present results are in agreement with those of **Ibrahim (2005)** who found that the higher weight of fruit, peel, pulp, seed and volume of mango Zebda cv. fruits was obtained by irrigation regimes 100 % and 80 % Et_o. On the other hand irrigation treatments 120 % (control) or 60 % Et_o gave the lowest weight of fruits, peel, pulp, seed % and volume in both seasons. Oppositly pulp firmness of fruits was relatively higher at treatment 80 % Et_o than at treatments 120 %, 100 %, or 60 % of Et_o. **Abdel-Razik (2012)** found that the reduction in irrigation water regime to be 70% of Et_c increased the pulp firmness of mango fruits compared with those irrigated with 100% Et_c.

We can come to the conclusion that the irrigation treatment 85 % of Et_c improved the physical characteristics of fruits through increasing fruit weight and volume, and pulp weight % and simultaneously decreasing peel weight %, seed % and pulp firmness in both studied cvs. and in the two studied seasons.

Table (3) Effect of different irrigation regimes on some physical characteristics of Mango fruit (Sediek cv.) at harvest in 2009 and 2010 seasons.

Characteristics / Treatments		Fruit weight (g)	Fruit volume (C.C)	Peel weight (%)	Seed weight (%)	Pulp weight (%)	Pulp firmness (Lb/inch^2)
	M^3/fed	2009					
100%Et_c of (control)	5252.3	618.93	591.67	11.93	7.90	80.17	25.48
85 % of Et_c	4464.5	561.87	540.00	10.31	7.65	82.04	26.67
70 % of Et_c	3676.6	417.20	390.00	12.10	9.26	78.64	27.57
L.S.D (5%)		35.35	26.64	0.49	2.57	0.84	0.47
2010							
100%Et_c of (control)	5501.7	508.30	483.33	11.45	7.85	80.70	24.82
85 % of Et_c	4676.4	433.20	401.67	10.97	7.47	81.56	25.88
70 % of Et_c	3851.2	357.33	320.00	12.72	8.29	78.99	26.90
L.S.D (5%)		25.23	36.78	0.46	0.40	0.24	0.31

Table (4) Effect of different irrigation regimes on some physical characteristics of Mango fruit (Ewais cv.) at harvest in 2009 and 2010 seasons.

Characteristics / Treatments		Fruit weight (g)	Fruit volume (C.C)	Peel weight (%)	Seed weight (%)	Pulp weight (%)	Pulp firmness (Lb/inch^2)
	M^3/fed	2009					
100%Et_c of (control)	5252.3	273.87	265.00	15.5	10.3	74.2	23.35
85 % of Et_c	4464.5	245.73	225.00	15.2	10.2	74.7	24.58
70 % of Et_c	3676.6	203.67	196.00	17.6	11.4	70.9	25.47
L.S.D (5%)		16.49	10.19	0.73	0.16	1.44	0.45
2010							
100%Et_c of (control)	5501.7	258.0	236.7	15.37	9.82	74.81	22.68
85 % of Et_c	4676.4	237.1	228.3	14.78	10.08	75.14	23.92
70 % of Et_c	3851.2	201.8	190.0	16.72	11.08	72.20	24.80
L.S.D (5%)		11.3	11.04	1.11	0.13	1.51	0.26

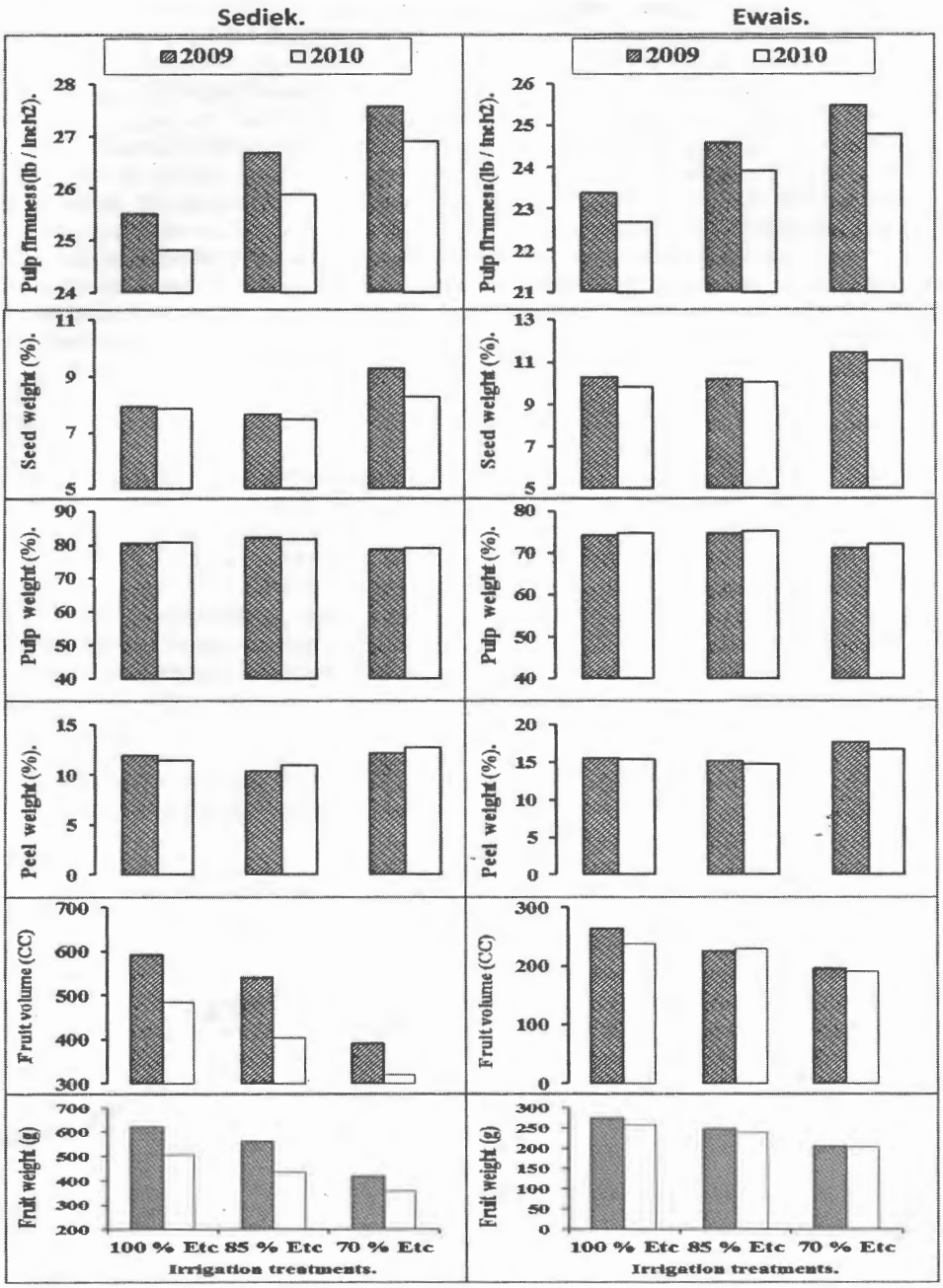

Fig.(1) Effect of different irrigation treatments on fruit weight, volume, percentages of peel, pulp and seed and Pulp firmness (Lb/inch^2) of Ewais and Sediek mango fruits at maturity stage in 2009 and 2010 seasons.

3.2.2. Biochemical characteristics:
3.2.2.1. Moisture percentage.

Data showed in Tables (5 and 6) and fig. (2) showed that fruit pulp moisture % was gradually and proportionally decreased with decreasing the irrigation water % of Et_c from 100% to 70%. The reduction in moisture content may be due to the fruit skin transpiration and to some extent to fruit respiration as reported by **Rathore et al., (2007)**. The present results are also similar with the finding of **Proietti and Antognozzi (1996)**, who reported that with increasing irrigation regime, pulp water content of olive was increased. **Othman and Mbogo (2009)** found that the mango Dodo cv. had higher moisture content than mango Viringe cv. Early season fruits had the lowest moisture content while late season fruit had the highest moisture. **Abdel-Razik (2012)** found that fruit pulp moisture % of mango was gradually and proportionally decreased with decreasing the irrigation water.

3.2.2.2. Dry matter.

Data presented in Tables (5 and 6) and fig. (2) showed that dry matter was significantly affected by different water regimes treatments in both seasons. Maximum percentage of dry matter was obtained by irrigation treatment 70 %of Et_c followed descendingly by that was obtained at 85 % of Et_c. The least values of dry matter percentage was shown by irrigation treatment 100 %Et_c in the two seasons.

The results were in agreement with those found by **Bhuyan (1994)** that the irrigation which was applied at fortnightly intervals from bloom or no irrigation of tree caused a reduction in dry matter in ripe fruits of mango Corabo cv.

3.2.2.3. Total soluble solids (T.S.S %).

Data in Tables (5 and 6) and fig. (2) indicated that TSS% in the fruit juice of the two mango cultivars increased with decreasing of the irrigation water % of Et_c from 100% to 70% of Et_c in both seasons.

These results were in agreement with those found by **Ibrahim (2005)** who reported that TSS % of mango pulp fruits were slightly higher at treatments 80% or 60 % Et_o than other treatments 100 and 120 % Et_o. **Abdel-Razik (2012)** showed that the TSS% was increased with the reduction of irrigation water that given to the orchard and the maximum increase was recorded at 70% of Et_c. while the lowest at 100 % of Et_c. **Rathore et al., (2007)** found that the increase and decrease in TSS% is directly correlated with hydrolytic changes in starch and conversion of starch to sugar being an important index of ripening process in mango. The reduction in TSS % is due to dilution of sugars with excessive fruit moisture contents according to **Nasir and Haq-Mian (1993)**.

3.2.2.4. Total fruit acidity percentage.

Results in tables (5 and 6) and fig. (2) showed that the total acidity percentages of two mango cvs. was significantly decreased with increasing the irrigation regimes from 70 % to 100 % of Et_c in the two studied mango cultivars in both 2009 and 2010. The highest value of total acidity percentage was found at 70% of Et_c at harvest while the lowest at 100% of Et_c.

These results were in agreement with those found by many workers working on mango. They reported that the highest value of total acidity was found at 70 % of Et_c while the lowest was found at 100 % of Et_c (**Abdel-Razik 2012; Ibrahim 2005; Naglea et al., 2010 and Pavel et al., 2003**).

3.2.2.5. TSS/Acid ratio.

TSS / Acid ratio is a parameter that indicates to fruit quality. The increase of the TSS / Acid ratio is coincided with increasing the sweetness of the fruit and vice versa. Therefore, the producer hopes that TSS / Acid ratio attained a value, at which fruit sugar and total fruit acidity will be in balance, neither very sweety nor acid. Thus the very sweety fruit in absence of acids is not desirable.

The results in table (5 and 6) and fig. (2) clearly showed that the differences between ratio of TSS / Acid under the two irrigation treatments 100 % and 85 % of Et_c were insignificant. Oppositely, the results showed a significant difference between TSS / Acid ratio under the effect of 70 % of Et_c irrigation treatment and the fruit TSS / Acid ratio under the effect of both 100 % and 85 % of Et_c irrigation treatments in both studied cvs. and in the two seasons. TSS / Acid ratio under 70 % Et_c showed a significant decrease in the ratio to attain the minimal value compared with those under 100 % or 85 % of Et_c irrigation treatments.

These results are in agreement with those found by **Ibrahim (2005)** that the TSS /acid ratio of mango fruits Zebda cv. was higher at irrigation treatment 80 % Et_o than irrigation treatments 120, 100 and 60 % of Et_o. **Spreer et al., (2007)** found that the TSS /acid ratio of mango fruits was increased in all treatments which regulated deficit irrigation and control (100 % Et_c). **Nasir and Haq-Mian (1993)** reported that, excessive moisture has a depressing effect on TSS/acid ratio.

3.2.2.6. Total sugars percentage (g / 100 g dr. wt.).

Results in tables (5 and 6) and fig. (2) showed that the total sugars content of the two mango cvs. was significantly increased with decreasing the irrigation regimes % of Et_c from 100% to 70 % in both 2009 and 2010. The maximum increase in total sugar was recorded at 70 % of Et_c, while the lowest one was at 100 % of Et_c.

These results are in agreement with those found by **Pavel et al., (2003)** reported that the total sugars of fruits mango was the lowest at treatments deficit irrigation 79 and 69 % from field capacity) than control (95 % field capacity) at harvest. **Khattab et al., (2011)** found that the total sugar % of fruits pomegranate was decreased by increasing irrigation levels.

We can come to the conclusion that the percentages of dry matter content, TSS, total acidity and total sugars of fruits at harvest day were gradually increased with decreasing of the irrigation water % of Et_c from 100 % to 70 % of Et_c in both seasons. Oppositely the percentage of pulp moisture and TSS /acid ratio were decreased by decreasing water irrigation. The irrigation treatment 85 % of Et_c improved biochemical characteristics of fruits through increased TSS /acid ratio and decreased the percentage pulp moisture and total acidity of fruits, where there was an insignificant difference between the irrigation treatment 85 % and 100 % of Et_c,

compared with irrigation treatment 70 % of Et_c in both studied cvs. and in the two studied seasons.

Table (5) Effect of different irrigation regimes on some biochemical characteristics of Mango fruit (Sediek cv.) at harvest in 2009 and 2010 seasons.

Characteristics / Treatments	Moisture %	Dry matter content %	TSS %	*Total acidity %	TSS /acid ratio	Total sugars %
	2009					
100 % of Et_c (control)	83.33	16.67	12.42	0.90	13.9	7.47
85 % of Et_c	82.67	17.33	13.00	0.91	14.3	7.77
70 % of Et_c	79.33	20.67	13.33	1.35	9.9	8.03
L.S.D (5%)	2.0	2.0	0.68	0.13	1.90	0.28
	2010					
100 % of Et_c (control)	82.83	17.17	12.90	0.83	15.5	8.07
85 % of Et_c	82.00	18.00	13.57	0.85	16.0	8.57
70 % of Et_c	78.67	21.33	14.67	1.17	12.6	9.10
L.S.D (5%)	1.16	1.16	0.43	0.78	0.88	0.25

***=equivalent Citric acid.**

Table (6) Effect of different irrigation regimes on some biochemical characteristics of Mango fruit (Ewais cv.) at harvest in 2009 and 2010 seasons.

Characteristics / Treatments	Moisture %	Dry matter content %	TSS %	*Total acidity %	TSS /acid ratio	Total sugars %
	2009					
100 % of Et_c (control)	81.33	18.67	15.60	0.53	29.3	9.80
85 % Et_c	80.33	19.67	16.40	0.54	30.2	10.22
70 % Et_c	77.33	22.67	17.27	0.83	20.7	11.35
L.S.D (5%)	0.50	0.50	0.54	0.04	4.27	0.29
	2010					
100 % of Et_c (control)	80.33	19.67	15.73	0.41	38.4	10.10
85 % of Et_c	79.67	20.33	16.93	0.43	39.7	10.37
70 % of Et_c	76.67	23.33	17.77	0.66	27.1	11.08
L.S.D (5%)	0.35	0.35	1.62	0.07	7.59	0.42

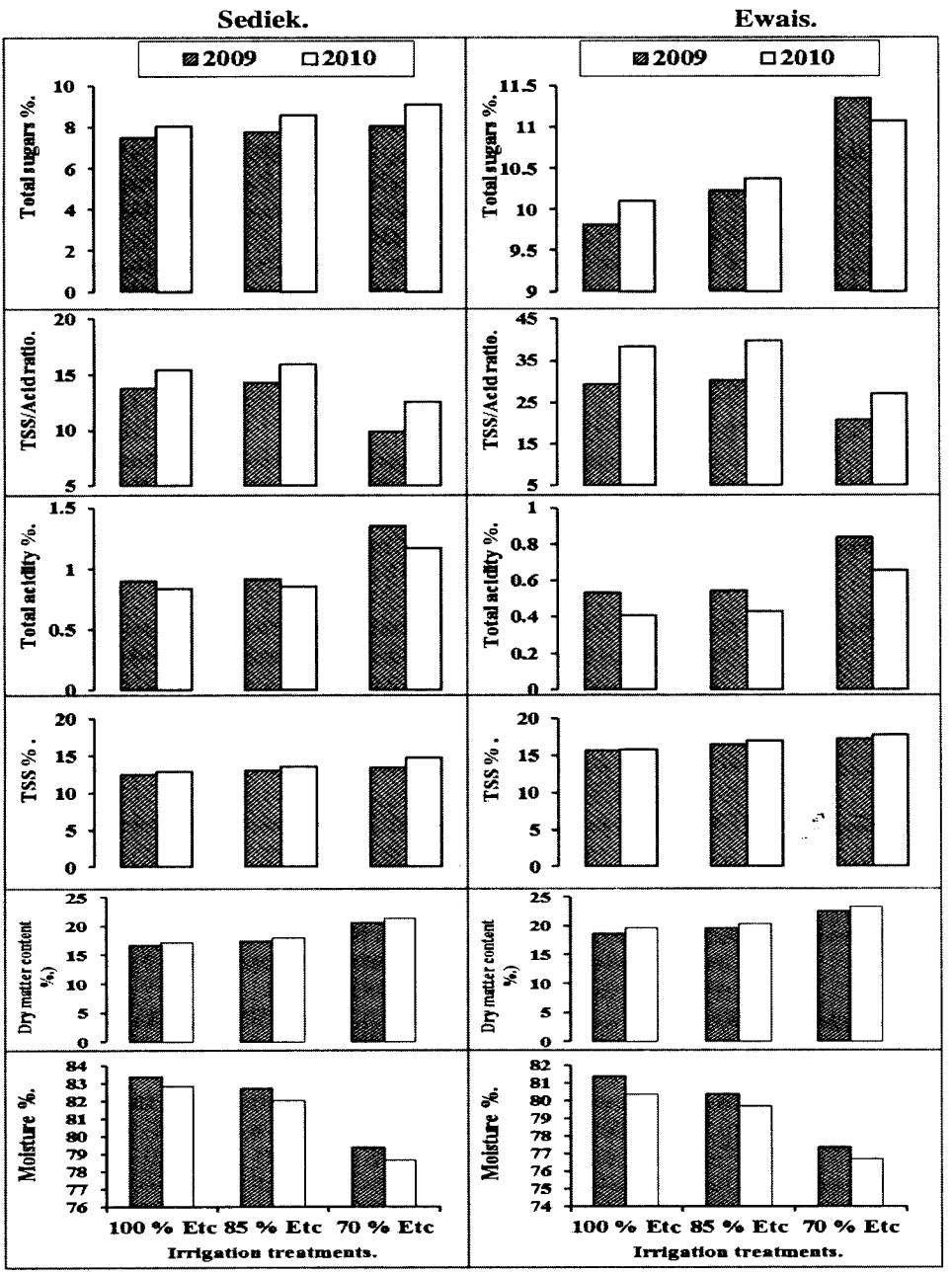

Fig.(2)Effect of different irrigation treatments on percentages of moisture , dry matter, TSS %, total acidity %, TSS / Acid ratio and total sugars % of Ewais and Sediek mango fruits in 2009 and 2010 seasons.

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تأثير ثلاث مقننات ري على محصول و بعض خصائص الثمار لصنفين من المانجو.

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الملخص العربى

أجرى هذا البحث خلال موسمين متتاليين ٢٠٠٩ و ٢٠١٠ على أشجار مانجو صنفى صديق و عويس ، نامية فى تربة رملية (أراضى مستصلحة حديثا) بمحافظة البحيرة – مصر. و كان عمر الأشجار ١٢ عام و مطعومة على أصول بذرية، و مسافة الزراعة ٣× ٥ م للصنف صديق و ٤ × ٦ م للصنف عويس و كانت تروى بالتنقيط.

الهدف من هذه الدراسة هو بحث تأثير ثلاث معاملات رى مختلفه هى ١٠٠ % من الإستهلاك المائى للمحصول (كنترول)، ٨٥ % و ٧٠ % من الإستهلاك المائى للمحصول على المحصول و خصائص الثمار الطبيعية و الكيماوية. حيث أن الأشجار التى رويت بمعاملات رى ٨٥ % و ٧٠ % من الإستهلاك المائى للمحصول حققت توفير كمية ماء رى ١٥ و ٣٠ % تقريبا على الترتيب مقارنة بالكنترول.

تم تنفيذ المعاملات من خلال نظام تصميم قطاعات كاملة العشوائية إحتوت على ثلاث مكررات كل مكررة تشمل خمسة أشجار لكلا الصنفين، و كانت الأشجار متماثلة فى النمو و تجرى عليها العمليات الزراعية المختلفة لكل الأشجار على السواء.

يمكن تلخيص أهم النتائج التى حصل عليها كالأتى :-

أدت معاملة الرى ٨٥ % من الإستهلاك المائى للمحصول الى أعلى عدد للثمار المتبقية على الأشجار و كذلك محصول الشجرة (كجم) على عكس المعاملة ٧٠ % من الإستهلاك المائى للمحصول أعطت أقل عدد للثمار و كذلك محصول / شجرة (كجم). أشجار الصنف صديق كانت تحمل أقل عدد للثمار المتبقية على الشجرة على عكس أشجار الصنف عويس، و لكن محصول شجرة الصديق كان عالى و ذلك لأن وزن ثمرة الصنف صديق كانت أكبر من وزن ثمرة الصنف عويس .

وجد أن المعاملة ٨٥ % من الإستهلاك المائى للمحصول حسنت من الصفات الطبيعية والكيماوية للثمار عند الحصاد من خلال زيادة وزن ،حجم و النسبة المئوية للب الثمار ، المواد الصلبة الذائبة و المواد الصلبة الذائبة / الحموضة الكلية للحم الثمار و تزامن هذا مع نقص كل من النسبة المئوية للقشرة و البذرة و صلابة لحم الثمار، محتوى الثمار من الرطوبة و الحموضة الكلية للثمار فى كلا صنفى و موسمى الدراسة. حيث كان لا يوجد فرق معنوى بين المعاملة ١٠٠ % (الكنترول) و ٨٥ % من الإستهلاك المائى للمحصول مقارنة بمعاملة ٧٠ % من الإستهلاك المائى للمحصول التى أعطت أقل قيم لكلا صنفى و موسمى الدراسة.

بالإضافة إلى تقليل استخدام كمية ماء الري ، الحصول على محصول جيد ذوجودة عالية وتكلفة منخفضة، خاصة في ظل وجود ندرة المياة و الإرتفاع المتزايد لعدد السكان مما يلزم له من التوسع في الزراعة أفقيا و رأسيا وخاصة في الأراضي الصحراوية و ذلك لسد الفجوة الغذائية.