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EFFECT OF SOIL MATRIC POTENTIAL ON "CANINO" APRICOT TREES IN SANDY SOIL UNDER DRIP IRRIGATION

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ABSTRACT

The present investigation was carried out in Aly Mubark experimental farm at El-Bostan in sandy soils, on 4-years old "Canino" apricot trees budded on apricot seedling rootstock during 2004 and 2005 seasons. The study aimed to study the effect of soil matric potential on vegetative growth, fruit yield, amount of water and its water use efficiency under drip irrigation system in sandy soil using the tensiometers. Three treatments of soil matric potential were used as T_1 (100-200 mbar), T_2 (200-300 mbar), T_3 (300-400 mbar), and control treatment as farm system which irrigated with 80 Liter/tree/irrigation. Increasing the amount of applied water to apricot trees enhanced their growth rate, i.e. tree size, trunk cross-sectional area (TCA) and shoot length while it decreased the total leaf chlorophyll content. T_1 treatment gave the highest fruit set% followed by control treatment while T3 gave the lowest values. T_1 treatment gave insignificant yield increment in first season, but it gave the highest significant yield increment in the second season. T3 treatment gave higher water use efficiency than T_1, T_2 and the control treatment, but it gave the lowest yield. Calculated seasonal amount of applied irrigation water were 2173.08, 932.40, 621.60 and 3477.6 m^3/feddan in the first season and 2940.63, 1212.0, 635.04 and 3477.6 m^3/feddan in the second season for the irrigation treatment T_1, T_2, T_3 and control. The water use efficiency for T_1 and control were 4.0767 and 2.315 Kg/ m^3 water in the first season and 3.3928 and 2.6165 Kg/ m^3 water in the second season, respectively. Therefore, using water soil potential at 100-200 mbar was recommended as the best level for "Canino" trees irrigation in sandy soil.

INTRODUCTION

Water is fast becoming on economically score resource in many areas of the world especially in arid and semi arid regions. In Egypt, water is vital on limited resource because of increasing population. Water availability to agricultural sector is becoming a major constraint to agricultural production. To maximize the use of this limited resource is through the use of modern irrigation system. The use of modern irrigation system is essential for the reduction of irrigation water demands (Brown, 1999). Bucks and Davis (1986) demonstrated the drip irrigation increased the beneficial use of water, enhanced plant growth and yield, reduced salinity, hazard improved application of fertilizer and other chemicals, limited weed growth and decreased energy required.

Levin *et al.* (1979) pointed out thatdrip irrigation enables a restricted volume of wetted soil to be maintained with small fluctuations in water tension and with the development of a dense root system with minimum loss of water and fertilizers by leaching. Calthoum (1975) found that the increase in tension from zero to 0.33 bar released more than 75% of water in light textured soil but, less than 50% in heavy ones. El-Gindy *et al.* (1991) on cucumber and squash showed that when the values of soil moisture tensions decreases the yield production and water use efficiency increases in calcareous soils. Abd El-Messeih and El-Gindy (2004) on apricot concluded that irrigation scheduling by the soil matric suction near field capacity has many advantage for "Canino" apricot trees such as saving irrigation water, good vegetative growth, good fruit yield and high water use efficiency under drip irrigation level from 100 to 200 mbar as soil moisture suction is the best treatment for getting good leaf mineral and total chlorophyll content and deep active rooting depth.

The aims of the present study were to study the effect of water stress (soil materic potential) of "Canino" apricot trees in new reclaimed sandy soil under drip irrigation system on vegetative growth and yield and saving irrigation water by irrigation scheduling.

MATERIALS AND METHODS

The present experiment was carried out at Aly Moubark experimental farm of south Tahrir Research Station during 2004 and 2005 seasons on four years old of "Canino" apricot trees budded on apricot seedling rootstock. The treated trees were spaced at 4x5 meters apart. Aly Moubark farm represents newly reclaimed soils of El-Bostan area. El-Behira Governorate. Surface drip irrigation system which used in the area. There are two lateral lines of drip irrigation system for each row of the trees on the two opposite sides. Six emitters/tree (61/h) installed on lateral line in a location opposite to tree trunk of 50 cm from tree. Emitters were spaced 0.5 meter apart on the lateral line.

Soil samples from three depths of 0 – 30, 30 – 60 and 60 -110 cm. were collected to determine some physical, hydrophysical and chemical properties according Page et al. (1982). The values are presented in Table 1, 2 and 3.

Table (1): Some chemical analysis of the experimental site of south Tahrir research station.

Soil depth (cm)	pH (1:2.5)	EC	Cation (meq/100 g soil)				Anion (meq/100 g soil)			
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl^{-}	$SO_4^{=}$
0 -30	8.00	0.45	0.70	0.50	0.96	0.09	-	0.60	1.1	0.55
30-60	7.66	0.33	0.55	0.40	0.65	0.05	-	0.55	0.75	0.35
60-110	7.5	0.24	0.40	0.30	0.47	0.03	-	0.45	0.50	0.25

Table (2):some physical analysis of the experimental site of south Tahrir research station.

Depth (cm)	CaCO3 (%)	B.D. (g/cm^3)	Particle size distribution (%)		
			Sand	silt	Clay
0 - 30	4.1	1.62	90.18	4.82	5.00
30 - 60	4.9	1.65	92.60	3.30	4.10
60 - 110	5.1	1.68	95.21	1.59	3.20
Mean	**4.70**	**1.65**	**92.66**	**3.224**	**4.1**

Table (3): Soil moisture content at different tensions of the experimental site of south Tahrir research station.

Depth (cm)	Total Porosity	Tension (mbar)*					Available water**
		100	200	300	400	1500	
0 - 30	37.69	11.00	9.33	8.34	7.86	5.4	5.6
30 - 60	36.54	10.80	7.00	8.06	7.41	5.20	5.6
60 - 110	35.39	10.00	8.85	7.93	7.11	5.00	5.0
Mean	**36.54**	**10.60**	**9.06**	**8.11**	**7.46**	**5.20**	**5.4**

* Depletion between 100 – 200 mbar = 1.64% from total volume.
Depletion between 200 – 300 mbar = 0.95% from total volume.
Depletion between 300 -400 mbar = 0.65% from total volume.
Total porosity = BD/TD – 1 where:
BD is soil bulk density.
TS is soil true density.
bar = 1000 mbar.

* available water = 0 at 0.1 bar – 0 at 15 bar

Experimental treatments:

Soil moisture stress = matric potential and osmotic potential = zero in experimental site.

The experiment consisted of three levels of water stress and control treatment as the follows:

Season 2004:

T_1 Irrigated at a soil matric potential (h) between 100-200 mbar. The soil moisture depletion equal 1.64% from total volume.
The irrigated soil volume/tree = 1.7 x 1.7 x 1.1 = 3.179 m^3
The quantity of applied water/tree = 1.64 % x 3.179 = 0.052 m^3 = 52 liters according to Israelsen and Hansen (1962).

T_2 Irrigated at a soil matric potential between 200 to 300 mbar. The quantity of applied water/tree = 0.95% x 3.179 = 0.03 m^3 = 30 liters.

T_3 Irrigated at a soil matric potential between 300 to 400 mbar. The quantity of applied water/tree = 0.65% x 3.179 = 0.02 m^3 = 20 litters.

T_4 Control treatment: the tree were irrigated with 80 liter/tree/irrigation-according to the usual amount used in the farm.

Season 2005:

The irrigated soil volume/tree = 1.85 x 1.85 x1.2 =4.107 m^3.

T_1 The quantity of applied water/tree = 1.64% x 4.107 m^3 = 0.067 m^3 = 67 liters

T_2 The quantity of applied water/tree = 0.95% x 4.107 = 0.39 m^3 .= 39 liters

T_3 The quantity of applied water/tree = 0.65% x 4.332 = 0.027 m^3 = 27 liters.

T_4 Control treatment: the tree were irrigated with 80 liter/tree/irrigation-according to the usual amount used in the farm.

Water use efficiency (WUE):

Water use efficiency is used to evaluate different irrigation treatment in producing maximum yield per unit of water consumed.

WUE was calculated for each treatment according to the following formula:

$$WUE = \frac{\text{apricot yield/Feddan(Kg)}}{\text{Seasonal water applied/Feddan}(m^3)}$$

Randomized complete block design with 6 replicates was used. Each replicate consisted of 3 trees, i.e. 4 treatment x 6 replicates x 3 = 72 trees.

Vegetative growth: Length of one year-old branches on each tree was recorded at late October. To determine the increase of tree size and the trunk cross-sectional area (TCA) according to Westwood (1988), the diameter of trees under study was measured at 10 cm over the graft union zone at late February and late October in the two seasons.

Leaf measurements were recorded during mid-July in both seasons. Records were made on leaf chlorophyll content as SPAD readings using a chlorophyll meter (Model SPAD 502, Minolta Corporation, NJ, USA), and leaf area using a leaf area meter (Model C/203 area meter, CID, Inc., USA). Each of the leaf characters measured was based on 20-leaf-sample taken from an intermediate position on shoots per tree.

Fruit set:

Percentage of fruit set was counted for all treatments after the end of fruit set.

Yield:

The total yield of each tree was determined as weight basis, in Kgs at the picking time in the beginning of June of both seasons.

Fruit quality:

Samples of 15 random fruits from each studied tree were used for quality measurements, viz, fruit weight, size, dimensions (length and diameter), firmness (using Advance Force Gauge RHI3, UK), TSS content (using a hand Refractometer), the acidity (expressed as gram of malic acid/100 ml juice), and TSS/acid ratio.

Results were statistically analyzed according to Snedecor and Cochran (1990) and New L.S.D. was used for comparison between means of each treatments.

RESULTS AND DISCUSSION

Vegetative Growth:

The growth of apricot tree under different irrigation treatments is showed as tree size, trunk cross-sectional area (TCA), shoot length, leaf area and leaf chlorophyll.

a. Tree size:

Results in Table 4 indicated that differences between irrigation treatments were found to be significant in both seasons under study. The highest increment in tree size was recorded for treatments of the control and T_1. Such results may prove that water supply is important for the growth rate of apricot trees. The lowest significant increment in tree size was obtained by

T_2 and T_3 treatments. The explanation of such results could be related to that those suffering from water stress during growth cycle or receiving water less than required rate.

These results are in harmony with those of Kramer (1980)who concluded that water stress caused a reduction cell target which is the most important reasons for reduced plant size. Neilsen *et al.* (1995) on Gala apple trees and Ali (2006) on "FlordaPrince" peach, stated that high frequency irrigation improved tree growth than lower frequency rates.

b. Trunk cross-sectional area (TCA):

Results in Table 4 showed clearly that trunk growth was affected significantly by different irrigation treatments. The control treatment and T_1 gave the highest significant TCA increase in the first season but was not significantly different in the second season, while the third and second treatments showed the significant lowest values in both seasons. In other words, increasing irrigation rate gave significant increment in TCA.

These results are in agreement with Ali (2006) who found that irrigation rate at 125 or at 100 CWR significantly gave the biggest trunk diameter while the effect of the rate of 75% or at 50% was significantly the least in both seasons. Abd El-Messeih (2000) reported that trunk cross-sectional area of apple tree increased proportionally with increasing irrigation rate.

c. Shoot length:

Concerning the effect of different irrigation treatments on the average shoot length, the results in Table 4 indicated that the highest significant average shoot length was obtained by control and T_1 treatments in the second season but was not significantly different in the first season followed by T_2 treatment, while T_3 treatment showed the lowest significant value in both seasons.

The present results are in line with those of Dencker and Hansen (1990) who stated that drip irrigation increased shoot growth of young apple trees of "Summerred" and "Mutsu" scions on M. 9, M. 26 and MM. 106 rootstocks as compared with the untreated trees. Also, Hussein (2004) reported that the rate of increment in shoot length of pear trees was higher when irrigation level raised from 0.6 to. 0.8 ET or from 0.8 to 1.0 ET.

d. Leaf area:

Leaf area of "Canino" apricot trees as affected by different irrigation treatments in 2004 and 2005 seasons are shown in Table 4. Results indicate generally that the treatments of control and T_1 had the highest insignificant leaf area as compared with the other irrigation treatments. On the other hand, the lowest leaf area was observed in T_3 as compared with T_2 and the differences were not significant in the first season. The data cleared that as the quantity of irrigation water increased, the leaf area of "Canino" trees increased except in T_1, where there were no significant differences in the average leaf area between the control and T_1 treatments in the second season. The results may be due to drainage of excess applied water in control treatment without benefit.

These results are in harmony with those of Lowand and Patil (1994) who cleared that leaf area greatens when the trees were subjected to the highest rate of irrigation water. Also, Abd El-Messeih (2000) found that average leaf area increased with increasing irrigation rate and the highest values were found in the trees grown under control and T_1 (0.1 – 0.2 bar) treatments, while the lowest values were detected in apple trees grown under deficit irrigation. Ali (2006) who mentioned that reducing irrigation rate from 125 (%) to 50% CWR or from 100% to 50% CWR linearly reduced leaf area in both seasons.

e.Total leaf chlorophyll content:

Results presented in Table 4 clearly showed that the total leaf chlorophyll content decreased as irrigation rate increased in both seasons. The total leaf chlorophyll content was higher in T_3 (300 – 400 mbar) and T_2 (200 – 300 mbar) treatments but was not significant differences between them as compared with that of the control or T_1 (100 – 200 mbar) treatments.

These findings are in harmony with Hussein (2004) on "Le-Conte" pear who mentioned that the reduction in irrigation rate was concurrent with a gradual increase in chl. a and b as well as a gradual decreased in leaf carotene content. However, this increment of leaf pigments may be a result to growth depression there by accumulation of these pigments in depressed plant leaves. Ali (2006) on "FloridaPrince" peach found that leaf pigments (Chlorophyll a, b and carotene) decreased as irrigation rate increased in both seasons. However, Ahmed (1990) and Al-Khateeb (1996) on fig mentioned that a decrease in leaf pigments (Chl. a, b and carotenoids) content as a results of growing under water stress conditions.

Apricot Yield:

a.Fruit setting %:

Fruit setting of apricot trees under different irrigation treatments is presented in Table 5. Treatment T_1 showed the highest significant values of fruit setting followed by the treatment of control. However, treatment T_3 and T_2 had the lowest values of fruit setting. These results revealed that increasing the amount of applied water result in a significant increase in fruit setting.The only exception of that is the treatment of control which received water more than treatment T_1, but had lower values of fruit setting than T_1.

The previous results may indicate that excess water or decreasing applied water caused an increase in fruit drop throughout fruit development. Therefore, applying adequate irrigation water greatly increased the retained fruits on apricot trees. In other words, adequate water supply at the root zone is very important in increasing fruit setting or reducing fruit shedding (fruit drop).

The present results are in line with those of Ali *et al.* (1998) who concluded that adequate soil moisture is very important in increasing fruit setting by apple trees. More water stored in the root zone or soil moisture stress reduced fruit set in apple trees. Also, Fathi (1999 a) and Ruiz-

Sanchez *et al.* (1999) mentioned that the dry soil conditions during floral development decreased the number of flowers and percentage of fruit set.

b. Fruit number and weight/tree:

Apricot fruit yield as fruit number and weight/tree as well as yield per tree under different irrigation treatments in the two seasons is presented in Table 5. The results revealed that the highest significant average fruit yield either in number or weight was obtained from the trees grown at T_1 treatment followed by those grown at control, while the lowest values were produced in T_3 treatment. The average yield (number or weight/tree) in T_2 was intermediate and differed significantly as compared with that in all other irrigation treatments. These results may be due to applying most adequate quantity of water to each tree in T_1 as compared with that in the control treatment in spite of the higher quantity of water applied to each tree in the latter treatment. The highest average fruit yield (42.19 and 47.51 Kg for two seasons, respectively) was recorded by T_1 treatment, but the lowest average (16.98 and 19.24 Kg for two seasons, respectively) was recorded by T_3 treatment.

These results are in agreement with those reported by Ben-Poratll and Greenblat (1994) on "Raanana" apricot trees irrigated with 100 or 75% of the daily pan evaporation found that yield was increased by about 12 and 18% at 100 and 75% levels, respectively. Ali (2006) found that yield increment of peach trees recorded 60.22 and 57.5% or 46.59 and 40.98% or 30.41 and 25.16% when irrigation rates increased from 50 till 125% CWR or 100% and 75% CWR, respectively in both seasons.

Fruit quality:

a. Physical properties:

Fruit quality of apricot tree parameters i.e; fruit weight, size, diameter, length and firmness as affected by different irrigation treatments in the two seasons is presented in Table 6. Results indicated that the highest fruit weight, size, diameter and length was obtained by T_1 and the control treatments, while the lowest significant values were obtained by T_3 treatment in both seasons. Meanwhile, the average fruit weight, size, diameter and length in T_2 treatment was intermediate and significantly differed than that in all other irrigation treatments. Although the trees in T_1 applied with a less amount of irrigation water than the control irrigation in both seasons, the fruit weight and size was higher in the former T_1 than the latter control treatment. It was concluded that the applied quantity of water to each tree is more suitable and adequate to induce normal vegetative growth, good yield and larger fruits from "Canino" apricot trees.

As for firmness, results showed that the highest fruit firmness was found in apricot trees grown under T3 followed by those of trees grown under T_2 , T_1 and control in both seasons. The differences among all treatments were significant. In other words, increasing applied water did result in significant decrease in firmness.

b. Chemical properties:

Total soluble solids in the juice were higher in treatments T_1, the control and T_2 while, treatment T_3 had the lowest values of TSS.

Table (4):Effect of irrigation treatments on the vegetative growth of "Canino" apricot trees during 2004 and 2005.

Irrigation treatments	Soil Matric Potential (mbar)	Tree size increase (m^3)		TCA increase (cm^2)		Shoot length (cm)		Leaf area (cm^2)		Leaf chlorophyll (SPAD reading)	
		2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
T_1	100 - 200	3.35	4.12	54.88	104.4	68.06	71.25	40.08	49.81	33.18	30.67
T_2	200 – 300	2.27	2.63	27.48	30.12	42.22	44.33	30.11	31.50	41.20	37.18
T_3	300 - 400	1.30	1.84	19.77	23.08	34.25	40.63	27.15	28.64	43.59	39.18
Control	--	4.98	5.71	60.07	108.1	70.46	74.50	47.44	51.62	29.67	26.17
New LSD		0.51	0.55	3.13	3.84	3.14	2.88	3.02	2.57	3.478	2.60

Table (5): Effect of irrigation treatments on fruit set, number of fruits and yield of "Canino" apricot trees during 2004 and 2005.

Irrigation treatments	Soil Matric Potential (mbar)	Fruit set %		No. of fruits/tree		Yield/tree (Kg.)	
		2004	2005	2004	2005	2004	2005
T_1	100 - 200	25.47	27.52	1236	1370	42.19	47.51
T_2	200 – 300	15.38	18.24	983.1	1046	24.31	26.50
T_3	300 - 400	13.21	15.19	934.4	906.1	16.98	19.24
Control	--	22.38	23.74	1175	1296	38.35	43.33
New LSD		1.86	0.32	30.92	35.71	4.26	3.45

Table (6): Effect of irrigation treatments on fruit physical properties of "Canino" apricot trees during 2004 and 2005.

Irrigation treatments	Soil Matric Potential (mbar)	Fruit weight		Fruit size (cm^3)		Fruit diameter (cm)		Fruit length (cm)		Firmness ($lb/Inch^2$)	
		2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
T_1	100 - 200	34.13	34.68	32.5	34.33	3.73	3.90	3.50	3.67	5.6	5.7
T_2	200 – 300	24.73	25.32	23.1	23.80	3.0	3.10	2.30	2.60	6.6	6.7
T_3	300 - 400	18.17	21.23	17.0	19.50	2.0	2.5	1.90	2.10	7.3	7.4
Control	--	32.63	33.43	31.4	32.60	3.5	3.70	3.20	3.47	5.3	5.4
New LSD		3.91	3.10	4.14	3.95	0.45	0.35	0.29	0.33	0.26	0.27

This trend reveal that decreasing irrigation rate caused a reduction in TSS on delaying the ripening of apricot fruits and the reverse trend was found to be true. The contrary of TSS was juice acidity. Increasing irrigation rate resulted in decrease in juice acidity. These results reveal that fruit quality of apricot trees was found to be better under optimum irrigation rate than under stress or water deficit conditions. Such findings could be detected when total soluble solids acidity ratio were calculated Table 7. Higher ratio values indicate better quality than lower values. It shows that treatment T3 or T_2 produce low fruit quality than treatment T_1 and the control.

The results are in harmony with those of Ali (2006) who reported that fruit weight and fruit size of peach were increased as irrigation rate increased while fruit firmness were increased by decreasing irrigation rate. Blasse *et al.* (1988) showed that irrigation increased apple fruit size and improved fruit quality. Also, Ramos *et al.* (1994) found that both fruit size decreased with water stress whereas soluble solids (TSS) and acidity increased . Moreover, Holzafed *et al.* (1995) indicated that withholding irrigation late in the season could be used in apple production to improve fruit quality in term of increasing fruit firmness.

Irrigation scheduling:

The monthly and seasonal amounts of applied water to apricot tree under different treatments during 2004 and 2005 seasons are shown in Table 8. The results revealed that monthly rates were low at the beginning of growing season (February and March) when the tree canopy was not established yet. These after gradually increase was observed as the tree canopy increased.

Monthly rates recorded its maximum during May and June then the deficit in monthly water requirement occurred during December and January at period of dormancy. The actual seasonal amount of applied water increased by decreasing the soil misture stress (matric potential).

The second season (2005) gave the highest amount of applied water. These differences were mainly due to increase the number of irrigations Table 9 and increase root zone depth.

The seasonal irrigation water quantities for T_1, T_2 , T_3 and control treatments as m^3/Feddan) were 2173.08, 932.4, 504 and 3477.6 in the first season and 2940.6, 1212.12, 639.04 and 3477.6 in the second season, respectively.

These results are in agreement with El-Gindy *et al.* (1991) on cucumber and squash and Abd El-Masseih and El-Gindy (2004) on apricot.

Water use efficiency:

Water use efficiency is defined as the equation of marketable crop yield produced per unit area over the amount of applied water to produce such yield. Water use efficiency can be increased by increasing crop production or by decreasing the amount of applied water.

Results in Table 10 indicate clearly the highest water use efficiency accompanied to T_3 and three gradual decrease parallel to increase the amount of applied water.

Table (7): Effect of irrigation treatments on fruit chemical properties of "Canino" apricot trees during 2004 and 2005.

Irrigation treatments	Soil Matric Potential (mbar)	TSS %		Titratableacidity %		TSS/acidity	
		2004	2005	2004	2005	2004	2005
T_1	100 - 200	14.50	15.50	0.9	0.8	16.73	19.60
T_2	200 – 300	11.90	12.70	1.2	1.1	10.10	11.6
T_3	300 - 400	10.80	11.50	1.3	1.3	8.33	8.90
Control	--	13.60	14.80	1.1	1.0	12.40	14.90
New LSD		0.51	1.33	0.30	0.21	4.60	4.41

Table (8): Water quantities (L/tree/month and total quantities m^3/Fed. in the different treatments during 2004 and 2005 season.

Year	Irrigation Treatment	Jan.	Feb.	Mar.	April.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total m^3/Fed.
2004	T_1	156	364	884	1144	1404	1456	1300	1196	1040	728	520	156	2173.08
	T_2	90	150	420	480	500	630	570	480	420	300	210	90	932.4
	T_3	40	80	240	260	320	340	320	260	220	160	100	60	504
	Control	0	1200	1600	1920	1920	1920	1920	1920	1920	1920	800	320	3045.6
2005	T_1	201	469	1139	1541	1876	1943	1809	1609	1407	1005	737	268	2940.6
	T_2	117	234	546	585	819	780	741	624	546	390	273	117	1212.12
	T_3	54	135	270	297	405	405	378	297	243	216	108	81	635.04
	Control	0	1200	1600	1920	1920	1920	1920	1920	1920	1920	800	320	3645.6

Table (9):The number of irrigation frequencies in the different irrigation treatment in each month during 2004 and 2005 season.

Year	Irrigation Treatment	Jan.	Feb.	Mar.	April.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
2004	T_1	3	7	17	22	27	28	25	23	20	14	10	3	199
	T_2	3	5	14	16	20	21	19	16	14	10	7	3	148
	T_3	2	4	12	13	16	17	16	13	11	8	5	3	120
	Control	0	10	15	24	24	24	24	24	24	24	10	4	207
2005	T_1	3	7	17	23	28	29	27	24	21	15	11	3	209
	T_2	3	6	14	15	21	20	19	16	14	10	7	3	148
	T_3	2	5	10	11	16	16	15	12	10	8	4	3	112
	Control	0	10	15	24	24	24	24	24	24	24	10	4	207

Table (10): Water use efficiency (Kg/m^3 water), fruit yield (Kg) and water quantities m3 of "Canino" apricot trees under irrigation treatments.

Irrigation Treatment	Tension m bar	Water quantities m^3/Fed.		Average m^3/Fed.	Fruit yield Kg/Fed.		Average Kg/Fed.	Water use efficiency Kg/ m^3 water		Average Kg/m^3 water
		2004	2005		2004	2005		2004	2005	
T_1	100 - 200	2173.08	2940.6	2556.84	8859	9977	9418	4.0767	3.3928	3.7348
T_2	200 - 300	932.40	1212.12	1072.26	5105	5565	5335	5.4751	4.5911	5.0331
T_3	300 - 400	504	635.04	569.52	3566	4040	3803	8.8049	6.3618	7.5615
Control		3477.6	3477.6	3477.6	8053.5	9099	8576.25	2.3158	2.6165	2.4660

Although the water use efficiency was higher by trees under T_3 and T_2 , but the yield was not big enough to be economic.

On the contrary, treatment T_1 and control had lower values of water use efficiency and higher fruit yield than control treatment (higher irrigation quantities) 1 because increasing applied water than T_1 did not cause an increase in fruit yield but decreased it.

The decrease in yield observed in control treatment may be due to fruit drop caused by excess of applied water.

Results in Table 10 showed that the water use efficiency for T_1 and control were 4.0767 and 2.3158 Kg/m^3 water in the first season and 3.3928 and 2.6165 Kg/m^3 water in the second season, respectively. T_1 treatment saved about 40 to 18% for the two seasons, respectively (29% as average) from applied water that used in the control treatment and gave the higher fruit yield about 10% for the two seasons than control treatment. The results were in agreement with Abd El-Messeih and El-Gindy 2004 on apricot.

CONCLUSION

The irrigation scheduling by soil matric suction 100 – 200 mbar (T_1) for Canino apricot tree saved about 29% of irrigation water and increased the fruit yield about 10% and improved fruit quality as compared with farm system (control).

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تأثير الشد الرطوبي الأرضي على أشجار المشمش صنف "كانينو" في الأراضي الرملية تحت نظام الرى بالتنقيط

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أجري هذا البحث خلال موسمى (٢٠٠٤ و ٢٠٠٥) على أشجار المشمش "كانينو" عمرها ٤ سنوات بمزرعة على مبارك التابعة لمحطة بحوث جنوب التحرير فى منطقة البستان بهدف دراسة تأثير الرى على أساس الشد الرطوبي الأرضي على النمو الخضري، المحصول الثمري، كفاءة استخدام المياه تحت نظام الري بالتنقيط فى الأراضي الرملية باستخدام أجهزة التنشيومترات.

استخدمت ثلاث معاملات ري: T_1 (الرى ما بين ١٠٠- ٢٠٠ مللى بار) ، T2 (الرى ما بين ٢٠٠ – ٣٠٠ مللى بار) ، T3 (الرى مابين ٣٠٠ – ٤٠٠ مللى بار) بالإضافة إلي معاملة الكنترول (نظام رى المزرعة وفيها يتم الرى بمعدل ٨٠ لتر/شجرة/رية).

- أدت زيادة كميات المياه المستخدمة إلى زيادة في معدل النمو أى حجم الشجرة – مساحة مقطع الساق فوق منطقة التطعيم – طول النموات – مساحة الورقة – محتوى الورقة من الكلوروفيل الكلى. بالرغم من انحفاض كفاء وحدة استخدام المياه.
- أعطت المعاملة T_1 أعلى نسبة عقد يليها الكنترول (معاملة المزرعة) بينما أعطت المعاملات T3 , T_2 أقل قيم لنسبة العقد ، بالرغم من زيادة كفاءة وحدة استخدام المياه.
- أظهرت النتائج أن أشجار المعاملة T_1 أعطت محصول غير معنوى فى الموسم الأول وكان أعلى محصول معنوى فى الموسم الثانى.
- هذا وقد كانت كميات المياه السنوية المستخدمة فى الرى وهى ٢١٧٣,٠٨ و٩٣٢,٤٠ و٦٢١,٦٠ و ٣٤٧٧,٦ م^3 للفدان فى الموسم الأول و٢٩٤٠,٦٣ و ١٢١٢ و ٦٣٥,٠٤ و ٣٤٧٧,٦ م^3 للفدان لمعاملات T_1 و T_2 و T3 والكنترول، على الترتيب.
- وقد كانت كفاءة استخدام المياه للمعاملة T_1 والكنترول ٤,٠٧٦٧ و ٢,٣١٥٨ كجم/ م^3 في الموسم الأول وكانت ٣,٣٩٢٨ و ٢,٦١٦٥ كجم/ م^3 ماء فى الموسم الثانى ، على التوالى.
- كانت أعلى كفاءة لاستخدام المياه من المعاملة T3 مقارنة بالمعاملات T_2 وT_1 و الكنترول والتى أعطت أقل محصول ثمرى.

ولذا نوصى بالمعاملة T_1 (شد رطوبى أرضى مابين ١٠٠ –٢٠٠ مللىبار) لرى أشجار المشمش الكانينو فى الأراضي الرملية.