Egypt .J.Hort .30 , No. 1-2, pp. 135-150 (2003)

Studies on Plant Growth, Productivity and Quality of Cantaloupe (*Cucumis melo* var. *cantaloupensis*) as Affected by Irrigation with Saline Water

F.S. Moursy, M.M. Wadid, M. M. Hashim* and A. F. Abou-Hadid*

Central Laboratory for Agricultural Climate, Agricultural Research Center and Department of Horticulture, Faculty of Agriculture, Ain-Shams Univ., Cairo, Egypt.*

PERFORMANCES of four cantaloupe hybrids (*Cucumis melo* var. *cantaloupensis*; Galia, Regal, Primal and Ideal) were studied. The experiments were conducted at Dokki protected cultivation site during winter seasons of 2000/2001 and 2001/2002.

Plants were grown in 10-litre plastic bags filled with sand and irrigated with different salinity levels (2, 4, 6 ds/m and control). Different salinity levels were made by diluting Rashedy salt in tab water. Results indicated that all plant growth or quality parameters decreased by increasing salinity levels except total soluble solids (TSS) and vitamin C. However, there were no significant differences between cultivars in number of leaves, dry weight, average fruit weight, early yield, marketable fruit weight, fruit firmness, total soluble solids and vitamin C.

It could be concluded from results that the interaction between hybrid Ideal and salinity levels of control, 2 and 4 ds/m gave the highest yield.

Salinity is a major environmental constraint to crop productivity because salinity creates hazards or toxicity problems especially in arid and semi-arid regions. Such arid regions have indigenous salinity problems. Expansion of agriculture and drought problems reduces water quality as well as quantity and creates a greater need for salt tolerant crops. In many arid and semi-arid regions of world, cantaloupe (*Cucumis melo* L.) is an important horticultural crop often cultivated under irrigation in areas where salinity threatens to become, or already is a problem.

The knowledge of the effects of various salt concentrations on economically important characteristics in this crop is limited. Some aspects of vegetative growth and yield have been investigated in controlled pot experiments or in a greenhouse (Meiri *et al.*, 1982).

Other studies (Shannon & Francois, 1978; Shannon *et al.*, 1984; Nerson & Paris, 1984; Pasternak, 1987 and Mendlinger & Pasternak, 1992) have

established that cultigens can vary from being salt sensitive to moderately salt tolerant. In study on the response of salt tolerance of three melon cultivars, *i.e.* Top Mark, PMR 45 and Hales Best, Shannon & Francois (1978) found that PMR 45 was the least affected cultivar with increasing salinity. However, Shannon *et al.* (1984) during their study on wild accessions of melon found that salinity decreased vegetative growth. On the other hand, Mendlinger (1993) reported that salinity led to reduction of leaf size and the vegetative growth of Top Mark, Persian, PMR 45 and Hales Best cultivars.

However, according to the available literature, no comprehensive study has been conducted that examined the over all effects of salinity levels on vegetative growth, flowering, yield and fruit quality in different cantaloupe cultivars.

Therefore, this study aimed to evaluate four cantaloupe cultivars under different levels of salinity in order to select the tolerant one, as well as to test the effect of different salinity levels on some fruit characteristics and to determine the suitable salinity level for each cultivar.

Material and Methods

The experiment was carried out at Dokki protected cultivation experimental site during winter seasons of 2000/2001 and 2001/2002.

Plant materials

Seeds of four cantaloupe hybrids (*Cucumis melo* var. *cantaloupensis* cvs. Galia, Regal, Primal and Ideal) were sown directly in 10-litre plastic bags filled with sandy soil under plastic house (9x60 m) on 11 th and 15th of November in winter seasons of 2000/2001 and 2001/2002, respectively. Soil and water were analysed and results are presented in Table 1. The electrical conductivity (EC) of soil was 0.62 mmhos/cm. The plastic house was divided into five beds. Each bed was 1 m wide and 60 m long. The distance between beds was 0.6 m. Plastic bags were distributed on the two sides of each bed. The space between each two plastic bags was 50 cm. Fertilization, pest and disease control were carried out as commonly followed under plastic house conditions according to Anonymous (1996).

Treatments

The interaction of four salinity levels namely: 2, 4, 6 ds/m and control with four cantaloupe hybrids, *i.e.* Galia, Primal, Ideal and Regal were applied. All treatments were adopted in a split plot design with three replicates having the cultivars as main plots and salinity levels as sub-main plots. This made the total number of experimental plots equals 4x4x3 = 48 plots.

TABLE 1. Chemical analysis of the soil, tab water and Rashidi salt at Dokki site.

Sample	EC (ds/m)	PH	Cations me/L				Anions me/L			
			Ca++	Mg++	Na+	K+	Co_3^-	Hco_3^-	Cl^-	So_4^-
Soil	0.62	7.7	0.55	0.2	5.35	0.13	0.00	1.0	2.42	2.76
Tab water	0.4	7.3	1.6	1.1	0.95	0.16	0.00	0.00	0.80	0.39
Rashidi salt	---	---	---	2.0	82.4	2.3	---	10	68.75	7.95

Measurements

Climatic data were recorded during the two seasons at Dokki protected cultivation site using automatic weather station (campbell scientific, Inc) located at the center of plastic house. Results of climatic data are presented in Table 2. Samples of 10 plants of each experimental plot were taken after 90 days from sowing date to determine plant height, total leaf area (cm^2) per plant, total plant fresh weight (g), total plant dry weight (g). Average fruit weight (g), total yield/ plant (g), marketable yield (g/plant) (round, sound, full-netted fruits, free of sun scald, cracking and other diseased fruits), total soluble solids (TSS), fruit firmness and vitamin C were determined in the end of each season. The average of the first two picking was calculated as the early yield (g/plant).

TABLE 2. Metrological data under plastic house at Dokki site during the experimental seasons of 2000/20001 and 2001/2002.

Dates	First season (2000/2001)				Second season (2001/2002)			
	Max. Temp.	Min. Temp.	Max. R.H%	Min. R.H%	Max. Temp.	Min. Temp.	Max. R.H%	Min. R.H%
10-20 /Nov.	24.8	16.3	98.8	79.8	19.5	16.4	98.9	80.3
21-30 /Nov.	21.3	16.4	89.4	82.6	20.3	14.1	99.6	79.8
01-10 /Dec.	18.4	14.4	99.6	91.7	20.0	13.3	99.5	89.9
11-20 /Dec.	17.4	13.9	90.0	74.9	19.4	12.0	99.4	82.0
21-30 /Dec.	14.3	9.7	90.4	87.7	16.3	9.4	99.3	89.3
1-10 /Jan.	16.5	9.4	95.5	85.9	14.8	10.3	97.6	92.2
11-20 /Jan.	16.6	11.9	95.5	83.8	13.5	9.8	93.7	94.3
21-30 /Jan.	11.5	8.8	99.3	86.5	12.2	9.0	99.0	91.9
01-10 /Feb.	15.3	12.9	95.0	75.8	17.2	8.8	99.5	78.5
11-20 /Feb.	17.1	12.19	98.9	86.4	16.3	9.2	99.5	82.1
21-28 /Feb.	14.3	12.9	95.9	79.2	15.0	8.4	99.4	84.9
01-10 /Mar.	19.8	13.2	99.5	75.9	16.8	13.2	99.4	70.1
11-20 /Mar.	16.0	14.8	98.6	82.1	17.0	14.8	99.7	81.6
21-30 /Mar.	14.8	15.6	98.4	74.6	15.6	15.3	99.2	78.3

Statistical design

Split plot design was applied with four cantaloupe cultivars as main factor and four salinity levels as sub-main factor in three replicates. Each replicate consisted of 48 plants. The obtained data were statistically analyzed according to Snedecor & Cochran (1971).

Results and Discussions

Plant height

Data presented in Table 3 represent the effect of cultivars and different salinity levels on plant height (cm) of four cantaloupe hybrids grown under greenhouse conditions during seasons of 2000/2001 and 2001/2002. The data indicated that plants grown under control conditions recorded significantly the highest value of plant height followed by plants treated with 2 and 4 mmhos/cm. The difference between the mentioned treatments and other treatments was significant. Plants treated with 6 mmhos/cm had the lowest plant height compared to control treatment.

TABLE 3. Effect of cultivars and different salinity levels on plant height of cantaloupe (cm) grown under plastic house at Dokki site during seasons of 2000/2001 and 2001/2002.

Cultivars(A)	2000-2001					2001-2002				
	Salinity levels (B)									
	Cont.	2ds/m	4ds/m	6ds/m	Mean	Cont.	2ds/m	4ds/m	6ds/m	Mean
Galia	207.00	208.50	201.00	148.50	191.25	175.95	177.23	170.85	126.23	162.56
Regal	249.83	238.33	237.50	208.50	233.54	212.36	202.58	201.88	177.23	198.51
Primal	220.00	216.00	173.83	171.50	195.33	212.36	183.60	147.76	145.78	172.37
Ideal	259.00	250.33	245.50	163.67	230.71	220.15	212.78	212.36	139.12	196.10
Mean	233.96	228.29	214.46	173.04		205.20	194.05	183.21	147.09	
L.S.D.(0.05) (A)	17.38					14.77				
L.S.D.(0.05) (B)	7.33					6.23				
L.S.D.(0.05) (AB)	14.60					12.46				

However, the highest value of plant height was found in Regal followed by Ideal without a significant difference between them in both seasons of study. A significant difference was found between the highest cultivar in plant height and other cultivars. Moreover, Galia was significantly the lowest cultivar in plant height.

In addition, the interaction between cultivars and different salinity levels showed that the highest value was found in Ideal under control treatment followed by the same cultivar under 2 mmhos/cm without a significant difference between them. The difference between the highest interaction value and other values was significant. The lowest value was observed in Galia treated with 6 mmhos/cm. The same trend of results was found in both seasons. Low salinity level seemed to have a positive impact on plant length. This impact returns to be negative impact with increasing level of salinity. These results were in agreement with those obtained by Shannon & Francois (1978); El-Beltagy *et al.* (1991); Franco *et al.* (1993) and Mendlinger (1993).

Number of leaves/plant

Table 4 shows the effect of cultivars and different salinity levels on number of leaves per plant of cantaloupe grown under greenhouse conditions at Dokki

during seasons of 2000/2001 and 2001/2002. The presented data showed that the highest number of leaves was found in control followed by 2 mmhos/cm with a significant difference between the two treatments. However, the lowest value was found in 6 mmhos/cm with significant difference compared to control treatment.

On the other hand, cultivars had no significant effect on number of leaves. Interaction between cultivars and different salinity levels showed that plants of Galia under control treatment had the highest number of leaves followed by Regal under control with significant difference between them. However, the lowest value was obtained when plants of Ideal irrigated with 6 mmhos/cm salinity level. The same results were observed in the two seasons. Growth of leaves may be better under low salinity level conditions. In addition, high salinity level may reduce the growth rate of leaves. Similar results were recorded by Saleh (1974); Choi *et al.* (1989); Mangal *et al.* (1993); Sattti *et al.* (1994) and Shannon & Grieve (1999).

TABLE 4. Effect of cultivars and different salinity levels on no. of leaves per plant of cantaloupe grown under plastic house at Dokki site during seasons of 2000/2001 and 2001/2002.

Cultivars(A)	2000-2001					2001-2002				
	Salinity levels (B)									
	Cont.	2ds/m	4ds/m	6ds/m	Mean	Cont.	2ds/m	4ds/m	6ds/m	Mean
Galia	35.67	32.33	28.67	25.83	30.63	30.32	27.48	24.37	21.96	26.03
Regal	34.83	30.83	29.17	26.17	30.25	29.61	26.21	24.79	22.24	25.71
Primal	31.67	30.33	29.50	25.67	29.29	29.61	25.78	25.08	21.82	25.57
Ideal	32.67	30.83	32.67	23.67	29.96	27.77	26.21	27.77	20.12	25.46
Mean	33.71	31.08	30.00	25.33		29.33	26.42	25.50	21.53	
L.S.D. (0.05) (A)	N.S					N.S				
L.S.D. (0.05) (B)	0.86					0.73				
L.S.D. (0.05) (AB)	1.71					1.45				

Total leaf area (cm^2)

It's clear from the presented data in Table 5 that the highest total leaf area per plant was found in plants under control treatment followed by plants under 2 mmhos/cm with a significant difference between the two treatments.

However, the highest cultivar in total leaf area was Ideal followed by Primal with a significant difference between the two cultivars. The lowest cultivar in total leaf area was Galia with significant difference compared to the other testedd cultivars. On the other hand, interaction between Ideal and control recorded the highest total leaf area per plant followed by Regal treated with control with a significant difference between them. The lowest significant value of total leaf area was observed in Galia plants irrigated with 6 mmhos/cm. The same trend of

results was obtained in both seasons. These results were in agreement with those found by Hashem *et al.* (1988) ; Chartzoulakis (1992) ; Savvas & Lenz (2000) and Wadid (2002).

TABLE 5. Effect of cultivars and different salinity levels on leaf area (cm^2) per plant of cantaloupe grown under plastic house conditions at Dokki site during seasons of 2000/2001 and 2001/2002.

Cultivars (A)	2000-2001					2001-2002				
	Salinity levels (B)									
	Cont.	2ds/m	4ds/m	6ds/m	Mean	Cont.	2ds/m	4ds/m	6ds/m	Mean
Galia	3055.0	2204.6	2589.3	1845.0	2423.5	2596.7	1873.9	2200.9	1568.2	2060
Regal	3773.0	2609.6	2270.3	2146.6	2699.9	3207.0	2218.2	1929.7	1824.6	2295
Primal	3431.6	3616.6	2821.0	3205.6	3268.8	2916.9	3074.1	2397.8	2724.8	2778
Ideal	5525.0	3749.6	2817.3	3105.3	3799.3	4696.2	3187.2	2394.7	2639.5	3229
Mean	3946.2	3045.2	2624.5	2575.7	---	3354.2	2588.3	2230.8	2189.3	---
L.S.D.(0.05) (A)	718.93					611.09				
L.S.D.(0.05) (B)	303.20					257.72				
L.S.D.(0.05) (AB)	606.41					515.45				

Total plant fresh weight

Data presented in Table 6 show the effect of cultivars and different salinity levels on total plant fresh weight (g) of cantaloupe. The highest value was observed in plants treated with control followed by plants treated with 2 mmhos/cm without a significant difference between them. The difference between the highest value and other values was significant. However, the lowest value was found in 6 mmhos/cm with significant different compared to other treatments.

TABLE 6. Effect of cultivars and different salinity levels on plant fresh weight (g) of cantaloupe under plastic house at Dokki site during season of 2000/2001 and 2001/2002.

Cultivars (A)	2000-2001					2001-2002				
	Salinity levels (B)									
	Cont.	2ds/m	4ds/m	6ds/m	Mean	Cont.	2ds/m	4ds/m	6ds/m	Mean
Galia	190.67	172.33	151.33	108.00	155.58	163.9	148.21	130.15	92.88	133.8
Regal	303.00	266.67	208.12	180.67	239.61	260.5	229.33	178.98	155.37	206.07
Primal	295.33	202.67	183.33	181.33	215.67	253.9	174.29	157.67	155.95	185.47
Ideal	280.00	244.00	198.67	183.33	226.5	240.8	209.84	170.85	157.67	194.79
Mean	267.25	221.42	185.36	163.33	---	229.8	190.42	159.41	140.47	---
L.S.D. (0.05) (A)	55.02					47.32				
L.S.D.(0.05) (B)	23.20					19.96				
L.S.D.(0.05) (AB)	46.41					39.91				

On the other hand, Regal was the highest cultivar in total plant fresh weight followed by Ideal cultivar without a significant difference between them. Galia cultivar recorded the lowest value in total plant fresh weight.

Concerning the interaction between cultivars and salinity levels, the highest value in total plant fresh weight was found in Regal and control treatment followed by Primal under control without a significant difference between them. A significant different was found between such treatments and other interaction values. However, the lowest value was found in plants of Galia treated with 6 mmhos/cm. The same trend of results was true in both seasons. Low salinity level gave better vegetative plant performance than that recorded under high salinity level. This result could be a reflection to high stem length, number of leaves and leaves area.

Total plant dry weight

Table 7 shows the effect of cultivars and different salinity levels on total plant dry weight (g) of cantaloupe. The highest total plant dry weight was found under control treatment followed by plants treated with 2 mmhos/cm with significant difference between the two treatments. Significant difference was found between the highest total plant dry weight value and other values. However, the lowest value was recorded in plants treated with 6 mmhos/cm salinity level with significant differences compared with other treated plants.

TABLE 7. Effect of cultivars and different salinity levels on plant dry weight of cantaloupe (g) grown under plastic house conditions at Dokki site during seasons of 2000/2001 and 2001/2002.

Cultivars (A)	2000-2001					2001-2002				
	Salinity levels (B)									
	Cont.	2ds/m	4ds/m	6ds/m	Mean	Cont.	2ds/m	4ds/m	6ds/m	Mean
Galia	20.48	20.26	17.94	18.91	21.64	25.35	17.42	16.27	15.43	18.61
Regal	21.80	21.26	20.82	18.05	20.50	18.75	18.37	17.91	15.52	17.63
Primal	22.87	21.58	19.37	16.45	20.06	22.87	18.56	16.66	14.15	18.05
Ideal	20.26	21.03	18.61	18.75	19.66	18.09	17.42	16.13	16.01	16.91
Mean	23.60	21.05	19.18	18.04	---	21.26	17.94	16.74	15.28	---
L.S.D.(0.05) (A)	N.S					N.S				
L.S.D.(0.05) (B)	1.12					0.96				
L.S.D.(0.05) (AB)	2.24					1.93				

On the other hand, cultivars didn't differ significantly in total plant dry weight. However, interaction between plants of Galia and control recorded the highest value of plant dry weight compared to the other tested treatments followed by Primal under control treatment with a significant difference between the two treatments. Significant difference was found between the highest interaction value and other interaction values. However, plants of Primal treated with 6 mmhos/cm were the lowest total plants dry weight. The same trend of results was observed in the two seasons. This trend suggestes that the higher

vegetative vigure actuly contained higher dry weight, not due to higher moisture content, which otherwise led to the contrast. These results were in agreement with those reported by Hashim *et al.* (1988); El-Beltagy *et al.* (1991) and Wadid (2002).

Early yield (g)/ plant

It is clear from the data shown in Table 8 that different salinity levels had significant effect on early yield per plant. The highest value was recorded on control followed by 2 mmhos/cm treatment without a significant difference between them. The difference between the highest value and other obtained values was significant. The lowest value was found in plants irrigated with 6 mmhos/cm. The high salinity level 6mmhos/cm caused reduction by 22% compared to control treatment. However, neither cultivars nor the interaction between salinity levels and cultivars had a significant effect on early fruit weight. The higher vegetative growth was translated into early yield. This means that the higher salinity leveled to the less early yield. The obtained results in this work were in agreement with those obtained by Mendlinger (1993) and Wadid (2002) in cantaloupe plants.

TABLE 8. Effect of cultivars and different salinity levels on early yield per plant (g) of cantaloupe grown under plastic house conditions at Dokki site during seasons of 2000/2001 and 2001/2002.

Cultivars (A)	2000-2001					2001-2002				
	Salinity levels (B)									
	Cont.	2ds/m	4ds/m	6ds/m	Mean	Cont.	2ds/m	4ds/m	6ds/m	Mean
Galia	423.55	456.30	423.14	380.37	420.84	423.55	415.23	385.06	346.13	392.4
Regal	470.07	448.19	338.14	272.83	382.31	427.76	407.85	307.71	248.28	347.9
Primal	507.33	461.58	457.94	357.13	446.00	461.67	420.03	416.73	324.99	405.8
Ideal	418.98	410.29	397.14	396.17	405.65	381.27	373.37	361.40	360.51	369.1
Mean	454.98	444.09	404.09	351.63	---	423.56	404.12	367.72	319.98	---
L.S.D. (0.05) (A)	N.S					N.S				
L.S.D. (0.05) (B)	79.05					71.93				
L.S.D.(0.05) (AB)	N.S					N.S				

Total yield (g)/plant

Total yield/plant (g) in the two seasons are presented in Table 9. Salinity levels had a significant effect on total yield/plant. The highest yield per plant was found in control followed by 2 mmhos/cm with a significant reduction by about 49% between the two treatments. Significant difference was found between the mentioned treatments and other treatments. The lowest value was observed in plants treated with 6 mmhos/cm. The cantaloupe plants treated with 6 mmhos/cm salinity level gave a significant reduction by 70% compared to control treatment. In addition, cultivars had significant effect on total yield per plant. The highest value was observed in Primal cultivar followed by Regal. The difference was significant and the reduction reached 32 % between them.

TABLE 9. Effect of cultivars and different salinity levels on total yield per plant (g) of cantaloupe grown under plastic house conditions at Dokki site during seasons of 2000/2001 and 2001/2002.

Cultivars (A)	2000-2001					2001-2002				
	Salinity levels (B)									
	Cont.	2ds/m	4ds/m	6ds/m	Mean	Cont.	2ds/m	4ds/m	6ds/m	Mean
Galia	939.47	651.31	465.20	327.20	595.80	854.91	592.70	423.33	297.7	542.17
Regal	1317.67	852.47	826.99	495.87	873.25	1317.67	775.74	752.56	451.2	824.30
Primal	2970.20	822.84	786.87	560.20	1285.03	900.96	748.78	716.05	509.7	718.89
Ideal	897.87	767.53	676.05	439.23	684.08	817.06	698.46	615.21	359.3	622.52
Mean	1531.30	773.54	688.78	455.63		972.65	703.92	626.79	404.5	
L.S.D.(0.05) (A)	149.22					140.18				
L.S.D.(0.05) (B)	62.93					59.12				
L.S.D.(0.05) (AB)	125.86					118.24				

However, the lowest value was found in Galia. Galia cultivar had significant reduction in yield per plant by 54% in comparison with Primal cultivar. Interaction of Primal and control showed the highest total yield per plant followed by interaction of Regal and control with a significant difference by 56% between them. The difference between the highest interaction value and other interaction values was significant. The lowest total yield was observed when Galia interacted with 6 mmhos/cm salinity level. This interaction caused a significant reduction by 89% compared to the highest value. The same trend of results was true in both seasons. This trend of results could be attributed to the negative effect of high salinity levels on vegetative growth, which reflected on reduced total fruit weight. In addition, low salinity level increased fruit weight due to the positive effect on vegetative growth. Similar results were obtained by Mendlinger (1993) and Wadid (2002) on Cantaloupe. In addition, Chartzoulakis (1992) and Chartzoulakis *et al.* (1995) indicated the same trend on cucumber.

Average fruit weight (g)

The first remarks are that the different salinity levels affected significantly average fruit weight (Table 10). Control treatment recorded the highest value followed by 2 mmhos/cm without a significant difference between them. A significant difference was found between the mentioned treatments and other treatments. However, 6 mmhos/cm was the lowest in average fruit weight. Such salinity level caused reduction by 23 % compared to control treatment.

In addition, cultivars had no significant effect on average fruit weight. Interaction between control and Primal cultivar recorded the highest average fruit weight followed by Galia without a significant difference between them. The difference between the highest interaction values and other interaction values was significant. However, the lowest value was found when Regal cantaloupe cultivar interacted with 6 mmhos/cm. Higher average fruit weight could be due to the positive impact of lower salinity level. Thus, higher total fruit weight/plant could

be reflected into high average fruit weight. Similar result was obtained by El-Doweny *et al.* (1993); Mendlinger (1993); Mendlinger (1994) and Wadid (2002) on Cantaloupe.

TABLE 10. Effect of cultivars and different salinity levels on average fruit weight of cantaloupe (gm) grown under plastic house at Dokki site during seasons of 2000/2001 and 2001/2002.

Cultivars (A)	2000-2001					2001-2002				
	Salinity levels (B)									
	Cont.	2ds/m	4ds/m	6ds/m	Mean	Cont.	2ds/m	4ds/m	6ds/m	Mean
Galia	498.59	446.13	424.85	362.92	433.12	453.71	405.98	386.62	358.8	401.3
Regal	486.71	424.85	422.71	330.26	416.13	442.91	430.89	384.67	333.2	397.94
Primal	580.45	536.39	488.87	366.17	492.97	528.21	488.11	444.87	333.2	448.6
Ideal	473.09	426.83	419.92	418.16	434.50	430.51	388.42	382.12	380.5	395.39
Mean	509.71	458.55	432.01	393.27	---	463.84	428.35	399.57	351.4	---
L.S.D. (0.05) (A)	N.S					N.S				
L.S.D. (0.05) (B)	65.08					59.22				
L.S.D.(0.05) (AB)	130.16					118.45				

Marketable yield (g)/plant

Data presented in Table 11 showed that salinity levels significantly affected marketable yield. However, cultivars and interaction between cultivars and salinity levels had no significant effect on marketable yield. Control plants gave the highest marketable yield compared with the other tested treatment. Marketable yield of plants irrigated with 2 mmhos/cm ranked second. The difference between them was not significant. Small amount of marketable fruits were obtained from high salinity level (6 mmhos/cm). Six mmhos/cm caused 24% reduction in marketable yield compared to control treatment. The same trend of results was observed in both seasons. Marketable yields could be higher when low salinity water was used than when the crop was grown in the absence of salinity. However, high salinity level due to reduction in marketable yield percentage. These results were in agreement with those reported by Shannon and Fran Çois (1978) on cantaloupe and Adams (1991) on Tomato.

Fruit firmness (pound/inch^2)

Data presented in Table 12 showed that different salinity levels affected significantly fruit firmness. The highest fruit firmness was found with control treatment followed by 2 mmhos/cm without a significant difference between them. Significant difference was found between the highest fruit firmness value and the other fruit firmness values. However, the lowest value was observed in 6 mmhos/cm salinity level and it caused 34% reduction in fruit firmness compared with other treated plants.

TABLE 11. Effect of cultivars and different salinity levels on marketable yield (g) per plant of cantaloupe grown under plastic house conditions at Dokki site during seasons of 2000/2001 and 2001/2002.

Cultivars (A)	2000-2001					2001-2002				
	Salinity levels (B)									
	Cont.	2ds/m	4ds/m	6ds/m	Mean	Cont.	2ds/m	4ds/m	6ds/m	Mean
Galia	491.83	472.02	421.60	323.70	449.84	418.06	401.22	358.36	351.83	382.3
Regal	501.86	360.11	353.08	392.19	401.81	426.58	333.36	300.12	306.09	341.5
Primal	529.93	524.55	437.15	413.92	453.83	450.44	445.87	371.58	275.15	385.7
Ideal	480.61	424.41	401.77	387.16	423.49	408.52	360.75	341.51	329.09	359.9
Mean	501.06	445.27	403.40	379.24	---	425.90	385.30	342.89	315.54	---
L.S.D. (0.05) (A)	N.S					N.S				
L.S.D. (0.05) (B)	69.33					58.93				
L.S.D. (0.05) (AB)	N.S					N.S				

TABLE 12. Effect of cultivars and different salinity levels on fruit firmness of cantaloupe grown under plastic house at Dokki site during seasons of 2000/2001 and 2001/2002.

Cultivar's (A)	2000-2001					2001-2002				
	Salinity levels (B)									
	Cont.	2ds/m	4ds/m	6ds/m	Mean	Cont.	2ds/m	2ds/m	6ds/m	Mean
Galia	20.00	17.00	15.99	13.33	16.58	18.62	15.47	14.55	12.13	15.19
Regal	21.67	19.33	16.33	14.63	17.99	19.72	17.59	14.86	13.32	16.37
Primal	21.00	20.00	16.67	14.33	18.00	19.11	18.20	15.17	13.04	16.58
Ideal	22.43	19.22	17.44	14.10	18.30	20.41	17.49	15.87	12.83	16.65
Mean	21.27	18.89	16.61	14.10	---	19.46	17.19	15.11	12.83	---
L.S.D.(0.05) (A)	N.S					N.S				
L.S.D.(0.05) (B)	0.73					0.33				
L.S.D.(0.05) (AB)	N.S					N.S				

Neither cultivars nor interaction between cultivars and salinity levels had significant effect on fruit firmness. The same trend of results was observed in both seasons. These results were mainly due to salt concentration and fruit moisture reduction at higher salinity which increased firmness than lower salinity level. These results were in agreement with those indicated by Wadid (2002) on cantaloupe.

Total soluble solids (T.S.S.)

Presented Data in Table 13 showed that different salinity levels affected significantly total soluble solids (TSS). The highest value was observed in 6 mmhos/cm salinity level. The difference between the highest TSS value and other TSS values was significant. However, the lowest significant value was found with control. Cultivars didn't affect significantly total soluble solids. In addition, the interaction between salinity level and cultivars had significant effect on total soluble solids. The highest value was found when Galia cultivar interacted with 6 mmhos/cm salinity level. A significant difference was found between the highest interaction value and other interaction values. The lowest value was observed in

Galia interacted with control. The improvement of total soluble solids may be due to the higher level of salinity, which led to higher salt concentration and lower water content in fruits rather than lower level. Obtained results were the same trend in both seasons. These results were in agreement with those obtained by El-Doweny *et al.* (1993); Mendlinger (1993); Mendlinger (1994) and Wadid (2002) in cantaloupe.

TABLE 13. Effect of cultivars and different salinity levels on T.S.S of cantaloupe grown under plastic house at Dokki site during seasons of 2000/2001 and 2001/2002.

Cultivars (A)	2000-2001					2001-2002				
	Salinity levels (B)									
	Cont.	2ds/m	4ds/m	6ds/m	Mean	Cont.	2ds/m	4ds/m	6ds/m	Mean
Galia	11.85	13.25	14.76	18.48	14.56	11.33	12.67	14.00	17.67	13.92
Regal	12.55	13.88	14.57	18.13	14.78	12.55	13.27	13.93	17.33	14.27
Primal	12.20	14.29	14.69	16.73	14.73	11.67	13.67	15.00	16.00	14.08
Ideal	12.00	13.60	14.64	17.08	14.38	11.67	13.00	14.00	16.33	13.75
Mean	12.20	13.75	14.89	17.61	---	11.80	13.15	14.23	16.83	---
L.S.D.(0.05) (A)	N.S					N.S				
L.S.D.(0.05) (B)	0.53					0.26				
L.S.D.(0.05) (AB)	0.26					0.53				

Ascorbic acid (mg/100g)

Ascorbic acid values of the four cantaloupe cultivars fruits in the two seasons are presented in Table 14. Salinity level affected significantly ascorbic acid. The highest value was observed in 6 mmhos/cm salinity level. A significant difference was found between the highest ascorbic acid content and other values. The lowest ascorbic acid value was observed under control condition. However, cultivars had no significant effect on ascorbic acid content. Regarding the interaction between salinity levels and cultivars, the highest value was found with Galia interacted with 6 mmhos/cm. The difference between the highest interaction and other interaction values was significant. The same trend of results was obtained in

TABLE 14 . Effect of cultivars and different salinity levels on ascorbic acid content (mg/100g) of cantaloupe grown under plastic house at Dokki site during seasons of 2000/2001 and 2001/2002.

Cultivar's (A)	2000-2001					2001-2002				
	Salinity levels (B)									
	Cont.	2ds/m	4ds/m	6ds/m	Mean	Cont.	2ds/m	4ds/m	6ds/m	Mean
Galia	18.63	19.10	27.90	28.67	23.57	19.49	19.98	29.49	29.98	24.74
Regal	19.63	20.70	26.97	27.80	23.77	20.53	21.65	28.20	29.08	24.87
Primal	20.93	22.27	24.17	25.67	23.25	23.29	23.29	21.89	25.28	23.44
Ideal	21.23	21.40	25.93	26.30	23.71	22.21	22.21	22.38	27.12	23.48
Mean	20.10	20.87	26.24	27.11	---	21.38	21.78	25.49	27.86	---
L.S.D. (0.05) (A)	N.S					N.S				
L.S.D. (0.05) (B)	1.00					1.05				
L.S.D.(0.05) (AB)	2.01					2.10				

both seasons. The increase in vitamin C arising under salinity may be due to the reduction in plant growth, *i.e.* leaf area, may increase the exposure of fruits to sunlight which is effective in increasing vitamin C. Al–Najum & Neimmah (1989) found similar results on tomato.

Conclusion

Salinity level

Increasing salinity levels particularly above 2 mmhos/cm led to different reduction percentage in most measured characters. However, total soluble solids (TSS) and ascorbic acid content of fruits increased particularly with increasing salinity above 2 mmhos/cm.

Cultivars

Performance of cv. Primal was the highest on most characters especially in total yield followed by Regal and Ideal. However, Galia performed the lowest in total yield.

Interaction between salinity levels and cultivars

Ideal cultivar gave the best results when salinity level didn't increase above 4 mmhos/cm. However, the suitable salinity level to avoid yield reduction in Regal and Galia was 2 mmhos/cm. In addition, Primal had the lowest performance when salinity level reached 2 mmhos/cm or increased particularly to 6 mmhos/ cm. Percentage of total yield reduction is presented in Table 15.

Table 15. Percentage of total yield reduction in cantaloupe cultivars caused by different salinity levels at Dokki site under plastic house conditions during 2000/2001 and 2001/2002 seasons.

Cultivars	2ds/cm	4ds/cm	6ds/cm	Mean
Galia	30.6	50.4	65.1	48.7
Regal	35.3	37.2	62.3	44.9
Primal	72.2	73.5	81.1	75.6
Ideal	14.5	24.7	51.0	30.0
Mean	38.15	46.45	64.87	------

References

Adams, S. (1991) Effects of increasing the salinity of the nutrient solution with major nutrients or sodium chloride on the yield, quality and composition of tomatoes grown in rockwool. *Journal of Horticultural Science*, **66** (2), 201.

Al-Najum, M.A. and Neimmah A.A. (1989) The interactive effects of water quality and fertilizer levels on yield and quality of tomato *Lycopersicon esculantum* in sandy soil. *Journal of Agriculture and Water Resources.* Research Soil and Water Resources. **8** (1), 113.

Anonymous (1996) *Protected Cultivation Manual*, UNDP-FAO-EGY/95/002.

Chartzoulakis, K.S. (1992) Effects of NaCl salinity on germination, growth and yield of greenhouse cucumber. *J. Hort. Sci.* **67** (1), 115.

Chartzoulakis, K.S., Gerasopoulos D., Olympios, Ch. and Passam, H. (1995) Salinity effects on fruit quality of cucumber and eggplant. *Acta Horticulturae*, 379, 187.

Choi, S.R., Lec, C.H., Lec, H.S., Shin, W.K. and Lee, Y.S. (1989) The effects of electrical conductivity of soil solution on the germination and regrowth of leaves and roots of several vegetable crops. *Soils and fertilizers* **31** (1), 56 (C.F. M.K. Mostafa. 1997. Effect of salinity on garden beet and carrot. *M.Sc. Thesis*, Faculty of Agriculture, Cairo Univ.) .

El-Beltagy, A.S., Doweny, H.H. El- and Ibrahim, A.A. (1991) Salt tolerance of four muskmelon cultivars. *Egypt. J. Hort.* **18**.1, 73.

El-Doweny, H.H., Helal, R.M., El-Beltagy, A.S. and Desouki, I.M. (1993) Salt tolerance of some local and introduced melon cultivars. *Egypt. J. Horticulture*, **17** (2), 151.

Franco, J.A., Esteban, C. and Rodriguez, C. (1993) Effect of salinity on various growth stages of muskmelon cv. Revigal. *J. Horticultural Science*, **68** (6), 899.

Hashim, M. M., El-Beltagy, A.S. and Jones, R.A. (1988) Salt tolerance in *Lycopersicon esculentum*. I- The effect of salinity on growth. *Egypt. J. Hort.* **15** (1), 58.

Mangal, J.L., Yadov, A.C., Singh, R.K. and Singh, A. (1993) Evaluation of potato cultivars for salinity tolerance. *Journal Ind. Potato Association*, **20** (2), 91.

Meiri, A., Hoffman, G.J., Shannon, M.C. and Poss, J.A. (1982) Salt tolerance of two muskmelon cultivars under two radiation levels. *J. Amer. Soc. Hort. Sci.* **107**,1168.

Mendlinger, S. (1993) Flowering, vegetative growths, yields, and fruit quality in muskmelons under saline conditions. *J. Amer. Soc. Hort. Sci.* **118** (6), 868.

Mendlinger, S. (1994) Effect of increasing plant density and salinity on yield and fruit quality in muskmelon. *Scientia Horticulturae*, **57** (1-2), 41.

Mendlinger, S. and Pasternak, D. (1992) Screening for salt tolerance in melons. *Hortscience*, 905.

Nerson, H. and Paris, H.S. (1984) Effect of salinity on germination, seedling growth and yield in melons. *Irr.Sci.* **5**, 265.

Pasternak, D. (1987) Salt tolerance and crop production. A comprehensive approach. *Annu. Rev. Phytopathol.* **25**,271.

Saleh, H.H. (1974) Physiological studies on salt tolerance of some vegetable crops. *Ph.D. Thesis*, Faculty of Agri. Ain-Shams Uni. (C.F. M.K. Mostafa. 1997. Effect of salinity on garden beet and carrot. *M. Sc. Thesis*, Faculty of Agriculture, Cairo Uni.).

Satti, S. M., Lopezll, E. and Al-Said, F.A. (1994) Salinity induced changes in vegetative and reproductive growth in tomato. *Communications in Soil Science and Plant*

Analysis **35** (5-6), 501. (C.F. M.K. Mostafa. 1997. Effect of salinity on garden beet and carrot. *M. Sc. Thesis*, Faculty of Agriculture, Cairo Univ.).

Shannon, M.C. and François, L.E. (1978) Salt tolerance of three muskmelon cultivars. *J. Amer. Soc. Hort. Sci.* **103** (1), 127.

Shannon, M.C., Bohn, G.W. and Mccreight, J.D. (1984) Salt tolerance among muskmelon genotypes during seed emergence and seedling growth. *Hort. Sci.* **19** (6).

Shannon, M.C. and Grieve, C.M. (1999) Tolerance of vegetable to salinity. *Scientia Horticulturae*, **78**, 5.

Snedecor, G.W. and Cochran W. G. (1971) *Statistical Methods.* 6th ed. Iowa State Univ. Press Amer., Iowa, USA.

Wadid, M.M. (2002) Studies on the productivity and fruit quality of melon (*Cucumis melo* var. *cantaloupensis*) irrigated with saline or fresh water in North Sinai. *Egypt. J. Appl. Sci.* **17** (7), 728.

(*Received* 2/4/2003)

دراسات على نمو وجودة وإنتاجية الكنتالوب تحت تأثير الرى بالماء المالح

فاطمة سيد مرسي، مجدي منير وديد، محمد هاشم الديب* و أيمن فريد أبو حديد*

المعمل المركزى للمناخ الزراعى و* قسم البساتين-كلية الزراعة-جامعة عين شمس – القاهرة – مصر.

أقيمت التجربة في صوب الأبحاث بالدقى التابعة للمعمل المركزى للمناخ الزراعى. اشتملت الدراسة على تقييم استجابة أربعة هجن من الكنتالوب التابعة لطراز الجاليا وهى جاليا وبريمال وريجال وإيديال للرى بالتركيزات المختلفة من الماء المالح (٢و ٤و ٦ ملليموز/سم والكنترول).

تم رصد مدى الاستجابة من خلال مجموعة من القياسات الخضرية والثمرية علاوة على مواصفات الجودة و هى:

طول النبات بالسنتيمتر وعدد الأوراق ومساحة الأوراق الكلية سم ^{2} والوزن الطازج والجاف للنبات وذلك بعد ٩٠ يوم من الزراعة. أما كمية المحصول الكلي للنبات و المحصول القابل للتسويق و متوسط وزن الثمرة و صلابة الثمار و محتوي الثمار من المواد الصلبة الذائبة الكلية و كذلك محتوي الثمار من حمض الاسكوربيك فقد تم قياسها و تحديدها أثناء موسم الجمع. بالنسبة لصفة المحصول المبكر للنبات فقد تم حسابها علي أساس إجمالى وزن الثمار في الجمعتين الأولى والثانية.

وقد أشارت النتائج إلي أن زيادة الملوحة تدريجيا عن ٢ ملليموز/ سم تؤدى إلى تقليل جميع الصفات المقاسة بنسب متفاوتة فيما عدا المواد الصلبة الذائبة الكلية والاسكوربيك اسيد (فيتامين سى) فقد حدثت فيها زيادة نسب متفاوتة مع زيادة نسبة الملوحة تدريجيا حتى ٦ ملليموز/سم.

كذلك أوضحت النتائج أن الهجين بريمال كان الأعلى فى المحصول الكلى تحت الظروف الملحية و كذلك باقى الصفات و يليه الهجين إيديال. بينما كان الهجين جاليا الأكثر انخفاض فى المحصول الكلى و باقى الصفات تحت ظروف الملوحة و حتى ٦ ملليموز/سم.

بالنسبة للتفاعل بين مستويات الملوحة والأصناف المختلفة تشير النتائج إلى أن الهجين إيديال كان افضل فى معظم الصفات وحتى مستوى ملوحة ٤ ملليموز/سم حيث لم يحدث أى انخفاض فى المحصول الكلى في كل من الهجينين ريجال وجاليا عندما كان مستوى الملوحة ٢ ملليموز/سم. بينما كان الهجين بريمال الأكثر انخفاضا فى المحصول مع زيادة نسبة الملوحة تدريجيا حتى ٦ ملليموز/سم.