The Interaction Between Salinity of Irrigation Water and N-Fertilzation on the Growth and Chemical Composition of Damsisa Plants

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ABSTRACT

A pot experiment was carried out during 2001 season to investigate the interaction effect of irrigation water salinity (0.49, 7, 11 and 14 dS/m), nitrogen sources (ammonium nitrate and urea) and nitrogen fertilization rates (0, 50, 100 and 150 Kg N/fed.) on the growth and chemical composition of damsisa (*Ambrosia maritime* L.) plants. The results showed that, the dry weight of the whole plant and oil percentage significantly decreased with increasing the levels of irrigation water salinity up to 14 dS/m. Increasing the salinity level of irrigation water to 7, 11 and 14 dS/m resulted in a marked decrease in dry matter to 68.87 %, 62.05 % and 50.57 %, respectively of the yield at the low salinity level (0.49 dS/m). The dry weight and oil percentage of damsisa plants were significantly increased with increasing nitrogen fertilizer up to 150 Kg N/fed. The source of ammonium nitrate fertilization resulted in highly significant increase than urea on dry weight and oil percentage at each level of salinity. The concentration of macro (N, P, K, Ca and Mg) and micro (Fe, Mn, Zn and Cu) nutrients contents of damsisa leaves were significantly decreased, but Na was increased as salinity rates increased from 0.49 to 14 dS/m. The concentration of N, P, K, Ca, Mg, Na, Zn and Cu of damsisa leaves were significantly increased as N-applications increased from 0 to 150 Kg N/fed. However, the concentrations of Fe and Mn decreased with increasing the rates of N-fertilization. Ammonium nitrate source produced a significant increase in the concentration of N, P and Mn, while urea source produced a significant increase in the concentration of Ca, Na, Fe, Zn and Cu of damsisa leaves. Total soluble salts as indicated by EC values increased with increasing salinity level of the irrigation water. Also, the EC values was significantly increased with increasing the levels of N-rates up to 150 Kg/fed. The highest values of EC was obtained from ammonium nitrate. In general, the damsisa maximum dry weight and oil percentage were observed at 0.49 dS/m salinity of irrigation water and 150 Kg N/fed. (ammonium nitrate) rate. Also, the N fertilization especially ammonium nitrate lowered the harmful effect either of the irrigation water or soil salinity.

INTRODUCTION

Damsisa (*Ambrosia maritime* L.), is a perennial herbaceous plant. Tuckholm, (1974) declared that it is richly branched gray herb with finely dissected fragrant leaves. The plant is widely distributed throughout the Mediterranean region. Damsisa is used in Egyptian folkore medicine as remedy of rheumatic pains, decoction of plant for asthma bilharzissia, diabetes and to expel kidney stones. Flowering branch stimulant stomachic, Pand expel renal stones. Amin (1990), reported that when the plants grown near the banks of canals snails escape far from these plants and even some dead snails were found. The active ingredients of this plant were ambrosin and damsin shown to be toxic to the snails representing the intermediate host of the schistosomiasis and fascioliasis found in canals (Picman *et al.*,1986). Damsisa is not toxic to non target organisms rats, rabbits, algae and daphnia (Geerts *et al.*, 1992 and 1994).

Arid and semi-arid countries are suffering from water shortage and accordingly are being forced to use poor quality water for irrigation. The salinity problem exists if salts accumulate in the crop root zone to a concentration that causes a loss in yield.

Rhoades (1974) mentioned that, the concentration of soluble salts in soil increases as irrigation water is removed by evaporation and transpiration and salts are left behind. He also added that, the accumulation of soluble salts in soil is controlled by the fraction of applied water that drains below the crop root zone (Leaching fraction). In addition, the salinity assessment must be made in view of the salt tolerance of crop and the leaching fraction. Ayers and Westcot (1985) tabulated the expected yield reduction of 0, 25 and 50 % due to the effect of either soil salinity of the saturated extract, (EC_e), or a comparable increase in irrigation water salinity, (EC_w). Rhoades (1987) mentioned that, the use of saline water for irrigation can be enhanced if a modified dual rotation (crop and water) system of management is used.

Hussein *et al.*, (1996) indicated that damsisa oil percentage was increased by increasing water salinity level. Ahmed *et al.*, (2001) reported that the vegetative growth of damsisa significantly increased by increasing soil salinity treatments up to 2000 ppm.

Nitrogen is an integral component of many essential plant compounds. A good supply of nitrogen stimulates root growth and development, as well as the uptake of other nutrients (Brady and Well, 1996). Azize (1990) worked on Damsisa plants found that fresh and dry matter were significantly increased by the application of N fertilizer. Moreover, El-Ghawwas *et al.*, (2001) showed that a significant increase in plant height, number of branches, fresh and dry weight per plant and per plot as well as damsin percentage in damsisa leaves by adding high levels of P, N and K. Abou Hussin and Barsoum (2002) found that the N-fertilization increased the dry matter yield of oil crops. They also, found that N-fertilization lowered the harmful effect of salinity on plants grown on calcareous soil.

The present work was carried out to study the interaction effect of irrigation water salinity and N-fertilization on the growth and chemical composition of damsisa plants.

MATERIALS AND METHODS

Soil:

A bulk sample from surface 30 Cm layer of clay soil were collected from El-Sabhia for the pot experiment and analyzed using the methods described by Jackson (1973). Some chemical and physical properties of the soil are presented in Table (1).

Irrigation water:

The irrigation waters were prepared by mixing sea water (55.96 dS/m) and tap water (0.49 dS/m) for obtaining four levels of irrigation water salinity (S_0 = 0.49, S_1 = 7, S_2 = 11, S_3 = 14 dS/m). The chemical composition of the irrigation waters are presented in Table 2.

Table 1. Some physical and chemical properties of the used soil.

Soil properties	Values
Particle size distribution	
Sand%	27.10
Silt %	21.25
Clay %	51.65
Soil texture	Clay
$PH_{(1:1)}$	7.72
EC*, dS/m	3.27
Total $CO_3^{=}$, %	6.8
Organic-C, %	2.3
Soluble cations (meq/100 g soil)*	
Ca^{2+}	10.48
Mg^{2+}	11.29
Na^{+}	11.00
K^{+}	0.98
Soluble anions (meq/100 g soil)*	
$CO_3^{=}$	0.00
HCO_3^{-}	4.60
Cl^{-}	18.42
$SO_4^{=}$	10.80

* = soil saturation paste

Table 2. Chemical composition of the tested irrigation waters.

Water treatment	SAR	Salinity dS/m at 25 C	Cation and anion composition (meq/L)					Boron ppm	pH
			Na^{+}	Ca^{2+}	Mg^{2+}	CO_3+ HCO_3	Cl^{-}		
Water tap S_0	1.90	0.49	2.30	1.61	1.47	1.86	1.85	0.03	7.8
Initial sea water	64.15	55.96	504.0	26.0	102.8	3.40	564.3	4.29	7.3
S_1	21.63	7.00	51.10	2.09	10.41	0.32	56.20	0.42	7.4
S_2	25.54	11.00	77.80	3.15	16.03	0.51	86.40	0.65	7.5
S_3	29.60	14.00	102.7	4.08	21.05	0.63	113.2	0.84	7.5

Pot experiment:

A pot experiment using damsisa (*Ambrosia maritime* L) plants was conducted in the greenhouse at Soil Salinity Laboratory, El-Sabhia Research Station near Alexandria city. Damsisa seeds were grown in each pot containing 22 Kg of soil on April 29, 2001. The plants were thinned 2 plants per pot. All plants were given an equal dose of phosphorus and potassium as documented rates. Treatment consisted of 32 combinations of three factors, arranged in a randomized split split plot design with three replications. The factors were (i) irrigation water with four levels of salinity (S_0, S_1, S_2 and S_3) were arranged at random as main plots. (ii) two nitrogen sources, urea (46 % N) and ammonium nitrate (33.5 % N) were arranged at random as sub-plot and (iii) four levels of N applied to the soil (0, 50, 100 and 150 Kg N / fed.) of the two sources were arranged at random as sub-sub plot. All pots were irrigated every three days to keep the soil moisture content at about the field capacity.

At harvesting (1st August 2001) dry weight of plants was recorded and composite leaf and root sample for each treatment were collected. Oil was extracted from leaves and flowering tops by water distillation methods and the oil percentage was calculated (British Pharmacopeia, 1968). The plant samples were washed with distilled and redistilled water, dried at 65 C for 48 hours, then ground and analyzed to determine N, P, K, Ca, Mg, Fe, Mn, Zn and Cu concentrations. Also, soil samples were collected from each pot to determine EC in soil saturation paste by using an electrical conductivity meter according to Jackson (1973).

In the leaves digested solution Ca, Mg, Fe, Mn, Zn and Cu were determined by Atomic Absorption Spectophotometer (Jackson, 1973), Na and K were determined by flame photometer (Jackson, 1973), total N was determined by microkjeldahl method and total P was determined by using the vanadmolydophosphoric method (Jackson, 1973). The data were statistically analyzed according to procedures reported by Snedecor and Cochran (1974).

RESULTS AND DISCUSSION

Plant growth and oil percentage:

The results presented in Table (3) clearly show that the salinity levels of irrigation water significantly decreased dry weight of the whole plant and oil percentage . It is noticed that increasing salinity levels up to 14 dS/m led to significant decrease in dry weight of whole damsisa plants. This effect may be, attributed to ion accumulation (Boyer, 1965), or disturbance in balance of metabolic products (Gill, 1979). Similar results were also, reported by Dawh (1982) on Datura, and Dow *et al.*,1989 on geranium. Leopold and Willing (1984) mentioned that, salinity might induce damage to photosynthetic effectiveness through the disturbance of chloroplast membranes by production of lesions, also, salinity depressed transpiration rate which might inhibit transpiration stream and nutrient uptake. Such disturbance or inbalance of nutrients was considered a reasonable cause restricting growth.

The magnitude of decreas in dry matter due to increasing the salinity level of irrigation water to 7, 11 and 14 dS/m amounted to 68.87 %, 62.05 % and 50.57 %, respectively of the yield at the low salinity level (0.49 dS/m). The decrease in growth, probably results also, from the decreased in the availability of water and increased toxicity of ions in the root media, produced by increased salinity of irrigation water.

The data in Table 3 indicated also that there was a highly significant increase in the dry weight of plants and oil percentage of damsisa, as affected by the addition of nitrogen fertilizer up to 150 Kg N/fed. The

Table 3.Effect of irrigation water salinity, sources and rates of nitrogen fertilization on dry weight and oil percentage of Damsisa plants.

Treatment				
Irrigation water Salinity level (dS/m)	N-source	N-rates (Kg/Fed)	Dry weight g /pot	Oil %
0.49	Ammonium nitrate	0	88.9	1.40
		50	111.6	1.85
		100	116.8	2.36
		150	130.2	2.36
	Urea	0	98.9	1.42
		50	103.6	1.80
		100	106.4	2.13
		150	108.0	2.26
Mean			107.53	1.95
7.00	Ammonium nitrate	0	66.67	1.25
		50	71.7	1.63
		100	80.9	1.83
		150	91.9	1.88
	Urea	0	59.0	1.16
		50	62.0	1.64
		100	70.7	1.74
		150	87.9	1.83
Mean			74.06	1.62
11.00	Ammonium nitrate	0	65.0	1.18
		50	70.4	1.34
		100	71.3	1.42
		150	77.67	1.47
	Urea	0	64.7	1.20
		50	63.3	1.28
		100	63.0	1.34
		150	58.3	1.36
Mean			65.72	1.32
14.00	Ammonium nitrate	0	58.0	0.95
		50	58.3	1.08
		100	58.66	1.23
		150	59.0	1.30
	Urea	0	56.0	0.95
		50	51.0	1.06
		100	49.06	1.16
		150	45.0	1.17
Mean			54.38	1.11
Overall mean		0	69.11	1.19
		50	74.22	1.46
		100	77.00	1.65
		150	82.37	1.70
	Salinity(A)		6.21	0.07
	Source(S)		4.36	0.03
	Rates(R)		5.30	0.05
	A x S		N.S.	N.S.
	A x R		10,59	0.09
	S x R		N.S.	N.S.
	A x S x R		N.S.	N.S.

- The N rates were calculated on the basis that one Faddan = 1 million Kg soil

** 1 feddan = 0.42 hectar

increase in dry weight of the whole plant of damsisa may be due to the role of N on biosynthesis of amino acids, chlorophyll and carbohydrates. Increasing nitrogen application level to 50, 100 and 150 Kg N/fed., resulted in a marked increase in dry weight of the whole plant to 7.4 %, 11.41 % and 19.19 %, respectively, of the dry weight of the control (without nitrogen). These results were in agreement of those obtained by Azize (1990) on Damsisa who found that fresh and dry matter were significantly increased by the application of N fertilizer. The data showed also, that there was an increase in oil percentage in damsisa leaves due to the different levels of N fertilizers. These results may be due to the increase of essential element for metabolic biosynthesis of oil production.

The results in Table 3 revealed also that fertilization with ammonium nitrate resulted in highly significant increase than urea in the dry weight and oil percentage of damsisa plants at each level of irrigation water salinity. A significant interaction between salinity and N rate on dry weight and oil percentages was observed. The maximum dry weight of the whole damsisa plant (119.1 g) were obtained through 0.49 dS/m salinity of irrigation water at nitrogen level of 150 Kg N/fed., while the minimum dry weight (47.50 g) was recorded for 14 dS/m salinity of irrigation water at 150 Kg N/fed.

In general, the damsisa maximum growth dry matter and oil percentage were observed at 0.49 dS/m salinity of irrigation water and 150 Kg N (ammonium nitrate) rate.

The relationship between dry weight and nitrogen fertilization was expressed by a straight line equation at each salinity of irrigation water levels with ammonium nitrate or urea (Table 4). The comparison of the slopes of the regression equations gives a quantitative expression of the efficiency of N with ammonium nitrate or urea at each salinity level. At the salinity levels of 7, 11 and 14 dS/m, the efficiency of N decreased to 64.64 %, 29.66 % and 2.66 %, from its efficiency at the lower level of irrigation water salinity (0.49 dS/m), respectively using ammonium nitrate. The corresponding values using urea were 317.28 %, 64.78 % and 116.28 %.

Table 4. The relationship between dry weigh/pot and applied N rates of Damsisa plants in relation to nitrogen sources and salinity of irrigation water.

Nitrogen sources	Salinity of irrigation water dS/m	Regression equation for each salinity levels (Y=dry weight g/pot, X=N rates Kg/fed)	r
Ammonium nitrate	0.49	Y = 91.95 + 0.263 X	0.967*
	7.00	Y = 65.06 + 0.170 X	0.987*
	11.00	Y = 65.26 + 0.078 X	0.967*
	14.00	Y = 57.99 + 0.007 X	0.999**
Urea	0.49	Y = 99.71 + 0.060 X	0.974*
	7.00	Y = 55.59 + 0.191 X	0.950*
	11.00	Y = 65.25 – 0.039 X	-0.904
	14.00	Y = 55.51 – 0.070 X	-0.987*

The dry weight (Y) was also, regressed against the salinity of irrigation water levels (X_1) and N rate (X_2) with ammonium nitrate or urea for the damsisa plants. The dry weight was positively correlated with the two variables . The regression equations for the relationship were:

$$Y = 101.22 - 3.824\ X_1 + 0.129\ X_2 \qquad (1)$$

$$Y = 100.697 - 3.901\ X_1 + 0.036\ X_2 \qquad (2)$$

The comparison of the slopes of each variable in equation (1 & 2) gives a quantitative estimate for the efficiency of one variable to the other using ammonium nitrate or urea. Thus the efficiency for salinity of irrigation water level and N rate would be equal to (3.824 : 0.129) or (29.64 : 1) with ammonium nitrate and (3.901 : 0.036) or (108.36 : 1) with urea.

Elemental composition:

Table 5 show the elements content of damsisa leaves as affected by the two sources, rates of nitrogen fertilizer and salinity levels of irrigation water. The data show that N, P, K, Ca and Mg contents of damsisa leaves were significantly decreased as salinity rates increased from 0.49 dS/m to 14 dS/m. However Na was increased as salinity rates increased from 0.49 dS/m to 14 dS/m due to increasing Na in the growth media. The decreased N and P uptake may be due to specific inhibitory effects of Na on the metabolic carriers responsible for anion absorption. Torres and Bingham (1973) attributed the reduction in yield by salinity, to Cl-induced N deficiency on the basis of observed decrease in leaf NO_3^-. Balba and Bassiuni (1968) using P^{32} showed that uptake of soil or fertilizer phosphorus had decreased with increasing chlorides in the irrigation water.

The decrease in the content of K by the plants may have been related to attendant increase in the absorption of Na. This result is in agreement with that of others (Mass *et al.*, 1972 and Nassem 1986). Balba (1960) also had shown that absorption of K by onion plants decreased with the increase in Na, Ca, or Mg in the soil saturation extract. Decreasing Ca and Mg contents due to Na salinity has also, been reported. Mass *et al.*, 1972 showed that increased salinity decreased Mg content of tomato and soybean plants.

On the other hand, the micro-elements content of damsisa leaves i.e. Fe, Mn, Zn and Cu (Table 6), were decreased significantly with increasing the irrigation water salinity.

Increasing the water salinity level, unfavorably affected plant growth which reflects the metabolic status of plants and consequently the accumulation of nutrients. It is generally agreed that the uptake of nutrients by plants depends primarily on the ability of root cells to accumulate the nutrients which requires expenditure of energy. Thus it is not surprising to find that increasing the salinity level has reduced the uptake of nutrients.

The results in Table (5 and 6) showed that there is highly significant increase in N, P, K, Ca, Mg and Na concentrations of damsisa leaves as N-applications increased from 0 to 150 Kg N/fed. On the contrary, the concentration of the micro-elements (Fe and Mn) decreased with increasing the rates of N-fertilization, while Zn and Cu increased.

Table 5. Effects of salinity for irrigation water, sources and rates of nitrogen fertilization on Macro nutrients concentrations of damsisa plants.

Treatment			N	K	Na	Ca	Mg	P
Irrigation water Salinity level (dS/m)	N-source	N-rates (Kg/Fed)	%					
0.49	Ammonium nitrate	0	1.74	2.85	0.36	0.11	0.88	0.29
		50	1.92	3.40	0.38	0.12	1.12	0.52
		100	2.07	3.68	0.45	0.14	1.29	0.33
		150	2.36	3.70	0.52	0.14	1.32	0.28
	Urea	0	1.54	2.83	0.35	0.13	1.21	0.28
		50	1.56	3.12	0.36	0.14	1.32	0.63
		100	1.93	3.87	0.45	0.16	1.47	0.21
		150	2.05	3.79	0.62	0.16	1.55	0.20
Mean			1.90	3.41	0.44	0.14	1.27	0.29
7.00	Ammonium nitrate	0	1.53	2.06	0.75	0.21	1.35	0.19
		50	1.64	2.52	0.92	0.21	1.38	0.28
		100	1.74	2.58	1.12	0.21	1.39	0.24
		150	1.85	2.80	1.20	0.21	1.53	0.22
	Urea	0	1.46	2.03	0.77	0.22	1.05	0.17
		50	1.49	2.44	0.96	0.23	1.14	0.19
		100	1.51	2.45	1.15	0.24	1.39	0.13
		150	1.56	2.48	1.30	0.25	1.65	0.18
Mean			1.60	2.42	1.02	0.22	1.36	0.20
11.00	Ammonium nitrate	0	1.27	1.89	1.33	0.17	1.33	0.14
		50	1.30	2.02	1.34	0.18	1.37	0.17
		100	1.34	2.11	1.48	0.18	1.24	0.16
		150	1.52	2.21	1.52	0.18	1.22	0.18
	Urea	0	1.10	1.87	1.37	0.19	1.17	0.15
		50	1.14	1.95	1.38	0.20	1.39	0.17
		100	1.21	2.10	1.45	0.19	1.28	0.17
		150	1.32	1.97	1.57	0.19	1.24	0.17
Mean			1.25	2.02	1.43	0.18	1.28	0.17
14.00	Ammonium nitrate	0	0.55	1.57	1.63	0.13	1.13	0.12
		50	0.80	1.67	1.66	0.13	1.12	0.16
		100	0.66	1.68	1.75	0.12	0.97	0.17
		150	0.74	1.66	1.83	0.11	0.90	0.16
	Urea	0	0.61	1.64	1.76	0.16	1.12	0.12
		50	0.71	1.70	1.83	0.14	1.11	0.16
		100	0.76	1.71	1.90	0.13	0.96	0.14
		150	0.83	1.61	2.01	0.12	0.81	0.15
Mean			0.69	1.66	1.80	0.13	1.01	0.15
Overall mean	0		1.23	2.10	1.04	0.16	1.16	0.19
	50		1.30	2.36	1.11	0.17	1.24	0.24
	100		1.40	2.52	1.22	0.17	1.25	0.19
	150		1.51	2.63	1.32	0.17	1.28	0.20
Salinity(A)			0.097	0.160	0.077	0.003	0.054	0.06
Source(S)			0.076	N.S.	0.051	0.001	N.S.	0.030
Rates(R)			0.062	0.101	0.067	0.002	0.066	0.041
A x S			0.152	N.S.	N.S.	0.003	0.068	0.061
A x R			0.127	0.201	N.S.	0.004	0.132	N.S.
S x R			N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
A x S x R			N.S.	N.S.	N.S.	0.006	N.S.	N.S.

Table 6. Effects of salinity for irrigation water, sources and rates of nitrogen fertilization on some micro nutrients concentrations of damsisa plants.

Irrigation water Salinity level (dS/m)	N-source	N-rates (Kg / fed.)	Fe	Mn	Zn	Cu
			mg/Kg DM			
0.49	Ammonium nitrate	0	108.0	100	24	22.8
		50	111.2	118	32	26.2
		100	111.6	140	33	25.5
		150	123.0	160	38	32.0
	Urea	0	125.0	140	33	27.8
		50	130.0	160	35	28.0
		100	152.0	166	36	28.1
		150	160.0	170	40	33.0
	Mean		127.6	144.3	33.9	27.9
7.00	Ammonium nitrate	0	156.4	140	36	22.1
		50	163.6	150	39	22.5
		100	164.0	160	40	22.5
		150	162.0	177	41	22.6
	Urea	0	191.8	130	62	24.4
		50	195.8	140	79	25.0
		100	197.5	120	82	20.0
		150	170.2	110	97	18.1
	Mean		175.1	140.8	69.5	22.1
11.00	Ammonium nitrate	0	75.0	125	33	15.3
		50	62.0	122	31	12.0
		100	56.0	100	26	17.3
		150	53.0	85	25	16.9
	Urea	0	131.2	110	55	16.0
		50	127.9	100	54	16.8
		100	111.6	90	44	18.3
		150	107.6	84	41	19.3
	Mean		90.8	102	38.6	16.5
14.00	Ammonium nitrate	0	49.0	75	24	15.2
		50	45.4	64	23	14.0
		100	41.4	60	20	13.2
		150	40.0	56	18	12.6
	Urea	0	87.8	70	36	17.0
		50	76.0	68	35	18.0
		100	63.8	60	24	15.0
		150	52.0	40	20	14.3
	Mean		57.0	61.8	24.9	14.9
Overall mean		0	115.7	111.3	37.8	20.1
		50	114.0	115.3	40.9	20.3
		100	112.2	112.0	38.1	20.0
		150	108.7	110.2	40	21.1
	Salinity(A)		6.310	5.72	1.40	2.26
	Source (S)		3.802	2.08	1.52	0.78
	Rates (R)		4.882	N.S.	1.33	N.S.
	A x S		7.658	4.16	3.04	1.57
	A x R		9.752	11.32	1.88	1.95
	S x R		N.S.	8.01	N.S.	1.38
	A x S x R		13.79	16.01	3.77	N.S.

The results in Table 5 clearly show that the ammonium nitrate source produced a significant increase in the concentration of N and P, while urea source produced a significant increase in the concentration of Ca and Na of damsisa leaves. Also, the data indicated that the ammonium nitrate source produced a significant increase in the concentration of Mn, while urea source produced a significant increase in the concentration of Fe, Zn and Cu (Table 6).

The interaction between salinity of irrigation water and nitrogen fertilization rates (A x R) had no significant effect on Na and P content, but it has a highly significant effect on the N,K, Ca and Mg contents in damsisa plant (Table 5). The same interaction has significant effect on Fe, Zn, Mn and Cu contents (Table 6). Also, the interaction between salinity of irrigation water and nitrogen sources had a significant effect on N, Ca, Mg and P contents.

The nitrogen content revealed a highly significant decreases with increasing the salinity of water using ammonium nitrate or urea sources. These decreases by the combined treatment for salinity of irrigation water (14 dS/m) and ammonium nitrate or urea amounted 68 % and 59 % less than that obtained with the control (0.49 dS/m) for the damsisa plants, respectively.

Similarly, the micro nutrients (Fe, Mn, Zn and Cu) content decreased significantly in all treatments as compared with the control in the damsisa plants. This could be to the decreased absorption of micronutrients due to increasing salinity (Abd-Ella and Khalil, 1985). A highly significant interaction between nitrogen fertilization rates and nitrogen sources was revealed for Mn and Cu concentration in damsisa. While the same interaction had no significant effect on N, P, K, Ca, Mg, Na, Fe and Zn concentration.

The second-order interaction between salinity of irrigation water, sources and rates of nitrogen (A x S x R) had no significant effect on N, P, K, Mg, Na and Cu concentrations in damsisa plants, but it has highly significant affect on Ca, Fe, Mn and Zn concentrations in damsisa plants (Tables 5 and 6).

The effect of irrigation water salinity on the total soluble salts in soil as indicated by the EC values was recorded in Table 7. The data show that, total soluble salts increased with increasing salinity level of the irrigation water. This increase was significant as the N levels increased up to 150 Kg N/fed. The highest values of EC was obtained from ammonium nitrate.

The interaction between irrigation water of salinity and nitrogen fertilization rates (A x R) and between irrigation water of salinity and nitrogen sources had significant effect on the soil salinity. The maximum value of EC was obtained from applying 14 dS/m saline irrigation water and ammonium nitrate. Also, the second-order interaction between irrigation water salinity, nitrogen rates and nitrogen sources (A x S x R) had significant affect on the EC of soil(Table 7).

Generally, the damsisa maximum dry weight and oil percentage were obtained at 0.49 dS/m salinity of irrigation water and 150 Kg N/fed. (ammonium nitrate) rate. Also, the N fertilization especially ammonium nitrate lowered the harmful effect of the irrigation water salinity or soil salinity.

Table 7. Effect of irrigation water salinity, sources and rates of nitrogen fertilization on the soil salinity (EC).

Treatment: Irrigation water salinity level (dS/m)	N-source	N-rates Kg/Fed	Soil salinity (EC dS/m)
		0	1.4
	Ammonium nitrate	50	1.6
		100	1.6
		150	2.3
0.49		0	1.57
	Urea	50	1.80
		100	1.80
		150	2.30
Mean			1.796
		0	19.0
	Ammonium nitrate	50	22.3
		100	22.6
		150	23.3
7.00		0	14.0
	Urea	50	15.0
		100	16.0
		150	17.0
Mean			18.65
		0	23.6
	Ammonium nitrate	50	23.8
		100	23.9
		150	24.0
11.00		0	24.3
	Urea	50	26.5
		100	26.7
		150	27.1
Mean			24.99
		0	30.0
	Ammonium nitrate	50	30.1
		100	30.8
		150	30.7
14.00		0	28.0
	Urea	50	28.5
		100	28.6
		150	28.8
Mean			29.31
Overall mean		0	17.65
		50	18.65
		100	19.00
		150	19.44
Salinity(A)			0.130
Source(S)			0.171
Rates(R)			0.210
A x S			0.343
A x R			0.418
S x R			N.S.
A x S x R			0.591

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الملخص العربي

تأثير التفاعل بين ملحية ماء الري ومصادر ومعدلات النتروجين على النمو والتركيب الكيماوي لنبات الدمسيسة

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أجريت هذه التجربة على نبات الدمسيسة في قصارى عام ٢٠٠١ لدراسة تأثير التفاعل بين ملوحة ماء الري (٠,٤٩ ، ٧، ١١ ، ١٤ ديسيمنز / متر) كما تم استخدام مصدرين للتسميد النيتروجيني نترات الأمونيوم ٣٣,٥ % نتروجين و اليوريا ٤٦ % نتروجين بمعدلات (صفر، ٥٠، ١٠٠ و ١٥٠ كجم نتروجين للفدان). أظهرت النتائج أن الوزن الجاف والنسبة المئوية للزيت يقلا معنويا بزيادة مستويات ملحية ماء الري حتى ١٤ ديسمنز / متر. وبزيادة مستويات ملحية ماء الري من ٧ إلى ١١ إلى ١٤ ديسمنز / متر ينتج نقص في الوزن الجاف بنسبة ٧٨,٨٧ % ، ٦٢,٠٥ % ، ٥٠,٥٧ % على التوالي مقارنة بمستوى الملحية المنخفض ٠,٤٩ ديسمنز / متر. كما أوضحت النتائج وجود زيادة معنوية في الوزن الجاف للنبات والنسبة المئوية للزيت بزيادة معدلات التسميد النيتروجيني حتى ١٥٠ كجم نتروجين للفدان. استخدام نترات الأمونيوم كمصدر للسماد النيتروجيني أدى إلى زيادة معنوية في الوزن الجاف للنبات والنسبة المئوية للزيت عن استخدام اليوريا كمصدر للسماد النيتروجيني عند كل مستوى من مستويات ملحية ماء الري. تركيزات العناصر الكبرى (نتروجين ، فسفور ، بوتاسيوم ، كالسيوم ، ماغنسيوم) والعناصر الصغرى (الحديد ، المنجنيز ، الزنك ، النحاس) في أوراق نبات الدمسيسة تقل معنويا بزيادة مستويات ملحية ماء الري حتى ١٤ ديسمنز / متر لكن تركيز الصوديوم في أوراق نبات الدمسيسة يزيد معنويا بزيادة ملحية ماء الري حتى ١٤ ديسمنز / متر. كما أن تركيز النتروجين والفسفور والبوتاسيوم والكالسيوم والماغنسيوم والصوديوم والزنك والنحاس في أوراق نبات الدمسيسة يزيد معنويا بزيادة معدلات التسميد النيتروجيني حتى ١٥٠ كجم نتروجين للفدان، بينما تركيز الحديد والمنجنيز في أوراق نبات الدمسيسة يقل معنويا بزيادة معدلات التسميد النيتروجيني. استخدام نترات الأمونيوم كمصدر للسماد النيتروجيني ينتج عنه زيادة معنوية في تركيز النتروجين والفسفور والمنجنيز في أوراق نبات الدمسيسة، بينما استخدام اليوريا كمصدر للسماد النيتروجيني ينتج عنه زيادة معنوية في تركيز الصوديوم والكالسيوم والحديد والزنك والنحاس في أوراق نبات الدمسيسة. زيادة الأملاح الكلية الذائبة زيادة معنوية بزيادة ملحية ماء الري واستخدام نترات الأمونيوم كمصدر للسماد النيتروجيني بمعدل ١٥٠ كجم نتروجين للفدان. وقد تم الحصول على أقصى وزن جاف للنبات وأقصى نسبة مئوية للزيت عند استخدام ماء ري مستوى ملحيته ٠,٤٩ ديسمنز / متر ونترات الأمونيوم كمصدر للسماد النيتروجيني بمعدل ١٥٠ كجم للفدان. ايضا التسميد النيتروجيني خاصة بنترات الأمونيوم قلل الأثر الضار لملحية ماء الري وبالتالي ملحية التربة.