

EFFECT OF IRRIGATION WITH SALINE WATER ON SOME POTATO VARIETIES

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ABSTRACT: *This investigation was conducted at the agriculture experimental station of Agriculture Research Center (A.R.C.) in Giza to study the response of the four potato varieties Maradonna, Markies, Diamant and Spunta to different saline levels. Whole potato seeds were sown in pots of 40 cm. in diameter on November 6th in 2003 and 2004 seasons. After complete emergence after 30 days from planting potato varieties were irrigated with saline solution of diluted Karon lake water at concentrations of 1000, 2000, 3000 and 4000 ppm beside the control 259 ppm (tap water). The obtained results showed that saline treatment of 1000 ppm significantly increased all the studied characteristics in the two seasons which included stem length, number of main stems, number of leaves / plant, dry weight of leaves, stems and roots, total leaves area, tuber fresh and dry weight / plant. Contrarily higher saline levels at 2000, 3000 and 4000 ppm decreased significantly these characteristics. Tuber weight and tuber number were significantly decreased as saline of water level increased from 259 to 4000 ppm in both seasons of 2003 and 2004. Diamant variety gave the highest values of all the studied characteristics except the number of main stems per plant and the roots dry weight. On the other hand Markies variety recorded the highest values in the number of main stems per plant and roots dry weight.*

Key Words: *saline water, irrigation, Maradonna, Markies, Diamant, Spunta, variety, leaves area, tuber fresh weight.*

INTRODUCTION

Potato is considered one of the main important vegetable crops for both local consumption and export. It occupies the first rank in export among the different vegetable crops in Egypt. About 200 thousand feddans are cultivated annually in the three seasons of fall, winter and summer. The total production of potato in Egypt per year is about two million tons where 150 thousand tons exported to the different markets such as England, West European countries and some Arab countries.

To face the increase in the population in Egypt, there is great increase in the reclaimed land especially in deserts which have a high concentration of salts in the soil due to the rare of rain. Although River Nile is the main source of irrigation in Egypt, nowadays water is not sufficient for irrigation of the

cultivated area required for food production. So, it becomes an important object to look for another sources of water that could be used for irrigation without harmful effect on both soil or field crops. Thus it has been suggested that the application of agrarian saline drainage water alone or mixed with the natural water from river Nile for irrigation is a national target to solve the shortage of water recourses.

MATERIALS AND METHODS

This investigation was carried out at the agriculture experimental station of the Agriculture Research Center (A.R.C.) in Giza Governorate. Two experiments were started on November 6th for both the fall seasons of 2003 and 2004. Marradonna, Markies, Diamant and Spunta varieties were the material of this study. The sand culture technique of Hewitt (1952) was used in this investigation. The crude sand was sieved through a 20 mesh sieve. then soaked for 3 days in 5% hydrochloric acid after which sand was washed by current tap water for 3 days to get rid of any salts afterwards and finally was dried by air. Plastic pots of 40 cm in depth were used and each pot filled with 20 kg. of this washed sand up to 5 cm. from its upper edge. The field capacity of the experimental soil was determined by the Pressure Cooker methods at 1/3 atm. it was found to be 2.9% on dry weight basis. The wilting point of the soil was found to be 1.56% as determined by the pressure membrane apparatus at 15 atm. (Isrealsen and Hansen 1962). Plants were irrigated with tap water till complete germination, then irrigation to the developed plants took place with nutrient solutions (Hoagland and Arnon, 1950). Molar stock solutions of pure salts were prepared separately in distilled water kept for the preparation of feeding solutions. The feeding nutrient solution was prepared just before application to the pots by dilution with tap water. Five levels of saline water were used which were 1000, 2000, 3000 and 4000 ppm beside the control tap water at 259 ppm. The saline water was prepared by diluting water brought from lake karon, El Fayoum Province, to the required levels. This water was analyzed for determining its E.C., anions and cations contents in both seasons. (Table1).

Table (1): The chemical analysis of Karon lake water in the two seasons of 2003and 2004

Season	PH	E.C mohhos	E.C ppm	S.A.R	R.S.C	S.S.P %	Anions Meq/L				Cations Meq/L			
							SO ₄ ⁻²	Cl ⁻	HCO ₃ ⁻	CO ₃ ⁻	K ⁺	Na ⁺	Mg ⁺²	Ca ⁺
2003	8.2	44	28160	43.3	-107.1	73.7	70	365	4.1	0.8	3.6	324.3	86	26
2004	8	48	30720	43	-113	71.9	53.3	407.5	12	-	7.8	340	110	15

After 75 days from planting, three plants from each treatment were taken to determine stem length (cm), number of main stems, number of leaves, dry weight(g.) of leaves, stems and roots, total leaves area (cm²) and tuber fresh and dry weight per plant(g.).

Effect of irrigation with saline water on some potato varieties

Harvesting date was done on February 19th in both fall seasons of 2003 and 2004 where the yield as number and weight (g.) of tubers per plant was determined for each replicate 4 plants.

Complete randomized blocks in factorial design were used in three replicates and each experimental unit containing 6 pots. Data statically analyzed by using the analysis of variance according to Snedecor and Cochran (1981). Least significant difference (L.S.D.) test at 5% level was used to verify differences between treatments mean data.

RESULTS

The effect of using the different saline water levels on stem length of the various potato varieties (Table 2) indicated that the differences among the different tested varieties reached the significance level. The variety Diamant recorded the highest stem length under the pervious condition meanwhile Maradonna and Markies exerted the shortest one in the two seasons of the experiment. The data show that the stem length of all the varieties significantly increased due to irrigation with the level of 1000 ppm while this characteristic decreased proportionally with the increase in the saline levels from 2000 up to 4000 ppm. The interaction between the tested varieties and saline levels reflected that the tallest significant stem length resulted from the Diamant variety which irrigated with the saline level of 1000 ppm in the first fall season only but it didn't reach this level of significance level in the second one.

The response of the number of main stems per plant in the various potato varieties to the different saline levels reached the significance level in the second season only (Table 2). Markies and Maradonna varieties recorded the highest number of main stems per plant without significant difference between both in the second season. Using the saline level of 1000 ppm gave rise to positive significant effect on the number of main stems per plant while exceeded the levels from 2000ppm. induced significant negative effect in all the examined varieties in both seasons. However, the interaction effect between the varieties and the saline levels didn't reach significant level in both seasons.

The results in Table (2) reveal that the variety Diamant gave the highest significant number of leaves per plant comparing with the other varieties under the conditions of the various saline levels in both seasons. It is clear from the presented data that the level of 1000 ppm induced the highest leaves number per plant while the high saline level of 4000 ppm gave the lowest one. The interaction effect between the potato varieties and the different saline levels did not reach significant level through the two seasons.

Table (2): Effect of irrigation with saline water on stem length, number of main stems/ plant and number of leaves / plant of potato varieties after 75 days from planting during the two fall seasons of 2003 and 2004.

Varieties	Salinity levels ppm	stem length		Number of main stems		Number of leaves per plant	
		Season 2003	Season 2004	Season 2003	Season 2004	Season 2003	Season 2004
Markies	259	53.6	45.67	4	3.33	38	42
	1000	54.9	48.33	4	3.67	40	43.33
	2000	43.6	42.56	3.67	3.33	31	39.67
	3000	42.1	40.46	3	3.33	29.67	37.67
	4000	40.1	38.27	2.33	2.67	29.66	34
	Mean	46.86	43.06	3.4	3.27	33.67	39.33
Maradonna	259	48.2	49.37	3.33	3.67	36	42.33
	1000	51.2	52.73	4.13	3.33	37	45
	2000	45.6	42.36	3.67	3.33	32.67	39.67
	3000	44.07	40.2	3.33	3	30	36.67
	4000	41.3	37.6	2	3	29.66	33.33
	Mean	46.07	44.45	3.29	3.27	33.07	39.4
Diamant	259	51.2	49.1	3.33	3	39.33	44.33
	1000	53.7	51.57	3.33	3.67	39.67	48.33
	2000	52.2	48.9	3.33	3.33	37.33	41.67
	3000	46.1	44.63	2.33	2.33	34.67	39.33
	4000	45.2	42.53	2	2.67	29.33	36.33
	Mean	49.68	47.35	2.87	3	36.07	42
Spunta	259	52.37	48.33	3.66	3.67	36.33	43
	1000	53.33	49.8	3	3	37.67	46
	2000	49.1	45.23	3	3.33	32.33	40.66
	3000	42.2	38.97	2.67	2.67	30.67	40
	4000	40.9	37.63	2	2.33	27.67	35.33
	Mean	47.58	43.99	2.87	3	32.93	41
Mean of salinity	259	51.34	48.12	3.58	3.42	37.42	42.92
	1000	53.28	50.61	3.62	3.42	38.58	45.67
	2000	47.63	44.77	3.42	3.33	33.33	40.42
	3000	43.62	41.07	2.83	2.83	31.25	38.42
	4000	41.88	39.01	2.08	2.67	29.08	34.75
L.S.D. at 5%							
Variety		2.478	0.484	N.S	0.176	1.726	0.529
Salinity		1.839	1.814	0.283	0.588	1.578	1.558
Variety X Salinity		3.678	N.S	N.S	N.S	N.S	N.S

Effect of irrigation with saline water on some potato varieties

The variation among the different potato varieties concerning the leaves dry weight per plant illustrated that significant differences existed under irrigation with the various saline levels (Table 3). Diamant variety recorded the highest significant leaves dry weight while Spunta and Markies exerted the lowest one under the previous conditions in the two seasons. Generally speaking, the saline level of 1000 ppm exerted significantly the heaviest leaf dry weight while more levels had harmful effect on this character. Regarding the interaction between the four potato varieties and the different saline levels reflected that Diamant variety gave the highest significant values at saline water level of 1000 ppm meanwhile the lowest value recorded with Markies variety at saline water level 4000 ppm. The interaction effect was significant in the first fall season only.

It is clear from the data in Table (3) that using different saline water levels on the stems dry weight of the investigated potato varieties caused significant effect in the first fall season of 2003 only but in the second one it did not reach the significance level. The Diamant variety recorded the highest stem dry weight per plant under the various saline conditions while Markies variety gave the lowest one in the first season only. The picture from using the various saline levels in irrigation reflected that the saline level of 1000 ppm gave rise to the heaviest significant increase in the stems dry weight while the other high levels gradually gave rise to negative effect on this character in both seasons. The interaction effect between potato varieties and saline levels had significant effect on the stems dry weight in the first fall season only. The highest values were recorded on Diamant variety watered by 1000 ppm saline level while the lowest ones obtained from Markies variety watered with 4000 ppm.

The effect of different saline water levels on the roots dry weight per plant of the tested potato varieties presented that Markies variety recorded the highest significant values while Maradonna and Spunta varieties recorded the lowest significant ones in the two seasons (Table 3). The saline level of 1000 ppm in both fall seasons gave the heaviest roots dry weight per plant while the high level of 4000 ppm induced significantly the lowest one. The interaction effect between the varieties and the different saline levels was significant in the two fall seasons. Markies variety irrigated with saline level of 1000 ppm gave the heaviest values while the lowest ones recorded from Spunta variety irrigated with the saline level of 4000 ppm.

The effect of irrigation with different saline levels on the total leaves area per plant (cm^2) of the examined potato varieties (Table 4) pointed to true variation among these varieties in both fall seasons.

Table (3): Effect of irrigation with saline water on leaves , stems and roots dry weight / plant of potato varieties after 75 days from planting during the two fall seasons of 2003 and 2004.

Varieties	Salinity levels ppm	Leaves dry weight		Stems dry weight		roots dry weight	
		Season 2003	Season 2004	Season 2003	Season 2004	Season 2003	Season 2004
Markies	259	9.67	9.51	4.38	4.28	21.13	16.97
	1000	10.33	10.16	4.52	4.76	21.78	17.67
	2000	8.68	8.08	3.08	3.01	14.33	10.73
	3000	7.28	6.84	2.77	2.75	13.74	10.8
	4000	5.48	5.27	2.44	2.43	11.3	9.34
	Mean	8.29	7.97	3.44	3.45	16.46	13.1
Maradonna	259	10.22	9.61	4.38	4.01	15.94	15.53
	1000	10.44	10.5	4.73	4.65	21.55	17.03
	2000	8.86	8.53	3.41	3.24	13.15	10.83
	3000	7.66	7.13	2.82	2.83	13.47	9.53
	4000	5.83	5.36	2.72	2.46	10.16	8.6
	Mean	8.6	8.23	3.61	3.44	14.86	12.31
Diamant	259	10.14	10.22	4.25	3.75	16.4	14.4
	1000	10.63	11.03	4.75	4.15	20.29	17.27
	2000	9.16	9.37	4.01	3.89	15.62	12.93
	3000	8.12	8.07	2.98	3.22	13.66	11.43
	4000	6.11	5.93	2.69	3.04	9.97	9.05
	Mean	8.83	8.92	3.74	3.61	15.19	13.02
Spunta	259	10.43	9.98	4.95	3.82	23.13	16.37
	1000	9.77	9.72	4.52	4.28	20.57	16.07
	2000	8.34	8.02	3.14	3.89	14.66	11.07
	3000	6.77	7.09	2.63	2.79	11.31	8.81
	4000	5.49	5.4	2.48	2.42	9.93	8.27
	Mean	8.16	8.04	3.54	3.44	15.92	12.12
Mean of salinity	259	10.11	9.83	4.49	3.97	19.15	15.82
	1000	10.29	10.35	4.63	4.46	21.05	17.01
	2000	8.76	8.49	3.41	3.51	14.44	11.39
	3000	7.46	7.28	2.79	2.9	13.05	10.14
	4000	5.73	5.49	2.58	2.59	10.34	8.18
L.S.D. at 5%							
Variety		0.209	0.213	0.165	N.S	0.793	0.453
Salinity		0.163	0.295	0.185	0.525	0.326	0.304
Variety X Salinity		0.325	N.S	0.369	N.S	0.651	0.608

Effect of irrigation with saline water on some potato varieties

Table (4): Effect of irrigation with saline water on total leaves area, tuber fresh weight and tuber dry weight / plant of potato varieties after 75 days from planting during the two fall seasons of 2003 and 2004.

Varieties	Salinity levels ppm	Total leaves area/ plant (cm ²)		Tuber fresh weight/ plant		Tuber dry weight/ plant	
		Season 2003	Season 2004	Season 2003	Season 2004	Season 2003	Season 2004
Markies	259	1190	1083.33	120.1	122.67	20.81	21.11
	1000	1203.33	1106.67	125.2	125.73	23.64	22.77
	2000	910	855	94.67	91.9	15.94	15.96
	3000	840	745.33	92.4	90.53	14.12	15.25
	4000	690	610	69.4	67.53	9.49	11.11
	Mean	966.67	880.07	100.35	99.67	16.8	17.24
Maradonna	259	1070	990	110.37	107.43	18.77	18.81
	1000	1190	1095.33	122.1	118.3	22.56	20.95
	2000	780	691.67	100.43	98.5	16.54	17.65
	3000	788.33	698.33	95.4	90.87	14.58	15.28
	4000	710	626.67	69.13	69.43	9.39	12.39
	Mean	907.67	820.4	99.49	96.99	16.37	17.04
Diamant	259	1170	1066.67	123.23	119.43	21.97	18.11
	1000	1210	1126.67	127.3	123.33	24.07	22.58
	2000	1059	1000.67	113.23	109.6	19.38	19.44
	3000	970	883.33	103.1	102.2	16.86	17.34
	4000	771	685	79.44	80.5	11.65	13.92
	Mean	1036	952.47	109.26	107.01	18.78	18.28
Spunta	259	1100	1011.67	117.43	112.23	20.82	17.58
	1000	1140	1041.67	121.27	115.73	22.36	20.75
	2000	960	865.33	95.43	92.47	16.39	16.45
	3000	700	616.67	64.27	74.43	9.87	13.43
	4000	618.33	580	60.23	60	8.27	9.39
	Mean	903.67	823.07	91.73	90.97	15.54	15.52
Mean of salinity	259	1132.5	1037.92	117.78	115.44	20.59	18.9
	1000	1185.83	1092.58	123.97	120.78	23.16	21.79
	2000	927.25	853.17	100.94	98.12	17.06	17.37
	3000	824.58	735.92	88.79	89.51	13.86	15.32
	4000	697.33	625.42	69.55	69.47	9.7	11.7
L.S.D. at 5%							
Variety		20.949	38.396	5.532	5.197	1.517	1.139
Salinity		45.933	23.766	5.202	3.171	0.793	1.767
Variety X Salinity		91.865	47.533	10.405	6.341	1.585	N.S

The Diamant variety recorded the highest total leaves area while Spunta variety gave the lowest values in the two fall seasons. Using the saline level of 1000 ppm led to a significant increase in total leaves area per plant but the different saline levels above 1000 ppm exerted negative proportional significant effect in both fall seasons. The interaction effect between the tested varieties and saline levels recorded significant effect on this characteristic. Diamant variety irrigated with the saline level of 1000ppm gave the widest area while Spunta variety which irrigated with saline level of 4000 ppm illustrated the lowest values of this character in both fall seasons.

The effect of using different saline water levels on the tuber fresh weight (g.) of the different investigated varieties at the plant age of 75 days after planting are shown in Table (4). The obtained data cleared that irrigation with various saline levels led to a significant variations among potato varieties in this character. The potato variety Diamant gave rise to the heaviest values while Spunta variety recorded the lowest ones under the various saline water levels. The saline level of 1000 ppm induced the highest tubers weight per plant whereas the lowest weight exerted from using the highest saline water level of 4000 ppm in both fall seasons. Regarding the interaction effect between varieties and saline levels, the resulted data showed that Diamant variety irrigated with the saline level of 1000 ppm produced the highest tuber fresh weight per plant while Spunta variety gave the lowest value when irrigated with the highest saline water level of 4000ppm in both fall seasons.

The presented data on the tubers dry weight per plant in Table (4) showed that irrigation with the different saline levels led to significant variations between the examined potato varieties in this characteristic. The Diamant variety recorded the heaviest tuber dry weight per plant while Spunta variety exhibited the lightest one under the saline conditions in both fall seasons. Irrigation with the saline level of 1000 ppm induced positive significant effect whereas the other saline levels of 2000, 3000 and 4000 ppm recorded significant proportional reductions in the tuber dry weight in the two fall seasons. The interaction between the tested varieties and the saline levels reflected significant effect on the tubers dry weight in the first fall season of 2003 only. Diamant variety irrigated with the saline level of 1000ppm gave the heaviest tuber dry weight per plant while Spunta variety which irrigated with the saline level of 4000 ppm illustrated the lightest values of this character.

The variations in the tuber fresh weight at harvest among the various potato varieties as a result from using the different saline levels reached significant level. The results in Table (5) reflected that the highest weight resulted from the variety Diamant while the lowest value exerted from Spunta variety in both fall seasons. The use of the different saline levels showed that the heaviest significant tuber fresh weight was obtained from the saline level of 1000 ppm while beyond this level a proportional trend of decrease took place where the lowest values were recorded from the saline level of 4000 ppm in both fall seasons. The interaction between potato varieties and

Effect of irrigation with saline water on some potato varieties

different saline levels showed that Diamant variety gave the highest significant tuber fresh weight per plant with the saline water level of 1000ppm while the lowest values resulted from Spunta variety irrigated with saline water level of 4000 ppm.

Table (5): Effect of irrigation with saline water on tuber fresh weight and tuber number / plant of potato varieties at harvest time during the two fall seasons on 2003 and 2004.

Varieties	Salinity levels ppm	Tuber weight /plant		Tuber number /plant	
		Season 2003	Season 2004	Season 2003	Season 2004
Markies	259	263.53	261.1	5.67	5.00
	1000	313.4	301.77	5.00	4.33
	2000	206.97	209.33	4.67	4.00
	3000	184.3	178.63	4.67	4.33
	4000	131.33	135.87	4.33	4.00
	Mean	219.91	217.34	4.87	4.33
Maradonna	259	275.9	273.33	6.00	5.33
	1000	317.5	310.7	5.33	5.00
	2000	211.27	213.73	5.00	4.67
	3000	178.17	183.37	5.00	4.33
	4000	120.5	121.83	4.33	4.00
	Mean	220.67	220.59	5.13	4.67
Diamant	259	308.7	314.03	7.33	6.67
	1000	369.5	363.07	7.33	7.00
	2000	253.5	249.97	7.33	6.67
	3000	219.37	214.9	6.00	5.67
	4000	187.43	183.93	6.00	5.67
	Mean	267.7	265.18	6.80	6.33
Spunta	259	268.53	266.5	4.67	4.67
	1000	306.63	299.43	4.33	4.00
	2000	192	190.97	4.00	3.67
	3000	155.83	158.57	4.33	4.00
	4000	99.37	103.57	3.67	3.33
	Mean	204.47	203.61	4.20	3.93
Mean of salinity	259	279.17	278.74	5.92	5.42
	1000	326.76	318.74	5.50	5.08
	2000	215.93	216	5.25	4.75
	3000	184.42	183.87	5.00	4.58
	4000	134.66	136.3	4.58	4.25
L.S.D. at 5%					
Variety		0.128	10.092	0.2388	0.3916
Salinity		7.821	6.322	0.3810	0.2713
Variety X Salinity		15.643	12.645	0.7619	0.5426

The effect of the different saline levels on the number of tubers per plant of the various potato varieties (Table 5) exhibited that the variation among the examined varieties reached the level of significance in the number of tubers per plant. The Diamant variety yielded the highest tubers number when compared with the other varieties in both fall seasons. Using different saline levels led to significant reduction in tuber number per plant at the harvest time comparing with the control in both fall seasons. The interaction between the potato varieties and the different saline water levels exhibited that Diamant variety resulted the highest significant tubers number per plant due to irrigation with tap water (control) while Spunta variety reflected the lowest significant values when irrigated with the highest saline water level of 4000ppm in both seasons.

Discussion

It is advisable to know the idea that any potato variety can withstand some amount of salt without adverse effects. In truth, the salt tolerance of potato varieties is not an exact value as it depends on many factors, conditions and limits such as the specified of the salt involved the conditions under which the variety is growing, the plant age and the specification of the genotype (Kenneth, 1990).

The obtained results cleared that there are two main trends. The first cleared a positive increase in the characteristics of the plants of various varieties by the irrigation with saline water at the level of 1000 ppm. The second one showed a negative proportional drop in these characteristics with the increase in saline levels. Regarding the increase in the physical characteristics of potato plant due to the irrigation with saline

water up to 1000 ppm, it is well known that the salt tolerance of any crop appraised according to three criteria: (1) the ability of the crop to survive on saline medium, (2) the resulted yield of the crop developed on this

medium and (3) the relative yield on a non saline one under similar growing conditions (Ayers, 1952).

In this experiment the maximum amount of salts under which potato grows safely and gave the highest significant yield was 1000 ppm. However, halophytes have a special and distinguishing feature enable their growth to be improved by low levels of salts but beyond a certain level growth is reduced (Ruskin *et al.*, 1990). This view was observed

requires some amounts of salts in their growth medium or in other words need moderate salinity conditions, this salts positively promote plant growth, enhance productivity and improves quality than salts free conditions (Pasternak *et al.*, 1979; Pasternak, 1987; Lo-Cascio *et al.*, 1988 and Gupta, 1990).

Physiological speaking, the first picture may be due to that sodium chloride which is the main salt in saline water plays an important role through inions Na^+ that is absorbed by plant in this form. Sodium was shown

Effect of irrigation with saline water on some potato varieties

recently by Australian workers to be an essential element for a group of plant exhibiting the so called hatch-slack pathway of carbohydrate metabolism. These studies threw light on crop stimulated by the application of sodium (Tisdale and Nelson 1975).

The harmful effect of irrigation with saline water more than 1000 ppm on potato physical and chemical characteristics may be related to the increase in osmotic pressure of external solution which can explained in terms of classical osmotic theory by the decrease in diffusion pressure gradient between the medium and plant (Bernstein and Hayward, 1958).

However, the depression effect of salinity on potato could be attributed to the reduction in cell number, cell enlargement and cell size of the intercellular space per unit area (Strogenov, 1962). This observed reduction in growth under high salinity levels may be due to the inhibition of both meristematic activity and elongation of cells (Nieman, 1965) beside the disturbance in metabolic activities which might be affected by the decrease in water absorption and disturbance of mineral balance or absorption and utilization together (El-Nimr, 1986).

The high tolerance of the variety Diamant comparatively to the other varieties may be related to plant adaptation to salinity stress which requires some means to adjust the osmotic potential of plant organs to at least matching that of the soil solution in order to maintain turgor pressure and gradient for water uptake. To accomplish this, some plants produced organic solutes as sucrose in carrots, while others take up salts to accomplish the same purpose as beets (Bernstein, 1975; Subbarao and Charis, 1994 and Raul *et al.*, 1997).

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تأثير الري بالماء المالح على بعض أصناف البطاطس

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الملخص العربي

أجري هذا البحث في محطة البحوث الزراعية بالجيزة لدراسة استجابة أربعة أصناف من البطاطس شملت مارادونا، ماركيز، دايمنت و سبونت لمستويات الملوحة المختلفه. تم زراعة درنات البطاطس الكاملة في أصص قطرها ٤٠ سم في شهر نوفمبر خلال الموسمين ٢٠٠٣، ٢٠٠٤. و بعد تمام الأنبات عقب ٣٠ يوم من الزراعة، تم ري أصناف البطاطس بمحلول ملحي ناتج من تخفيف ماء بحيرة قارون إلى تركيزات ١٠٠٠، ٢٠٠٠، ٣٠٠٠ و ٤٠٠٠ جزء في المليون بجانب الكنترول الذي تم ريه بماء صنوبر بتركيز ٢٥٩ جزئ في المليون. وأضحت النتائج ما يلي:

١. أدت معاملة الملوحة ١٠٠٠ جزئ في المليون إلى زيادة معنويه في كل الصفات الطبيعيه والكيميائية تحت الدراسة خلال الموسمين والتي تضمنت طول الساق، عدد الأفرع الرئيسية، عدد الأوراق لكل نبات، الوزن الجاف للأوراق، السيقان، الجذور ، المساحة الورقية الكلية للنبات (سم^٢)، الوزن الطازج والجاف للدرنات.

٢. التركيزات العالية من الملوحة ٢٠٠٠، ٣٠٠٠ و ٤٠٠٠ جزء في المليون تسببت في نقص معنوي في طول الساق، عدد الأفرع الرئيسية، عدد الأوراق لكل نبات، الوزن الجاف للأوراق، السيقان، الجذور ، المساحة الورقية الكلية للنبات (سم^٢)، الوزن الطازج والجاف للدرنات خلال الموسمين.

٣. نقص الوزن الطازج والعدد للدرنات معنوياً بزيادة الملوحة عن المقارنة في المحصول لكلا الموسمين ٢٠٠٣، ٢٠٠٤.

٤. حقق الصنف دايمنت أعلى قيم لكل الصفات تحت الدراسة فيما عدا عددالسيقان الرئيسية لكل نبات و الوزن الجاف للجذور والتي كانت أعلاها في الصنف ماركيز.