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EFFECT OF USING SOME ORGANIC MATERIALS ON GROWTH, YIELD AND SOME NUTRIENTS UPTAKE OF SPINACH PLANTS GROWN UNDER SALT CONDITIONS

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ABSTRACT

Apot experiment was carried out in the farm of Fac. of Agric. Mansoura University during the winter cultivation of 2010 and 2011 to investigate the impact of minimizing levels effect of salinity for spinach plant (*SpinaciaOleracea*) by using some organic materials.

Thirty treatments were arranged in split-split block design, which three treatments of salinity levels, S_1 (2.55), S_2 (4.79), and S_3 (6.39) ds /m in 1:5 soil water extraction were assigned to the main plots. Five treatments of organic materials, i.e; farmyard manure (F.Y.M.), chicken manure (Ch.M.),compost of rice straw, wood saw dust (W.S.) and the untreated treatments (control)were allocated in the sub-plots. Each treatment was investigatedtwice; one was sprayed with ascorbic acid and the other without spraying it and arranged in sub-sub plots. Thus, the total numbers of pots were 90 pots.

The results of this investigation revealed that; with increasing salinity levels, the mean values of fresh and dry weights (g) of spinach plant leaves,rootsand the mean values of N, P&K uptake (mg/plant) of spinach plant leaves and roots.AlsoCa, Mg & Na uptakes (mg/plant) ofroots were decreased. On the other hand, the mean values of Ca, Mg and Na uptakes (mg/plant) of spinachleaves were increased with increasing salinity levels.

Data also indicated that under addition of organic materials, all parameters under investigation were significantly increased.The highest mean values of fresh and dry weights (g) of spinach leaves and roots and the highest mean values of N, P &K uptakes (mg/plant) of spinach foliage and roots were recorded with adding chicken manure, however the highest mean values of Ca, Mg and Na uptakes (mg/plant) of spinach foliage and roots were realized with adding wood saw dust.

Concerning the effect of ascorbic acid as foliar application at rate of 400 ppm, it wasfound that all parameters under investigation significantly increased except the mean values Ca, Mg & Na uptakes (mg/plant) of spinach rootswhich were significantly decreased.

Keywords: Salinity levels, organic materials, ascorbic acid and spinach plants.

INTRODUCTION

Spinach plant has a high nutritional value, and it is rich in antioxidants, especially when use fresh, steamed, or quickly boiled. It is a rich source of vitamin A (and especially high in Lucien), vitamin C, vitamin E, vitamin K, magnesium, manganese, folate, betaine, iron, vitamin B2, calcium, potassium, vitamin B6, folic acid, copper, protein, phosphorus, zinc, niacin, selenium and omega-3 fatty acids. Recently, opioid peptides called rubiscolins have also been found in spinach. Polyglutamylfolate(Vitamin B9 or folic acid) is a vital constituent of cells and

spinach is a good source of folic acid, but boiling spinach leaves more than half of the level of folatecan left in the spinach leaves, while through microwaving which does not affect folate content (Ball, 2006)

Salinity adversely affects important physiological and biochemical processes in plants ultimately leading to reduction in plant growth and development (Munns, 2002; Tester and Davenport, 2003). These adverse effects are induced by either restricting the flow of water and nutrients into the plants or by direct injury to plant cells through the accumulation of toxic ions (Apse and Blumwald, 2002). Plant response to salinity stress occurs in two phases: an initial and rapid response to the elevation in external osmotic pressure and a slower response due to the buildup of Na+ inside the plant cells (Munns*et al.,* 2006). When salt concentrations in the soil increase, the osmotic potential of the medium decreases, restricting the flow of water and nutrients through the roots membrane leading to reduction in plants growth and development (Volkamar*et al.,*1998). Other effects of osmotic stress include inhibition of roots growth, decrease in stomatal water conductance leading to reduction in the rate of photosynthesis (Munns*et al.,*2002).

Organic farming strives for a balance between a reasonable good yield, a high produce quality and a limited environmental impact. Inputs include plant residues and plant based composts, animals manures from various origin and stages of decomposition and additional fertilizers like rock dust (Anonymous, 2005). Soil fertility and especially soil biological fertility is promoted within organic farming for reasons of nutrient cycling, structure improvement or biodiversity (Fragstein, 2006). Very little research has been done to facilitate farmers to make choices between available amendments and improve soil fertility within the legal framework of organic farming.

This study was conducted to determine the effect of soil salinity levels and some organic materials as FYM, compost of rice straw, chicken manure and wood saw dust on growth, yield and nutrients uptake of spinach plants sprayed with ascorbic acid or not.

MATERIALS AND METHODS

A pot experiments was carried out in the experimental farm of Fac. of Agric.; Mansoura University during the winter cultivation of 2010 and 2011 to investigate the impact of minimizing levelseffect of salinity on spinach plant (*SpinaciaOleracea*) using some organic materials.

Thirty treatments were arranged in split-split block design, which three treatments of salinity levels, S_1(1.95), S2 (7.35), and S3 (9.40) ds /m in 1:5 soil water extractionwere assigned to main plots. While five treatments of organic materials, i.e; farmyard manure (F.Y.M.), chicken manure (Ch.M.),compost of rice straw, wood saw dust and the untreated treatments (control) as sub-plots. Each treatment was investigatedtwice; one sprayed with ascorbic acid in foliar way and the other was not sprayed and arranged

as sub-sub plots. Thus, the total number of pots required for each cultivation was 90 pots.

Ninety plastic pots(25 cm diameter and 35 cm height)were filled with 10 kg air-dried soil collected from the surface layer (0-30cm) of three locations located near EL-SerwAgric. Research Station.Some physical and chemical properties are shown in Table (1).

Table (1): Somephysical and chemical properties of the usedsoilduring the1st and 2ndcultivations:

Soil characters		L_1	L_2	L_3
Mechanical analysis (%)	Coarse sand	2.9	2.6	1.8
	Fine sand	22.6	18.1	14.7
	Silt	32.1	31.4	29.7
	Clay	42.4	47.9	53.8
	Texture class	Clayey	Clayey	Clayey
E.C. dS.m^{-1}(1:5)		0.39	1.47	1.88
pH (1:2.5)		8.27	8.12	8.09
S.P. %		61	63	65
O.M. %		1.44	1.37	1.19
T. $CaCO_3$ %		1.93	2.44	2.87
Water soluble ions meq/100g soil	Ca^{++}	0.64	1.96	2.53
	Mg^{++}	0.47	1.67	2.02
	Na^{+}	0.82	3.75	4.91
	K^{+}	0.06	0.15	0.17
	CO_3^{--}	-	-	-
	HCO_3^{-}	0.42	2.03	2.19
	Cl^{-}	0.77	3.93	4.88
	SO_4^{--}	0.80	1.57	2.56
Available (mg/kg)	N	53.6	42.4	40.7
	P	4.93	4.16	3.92
	K	366	345	318

The experimental pots were mixed with organic materials at the rate of 10 ton.fed^{-1}, i.e; 100gm per pot were added in the surface layer (0-15 cm) for 10 days. Some chemical properties of used organic materials are presented in Table (2)

Table (2): Some chemical properties of the used organic materials during both 1st and 2ndcultivations:

materials	O.M% %	C %	T.N%	C/N	SP%	P(ppm)	K(ppm)
FYM	49.2	28.6	1.87	15.3:1	193	361	1020
C.H.M	56.1	32.6	2.63	12.4:1	210	392	1175
Rice straw	50.8	29.5	1.59	18.6:1	145	346	936
Wood dust	8.5	4.9	0.06	82:1	240	2.3	52

Twenty seeds/pot of spinach cv. DASH were sown on 22 November and 20 January (2010 and 2011), respectively at equal distance and depth. After 15 days of sowing,the plants were thinned to the ten uniform plants per pot. Then after another 15 days the second thinningwas done at the five

uniform plants per pot.Soil moisture was kept at 70% filed capacity by watering to the constant weights every 5-7 days by weighing pots.

The fertilizers NPK were added for spinach plants as recommended by the Ministry of Agriculture and LandReclamation, 100 kg.fed^{-1} N as ammonium sulphate (20.5% N), 150 kg.fed^{-1} as super phosphate (15.5% P_2O_5) and 50 kg.fed^{-1} K as Potassium sulphate (48%K_2O). P fertilizer was added to the soil before sowing, while N & K fertilizers were added in two equal doses; one after 15 days from sowing and the other dose after two weeks.

Ascorbic acid obtained from El-Gomhoria Co.; Mansoura, Egypt, was applied at rates of zero (control) and400 ppm/pot. Ascorbic acid was foliarly applied twice; one after the second thinning of spinach plants and the other one after two weeks later from the 1st spraying.

At marketing stages; 45 days after sowing of spinach plants; 5 plants were randomly taken from each experimental plot; put in paper bags and transfer immediately to the laboratory. Fresh weight of plants was determined; the plants were oven dried at 70^{o}C till constant weight. Then, the dried plantswere weighed (dry weights, g/plant) and stored for chemical analysis.

♠ **Soil analysis:**

* The electrical conductivity values of the 1: 5 soil water extract were measured by EC meter according to the method of *US Salinity Lab (1954).*
* pH value, $CaCO_3$ and organic matter content were determined according to *Jackson(1967)*.
* Particle size distribution was determined according to *Piper (1950)*.
* Available N, P and K in the soil were determined according to the methods of *Bremner and Mulvany(1982), Olsen and Sommers(1982)*and *Black(1965).*
* Available Ca, Mg and Na were extracted by the methods outlined by *Black(1965)* and determined by using flame photometer.

♠ **Plant Analysis*:***

* Total N and P were determined in the digested plant materials using the methods of *Pregle(1945), Jackson(1967)*, *respectively.*
* Total K, Ca, Mg and Na were determined in the digested solution of plant materials using the methods of *Black(1965).*

All obtained data were subjected to statistical analysis according to Gomez and Gomez(1984). Means of treatments were compared using least significant differences (LSD).

RESULTS AND DISCUSSION

Fresh and dry weights (g) of spinach leaves:

Data presented in Table (3) showed the effect of salinity levels, some organic materials and ascorbic acid on fresh and dry weights (g/plant) of spinach leaves plant and its interactions during both cultivations of the experiment.

Table (3): Interaction effect of salinity levels and organic materials on fresh and dry weights (g) of spinach plant leaves during 1st and 2nd cultivations:

Cha. / Treat.			Fresh weights 1st	Fresh weights 2nd	Dry weights 1st	Dry weights 2nd
A: Salinity levels						
S1			13.59	12.97	1.50	1.17
S2			11.61	11.04	1.28	0.99
S3			9.14	8.66	1.01	0.78
L.S.D at 0.0 5			**0.04**	**0.02**	**0.01**	**0.01**
B: Organic materials						
0			10.73	10.12	1.18	0.91
FYM			11.81	11.22	1.30	1.01
C.H.M			12.27	11.71	1.35	1.05
Compost rice straw			11.39	10.87	1.25	0.98
Wood saw dust			11.02	10.53	1.21	0.95
L.S.D at 0.05			**0.07**	**0.06**	**0.01**	**0.01**
C: Foliar application						
0			10.84	10.27	1.19	0.92
AS			12.05	11.51	1.33	1.04
F. Test			**	**	**	**
L.S.D at 0.05			**0.10**	**0.09**	**0.01**	**0.01**
D: Interactions						
S1	**0**	**0**	11.90	11.36	1.32	1.02
		AS	13.71	13.16	1.51	1.18
	FYM	**0**	13.24	12.55	1.46	1.13
		AS	14.81	14.24	1.63	1.28
	C.H.M	**0**	13.44	12.71	1.48	1.14
		AS	15.28	14.68	1.68	1.32
	Rice straw	**0**	12.72	12.13	1.40	1.09
		AS	14.40	13.77	1.58	1.24
	Wood dust	**0**	12.31	11.63	1.35	1.05
		AS	14.06	13.43	1.55	1.21
S2	**0**	**0**	10.48	9.75	1.15	0.88
		AS	11.70	10.97	1.29	0.99
	FYM	**0**	11.32	10.66	1.25	0.96
		AS	12.45	11.77	1.37	1.06
	C.H.M	**0**	11.73	11.27	1.29	1.01
		AS	13.15	12.41	1.45	1.12
	Rice straw	**0**	10.80	10.42	1.19	0.94
		AS	12.16	11.66	1.34	1.05
	Wood dust	**0**	10.62	10.25	1.17	0.92
		AS	11.67	11.22	1.28	1.01
S3	**0**	**0**	8.00	7.48	0.88	0.67
		AS	8.61	8.01	0.95	0.72
	FYM	**0**	9.22	8.59	1.01	0.77
		AS	9.86	9.47	1.09	0.85
	C.H.M	**0**	9.66	9.09	1.06	0.82
		AS	10.36	10.11	1.14	0.91
	Rice straw	**0**	8.67	8.25	0.95	0.74
		AS	9.60	8.97	1.06	0.81
	Wood dust	**0**	8.44	7.89	0.93	0.71
		AS	8.99	8.73	0.99	0.79
L.S.D at 0.05			**N.S**	**N.S**	**N.S**	**N.S**

Concerning the effect of salinity levels data in Table (3) revealed that; the mean values of fresh and dry weights (g/plant) of spinach leaves were significantly decreased due to increasing salinity level from S_1 to S_3. Fresh and dryweights (gm/plant) were decreased by 14.57 & 32.74% for fresh weights and 14.67 & 32.67% for dry weights in the 1st cultivation for S2 and S3 respectively compared to S_1. The same trend was realized for spinach plant during 2nd cultivation of the experiment due tothe effect of salinity on water, nutrients uptake and nutrients balance and also to toxic effect of NaCl.

Regarding the effect of organic materials on fresh and dry weights (g/plant), data in Table (3) indicated that the mean values of fresh and dry weights (g/plant) increased significantly by adding organic material compared to the untreated treatment.The highest mean values of fresh and dry weights of spinach leaves were realized from the plants treated with chicken manure, while the lowest one was obtained with wood saw dust.The same trend was occurred during both cultivations of the experiment.Similar results were obtained by Abd-Alla*et al.,* (2001a), Hanaa*et al.,* (2005) and Masarirambi*et al.,* (2010).

As shown in Table (3) it could be observed that the average values of fresh and dry weights of spinach leaves treated with ascorbic acid were higher than the untreated treatment, this trend was true during the two experimental cultivation.

Concerning the interaction effect among studied treatments, data in the same Table (3) showed no significant effect on fresh and dry weights (g/plant) of spinach leaves during both cultivations.

Fresh and dry weights (g) of spinach roots:

Data in Table (4) showed the effect of salinity levels, some organic materials and ascorbic acid on fresh and dry weights (g/plant) of spinach roots plants and their interactions during both cultivations of the experiment.

Increasing salinity levels from S_1 to S_3led to a significantly decrease in fresh and dry weights of spinach roots.

The highest mean values of fresh and dry weights (g/plant) of spinach roots were found to be associated with the addition of chicken manure, which recorded 1.55 and 0.31 (g/plant) for fresh and dry weights in the 1st cultivation and 1.10 & 0.24 (g/plant) in the 2nd cultivation, respectively.The lowest mean values of fresh and dry weights were obtained from the plants treated with wood saw dust. In this connect; fresh and dry weights were positively affected due to an addition of organic material and recorded higher magnitudes compared with untreated plants. It is due to the effect of organic material on improving soil physical and chemical properties helping plants to tolerate the higher level of salinity.

Concerning the effect of ascorbic acid, data in the same Table show thatsprayingwith ascorbic acid spinach plants was more effective for increasing fresh and dry weights of spinach roots than the untreated plants and this effect was significant.

The comparison among the means of the various combined treatments of salinity levels, organic materials and ascorbic acid as shown in Table (4) reflected a significant effect just with fresh weights in the

1st cultivation. Such effect did not reach to the level of significance among the values of fresh weights in 2nd cultivation and dry weightsin both cultivation.

Table (4): Interaction effect of salinity levels and organic materials on fresh and dry weights (g) of spinach roots during 1st and 2nd cultivations:

Cha. / Treat.			Fresh weights		Dry weights	
			1st	2nd	1st	2nd
A: Salinity levels						
S1			1.69	1.31	0.38	0.29
S2			1.44	1.12	0.32	0.25
S3			1.15	0.88	0.25	0.19
L.S.D at 0.05			**0.01**	**0.01**	**0.01**	**0.01**
B: Organic materials						
0			1.31	1.03	0.30	0.23
FYM			1.44	1.14	0.32	0.25
C.H.M			1.55	1.18	0.34	0.26
Compost rice straw			1.44	1.10	0.31	0.24
Wood saw dust			1.39	1.07	0.30	0.24
L.S.D at 0.05			**0.01**	**0.01**	**0.01**	**N.S**
C: Foliar application						
0			1.37	1.04	0.30	0.23
AS			1.48	1.16	0.33	0.26
F. Test			**	**	**	**
L.S.D at 0.05			**0.01**	**0.01**	**0.01**	**0.01**
D: Interaction						
S1	**0**	**0**	1.51	1.15	0.33	0.25
		AS	1.74	1.33	0.38	0.29
	FYM	**0**	1.68	1.27	0.36	0.28
		AS	1.56	1.44	0.41	0.32
	C.H.M	**0**	1.71	1.29	0.37	0.28
		AS	1.93	1.48	0.42	0.33
	Rice straw	**0**	1.61	1.23	0.35	0.27
		AS	1.81	1.39	0.40	0.31
	Wood dust	**0**	1.55	1.18	0.34	0.26
		AS	1.78	1.36	0.39	0.30
S2	**0**	**0**	1.32	0.99	0.29	0.22
		AS	1.18	1.11	0.32	0.24
	FYM	**0**	1.43	1.08	0.31	0.24
		AS	1.57	1.19	0.34	0.26
	C.H.M	**0**	1.48	1.14	0.32	0.25
		AS	1.67	1.25	0.36	0.28
	Rice straw	**0**	1.37	1.05	0.30	0.23
		AS	1.54	1.18	0.33	0.26
	Wood dust	**0**	1.35	1.04	0.29	0.23
		AS	1.47	1.13	0.32	0.25
S3	**0**	**0**	1.01	0.76	0.22	0.17
		AS	1.09	0.81	0.24	0.18
	FYM	**0**	1.16	0.87	0.25	0.19
		AS	1.24	0.96	0.27	0.21
	C.H.M	**0**	1.21	0.92	0.27	0.20
		AS	1.31	1.02	0.28	0.22
	Rice straw	**0**	1.09	0.83	0.24	0.18
		AS	1.21	0.91	0.26	0.20
	Wood dust	**0**	1.07	0.80	0.23	0.18
		AS	1.14	0.88	0.25	0.19
L.S.D at 0.05			**0.05**	**N.S**	**N.S**	**N.S**

NPK-uptake (mg/plant) of spinach leaves and roots:

Data illustrated in Table (5) reflect the effect of salinity levels, organic materials and ascorbic acid on N, P & K uptake (mg/plant) in the foliage of spinach plant and its interactions during the two cultivations of the experiment.

Table (5): Interaction effect of salinity levels and organic materials on NPK-uptake (mg/plant) of spinach leaves during 1st and 2nd cultivations:

Cha. / Treat.			N-uptake mg/plant		P-uptake mg/ plant		K-uptake mg/ plant	
			1st	2nd	1st	2nd	1st	2nd
A: Salinity levels								
S1			70.37	51.84	7.36	5.98	47.28	34.32
S2			52.29	38.00	5.64	4.49	30.65	23.23
S3			31.81	23.70	4.00	3.17	17.72	13.86
L.S.D at 0.05			**2.78**	**0.46**	**0.04**	**0.06**	**1.08**	**0.46**
B: Organic materials								
0			46.89	32.99	4.84	3.84	24.38	18.30
FYM			54.28	40.06	6.09	4.83	36.17	25.78
C.H.M			58.38	43.35	6.60	5.30	39.38	30.20
Compost rice straw			50.46	37.51	5.60	4.49	31.72	23.94
Wood saw dust			47.31	35.28	5.18	4.24	27.69	20.87
L.S.D at 0.05			**2.43**	**0.34**	**0.04**	**0.05**	**0.89**	**0.36**
C: Foliar application								
0			46.26	33.54	5.06	4.04	28.14	20.66
AS			56.72	42.16	6.27	5.05	35.63	26.95
L.S.D at 0.05			**1.75**	**0.32**	**0.05**	**0.05**	**0.64**	**0.24**
D: Interaction								
S1	**0**	**0**	54.39	39.78	5.47	4.40	32.38	24.10
		AS	71.23	52.47	7.12	5.78	42.43	32.02
	FYM	**0**	66.19	48.17	7.00	5.57	46.77	24.37
		AS	83.40	61.82	8.84	7.17	59.39	44.41
	C.H.M	**0**	68.42	49.97	7.51	6.03	49.83	37.05
		AS	88.53	65.43	9.67	7.87	63.95	48.49
	Rice straw	**0**	61.09	44.95	6.33	5.12	41.35	30.63
		AS	78.21	58.12	8.13	6.58	52.88	39.67
	Wood dust	**0**	57.06	42.14	5.89	4.89	36.14	27.12
		AS	75.17	55.54	7.61	6.42	47.63	35.37
S2	**0**	**0**	52.67	29.86	4.35	3.43	20.55	15.52
		AS	51.26	37.42	5.41	4.25	25.58	19.40
	FYM	**0**	48.29	35.68	5.49	4.25	30.75	23.23
		AS	58.73	43.74	6.67	5.23	38.00	28.73
	C.H.M	**0**	51.95	38.92	5.83	4.66	34.61	26.66
		AS	65.25	47.94	7.20	5.71	44.57	32.74
	Rice straw	**0**	44.55	33.62	5.01	4.03	26.66	20.75
		AS	56.02	41.79	6.20	4.98	33.72	25.41
	Wood dust	**0**	42.90	32.02	4.63	3.77	23.44	17.91
		AS	51.33	39.05	5.66	4.56	28.67	21.95
S3	**0**	**0**	23.96	17.69	3.05	2.40	11.82	8.69
		AS	27.86	20.71	3.64	2.81	13.49	10.05
	FYM	**0**	32.57	23.28	3.99	3.10	19.46	14.76
		AS	37.24	28.00	4.64	3.73	23.15	18.84
	C.H.M	**0**	35.02	26.18	4.34	3.42	17.95	16.38
		AS	41.12	31.67	5.04	4.12	25.35	19.87
	Rice straw	**0**	28.21	21.34	3.61	2.83	16.18	12.43
		AS	34.66	25.27	4.35	3.42	19.53	14.77
	Wood dust	**0**	26.63	19.48	3.39	2.63	14.14	10.32
		AS	30.79	23.44	3.91	3.19	16.10	12.53
L.S.D at0.05			**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**0.94**

The different comparisons tabulated in Table (5) indicate that with increasing levels of salinity the average values of N, P & K uptake (mg/plant) in the foliage of spinach plant were significantly decreased during the two cultivations.

It has been demonstrated from the data in Table (5) that adding of chicken manure as organic material was superior for increasing N, P & K uptake (mg/plant) of the foliage of spinach plant followed by an addition of FYM, compost of rice straw and finally wood saw dust as compared with control.

Results in Table (5) show that sprayingby ascorbic acid, statistically increased N, P & K uptakes (mg/plant) of the foliage of spinach plant than those obtained with not sprayed plantsby ascorbic acid. Such effect was detected during both of the cultivations.

According to the data illustrated in Table (5) it can be observed that the interaction effect between salinity levels, organic materials and ascorbic acid had no significant effect on the values of these parameters. Such effect was the same during both cultivation of the experiment. Except for K-uptake mg/plant in the second cultivation which had a significant effect and recorded the highest value with ascorbic acid and chicken manure at S1 of salinity levelwhich was 48.49 mg/plant.

Data in Table (6) show the effect of salinity levels, organic material and ascorbic acid as well as their interaction on N, P & K uptake (mg/plant) by spinach roots during both cultivations of the experiment.

With regard to the effect of salinity levels, table (6) shows that the mean values of N, P & K uptake (mg/plant) by spinach roots were significantly decreased as the level of salinity was increased. Similar results were obtained by Farouk (2005), Yousif (2007) and Metwally (2009)who found that salinity stress levels (2000, 4000 or 6000 mg/l) decreased N, P, K and Ca while increased Na content in the shoots of pepper plant.

Regarding the effect of adding organic materials FYM, chicken manure, compost of rice straw and wood saw dust to soil, data in the same Table reflect that; the average of N, P & K uptake (mg/plant) by spinach roots were increased over the control treatment by 21.50, 30.95, 13.38 & 5.39% for N-uptake, 25.15, 34.50, 18.71 & 7.02% for P-uptake and 51.93, 64.35, 23.13 & 15.42% for K-uptake in the 1stcultivation for the treatments of FYM, chicken manure, compost of rice straw and wood saw dust, respectively. The same trend was true in the 2ndcultivation. These results are in accordance with those obtained byDatt*et al.,* (2003),El-Mansi*et al.,* (2004),Abou El-Magd*et al.,* (2008) andDikinya and Mufwanzala (2010)who found that significant increase of nitrogen and phosphorus were observed following the addition of chicken manure to spinach plants (*Spinacia Oleracea*).

The illustrated average values of N, P & K uptake (mg/plant) by spinach roots were significantly increased by spraying ascorbic acid compared with not sprayed plants. It can be explained on the basis that ascorbic acid helps in activation may enzymes and hormons in plant. These results are in agreement with those obtained by El-Ghamriny *et al.* (1999), Sakr and Gadalla (2009a) and Metwally (2009).

The difference between the average values of N, P & K uptake (mg/plant) by spinach roots as affected by salinity levels, organic material and ascorbic acid had no significant effect in general except N and P uptake in the 1st cultivation which had a significant effect and recorded the highest values with spraying ascorbic acid and adding chicken manure at the 1st level of soil salinity of studied experiment.

Table (6): Interaction effect of salinity levels and organic materials on NPK-uptake (mg/plant) of spinach roots during 1st and 2nd cultivations

Treat.	Cha.		N-uptake (mg/plant)		P-uptake (mg/ plant)		K-uptake (mg/ plant)	
			1st	2nd	1st	2nd	1st	2nd
A: Salinity levels								
S1			19.25	14.19	2.01	1.61	14.91	11.52
S2			16.31	12.19	2.09	1.68	13.08	9.95
S3			13.38	9.74	1.90	1.47	8.64	6.68
L.S.D at 0.05			**0.21**	**0.57**	**0.01**	**0.05**	**0.84**	**0.19**
B: Organic materials								
0			14.28	10.19	1.71	1.35	9.34	7.07
FYM			17.35	12.91	2.14	1.68	14.19	10.70
C.H.M			18.70	13.98	2.30	1.86	15.35	11.74
Compost rice straw			16.19	11.92	2.03	1.58	11.50	9.31
Wood saw dust			15.05	11.23	1.83	1.49	10.78	8.20
L.S.D at 0.05			**0.30**	**0.51**	**0.02**	**0.04**	**N.S**	**0.15**
C: Foliar application								
0			15.93	11.64	1.95	1.55	12.12	9.14
AS			16.69	12.44	2.04	1.63	12.30	9.63
L.S.D at 0.05			**0.23**	**0.35**	**0.02**	**0.03**	**N.S**	**0.14**
D: Interaction								
S1	**0**	**0**	16.68	12.41	1.71	1.33	11.88	8.84
		AS	17.76	13.26	1.78	1.45	12.64	9.72
	FYM	**0**	20.00	14.61	2.08	1.65	16.84	12.46
		AS	20.32	15.40	2.14	1.75	17.22	12.97
	C.H.M	**0**	19.93	15.43	2.20	1.83	17.66	13.14
		AS	22.07	16.28	2.39	1.94	19.15	14.26
	Rice straw	**0**	19.84	13.55	2.16	1.55	15.63	11.48
		AS	19.49	14.26	2.03	1.60	10.37	11.94
	Wood dust	**0**	17.19	12.99	1.70	1.44	13.37	9.84
		AS	19.17	13.75	1.89	1.55	14.37	10.56
S2	**0**	**0**	14.49	10.65	1.75	1.40	9.27	7.04
		AS	15.09	11.29	1.87	1.50	10.19	7.72
	FYM	**0**	16.71	12.42	2.15	1.71	15.00	11.01
		AS	17.49	13.04	2.28	1.80	15.11	11.52
	C.H.M	**0**	17.93	13.50	2.35	1.88	16.20	12.62
		AS	19.77	14.22	2.49	1.98	17.06	12.99
	Rice straw	**0**	15.39	11.65	2.01	1.64	12.17	9.52
		AS	16.48	12.36	2.13	1.75	13.08	9.77
	Wood dust	**0**	14.63	11.22	1.90	1.56	11.12	8.55
		AS	15.11	11.58	1.98	1.59	11.56	8.79
S3	**0**	**0**	10.68	5.56	1.51	1.14	6.10	4.51
		AS	10.95	7.97	1.63	1.26	5.95	4.58
	FYM	**0**	14.61	10.68	2.02	1.56	9.99	7.65
		AS	14.90	11.17	2.10	1.54	10.32	7.99
	C.H.M	**0**	16.18	11.72	2.12	1.71	10.85	8.53
		AS	16.30	12.74	2.25	1.80	11.17	8.89
	Rice straw	**0**	12.57	9.69	1.93	1.47	8.58	6.24
		AS	13.39	9.99	1.93	1.50	9.19	6.88
	Wood dust	**0**	12.06	8.57	1.73	1.35	7.11	5.61
		AS	12.11	9.27	1.78	1.43	7.13	5.87
L.S.D at 0.05			**0.88**	**N.S**	**0.09**	**N.S**	**N.S**	**N.S**

Ca, Mg & Na-uptake (mg/plant)of spinach leaves and roots:

Ca, Mg and Na-uptake (mg/plant) of spinach foliage as influenced by salinity levels, organic material and ascorbic acid as well as their interactions are presented in Table (7) during both cultivationsof the experiment.

Table (7): Interaction effect of salinity levels and organic materials on Ca, Mg & Na-uptake (mg/plant) of spinach leaves during 1st and 2ndcultivations

Cha. / Treat.			Ca mg/plant		Mg mg/plant		Na mg/plant	
			1st	2nd	1st	2nd	1st	2nd
A: Salinity levels								
S1			10.79	7.45	8.18	5.88	6.69	4.86
S2			11.68	8.06	9.24	6.41	7.05	4.87
S3			12.37	8.36	9.52	6.41	7.27	4.89
L.S.D at 0.05			**0.37**	**0.29**	**0.30**	**0.32**	**0.08**	**N.S**
B: Organic materials								
0			13.29	8.99	10.14	6.95	8.21	5.67
FYM			10.52	7.08	8.49	5.80	6.31	4.39
C.H.M			9.89	6.78	7.77	5.47	5.94	4.09
Compost rice straw			11.79	8.11	9.18	6.32	7.00	4.83
Wood saw dust			12.50	8.72	9.25	6.61	7.48	5.34
L.S.D at 0.05			**0.30**	**0.21**	**0.36**	**0.23**	**0.21**	**0.20**
C: Foliar application								
0			10.42	7.09	8.14	5.52	6.29	4.31
AS			12.81	8.82	9.83	6.95	7.71	5.44
L.S.D at 0.05			**0.20**	**0.11**	**0.18**	**0.15**	**0.17**	**0.11**
D: Interaction								
S1	**0**	**0**	10.43	7.20	8.32	6.09	7.43	5.17
		AS	13.58	9.68	10.87	7.86	9.76	7.00
	FYM	**0**	8.80	5.95	6.96	4.63	4.97	3.73
		AS	10.65	7.59	8.58	6.06	6.47	4.78
	C.H.M	**0**	8.44	5.51	5.87	4.07	4.73	3.39
		AS	10.58	7.39	7.17	5.81	6.33	4.53
	Rice straw	**0**	9.66	6.61	7.66	5.19	5.98	3.96
		AS	12.22	8.51	9.27	6.69	7.06	5.20
	Wood dust	**0**	10.12	7.04	7.92	5.36	6.39	4.72
		AS	13.38	9.03	9.20	7.03	7.75	6.13
S2	**0**	**0**	12.65	8.48	9.47	6.34	7.25	5.10
		AS	15.83	10.76	11.96	8.09	9.12	6.07
	FYM	**0**	9.59	6.40	8.00	5.41	5.96	4.07
		AS	11.55	7.70	9.72	6.68	7.17	4.98
	C.H.M	**0**	8.29	5.52	7.05	4.85	5.17	3.50
		AS	10.39	7.20	8.75	6.12	6.23	4.18
	Rice straw	**0**	10.79	7.64	8.61	5.79	6.31	4.35
		AS	13.22	9.24	10.14	7.14	8.04	5.63
	Wood dust	**0**	11.04	7.85	8.58	6.19	7.06	4.88
		AS	13.49	9.76	10.16	7.51	8.19	5.92
S3	**0**	**0**	12.46	8.15	9.33	6.12	7.13	4.73
		AS	14.79	9.67	10.89	7.17	8.55	5.93
	FYM	**0**	10.67	7.11	8.42	5.42	6.30	4.05
		AS	12.35	8.28	9.77	6.77	7.45	4.98
	C.H.M	**0**	9.97	6.78	8.20	5.22	6.11	3.99
		AS	11.66	8.25	9.62	6.73	7.06	4.98
	Rice straw	**0**	11.06	7.67	8.71	5.92	6.56	4.39
		AS	13.78	9.02	10.67	7.18	8.05	5.43
	Wood dust	**0**	12.33	8.40	9.01	6.20	7.04	4.57
		AS	14.65	10.24	10.62	7.40	8.45	5.82
L.S.D at 0.05			**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**

Obtained data at Table (7) indicated that the average of all the above mentioned parameters were significantly increased due to increasing salinity levels and the highest values were realized with S3 level as compared with S1 level. This can be attributed that cations are components of salts in the studied soil and their values are increased with increasing salinity.

With respect to the effect of organic material it can be noticed from the data in Table (7) that; adding organic materials significantly affected Ca, Mg and Na-uptakes (mg/plant) by spinach foliage. The highest values of Ca, Mg and Na-uptake (mg/plant) by spinach foliage were recorded with adding wood saw dust compared with control. On the other hand the lowest values were recorded with adding chicken manure.It due to the chemical effect of chicken manure on these nutrients uptake.

The effect of ascorbic acid on Ca, Mg and Na-uptake (mg/plant) by spinach foliage, data indicated that there are significant increases with spraying ascorbic acid compared with untreated plant.

Concerning the effect of the interaction, data in Table (7) indicated that; Ca, Mg and Na-uptake (mg/plant) of spinach foliage had no significant effect due to addition of organic materials and spraying ascorbic acid under any levels of studied soil salinity. This trend was happened during the both cultivations of the experiment.

Data in Table (8) indicated the effect of salinity levels, organic materials and ascorbic acid as well as their interactions on Ca, Mg and Na-uptake (mg/plant) of spinachroots during both cultivations of the experiment.

It is evident from data in Table (8) that, salinity levels had a significant effect on Ca, Mg and Na-uptake (mg/plant) by spinachroot,taken on consideration the effect of salinity levels the mean values of Ca, Mg and Na-uptake (mg/plant) of spinachroot were decreased with increasing salinity level from S_1 to S_3.

With regard to the effect of organic materials in forms of FYM, chicken manure, compost of rice straw and wood saw dust, data in Table (8) revealed that there were a significant differences between the average values of Ca, Mg and Na-uptake (mg/plant) of spinachroots due to adding organic materials. Comparing with the untreated plants, Ca, Mg and Na-uptakes were decreased by 26.09, 29.75, 14.87 & 8.70% for Ca-uptake, 13.37, 25.87, 12.21& 2.33% for Mg-uptake and 22.88, 21.40, 13.28 & 7.75% for Na-uptake in the 1stcultivation for the treatments of FYM, chicken manure, compost of rice straw and wood saw dust. The same trend was true in the 2ndcultivation.

The average values of Ca, Mg and Na-uptake (mg/plant) of spinachroots were significantly decreased due to spraying with ascorbic acid.

As for the interaction effect between the previously mentioned parameters data in the same table also showed no significant effect on Ca, Mg and Na-uptake (mg/plant) of spinachroots during both cultivations.

Table (8): Interaction effect of salinity levels and organic materials on Ca, Mg & Na-uptake (mg/plant) of spinach roots during 1st and 2nd cultivations

Cha. / Treat.			Ca (mg/plant)		Mg (mg/plant)		Na (mg/plant)	
			1st	2nd	1st	2nd	1st	2nd
A: Salinity levels								
S1			4.30	3.45	3.63	2.57	2.96	2.09
S2			3.62	2.57	3.17	2.04	2.15	1.56
S3			3.13	2.30	2.41	1.65	1.97	1.45
L.S.D at 0.05			**0.17**	**0.18**	**0.09**	**0.15**	**0.22**	**0.15**
B: Organic materials								
0			4.37	3.17	3.44	2.26	2.71	2.01
FYM			3.23	2.39	2.98	1.92	2.09	1.55
C.H.M			3.07	2.43	2.55	1.72	2.13	1.33
Compost rice straw			3.72	2.86	3.02	2.19	2.35	1.80
Wood saw dust			3.99	2.99	3.36	2.36	2.50	1.80
L.S.D at 0.05			**0.20**	**0.17**	**0.19**	**0.14**	**0.27**	**0.13**
C: Foliar application								
0			3.72	2.78	3.15	2.12	2.33	1.71
AS			3.65	2.77	2.98	2.06	2.39	1.69
L.S.D at 0.05			**N.S**	**N.S**	**0.14**	**N.S**	**N.S**	**N.S**
D: Interaction								
S1	**0**	**0**	5.33	3.85	4.14	3.06	3.65	2.58
		AS	5.08	3.70	4.42	2.83	3.53	2.60
	FYM	**0**	4.04	3.09	3.26	2.33	2.68	1.95
		AS	3.81	2.81	3.20	2.22	2.50	1.96
	C.H.M	**0**	3.56	3.16	2.81	1.90	2.41	1.48
		AS	3.30	2.99	2.80	2.02	2.69	1.63
	Rice straw	**0**	3.74	3.64	3.59	2.72	2.84	2.11
		AS	4.63	3.55	3.47	2.72	2.58	2.02
	Wood dust	**0**	4.81	3.61	4.32	2.97	3.29	2.38
		AS	4.70	4.07	4.23	2.94	3.41	2.22
S2	**0**	**0**	4.37	3.52	3.68	1.96	2.53	1.93
		AS	4.64	3.27	3.14	2.18	2.45	1.85
	FYM	**0**	2.87	2.05	3.25	1.95	1.96	1.44
		AS	2.97	2.09	3.10	1.87	1.73	1.45
	C.H.M	**0**	2.88	2.19	3.27	1.95	1.59	1.04
		AS	2.80	2.09	2.56	1.68	2.28	1.16
	Rice straw	**0**	3.97	2.67	3.05	2.10	2.03	1.75
		AS	3.66	2.59	3.08	2.14	2.63	1.82
	Wood dust	**0**	4.13	2.61	3.27	2.42	2.22	1.50
		AS	3.92	2.66	3.28	2.15	2.13	1.68
S3	**0**	**0**	3.52	2.30	2.76	1.86	1.85	1.63
		AS	3.29	2.40	2.50	1.66	2.25	1.44
	FYM	**0**	3.10	2.13	2.59	1.64	1.96	1.39
		AS	2.76	2.29	2.43	1.50	1.85	1.28
	C.H.M	**0**	3.00	2.05	2.01	1.40	1.94	1.37
		AS	2.89	2.09	1.86	1.36	1.90	1.31
	Rice straw	**0**	3.10	2.44	2.53	1.73	1.93	1.58
		AS	3.25	2.27	2.37	1.70	2.08	1.54
	Wood dust	**0**	3.35	2.37	2.76	1.80	2.02	1.56
		AS	3.04	2.61	2.28	1.84	1.91	1.45
L.S.D at 0.05			**N.S**	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**

CONCLUSION

Under the same conditions of this investigation it could be recommended that; the most suitable organic material treatment was in the form of chicken manure with spaying ascorbic acid under the second level of salinity (1.47 ds/m). This gave the highest safe yield of spinach plants.

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تأثير استخدام بعض المواد العضويه على نمو ومحصول وامتصاص بعض العناصر فى نباتات السبانخ الناميه تحت ظروف ملحيه

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****معهد بحوث الاراضى والمياه والبيئه – مركز البحوث الزراعيه**

اجريت تجربه اصص فى مزرعه كليه الزراعه – جامعه المنصوره فى موسم شتاء عامى 2010 – 2011 لدراسه تأثير تقليل الضرر الملحى الحادث لنباتات السبانخ باستخدام بعض المواد العضويه.

نفذت معاملات التجربه فى قطع منشقه مرتين حيث وضعت تركيزات الملوحه الثلاث فى القطع الرئيسيه (1.95 و 7.35 و 9.40 ديسيمنز/ متر) وخمس معاملات الشقية الأولى للمواد العضويه (كنترول و سماد بلدى و زرق دواجن و كمبوست قش الارز و نشاره خشب) ثم رشت نصف هذه المعاملات بحمض الاسكوربيك والنصف الاخر لم يرش وهذه هى المعاملات الشقية الثانية.

اظهرت نتائج البحث انه بزياده ملوحه التربه حدث نقص فى الوزن الطازج والجاف لنباتات السبانخ وكذلك الممتص من العناصر (النيتروجين , الفوسفور و البوتاسيوم) بينما ازدادت قيم عناصر الصوديوم ، والماغنسيوم والكالسيوم الممتصه بزياده بزياده الاملاح فى التربه. كما العضويه زادت قيم الصفات المدروسه زياده معنويهباستخدام المخلفات.

وجد ان افضل معامله من المواد العضويه المستخدمه هى سماد زرق الدواجن حيث حقق أعلي امتصاص للعناصر المدروسه بينما كانت أقل القيم المتحصل عليها من العناصر الممتصه مع نشاره الخشب.

وجد أنه مع رش النباتات بحمض الاسكوربيك زادت قيم الصفات المدروسه كلها ماعدا القيم الممتصة من عناصر الكالسيوم ، الماغنسيوم و الصوديوم فى جذور نبات السبانخ.

قام بتحكيم البحث

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