content was higher in plants sprayed by foliar potassium fertilizers.

Table 5: Effect of potassium spray on photosynthetic pigments concentration in cotton leaves

Potassium spraying	Chl. a	Chl. b	Carot.	Chl. a +Chl. b
Without	8.90	3.54	1.83	12.44
Once	7.03	5.46	2.50	12.49
Twice	8.19	4.21	1.50	12.40
LSD $_{5\%}$	1.12	N.S	N.S	N.S

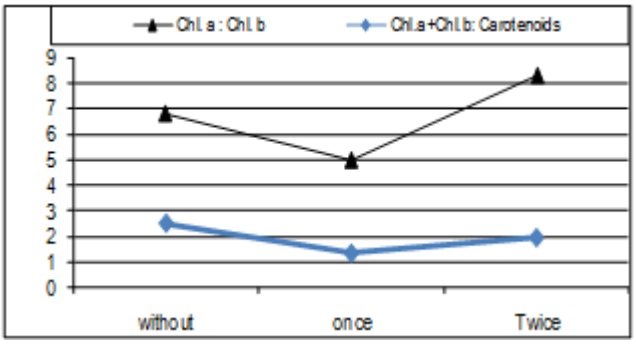

Figure 2: Effect of potassium spray on photosynthetic pigments concentration ratios in cotton leaves

c) Salinity X Potassium foliar application

The interactive effect of salinity and potassium foliar fertilization on chlorophyll and carotenoids were illustrated in Table (6) and Fig. (3). Data showed that in spite of the increment in carotenoids concentration by application potassium one time but sharply depressed when plants irrigated either by 3.91 or 7.82 dS/m salt level. Positive effect was detected in the concentration of this pigment by spray potassium fertilizer but the effect by two sprays was more than one only compare to that in the control plants. Data also clearly indicated that when plants irrigated regularly by tap water, the total chlorophyll increased by potassium treatment and the effect was more by twice application. In plants irrigated by water with 3.91dS/m this parameter lowered markedly by one spray and slightly two sprays. Under 7.82 dS/m salinity level total chlorophyll seemed to be without effect in plants received two potassium sprays increased while it increased by one spray. Kaya et al. (2001) concluded that supplementary P and K can reduce the adverse effects of high salinity on plant growth and physiological development. Kaya et al. (2007) demonstrated that chlorophyll content was decreased by salinity and supplementary NO_3 and proline treatments significantly ameliorated the adverse effect of salinity on growth, yield and physiological parameters.

Table 6: Effect of potassium spraying and salt stress on photosynthetic pigments in cotton leaves

Salinity dS/m	*Potassium spraying*	*Chl. a*	*Chl. b*	*Carot.*	*Chl.a+Chl.b*
0.38	Without	7.97	1.87	1.10	9.84
	Once	7.09	3.13	1.73	10.22
	Twice	8.18	3.50	1.92	11.68
3.91	Without	11.28	4.68	1.54	15.86
	Once	7.12	4.78	2.60	11.90
	Twice	8.66	4.40	1.15	13.06
7.82	Without	7.44	4.06	2.85	11.50
	Once	6.89	8.46	3.17	15.35
	Twice	7.72	4.72	1.43	12.44
L.S.D at 5%		N.S	N.S	3.04	N.S

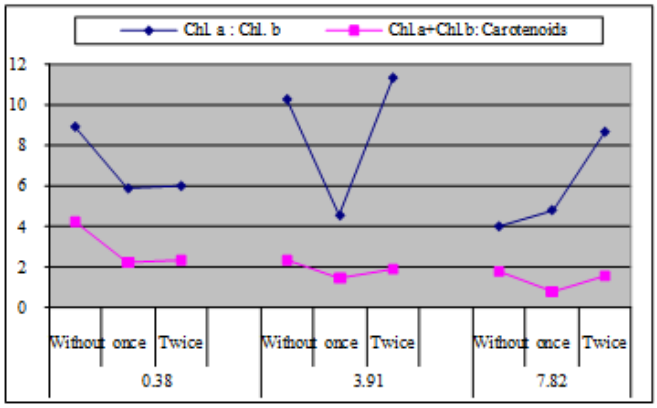

Figure 3: Effect of potassium spraying and salt stress on photosynthetic pigments ratios in cotton leaves

Macronutrients

a)Effect of salinity

Data in Table (7) and Fig. (4) indicated that nitrogen, phosphorus and potassium concentrations in cotton leaves increased as the salt concentration increased in irrigation water. Data in the same table showed that N content increased by the 1st level of salinity and tended to decreased by the highest salinity level used. Phosphorus content increased gradually with increasing salinity level. Nevertheless, K content (mg/plant) decline by both salinity treatment but the decrement by the 1st level of salt was little more than that caused by the 2nd level of salts in water of irrigation. Gouia et al. (1994) demonstrated that Na and Cl concentration increased in NaCl treated plants. The concentration of K, Ca and N were reduced in shoots and increased in roots. Heikal (2004) revealed that Na and Ca contents in all tested plants (Sunflower, wheat and radish) were decreased progressively with salinity while P was not affected. Potassium addition was positively correlated with nutrient content (N, P and K) of bean plants under salt stress conditions and the superiority for potassium silicate; this may be due to the role of potassium in water regulation, intake and increase water use efficiency (Abou- Baker et al., 2011), in addition to the role of potassium in mitigating the toxic effect of Na (Abou-Baker et al., 2012). In this concern Hussein et al. (2012) reported that uptakes of different elements (N, P and K of cotton leaves) were significantly affected with salt stress. This may be due to that effect of salinity was more clearly

on dry weight so that, data of uptake take the same trend of dry weight.

Table7 : Effect of salinity on macronutrients content in cotton leaves

Salinity dS/m	Content (mg/pot)		
	N	P	K
0.38	40.07	7.72	28.72
3.91	44.44	13.68	25.97
7.82	41.89	7.36	26.09
LSD at 5%	N.S	3.79	N.S

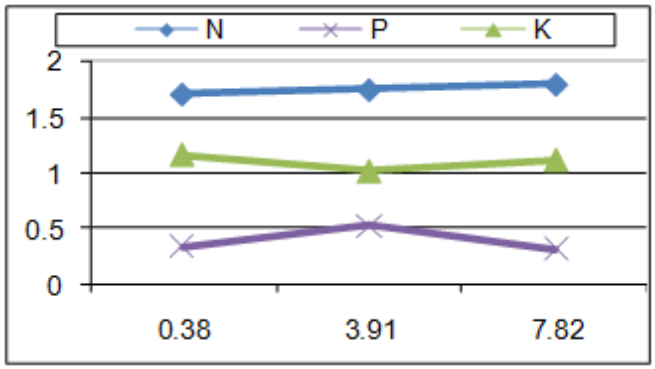

Figure 4: Effect of salinity on macronutrients concentration in cotton leaves.

b) Effect of potassium foliar application

Data presented in Table (8) and Fig. (5) showed that potassium chloride as foliar application increased the concentration as well as content of N, P and K in leaves; meanwhile, the increment with one application was more than two sprays**.** Hussein et al. (2006) found that N and K concentrations in shoots of barley plants were increased as a result of K application. Foliar application of K may offer the opportunity of correcting these differences more quickly and efficiently especially late in the season when soil application of K may not be effective. Also, to face the great needs of nutrients especially at the period of fruiting (Marchener, 1995 and Oosterhuis et al., 1995). On barley, Ouda et al. (2005) observed that application of K increased N, P and K percentages in grains. Chapagain and Wiesma (2004) found that chlorophyll, potassium, phosphate, magnesium and iron contents in the leaves were significantly higher in plants sprayed with potassium as Mono-potassium phosphate than that of non sprayed plants.

Table 8: Effect of potassium spraying on content of macronutrients in cotton leaves

Potassium spraying	Content (mg/pot)		
	N	P	K
Without	39.49	7.08	23.78
Once	49.87	12.66	31.94
Twice	37.79	9.63	22.22
LSD at 5%	N.S.	2.16	5.4

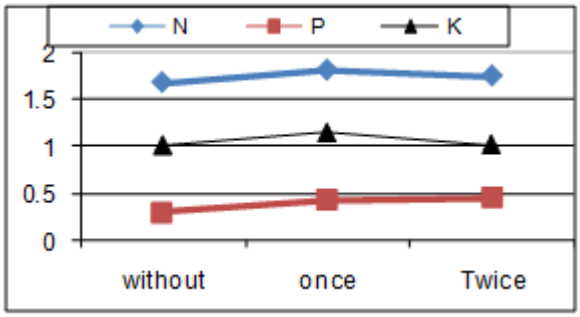

Figure 5: Effect of potassium spraying on concentration of macronutrients in cotton leaves.

c)Salinity X Potassium foliar application

The interactive effect of salinity and potassium chloride foliar spraying on the macronutrients concentration were recorded in Table (9**)** and Fig. (6). On the concentration of N, under irrigation by fresh water or with that contains the 1st level of salts, potassium one or two sprays seemed to be affected similarly; however, irrigation by diluted seawater with 7.82 dS/m, one spray of potassium only increased N concentration in leaves. The response of P concentration to K spraying under the 3rd level of salt or irrigated by fresh water regularly was approximately similar, while both K sprayings gave the same value by the 1st level of salt water. Data in Table (9) also cleared that application of one spray of K pronouncedly affected N and P concentrations under the high level of salt. Under fresh water irrigation K concentration increased by both number of sprays but the increase by one spray more than that with two sprays. Under the 1st level of salt in water of irrigation, sprays K showed the opposite effect on K concentration. Concerning the interactive effect on content of the above mentioned three macronutrients, the higher values N and K was by one spray of potassium chloride. This was true under the three salinity treatments. Meanwhile, K content showed similar response under the 1st level of salt or regular irrigation by fresh water, however, it decreased by one spray and increased by the two sprays compare to that of leaves without K application.

Table 9: Effect of potassium spraying and salinity on macronutrients content in cotton leaves.

Salinity dS/m	Potassium spraying	Content (mg/pot)		
		N	P	K
0.38	Without	37.0	4.54	14.98
	Once	49.69	9.19	50.83
	Twice	33.53	9.42	20.35
3.91	Without	39.12	9.15	28.14
	Once	56.96	19.20	32.0
	Twice	37.24	12.70	17.77
7.82	Without	42.34	7.54	28.23
	Once	42.86	7.85	22.44
	Twice	40.48	6.67	27.6
L.S.D at 5 %		N.S	N.S	N.S

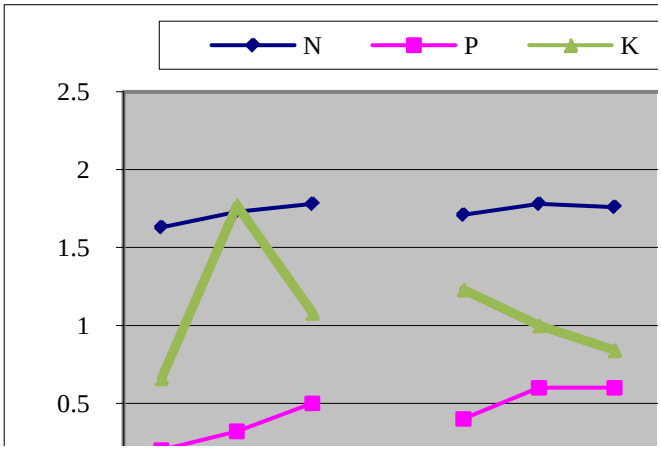

Figure 6: Effect of potassium spraying and salinity on macronutrients concentration in cotton leaves

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