EFFECT OF SOME CULTURAL PRACTICES ON CAULIFLOWER TOLERANCE TO SALINITY UNDER RAS SUDER CONDITIONS

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ABSTRACT

Cauliflower (*Brassica oleracea* var. botrytis) plants cv Toobi was cultivated during two successive seasons (2004-2005 and 2005-2006). The experiment was conducted at the Experimental Farm, Desert Research Center, Ras Suder Region, South Sinai Governorate, Egypt, to study the effect of ridge height (25 and 50cm) and magnetite level (0, 50, 100, 150 and 200 kg/fed) on the growth and yield. The obtained results indicated that growing cauliflower plants on the high ridge planting method affected positively the vegetative growth, curd weight, total yield, and nitrogen, phosphorus, potassium and iron contents in leaves and curds, but decreased sodium and chloride contents in leaves and sulphur contents in leaves and curds . Results also indicated that increasing magnetite levels led to increase the vegetative growth characters, curd weight, yield and mineral concentrations, i.e., nitrogen, phosphorus, potassium and iron in leaves and curds, but decreased sodium and chloride contents in leaves and sulphur contents in leaves and curds. The highest yield was produced when 200 kg magnetite/fed was added combined with using the high ridge planting method.

Key words: Cauliflower, Ridge height, Magnetite level, Vegetative growth, Total yield, Curd characters.

INTRODUCTION

Cauliflower (*Brassica oleracea* var. botrytis) plants cv. Toobi is considered as one of the most important vegetable crops in the winter season. In Egypt, the total area cultivated with cauliflower was about 9668 feddans yielding a total of 100156 ton , with an average of 10.36 ton/feddan (Ministry of Agriculture, 2005).

Cauliflower curd is known to be rich in niacin, vitamin C and moderate in calcium, phosphors and iron. The rapid and ever increased consumption of vegetables need more extension, both horizontal and vertical, especially in semi arid lands. These areas are characterized by high salinity in the soil and the major water resources. The harmful effects of salinity on plant growth, productivity and quality of curd may be reduced through application of natural rock as magnetite and growing the plants on the higher ridges.

Magnetite (magnetic iron) is one of the most important factors affecting plant growth. Application of iron increased the plant height as reported by Fawzi *et al.* (1993) on pea and cowpea and the production of dry matter as indicated by Eid *et al.* (1991) on garlic. Abd El-Al (2003) noticed that adding magnetic iron at a rate of 100 kg/fed increased plant height, leaf number and dry weight of eggplant (*Solanum melogena* L.) compared with control (no iron addition).

Ridge height planting method affect plant growth and development. Plant height was increased by using high ridge compared to low ridge (Tarawali and Mohamed-Saleem, 1985 on sorghum). Number of leaves (Bakhat *et al.* 2006 on maize) was increased when ridge method was used compared to flat one. Han *et al.*, 2001 on licorice, found that fresh and dry weight of plant in high ridge were 1.3 to 1.5 times as high as those in low one.

Takahashi *et al.* (2003) found that the nitrogen content of leaves in wheat cultivar Haruyutaka was higher on the high ridge bed than the low ridge bed.

The effect of iron fertilizer application on leaf chemical composition was studied by many investigators. Iron application increased Fe content of leaves as reported by Sharma *et al.* (2003) on mung bean. Fertilization with iron increased N (Maurya *et al*, 1993 on urd bean), P (Reddy and Malewar, 1992 on spinach), K (Singh *et al.*, 1995 on Frensh bean) and S (Krzywy and Gowacka, 1998 on radish).

Abd El-Al (2003) showed that addition of iron for eggplant at the time of cultivation resulted in the higher values of N, P, K, and Fe compared with the no iron addition.

Yield was significantly increased by iron application. Singal and Saraf (1995), on cauliflower, indicated that the yield was higher with Fe sprays than in water sprayed control .Addition of magnetic iron to eggplant resulted in the increasing yield when compared to no iron addition (Abd El-Al, 2003). Al-Said and Kamal (2005), on eggplant, showed that Fe-chelates at the highest rate increased average fruit weight, early total yield per feddan.

The yield of some crops is markedly influenced with ridge height. Takahashi *et al.* (2003) showed that the grain yield of wheat cultivars was higher on the high ridge bed than on the low ridge bed. In addition, Bakht *et al.* (2006) found that maximum grain and biological yield of maize was recorded in ridge planting compared flat planting.

Therefore, the aim of this work was to study the response of cauliflower plants to the height of ridge and application of magnetite under Ras Suder conditions.

MATERIALS AND METHODS

The experiments were conducted at Ras Sudr Research Station, Desert Research Center, at South Sinai Governorate, during the two successive growing seasons 2004/2005 and 2005/2006 to study the effect of the ridge height and magnetite level on vegetative growth, mineral composition and yield of Cauliflower plants cv Toobi.

Table (1) : Mechanical properties of the experimental soil.

Depth (cm)	$CaCO_3$ %	Coarse sand (1 – 0.5mm)	Fine sand (0.25 – 0.1mm)	Silt (0.05 - 0.002mm)	Total sand (0.1-1)	Clay < (0.002)	Class texture
				%			
0-30	56.99	53.68	27.60	8.05	81.28	10.79	Sandy loam
30-60	52.48	23.74	62.34	7.59	86.08	6.33	Sandy loam

The soil of the location was highly calcareous and saline. The mechanical and chemical analyses of the experimental soil are presented in Tables (1and 2). The soil analysis was carried out

according to Richards (1954), Black and Editor (1965) and Jackson (1967).

Table (2): Chemical properties of the experimental soil.

Depth (cm)	pH	EC dS/m2	Saturation soluble extract							
			Soluble anions (meq / 100g)				Soluble cations (meq / 100g)			
			CO^{-2}_3	HCO^{-}_3	SO^{-2}_4	Cl^{-}	Ca^{+2}	Mg^{+2}	Na^{+}	K^{+}
0-30	7.7	4.77	0.00	6.00	10.50	31.20	24.00	11.00	10.52	2.18
30-60	7.4	4.16	0.00	3.00	16.10	22.50	16.83	6.00	17.80	0.097

Cauliflower seeds cv Toobi were sown in nursery on July 1st of both seasons. Uniform transplants were obtained after 50 days from seed sowing in both seasons for field experiments.

The design of the field experiment was split plot with three replications in the first season and four replications in the second one. Every replicate included 10 treatments which were the combination of two ridge height planting methods and five magnetite levels. The main plots were devoted to the ridge height, while the sub-plots were occupied with the magnetite treatments. The experimental plots were established after ploughing twice, each was of 9 m^2 and consisted of 4 ridges, each ridge was 3 m length and 75 cm width. The distance between plants was 50 cm.

The experimental treatments:

Ridge height: Two ridge heights were used, namely 25 and 50 cm.

Magnetite: Five magnetite levels were tested, i.e., control (untreated), 50,100, 150 and 200 kg/fed. Magnetite rates were applied immediately just before transplanting.

The used magnetite contained 3.72 % SiO_2, 14.90% TiO_2, 1.23% Al_2O_3, 76.56% Fe_2O_3, 0.35% MnO, 1.21% MgO, 0.45% CaO, 0.42% Na_2O, 0.05% K_2O, 0.07% P_2O_5, 0.09% Cl, 0.05% SO_3 and 0.60% L.O.I, as reported by The Egyptian Geological Survey and Mining Authority.

All plots received 20 m^3 farmyard manure / fed, 150 kg calcium super phosphate / fed (15.5% P_2O_5), 50 kg potassium sulfate / fed (48-52% K_2O) and 100 kg ammonium sulfate / fed (20.5% N) before

transplanting and were mixed with the surface layer. All agricultural practices were carried as recommend.

The experiment site was irrigated immediately after transplanting and thereafter, it was irrigated at 7day intervals by saline water pumped from a well (4500 ppm). The surface irrigation method was used in the experiment. The analysis of irrigation water is given in Table (3).

Table 3: Chemical analysis of the irrigation water.

pH	Ec dS/m^2	Soluble anions (meq/l)				Soluble cations (meq/l)			
		CO^{-2}_3	HCO^{-}_3	SO^{-2}_4	Cl^{-}	Ca^{++}	Mg^{++}	Na^{+}	K^{+}
8.6	7.03	0.00	2.50	21.23	41.28	4.50	13.43	47.05	0.12

Data recorded:

Growth characteristics:

Random samples of three plants each were taken at harvest from each experimental plot to determine stem length, leaf number and total dry weight per plant. The plants were dried in an electric oven at 70° C to constant dry weight.

Yield:

The harvest started at 120 days from transplanting and it continued for about 16-25 days in the first and second seasons, respectively. Plants of the two inner ridges were used for yield determination. The curd characters, i.e., length, diameter and weight, were recorded at 120 days from transplanting.

Mineral composition:

Plant leaves and curd samples were taken at 80 and 120 days, respectively, from each plot. Samples were dried in an electric oven (60-70 ^{0}C) till a constant weight was reached. Samples were milled to a fine powder material and kept for mineral determination. Total nitrogen was determined by modified microkjeldahl method according to Peach and Tracey (1956). Phosphorus determination method depended on the formation of a blue complex between ammonium molybdate in the presence of ascorbic acid (reducing agent) according to Rowell (1993). The samples were measured with spectrophotometer at 880 nm. Potassium and sodium were measured

by flame photometer as described by Irri (1976). Chloride contents of the samples were determined according to Jackson and Thomson (1960), iron was determined by atomic absorption spectrophotometer as described by Evenhuis and Dewaard (1980) and sulphur was determined by the terbidimetric method according to Rowell (1993).

Statistical analysis:

All obtained data were subjected to the proper statistical analysis of variance of the split plot design according to the procedure outlined by Snedecor and Cochran (1980). Mean values of treatments were differentiated by using L.S.D at 5% level as mentioned by Steel (1960).

RESULTS AND DISCUSSION

Growth characteristics:

Data in Table (4) showed that the stem length was taller, the leaf number was higher and the dry weight was heavier for plants grown on the higher ridge compared with those grown on the lower one, in both growing seasons. These results confirm those of Tarawali and Mohamed-Saleem (1985) on plant length, Bakht *et al.* (2006) on leaf number and Han *et al.* (2001) on dry weight.

The increased plant growth of plants grown on the high ridge might be attributed to the increase of N, P, K and Fe and the decrease of Na and Cl concentrations compared to those of the lower ridge planting method.

Concerning the studied magnetite levels, the results indicated that the most effective treatment for enhancing the stem length, leaf number and dry weight was the highest magnetite level. Similar results reported by Fawzi (1993) on stem length, Eid *et al.* (1991) and Abd El-Al (2003) who indicated that Fe addition increased the number of leaves.

The satisfactory stimulation of plant growth due to the application of magnetite may be referred to the encouragement of N, P, K and Fe uptake and the reduction of Na and Cl.

As for the interaction between ridge height and magnetite level, generally, the most vigorous plants were those grown on the high ridge and received the highest magnetite level. Whereas the lowest growth values were obtained from plants raised on the low ridge and unfertilized with magnetite. The differences among treatments were

significant at harvest in both growing seasons, except stem length in the second season.

In other words using the high ridge planting method combined with the application of 200 Kg magnetite per feddan resulted in reducing the inhibition of plant under salinity conditions. The plant dry weight was 306.88 and 398.87 g for plants grown on the low ridge without magnetite addition and was 622.77 and 594.05 g for plants grown on the high ridge and received 200 Kg magnetite per feddan (Table 4).

Table 4: Effect of ridge height and magnetite level on stem length, leaf number and dry weight of cauliflower plants cv Toobi at harvest during 2004/2005 and 2005/2006 seasons .

Magnetite Kg/fed	Stem length cm		Mean	Leaf number /plant		Mean	Dry weight g/plant		Mean
	Ridge height cm			Ridge height cm			Ridge height cm		
	25	50		25	50		25	50	
	2004/2005								
Control	21.83	22.66	22.25	30.66	30.99	30.83	306.88	330.95	318.92
50	23.03	25.73	24.38	31.66	33.22	32.44	332.90	391.92	362.41
100	24.33	26.68	25.51	33.33	34.11	33.72	398.33	446.69	422.51
150	24.83	27.22	26.03	34.66	34.55	34.61	512.37	551.03	531.70
200	25.58	28.99	27.29	34.77	36.22	35.50	587.40	622.77	605.09
Mean	23.92	26.26		33.02	33.82		427.58	468.67	
	2005/2006								
Control	17.87	18.24	18.06	27.75	29.42	28.59	398.87	438.15	418.51
50	19.41	20.21	19.81	30.25	30.41	30.33	460.33	480.14	470.24
100	19.41	20.42	19.92	30.75	30.92	30.84	494.85	497.99	496.42
150	20.04	21.04	20.54	30.80	31.15	30.98	514.03	536.06	525.05
200	20.49	21.37	20.93	31.49	31.52	31.51	543.67	594.05	568.86
Mean	19.44	20.26		30.21	30.68		482.35	509.28	

L.S.D at 5% for	2004/ 2005	2005/ 2006	2004 / 2005	2005 / 2006	2004 / 2005	2005 / 2006
Ridge height	0.27	0.35	0.43	0.35	0.46	0.20
Magnetite	0.41	0.24	0.39	0.37	0.45	0.32
Interaction	0.58	N.S	0.55	0.52	0.63	0.45

Mineral content of leaves:

The effect of ridge height and magnetite level on the percentages of N, P, K, Na, Cl, S and iron content in leaves of cauliflower leaves after 80 days from transplanting during the two growing seasons, are presented in Tables (5 and 6). As regard to the effect of ridge height, results indicated that the high ridge planting method increased leaf nitrogen, phosphorus, potassium and iron concentrations compared to the low ridge height planting method. Whereas, sodium, chloride and sulphur contents of leaves were decreased when plants were grown on the high ridge compared to those of the low ridge. Similar results were found by Takahashi *et al.* (2003).

Table 5: Effect of ridge height and magnetite on N, P, K and Fe of leaves of cauliflower plants cv Toobi during 2004/2005 and 2005/2006 seasons .

Magnetite level	N %		Mean	P %		Mean	K %		Mean	Fe Mg/100g		Mean
	Ridge height (cm)			Ridge height (cm)			Ridge height (cm)			Ridge height (cm)		
	25	50		25	50		25	50		25	50	
						2004/2005						
Control	1.62	1.68	1.65	0.39	0.45	0.42	3.89	4.26	4.08	27.81	30.74	29.28
50	1.73	1.83	1.78	0.47	0.49	0.48	4.86	4.86	4.86	32.32	34.35	33.34
100	1.95	2.01	1.98	0.50	0.51	0.51	4.93	5.24	5.09	33.71	39.63	36.67
150	2.09	2.29	2.19	0.53	0.57	0.55	4.96	5.42	5.19	36.01	40.53	38.27
200	2.24	2.43	2.34	0.55	0.59	0.57	5.07	5.73	5.40	38.43	43.69	41.06
Mean	1.93	2.05		0.49	0.52		4.74	5.10		33.66	37.79	
						2005/2006						
Control	1.52	1.76	1.64	0.37	0.42	0.40	4.89	5.11	5.00	29.20	33.65	31.43
50	1.68	1.93	1.81	0.42	0.45	0.44	5.19	5.26	5.23	34.83	38.24	36.54
100	1.74	2.22	1.98	0.43	0.45	0.44	5.24	5.54	5.39	37.03	44.55	40.79
150	1.79	2.29	2.04	0.45	0.48	0.47	5.35	5.63	5.49	38.02	45.35	41.69
200	2.29	2.37	2.33	0.47	0.52	0.50	5.40	5.66	5.53	42.33	46.97	44.65
Mean	1.80	2.11		0.43	0.46		5.21	5.44		36.28	41.75	

L.S.D at 5 % for	2004/2005	2005/2006	2004/2005	2005/2006	2004/2005	2005/2006	2004/2005	2005/2006
Ridge height	0.10	0.27	N.S	N.S	N.S	N.S	0.36	0.33
Magnetite	0.13	0.24	0.04	0.04	0.35	0.27	0.38	0.43
Interaction	N.S	N.S	N.S	N.S	N.S	N.S	0.54	0.61

The enhancement of high ridge planting method in increasing N, P, K and Fe and decreasing Na and Cl concentrations compared to the low ridge one may be due to the favorable aeration for roots, efficient of photosynthesis of leaves and reducing the salinity effect for plants raised by the high ridge planting method.

Concerning the effect of magnetite level, it was found that there were gradual increments in nitrogen, phosphorus, potassium and iron

concentrations in leaves with increasing magnetite levels. Whereas, percentages of sodium, chloride and sulphur in leaves were decreased with increasing the magnetite levels. The results agree with those of Reddy and Malewar (1992), Maurya et al.(1993), Singh et al. (1995), Krzywy and Gowacka (1998) and Sharma et al. (2003).

Table 6: Effect of ridge height and magnetite level on S, Na and Cl of cauliflower plants cv Toobi during 2004/2005 and 2005/2006 seasons.

Magnetite Kg/fed	S %		Mean	Na %		Mean	Cl %		Mean
	Ridge height cm			Ridge height Cm			Ridge height cm		
	25	50		25	50		25	50	
	2004/2005								
Control	1.63	1.59	1.61	1.63	1.09	1.36	1.36	1.16	1.26
50	1.62	1.55	1.59	1.04	0.74	0.89	1.15	1.03	1.09
100	1.58	1.52	1.55	0.98	0.73	0.86	1.02	0.76	0.89
150	1.58	1.48	1.53	0.8	0.63	0.72	0.88	0.70	0.79
200	1.57	1.42	1.50	0.66	0.55	0.61	0.83	0.48	0.66
Mean	1.60	1.51		1.02	0.75		1.05	0.83	
	2005/2006								
Control	1.56	1.52	1.54	1.84	1.55	1.70	1.63	1.49	1.56
50	1.55	1.51	1.53	1.63	1.43	1.53	1.43	1.37	1.40
100	1.54	1.49	1.52	1.54	1.26	1.40	1.35	1.29	1.32
150	1.52	1.49	1.51	1.35	1.17	1.26	1.17	1.11	1.14
200	1.46	1.42	1.44	1.25	1.14	1.20	0.91	0.66	0.79
Mean	1.53	1.49		1.52	1.31		1.30	1.18	

L.S.D at 5% for	2004/ 2005	2005/ 2006	2004 / 2005	2005 / 2006	2004 / 2005	2005 / 2006
Ridge height	N.S	N.S	0.20	0.10	N.S	N.S
Magnetite	N.S	N.S	0.13	0.12	0.29	0.19
Interaction	N.S	N.S	0.18	N.S	N.S	N.S

The favorable influence of the application of the highest level of magnetite on increasing the concentrations of N, P, K and Fe and reducing those of Na and Cl might be attributed to creating a high energy magnetic field in root media of the growing plants. This, in turn, may stimulate the absorption of these elements and decrease that of Na and Cl.

Regarding the effect of interaction between ridge height planting method and magnetite level, it was not significant, except sodium percent in the first season, and iron concentration in both seasons.

It is worth to mention that planting on the high ridge planting method combined with the addition magnetite at 200 Kg/fed resulted in increasing the absorption N, P, K and Fe which stimulate plant growth suggested before and decreasing that of Na and Cl which inhibit plant growth. Hence, reduce the harmful effect of salinity on plants.

Curd fresh weight and yield:

As to the effect of ridge height on curd fresh weight, data indicated that curd fresh weight increased with increasing ridge height in the two seasons (Table, 7). The higher curd fresh weight was observed in plants grown by the high ridge planting method compared with the low ridge one.

As for the effect of magnetite level on curd fresh weight, the results showed that the application of magnetite at the rate of 200 kg/fed produced the highest value of curd fresh weight. These results agree with those of Al-Said and Kamal (2005) on eggplant, who reported that foliar spray with Fe-chelates at the highest rate (2 g/l) increased average fruit weight.

The effect of interaction between ridge height and magnetite level on curd fresh weight indicated that the highest value was obtained from the high ridge planting method combined with 200 kg magnetite/fed, in the two seasons.

The total yield of plants raised on the high ridge planting method was significantly higher compared with the low ridge one in the two growing seasons (Table,7). These results are coincided with those of Takahashi *et al.*(2003), who showed that the grain yield of wheat cultivars were higher on the high ridge bed than on the low ridge one. Similar resulted were also obtained by Bakht et al (2006) who found that maximum grain and biological yield of maize was recorded in ridge planting compared flat planting.

Concerning the effect of magnetite level, data indicated that the highest total yield per feddan in the two studied seasons were obtained by the application of magnetite at the rate of 200 kg/fed. Meanwhile, the control untreated treatment gave the lowest total yield per feddan. These results are in agreement with those of Singal and Saraf (1995), who found that the yield of cauliflower was higher with Fe sprays than in water sprayed control. Addition of magnetic iron to eggplant plant resulted in the higher yield when compared to no iron addition as

mentioned by Abd El-Al (2003). Similar results were obtained by Al-Said and Kamal (2005).

Regarding to the interaction effect between ridge height and magnetite level on total yield per feddan, the addition of 200kg magnetite/fed along with the high ridge method recorded the highest total yield per feddan. The lowest total yield per feddan was recorded by no magnetite application combined with the low ridge treatment, in both seasons.

The satisfactory influence of using the high ridge planting method on curd fresh weight and total yield may be due its favorable effect on plant growth (Table 4) and mineral composition (N, P, K and Fe) (Tables 5 and 6) . Besides, reducing the concentration of Na and Cl in leaves. The yield per feddan reached 6.99 and 8.38 ton under the low height planting method without magnetite addition and attained 10.27 and 10.21 ton by using the high ridge planting method combined with the addition of 200 Kg magnetite per feddan.

Curd mineral composition:

Curd minerals, N, P, K, S and Fe, as influenced by ridge height and magnetite level are presented in Tables (7 and 8). Nitrogen, phosphorus, potassium and iron concentrations were higher in the curds of plants grown by the high ridge planting method compared with those of the low ridge one. Whereas, sulphur was lower in curds when plants were grown on the high ridge as compared with those of plants of the low ridge planting method.

Magnetite levels had significant effect on chemical characters of cauliflower curd cv Toobi (Table, 7 and 8). In general, there were gradual increments in curd nitrogen, phosphorus, potassium and iron contents with increasing the magnetite level. While, sulphur was decreased with increasing the magnetite level. The same trend was reported by Abd El-Al (2003) showed that addition of iron for eggplant at the time of transplanting resulted in the higher values of N, P, K, and Fe compared with the no iron addition.

Regarding the effect of interaction between ridge height and magnetite level on mineral concentrations, i.e., nitrogen, phosphorus, potassium, sulphur and iron of cauliflower curd cv Toobi, no significant differences were detected except for iron content where plants raised on the high ridge contained the highest iron content in their curds compared to any other interaction treatment.

Table 7: Effect of ridge height and magnetite on Curd fresh weight, Total yield and N and P of curd of cauliflower plants cv Toobi during 2004/2005 and 2005/2006 seasons .

Magnetite level	Curd fresh weight Kg			Total yield Ton/fed			N %			P %		
	Ridge height cm		Mean	Ridge height cm		Mean	Ridge height cm		Mean	Ridge height cm		Mean
	25	50		25	50		25	50		25	50	
						2004/2005						
Control	0.764	0.831	0.798	6.99	7.59	7.29	1.85	1.99	1.92	0.45	0.48	0.47
50	0.840	0.988	0.914	7.68	9.03	8.36	2.11	2.14	2.13	0.53	0.53	0.53
100	0.982	1.004	0.993	8.97	9.18	9.08	2.19	2.28	2.24	0.57	0.60	0.59
150	1.016	1.111	1.064	9.29	10.15	9.72	2.26	2.40	2.33	0.58	0.61	0.60
200	1.102	1.124	1.113	10.07	10.27	10.17	2.35	2.52	2.44	0.58	0.62	0.60
Mean	0.941	1.012		8.60	9.24		2.15	2.27		0.54	0.57	
						2005/2006						
Control	0.915	0.958	0.937	8.38	8.76	8.57	1.94	2.01	1.98	0.55	0.58	0.57
50	0.993	1.062	1.028	9.08	9.71	9.40	2.07	2.12	2.10	0.58	0.60	0.59
100	1.025	1.092	1.059	9.37	9.98	9.68	2.21	2.36	2.29	0.62	0.62	0.62
150	1.049	1.105	1.077	9.59	10.11	9.85	2.32	2.49	2.41	0.63	0.64	0.64
200	1.097	1.116	1.107	10.03	10.21	10.12	2.40	2.56	2.48	0.64	0.65	0.65
Mean	1.016	1.067		9.29	9.75		2.19	2.31		0.60	0.62	

L.S.D at 5 % for	2004/ 2005	2005/ 2006	2004/ 2005	2005/ 2006	2004/ 2005	2005/ 2006	2004/ 2005	2005/ 2006
Ridge height	0.019	0.011	0.16	0.10	N.S	0.10	N.S	0.01
Magnetite	0.012	0.010	0.11	0.09	0.10	0.13	0.03	0.04
Interaction	0.016	0.015	0.16	0.13	N.S	N.S	N.S	N.S

Table 8: Effect of ridge height and magnetite level on K, Fe and S of cauliflower plants curd cv Toobi during 2004/2005 and 2005/2006 seasons.

Magnetite Kg/fed	K %		Mean	Fe Mg/100g		Mean	S %		Mean
	Ridge height cm			Ridge height (cm)			Ridge height (cm)		
	25	50		25	50		25	50	
			2004/2005						
Control	4.68	5.05	4.87	11.75	11.96	11.86	1.49	1.36	1.43
50	5.16	5.52	5.34	12.20	15.48	13.84	1.45	1.32	1.39
100	5.21	5.83	5.52	13.04	15.85	14.45	1.42	1.25	1.34
150	5.24	6.18	5.71	13.60	17.61	15.61	1.26	1.14	1.20
200	5.68	6.22	5.95	14.35	18.45	16.40	1.21	1.11	1.16
Mean	5.19	5.76		12.99	15.87		1.37	1.24	
			2005/2006						
Control	4.89	5.27	5.08	11.86	12.09	11.98	1.38	1.34	1.36
50	5.46	5.82	5.64	12.73	17.65	15.19	1.35	1.23	1.29
100	5.58	5.96	5.77	14.12	18.08	16.10	1.34	1.22	1.28
150	5.73	6.02	5.88	14.63	19.06	16.85	1.28	1.18	1.23
200	5.83	6.11	5.97	17.72	19.45	18.59	1.19	1.13	1.16
Mean	5.50	5.84		14.21	17.27		1.31	1.22	

L.S.D at 5% for	2004/ 2005	2005/ 2006	2004 / 2005	2005 / 2006	2004 / 2005	2005 / 2006
Ridge height	0.10	N.S	0.13	0.36	0.10	0.05
Magnetite	0.45	0.24	0.31	0.43	0.10	0.06
Interaction	N.S	N.S	0.44	0.60	N.S	N.S

From the above mentioned results it could be concluded that the high ridge planting method combined with the application 200 Kg magnetite per feddan reduced the harmful effect of salinity on cauliflower plants under Ras Suder conditions.

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تأثير بعض العمليات الزراعية على تحمل القنبيط للملوحة تحت ظروف منطقة رأس سدر

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أجريت الدراسة فى موسمين متتالين هما 2005/2004 و 2005/ 2006 بمزرعة محطة بحوث رأس سدر التابعة لمركز بحوث الصحراء بهدف دراسة تأثير إرتفاع خط الزراعة (25 سم و 50 سم) ومستويات خام الماجنيتيت (بدون، 50، 100، 150و 200 كجم/فدان) على النمو والمحصول للقنبيط صنف الطوبى.

أوضحت النتائج المتحصل عليها أن خط الزراعة العالى (50سم) أدى إلى زيادة معنوية فى كلا من طول الساق وعدد الأوراق و الوزن الجاف لنبات القنبيط وكذلك المحصول الكلى للفدان ومحتوى الأوراق والأقراص من كل من النيتروجين والحديد بينما أدى إلى نقص محتوى الأوراق من الصوديوم و محتوى الأقراص من الكبريت. ومن ناحية أخرى أدت زيادة مستويات الماجنيتيت إلى زيادة تدريجية فى طول الساق وعدد الأوراق و الوزن الجاف للنبات و المحصول الكلى للفدان و محتوى الأوراق والأقراص من كل من النيتروجين والفوسفور والبوتاسيوم والحديد، بينما أدت إلى نقص تدريجى فى محتوى الأوراق من الصوديوم والكلوريد و محتوى الأوراق والأقراص من الكبريت.

أمكن الحصول على أفضل نمو خضرى للنبات ومحصول كلى للفدان وصفات كيماوية للأقراص بالزراعة على الخط العالى (50سم) مع إضافة 200 كجم ماجنيتيت/فدان.