ISSN 1110-0419

Annals Of Agric. Sc., Moshtohor,
Vol. 46(3): Ho. 361-371, (2008).

EFFECT OF SOME CHEMICAL AND NATURAL SUBSTANCE APPLICATIONS ON GROWTH, YIELD AND QUALITY OF SQUASH (*CUCURBITA PEPO*, L.) GROWN IN EARLY SUMMER SEASON

BY

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ABSTRACT

Two field experiments were conducted at the Experimental Farm of Horticultural Research Institute (Qaha Farm) during the early summer seasons of 2005 and 2006 to elucidate the effect of foliar application of yeast extract at 5 g/L. and ascorbic acid at 500 ppm as natural antioxidant substances, and micro-nutrients, i.e., Fe, Mn and Zn either in a single form or in a mixture at 25 ppm for each and their combination in addition to check treatment on vegetative growth, chemical constituents of plant foliage and fruits, flowering and fruit yield and its components as well as fruit traits of squash cv "Eskandarani" grown in early summer season.

The obtained results showed that spraying plants with ascorbic acid reflected the highest. Using micro-nutrients especially in a mixture form exhibited the highest values of vegetative growth aspects, earlier flowering, average fruit weight early and total yield, chemical constituents (T.S.S and total carbohydrates in fruits, chlorophyll a, b and carotenoides, N, P, K, Fe, Zn and Mn in leaves). The interaction between yeast extract and the mixture of tested micro-nutrient was the superior treatment which show the highest values in all measured growth, chemical, flowering and yield as well as fruit quality parameters during both seasons of study.

Generally, from the obtained results of this study, the foliar application of yeast extract combined with iron, zinc and manganese was the best combination and it is recommended for increasing productivity and improving fruit quality of squash (cv. Eskandarani) under condition of early summer planting.

INTRODUCTION

Summer squash is one of the most important cucurbits in A.R.E. Squash is one of warm requiring vegetable crops and it does not tolerate either cooler or frosty weathers during germination and different stages of growth and development without indoor protection. Squash is injured when exposed to nonfreezing temperatures, *i.e.*, below 12°C (Rab and Saltveit. 1996).

Moreover, the economic target was actuated the farmers to sowing the plants in early dates to achieve the highest price. So that, great attention has been focused on the possibility to improve the ability of vegetables to tolerate cold stress, among these treatments is the use, use of some chemicals and natural extracts as yeast (Fathy *et al.*, 2000).

Yeast extract was suggested to participate in a beneficial role during frost stress due to its cytokinin content (Barnett *et al.*, 1990), that improve the formation of flower initiation by its effect on carbohydrate accumulation (El-Desouky *et al.*, 1998). Also, it was reported that it has stimulatory effects on cell division and enlargement, protein and nucleic acid synthesis as well as chlorophyll formation (Fathy and Faried, 1996). In addition to its content of cryoprotective agent, *i.e.*, sugars, protein, amino acids and also several vitamins (Shady, 1978). Improving growth and fruiting of economical plants by yeast application was reported by El-Desouky *et al.* (1998) and Wanas (2002).

Also, group of substances known as antioxidants or oxygen free radical scavengers (citric acid, carotenoids, ascorbate, α-tocopherol, glutathion and vitamins) were exogenously applied to protect the plants against adverse effects of environmental stress (Anton and Basseim. 1998; Anton *et al.*, 1999; Arisha 2000, Fathy *el al., 2003*).

Ascorbic acid is known as one of the important antioxidants due to its molecules auto (ox-redox.) properties that act as cofactor for some specific antioxidant enzymes, *i.e.*, dismutase, catalase and peroxidase, that catalyze in breakdown of the toxic H_2O_2, OHO2 radicals (Elad, 1992, Aono *el al.*, 1993). In addition, some studies have been reported that ascorbic acid had positive effect on plant growth and development by its role in alleviating cold stress conditions (El-Lithy *el al.*, 2001, Fathy *et al.*, 2003).

The plant nutrition is one of the primary factors which play a major role in vertically raising the yield of vegetable crops, especially those of upright vegetation like squash. But, the low temperature reduce the availability of nutrients from soil solution (Carolus and Dawnes, 1958). Micronutrients are needed relatively in very small quantities. However, their deficiency or excess induce great disorders in the physiological processes of plants (Marschner, 1995; Srivastava and Gupta, 1996). Iron is a necessary element in plant nutrition, because it has a several functions especially, in plant metabolism process, i.e., oxidation-reduction reaction, respiretion, nitrate reduction, RNA and protein metabolism. Also, correlation was noticed in green plants between chlorophyll content and level of iron supplied (Jakobscen and Dertili, 1956). Also, zink is essential for plant metabolism (as an activator of several enzymes) of carbohydrates, protein, phosphates, RNA synthesis and tryptphan (the precursor of growth phytohormone indole acetic acid), chlorophyll synthesis, photosynthesis as well as a co-factor of various enzymes, which act on phosphotylated substrates (Mohr and Schopfer, 1995). Manganese also, plays role in regulating the level of auxin, in photosynthetic apparatus synthesis the best defined function of Mn is in the photosynthetic reaction in which oxygen is produced from water (Marshner, 1995), it functions as an enzyme activator. Enzymes of the Krebs Cycle require the presence of manganese as an activator (Devlin, 1975). Manganese is also thought to be involved in the destruction or oxidation of indol acetic acid (IAA), a natural auxin of plants (Goldacre, 1961).

In Egypt, micronutrients deficiency problems have been increased in vegetable crops. Some reasons are the high pH in soil with reduce the availability of micronutrients especially iron, zinc and manganese, decreasing use of farmyard manure on agricultural soil, higher crop yields which increase plant nutrient demands, and use of high analyses NPK fertilizers containing lower quantities of micronutrients contaminant (El-Fouly, 1983). The practices of supplying micronutrients to plants through their leaves have been recommended to overcome such problem.

Therefore, the aims of the present study were to alleviate the adverse effects of low temperature and its probable accompanied oxidative stress on summer squash towards improving yield and fruit quality under condition of early summer season by using some natural extracts and antioxidant (bread yeast extract and ascorbic acid) as well as some trace elements (iron, zink, manganese and their combination).

MATERIALS AND METHODS

Two field experiments were conducted at the Experimental Farm of Horticultural Research Institute (Qaha Farm) Qalyoubia Governorate during the early growing summer seasons of 2005 and 2006 to evaluate the effects of foliar applica-tion of yeast extract and ascorbic acid as well as trace elements (Fe, Mn, Zn and their combination) on vegetative growth, flowering, yield and its components, in addition to the chemical constituents of plant leaves and fruit traits of squash cv "Eskandarani".

The soil of the experimental field was clay loam in texture with pH value of 8.1 and 1.7 % organic matter. Soil available N, P and K contents were 92.4 ppm, 6.5 ppm, and 215.5 ppm for the first season, and 94.3 ppm, 6.7 ppm and 211.3 ppm for the second season, respectively. Soil analysis was done using standard method described by Jackson (1967).

Squash seed were sown on 5th and 3rd of February in the first and second seasons, respectively. Seeds were sown in hills on one side with 50 cm between plants. Each experimental sub – plot consisted of 3 rows each of 70 cm wide and 5.5m length with an area about 11.55 m^2.

The treatments were laid out in split plot design with three replicates. The main plots were devoted to ameliorative substances (yeast extract at 5gm/L and ascorbic acid at 500 ppm/L) treatments while the sub plots were assigned to treatments of the nutrient elements (Fe, Zn, Mn, Fe + Zn, Fe + Mn, Zn+ Mn, Fe + Zn + Mn) at 25 ppm for each of them in addition to the control treatment (distillated water).

Yeast extract was prepared by using technique allowed yeast cells (bread yeast) to be growing and multiplied efficiently during conductive aerobic and nutritional conditions. To produce denovo beneficial bioconstituents, i.e., carbohydrates, sugars, proteins, amino acids, fatty acids, hormones, etc, hence allowed such constituents to release out of yeast cells in readily form by two cycles of freezing and thawing for disruption of yeast cells and releasing their content. Such technique for yeast preparation was modified after Spencer *et al.* (1983). Yeast is bio-compound locally produced in Egypt, it contains 47% protein, 33% carbohydrates, 8% nucleic acids, 4% lipids, minerals 8%(Na, Fe, Mg, K, P, S, Zn, Si, Cu, Se, Mn, Cr, Ni, Va, Sn and Li), Vici, thiamin, riboflavin, pyri-doxine, pantorhenate, biotin, cholin, folic acids and Vit-B12 (Nagodawithana, 1991).

Squash plants were sprayed with the yeast extract and ascorbic acid solutions three times (15, 30, 45 days after sowing), as well as trace elements. The plants were sprayed until dropping of using a hand-sprayer. Bio-film as a wetting agent was applied at 0.5 ml/liter of solution. Trace elements (Fe, Zn and Mn) were used in the form of $FeSO_4.7H_2O$ (20% Fe), $ZnSO_4.7H_2O$ (22% Zn) and $MnSO_4.H_2O$ (32.5%Mn).

Thinning took place after complete germination (two weeks after germination), with leaving one plant per hill.

Mineral fertilizer with the recommended dose of NPK, i.e., 60kg N/fed as ammonium sulphate 20.5%, 30 kg/fed P_2O_5 as calcium superphosphate 15.5% and 48 kg K_2O/fed as potassium sulphate 48%. The first was added after 3 weeks and the second was after 5 weeks from sowing. The other cultural practices for commercial production of squash were used according to the instruction laid done by the Ministry of Agriculture, Egypt. The beginning of harvest was done 50 days after sowing in both seasons.

Data recorded:

1- Plant growth and flowering characteristics:

Sample of 5 plants was taken randomly from each treatment after 60 days from sowing to estimate plant height, number of leaves /plant, shoot fresh and dry weight/plant. Besides, the number of days elapsed from sowing till the anthesis of the first female (pistillate) flower for 25 % of plants per plot and sex ratio (number of staminate / pistillate flowers) were recorded.

2- Yield and its components:

Early yield was determined as the first six harvests. All fruits of each plot were counted during the harvest period and weighed to record the total yield.

3- Chemical analysis:

At 60 days after sowing, samples of fresh leaves were taken to determine chlorophylls (a and b), N, P and K concentrations according to the methods described by Black (1965), John (1970) and Brown and Lilleland (1946), respectively. For iron, zink and manganese determination, Atomic absorption Spectrophotometer "Jaril-Ash 850" was used.

4- Fruit traits:

Sample of 10 fruits was taken randomly from each plot to measure average fruit weight, as well as to determine total soluble solids (TSS) according to A.O.A.C (1970). While, carbohydrates content was determined by method of Magnestki *et al.* (1959).

The obtained data from this study were statistically analyzed and treatment means were compared by using least significant difference (L.S.D) as reported by Gomez and Gomez (1984).

The air temperatures during the two growing seasons of squash at Qaha district were presented in Table (1).

Table (1): Mean monthly air temperature at Qaha district during the growing seasons 2005 and 2006 of squash plants.

Temperature	Seasons 2005		Seasons 2006	
	Max. (°C)	Min. (°C)	Max. (°C)	Min. (°C)
January	16.3	6.2	18.7	7.8
February	18.6	6.7	19.6	7.3
March	21.0	8.0	20.5	10.3
April	24.5	12.0	25.5	9.3
May	26.5	14.4	28.5	15.0

RESULTS AND DISCUSSION

A. Vegetative growth and flowering:

The data in Table (2) show that number of leaves/plant and fresh and dry weight/plant were increased in both seasons as a result of foliar application with ascorbic acid. But, the increment did not reach the level of significance compared with yeast application. As regard to flowering, data in the same table show that spraying squash plants with yeast extract reduced the period from sowing till anthesis of the first pistillate flower and gave the lowest sex ratio, which gave the highest yield (Table, 3) compared with the spraying with ascorbic acid. These findings were harmony with those reported by Anton and Basseim (1998), Anton *et al.* (1999), Arisha (2000) and Fathy *et al.*, (2003) who demonstrated that the antioxidants such as citric acid, carotenoids, ascorbate, tocopherol, glutathione and vitamins protected plants against the adverse effects of environment when then they were exogenously applied.

Concerning the effect of foliar application of trace elements (Fe, Zn, Mn and their combination), data in Table (2) show that untreated plants (control) had the lowest values of all studied growth characters compared with plants which treated with single or combined trace elements. In addition, the treatments contained Fe com-bined with Zn gave the best results for plant growth and flowering traits, this findings may be due to the role of zinc in the synthesis of auxins (Mohr and Schopfer, 1995).

As regard to flowering traits, data in Table (2) show also that the combination among Fe, Zn and Mn reduced the period from sowing till the anthesis of the first pistillate flower comparing with the untreated ones The lowest sex ratio was obtained by the same combination treatment.

The interaction between yeast extract, ascorbic acid and trace elements had significant effects on the different studied characters of plant growth in both seasons. The combination between Fe and Zn with or without Mn recorded the highest values of plant growth in both season. The same combination of trace elements recorded the superior results of flowering characters such as number of days till the first female flower appearing and sex ratio. These results were true with the application of either ascorbic acid or yeast in both seasons.

B. Yield and its components:

Data in Table (3) show that average fruit weight, number of fruits of early yield, early yield /plot as well as total yield/fed. were significantly increased by foliar spray with yeast extract compared with the ascorbic acid in both seasons except for number of fruits. This may be due to the stimulative effect of yeast extract on enhanced flowering characters (Table 2) which affect yield and its component. These results were similar to those reported by many investigators on different vegetable crops (Fathy and Farid, 1996; Hewedy *et al.*, 1996; Fathy *et al.*, 2000; Khedr and Farid, 2000). These results may be due to effect of yeast via its cytokinins content (Skoog and Miller, 1957) and the high content of vitamin B5 and minerals that might play a considerable role in orientation and translocation of metabolites from leaves into the productive organs. Also, it might play a role in the synthesis of protein and nucleic acid (Natio *et al.*, 1981).

Table (2): Effect of yeast extract and ascorbic acid with the addition of trace elements (Fe, Zn, Mn and their combination) on vegetative growth and flowering characteristics of squash plants during 2005 and 2006 seasons.

Antioxidants (a)	No. of leaves / plant		Fresh weight/ plant (g)		Dry weight/ plant (g)		No. days till the first female flower		Sex ratio	
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
Ascorbic acid	22.83	21.98	646.23	618.91	87.76	77.97	52.65	52.76	2.78	2.51
Yeast extract	22.65	21.49	655.14	616.64	87.85	77.69	48.48	51.62	2.30	2.35
L.S.D 5%	NS	NS	NS	NS	NS	NS	0.79	1.09	0.11	0.03
Trace elements										
Fe	20.84	19.27	629.12	597.02	86.57	75.22	51.44	53.31	2.46	2.42
Zn	25.25	24.45	694.69	655.61	91.97	82.60	48.31	49.81	2.73	2.19
Mn	18.31	18.01	614.23	572.11	83.53	72.08	52.52	55.31	2.88	2.76
Fe + Zn	28.68	26.32	691.88	676.58	92.76	85.25	48.32	48.78	1.98	1.99
Fe + Mn	19.69	19.24	623.38	586.64	84.77	73.91	52.00	54.11	2.68	2.50
Zn + Mn	22.26	23.56	660.48	617.48	89.82	77.79	49.59	52.47	2.33	2.26
Fe + Mn + Zn	29.34	26.88	715.25	689.77	94.60	86.91	47.52	47.31	1.85	1.89
Without	17.55	15.62	576.48	546.97	78.39	68.91	54.81	56.42	3.44	3.42
L.S.D 5%	1.932	2.34	20.41	4.63	4.43	0.58	1.58	2.19	0.22	0.06
Interaction (a x b)										
Ascorbic acid										
Fe	20.01	20.22	642.10	611.99	87.32	77.11	53.33	53.62	2.62	2.43
Zn	25.37	24.62	688.41	648.08	91.95	81.65	50.24	49.21	3.39	2.26
Mn	18.39	18.22	609.93	572.01	82.95	72.07	54.71	57.21	3.25	2.86
Fe + Zn	29.19	26.61	683.85	671.29	93.00	84.58	50.13	48.21	2.05	2.16
Fe + Mn	19.29	20.19	619.27	599.07	84.22	75.48	54.48	55.21	2.85	2.46
Zn + Mn	22.92	23.00	672.27	621.48	91.42	78.30	51.33	53.41	2.62	2.42
Fe + Mn + Zn	29.99	27.36	695.43	676.12	93.24	85.19	49.04	48.02	1.94	1.95
Without	17.68	15.61	573.58	551.20	78.00	69.45	57.95	57.22	3.54	3.51
Yeast extract										
Fe	21.62	19.32	631.13	582.05	85.83	73.33	49.55	53.01	2.3	2.41
Zn	25.13	24.28	700.97	663.14	91.99	83.55	47.39	50.41	2.07	2.12
Mn	18.22	17.81	618.52	572.22	84.11	72.10	50.34	53.41	2.51	2.67
Fe + Zn	28.17	26.04	699.92	681.87	92.52	85.91	46.51	49.36	1.91	1.82
Fe + Mn	20.09	18.28	627.48	574.19	85.33	72.34	49.52	53.01	2.52	2.55
Zn + Mn	21.87	24.12	648.70	613.48	88.22	77.29	47.85	51.53	2.04	2.11
Fe + Mn + Zn	28.69	26.40	735.07	703.41	95.97	88.63	46.01	46.61	1.75	1.83
Without	17.42	15.63	579.38	542.73	78.79	68.38	51.34	55.62	3.34	3.33
L.S.D 5%	2.88	3.30	28.87	6.55	6.26	0.82	2.23	3.09	0.31	0.09

Table (3): Effect of yeast extract and ascorbic acid with the addition of trace elements (Fe, Zn, Mn and their combination) on total yield and its components of squash plants during 2005 and 2006 seasons.

Antioxidants (a)	Fruit fresh weight (g)		No. fruit of early yield/ plot		Early yield /plot (kg)		Total yield (ton/fed)		T.S.S (%)	
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
Ascorbic acid	114.58	107.68	54.47	51.37	5.87	5.59	12.56	13.40	3.89	3.76
Yeast extract	120.25	110.26	56.49	54.09	7.06	7.18	15.23	14.85	3.96	3.79
L.S.D 5%	1.95	1.71	NS	1.03	0.23	0.69	0.65	0.50	NS	NS
Trace elements (b)										
Fe	110.51	108.78	51.75	52.19	6.28	6.81	12.58	14.56	3.91	3.78
Zn	124.69	112.50	58.98	56.37	6.76	6.91	15.25	15.30	4.02	3.92
Mn	106.99	104.00	43.47	40.93	5.56	5.78	11.36	12.24	3.79	3.32
Fe + Zn	125.90	112.85	68.53	64.10	7.10	7.22	17.07	16.24	4.14	4.03
Fe + Mn	112.47	108.70	49.31	49.73	6.17	5.65	12.32	12.92	3.82	3.80
Zn + Mn	120.37	110.66	56.22	55.56	6.68	6.95	13.90	14.96	3.91	3.88
Fe + Mn + Zn	132.26	114.20	75.27	72.78	7.62	7.72	18.28	16.71	4.26	4.35
Without	103.11	100.08	40.30	30.17	5.07	4.06	10.37	10.07	3.63	3.14
L.S.D 5%	3.89	3.43	8.73	2.06	0.46	1.37	1.29	1.00	0.18	0.21
Interaction (a x b)										
Ascorbic acid										
Fe	105.27	107.68	51.16	55.63	5.63	6.05	11.52	14.28	3.91	3.91
Zn	120.46	112.21	57.57	55.33	6.27	6.21	13.06	14.65	4.01	3.96
Mn	103.51	100.88	42.59	37.82	5.26	4.64	10.79	10.95	3.77	3.32
Fe + Zn	122.3	112.34	66.74	62.99	6.55	6.55	15.73	15.45	4.18	3.94
Fe + Mn	111.06	107.66	47.41	47.51	5.38	4.97	10.92	11.72	3.81	3.71
Zn + Mn	115.36	108.75	55.09	55.49	5.95	6.29	11.89	14.44	3.89	3.93
Fe + Mn + Zn	130.01	112.80	73.10	70.39	7.07	6.8	16.98	16.04	4.11	4.26
Without	98.65	99.05	28.75	25.77	4.91	3.26	9.63	9.69	3.51	3.05
Yeast extract										
Fe	115.76	109.88	52.34	48.75	6.93	7.56	13.64	14.84	3.91	3.65
Zn	128.91	112.80	60.39	57.42	7.26	7.61	17.44	15.95	4.02	3.88
Mn	110.47	107.13	44.36	44.04	6.22	6.93	11.94	13.53	3.82	3.31
Fe + Zn	129.51	113.36	70.32	65.21	7.66	7.9	18.41	17.04	4.10	4.11
Fe + Mn	113.88	109.73	51.2	51.94	6.96	6.33	13.72	14.13	3.82	3.89
Zn + Mn	125.38	112.56	57.35	55.63	7.41	7.62	15.92	15.48	3.93	3.83
Fe + Mn + Zn	134.5	115.50	77.44	75.17	8.17	8.64	19.62	17.38	4.4	4.44
Without	100.56	101.10	38.51	34.56	5.88	4.85	11.12	10.45	3.75	3.22
L.S.D 5%	5.50	4.85	12.35	2.91	0.65	1.95	1.83	1.41	0.26	0.29

Concerning the application effect of iron, zinc, manganese and their combinations on yield and its components, data in Table (3) show that all trace elements treatments significantly increased all the estimated characteristics over the untreated ones in both season. Moreover, it is evident that using the mixture of micro-nutrients of Fe and Zn and or without Mn were the most superior among the used treatments. It could be suggested that the resultant improvement in early and total yield of summer squash by the application of the mentioned treatments and also the depression in those of untreated plants under cold stress condition were logically true and expected, since the same treatments gave similar effects on growth parameters specially the clear accumulation in dry matter (Table 2) and mineral content (Table 4 and 5). These results were attributed to several important function in alteration the plants to be-in an internal active protective case against cold stress adverse effect. The obtained results and interpretation are confirmed by findings of Alien (1968), Ashour and El-Fouly (1970), El-Ghamriny (1976), Amer (1981), El-Beheidi *et al.*, (1988b) and El-Nagar (1996).

The interaction between foliar spray with yeast extract and ascorbic acid with trace elementsindicated that the highest values of average fruit weight, number of fruits of early yield, early yield/plot and total yield/fed were obtained from plants sprayed with yeast extract with the combination treatment of foliar spray with iron, zinc and manganese followed by Fe with Zn compared with other treatment especially untreated one.

C. Fruit quality:

Data in Table (3 and 4) show that TSS content and total carbohydrates were increased by foliar spray of yeast extract compared with the plants that were treated with ascorbic acid. But, the increment did not reach the level of significant for TSS content in both season. Similar results were obtained by Mohamed *et al.* (1999) and Fathy *et al.* (2000).

Table (4): Effect of yeast extract and ascorbic acid with addition of trace elements (Fe, Zn, Mn and their combination) on total carbohydrates in fruits and chemical constituents of leaves of squash plants during 2005 and 2006 seasons.

Antioxidants (a)	Total carbohydrates (mg/100 g F.W)		N (%)		P (%)		K (%)		Fe (%)	
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
Ascorbic acid	14.53	14.49	4.30	3.74	0.53	0.42	2.59	2.25	117.68	123.18
Yeast extract	16.34	15.68	4.92	4.07	0.55	0.47	2.43	2.43	121.20	126.91
L.S.D 5%	0.50	0.11	0.33	0.17	NS	0.03	0.06	0.02	2.79	1.55
Trace elements (b)										
Fe	15.38	14.02	4.64	3.94	0.49	0.38	2.70	2.33	123.65	128.21
Zn	17.40	16.07	4.99	4.10	0.60	0.51	2.80	2.41	118.71	124.03
Mn	13.00	13.25	4.04	3.44	0.49	0.31	2.44	2.25	108.09	119.60
Fe + Zn	17.75	17.61	5.17	4.21	0.61	0.56	2.86	2.42	132.75	132.18
Fe + Mn	13.73	13.88	4.33	3.69	0.49	0.39	2.58	2.28	109.78	122.03
Zn + Mn	16.58	14.63	3.83	4.02	0.52	0.49	2.72	2.31	121.80	125.66
Fe + Mn + Zn	18.63	18.98	5.22	4.35	0.67	0.62	2.93	2.65	133.56	137.94
Without	11.01	12.23	3.66	3.07	0.41	0.30	2.32	2.09	107.19	110.72
L.S.D 5%	1.00	0.22	0.66	0.34	0.06	0.05	0.12	0.04	5.59	3.10
Interaction (a x b)										
Ascorbic acid										
Fe	14.52	13.59	4.52	3.83	0.47	0.32	2.66	2.22	121.18	126.18
Zn	15.99	14.78	4.61	4.00	0.61	0.52	2.69	2.36	118.29	123.11
Mn	13.35	12.74	3.66	3.55	0.47	0.28	2.36	2.08	105.29	119.08
Fe + Zn	16.41	16.17	4.65	4.02	0.61	0.55	2.77	2.38	132.21	131.09
Fe + Mn	13.74	13.82	4.17	3.38	0.46	0.37	2.49	2.18	108.11	120.29
Zn + Mn	14.85	14.75	4.51	3.98	0.52	0.51	2.61	2.19	118.27	123.11
Fe + Mn + Zn	16.77	18.08	4.67	4.26	0.65	0.61	2.84	2.58	133	137.57
Without	10.64	12.02	3.59	3.03	0.42	0.24	2.34	2.01	105.07	105.12
Yeast extract										
Fe	16.25	14.45	4.76	4.04	0.52	0.44	2.75	2.43	126.11	130.24
Zn	18.81	17.35	5.39	4.20	0.58	0.51	2.91	2.45	119.13	125.06
Mn	12.65	13.76	4.41	3.82	0.51	0.35	2.53	2.41	110.88	120.12
Fe + Zn	19.08	19.05	5.68	4.40	0.62	0.57	2.95	2.45	133.3	133.27
Fe + Mn	13.73	13.94	4.49	4.01	0.53	0.42	2.67	2.39	111.46	123.77
Zn + Mn	18.31	14.52	5.15	4.07	0.53	0.47	2.83	2.43	125.32	128.21
Fe + Mn + Zn	20.50	19.88	5.78	4.77	0.69	0.63	3.01	2.73	134.13	138.31
Without	11.38	12.45	3.73	3.21	0.39	0.36	2.31	2.17	109.31	116.32
L.S.D 5%	1.41	0.31	0.93	0.48	0.09	0.07	0.17	0.05	7.90	4.39

Concerning the effect of foliar spray with trace elements and their combination on fruit quality, data in Table (3&4) show clearly that all treatments significantly increased TSS content and total carbohydrates in both seasons compared with the control. Similar results were obtained by El-Ghamriny (1976), El-Beheidi *et al.* (1978) and El-Nagar (1996).

As regard to the effect of the interaction, data in the same table, show that spray plants with yeast and combined treatment (Fe+Zn+Mn) significantly increased all the studied fruit quality traits.

D. Chemical composition:

Table (4 and 5) indicate that foliar spray with yeast extract significantly increased N, P, Fe, Zn and Mn concentrations in both seasons. Similar results were obtained by Fathy and Farid (1996), Mohamed *el al.* (1999) and Fathy *et al.* (2000). While, spraying with ascorbic acid did not significantly affect chlorophyll but increased carotinoides,

in both season. Similar results were reported by Hala *el al.* (2005). Who reported the positive effect of antioxidants on photosynthetic pigments in broad bean plants. The increment of photosynthetic pigments in response to ascorbic acids might be due to their role as antioxidants in protecting chloroplasts from oxidative damage by oxidative stress (Munne *el al.*, 2001).

The significant lowest content of minerals and chlorophylls a, b and carotene of the untreated plants reflected unconductive internal physiological and metabolical status and might led to poor cold tolerance case, such case extended to growth and yield of these plants.

Table (5): Effect of yeast extract and ascorbic acid with addition of trace elements (Fe, Zn, Mn and their combination) on chemical constituents of leaves of squash plants during 2005 and 2006 seasons.

Antioxidants (a)	Zn (%)		Mn (%)		Chlorophyll a		Chlorophyll b		Carotenoids	
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
Ascorbic acid	23.89	20.25	7.19	11.10	0.61	0.55	0.40	0.36	0.72	0.75
Yeast extract	25.49	21.49	8.56	12.04	0.58	0.52	0.39	0.36	0.62	0.63
L.S.D 5%	1.19	0.97	0.18	0.13	NS	0.03	NS	NS	0.02	0.04
Trace elements (b)										
Fe	22.75	18.26	7.04	10.54	0.60	0.50	0.38	0.36	0.65	0.67
Zn	27.19	24.42	7.57	10.97	0.63	0.57	0.42	0.40	0.72	0.75
Mn	21.62	16.52	8.16	11.91	0.55	0.45	0.34	0.30	0.52	0.55
Fe + Zn	29.26	26.37	7.82	11.53	0.64	0.61	0.45	0.43	0.80	0.83
Fe + Mn	22.97	16.95	8.30	12.14	0.55	0.49	0.36	0.34	0.61	0.58
Zn + Mn	23.84	20.89	8.59	12.68	0.60	0.55	0.39	0.36	0.70	0.72
Fe + Mn + Zn	29.60	30.09	8.77	13.22	0.65	0.67	0.47	0.44	0.84	0.89
Without	20.31	13.46	6.77	9.59	0.54	0.44	0.31	0.28	0.49	0.52
L.S.D 5%	2.39	1.95	0.37	0.26	0.06	0.05	0.05	0.04	0.07	0.07
Interaction (a x b)										
Ascorbic acid										
Fe	22.26	16.94	6.45	9.97	0.61	0.51	0.39	0.36	0.68	0.72
Zn	25.56	23.51	6.47	10.11	0.65	0.59	0.41	0.40	0.76	0.79
Mn	21.74	16.02	7.49	11.66	0.56	0.45	0.33	0.29	0.63	0.67
Fe + Zn	27.58	26.54	7.05	11.05	0.65	0.61	0.47	0.44	0.82	0.85
Fe + Mn	22.6	16.21	7.58	12.03	0.57	0.49	0.37	0.33	0.66	0.67
Zn + Mn	23.63	21.13	8.12	12.22	0.62	0.58	0.41	0.37	0.76	0.78
Fe + Mn + Zn	27.76	29.11	8.30	12.48	0.68	0.73	0.49	0.45	0.88	0.93
Without	20.04	12.53	6.13	9.32	0.54	0.44	0.32	0.29	0.56	0.61
Yeast extract										
Fe	23.23	19.62	7.63	11.12	0.59	0.49	0.37	0.36	0.62	0.63
Zn	28.84	25.44	8.66	11.84	0.62	0.55	0.43	0.41	0.69	0.72
Mn	21.51	17.03	8.84	12.17	0.54	0.45	0.36	0.31	0.41	0.43
Fe + Zn	30.94	26.21	8.60	12.01	0.63	0.60	0.44	0.42	0.78	0.81
Fe + Mn	23.36	17.71	9.02	12.26	0.54	0.49	0.36	0.35	0.56	0.49
Zn + Mn	24.05	20.65	9.06	13.15	0.58	0.53	0.37	0.36	0.65	0.66
Fe + Mn + Zn	31.44	31.07	9.25	13.96	0.63	0.61	0.46	0.44	0.81	0.86
Without	20.58	14.39	7.42	9.86	0.54	0.44	0.31	0.28	0.41	0.43
L.S.D 5%	3.38	2.77	0.53	0.37	0.09	0.07	0.07	0.05	0.05	0.10

As regard to the effect of trace elements and their combination on chemical composition, data in Tables (4 & 5) show that all treatments significantly increased N, P, K, Fe, Zn and Mn as well as chlorophylls a, b and carotinoide concentrations compared with the control (untreated plants) in both seasons. The pronounced superior effect of foliar spray with trace elements may be due to the fact that micronutrient application may be increased the uptake and content of N, P, K, Fe, Zn and Mn in plant. Similar results were obtained by El-Ghamriny (1976), El-Beheidi *et al.*, (I988b) and El-Nagar (1996).

As for the interaction effect on chemical composition, data in Table (4&5) show also that foliar spray with yeast extract

and ascorbic acid in addition to trace elements and their combinations significantly increased all assayed macro and micro elements. However, yeast extract might be enhanced the capability of plants to reduce the adverse effect of cold via its role in activation of plasma membrane ATP as pump. (Schaller and Sussman, 1988) and might be thereby alter the plant cells into harden to tolerate status (Iswari and Palta. 1989 and Palta, 1990), which reflect on good absorption of nutrients and water from soil solution.

Generally, from the obtained results of this study, the foliar application of yeast extract combined with the mixture of iron, zinc and manganese was the best treatment and it is recommended for increasing productivity and improving fruit quality of squash (cv. Eskandarani) under condition of early summer planting.

REFERENCES

A.O.A.C. (1970): Association of Official Agricultural Chemists. Methods of Analysis 11th edition, Washington DC USA

Alien. D.A. (1968): The effect of a combination of micro-elements, N and P on the yield and quality of tomatoes. Trudy Azerb Nauc, Issled. Inst. Ovose., 2:175-178. (C.F. Hort Abst 41:4220)

Amer. S.S.A. (1981): Effect of some growth regulators and some minor elements on growth and yield of tomato. M. Sc. Thesis, Fac. of Agric Moshtohor, Zagazig Univ., Egypt.

Anton. N.A. and Basseim, M.M. (1998): Effect of phosphorus and potassium fertilizers and foliar spray with ascorbic and citric acids on peanut plant under sandy soil conditions. Zagazig J. Agric, Res., 25 (5): 733-742 .

Anton. N.A.; Abdel-Nour, A.Sh. and El-Set A Abdel-Aziz (1999): Response of barley to ascorbic, citric acids and micronutrients mixture under sandy soil conditions. Zagazig J. Agric Res., 26(6): 1553-1561

Aono, M.; Kubo, A.; Saji, H.; Tanaka, K and Kondo, L (1993): Enhanced tolerance to photooxidative stress of transgenic (*Nicotiana tabacum*) with high chloroplastic glutathione reductase activity. Plant Cell Physiol., 34: 129-135

Arisha, H.M.E. (2000): Effect of vitamin C on growth, yield and tuber quality of some potato cultivars under sandy soi conditions. Zagazig J. Agric. Res., 27:91-104.

Ashour, N.T. and El-Fouly, M.M. (1970) A preliminary study on the effect of foliar spray with micro-elements and growth regulators on growth of tomato in winter season. German J. Hort, Sci.. 35:415

Barnett, J.A.; Payne, R W. and Yarrow, D. (1990): Yeasts, Characteristics and Identification. Cambridge Univ. Press Publi. by the Prese Syndicate of the Univ. of Cambridge Camb PP.999.

Black, C.A. (1965): Methods of Soil Analysis, Part 1. Physical and Mineralogical Properties. ASA. Madison, Wise., USA.

Brown, J.D. and Lilleland, O. (1946): Rapid determination of potassium and sodium in plant material and soil extracts by flame photometry. Proc. Amer. Soc. Hort. Sci., 48: 341-346.

Carolus, R.L. and Dawnes; J.D. (1958): Studied in muskmelon and tomato response to polyethylene mulching. Mich. Agric. Expt. Sta. Quart. Bul., 40:770-785.

Castelfranco, P.A. and Beale, S.I. (1983): Chlorophyll biosynthesis recent advances and areas of current interest. Ann Rev. Plant Physiol., 34:241-278.

Delvin, R.M. (1975): Plant Physiology. Affiliated East-West Press, New Delhi. pp. 159-205.

El-Beheidi, M.A; Said, S.and El-Mansi, A.A (1978) Response of cucumber plants to foliar nutrition with boron, zinc and cobelt. J. Agric Res. Zagazig Univ.. 1: 177-190.

El-Beheidi, M.A.; El-Mansi, A.A.; El-Sawah, M.H.; Metwally, A.M.; El-Ghamriny, M.A. and Hewedy, A.M. (1988b) Effect of foliar nutrition cold tolerance growth and mineral contents of some tomato cultivars. Proc. 2nd Hort. Sci. Conf. Tanta Univ., 1:101-113.

Elad, Y. (1992): The use of anti-oxidants (free radicals scavengers) to control grey mould and while mould in various crops. Plant Pathol., 41 (4): 417-426.

El-Desouky, S.A; Wanas, A.L.W. and Khedr, Z.M.A. (1998): Utilization of some natural plant extracts (of garlic and yeast) as seed - soaked materials to squash (Cucurbita pepo, L.). 1- Effect on growth, sex expression and fruit yield & quality. Ann. Agric. Sci. Moshtohor, Zagazig Univ . 25 (2): 839 -854

El-Fouly, M.M. (1983): Micronutrients in arid and semi-arid areas: level in soils and plants and needs for fertilizers with references to Egypt. Proc. 15th Coll. Int. Potash inst. (Bern), p.163.

El-Ghamriny, M.A. (1976): Response of cucumber plants to some micro-nutrients. M.Sc. Thesis, Fac. of Agric., Zagazig Univ., Egypt.

El-Lilhy, YT.E and Nadia, H. El-Greadly (2001): Study on the effect of ascorbic acid, nicotinamide and their combinations on growth, flowering, yield, fruit quality and endogenous hormones of melon plants under effect of salinity of water irrigation. J. Agric. Sci., Mansoura Univ., 26: 4407 - 4420

El-Nagar, MH. (1996): Physiological studies of pepper. Ph.D Thesis, Fac. of Agric., Mansoura Univ., Egypt.

Fathy. El.S.L. and Farid, S. (1996): The possibility of using vitamin B5 and yeast to delay senescence and improve growth and yield of common beans (*Phaseolus vulgaris*, L.) . J. Agric. Sci. Mansoura Univ., 21 (4): 1415 - 1423.

Fathy, El.S.L.; Farid, S. and El-Desouky, S.A. (2000): Induced cold tolerance of outdoor tomatoes during early summer season by using triphosphate (ATP), yeast, othier natural and chemical treatments to improve their fruiting and yield. J. Agric. Sci., Mansoura Univ., 25 (1): 377-401.

Fathy, El.S.L.; Abd El-Rahmanm A.M.M. and Khedr, Z.M.A. (2003): Response of broad bean to foliar spray of different K-sources and energy related organic compounds (EROC) to induce better internal K and sugars case towards better growth and productivity. J. Agric. Sci., Mansoura Univ., 28 (4): 2935 2954 .

Goldacre, P.L. (1961): The indole-3-acetic acid oxidase-peroxidase of pear. pp 143-147. In R.M. Klein, ed., Plant Growth Regulation. Amer. Iowa State Univ. Press.

Gomez, K.A and Gomezm AA (1984): Statistical Procedure for Agricultural Research. 2nd Ed. John Wiley and Sons. Inc. New York, 680 P.

Hala, M.S. El-Bassiouny; Mirvat, E. Gobarah and Amany A. Ramadan (2005): Effect of antioxidants on growth, yield and fabism causative agents in seeds of *Vicia faba* L. plants grown under sandy soil. J. Agron., 4(4): 281-287.

Hewedy, A.M.; Morsy, M.A and Hafezm M. (1996): Effect of frequency of fruit picking and foliar spray with some stimulants on the subsequent seed yield of eggplant. 1st Egypt - Hung. Hort. Conf., 1:50-60.

Iswari, S. and Palta, J.P. (1989): Plasma membrane ATP-ase as a site of functional alternation during cell acclimation and freezing. P. 123-137 Inc. P.H. Li (ed). Low Temp., Stress Physiology in Crops. CRC Press, Boca Ration. Fla (C.F. Hort. Sci., 25: 11, 1999).

Jackson, M.L. (1967): Soil Chemical Analysis. Printice Hall, Inc Eng. Woold Clifits, New Jersy .

Jakobscen A. and Dertili, J. (1956): The relation between iron and chlorophyll contents in chlorotic sunflower leaves. *Plant Phusiol* 31: 199-204

John, M.K. (1970): Colorimetric determination of phosphorus in soil and plant materials with ascorbic acid. Soil Sci., 109:214-220.

Khedr, Z.M.A. and Farid, S. (2000): Response of naturally virus infected tomato plants to yeast extract and phosphoric acid application. Annals Agric. Sci. Moshtohor, 38(2):927-939.

Kraig, E. and Haber, J.E. (1980): Messenger ribonucleic acid and protein metabolism during sporulation of *Saccharomyces cerevisiae*. J. Bacteriol., 144:1098-1112.

Magnestki, K.P.; Tsugary, Y.A. and Maklov, B.K. (1959): New methods for plants and soil analysts. Agricultural Academy Press Manometric Techniques. U.M.B Rell. Burris-Stouffer.

Marschner, H. (1995): Mineral Nutrition of Higher Plants. 2nd Ed. Academic press, London. P. 75.

Mohamed, F.I.; Hellal, F.A. and El-Shabraway, R.A. (1999): A comparative study on the effect of bread yeast and foliage nutrients application on the produc-tivity and quality of two pea cultivars. Egypt. J. Appl. Sci. 14(10):284-299.

Mohr, M and Schopfer, P. (1995): Plant Physiology. pp. 112-114. Springer-Verlag, New Yourk.

Munne, B.S.K.; Schwarz, A. and Algere, L. (2001): Water deficit in combination with high solar radiation leads to midday depression of tocopherol in field grown lavender (*Lavandula stoechas*) plants. Aust. J. Plant Physiol., 28:315-321.

Nagodawithana. W.T. (1991): Yeast Technology. Universal Foods Cooperation. Milwauke, Wisconsin. Published by Van Nostrand, New York.

Natio, K.; Nagama, S.; Furye, K. and Suzuki, H. (1981) Effect of benzyladenine on RNA and protein synthesis in intact bean leaves at various stages of ageing. Plant Physiol.. 52:342-348.

Palta, J.P (1990): Stress interactions at the cellular and membrane levels. HortScience, 25(11): 1377-1381.

Rab, A. and Saltveit, M.E. (1996): Sensitivity of seedling radicals to chilling and heat-shock induced chilling tolerance. J. Amer. Soc. Hort. Sci., 121 (4): 711-715.

Schaller, G.E. and Sussman, M.R. (1988): Phosphorylation of plasmd membrane H+-ATP-ase of oat roots by Ca+ stimulated protein kinase. Planta, 173:509-518.

Shady, M.A. (1978): The Yeast. Adv. Cour. For Post Grad. St. In Microbiol. pp. 146-247. Agric. Bor. Dept. Fac. Agric. Mansoura Univ.

Skoog, E. and Miller, C.O. (1957): Biological Action of Growth Substances. Cambridge Univ. Press., Camb, 1957-2000.

Spencer, T.F.T.; Dorothy, S.M. and Smith, A.R.W. (1983): Yeast genetics-fundamental and applied aspects. pp. 16 - 18, ISBNO - 387 - 90973 - 9. Springer Verlag New York, USA.

Srivastava, P.C. and Gupta, U.C. (1996): Trace elements in crop production. Sci. Pub. Inc. Lebanon, NH 03766, USA, 365 pp.

Vogel, A.I. (1975): A Text Book of Practical Organic Chemistry. Publ. by English Language Book Soc. and Longman Group Lim.. 3rd Ed., P. 969.

Wanas, A.L. (2002): Response of faba bean (*Vicia faba*, L.) plants to seed-soaking application with natural yeast and carrot extracts as phytohormones and other growth, factors-rich sources. Ann. Agric. Sci., Moshtohor, 40(1): 83 -102.

تأثير إضافة بعض المواد الطبيعية والكيماوية على محصول وجودة الكوسة المنزرعة في العروة الصيفية المبكرة

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أجريت تجربتان حقليتان بمحطة البحوث الزراعية التابعة لمعهد بحوث البساتين (مزرعة قها)، خلال العروة الصيفية المبكرة لموسمي الزراعة ٢٠٠٥ ، ٢٠٠٦ لدراسة تأثير الإضافة الورقية لمستخلص الخميرة بتركيز ٥ جم / لتر وحامض الأسكوربيك بتركيز ٥٠٠ جزء في المليون وكذلك الرش ببعض العناصر الصغرى وهي الحديد والزنك والمنجنيز اما في صورة منفردة أو مجتمعة بتركيز ٢٥ جزء في المليون لكل منهم وذلك على النمو الخضري والمحتوى الكيماوي والتزهير والمحصول وكذلك جودة الثمار الناتجة لصنف الكوسة الاسكندراني المنزرع في العروة الصيفية المبكرة.

- تبين من الدراسة أن الرش بمخلوط العناصر الصغرى أدى إلى إحداث زيادة ملحوظة في قياسات النمو الخضري والتبكير في خروج أول زهرة مؤنثة وزيادة وزن الثمرة وكذلك زيادة المحصول وزيادة نسبة المواد الصلبة ومحتوى الكربوهيدرات بالثمار، كما أدى إلى زيادة محتوى الأوراق من كلوروفيل أ ، ب والكاروتين وكذلك محتواها من عناصر النيتروجين والفوسفور والبوتاسيوم والحديد والزنك والمنجنيز.
- أدى التفاعل بين مستخلص الخميرة ومخلوط العناصر الصغرى إلى زيادة في قياسات النمو الخضري ، المحتوى الكيماوي للأوراق ، التزهير ، المحصول وأيضاً صفات الجودة للثمار خلال موسمي الدراسة.

وتوصى الدراسة برش نباتات الكوسة بمستخلص الخميرة ومخلوط العناصر الصغرى (حديد + زنك + منجنيز) لزيادة الإنتاج وتحسين جودة ثمار الكوسة صنف "اسكندراني" وزيادة قدرة النباتات على تحمل البرودة في العروة الصيفية المبكرة