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EFFECT OF LOW TEMPERATURES AND SOME NATURAL SUBESTANCES ON FRUITS AND SEED YIELD OF SQUASH (*Cucurbita pepo* L.) IN EARLY SEASON.

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ABSTRACT

Two field experiments were conducted at El-Baramoon Research Station ,Hort. Research Institute during two early summer seasons 2001 and 2002 .This work was designed to study the effect of foliar application of nigella oil (2 ml / L.) , yeast extract (5%) garlic extract (20 ml /L) beside on control treatment in combination with seed cold treatments, i.e. 0^0C,-1^0C and ,-2^0C as well as room temperature on plant growth and flowering , chemical constituents, fruit yield and seed yield of squash cv. Eskandrani .The results could be summarized as follows :-

The applied treatments significantly differed among them and were superior the control in their impact on all growth parameters, flowering behavior, foliar mineral concentration (NPK and Ca), chlorophyll (a+b), early and total fruit yield, seed yield and its components during the two seasons.

The best results were obtained by application of yeast extract 5% X -2^0C treatment. Therefore, it could be recommended for using this treatment to raise fruit and seed productivity and improving fruit quality of squash cv. Eskandrani under conditions of the early summer planting.

INTRODUCTION

Squash (*Cucurbita pepo* L) is one of the most popular vegetable crops in Egypt. The area of squash in 2006 was about 90 thousand feddan which produces about 660 thousand tons of fruits, according to the institute of agriculture economic and statistics in Egypt 2007.

There is a lack of squash production in Egyptian market during early summer and winter seasons. Growth and development of open field squash plants at early summer or in winter season are severely affected as a result of frost and cold temperature. In addition to high expensive cost of squash production in greenhouse and tunnels. So, to produce squash in early summer in out door certain agriculture methods should be conducted to improve it's ability to tolerate cold stress. Cold stress known to induces serious internal biosynthetic and physiological disturbances, i.e. adverse changes in structural and biochemical properties of photosynthetic and respiratory system .Most of the basically ATP generating pathway, i.e., photophophorylation, glycolysis, TCC-cycele and oxidative phosphorylation are restricted, reduction in growth and protein syntheticsis,depletion in carbohydrate reserves ,serve decrease in phosphorus uptake and ATP synthesis and sequestering NH_4 into new nitrogen containing compouns Rabe and Lovatt,(1986). Also,cold stress induce high levels of endogenous ethylene led to more dtress injurious effect.Wang,(1987) .In this respect, the positive effect of seed cold treatments on vegetable crops productivity and cold tolerance was observed by (Higazy *et al.*, 1976; Shafshak,1987; Ahmed,1997; Abd Allah,2000 and Ali, 2000.).

Recently, great attention has been concentrated on the possibility of using several methods to improve the ability of vegetables to tolerate cold stress. Among these treatments, the use of some chemical and natural substances, *i.e.*, nigella oil , yeast extract , garlic extract and others as natural biosubestanes suggested to be of useful stimulatory, nutritional and protective functions when are applied on to vegetable plants during stressful condition. These phytoextracts known to be rich in, hormone , sugars, amino acids, nucleic acids , protein , phospholipids, vitamins and minerals as well as some monoterpenes ,glycosides and sulphed constitutes, those in turn may accelerate cell division and enlargement, enhances nucleic acids , proteins and chlorophyll synthesis, exert important cryoptective and osmoregulatory functions consequently, promotes the formation of flower and improves fruit setting (Winkler, 1962; Roberts,1976; Kraig and Haber,1980; Castelfronco and Beale, 1983;Spencer *et al.*, 1983 and Nover *et al* ., 1983 and Weiderrecht *et al.*,1988 Fathy and Farid, 2000).

The present study aimed to increase squash plants tolerance to the cold with improving the growth, chemical composition, flowering, fruit quality, fruit and seed yield under early summer condition.

MATERIALS AND METHODS

Two field experiments were conducted at Horticultural Research Farm of El- Baramoon, Dakahlia Governorate, .during the early summer growing seasons of 2001 and 2002 .Squash seeds were sown directly in the field on the last week of January for both seasons as follows:

1- Seed low temperature treatments ,were don by soaking in water and kept for 24 hours to swell .After swelling , the seeds were taken out of the water and divided equally and distributed on four plastic plates with filter paper , three plates with seeds were kept for 24 hours at different positions of freezer regulated and calibrated at different low temperature of $0^{0}C$,$-1^{0}C$ and ,$-2^{0}C$ for the different positions .Other ones were kept for 24 hours at the room temperature as control ,then, seeds were taken and directly sown in the field at 40 cm apart on one side of the ridge 3m long and 1.0 m wide.

2- Foliar application of natural oils and phytoextracts:

Squash plants were sprayed with:

-Nigella oil (black cumin) at concentration of 2ml/L, obtained from Gomhoria Com.

- Yeast extract was prepared by mixing 1Kg yeast to 0.25kg Molase for a period of 24 hours and then applied at concentration of 50 ml /L.
- Garlic extract was prepared from garlic bulb succulent cloves that blended well (5 min),then Blended garlic material mixed with methanol 95 % 1:1 (W /V) for 12 hours in sealed 1 L flask .Mixture was filtered and the filtrate was completed to 1L (V) distilled water ,then the extract used at concentration of 20ml / L.

Environmental temperature during the study is presented in Table (1).

The experimental design and treatments:-

Split plot system in a randomized complete block design with three replicates was used.

The foliar applied natural substances were randomly located in the main plots. Whereas, the sub plots were devoted low temperature treatments. The sub plot area was 12.0 m^2, which consisted of 4 ridges, 3.0 m length and 1.0 m width.

The experimental included 16 treatments, which were the combination between four foliar applications (nigella oil, yeast ext., garlic ext.. and tap water control) four seed cold treatments (0^0C,-1^0C and ,-2^0C added to ambient temperature).The plants were foliar sprayed 3 times (20,30 and 40 day) after sowing.

The experimental plots were managed as recommended.

The experimental parameters:-

1- Seed germination:-

Seed germination percentage and rate were determined in separate laboratory experiment in two seasons.

2- Vegetative growth:-

Representative 4 plants from each plot were randomly taken at 50 days after sowing for determination of stem length (cm), number of leaves per plant , fresh and dry weight per plant as well as leaf area (cm) which calculated from relation between area unit and dry weight of leaf (Koller , 1972) as follows :

$$\text{Leaf area per plant } (m^2) = \frac{\text{Leaves dry weight / plant X 10 disks area } (m^2)}{\text{Average dry weight of ten leaf disk}}$$

3- Chemical composition:-

At the same stage samples of 4th leaves were taken from plants of each plot and were used for the following chemical analysis.

a-Determination of the chlorophyll content: -

Samples of 0-2 g of fresh leaves were used for extraction and determination of chlorophyll a, b and total by using spectrophotometer and method of (Nornal,1982.)

b- NPK and Ca were determined according to the methods of (Cotton, 1954, Horneck and Miller,1998;Horneck and Hanson,1998).

4- Flowering parameters:

a- Flowering time (days), it was recorded the period from sowing till anthesis of the first pistillate flower of 25 % of plants / plot.

b-Three plants in each plot were randomly chosen, labeled and the following data were recorded:-

* Number of nodes of the first pistillate flower.
* Number of staminate and pistillate flowers during the whole season.
* The sex ratio calculated as the ratio of staminate / pistillate flowers.

5- Fruit yield and its components:

Fruit yield and its components were recorded from the plants of two rows of 6.0 m^2 area. Early yield was determined from the first 3 harvesting in terms of fruit yield/plant (gm) and yield / fed (ton)also, number and weight of

fruits from the cumulative harvestings all over the season were recorded and used to determine the following parameters:

* Fruit number / plant
* Fruit yield / plant.
*Total fruit yield / fed.
* Relatively yield (%).

$$RY\% = \frac{\text{Yield / plant of the treatment}}{\text{Yield / plant of control}} \times 100$$

*Average fruit weight (gm)
*Fruit shape (L/D)

It was calculated as the ratio between the length and the diameter (L/D) of the fruit.

6- Seed yield and its components:

The plants of the remainder two rows ($6m^2$ area) of each plot were regarded for seed yield. Only two fruits of each plant were left and then harvested successively at the full ripening stage, the following parameters were determined.

* Number and weight of seed / fruit.
* Seed yield / plant.
* Total seed yield / fed.
* Seed index (weight of 1000 seeds).

Statistical analysis :-

All collected data were subjected to statistical analysis using the normal (F-test) .Means was compared using Least Significant Difference (LSD) according to the method described by(Gomez and Gomez 1984). Also, the data of air temperatures, day and night (max / min), physical and chemical analysis of the experiment soil in the two seasons were presented herein Tables (1 & 2).

Table (1): Mean monthly air temperature at El-Dakahlia districts during the growing seasons (2001and 2002) of squash plants.

temperature	2001 season		2002 season	
	Max	Min	Max	Min
January	19.6	9.7	20.1	9.6
February	20.3	10.1	21.3	11.2
March	26.6	11.9	25.1	13.4
April	27.1	13.1	27.1	13.0
May	31.2	17.0	31.8	16.9

The physical and chemical properties of the experimental soil are shown in Table (2) according to Black, (1965) and Page *et al.*, (1982).

Table (2): Physical and chemical analysis of experimental soil during 2001 and 2002.

Soil properties	2001	2002
Texture	clayey	clayey
Clay %	60.95	60.25
Silt%	18-11	18-33
Fine sand %	19-73	20-22
Coarse sand %	0.81	0.85
PH (units)	7.9	8.0
EC(dsm)	0.90	0.91
Organic matter %	1.83	1.90
S.N (ppm)	55.3	60.1
Available p (ppm)	11.2	12.4
Available k (ppm)	500.1	495.3

RESULTS AND DIDSCUSSION

1- Seed germination:

Data presented in Table (3) show the effect of low temperature on the germination percentage and rate of squash seeds during the seasons of 2001 and 2002.

It is obvious from this data that, all the used seed cold treatments gave rise to significantly increased percentage of seed germination and to reduced number of days from sowing up to the germination of the maximum number of seeds than that of the control in both seasons. The most effective treatment which showed the highest percentage and rate of germination was -2^{0}C.The obtained results are in conformity with those reported by Hennart,(1985) working on many vegetable crops including squash,(Scott and Jones,1986;Coolbeart *et al.*,1987and Gabal,1990 working on tomato).They mentioned that low temperature pre sowing treatment of seeds increased substantially, germination percentage and enhanced germination rate.

Table (3): Effect of seed cold treatments on germination of squash seeds.

Cold treatments	Season 2001		Season 2002	
	G %	G rate	G %	G rate
0^{0}C	82.1	7.6	82.0	7.7
-1^{0}C	84.1	7.4	86.3	7.5
-2^{0}C	91.3	6.6	90.6	6.8
Room temp.(Control)	74.1	9.9	74.0	9.1
LSD	**1.95**	**1.21**	**1.94**	**1.23**

2- Vegetative growth characteristics:

Table (4) illustrates the effect of biostimulants foliar spray and seed cold treatments on vegetative growth characteristics of squash plant during 2001 and 2002 early summer seasons.

Table (4): Effect of biostimulants foliar spray and seed cold treatments and their combination on vegetative Growth characteristics of squash plant during 2001 and 2002.

parameters		Stem length(cm) cm)		No. leaves/p		Leaf area(m^2)		Fresh weight(kg)		Dry weight(g)	
Seasons / Treatments		2001	2002	2001	2002	2001	2002	200	2002	2001	2002
Foliar spray	Nigella oil	33.63	34.33	17.51	17.60	1.22	1.23	2.05	2.07	156.28	157.30
	Yeast ext.	37.10	37.85	18.53	18.68	1.54	1.29	2.18	2.20	157.63	158.73
	Garlic ext.	32.17	32.87	12.85	12.97	0.81	0.82	1.26	1.27	105.99	106.64
	Control*	31.48	32.10	11.18	10.90	.068	0.69	1.13	1.13	94.15	94.53
LSD		**0.069**	**0.573**	**0.017**	**0.503**	**0.005**	**0.004**	**0.003**	**0.013**	**0.238**	**0.788**
Low temperature	0^0 C	37.30	38.30	14.35	14.48	0.96	0.86	1.55	1.58	114.35	115.13
	-1^0 C	38.85	39.93	16.58	16.73	1.10	1.11	1.84	1.86	140.53	141.94
	-2^0 C	41.20	42.55	18.55	18.44	1.35	1.40	2.02	2.04	172.65	174.40
	Control**	17.30	16:23	10.58	10.50	0.68	0.67	1.21	1.20	86.52	851.73
LSD		**0.049**	**0.677**	**.0017**	**0.485**	**0.006**	**0.004**	**0.003**	**0.013**	**0.244**	**0.536**
Nigella oil	0^0 C	38.1	39.4	17.4	17.6	1.2	1.1	1.9	1.9	136.6	137.9
	-1^0 C	37.8	39.2	19.8	20.0	1.4	1.4	2.4	2.4	179.0	180.8
	-2^0 C	40.6	42.0	21.7	21.9	1.5	1.6	2.5	2.5	207.9	210.0
	Control	18.0	16.7	11.1	10.9	0.8	0.8	1.4	1.4	101.6	100.5
Yeast ext.	0^0 C	40.7	42.1	16.6	16.8	1.3	1.0	2.2	2.2	128.4	129.7
	-1^0 C	42.4	43.8	22.4	22.6	1.5	1.5	2.5	2.5	190.1	192.0
	-2^0 C	46.8	48.4	23.9	24.2	1.9	1.9	2.6	2.6	212.3	214.5
	Control	18.5	17.1	11.2	11.1	0.8	0.8	1.4	1.4	99.7	98.7
Garlic ext.	0^0 C	35.40	36.70	12.5	12.7	0.7	0.7	1.1	1.1	89.9	90.2
	-1^0 C	37.70	38.90	12.7	12.9	0.8	0.8	1.2	1.2	104.8	105.9
	-2^0 C	38.90	40.20	15.7	15.9	1.2	1.2	1.7	1.8	154.7	156.3
	Control	16.70	15.70	10.5	10.4	0.6	0.6	1.0	1.0	74.6	74.2
Control	0^0 C	35.0	35.3	10.9	10.8	0.6	0.6	1.1	1.1	102.5	102.7
	-1^0 C	37.5	37.8	11.4	11.4	0.7	0.7	1.2	1.2	88.2	89.1
	-2^0 C	39.4	39.6	12.9	11.8	0.9	0.9	1.2	1.3	115.7	116.8
	Control	16.0	15.9	9.5	9.6	0.5	0.5	14.1.0	141.0	70.2	69.5
LSD		**0.097**	**1.355**	**0.034**	**0.969**	**0.009**	**0.007**	**0.006**	**0.026**	**0.488**	**1.234**

The vegetative growth characteristics tested were stem length, number of leaves, leaf area, fresh and dry weight the presented data prove that, all the applied foliar sprays of biostimulants significantly increased stem length, number of leaves, leaf area, fresh and dry weight of their plants in comparison with the control treatment during the two seasons.

The most stimulatory and potent effects in diminished order was of yeast extract followed by nigella oil and garlic extract one respectively. The increase in vegetative growth values resulted from yeast extract application may be due to its high content of essential biostimulants, .i.e. ,carbohydrate, protein, GA3, IAA, cytokinins and vitamins, as well as mineral content .Vogel ,(1975), these in turn caused stimulation of cell division and enlargement ,protein and carbohydrate synthesis as well as chlorophyll formation (Kraig and Haber, 1980; Casteliranco and Beals, 1983 ; Spencer *et al.*, 1983 ; Fathy and Farid 1996 and Fathy *et al.*, 2000).Also, the same data in Table(4) indicated that low temperature had significant enhanced effect on all the studied growth characters during 2001 and 2002, such data indicated that low temperature of -2^0C was the most effective one of the highest vegetative growth characters compared with other low temperature treatments and the control one at the two seasons of study.
The control treatment was absolutely of the significantly lowest growth values in the two seasons.

These results are in agreement with those obtained by (Madzorova , 1962 on tomato Belousova, 1973 m, on pepper , Zaghloul, 1980 on cucumber, Shafshak 1983on pepper ,Hennart, 1985;Scott and Jones, 1986, Gabal,1990and Liu, 1994 on cucumber , Fathy, 1995 on tomato, Mohammed,1995 on eggplant, El-Nagar,1996 on pepper, Ahmed, 1997 on squash , Ali,2000 on pea and Shafshak.,*et al.*,2007) on Squash. Such growth stimulation and increments as a result of presowing seed cold treatments even under unfavorite low temperatures prevails during the vegetative growth stage of early squash seasons could be explained based on the same beneficial effect of these treatments on their plants foliar N,P, K and Ca concentration as well as cholorophyll content (table 5).

That conclusion could to be related to the whole plant physiological and metabolical process and with cold tolerant status of plants (Alden and Herman,1971 ;Shin and Jung, 1971 ;James and Brown, 1975 ; Iswari and Palta 1989 and Palta, 1990). The same data in Table (4)also, indicate that, all the studied vegetative growth characteristic were significantly affected by foliar sprays and low temperature interaction treatments, at the same time show that minimizing the temperature degree which squash seeds were steeping with them from room temperature (control) up to -2^0C resulted in considerable increase in all the mentioned characters with all of the used foliar spraying treatments.

It is also evident that, room temperature treatments resulted in the lowest values of the mentioned characters with all foliar spraying treatment compared with other interaction ones.

Also ,this data indicated obviously that, the interaction treatments of the highest values of the mentioned characters were the yeast extract X -2^0C followed by yeast extract X -1^0C whereas , the treatment of water spray X

room temperature had significantly the lowest values at the two seasons, the superiority of yeast extract X -2^{0}C treatment in vegetative growth characters relative to the other interaction treatments could be expected , since the plants of the same treatment were of the highest foliar NPK, Ca and of chlorophyll content .

Such chemical constituents had been known to involve in and activate the whole bio-assimilation processes ,such as sugar , amino acids, nucleic acids and ATP biosynthesis , which in turn affect growth aspects and at the same time might be involved in activation of H-ATP-ase (membrane pumps) , in an active form related tightly with cold tolerability (Palta ,1990).

3- Chemical composition: -

Data presented in Table (5), revealed that, all foliar spray treatments were differed significantly among them and highly superior the control in chlorophyll (a +b), N, P, K and Ca in their leaves during the two seasons. The same data cleared that, the highest values were recorded with yeast extract treatment at both seasons. Similar results were obtained by (EL-Beheidy *et al.*, 1988$_{b}$; Fathy and Faried,1996 and Fathy *et al.*, 2000). present significant increments in chlorophyll (a +b) and mineral concentration values by all treatments compared with the control may be explained based on the activator and protective impact of the applied biostimulants particularly yeast extract and nigella oil on the whole metabolic and bioassimilation processes and on the transporter enzymes as well as protection of chloroplasts and chlorophyll against the destructive effects of the prevailing low temperature. Whereas, the worst growth case of the control may be due to the degradable effect of low temperature condition (Table 1) and it's paralleled inducible oxidative stress on plasma membrane and it's binding transporter enzymes and then the consequential inhibition for, mineral uptake and translocation processes (Palta,1990 and Dicknson *et al.*,1991).

The same data presented in Table (5) show the effect of low temperature on chlorophyll (a +b),N,P,K and Ca content of leaves ,such data indicated that all used treatments significantly increased the content of plant tip from (a +b)chlorophyll ,N,P,K and Ca over control treatment at both seasons .

It is evident from the same data that the highest values of-2^{0}C treatment followed by,-1^{0}C treatment in both seasons.

These results are confirmed by those of(Shafshak,1983;; Gabal, 1990;Fathy,1995 ; Ahmed,1997 and Shafshak *et al.*, 2007) ,they stated that.In addition, the beneficial effect of low temperature treatments on foliar N,P,K, Ca and chlorophyll concentration of their plants logically reflected on their sugars and amino acids biosynthesis,those that known to be closely related with cold tolerance potency via their osmoregulatory and cryoprotective functions as well as tissue water content and Form .This coincided by the finding of (Jung and Smith ,1961) whom stated that, during cold acclimation an increase soluble sugars occurred and suggested that such increase in sugars might be protect protein against denaturation during cold stress condition ,regulate water content of the cell and increase binding water that have important function in tolerance cold stress condition .

Table (5): Effect of biostimulants foliar spray and seed cold treatments and their interaction on chemical composition of Squash plant during 2001 and 2002

Parameters		N %		P%		K%		Ca %		Total chlorophyll(a+b) (a+b mg/100ml	
Seasons / Treatments		2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Foliar spray	Nigella oil	4.50	4.51	.0.32	0.32	3.26	3.26	2.17	2.19	98.30	99.75
	Yeast ext.	4.54	4.56	0.33	0.33	3.40	3.40	2.19	2.20	101.10	1021.35
	Garlic ext.	3.83	3.84	0.31	0.32	3.32	3.32	1.82	1.73	102.20	101.05
	Control*	3.31	3.32	0.30	0.31	3.24	3.25	1.53	1.71	98.42	98.55
LSD		0.013	0.014	0.001	0.002	0.033	0.034	0.029	0.027	0.024	0.026
Low temperature	0^0 C	4.57	4.58	0.32	0.32	3.31	3.31	1.82	1.87	97.60	97.98
	-1^0 C	4.70	4.71	0.33	0.33	3.46	3.46	2.05	2.07	99.13	100.28
	-2^0 C	4.76	4.77	0.33	0.35	3.50	3.53	2.21	2.24	111.98	113.23
	Control**	2.16	2.66	0.29	0.28	2.86	2.95	1.64	1.65	91.25	89.53
LSD		0.018	0.015	0.002	0.002	0.025	0.033	0.032	0.032	0.026	0.037
Nigella oil	0^0 C	5.11	5.12	0.316	0.314	3.31	3.31	2.03	2.04	96.80	96.90
	-1^0 C	5.33	5.34	0.323	0.323	3.42	3.42	2.36	2.37	99.00	99.10
	-2^0 C	5.44	5.45	0.344	0.341	3.43	3.43	2.54	2.58	110.40	112.30
	Control	2.13	4.14	0.284	0.282	2.89	2.89	1.76	1.76	88.00	88.80
Yeast ext.	0^0 C	5.16	5.18	0.320	0.318	3.31	3.31	1.97	1.98	96.40	97.7
	-1^0 C	5.38	5.40	0.324	0.322	3.46	3.46	2.43	2.45	101.00	102.00
	-2^0 C	5.46	5.47	0.393	0.391	3.57	3.57	2.60	2.62	115.20	116.40
	Control	2.16	2.17	0.284	0.272	2.87	2.87	1.75	1.75	91.80	92.40
Garlic ext.	0^0 C	4.36	4.37	0.322	0.312	3.30	3.30	1.68	1.68	99.30	100.10
	-1^0 C	4.41	4.42	0.333	0.329	3.48	3.48	1.85	1.80	100.40	101.10
	-2^0 C	4.44	4.44	0.245	0.344	3.50	3.50	2.17	1.88	112.10	113.70
	Control	2.12	2.12	0.282	0.281	3.01	3.01	1.56	1.56	89.00	89.30
Control	0^0 C	3.65	3.66	0.328	0.327	3.30	3.30	1.58	1.78	97.90	97.20
	-1^0 C	3.67	3.68	0.338	0.337	3.48	3.48	1.56	1.67	99.10	98.90
	-2^0 C	3.71	3.72	0.342	0.340	3.50	3.60	1.53	1.88	110.20	110.50
	Control	2.21	2.22	0.291	0.289	2.68	3.01	1.47	1.52	86.50	87.60
LSD		0.036	0.030	0.004	0.004	0.050	0.066	0.064	0.065	0.052	0.074

As for the interaction effect on chemical composition data in (Table 5) show that foliar spray with yeast extract X-2^{0}C treatment significantly gave the highest values for chlorophyll (a +b), N, P, K and Ca concentrations in both seasons. Also, it was distinct that treatment of nigella oil X-2^{0}C was the following important one of considerable high values for all mineral and chlorophyll components in two seasons.

4-Flowering traits:-

Data in Table (6) show that, all the used foliar sprays decreased significantly sex ratio (female to male flowers), flowering time (days) and number of nodes of the first female flower of squash plant compared with the control treatment. The same data clearly that yeast extract treatment gave significantly the lowest values of sex ratio and number of nodes of the first female flower in the two seasons ,whereas , using nigella oil treatment gave considerably the lowest value of flowering time (days) at the two seasons. It was also clear from table(6) that all the used low temperature treatments were greatly decreased sex ratio, number of days to flowering and number of nodes of first female flower of squash plant compared with the control treatment in two seasons.

In this respect the most effective one was ,-2^{0}C treatment that gave the significant lowest sex ratio and number of nodes of the first female flower, also considerably reduced the period from sowing till anthesis of the first female flower in the two seasons.

The same data also cleared that using yeast extract treatment X-2^{0}C gave significantly the best values of sex ratio flowering time (days) and number of nodes of the first flower in two seasons. Similar results were obtained by (Higazy *et al.,* 1976; Shafshak, 1987; Fathy, 1995; Ahmed 1997 and Abd-Allah, 2000).

5-Fruit yield and yield components:

The data presented in Table (7) showed the effect of foliar spray (nigella oil, yeast extract, garlic extract and control), low temperature (0^{0}C,-1^{0}C,-2^{0}C and room temperature) and their interaction on early and total yield components of squash plants during 2001 and 2002 seasons.

Such data cleared that, all foliar spray treatments were greatly increased early yield, total yield and its components over the control in two seasons .The significant highest values were of yeast extract treatment at both seasons. The promotional effect of yeast extract was in agreement with the results obtained by (Fathy and Faried ,1996 ; Hewedy *et al* .,1996 ; Fathy *et al* .,2000) . Herein , the superiority of yeast extract treatment and the beneficial effect of the others could be due to their similar enhancable effect on growth and chemical composition and flowering of their plants Table (4,5 and 6).However the same data in Table (7) cleared that all of the used low temperature considerably improved all of the , early yield / plant (gm) , and early yield / fed (ton) as well as total fruits number / plant, total yield / plant (kg) ,) , total yield / fed (ton) and relative yield (%) at the both seasons .

Such data also, indicated that low temperature of ,-2^{0}C followed by -1^{0}C were of the highest values of early and total yield and their components compared with other treatments in the two seasons .

Table (6): Effect of biostimulants foliar spray and seed cold treatments and their interaction on flowering traits of squash plant during 2001 and 2002.

Parameters		No. days to flowering		No. nods of first female		Six ratio	
Treatments \ Seasons		2001	2002	2001	2002	2001	2002
Foliar spray	Nigella oil	56.85	55.64	5.01	5.37	1.49	1.54
	Yeast ext.	56.99	55.82	4.93	5.26	1.27	1.35
	Garlic ext.	57.48	57.22	5.20	5.31	1.56	1.61
	Control*	62.36	59.62	6.12	6.23	1.95	2.03
LSD		**0.273**	**0.277**	**0.016**	**0.047**	**0.016**	**0.024**
Low temperature	0^0 C	56.85	56.79	4.91	5.21	1.40	1.45
	-1^0 C	56.99	56.92	4.98	5.23	1.31	1.35
	-2^0 C	52.48	52.76	3.63	3.85	1.09	1.17
	Control**	62.36	61.83	7.74	7.89	2.46	2.56
LSD		**0.211**	**0.212**	**0.025**	**0.041**	**0.012**	**0.018**
Nigella oil	0^0 C	55.30	55.47	4.60	5.01	1.35	1.37
	-1^0 C	55.33	55.85	4.73	5.11	1.30	1.29
	-2^0 C	50.00	49.95	3.20	3.48	1.10	1.15
	Control	61.22	60.01	7.49	7.90	2.22	2.35
Yeast ext.	0^0 C	55.40	55.80	4.53	5.02	1.22	1.24
	-1^0 C	55.90	55.75	4.80	4.95	0.99	1.00
	-2^0 C	49.70	49.83	3.00	3.30	0.61	0.76
	Control	61.00	61.90	7.40	7.76	2.25	2.40
Garlic ext.	0^0 C	57.80	56.77	5.01	5.13	1.40	1.47
	-1^0 C	57.73	57.13	4.95	5.01	1.33	1.39
	-2^0 C	53.11	53.24	3.31	3.20	1.11	1.14
	Control	61.18	61.75	7.54	7.90	2.38	2.43
Control	0^0 C	58.90	58.85	5.50	5.70	1.63	1.73
	-1^0 C	59.00	58.95	5.45	5.83	1.60	1.70
	-2^0 C	57.13	58.02	5.00	5.40	1.55	1.63
	Control	66.03	62.66	8.53	8.00	3.01	3.06
LSD		**0.431**	**0.424**	**0.050**	**0.081**	**0.024**	**0.036**

Table (7): Effect of biostimulants foliar spray and seed cold treatments and their interaction on fruit yield of squash plant during 2001 and 2002.

Parameters		Early yield (gm) / p		Early yield (ton) / f		No. fruit/ p		Total yield / p (kg)		Total yield / f (ton)		Relative yield% of contol		Av. fruit weigh (gm)		Shape index (cm)	
Seasons / Treatments		2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Foliar spray	Nigella oil	165.62	166.90	1.57	1.58	15.53	15.47	2.12	2.12	20.14	20.10	126.2	126.9	136.52	137.7	3.58	3.66
	Yeast ext.	258.18	253.53	2.45	2.40	16.92	16.78	2.16	2.17	20.52	20.64	130.1	129.3	127.76	129.90	3.57	3.57
	Garlic ext.	205.44	205.57	1.95	1.95	15.18	14.98	1.94	1.94	18.39	18.38	129.1	128.6	127.03	129.09	3.24	3.25
	Control*	157.54	158.13	1.50	1.49	13.98	13.74	1.68	1.69	15.95	16.07	117.0	117.8	119.73	122.89	3.23	3.22
LSD		**1.586**	**1.154**	**0.015**	**0.023**	**0.160**	**0.189**	**0.019**	**0.025**	**0.178**	**0.211**	**3.610**	**7.224**	**2.047**	**2.811**	**0.015**	**0.002**
Low temper-ature	0^0 C	192.61	191.45	1.83	1.82	15.45	15.29	1.95	1.95	18.55	18.49	124.7	124.1	126.58	127.42	3.59	3.51
	-1^0 C	204.44	200.70	1.94	1.91	15.70	15.53	2.08	2.08	19.71	19.73	132.9	132.1	132.54	134.23	3.44	3.50
	-2^0 C	257.77	259.45	2.45	2.46	16.62	16.56	2.30	2.33	21.85	22.06	146.1	146.4	137.82	140.20	3.38	3.43
	Control**	131.97	132.53	1.25	1.25	13.84	13.59	1.57	1.57	14.88	14.91	100.0	100.0	113.04	115.51	3.19	3.26
LSD		**1.583**	**0.918**	**0.015**	**0.022**	**0.106**	**0.171**	**0.028**	**0.034**	**0.264**	**0.329**	**1.918**	**3.3**	**2.095**	**2.390**	**0.016**	**0.013**
Nigella oil	0^0 C	162.7	163.3	1.546	1.552	15.1	15.0	2.01	2.01	19.09	19.13	121.9	119.9	133.1	134.0	3.7	3.7
	-1^0 C	169.3	165.1	1.608	1.565	15.4	15.2	2.40	2.40	22.80	22.80	145.5	142.8	155.8	157.9	3.7	3.7
	-2^0 C	203.3	210.3	1.931	1.998	17.6	17.7	2.58	2.60	24.51	24.67	156.4	154.5	147.2	146.7	3.7	3.6
	Control	127.2	128.8	1.208	1.223	14.0	13.9	1.65	1.68	15.67	15.96	100.0	100.0	117.6	120.6	3.2	3.3
Yeast ext.	0^0 C	237.3	230.9	2.254	2.193	17.5	17.2	2.06	2.06	19.57	19.57	122.6	125.0	118.0	119.6	3.9	3.9
	-1^0 C	267.1	256.5	2.538	2.437	17.6	17.5	2.08	2.09	19.76	19.83	123.8	126.6	118.2	119.3	3.9	3.8
	-2^0 C	389.2	387.4	3.697	3.652	18.1	18.3	2.66	2.67	25.24	25.34	158.1	156.4	146.8	145.8	3.3	3.7
	Control	139.1	139.3	1.322	1.337	14.5	14.1	1.68	1.65	15.96	15.68	100.0	100.0	115.9	117.3	3.2	3.3
Garlic ext.	0^0 C	211.3	211.4	2.008	2.009	15.1	15.0	2.06	2.03	19.57	19.32	137.3	134.6	136.1	135.5	3.3	3.3
	-1^0 C	223.2	225.6	2.120	2.143	15.6	15.5	2.03	2.04	19.32	19.35	135.5	134.9	130.6	131.4	3.3	3.2
	-2^0 C	250.2	249.9	2.376	2.374	16.2	16.1	2.15	2.19	20.43	20.50	143.4	144.7	132.7	135.9	3.2	3.2
	Control	137.1	135.3	1.302	1.254	13.8	13.3	1.50	1.51	14.25	14.35	100.0	100.0	108.7	113.50	3.2	3.3
Control	0^0 C	159.2	160.2	1.515	1.522	14.1	13.9	1.68	1.68	15.96	15.93	117.1	117.0	119.1	120.6	3.5	3.2
	-1^0 C	158.2	155.5	1.503	1.478	14.2	13.9	1.79	1.78	16.97	16.95	124.6	124.2	125.5	128.3	3.3	3.2
	-2^0 C	188.4	190.2	1.790	1.806	14.6	14.1	1.81	1.87	17.23	17.74	126.5	130.2	124.5	132.4	3.2	3.2
	Control	124.4	126.7	1.181	1.172	13.0	13.1	1.43	1.44	13.62	13.65	100.0	100.0	110.0	110.6	3.2	3.2
LSD		**1.790**	**1.836**	**0.030**	**0.045**	**0.213**	**0.341**	**0.056**	**0.067**	**.0529**	**0.658**	**3.837**	**6.602**	**4.191**	**4.780**	**0.032**	**0.027**

It is also clear that, the control treatment was significantly of the lowest yield values compared with all the other treatments in the two seasons. Concerning the effect of interaction, the same data proved that, the highest values of the early and total yield and their components were of yeast extract X -2^{0}C treatment. This treatment increased the total yield with about 58.1 and 56.4 % respectively over the control treatment at the two seasons. In addition, the same data indicated that all the applied seed treatments and foliar spray were considerably squash improved fruit quality characters (average fruit weight and fruit shape index L / D) compared with the control in two seasons. Such data indicated that the nigella oil treatment resulted in the highest average fruit weught (gm) and fruit shape index (L/D) the same data showed that the most of the used low temperature increased significantly all physical characters of squash fruits over the control treatment it's also showed the highest values of average weight was of -2 treatment, where as the highest fruit shape index was of 0C. the two seasons have the same trend Also, it was evident that the considerable highest value for average fruit weight was of nigella X -1^{0}C and the highest fruit shape index L / D value was of yeast extract X -0^{0}C and yeast extract X -1^{0}C at both seasons.

Similar results were obtained by Shafshak, (1983) on sweet pepper , (Gabal, 1990 on tomato, Vogal (1990), Zghaloul *et al.*,1992 on cucumber ,Fathy, 1995 on tomato , El- Nagar, 1996 on sweet pepper , Ahmed, 1997 on squash and Abou El-Nasr *et al.*, 2001 on squash Shafshak *et al.*,2007).

6-Seed yield and its components:

Data presented in table (8) showed the influence of foliar spray and low temperature and their interaction on number and weight of seed / fruit, seed index , seed weight / plant (gm) , seeds yield / area (gm) and seed yield / fed (kg) of squash plants. Such data indicated clearly that the biostimulants foliar spray were significantly increased seed yield and its components over the control at both seasons.

The highest values were of yeast extract treatment followed by nigella oil and garlic extract respectively in two seasons.

However this data in table (8) also, cleared that all of the used low temperature considerably improved number and weight of seeds / fruit , seed index , seed yield / plant (gm) seed yield / area (gm) and seed weight / fed (kg) at both seasons. Also, that low temperatures of ,-2^{0}C followed by ,-1^{0}C and 0^{0}C were of the highest values for seed yield and its components compared with control treatment in the two seasons .Similar results obtained by Higazy, 1976; Eid *et al.*, 1988 on broad bean , Abd –Alla, 2000 ; Ali,2000 and Mady, 2000on squash. In connection with the effect of interaction, the same data indicated that the interaction treatment of the highest values of seed yield and its components were yeast extract X -2^{0}C treatment followed by yeast extract X -1^{0}C at the two seasons.

Table (8): Effect of biostimulants foliar spray and seed cold treatments and their interaction on seed yield of squash plant during 2001 and 2002.

parameters		No. of seeds / fruit		Seed w./ F (gm)		Seed index wt.1000 seeds		Seed w. /plant (gm)		Seed w. /area (gm)		Seed yield / F(kg)	
Seasons / Treatments		2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Foliar spray	Nigella oil	134.4	133.80	26.75	26.39	198.1	196.3	53.498	52.79	802.4	719.9	507.9	501.3
	Yeast ext.	141.7	141.50	30.41	30.18	212.6	211.5	60.83	60.41	912.4	906.2	577.6	573.6
	Garlic ext.	133.9	133.50	25.59	25.71	190.3	191.8	51.19	51.42	767.9	771.2	486.1	488.2
	Control*	126.9	126.70	24.39	24.25	192.2	191.7	48.84	48.51	732.6	727.7	463.8	460.6
LSD		**0.249**	**0.547**	**0.661**	**0.526**	**5.30**	**5.818**	**0.569**	**0.875**	**7.131**	**7.006**	**5.983**	**5.006**
Low temperature	0^0 C	134.7	134.20	25.69	25.47	190.70	198.6	51.39	50.94	770.9	764.1	487.9	551.2
	-1^0 C	135.9	135.60	28.01	27.81	199.4	204.5	56.02	55.62	840.3	834.3	531.9	528.1
	-2^0 C	140.6	140.60	32.90	32.73	236.6	233.2	65.39	65.56	985.4	981.8	623.7	621.5
	Control**	125.8	125.8	20.60	20.60	163.8	163.9	41.25	41.11	618.8	616.7	391.7	390.3
LSD		**0.305**	**0.503**	**0.717**	**0.413**	**7.131**	**6.512**	**0.672**	**1.059**	**9.140**	**8.995**	**9.001**	**9.017**
Nigella oili	0^0 C	134.18	133.98	25.16	24.85	187.5	185.5	5032	49.7	754.8	745.5	477.8	471.9
	-1^0 C	136.30	135.54	27.31	27.18	200.4	200.1	54.62	54.36	819.3	815.4	518.0	516.2
	-2^0 C	140.14	139.55	33.62	32.80	239.9	235.0	67.24	65.60	1008.6	984.0	638.4	622.9
	Control	127.07	126.08	20.89	20.75	164.4	164.6	41.78	41.5	626.7	622.5	396.7	394.0
Yeast extract	0^0 C	141.44	140.84	28.40	28.00	200.8	198.9	56.80	56.0	852.0	840.0	539.3	531.7
	-1^0 C	144.49	144.07	32.59	32.10	225.6	22.82	65.18	64.20	977.7	963.0	618.9	609.6
	-2^0 C	152.17	151.96	39.53	39.40	259.8	259.3	79.06	78.80	1188.9	1182.0	750.7	748.2
	Control	128.70	129.27	21.13	21.32	164.2	164.9	42.26	42.64	633.9	639.6	401.3	404.9
Garlic extract	0^0 C	134.87	134.77	25.12	25.13	186.3	186.5	50.24	50.26	753.6	753.9	477.0	477.2
	-1^0 C	135.00	135.40	26.99	26.95	199.9	199.00	53.98	53.90	809.7	808.5	512.5	511.8
	-2^0 C	139.87	138.93	30.13	30.70	215.4	221.3	60.26	61.40	903.9	921.0	572.2	582.9
	Control	126.17	125.10	20.15	20.05	159.7	160.3	40.30	40.1	604.5	601.5	382.7	380.7
Control	0^0 C	128.15	127.32	24.10	23.90	188.1	187.7	48.20	47.80	723.0	717.0	457.7	453.9
	-1^0 C	128.13	127.43	25.15	25.01	196.3	196.3	50.30	50.02	754.5	750.3	477.6	474.9
	-2^0 C	130.07	129.07	28.10	28.01	216.0	217.00	56.20	56.02	843.0	840.3	533.6	531.9
	Control	121.33	121.25	20.23	20.10	166.7	165.8	40.66	40.20	609.9	603.0	386.1	381.7
LSD		**0.610**	**1.006**	**1.434**	**1.303**	**11.816**	**10.950**	**1.344**	**2.119**	**17.310**	**15.18**	**14.013**	**13.020**

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تاثيردرجات الحرارة المنخفضة وبعض المواد الطبيعيه على المحصول الثمرى والبذرى فى قرع الكوسه .

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اجريت تجربتان حقليتان بالمزرعه البحثيه التابعه لمعهد بحوث البساتين – البرامون – دقهليه بالموسم الصيفى المبكر لعامى ٢٠٠١ و ٢٠٠٢ لدراسه تاثير الرش ببعض المواد الطبيعيه (زيت حبه البركه ٢ مل / لتر – مستخلص الخميره ٥ % (٥٠ مل/لتر) و مستخلص الثوم ٢٠%٢ مل / لتر) على نباتات الكوسه والتى قد تعرضت بذورها لدرجات حراره منخفضه (صفر و –١ م° و–٢م° و المقارنه (حراره الغرفه) وكذلك التفاعل بين هذه المعاملات على النمو والتركيب المعدنى ومحصول الثمار والبذور وذلك لمحاوله التغلب على حساسيه نبات الكوسه لدرجات الحرارة المنخفضة والصقيع خلال العروة الصيفيه المبكره وبالتالى تحسين النمو والانتاجيه خلال تلك الظروف غير المواتيه.

وقد اوضحت الدراسه ان افضل النتائج المتحصل عليها هى برش نباتات الكوسه صنف الاسكندرانى المنزرعه خلال شهر يناير بمستخلص الخميره بتركيز ٥ % وذلك بعد تعريض بذورها لدرجه حراره –٢ م لمده ٢٤ ساعه وادت هذه المعامله الى تحسين النمو الخضرى والتركيب المعدنى وتعظيم محصول الثمار والبذور لنباتات الكوسه تحت ظروف البروده السائده فى العروه المبكره.