J. Plant Production, Mansoura Univ., Vol. 5 (2):241 - 253, 2014

EFFECT OF N-FORMS AND SOME BIO-STIMULANTS ON PRODUCTIVITY OF CUCUMBER:
1-VEGETATIVE GROWTH AND CHEMICAL CONSTITUENTS.

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ABSTRACT

Two field experiments were carried out in a private farm at El-Mahalla El-Kubra, Gharbia governorate during the two successive summer seasons of 2011 and 2012. The aim was to investigate the effect of nitrogen fertilization forms i.e ammonium sulphate and calcium nitrate and some bio-stimulants i.e humic acid, fulvic acid, EM and yeast extract under high temperature on vegetative growth parameters and chemical constituents in leaves of cucumber (*Cucumis sativus* L.) cv. Prince.

The obtained results showed that the effect of N-forms was significant on all vegetative growth parameters and chemical constituents of cucumber plants. The maximum values of these parameters were executed for the treatment of (50%NH_4 + 50%NO_3). As for foliar spraying of cucumber, plants with bio-stimulants significantly increased the mean values of the vegetative growth parameters and chemical constituents as compared to the control treatment. The best foliar application were yeast extract at 10 g/l or effective Microorganisms (EM) at 20 ml/l.

Therefore, using nitrogen fertilization as (50% NH_4 +50% NO_3) combined with spraying yeast extract at 10 g/l or effective Microorganisms (EM) at 20 ml/l could be recommended in case of high temperature conditions.

Keywords: Cucumber (*Cucumis sativus*) – vegetative growth parameters – chemical constituents of leaves – N-forms NH_4:NO_3 – bio-stimulants – humic acid – fulvic acid - effective Microorganisms (EM) – yeast extract – high temperature.

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is a member of the economically important family cucurbitaceae. Cucumber is warm season crop. However, it has ability to grow under very wide range of climate, so it is grown through the world using open field or greenhouse. It is grown in Egypt in open fields at summer season and under greenhouses or plastic tunnels in winter season. The cultivated open field area reached 71932 feddan with average yield of 9.33 ton/feddan. Relatively heat temperature in summer led to an increase in No. of male flowers and decreased total yield.

Nitrogen is essential to all living organisms and is used in the synthesis of enzymes, nucleoproteins. In addition, nitrogen is an important component of chlorophyll. Plants absorb N only as inorganic nitrate ions (NO_3^-) or ammonium (NH_4^+) and, or amino ions (NH_2^+). Available N is often a more limiting factor affecting plant growth than any other nutrient (El-Tantawy and Mahmoud, 2013).

Recently, great attention has been focused on the possibility of using natural and safe substituents in order to improve plant growth of horticultural plants under high temperature. Thus there was a necessity for judicious use of special management practices to maximize the yield by using humic acid, fulvic acid, effective Microorganisms (EM) and yeast extract. Humic substances, such as humus, humate, humic acid, fulvic acid, and humin, play a vital role in soil fertility and plant nutrition. Humic acid is in common use as major components of vegetable and crop biostimulant formulations, auxine and cytokinin like activities of humic acids have been reported (Piccolo *et al.*, 1992). Humic acid is considered to increase the permeability of plant membranes and enhance the uptake of nutrients. Fulvic acid had a role in promoting plant growth and flowering, the importance of fulvic acid likes its ability to promote hormonal activity in plant (Clapp *et al.*, 2002). EM as a biofertilizer contains group of beneficial microorganisms (primary photosynthetic and lactic acid bacteria, yeast, actinomycetes and fermenting fungi) which promotes germination, improves physical, chemical and biological environments of the soil and suppresses soil borne pathogens and pests, furthermore, it enhances the photosynthetic capacity of crops (Woodward, 2003). Yeast extract is a natural bio-substance suggested to be of useful promotional and nutritional functions, due to their hormones, sugars, amino acids, nucleic acids, vitamins and minerals content. It contains a natural growth regulators, especially, cytokinins which play an important role and had a simulative effect on cell division, enlargement, protein and nucleic acids synthesis. The yeast also contains tryptophan (Abdel-Latif, 1987) which is considered the precursor of IAA (Moor, 1979). Consequently, the application of yeast extract produced more IAA which increased plant growth (Sakr *et al.*, 2013).

The aim of this study is to evaluate the growth characteristics and chemical constituents of cucumber in response to different N-forms and some bio-stimulants treatments and their interactions under high temperature.

MATERIALS AND METHODS

Two field experiments were carried out at a private farm near El-Mahalla El-Kubra city, Gharbia governorate during the two successive summer seasons of 2011 and 2012, to investigate the effect of nitrogen forms and some bio-stimulants at high temperature on vegetative growth parameters and biochemical constituents of Cucumber (*Cucumis sativus* L.) cv. prince. Split-plot design with three replicates in the both seasons was used in this study. Five treatments of N-forms combinations (NH_4^+ : NO_3^-) and five bio-stimulants (control, humic acid, fulvic acid, effective microorganisms (EM) and active dry yeast) were used in foliar way. Thus the experiment included 25 treatments as follows:

I. First factor (N-forms):

1- N1= 100% NH_4^+ + 0% NO_3^-.
2- N2= 75% NH_4^+ + 25% NO_3^-.
3- N3= 50% NH_4^+ + 50% NO_3^-.
4 -N4= 25% NH_4^+ + 75% NO_3^-.

5- N5= 0% NH_4^+ + 100% NO_3^-.

II. Second factor (Bio-stimulants treatments):

1- Control (tap water).
2- Humic acid 20 m/l.
3- Fulvic acid 20 m/l.
4- EM 20 m/l.
5-Yeast extract 10 g/l.

All bio-stimulants were used in the foliar way.

The seeds of cucumber were sowing in the fourth week of june in both seasons of the study. Cucumber seeds were sown in hills handly at 30 cm distance between seeds on ridges. The plot area was 9 m^2 (1.5m x 6m).

The physical and chemical properties of the experimental soil have presented in Table (1).

Table (1): Physical and chemical analysis of the experimental soil during 2011 and 2012 seasons.

Seasons	O.M %	$CaCO_3$ %	Coarse sand%	Fine Sand %	Silt %	Clay %
2011	2.45	1. 97	1.92	18.33	32.21	47.54
2012	2.19	2.09	2.37	18.46	33.26	45.91

Table 1: continued

S.P %	Available (ppm)			Texture class	EC** ds/m	pH*
	N	P	K			
59	58.6	5.1	328	Clay	1.03	7.83
57	53.9	4.7	315	Clay	0.98	7.96

*Soil suspension (1:2.5)   ** Soil extraction (1:5)

Nitrogen fertilizer was added in the form of Ammonium sulphate [$(NH_4)_2SO_4$; 20.6% N] as a source of NH_4^- and Calcium nitrate [Ca $(NO_3)_2$, 15.5% N] as a source of NO_3^-. These fertilizers where added at the level 100 kg N/fed. The given doses were divided into two equal parts; the first at 21 days from planting and the other at two weeks later in both seasons.

Humic acid, fulvic acid and EM were obtained from Ministry of Agriculture, and foliarly applied at the rates of 20 ml/l for each. The control treatment was sprayed with tap water. Yeast extract: Backer's yeast mixed with sugar at ratio of 1:1 and left for 3 hours at room temperature. Then it was frozen for disruption of yeast tissue and releasing their content. Prepration of yeast extract was done according to El-Ghamriny *et al.* (1999) at the rate of 10 g/l. All the treatments of bio-stimulants were foliarly applied at two stages; one after two weeks from sowing and the other 7 days later.

After 50 days from the sowing 5 plants were randomly chosen from each treatment to determine the following parameters:

- Plant height (cm).
- Number of leaves per plant.
- Plant dry weight (g/plant).
- Leaf area /plant: was determined according to the method mentioned by (Koller, 1972).

Chemical constituents in the leaves:

- Chlorophyll content: was estimated as the method described by Goodwine (1965).
- Total nitrogen content: was determined in dried plant materials by using Keldahl methods described by Jackson (1967).
- Total phosphorus content: was determined using methods described by (Jackson 1967).
- Potassium content: was determined in the digested plant materials using a flame photometer according to Black (1965).

The obtained data were subjected to statistical analysis as split plot design with three replicates in both seasons according to Gomez and Gomez (1984).The differences between the treatments were compared using least significant differences (L.S.D) as described by Snedecor and Cochran **(**1967).

RESULTS

1- Vegetative growth parameters:

Concerning the effect of nitrogen forms combinations on vegetative growth parameters i.e.; plant height, number of leaves, leaf area and dry weight; data in Table (2) showed that all parameters under investigation gave significant differences among their values. As respect of the N-forms, the maximum values of the vegetative growth parameters were executed for the treatment of N3 (50%NH_4 + 50%NO_3). On the other hand, the lowest values of these parameters were produced when 100% NH_4 was the only N-form of cucumber plants. The same trend was happened during the second season of the experiment.

Concerning the effect of bio-stimulants; data of the same Table also indicated that; foliar spraying with bio-stimulants (humic acid, fulvic acid, EM and yeast extract) significantly increased the mean values of the vegetative growth parameters as compared with the untreated plants. For Bio-stimulants under study; yeast extract was the most pronounced and associated with the highest mean values for all previously mentioned traits comparing with control of foliar amendments.

Data in Table (3) indicated the presence of interaction effects between N forms and rates of foliar amendments on vegetative growth parameters during the two seasons. It was obvious that; foliar spraying of humic acid, fulvic acid, EM and yeast extract under study stimulates vegetative growth parameters under investigation. In this respect, foliar spraying of yeast extract combined with N forms was superior for increasing the values of these parameters.

Table (2): Effect of N-forms and a bio-stimulants applications at high temperature on some vegetative growth parameters of cucumber during 2011 and 2012 seasons.

Characters	plant height (cm)		No. of leaves/plant		Leaf area m^2/plant		Dry weight (g/plant)	
Treatments	**2011**	**2012**	**2011**	**2012**	**2011**	**2012**	**2011**	**2012**
A: Nitrogen forms								
N1	121.47	119.47	23.87	22.93	0.076	0.073	29.07	29.07
N2	159.73	157.80	36.87	32.67	0.172	0.168	49.13	46.67
N3	189.13	188.13	49.53	45.47	0.432	0.400	76.13	74.33
N4	171.33	168.80	40.13	36.00	0.227	0.218	59.80	58.00
N5	144.00	135.00	27.73	25.33	0.124	0.121	39.53	38.00
LSD	**8.90**	**5.12**	**1.35**	**0.96**	**0.089**	**0.058**	**7.21**	**6.75**
B: Bio- stimulants								
Control	141.07	138.33	30.27	27.93	0.158	0.151	39.73	38.73
Humic acid	153.87	148.47	33.33	30.40	0.182	0.175	49.67	47.07
Fulvic acid	158.80	155.20	35.60	32.80	0.199	0.193	51.40	50.07
EM	165.47	162.00	38.13	34.73	0.238	0.220	54.73	53.33
Yeast extract	166.47	165.20	40.80	36.53	0.254	0.242	58.13	56.87
LSD	**3.55**	**2.50**	**0.45**	**0.40**	**0.024**	**0.016**	**2.37**	**1.75**

N1= 100% NH_4^+ + 0% NO_3^- N2= 75% NH_4^+ + 25% NO_3^- N3= 50% NH_4^+ + 50% NO_3^-.
N4= 25% NH_4^+ + 75% NO_3^-. N5= 0% NH_4^+ + 100% NO_3^-.

Table (3): Effect of interaction between N-forms and bio-stimulants applications at high temperature on some vegetative growth parameters of cucumber during 2011and 2012 seasons.

Characters		Plant height (cm)		No. of leaves/plant		Leaf area m^2/plant		Dry weight (g/plant)	
Treatments		2011	2012	2011	2012	2011	2012	2011	2012
N1	Control	97.00	93.67	19.00	18.33	0.054	0.052	20.67	21.00
	Humic acid	114.00	110.33	21.67	20.33	0.064	0.063	29.00	28.33
	Fulvic acid	127.00	125.33	24.33	23.33	0.078	0.074	30.67	30.67
	EM	134.00	134.00	26.00	25.67	0.091	0.083	32.00	32.00
	Yeast extract	135.33	134.00	28.33	27.00	0.094	0.091	33.00	33.33
N2	Control	146.33	145.33	31.00	28.33	0.151	0.148	38.33	36.00
	Humic acid	158.67	153.67	34.67	30.67	0.166	0.162	49.00	44.00
	Fulvic acid	159.33	158.00	37.00	33.00	0.174	0.169	49.33	48.00
	EM	167.00	165.33	39.00	35.00	0.180	0.177	53.33	51.33
	Yeast extract	167.33	166.67	42.67	36.33	0.190	0.186	55.67	54.00
N3	Control	168.00	174.67	44.00	41.00	0.283	0.268	62.00	60.00
	Humic acid	181.00	183.00	47.33	44.00	0.357	0.333	74.00	71.33
	Fulvic acid	190.00	185.33	49.00	46.00	0.398	0.381	76.33	75.00
	EM	202.33	194.67	52.33	47.33	0.538	0.483	79.00	78.67
	Yeast extract	204.33	203.00	55.00	49.00	0.583	0.537	89.33	86.67
N4	Control	160.67	159.00	34.33	31.33	0.191	0.185	48.00	48.00
	Humic acid	171.67	165.33	37.00	34.00	0.212	0.202	58.00	55.33
	Fulvic acid	172.67	170.00	40.00	36.33	0.225	0.217	61.33	59.00
	EM	175.33	173.67	43.67	38.00	0.245	0.230	65.00	62.00
	Yeast extract	176.33	176.00	45.67	40.33	0.262	0.257	66.67	65.67
N5	Control	133.33	119.00	23.00	20.67	0.109	0.101	29.67	28.67
	Humic acid	144.00	130.00	26.00	23.00	0.114	0.116	38.33	36.33
	Fulvic acid	145.00	137.33	27.67	25.33	0.120	0.123	39.33	37.67
	EM	148.67	142.33	29.67	27.67	0.136	0.127	44.33	42.67
	Yeast extract	149.00	146.33	32.33	30.00	0.143	0.137	46.00	44.67
LSD		**10.78**	**6.78**	**1.54**	**1.19**	**0.096**	**0.063**	**8.199**	**7.29**

2- Chemical constituents in the leaves:

Concerning the effect of N-forms on nitrogen, phosphorus, potassium and total chlorophyll contents in leaves of cucumber, data presented in Table (4) showed that nitrogen, phosphorus, potassium and total chlorophyll contents were significantly increased with the third form of N fertilization during both seasons.

Regarding the effect of bio-stimulants on these constituents in leaves, data in the same Table showed that different bio-stimulants gave rise to significant increase in N, P, K and total chlorophyll contents. The highest values were obtained from planted sprayed with EM.

Table (4): Effect of N-forms and bio-stimulants applications at high temperature on some chemical constituents in leaves of cucumber during 2011 and 2012 seasons.

Characters	N %		P %		K %		Total chl. (mg/g fw)	
Treatments	**2011**	**2012**	**2011**	**2012**	**2011**	**2012**	**2011**	**2012**
A: Nitrogen form								
N1	1.81	1.88	0.179	0.173	1.19	1.24	0.977	0.936
N2	2.49	2.46	0.265	0.258	1.85	1.80	1.079	1.041
N3	3.20	3.18	0.346	0.343	2.59	2.50	1.186	1.158
N4	2.84	2.88	0.304	0.302	2.33	2.37	1.134	1.105
N5	2.19	2.22	0.237	0.242	1.51	1.55	1.037	1.000
LSD	0.02	0.02	0.004	0.004	0.03	0.03	0.003	0.003
B: Bio-stimulants								
Control	2.35	2.38	0.246	0.245	1.74	1.76	1.067	1.030
Humic acid	2.46	2.47	0.255	0.252	1.82	1.83	1.074	1.043
Fulvic acid	2.52	2.54	0.267	0.263	1.90	1.90	1.084	1.050
EM	2.63	2.64	0.288	0.285	2.03	2.01	1.097	1.062
Yeast extract	2.57	2.58	0.274	0.273	1.98	1.97	1.092	1.057
LSD	**0.03**	**0.03**	**0.002**	**0.003**	**0.03**	**0.03**	**0.003**	**0.003**

Concerning the effect of interaction between N-forms, bio-stimulants on nitrogen, phosphorus, potassium and chlorophyll contents in leaves, results in Table (5) showed that N, P, K and total chlorophyll concentration were increased significantly under spraying plants with humic acid, fulvic acid, EM and yeast extract with N-forms. The highest values came from treated plants with 50% NH_4 + 50% NO_3 combined with spraying EM.

Table (5): Interaction effect between N-forms and bio-stimulants at high temperature on some chemical constituents in leaves of cucumber during 2011 and 2012 seasons.

Characters		N %		P%		K%		Total chl. (mg/g fw)	
Treatments		**2011**	**2012**	**2011**	**2012**	**2011**	**2012**	**2011**	**2012**
N1	**Control**	1.63	1.77	0.170	0.160	1.06	1.12	0.960	0.922
	Humic acid	1.75	1.82	0.172	0.163	1.14	1.19	0.969	0.928
	Fulvic acid	1.83	1.88	0.176	0.171	1.20	1.25	0.979	0.935
	EM	1.95	2.00	0.196	0.192	1.29	1.34	0.990	0.949
	Yeast extract	1.91	1.91	0.182	0.178	1.24	1.30	0.986	0.946
N2	**Control**	2.33	2.29	0.250	0.242	1.60	1.61	1.062	1.023
	Humic acid	2.47	2.42	0.261	0.250	1.73	1.71	1.069	1.037
	Fulvic acid	2.52	2.47	0.263	0.254	1.83	1.76	1.081	1.042
	EM	2.61	2.60	0.281	0.278	2.07	1.99	1.095	1.055
	Yeast extract	2.54	2.53	0.269	0.264	2.03	1.96	1.088	1.046
N3	**Control**	3.02	3.00	0.301	0.300	2.43	2.35	1.170	1.139
	Humic acid	3.14	3.06	0.331	0.329	2.50	2.43	1.177	1.151
	Fulvic acid	3.23	3.22	0.346	0.341	2.61	2.53	1.190	1.158
	EM	3.35	3.31	0.375	0.374	2.74	2.61	1.197	1.176
	Yeast extract	3.27	3.29	0.374	0.370	2.68	2.56	1.196	1.168
N4	**Control**	2.69	2.73	0.288	0.293	2.22	2.26	1.120	1.090
	Humic acid	2.82	2.84	0.285	0.282	2.27	2.33	1.126	1.101
	Fulvic acid	2.87	2.90	0.314	0.308	2.32	2.37	1.135	1.105
	EM	2.93	2.99	0.329	0.323	2.43	2.46	1.148	1.118
	Yeast extract	2.91	2.94	0.303	0.303	2.40	2.44	1.139	1.113
N5	**CSontrol**	2.10	2.11	0.220	0.228	1.36	1.44	1.020	0.977
	Humic acid	2.14	2.18	0.226	0.234	1.45	1.50	1.027	0.996
	Fulvic acid	2.18	2.23	0.237	0.242	1.55	1.58	1.035	1.008
	EM	2.29	2.31	0.261	0.258	1.61	1.64	1.055	1.011
	Yeast extract	2.23	2.24	0.243	0.248	1.56	1.60	1.049	1.010
LSD		**0.06**	**0.06**	**0.006**	**0.006**	**0.06**	**0.06**	**0.006**	**0.006**

DISCUSSION

1- Vegetative growth parameters:

The results indicated that, the combination of NH_4^- and NO_3^+ produced the greatest value of vegetative growth parameters in comparison to all NH_4^- or all NO_3^+. Also, the results stated that, the lowest of all vegetative growth parameters were produced when 100% NH_4 was only used N-form. This could be attributed to, in most cases plants grown in ammonium medium without nitrate generally contain lower concentrations of potassium, calcium and magnesium than those supplied with nitrate alone because of the 100 % NH_4^- treatment reduced uptake of these elements. This effect led to the reduction of vegetative growth (El-Gamiely, 1988).

It could be concluded that nitrate ion has a better effect on N absorption comparing with ammonium ion. These results are in accordance to Tartoura and El-Saei (2001) and Tartoura (2001).

Increases in vegetative growth parameters in response to bio-stimulants treatments may be related to the induction of bio-stimulants response and protective role of membranes that increase cell division and cell elongation. The increment of vegetative growth parameters that achieved with foliar application of humic and fulvic acid as compared with control may be through increasing nutrient uptake, serving as a source of mineral plant nutrient and regulator of their release (Atiyeh *et al.*, 2002 and Neri *et al.*, 2002). Increases in vegetative growth parameters in response to fulvic acid treatments may be related to: 1- Hormone-like activity of fulvic acid. 2- Plant growth hormones adsorbed onto the humates. 3- Direct effect on plant growth assuming a hormonal action of fulvic acid. 4- simulative effect of N, P and K elements with fulvic acid as biological fertilizer contains plant growth hormones adsorbed onto the humates. Similar results were reported by Soliman (2011) reporting that the improvement in growth characters may be attributed to the fact that the use of EM enhances the beneficial microbes in the environment (Higa, 2000), which attributed to the profound effect of 1- Its ability to release plant growth promoting substances which might be stimulated plant growth. 2- Synthesis of some beneficial organic acids, bioactive substances and vitamins.

The application of active dry yeast on plants gave rise to increase gradually vegetative growth parameters. It could be concluded that, yeast as a natural source of cytokinins might enhance cell division and cell enlargement so far increasing the leaf surface area as well as enhancing the accumulation of soluble metabolites as mentioned about the role of cytokinins. Also yeast is a natural source of Bs vitamin and most of the essential elements. These results are in harmony with the findings of Shehata *et al*. (2012) on cucumber and Wanas (2006) on squash.

2- Chemical constituents in the leaves:

Regarding to chlorophyll contents, its content was increased by $Ca(NO_3)_2$ additions more than $(NH_4)_2SO_4$ adaptations. This can be attributed to that $Ca(NO_3)_2$ gives the plant more change to absorb more N and in turn to build more chlorophyll molecules. Nitrogen is considered as the backbone in the chlorophyll structure. This result is confirmed by that recorded by Tartoura and El-Saei (2001).

Concerning the effect of N-forms on nitrogen, phosphorus and potassium contents in leaves, data presented in this investigation showed that nitrogen, phosphorus and potassium contents were significantly increased with the third form of N fertilization during the both seasons.

These results are in the same line with those reported by Tartoura (2001) and El-Deweny (2011). Generally, the positive response of the chemical constituents could be attributed to the source of N-fertilizer for the plants treated with N3 treatment. It is residually acid forming. Whereas, the sources of N fertilizers for the plants treated with N4 treatment were ammonium sulfate and calcium nitrate. These N-fertilizers are residually acid and basic forming. Continued use of these N fertilizers can affect pH of soil and increasing these elements in rooting zone soluble and availability form encouraged the plant to absorb more of them, consequently the uptake of the elements was increased (Hartmann *et al.*, 1988).

Increasing of photosynthetic pigments may be due to increasing magnesium and iron, which are required for chlorophyll biosynthesis.

Humic acid can stimulate the uptake of macro- and microelements that may be due to increase water consumption by plants accompanied with increase of nutrient uptake which is known to be involved in plant growth by enhance increasing the permeability of membranes of root cells due to improving root growth and development. Where application of humic acid stimulate root growth, increased proliferation of root hairs, production of smaller but more ramified secondary roots and enhancement of root initiation (Liu *et al.*, 1998). This hypothesis was confirmed by significant increase in nitrogen, phosphorous and potassium in treated plant.

Data indicated that total chlorophyll in leaves were increased due to spraying plants with fulvic acid. These results may be attributed to the known function of some elements like nitrogen which was found in such important molecules as prophyrin. The prophyrin structure was found in metabolically important compounds in chlorophyll (Develin, 1979). The increase in N, P and K % in leaves as a result of spraying of fulvic acid may be due to the promotive effect of the plant growth substances, hence more nutrients might be absorbed to build up the plant organs and metabolites. These results are in harmony with those of Khalil *et al.* (2011) and Soliman (2011) on cucumber.

The enhancing effects of EM on chlorophyll concentration and their content may be due to their effects on increasing not only mineral uptake but also the production of growth substances especially cytokinins (Omay *et al.*, 1993). Cytokinins are known to stimulate chlorophyll synthesis and delay chlorophyll destruction and senescence. The favorable effect of EM on P content may be due to its fundamental role in converting fixed P form to be available for plant nutrition making the uptake of nutrients by plants more easy (Abou-Hussein *et al.*, 2002). The increase in K content under EM reflects an enhanced growth which might be possible due to the role of microorganisms in increasing K-uptake (El-Shahawy, 2003).

Stimulative effect of yeast extract on photosynthetic pigments may be due to a beneficial role during vegetative growth through enhancement of the chlorophyll formation and photosynthetic efficiency due to its content of vitamins and amino acids which increased the metabolic processes role and levels of endogenous hormones, i.e. IAA and GA_3 and endogenous cytokinins which have been established to induce the biosynthesis of chloroplast pigments, in turn retard senescence. The enhancable effect of yeast extract on N, P and K may be attributed to increases of leaf area and photosynthetic pigments thus increase photosynthesis process and hence more photosynthates being created as well as enhancement of mineral translocation from roots to leaves. This observation agrees with the report of Shehata *et al.* (2012) on cucumber and Wanas (2006) on squash.

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تأثير صور النيتروجين وبعض المنشطات الحيوية على إنتاجية الخيار:-
١- النمو الخضرى و المكونات الكيماوية.

علـــى فتحـــى حمايـــل* ، محمـــد ســـعد حمـــاده ، الســـيد أحمـــد طرطـــورة*** و محمود أحمد عبد الهادى***
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أجريت تجربتان حقليتان فى مزرعة خاصة بالقرب من المحلة الكبرى خلال موسمى الزراعة ٢٠١١-٢٠١٢ لدراسة تأثير صور النتروجين المختلفة (سلفات النشادر و نترات الكالسيوم) وبعض المنشطات الحيوية (حمض الهيوميك ، و حمض الفالفيك ، و الكائنات الحية الدقيقة الناشطة ، ومستخلص الخميرة) خلال درجات الحرارة المرتفعة على النمو الخضرى و التركيب الكيماوى لنبات الخيار. و أظهرت النتائج تأثر جميع صفات النمو الخضرى و المحتوى الكيماوى بصور النيتروجين المختلفة و كانت أعلى القيم عند المعاملة (٥٠% امونيوم + ٥٠% نترات).

أما بالنسبة لرش نباتات الخيار بالمنشطات الحيوية فقد أعطى ذلك زيادة كبيرة فى صفات النمو الخضرى و المحتوى الكيماوى مقارنة بمعاملة الكنترول، وكانت أفضل المعاملات عند الرش بمستخلص الخميرة بتركيز ١٠ جم/لتر أو الكائنات الحية الدقيقة النافعة بتركيز ٢٠مل/لتر، مما يوضح أهمية صور النيتروجين و المنشطات الحيوية على النمو الخضرى لنبات الخيار و كذلك التركيب الكيماوى له.

لذلك توصى الدراسة بإستخدام التسميد النيتروجينى لنبات الخيارعلى الصورة (٥٠% امونيوم + ٥٠% نترات) مع الرش بمستخلص الخميرة بتركيز ١٠ جم/لتر أو الكائنات الحية الدقيقة النافعة بتركيز ٢٠مل/لتر تحت ظروف الحرارة المرتفعة.

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