EFFECT OF BREAD YEAST APPLICATION AND SEAWEED EXTRACT ON CUCUMBER (*Cucumis sativus* L.) PLANT GROWTH, YIELD AND FRUIT QUALITY.

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ABSTRACT

An experiment was carried out in the plastic house of Horticulture Department/college of Agriculture/ Duhok University on Cucumber plants during 2009 growing season to determine the effect of bread yeast and seaweed extracts Alga 600 and sea force 2 on growth, yield and its component on Cucumber C.V. shadi. The results showed that spraying bread yeast or seaweed extract resulted in positive significant difference in shoot characteristics and in all yield traits as compared to untreated treatment. The interaction between yeast and seaweed extract was significantly enhanced all detected traits. Since cucumber plant received 6 $g.l^{-1}$ bread yeast and sprayed with a mixture of 0.33$ml.l^{-1}$ Alga 600 +2.5 $ml.l^{-1}$ Sea force 2 were characterized by the highest values of all shoot and yield characteristics.

INTRODUCTION

Cucumber, *Cucumis sativus* L. has been commonly cultivated in Iraq during the summer and fall as well as in low tunnels and plastic and green houses and its fruit use as fresh or after processing (Matlob *et al* 1989). The yield per unit area in Iraq is still too low comparing with world production. Bread yeast *Saccharomyces cerevisiae* is considered as a type of biofertilizer which is usually added to soil or as foliar application on vegetable crops (El-Ghamry *et al* 1990) because its nutrition properties as well as its produce substances like growth regulators such as gibberellins and auxins (Sarhan and Sharif 1988), and its ability to produce a group of enzymes (Dinkha and Khazrge 1990). Yeast treatment suggested to participate beneficial role in improving growth of vegetable crops which reported by Fathy and Farid (1996), Hewedy *et al*. (1996) Mohammed *et al*. (1999) Fathy *et al* (2000), Omer (2003) and Sarhan (2008). The uses of plant extracts is began to be applied like seaweed extract which is rich in macro and micro elements, Important plant hormones like Auxins, Gibberellins and Cytokinin which induce cell division and increasing cell enlargement and lead to balance of physiological and biological processes and increasing photosynthesis processes and improving growth characters (Jensen (2004)). Kowalski *et al* (1999) describe the positive effects of seaweed extract on plant growth and increasing yield of potato plant significantly, and Thomas (2002) describe that using seaweed extract (sea Buck thorn) causes increasing growth and fresh weight of vegetative and roots growth significantly of Rosemary plant while Jensen (2004) stated that seaweed extract contain micro elements (Co, B, Mo, Zn, Cu) and macro elements, Auxins, Gibberellins and Cytokinin and when sprayed lead to increase nutrient absorption and root growth ability and increasing stem thickness .

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MATERIALS AND METHODS

The experiment was carried out at the vegetative research farm, College of Agriculture, University of Duhok under plastic house during the season of 2009 to study the effect of bread yeast and seaweed extract (Alga 600 and sea force 2) on plant growth, yield and fruit quality of cucumber. The seed of cucumber C.V. Shadi was sowing at 15th February 2009. The experiment included eight treatments as follows:

Y0 E0 untreated plants (control)
Y0 E1 Alga 600 at 0.33 $g.l^{-1}$ concentration.
Y0 E2 sea force 2 at 2.5 ml l^{-1} concentration.
Y0 E3 mixture of two seaweed extracts 0.33g l^{-1} +2.5 ml l^{-1} (E1+E2)
Y1 E0 yeast and without seaweed extracts 6g l^{-1}.
Y1 E1 yeast and seaweed extracts (Alga 600) at concentration 0.33g l^{-1}.
Y1 E2 with yeast and seaweed extract (sea force 2) at 2.5 ml l^{-1} concentration.
Y1 E3 yeast and mixture of both seaweed extracts 0.33g/L + 2.5 ml l^{-1}. (E1+E2).

Yeast spraying was applied three times within ten days intervals. Starting from 20 day after sowing .Seaweed extract was sprayed three times as well as, after flower initiation ten days –intervals. The seeds were sown on rows with width of 75 cm and the distance between plants was 40 cm. uniform cultivation practices were followed according commercial farmers. The previous treatments were arranged in three replicates using complete randomized block design (RCBD). Data were analyzed by using SAS program (Anonymous, 2001).

Experimental measurements were as follows: Vegetative characteristics: which include Plant height (cm): measurement were made at the end of the growing season, Total chlorophyll content, take after 45 day from planting by Chlorophyll meter, model SPAD-502. And Yield characteristics: which include, Early fruits yield: of first six harvests from each treatment were weighted to calculate the early yield per M^2 and per hectare. Total yield: all fruits harvested from each treatment along the harvesting period were weighted to calculate the total yield per M^2 and per hectare Harvesting was recorded on march .20th and the final harvest was on may 20th 2009, plants were harvested 18 times with harvesting intervals of 3days., Fruit number per plant,. Fruit characteristics: Ten fruits from each treatment were randomly taken for determining average fruit character which were recorded at harvesting time of those harvests in which had more than ten fruits for several times as follows:-[1-] Fruit weight (gram). [2-] Fruit number /plant [3-] Fruit length (cm). [4-] Fruit diameter (cm). [5-] Total soluble substances (TSS) %.

RESULTS AND DISCUSSION

1-Vegetative characteristics: Table (1) and (2) show that bread yeast caused significant increase in shoot characteristics plant height as compared with control. The results showed as well that spraying plants with both seaweed extracts Alga 600 and sea force 2 caused positive significant differences as compared with control. The spraying with a mixture of the extracts of Alga 600

and sea force 2 gave the highest values of shoot growth characteristics when compared with other treatments. The interaction between treatments bread yeast and spraying of seaweed extract was significant in its effect. Since cucumber plants received treated 6 $g.l^{-1}$ bread yeast and sprayed with a mixture of 0.33$g.l^{-1}$ Alga 600 and 2.5g $ml.l^{-1}$ sea force2 characterized by the highest values of plant height 173.67 cm and highest total chlorophyll content 39.75% as compared with control treatment.

This character of plant height could give a clear depict of size and profusion of the vegetative growth of cucumber plant which in turn, reflected on the number of flowers and fruit number/plant (Al-Mokhtar *et al* 1991). This enhancement in the characteristics of the vegetative shoot growth may attribute to the ability of yeast to increase the production of stimulants for plant growth, especially Gibberellins, Auxins and Cytokinins which work to improve the plant cell division and its growth (Bowen and Rovira, 1991, Ahmed *et al* 1995, Glick, 1995 and Sarhan 2008). The increase in shoots characteristics might be due to the Auxins content in the seaweed extracts which have an effective role in cell division and enlargement. This leads to increase the shoot growth, leaves area and plant dry weight (Gollan and Wright 2006). This extracts contain Cytokinins as well in which induce the physiological activities and increase the total chlorophyll in the plant. This will positively reflects on the activity of photosynthesis and the synthesized materials which will positively reflects on shoots characteristics (Thomas, 1996). And also might due to the minerals Zn, Cu and B content in the seaweed extracts, which have a great role in cell division and enlargement and induce the photosynthesis and then a great shoot growth (Lopez *et al* 2008). Or might also due to the macronutrient content in seaweed extracts. Macronutrients have a great role in plant nutrition like nitrogen, potassium and phosphorous which are very essential for the growth and development of the plant (Attememe, 2009). This increase in total chlorophyll content in leaves might be due to Cytokinins and some nutrient materials content in seaweed extracts, nitrogen enter in the molecule structure of chlorophyll. (Al-Sahaff, 1989).

Table (1): Effect of yeast and seaweed extract on vegetative characters of cucumber

Treatment / characteristics	Yeast		Seaweed extracts			
	Y_0	Y_1	E_0	E_1	E_2	E_3
plant height cm.	139.96 b	159.55 a	136.94 b	145.16 b	155.27 a	161.65 a

Treatment	Yeast					
chlorophyll %	27.444 a	31.542 a	25.69 b	28.67 b	25.92 b	37.70 a

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 levels.

Table (2): Effect of interaction treatments of yeast and seaweed extract on vegetative characters of cucumber

characteristics	Y_0				Y_1			
	Seaweed				Seaweed			
	E_0	E_1	E_2	E_3	E_0	E_1	E_2	E_3
Plant height cm.	119.43 c	134.79 bc	155.99 ab	149.62 ab	154.44 ab	155.53 ab	154.44 ab	173.67 a
chlorophyll %	27.28 b-d	27.06 b-d	19.80 d	35.64 ab	24.10 cd	30.28 a-d	32.03 a-c	39.75 a

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 levels.

2-Yield characteristics: Tables 3-6 show that dry bread yeast caused significant increase in all yield traits as compared with untreated. And also show that spraying cucumber plants by seaweed extracts affect significantly on quantitative characters. The interaction treatment between yeast and seaweed extracts was significant in its effect. Since cucumber plants received 6 gml^{-1} bread yeast and sprayed with a mixture of $0.33g.l^{-1}$ + 2.5 ml l^{-1} Alga 600 and sea force2 were characterized by the highest value in fruit weight 126.55 g/fruit, fruit number/plant 21.73 fruit length 18.20 cm, fruit diameter 2.64 cm, %TSS 4.33. Early yield 4.05 kg/m^2 and early yield 37.28 ton/hectare and yield/plant 10.96 kg and total yield 100.92 ton/hectare as compared with the least values of these traits for control which gave 2.5 kg/m^2, 23.20 ton/h., 6.33 kg, and 58.20 ton/h., 14.76cm, 2.13 cm, 99.27 gm, 13.20, %3.00 respectively. These simulative effects of bread yeast enhanced growth and yield were reported by many investigators on different vegetable (Fathy *et al*., 2000 and Khedr and Farid, 2000 and Omer, 2003 and Sarhan, 2008).These results may be due to yeast Vrg its Cytokinins content, and the high content of vitamin B5 and minerals yeast composition might be play a considerable role in orientation and translocation of metabolites from leaves in to the productive organs. Also it might play a role in the synthesis of protein, and nucleic acid (Natio *et al*, 1981).

Table (3): Effect of yeast and seaweed extract on yield characters of Cucumber

Treatments / characters	Yeast		seaweed extracts			
	Y_0	Y_1	E_0	E_1	E2	E3
Early yield Kg/M^2.	2.97 b	3.444	2.74 c	2.90 c	3.23 b	3.95 a
Early yield Ton/hec.	27.68 b	31.72 a	25.28 c	26.68 c	30.40 b	36.36 a
Yield/plant. kg	7.092 b	8.725 a	6.84 c	7.20 c	7.99 b	9.60 a
Total yield Ton/hec	65.24 b	80.28 a	62.92 c	66.20 c	73.56 b	88.36 a

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 levels.

Table (4): Effect of Yeast and Seaweed extract on Fruits characters of Cucumber

Treatments / characters	Yeast		seaweed extracts			
	Y_0	Y_{100}	E_0	E_1	E_2	E_3
Fruit weight g	98.71 b	116.09 a	105.79 b	101.82 b	103.90 b	118.09 a
fruit No./plant	15.50 b	18.24 a	14.04 c	15.96 b	17.98 a	19.51 A
Fruit length cm	15.60 b	17.39 a	15.41 c	16.04 bc	16.89 ab	17.65 a
Fruit Diameter cm.	2.20 b	2.51 a	2.20 b	2.37 ab	2.35 ab	2.50 a
TSS %	3.24 b	3.95 a	3.39 b	3.25 b	3.70 ab	4.03 a

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 levels.

All of these occurrences and attributes might lead to improve the cucumber yield. The yield increase of cucumber plant may be due to the increase of the distillate flowers number which lead to increase the number of fruits that reflected on yield /plant and total yield, and the increase in fruits weight in cucumber plants which were sprayed with seaweed extracts may be due to its role in increasing the leaves numbers, leaf area and dry weight so the physiological activities as photosynthesis and providing plant by nutrition and these could be the reasons of increasing fruit weight (Al-Saberi, 2005). The effect of seaweed extracts lead to increase the percentage of the total soluble substances because of its effect on increasing leaf area and efficiency of the photosynthesis process (Jensen, 2004).

Table (5): Effect of interaction treatments of yeast and seaweed extract on yield characters of cucumber.

Treatment / Characters	Yeast							
	Y_0				Y_1			
	Seaweed				Seaweed			
	E_0	E_1	E_2	E_3	E_0	E_1	E_2	E_3
Early yield (kg/M2.)	2.52 e	2.60 de	2.91 cd	3.86 ab	2.96 c	3.21 c	3.56 b	4.05 a
Early yield ton/hec.	23.20 e	23.88 de	28.08 cd	35.48 a	27.32 c-e	29.52 bc	32.72 ab	37.28 a
Yield/plant. kg	6.33 e	6.47 de	7.33 cd	8.24 bc	7.35 cd	7.92 bc	8.66 b	10.96 a
Total yield ton/h.	58.20 e	59.52 de	68.44 cd	75.84 bc	67.64 cd	72.88 bc	79.68 b	100.92 a

Treatment / Characters	Yeast							
	Y_0				Y_1			
	Seaweed				Seaweed			
	E_0	E_1	E_2	E_3	E_0	E_1	E_2	E_3
Fruit weight g	99.27 c	91.47 c	94.47 c	109.64 b	112.31 b	112.16 b	113.32 b	126.55 a
fruit No./plant	13.20 d	14.70 cd	16.80 bc	17.30 bc	14.89 cd	17.21 bc	19.15 b	21.73 a
Fruit length cm	14.76 d	14.76 d	15.79 cd	17.09 a-c	16.07 b-d	17.32 ab	17.99 a	18.20 a

Fruit Diameter Cm	2.13 c	2.19 c	2.13 c	2.37 a-c	2.27 bc	2.55 ab	2.57 ab	2.64 a
TSS %	3.00 c	3.00 c	3.33 bc	3.62 bc	3.78 ab	3.50 bc	4.07 ab	4.43 a

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 levels.

Table (6): Effect of interaction of yeast and seaweed extract on fruits characters of cucumber.

تاثير الرش بخميرة الخبز وبعض مستخلصات الاعشاب البحرية في نمو وانتاج نبات الخيار *Cucumis sativus* L.

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الخلاصة

أجريت الدراسة في البيت البلاستيكي على نبات الخيار في كلية الزراعة / جامعة دهوك خلال موسم ٢٠٠٩. بهدف دراسة تأثير خميرة الخبز ومستخلصات الأعشاب البحرية في نمو وحاصل الخيار صنف شادي ومكوناتها. أظهرت النتائج بأن رش خميرة الخبز أو المستخلصات أحدثت اختلافات معنوية موجبة في صفات النمو الخضري وكذلك جميع صفات الحاصل المدروسة مقارنة بمعاملات عدم الرش. التداخل بين الخميرة و المستخلصات شجعت معنوياً جميع الصفات المدروسة. تميزت نباتات الخيار التي استلمت ٦غم/لتر خميرة ورشت بخليط من ٠,٣٣غم/لتر + ٢,٥ مل/لتر من مستخلصي الگا٦٠٠ و سي فورس٢ بأعلى قيم صفات النمو الخضري والحاصل حيث اعطت نباتات الخيار عند هذه المعاملة اعلى القيم في ارتفاع النبات ١٧٣,٦٧سم والكلوروفيل الكلي٧٥ ،٣٩ % و اعلى حا صل كلي بلغت ١٠٠,٩٢طن/هكتار كما واعطت اعلى القيم في وزن الثمره ٥٥، ١٢٦غم و طول الثمرة ١٨,٢٠سم وقطر الثمرة ٢,٦٤سم وعدد الثمار ٢١,٧٣ ثمرة/نبات.

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