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Effect of plant extracts and growth regulators on endogenous hormones and carbohydrate of snak cucumber (*Cucumis melo* var.Flexueses Naud) and cucumber (*Cucumis sativus* L.)

تأثير رش بعض المستخلصات النباتية ومنظمات النمو النباتية في المحتوى الهرموني الداخلي والكاربوهيدرات للنوعين النباتيين خيار القثاء (*Cucumis melo* var.flexuoses Naud) والخيار (*Cucumis sativus* L.)

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Abstract:
Two experiments were conducted during the growing seasons of 2002 and 2003 to find out the effect of garlic extract at (1: 0.5) and (1:1) (wt:volume) concentration and Liqurous extract at 1.25 and 2.50 mg/ L and growth regulator IAA at 25 ,50 and 75 mg/ L and ethephon at 100,200,300 mg/ L on endogenous hormones (auxins and gibberellins) and carbohydrates at three growth stage of snak cucumber and cucumber which were ; third to fourth true leaf stage, male flower appearance stage and female appearance stage . Random1zed complete block design was used with three replications for both experiments. Results showed a decrease in gibberellins and increase in auxins contents in both plants by the treatments of IAA (75 mg/L) and ethephon at (200,300 mg/L). Gibberellins contents decreased significantly by Liqurous at 2.50 gm/L for both plants in the second season only whereas, auxins contents increased by treatment of garlic (1:1) and Liqurous (2.5 gm/L) in cucumber for both seasons. Carbohydrates contents decreased at IAA (25 and 50 mg/L) for both season and increased in second season by ethephon in snake cucumber and by IAA (75mg/L) in the first season in cucumber. Male flowers appearance stage gave highest gibberellins contents compare to other stages. Female flowers appearance stage gave highest auxins and carbohydrates contents compare to other stages. Ethephon at 300mg/L treatment at female flower appearance stage gave the lowest gibberellins and highest auxins and carbohydrates for both plant and seasons.

الخلاصة :
أقيمت تجربتين احدهما على خيار القثاء والأخرى على الخيار في قضاء أبي الخصيب- محافظة البصرة في الموسمين الخريفيين لعامي 2002 و 2003م لمعرفة تأثير رش مستخلصين نباتيين هما مستخلص الثوم بتركيزين (1:0.5) و (1:1) (وزن: حجم) ، ومستخلص عرق السوس بتركيزين 1.25 و 2.50 ملغم/لتر، ومنظمي النمو IAA بتركيز 25 و50 و 75ملغم/لتروالأثيفون بتركيز 100 و 200 و 300 ملغم/لتر في محتوى نباتات القثاء والخيار من هرموني النمو الداخليين (الاوكسينات متمثلة بـIAA والجبرلينات) ومحتوى الكاربوهيدرات وعلى ثلاث مراحل: مرحلة الورقة الحقيقية الثالثة/الرابعة (مرحلة ماقبل الرش) ، ثم مرحلة ظهور الأزهار الذكريةومرحلة ظهور الأزهار الأنثوية. نفذت كل تجربة بتصميم القطاعات العشوائية الكاملة بثلاث مكررات. وقد اظهرت النتائج ما ياتي: انخفاض محتوى الجبرلينات وازدياد محتوى الاوكسينات في النباتيين تحت الدراسة معنويا عند الـIAA بتركيز 75ملغم/لتر والأثيفون بتركيز 200 و 300 ملغم/لتر .وانخفض محتوى الجبرلينات معنويا عند عرق السوس بتركيز 2.50غم/لتر في كلا النباتين وللموسم الثاني فقط بينما ازداد محتوى الاوكسينات معنويا عند الثوم بتركيز1:1وعرق السوس بتركيز 2.50غم/لترفي الخيار في الموسمين. وانخفض محتوى الكاربوهيدرات معنويا عند الـIAA بتركيز 25 و 50ملغم/لتر للموسمين بينما ازداد معنويا في الموسم الثاني عند المعاملة بالأثيفون في القثاء وعند الـIAA بتركيز75ملغم/لتر في الموسم الاول للخيار. و أعطت مرحلة ظهور الأزهار الذكرية اعلى محتوى للجبرلينات مقارنة بمرحلتي قبل الرش وظهور الأزهار الأنثوية بينما اعطت مرحلة ظهور الأزهار الأنثوية اعلى محتوى للاوكسينات والكاربوهيدرات مقارنة بمرحلتي قبل الرش وظهور الأزهار الذكرية . اعطت المعاملة بالأثيفون بتركيز 300 ملغم/لتر في مرحلة ظهور الأزهار الأنثوية اقل محتوى للجبرلين واعلى محتوى للاوكسينات والكاربوهيدرات في كلا الموسمين ولكلا النباتين قيد الدراسة.

Introduction

Cucurbitacae family consists of many species of which two species belong to one genus, they are snake cucumber (*Cucumis melo* var.Flexueses Naud) and cucumber (*Cucumis sativus* L.)which are

considered an important summer crops in Iraq. It is clear that the sex ratio have an important role in production increase for both crops. To increase production many methods were applied such as photoperiod, temperature, fertilizers, growth regulators and plant extracts as an alternative for growth regulators (Abou- Hussein,et al., 1975). It is well known that ethphon improve female flowers production in cucumber (McMurray and Miller, 1968) also IAA have the same role (Takashashi and Jaffe, 1984), in contrast gibberellins (GA_3) caused an increase of male flowers in cucumber (Al-Juboory and Splittostesser, 1994. Davies (1987) mentioned that sex expression in cucumis genus is under control of hormonal balance as a ratio of auxins to gibberellins. Garlic extract caused increase of female flowers in squash (Abou-Hussein *et al*. 1975; Helmy ,1992). The dially disulphide which present in garlic extract inhibit viability and activity of 3- hydroxyl -3-methyl glutary-COA which is responsible for synthesis of mevalonic acid. Al-Janabi (1984) showed that the Liqurous extracts contained terpeniods, starch and gums. Also, Ibrahim (1985) found that Liqurous contained Glycyrrhicin which is responsible for sweetness of roots. Al-Sahaf and Almarsomi (2001) stated that the spray of Liqurous extrat on onion plants at 2.50 gm/L caused an early flowering and increased fruit set. The effect of ethephon on endogenous hormones have been studied by Rudich *et al.*(1972) and they found that ethephon treatment caused an increase of auxin and decrease gibberellins. Endogenous gibberellins were decreased by ethephon and increased by exogenous gibberellins treatment in cucumber (Saito *et al*. 1988).

The objectives of this study is to evaluate the use of extract from garlic and Liqurous at different concentration compared to growth regulators (ethephon and IAA) in their effect on endogenous hormones (auxin and gibberellins) and carbohydrates in snak cucumber and cucumber.

Materials and methods

Two experiments were conducted, one related to cucumber and the second on snak cucumber in Abulkasib-basrah during fall season of 2002 and 2003. Soil was silty clay with pH 7.8 and 7.72 and Ec 9.91 and 9.79 ds/m and the organic mater was 1.32 and 1.36% for both seasons respectively.Each experiment contained eleven treatment which were: distilled water, garlic extract at 1: 0.5 and 1:1 garlic to water w/v, extract of dried roots of Liqurous 1.25 and 2.5 gm/L, IAA 25, 50 and 75 mg/L, ethephon at 100,200 and 300 mg/L. preparation of garlic extracts were as stated by Al-Delaimy and Ali (1970) and Liqurous water extract were prepared as described by Harborne (1973).Randomized complete block design (RCBD) was used for each experiment with three replications. Seeds of local variety of snak cucumber (Khnasry) and Beit alpha variety of cucumber were used in the study. Seeds were sown on July 22 for snak cucumber and august 26 for cucumber. Plants were sprayed by treatment when they reach the third true leaf. Tween 20 was added by 0.1% as wetting agent.All the cultural practices were applied as recommended. Changes in endogenous hormones (auxins and gibberellins) were determined by use of apical meristems and some of the young leaves at three stages ie. third true leaf stage, first appearance of male flower, and first appearance of female flower. Extraction and clarification for auxin-like substances and gibberellins were done as described by Abbas *et al*.(1995). Bioassy for each hormone was done by straight growth test of wheat coleoptile which is sensitive to auxin- like substances, and embryogenic stem growth of lettuce test which is sensitive test to gibberellins - like substances (Audus, 1972) Total soluble carbohydrates were measured by the use of phenol- sulphric acid method as described by Dobois *et al*. (1956) at the same three stages for endogenous hormones. Means were compared by Revised Least Significant Test (RLSD) at 0.05 level (Al-Rawi and khalaf Allah, 1980)

Result and discussion

Table (1) indicated that spraying of snake cucumber by garlic extract at (1:1) and both Liqurous extracts in the second season caused significant decrease in gibberellins – like substances. IAA at 25 mg/L in the second season and IAA at 50 and 75 mg/L and ethephon at all concentration at both seasons also caused significant decrease in gibberellins – like substance especially at 300 mg/L ethephon . All other treatments did not have significant effect on gibberellin contents of plant.

Results also indicated that plant at male flower appearance stage at both seasons contained highest content of gibberellin – like substance compared to pre spraying and female flower appearance stages. Interaction between treatments and growth stages was significant.

Table (2) showed that spray of cucumber by Liqurous extract at 1.25 gm/L caused significant increase in gibberellins – like substance whereas, at 2.25 mg/L caused a decrease in gibberellins content at the second season . Cucumber plants which sprayed by IAA 75 mg/L and ethephon at 200 and 300 mg/L for both seasons caused significant decrease in gibberellins – like substance. Plants at male flower appearance stage for both seasons contained highest gibberellin content compared to other growth stages. Interaction between treatments and growth stages was significant. The decrease of gibberellin content by increase the growth regulator concentration is in agreement with Rudich *et al*. (1972) and Saito *et al*. (1988). Ethephon and IAA improve femal flower production (Mcmurray and Miller, 1969; Takahashi and Jaffe, 1984). In contrast, exogenous application of gibberellins increases male flower production in cucumber (Al-Juboory and Splittstoesser, 1994). The action of ethephon and auxin in the increase of female flower is a result of increase in ethylene production which cause antagonism between gibberellin and ethylene on sex expression in cucurabitaceae (Rudich *et al*.1972), or the ability of ethylene to produce antigibberellins (Robinson *et al*.1970).

Table (3) showed that IAA at 75 mg/L and ethephon at 200 and 300 mg/L on snake cucumber caused significant increase in auxins contents where, other treatments did not have a significant effect. Results also indicated that plants at female flower appearance stage for both seasons contained highest auxine contents compared to other growth stages. Interaction between treatments and growth stages was significant.

Table (4) indicated that spray of garlic extract at (1:1) and Liqurous extract at at 2.5 gm/L on cucumber caused significant increase in auxins – like substance, whereas, garlic extract at (0.5 :1) and Liqurous extract at 1.25 gm/L decreased auxin content for both seasons. Results also indicated that plant at female flower appearance stage for both seasons were superior in auxins contents compared to other growth stages. The increase of endogenous auxins under the effect of exogenous application of auxins is in agreement with Rudich *et al*. (1972) and Saito *et al*. (1988). The increase of endogenous auxins at female flower appearance stage accompany by increase in female flower number and decrease of male flowers and this might be related to the effect of exogenous auxins and ethephon to increase ethylene production in plant tissues (Yang , 1969 ; Fuchs and Lieberman,1968).

Table (5) indicated that treatment by IAA at 25 and 50 mg/L at both seasons in snak cucumber and treatment by ethephon at all concentrations in second season caused significant in carbohydrates contents. It was noticed that carbohydrates contents were highest at female flower appearance stage at both season compared to other growth stages. The Interaction between ethphon at 300mg/L and female flower appearance stage gave highest carbohydrates which were 59.22 and 59.75mg/gm as dry weight for both seasons respectively.

Table (6) showed that treatment by IAA at 75 mg/L at first season increased Carbohydrates contents also, female flower appearance stage at both seasons contained. Highest carbohydrates compared to other growth stages of cucumber. The increase in carbohydrates contents at female flower appearance stage also related to the high contents of endogenous auxins. Auxins and carbohydrates increase female flower production (Ito and Saito, 1960). The increase in carbohydrates at female flower appearance stage is a physiological process where the accumulation of nutrients occurred because of the exogenous application of auxins and ethephon which caused increase in ethylene production (Yang, 1969; Fuchs and Lieberman, 1968) which might oppose gibberellins in sex expression of flowers (Rudich *et al*. 1972).

Table (1) Effect of plant extracts, growth regulators and growth stages on gibberellin contents of apical meristem in snak cucumber (µg/kg fresh weight).

Treatments	First season				Second season			
	Prespraying stage	Male flowers appearance stage	Female flowers appearance stage	Average	Prespraying stage	Male flowers appearance stage	Female flowers appearance stage	Average
Control	8.67	14.25	8.25	10.39	9.82	15.55	9.89	11.78
Garlic 1:0.5	8.49	14.01	8.33	10.28	9.80	15.17	9.61	11.53
Garlic 1:1	8.33	13.79	7.93	10.02	9.86	13.81	7.85	10.51
Liqurous 1.25	8.51	13.99	8.27	10.26	9.77	13.87	8.03	10.56
Liqurous 2.50	8.70	13.61	7.82	10.04	9.89	13.75	7.91	10.52
IAA 25	9.01	13.09	7.11	9.74	9.67	12.89	7.03	9.86
IAA 50	8.75	12.50	6.97	9.41	9.66	12.11	6.70	9.49
IAA 75	8.72	12.42	6.85	9.33	9.78	12.19	6.67	9.55
Ethephon 100	9.00	12.92	7.09	9.67	9.40	12.00	6.59	9.33
Ethephon 200	9.08	12.22	6.68	9.33	9.60	11.09	6.42	9.04
Ethphon 300	8.70	9.89	6.24	8.28	9.79	10.55	6.35	8.90
Average	8.72	12.97	7.44		9.73	13.00	7.56	

R.L.S.D.
-for treatment effect (first season) = 0.70
-for growth stages effect t (first season) = 0.70

-for interaction between treatments effect and growth stages (first season) =1.20

R.L.S.D.
-for treatment effect (second season) = 0.65
-for growth stages effect (second season) =0.65
-for interaction between treatments effect and growth stages (second season) =1.13

Table (2) Effect of plant extracts, growth regulators and growth stages on gibberellin contents of apical meristem in cucumber (µg/kg fresh weight).

Treatments	First season				Second season			
	Prespraying stage	Male flowers appearance stage	Female flowers appearance stage	Average	Prespraying stage	Male flowers appearance stage	Female flowers appearance stage	Average
Control	8.30	12.71	9.02	10.01	8.75	13.08	9.21	10.35
Garlic 1:0.5	8.35	13.13	9.54	10.34	8.60	13.50	9.72	10.61
Garlic 1:1	8.30	12.55	8.83	9.89	9.01	12.31	8.75	10.02
Liqurous 1.25	7.97	13.01	9.33	10.10	8.60	13.45	9.42	12.42
Liqurous 2.50	7.80	12.40	8.81	9.67	9.03	12.00	8.65	9.89
IAA 25	8.45	13.20	9.49	10.38	8.70	13.35	9.55	10.53
IAA 50	8.31	12.72	8.97	10.00	8.83	13.13	9.41	10.46
IAA 75	7.85	11.85	8.01	9.24	9.00	11.97	8.21	9.73
Ethephon 100	8.40	12.60	8.85	9.95	8.70	12.30	8.70	9.90
Ethephon 200	7.91	11.75	7.89	9.18	8.25	11.84	7.93	9.34
Ethphon 300	8.09	9.67	6.55	8.10	8.35	9.89	6.79	8.34
Average	8.16	12.33	8.76		8.71	12.44	8.71	

R.L.S.D.
-for treatment effect (first season) = 0.44
-for growth stages effect (first season) = 0.44

-for interaction between treatments effect and growth stages (first season) =0.67

R.L.S.D.
-for treatment effect (second season) = 0.46
-for growth stages effect (second season) =0.46
-for interaction between treatments effect and growth stages (second season) =0.80

Table (3) Effect of plant extracts, growth regulators and growth stages on auxin – like substances contents of apical meristem in snak cucumber (µg/kg fresh weight).

Treatments	First season				Second season			
	Prespraying stage	Male flowers appearance stage	Female flowers appearance stage	Average	Prespraying stage	Male flowers appearance stage	Female flowers appearance stage	Average
Control	83.75	76.99	98.76	86.50	85.21	77.75	100.51	87.82
Garlic 1:0.5	82.97	76.50	98.50	85.89	85.00	76.33	100.15	87.16
Garlic 1:1	83.50	77.35	99.09	89.65	85.41	78.90	101.77	88.69
Liqurous 1.25	83.00	77.17	98.88	89.35	85.00	78.60	101.09	88.23
Liqurous 2.50	83.25	77.92	99.71	86.96	85.09	78.93	101.85	88.62
IAA 25	84.00	76.00	98.12	86.04	84.90	76.55	100.30	87.25
IAA 50	83.85	77.39	98.85	86.70	85.17	78.64	101.25	88.35
IAA 75	83.41	79.85	103.00	88.75	85.19	80.93	104.09	90.07
Ethephon 100	83.60	77.50	99.30	89.80	84.90	78.69	101.41	88.33
Ethephon 200	83.58	78.99	102.70	88.42	85.11	80.77	103.12	89.67
Ethphon 300	83.80	81.13	104.33	89.75	85.25	82.00	104.60	90.62
Average	83.52	77.86	100.11		85.11	78.92	101.83	

R.L.S.D.
-for treatment effect (first season) = 0.76
-for growth stages effect (first season) = 0.76

-for interaction between treatments effect and growth stages (first season) =1..32

R.L.S.D.
-for treatment effect (second season) = 1.06
-for growth stages effect (second season) =1.06
-for interaction between treatments effect and growth stages (second season) =1.84

Table (4) Effect of plant extracts, growth regulators and growth stages on auxin – like substances contents of apical meristem in cucumber (µg/kg fresh weight).

Treatments	First season				Second season			
	Prespraying stage	Male flowers appearance stage	Female flowers appearance stage	Average	Prespraying stage	Male flowers appearance stage	Female flowers appearance stage	Average
Control	77.70	65.11	89.52	77.44	79.82	70.03	92.30	80.72
Garlic 1:0.5	76.91	57.50	78.30	70.90	79.50	64.74	89.00	77.75
Garlic 1:1	76.90	73.90	92.50	81.10	78.76	75.71	93.98	82.82
Liqurous 1.25	78.10	60.02	81.22	73.11	78.73	65.87	89.90	78.17
Liqurous 2.50	77.05	75.00	92.93	81.66	78.20	75.93	94.12	82.75
IAA 25	77.40	81.30	93.70	84.13	77.71	81.77	94.01	84.50
IAA 50	76.82	84.72	95.59	85.71	77.01	85.10	95.75	85.89
IAA 75	78.23	86.95	97.25	87.48	80.00	87.15	97.60	88.25
Ethephon 100	78.00	84.07	95.13	85.73	78.93	87.50	97.90	88.11
Ethephon 200	77.66	86.90	97.00	87.19	78.20	87.79	98.92	88.30
Ethphon 300	77.91	89.75	102.30	89.99	78.52	90.01	102.54	90.36
Average	77.52	76.84	92.31		78.68	79.24	95.09	

R.L.S.D.
-for treatment effect (first season) = 0.67
-for growth stages effect (first season) = 0.67

-for interaction between treatments effect and growth stages (first season) =1.16

R.L.S.D.
-for treatment effect (second season) = 0.84
-for growth stages effect (second season) =0.84
-for interaction between treatments effect and growth stages (second season) =1.45

Table (5) Effect of plant extracts, growth regulators and growth stages on total carbohydrates contents in snak cucumber (mg/gm dry weight).

Treatments	First season				Second season			
	Prespraying stage	Male flowers appearance stage	Female flowers appearance stage	Average	Prespraying stage	Male flowers appearance stage	Female flowers appearance stage	Average
Control	49.66	52.73	54.91	52.43	51.09	53.15	55.95	53.40
Garlic 1:0.5	50.01	52.11	54.33	52.15	51.13	52.30	54.75	52.73
Garlic 1:1	50.17	51.29	55.64	52.37	50.99	51.00	56.32	52.77
Liqurous 1.25	51.00	51.90	54.99	52.63	51.09	51.67	56.04	52.93
Liqurous 2.50	50.30	51.01	55.98	52.43	50.17	51.25	56.56	52.66
IAA 25	50.01	50.35	54.11	51.49	49.70	50.39	57.32	52.47
IAA 50	49.79	50.19	50.19	50.06	49.90	50.01	56.25	52.05
IAA 75	49.70	50.00	57.66	52.45	49.81	49.89	58.93	52.88
Ethephon 100	50.91	50.40	55.73	52.35	51.19	49.61	56.40	52.40
Ethephon 200	50.83	49.92	56.90	52.55	50.65	48.27	57.84	52.25
Ethphon 300	50.44	46.34	59.22	52.00	49.97	46.75	59.75	52.16
Average	50.26	50.57	55.88		50.52	50.39	56.92	

R.L.S.D.
-for treatment effect (first season) = 0.69
-for growth stages effect (first season) = 0.69

-for interaction between treatments effect and growth stages (first season) =1.17

R.L.S.D.
-for treatment effect (second season) = 0.85
-for growth stages effect (second season) =0.85
-for interaction between treatments effect and growth stages (second season) =1.47

Table (6) Effect of plant extracts, growth regulators and growth stages on total carbohydrates contents in cucumber (mg/gm dry weight).

Treatments	First season				Second season			
	Prespraying stage	Male flowers appearance stage	Female flowers appearance stage	Average	Prespraying stage	Male flowers appearance stage	Female flowers appearance stage	Average
Control	53.57	55.11	58.00	55.56	53.81	55.47	58.72	56.00
Garlic 1:0.5	53.51	55.37	56.43	55.10	53.70	55.60	57.89	55.73
Garlic 1:1	53.53	54.90	58.90	55.78	53.72	54.73	59.11	55.85
Liqurous 1.25	53.49	55.01	56.79	55.10	53.61	55.59	58.37	55.86
Liqurous 2.50	53.47	54.81	58.76	55.76	53.69	54.34	59.30	55.78
IAA 25	53.49	55.11	59.81	56.14	53.70	55.45	59.97	56.37
IAA 50	53.60	55.17	60.70	56.49	53.69	55.39	60.85	56.64
IAA 75	53.52	54.00	62.42	56.65	53.80	54.11	62.59	56.83
Ethephon 100	53.48	55.03	60.33	56.28	53.71	54.66	61.50	56.62
Ethephon 200	53.46	53.44	62.10	56.33	53.91	53.65	62.75	56.77
Ethphon 300	53.62	50.22	64.78	56.21	53.75	50.57	64.91	56.41
Average	53.52	54.38	59.93		53.47	54.51	60.54	

R.L.S.D.
-for treatment effect (first season) = 0.97
-for growth stages effect (first season) = 0.97

-for interaction between treatments effect and growth stages (first season) =1.68

R.L.S.D.
-for treatment effect (second season) = 1.19
-for growth stages effect (second season) =1.19
-for interaction between treatments effect and growth stages (second season) =2.02

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