

EFFECT OF SEED SOAKING AND / OR FOLIAR SPRAY OF ATONIK ON VEGETATIVE GROWTH, SEX EXPRESSION AND YIELD OF SQUASH PLANTS

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ABSTRACT

Two field experiments were carried out on squash CV.Eskandrani in the two summer seasons 2005 and 2006 to study the effect of Atonik seed treatments at 0, 25 and 0, 5 ml / L or foliar spray treatments 0, 25 and 0, 5 ml / L and their combination on vegetative growth, sex expression and yield of squash plants.

The obtained results are summarized as follow:-

- 1- Atonik treatments (seed soaking or foliar spray) caused a significant increase in vegetative growth characters, expressed as number of leaves, plant height, and plant fresh and dry weight over control.
- 2- Atonik treatments over rise to a significant decrease of male flowers and caused a significant increase in female flowers and reduced sex ratio in both seasons.
- 3- Atonik treatments induced a significant increase of yield of squash (No. of fruit / plant, average fruit weight, number of fruits / plant, yield Kg per plant and yield ton / fed.) compared with control .
- 4-Seed soaking 0.5 ml / L plus foliar spray 0.5 ml / L gave higher values over than the other treatments.

Finally, it can be concluded that the best treatment is soaking of squash seeds combined with foliar sprays of Atonik at 0.5 ml / L for improving the yield.

INTRODUCTION

Summer squash (*Cucurbita pepo*.L.) is one of the most important vegetable crops in Egypt. It's known that cucurbits grown under hot condition (summer season) which high temperature and long day produce higher male flowers and fewer female flowers (Cantliffe 1981). Sex expression of squash is of prime importance in yield production ,since only female flowers can ultimately produce fruits .Sex expression has been noticed to be influenced by genetic constitution (Shifriss and Galun ,1956 and Shifriss 1961) and environmental conditions .Sex expression can be affected by exogenous application of fertilizers and growth regulators (EL-Beheidy and EL-Mansi,1974) on cucumber,Baha EL-Din *et al* (1983)on cucumber and squash and Hanafy Ahmed (1997) on squash.

Atonik (Sodium mono- nitroguaiacol) is one of the organic growth regulators substance without any phytotoxicity or any harm effects to man or environment .It is neither a growth hormone nor a pesticide (Wojdya, 2004).The active ingredients in Atonik are 0.2 % sodium ortho-nitrophenolate (O-NP) ,0.3 % Sodium-paranitrophenolate (P-NP) and 0.1 % sodium 5-nitroguaiacolate (NB) . Atonik stimulates plant growth by altering membrane – dependent plant system as photosynthesis, respiration, hormone reception and degradation, translocation and ion accumulation (Urwilero and Stutte 1987) . Atonik is used to promote germination ,enhance vegetative growth ,actives plant cell metabolism and thereby improves growth and yield .

The beneficial effects of Atonik foliar application have been noted in rice, wheat, cucumber and potato (Anonymous 1976). Soaking of cucumber seeds in Atonik solution at 0.5 ml / L for eight hours makes germination quicker, more uniform and increases the hypocotyls length of the seedlings (Abd El-Magid *et al* 1996). Arora *et al* (1989) on squash found that Atonik were sprayed 4 times at 500 mg / L, gave the highest values squash yield. Also, Arora and Kumar (1991) on squash and round melon found that Atonik seed treatment for 8 hours at 0.05 % plus foliar spray at 0.05 % gave the highest values of both vegetative and yield.

This work aims to study the effect of Atonik seed treatments for 8 hours at 0.25 ml /L, 0.5 ml /L and foliar application with Atonik at 0.25 and 0.5 ml /L on vegetative growth, sex expression and yield of squash plants.

MATERIALS AND METHODS

Two field experiments were carried out at Gemmeiza Agric. Res. Station, Gharbiya Governorate, during 2005 and 2006 seasons to study the effect of two seed soaking and foliar spray of Atonik in comparison with un-treated plots (Seed soaking and spraying with tap water as a control) on vegetative growth, sex expression and yield of squash CV. Eskandrani. A randomized complete blocks design with three replicates was used in both seasons.

The nine treatments were as followed :

- 1- Un-treated (Seed soaking and spraying with tap water, as a control.
- 2- Atonik seed treatment at 0.25 ml / L .
- 3- Atonik seed treatment at 0.50 ml /L.
- 4- Foliar application of Atonik at 0.25 ml /L.
- 5- Foliar application of Atonik at 0.50 ml /L.
- 6- Atonik seed treatment at 0.25 ml /L+foliar application of Atonik at 0.25 ml / L.
- 7- Atonik seed treatment at 0.25 ml /L + foliar application of Atonik at 0.50 ml / L.
- 8- Atonik seed treatment at 0.5 ml /L + foliar application of Atonik at 0.25 ml / L.
- 9- Atonik seed treatment at 0.5 ml /L + foliar application of Atonik at 0.5 ml / L.

Seeds were soaked for 8 hours at 0.25 ml /L and 0.5 ml /L Atonik for seed treatments. Meanwhile, foliar spray treatments was performed at the 2-3 true leaf stage for the first spray and the second was applied 7 days after first spray, using hand operated compressed air at the rate of 200 liter / fed. Seeds of squash CV. Eskandrani were sown on 16th and 20th April of 2005 and 2006, respectively.

The plot area was 16 m², consisted of 4 ridges 0.8 m wide and 5 m long. The distance between plants were 35 cm, thinning took place after complete germination i.e., two weeks after seed sowing, leaving one plant per hill. The usual agricultural procedure of squash were used. Nitrogen fertilizer was applied as ammonium nitrate (33.5 % N) at the rate of 60 kg N /

Fed.in two equal doses 21 and 36 days after sowing before the first and second irrigation ,phosphorus fertilizer was applied at 100 kg Calcium super phosphate (15.5 % P_2O_5) during seed bed preparation .Potassium fertilizer was added at the rate of 24 kg K_2O / Fed.as potassium sulphate (48 % K_2O) in one dose with the 1st dose of nitrogen .The other cultural practices was carried out as recommended for the conventional squash planting.

Studied traits:

1- Vegetative growth characters:

Vegetative growth characters were measured after 70 days from planting; five plants were collected randomly from each plot to determine No. of leaves, plant height cm, plant fresh and dry weight (gm)

2- Sex expression:

Five plants from each plot were chosen and labeled for the present study, male and female flowers for each treatment were counted two days intervals up to the end of the season.

Sex ratio = [male / female] were determined.

3- Yield and its components:

Yield parameters; No. of fruits per plant, average fruit weight (gm), No. of fruits per plot and yield of total fruit weight kg per plot was determined by summation all harvests through out the season and the yield calculated as (ton / fed.). The obtained data were statistically analysis of the randomized blocks design as described by (Gomez and Gomez 1984).Treatments were compared using the least significant differences values (LSD) at 5 % level probability.

RESULTS AND DISCUSSION

Data presented in table (1) showed that No. of leaves per plant, plant height, plant fresh and dry weight were significantly response due to different treatments of Atonik compared with control in both seasons. Meanwhile, there is no significant differences between foliar spray at 0.5 ml / L, soaking seeds at 0.25ml /L+ foliar spray at 0.5 ml / L seed soaking at 0.5 ml /L and seed soaking at 0.5 ml /L + foliar spray at 0.5 ml / L treatments on number of leaves in the first season .

Data in table (1) show also that plant height significantly increased by Atonik treatments .The promoting effect of Atonik on plant height might be attributed to his role in stimulating cell division and enlargement , similar results were reported by Ansary *et al* 1991. The highest values of growth characters were obtained from seed soaking at 0.5 ml /L and foliar application of Atonik at 0.5 ml / L in both seasons'. This increases might be due to the stimulation effect of Atonik increasing N uptake which in turn reflected on increasing the metabolic processes (Urwiler and Stutte 1987 and Amin 2003 on wheat).These results one in agreement with those obtained by Arora *et al*, (1989) and Arora and Kumar (1991) on squash.

Table (1): Effect of soaking and / or foliar spray of Atonik on vegetative growth of summer squash plants in 2005 and 2006 seasons.

Treatments	No. leaves		Plant height (cm)		Plant fresh weight (gm)		Plant dry weight (gm)	
	2005	2006	2005	2006	2005	2006	2005	2006
control	24.67	23.67	34.67	38.00	780.00	710.00	130.00	123.33
Soaking 0.25ml/L	29.00	27.33	42.33	44.00	865.33	884.00	143.33	140.00
Soaking 0.50ml/L	31.33	30.00	51.67	54.00	930.00	903.33	155.00	150.00
Foliar spray 0.25ml/L	31.10	32.00	41.00	43.00	990.00	980.33	165.00	155.00
Foliar spray 0.50 ml/L	36.67	33.00	36.33	50.00	1041.00	1060.00	173.33	165.00
S 0.25ml/L + F 0.25ml/L	31.67	30.00	46.67	52.30	1088.00	1050.00	180.67	176.00
S 0.25ml/L + F 0.50ml/L	37.33	34.33	53.33	58.00	1138.00	1111.00	190.00	187.00
S 0.50ml/L + F 0.25ml/L	34.67	33.00	52.33	57.33	1281.00	1186.00	205.00	200.00
S 0.50ml/L + F 0.50ml/L	37.67	37.33	61.33	66.67	1290.00	1253.33	218.33	214.00
L.S.D.at 5 %	4.1	3.67	2.98	2.92	35.84	60.00	10.12	12.58

S: Seed soaking for 8 hours

F: foliar spray.

Sex expression :

Data in Table(2) show that, Atonik treatments significantly decreased male flowers and significantly increased female flowers and reduced sex ratio in both seasons. The highest values of male flowers were obtained from control. Soaking of squash seeds at 0.5 ml /L of Atonik plus foliar application of Atonik at 0.5 ml /L together gave the highest values of female flowers and reduced sex ratio. Generally, it may be stated that under such experimental condition, the improving effect of use Atonik treatments on flowering traits would be expected, since such treatments promoted vegetative traits.

Table (2) Sex expression squash plants as affected by seed soaking and / or foliar spray of Atonik in 2005 and 2006 seasons.

Treatments	No. of male flowers / plant		No. of female flowers/ plant		Sex ratio	
	2005	2006	2005	2006	2005	2006
control	21.67	22.67	6.67	6.67	3.23	3.58
Soaking 0.25ml/L	19.67	21.39	8.67	9.00	2.67	3.39
Soaking 0.50ml/L	18.00	20.67	8.67	10.00	2.13	2.22
Foliar spray 0.25ml/L	21.00	23.33	8.00	9.00	2.65	2.62
Foliar spray 0.50 ml/L	17.00	18.67	9.67	10.67	2.07	1.96
S 0.25ml/L + F 0.25ml/L	20.67	21.00	8.67	10.00	2.42	2.13
S 0.25ml/L + F 0.50ml/L	16.67	17.67	13.00	14.00	1.62	1.37
S 0.50ml/L + F 0.25ml/L	19.00	21.33	13.00	13.33	1.45	1.61
S 0.50ml/L + F 0.50ml/L	16.00	16.33	13.67	14.67	1.10	1.33
L.S.D.at 5 %	2.24	2.98	1.78	2.13	0.63	0.58

S: Seed soaking for 8 hours

F: foliar spray.

3- Yield and it's components:

Data in Table (3) show clearly that Atonik treatments significantly increased number of fruits / plant, average fruit weight (gm), yield in (kg)/ plot as in ton / fed. as compared with control . There is no significant differences between seed soaking at 0.25 ml / L + foliar spray at 0.5 ml /L and seed soaking at .05 ml /L + foliar spray at 0.5 ml /L in the first season on No. of fruits / plant .

The highest values were obtained from soaking squash seeds at Atonik 0.5 ml /L and foliar application of Atonik at 0.5 ml /L in both seasons .This result could be in agreement with those obtained by Arora *et al* 1989 and Arora and Kumar 1991 on squash. Also, Guo and Oosterhuis (1995) reported that Atonik increased cotton crops yield through enhanced assimilation nutrient uptake, nitrate reduction and photosynthesis , improved flow of assimilates (translocation and cytoplasmic streaming) and increased cell integrity

The increases in yield per fed due to Atonik treatments may be due to their favorable effects on growth and sex expression which reflected an increases in yield components such as number of fruits per plant and average fruit weight which increased yield per unit area.

Table (3) Effect of seed soaking and / or foliar spray of Atonik on yield and its components of squash plants during 2005 and 2006 seasons.

Treatments	No.fruits/plant		Average fruit weight (gm)		No.fruits/ plot		Yield (kg) / plot		Yield(ton)/ fed	
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
control	4.90	5.30	99.33	97.67	274.40	296.80	26.88	27.71	6.45	6.50
Soaking 0.25ml/L	5.57	5.47	111.33	116.00	311.40	306.13	33.47	39.21	7.81	8.58
Soaking 0.50ml/L	5.57	5.90	123.33	118.33	311.36	349.13	37.21	35.53	8.69	9.10
Foliar spray 0.25ml/L	5.58	6.15	117.67	114.67	312.80	326.00	35.28	36.17	8.21	8.23
Foliar spray 0.50 ml/L	6.00	6.68	122.67	120.00	331.33	363.00	42.01	44.29	9.75	10.23
S 0.25ml/L + F 0.25ml/L	6.73	5.90	125.00	131.67	377.10	330.00	41.88	44.06	9.80	10.23
S 0.25ml/L + F 0.50ml/L	7.17	6.93	133.00	131.67	401.33	396.67	51.40	51.51	11.92	11.97
S 0.50ml/L + F 0.25ml/L	6.13	6.33	120.00	121.00	362.20	354.80	43.17	41.37	10.10	9.58
S 0.50ml/L + F 0.50ml/L	7.50	7.42	129.00	135.00	420.00	425.67	61.05	60.31	14.17	14.58
L.S.D.at 5 %	0.58	0.55	7.11	7.18	34.17	23.11	3.50	7.55	0.80	1.44

S: Seed soaking for 8 hours

F: foliar spray.

REFERENCES

- Abd-El-Magid,Z ;G.Horvath and Z.Fu'stos (1996). Effect of pre-sowing soaking periods in Atonik solution on seed germination and seedling growth in cucumber (*Cucumin sativis* L.) 1st Egypt. Hung.Hort.(2) : 54-59.
- Arora,S.K.and J.Kumar (1991). Effect of Atonik on growth, flowering and yield of summer squash and round melon. Haryana Agric.Univ., Hisar Indian. Research and development Reporter.8:1,31-5.
- Arora,S.K.and J.Kumar and M.L.Pandita (1989).Studies on the effect of ethephon mixatal and Atonik on vegetative growth ,flowering and yield of summer squash (*Cucurbita pepo* L.) .Haryana Agric.Univ.,Hisar Indian. Research and development Reporter. 6:2,35-58.
- Amin,A.A.(2003).Physiological response of wheat plant to foliar application of Pix and Atonik .J.Agric.Sci.Mansoura Univ.,28 (2):979-993.
- Anonymous (1976). Atonik a new plant stimulant.Asahi chemical Mfg-co-Ltd.Tokyo.Japan pp.1-10.
- Ansary,E.M. ; A.Fathy and M.Abou(1991) Response of(*Borage officinalis* ,L) plants grown under saline conditions to Atonik and kintetin .Minofiya J.Agric. Res.16 (2) : 1215- 1235.

- Baha EL-Din, S.A.; R.M. Helal; S.A. Awany and M.M. Ragab (1983). Studies on producing gynoecious cucumber and squash strains by aid of ethrel foliar spray .Annals Agric.Sci., Fac. Agric., Ain Shams Univ. Cairo ,Egypt 28(2):917-933.
- Cantliffe, D.J. (1981). Alteration of sex expression in cucumber due to changes in temperature light intensity and photoperiod .J. Agric. Soc. Hort. Sci. 106 303-307.
- EL-Beheidi ,M. and A.E. Mansi (1974). Effect of plant population and nitrogenous fertilizer on growth, sex expression, yield and quality of cucumber plants .Zag. J. Agric. Res. (1) ,173-186.
- Gomez, K.A. and A.A. Gomez (1984). Statistical procedures for agriculture Research .2nd Ed. John. Willy and Sons. Inc. New York.
- Guo, C. and Oosterhuis, D.M. (1995) Atonik: a new plant growth regulator to enhance yield in Cotton .Proc. Beltwide cotton Conf. ,San Antonio T.X. USA. January 4-7, 1995: Vol. (2) : 1086 – 1088.
- Hanafy Ahmed, A.H. (1997). Effect of foliar application of some chemical on sex expression of squash plants .J. Agric. Sci. Mansoura Univ., 22 (3) 697-7-717.
- Shifriss, O. (1961). Sex control in cucumbers .J. Hered 25: 5-12 (CF. J. Amer. Soc. Hort. Sci. 94 (4) :402).
- Shifriss, O. and E. Galum (1956). Sex expression in the cucumber .Proc. Amer. Soc. Hort. Sci. 67 : 479-489.
- Urwiler, M.J. and C.A. Stutte (1987). Laboratory and field evaluation of Atonik on Cotton. Special Report to Asahi chemical Mfg – Co .Japan ,Univ. of Arkansas Experiment Station Special Report : 48pp.
- Wojdya ,A.T. (2004). Effectiveness of Atonik in the control of powdery mildew, black spot and rust .Folia – Horticulture ,16 (1) :175 – 181

تأثير نقع البذرة والرش بالأتونيك على النمو والنسبة الجنسية والمحصول في الكوسة.

رضا عبد الخالق الشبراوى

قسم بحوث الخضر – معهد بحوث البساتين – مركز البحوث الزراعية – الجيزة – مصر.

أجريت تجربتان حقليتان بمحطة البحوث الزراعية بالجيزة – محافظه الغربية خلال موسمي ٢٠٠٥ و ٢٠٠٦ لدراسة تأثير نقع بذور الكوسة في محلول الاتونيك لمدة ٨ ساعات بتركيز ٠,٢٥ & ٠,٥٠ مل / لتر وكذلك الرش مرتين (الأولى في مرحلة ٢-٣ أوراق حقيقية والثانية بعد أسبوع بتركيز ٠,٢٥ & ٠,٥٠ مل / لتر والتوافق الممكنة بينهما على النمو والنسبة الجنسية والمحصول .

وكانت أهم النتائج ما يلي:

- ١- أدت المعاملة بالأتونيك إلى زيادة نمو الخضري متمثلا في عدد الأوراق – طول النبات – الوزن الطازج والجاف للنبات زيادة معنوية في كلا الموسمين مقارنة بالكنترول.
 - ٢- أدت المعاملة بالأتونيك إلى نقص عدد الأزهار المذكرة وزيادة عدد الأزهار المؤنثة وتقليل النسبة الجنسية في كلا الموسمين مقارنة بالكنترول.
 - ٣- أدت المعاملة بالأتونيك إلى زيادة المحصول زيادة معنوية في كلا الموسمين مقارنة بالكنترول.
- لذلك يمكن التوصية بنقع بذور الكوسة لمدة ٨ ساعات في محلول تركيزه ٠,٥٠ مل اتونيك والرش مرتين بنفس التركيز (الرشة الأولى في مرحلة ٢-٣ أوراق حقيقية والثانية بعد أسبوع) وذلك للحصول على اعلي محصول تحت الظروف المماثلة لظروف التجربة .