

## Effect of vernalization and growth stimulants foliar application treatments on cantaloupe plants under greenhouses condition.

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### Abstract

Field experiments were carried out on melon, (*Cucumismelo var. cantaloupensis*; *F1 Royall*) at Kaha protected cultivation site during winter seasons of 2004/2005 and 2005/2006.

Studies aimed to investigate the effect of soaking seeds in water for 8 hours and vernalized at 1°C for 24 hours. The seeds were sown in trays and seedlings were transplanted in the greenhouse after 18 days. Two vernalization treatments one at 1°C for 24hr. and the second was the Control (Non vernalization). Three foliar application i.e., (Amino acids at 1ml, Salicylic acid at 5mM, Garlic extract at 10% and Control (distilled water) were applied for three times after transplanting of seedlings. The results showed that plant growth, early yield, total yield and marketable yield and T.S.S.%, total sugars as well as vitamin C were increased by using Amino acids, Garlic extract, followed by Salicylic acid and Control with vernalization.

**Key Words:** Vernalization- Amino acids- Salicylic acid- Garlic extract-*Curcumis melo* -Vegetative growth - Yield.

### Introduction

Melon (*Cucumis melo var. cantalupensis L*) is one of the most popular vegetable crops in Egypt. Vernalization treatments with low temperature promote growth and yield (Ventura and Mendlinger 1998 and Streck 2002) on muskmelon.

Every plant like any organism needs certain components for growth, whereas, the basic components of living cells is protein. The main source of protein in plant tissues is amino acids. The requirement of nitrogen through amino acids in essential quantities is well known as a mean to increase growth and yield for all crops. Furthermore, nitrogen and/or amino acids are the fundamental ingredients for the process of protein synthesis Al-Said and Kamal (2008) on sweet pepper mentioned that the importance of nitrogen or amino acids came from their widely use for the biosynthesis of large variety of non protein nitrogenous materials i.e., pigments, vitamins coenzymes, purine and pyrimidine bases and caused an enhancement in plant growth, fruits yield and its component. Ali (1995) and Ahmetet al. (2007) on muskmelon observed that, salicylic acid which is a secondary plant product, performs important actions in the growth and development processes of plants. It can stimulate plant growth, yield of vegetables as well as it contains some phenolic compounds which exercise their effect of providing resistance against different stress factors in plants ( Yuan and Lin, 2008) by modifying the effects of abscisic acid and gibberellic acid and cytokinins. Also, the previous studies indicated that, the foliar spraying of garlic extract on many vegetables resulted in a great influence on plant growth, fruits yield as well as physical and

chemical fruits quality (Shafshak et al.2004) on squash and (AL-hassany, 2010) on cucumber.

The aim of the present study is to investigate the effects of pre-sowing seed vernalization and foliar spray with amino acids, salicylic acid and garlic extract solution in addition to the control on vegetative growth traits, chemical composition, fruit yield and its quality of melon.

### Materials and methods

During the two successive seasons of 2004/2005 and 2005/2006, two field experiments were conducted in the greenhouse Agric. Res. Cent., Kaha, Farm EL-kalubia, Egypt to study the effect of soaking seeds in water for 8 hours and vernalized at 1 °C for 24 hours and it were sown in trays and transplanted under greenhouse after 18 days of sowing. Plants were foliar sprayed three times beginning 25days of sowing with 8days intervals with some growth stimulants (amino acids1m/l, salicylic acid 5mM or garlic extract 10% beside Control (water foliar spraying) substances and their interaction on the vegetative growth, fruits yield and its some physical and chemical properties of melon plants (*Cucumismelo var. cantaloupensis*). The soil of experimental field was clay loam in texture with E.C, dS/m 0.5 and pH 7.80, available N was 0.7 mg/kg. P 3.6 mg/kg.and exchangeable K was 4.1 mg/kg.The experimental treatments were arranged in a split plot design with 4 replicates where the vernalization treatments were distributed in the main plots and the natural growth stimulants were randomly located in the sub plots. Each experimental plot consisted of two ridge 1.5m in width and 8m in length with an area of 12m<sup>2</sup>. A random sample of 3 plants were taken from every experimental plot at 55

days after seeds sowing to determine, the vegetative growth characters i.e., length of plant, number of leaves/plant, leaf area and dry weight of whole plant. Fruits were harvest at two weeks (15 days) intervals in both seasons to determine total yield and its components i.e., early yield kg/plant or as ton/fed., total yield kg per plant and ton/fed, number of fruit/plant and marketable yield of fruits. Samples of melon fruits in first and mid of harvesting season were taken for chemical determination, whereas, total soluble solids (T.S.S. %) using abbe refractometer, vitamin C and total sugars were analyzed of Variance (ANOVA) using M-STATC statistical software.

## Results and discussion

### 4.1. Plant Growth Characters:

#### 4.1.a. Effect of seed vernalization.

Data in Table (1) showed the effect of pre-sowing seed vernalization on vegetative growth characters expressed as plant height, number of leaves and branches per plant and leaf area as well as fresh and dry weight per plant, data revealed that all the aforementioned growth measurements at 55 days were significantly affected due to low temperature seeds through vernalization before sowing compared with the control treatment (without vernalization). Obtained results are true during both seasons of growth. Such increments in vegetative growth traits due to vernalization may be attributed to the main role of vernalization on tolerance of low temperature stress during the first stage of growth and also increasing the level of auxin in plant cells and consequently affect cell formation and elongation and in turn increased plant morphological characters. Also, cold vernalization may increase gene action which responsible for new promotion and assimilation which may affect tolerance cold stress and plant vegetative growth. In this respect, **Ventura and Mendlinger 1998** and **Streck 2002**) on muskmelon, **Tewari et al (2009)** on cucumber and **Mady (2000)** on squash. Reported similar results on such tested crops.

#### 4.2.1. b Effect of growth stimulants.

With regard to the effect of foliar spray with tested growth stimulants i.e., amino acids at 1 m/l, salicylic acid at 5mM and Garlic extract at 10%, on vegetative growth aspects of melon. Such data indicate that spraying the plants three times starting one week after transplanting and every week by intervals significantly increased all the aforementioned growth parameters during both seasons of growth compared with the control treatment Table (1) In addition, using amino acids solution at 1m/l exhibited the highest values in all measured growth parameters

followed in descending order. by using garlic extract at 10% and salicylic acid at 5mM

Such results are true during both seasons of study. Obtained results may be due to the main role of growth stimulants (amino acids, salicylic acids and garlic extract) on cell division, cell elongation and cell protoplasm formation and in turn increased plant growth. Also such tested materials increased plant resistance to disease and maintain plants health and retarded the senescence of plant growth.

In this connection, **Faten et al. (2010)** on squash and **El-Tantawy et al. (2009)** on tomato, in case of amino acids, **Ali (1995)** on melon, **Singh et al. (2010)** on cucumber and **Mady (2009)** on tomato in case of salicylic acid, **EL hassany (2010)** and **Zhi-hui et al. (2007)** on cucumber, **Shafshaket al. (2004)** on squash and **Abdel – Moniam et al. (2011)** on kidney bean reported similar results on such vegetable crops.

#### 4.1. c Effect of the interaction.

As for the effect of the interaction, data in Table (1) showed that all measured growth parameters were significantly affected due to the interaction treatments between pre-sowing seed vernalization via spraying the plants with tested growth stimulants at 55 days from sowing. In this respect, pre-sowing seed vernalization combined with spraying the plants three times with amino acids at 1m/l during the growing seasons, reflected the heights values in all measured growth aspects. In addition, pre-sowing seed vernalization combined with garlic extract and salicylic acid ranks the second and the third treatment, respectively during the two seasons of growth.

### 4.2-Fruit yield and its components.

#### 4.2.1- Early fruit yield.

##### 4.2.1.a-Effect of seed vernalization.

Data in Table (2) showed that pre sowing vernalization of cantaloupe seeds with low temperature significantly increased early yield for both plant and faddan compared with non vernalization treatment during the two seasons of the study. The vernalization treatment produced 1.675 kg./plant and 16.080 t/fed. While the non vernalized produced 1.544 kg. /plant and 14.822 t/fed. for the first season (2004/2005). The second season early yield was 1.612kg./plant and 15.475 t/fed. for vernalized treatment and 1.494 kg. /plant and 14.343 t/fed. for thenon vernalized one. In this concept, **Ventura and Mendlinger 1998** and **Streck 2002**) on muskmelon, **Tewari et al (2009)** on cucumber and **Mady (2000)** on squash. reported similar results.

#### 4.2.1. b-Effect of growth stimulants .

Data in Table (2) showed that there were significant differences in early yield either for plant or faddan as a result of spraying plants with tested growth stimulants during the two seasons of study.

In addition, the best treatment was amino acids application followed by garlic extract which produced 1.737kg/plant and 1.688 kg./plant and 16.675 t/fed. and 16.205 t/fed. respectively in the first season. While, the salicylic acid treatment gave 1.538 kg./plant and 14.765t/fed. In the second season amino acids foliar gave 1.675 kg./plant and 16.080 t/fed., garlic extract produced 1.663 kg./plant and 15.965 t/fed., in the same time salicylic acid gives 1.475 kg./plant and 14.160 t/fed., while the control gave 1.400 kg./plant and 13.440 t/fed., respectively. *Fatenet al. (2010)* on squash, *Kamar and Omar (1987)* on cucumber in case of amino acids, *Singh et al. (2010)* on cucumber and *Mady (2009)* on tomato in case of salicylic acid and *Al-hassany (2010)* on cucumber and *El-Desouky et al. (1998)* on squash *Abdel – Moniamet al. (2011)* on kidney bean in case of garlic extract.

#### 4.2.1. c-Effect of the interaction.

As for the effect of the interaction between vernalization and foliar application treatments on early yield. Table (2) showed that there is a significant difference in early yield for both plant and faddan between the interaction treatments during the two seasons of the study. The foliar application of amino acids combined with seed vernalization exhibited the highest early yield (1.800 and 1.750 kg./plant and 17.280 and 16.800 t/fed.) during first and second seasons, respectively followed by garlic extract and salicylic acid as well as the control. From results it can be concluded that early yield was affected by vernalization of seeds. The foliar application of amino acids, garlic extract and salicylic acid increased early yield compared with the control .

#### 4.2.2. Total fruit yield.

##### 4.2.2.a. Effect of seed vernalization.

Data in Table (2) declared the effect of vernalization on the cantaloupe total yield under greenhouse conditions during the two seasons of the study. Such data indicated that total fruit yield for both plant and feddan were significantly increased as a result of pre-sowing seed vernalization at 1 °C for 24 hr. compared with the control treatment. Obtained results are true during both seasons of study. In this respect, the total yield under vernalization treatment was 4.700 kg./plant, 45.120 t/fed. and 4.637 kg./plant, 44.160 t/fed. for the first and second seasons, respectively. The non vernalization treatment produced total yield 4.500 kg./plant, 43.200 t/fed. and 4.406kg./plant, 42.240 t/fed. for

the first and second season, respectively. No significant difference was observed in number of fruits/plant under both treatments in the two seasons. However, the highest number of fruits /plant was recorded in case of pre-sowing seed vernalization.

Obtained results are in agreement with those reported by *Ventura and Mendlinger (1998)* and *Streck (2002)* on muskmelon and *Tewari et al (2009)* on cucumber and *Ahmed (1997)* on squash who showed that, low temperature significantly exhibited an extended fruiting period, giving more fruits and consequently higher total yield.

#### 4.2.2.b-Effect of growth stimulants.

Data in Table (2) indicate that total fruit yield either per plant or faddan as well as number of fruit per plant were affected as a result of growth stimulants application. In this respect such differences were reached the level of significance in case of total fruit yield for both plant and faddan during the two seasons. In addition, using such substances significantly increased the total yield for each of plant and Fadden compared with the control treatment. Moreover, amino acids treatment recorded the highest fruit yield compared with other tested treatments. It gave 4.800 kg./plant for the first season and 4.875 kg./plant in the second one. Furthermore, garlic extraction application ranks the second and produced 4.700 kg./plant, and 4.725 kg./plant during and second seasons respectively. While salicylic acids gave 4.500 and 4.362 kg./plant in both seasons of study respectively. Such increments in total yield as a result of growth stimulants application were connected with the increase in vegetative growth and number of fruits /plant as well as increasing fruit parameters. Obtained results are in agreement with those reported by *Fatenet al. (2010)* on squash plant and *El-Tantawy et al.(2009)* on tomato in case of amino acids, *Singh et al. (2010)* on cucumber and *Mady (2009)* on tomato in case of salicylic acid, in case of salicylic acid, *Shafshaket al. (2004)* on squash *Al-hassany, ( 2010)* on cucumber and *Abdel – Moniamet al. (2011)* on kidney bean in case of garlic extract.

#### 4.2.2.c-Effect of interaction.

AS for the effect of the interaction between vernalization and foliar application treatments on total yield the same data presented in Table ( 2) showed that no significant differences were observed between all treatments during the two seasons of the study. Moreover, the best treatment was using Amino acid followed by garlic extraction combined with pre-sowing seed vernalization during both seasons of study.

#### 4.2.3. Marketable fruit yield .

##### 4.2.3.a-Effect of seed vernalization

Table (2) showed that there were significant differences in marketable yield as a result of pre-sowing seed vernalization compared with the non vernalization treatment during the two seasons of the study. Marketable yield was 4.387 kg./plant and 4.412 kg. /plant for vernalization treatment and 4.188 kg./plant and 4.238 kg. /plant for non vernalization treatment during the first and second seasons, respectively. Obtained results are going with the same result of early yield. In this connection, **Streck (2002)** on muskmelon, **Tewari et al (2009)** on cucumber and **Ahmed (1997)** on squash indicated that low temperature levels increased all physical characters.

#### 4.2.3.b-Effect of growth stimulants.

With regard to the effect of spraying the plants with growth stimulants i.e., amino acids, salicylic acid and garlic extract solutions, the same data in Table (2) showed that application of such growth stimulants and anti diseases substances led to significant increase in marketable yield compared with the control. The marketable yield recorded 4.450 kg./plant for Amino acids, 4.400kg./plant for garlic extraction and 4.250kg./plant for salicylic acid while the control was 4.050 kg./plant during the first season. While in the second season were 4.600 kg./plant for Amino acids application, 4.525 kg./plant for garlic extract and 4.100 kg./plant for salicylic acid and 4.075 kg. /plant for the control.

From the foregoing results, foliar application with Amino acid was the best treatment followed by garlic extract compared with salicylic acid and control. In this connection, **Shafshaket al.(2008)** and **El-Tantawy et al. (2009)** on tomato indicated that foliar spray of amino acid resulted in the heaviest fruits yield as well as its best physical properties in case of amino acids, **Singh et al. (2010)** on cucumber and **Mady (2009)** on tomato in case of salicylic acid, **AL-hassany, (2010)** on cucumber and **Shafshaket al. (2004)** on squash and **Abdel – Moniamet al. (2011)** on kidney bean in case of garlic extracts.

#### 4.2.3.c.Effect of the interaction.

As for the effect of the interaction the same data in Table (2) indicate that marketable yield /plant was not significantly affected as a result of the interaction treatments during both seasons of study. However, the highest value of marketable yield was recorded as a result of the combination between pre-sowing seed vernalization and spraying the plants with either amino acids at 1m/L or garlic extract at 10%.

### 4.3. Chemical fruit quality:

#### 4.3.a.Effect of vernalization treatments.

Data recorded in Table (3) indicated that all assayed fruit chemical constituents vitamin C, total sugars and total soluble solids (T.S.S.%), were significantly increased during the two seasons of study as a result of vernalization application during

the growing seasons compared with the control treatment. Obtained results were true during both seasons of study. In addition, the highest values of all measured chemical constituents were reported by the result of **Ventura and Mendlinger (1998)** who working on muskmelon the effects of suboptimal low temperature in melon. (*Cucumis melo L.*) had significantly higher amounts of total soluble solids (TSS%) and total sugars. As indicated also by **Tewari et al.(2009)** on cucumber and **Ahmed (1997)** on squash.

#### 4.3. b-Effect of growth stimulants.

Concerning the effect of foliar spray treatments, the same data in Table (3) showed that spraying melon with foliar application significantly increased the concentrations of assayed organic constituents of fruits i.e., vitamin C, total sugars and total soluble solids (T.S.S.%), content compared to the control during both seasons of study. In this regard, the highest concentration in all the assayed organic constituents was recorded in case of using Amino acids followed by Garlic extract and Salicylic acid, respectively. Such enhancing effect due to using such tested growth stimulants on measured chemical constituents may be attributed to the constituents of growth stimulants. Obtained results are in the same direction to those recorded by **Shafshaket al.(2008)** and **El-Tantawy et al.(2009)** on tomato in case of amino acids, **Singh et al. (2010)** on cucumber, **Shafshaket al. (2004)** on squash in case of salicylic acid, **AL-hassany, (2010)** on cucumber and **Abdel – Moniamet al. (2011)** on kidney bean in case of garlic extract.

#### 4.3. c.Effect of the interaction.

Concerning the interaction between vernalization and foliar spray treatments data in Table (3) indicate that the highest concentration in all determined organic constituents (vitamin C, total sugars and total soluble solids (T.S.S%) and total sugars concentration) were recorded as a result

of using vernalization application combined with foliar spray compared with other interaction treatments. Moreover, the best treatment was using Amino acid followed by garlic extraction combined with pre-sowing seed vernalization during both seasons of study. Concerning the interaction between vernalization and foliar spray treatments data in Table 3 indicate that the highest concentration in all determined organic constituents (vitamin C, total sugars and total soluble solids (T.S.S.%), and total sugars concentration) were recorded as a result of using vernalization application combined with foliar spray compared with other interaction treatments. Moreover, the best treatment was using Amino acid followed by garlic extraction combined with pre-sowing seed vernalization during both seasons of study.

**Table 1.** Effect of vernalization, growth stimulants foliar application and their interaction on vegetative growth characters of cantaloupe plants during 2004/2005 and 2005/2006 seasons.

Characteristics	2004/2005						2005/2006						
	Plant height cm	No. of leaves	Leaf area cm	No. of branches	Plant fresh weight/kg.	Plant dry weight/g.	Plant height cm	No. of leaves	Leaf area cm	No. of branches	Plant fresh weight/kg.	Plant dry weight/g.	
Vernalization													
Treatments													
Vernalization	221.2	116.1	210.6	8.15	1.468	145.1	229.8	113.9	214.1	7.4	1.496	150.3	
Non vernalization	207.4	99.9	186.6	6.9	1.352	121.7	211.9	94.9	188.5	6.3	1.373	102.5	
L.S.D at 0.05	2.88	0.71	1.80	0.3	0.020	8.11	2.90	0.65	2.77	0.57	0.121	13.32	
Foliar application													
Amino acids	240.6	129.3	225.0	8.9	1.615	130.1	250.0	122.5	229.4	8.3	1.635	138.5	
Salicylic acid	219.3	109.0	202.5	7.3	1.368	141.5	226.3	103.0	209.4	6.3	1.344	131.9	
Garlic extract	231.0	121.9	218.5	8.3	1.410	154.9	236.4	115.5	215.8	7.3	1.504	143.2	
Control	166.3	71.9	148.1	5.8	1.247	107.3	170.6	76.8	150.5	5.5	1.256	91.8	
L.S.D at 0.05	3.89	1.02	1.61	0.05	0.028	13.93	2.13	0.91	2.13	0.27	9.75	12.95	
Vernalization x Foliar application													
Vernalization	Amino acids	247.5	135.0	240.0	9.5	1.763	140.3	260.0	131.1	245.0	9.0	1.759	177.8
	Salicylic acid	227.0	123.0	214.8	7.6	1.386	144.2	235.0	116.0	222.5	6.8	1.350	148.7
	Garlic extract	235.3	130.0	230.0	9.0	1.473	183.1	244.0	125.0	230.0	7.8	1.581	166.1
	Control	175.0	76.3	157.5	6.5	1.250	112.8	180.0	83.8	158.8	6.0	1.249	108.3
Non vernalization	Amino acids	233.8	123.5	210.5	8.2	1.467	119.9	240.0	114.0	213.8	7.5	1.510	99.3
	Salicylic acid	211.5	95.0	190.3	7.0	1.349	138.8	217.5	90.0	196.3	5.8	1.338	115.1
	Garlic extract	226.8	113.8	207.0	7.6	1.347	126.7	228.8	106.0	201.5	6.8	1.427	120.4
	Control	157.5	67.5	138.8	5.0	1.244	101.7	161.3	69.8	142.3	5.0	1.218	75.3
L.S.D at 0.05	5.50	1.44	2.29	0.07	0.039	19.70	3.02	1.29	3.01	0.38	0.125	18.31	

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## تأثير معاملات الأرتباج والرش الورقي بمتشطات النمو على نباتات الكانتالوب تحت ظروف البيوت المحمية

(1) نادية سعد شفشوق - (1) سعيد معوض عيد - (2) جاد الرب محمد سلامة - كرم محمد الدسوقي

كلية الزراعة قسم البساتين - مشتهر - جامعة بنها - مصر 2012.

مركز البحوث الزراعية شعبة بحوث الخضر بالدقي. (2)

أجريت تجربة حقلية على الكنتالوب هجين رويال في مزرعة قها للزراعات المحمية خلال الموسم

الشتوي 2004/2005 و 2005/2006.

يهدف البحث الى دراسة تأثير نفع البذور في الماء لمدة 8 ساعات و ارتباجها على درجة حرارة 1 م<sup>5</sup> لمدة 24 ساعة. زرعت البذور في صواني وتم نقلها إلى ارض الصوبة بعد 18 يوم. تضمنت التجربة معاملتين ارتباج واحدة على درجة 1 م<sup>5</sup> لمدة 24 ساعة والثانية معاملة الشاهد (بدون ارتباج) وثلاثة معاملات رش ورقي (الأحماض الأمينية 1مل/لتر و حامض السلسليك كليمكافئ ومستخلص الثوم 10% والكنترول(ماء مقطر) رشت بها الشتلات بعد النقل ثلاث مرات. أخذت قياسات النمو والجودة وأوضحت النتائج زيادة النمو الخضري والمحصول المبكر والكلى والمسوق وكذلك المواد الصلبة الذائبة الكلية والسكريات بالإضافة إلى فيتامين ج خاصة مع الرش بالأحماض الأمينية، مستخلص الثوم يليه حامض السلسليك ثم الكنتترول مع الارتباج.

مفتاح الكلمات: الارتباج-الأحماض الأمينية-حامض السلسليك-مستخلص الثوم-الكنتالوب-النمو الخضري- المحصول.