Plant Archives Vol. 19 No. 1, 2019 pp. 1768-1772 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

RESPONSES OF TWO VARIETIES OF *CUCURBITA PEPO*. L. PLANTED INSIDE THE PLASTIC HOUSES TO FOLIAR SPRAYING OF ASCORBIC ACID

Ahlam Ahmed Hussein and Khalid Ibrahem Mustaf

Department of Horticulture and Landscaping, College of Agriculture, Diyala University, Iraq.
E-mail : happy_times2053@yahoo.com, khalidagre@yahoo.com

Abstract

The experiment was carried out in one of plastic houses in the research station belong to the Department of Horticulture and Landscaping, College of Agriculture / Diyala University during the season 2017-2018 to study effect foliar spraying of Ascorbic acid three concentrations (0, 50, 100 mg \ L^{-1}) on vegetative growth and qualitative characteristics of two varieties of squash (Carisma V_1 and Alexandria V_2) under plastic houses conditions. The experiment included 6 treatments. Randomized Complete Block Design (RCBD) was used with three replicates; therefore, the number of pilot unit was 18 and each one included 10 plants. The results showed that the variety V_2 was superior in most of vegetative growth and qualitative characteristics such as (plant height, relative amount of chlorophyll present in plant leaves , dry weight of plant and N,P,K ratio) as recorded (22.07cm/plant^{-1}, 34.96 SPAD unit and 42.26g /plant^{-1}, 0.389%, 0.038% and 0.146%) respectively. While, the Ascorbic acid treatment S_3 (100 mg \ L^{-1}) was gave increase of plant height, relative amount of chlorophyll present in plant leaves and N,P,K ratio. But there is non-significant from other treatments in dry weight of plant. The interpenetration between Alexandria V_2 and (100 mg \ L^{-1}) Ascorbic acid (V_2S_3) are superiority and gave the best results in vegetative growth and qualitative characteristics compared of other treatments. But all of these treatments outperformed on control treatment which gave lowest rates for these traits.

Key words : Ascorbic acid, *Cucurbita pepo* L, plastic houses, foliar spraying.

Introduction

Summer squash is a plant of cucurbitaceae and its scientific name (*Cucurbita pepo* L). The regions of Mexico are the original home of this type of pepo (Al-Mohamady, 1990). Horticultural varieties of squash are of great importance either to their horticultural fruits or to their mature seeds, which are rich in fat and protein. The fat content ranges from 40-45% to 51%. The proportion of protein 30-35% (Francois *et al*, 2006), as well as its obvious richness with the antioxidant (Tocopherols) of medical importance (Kamal and Andersson, 1997). Phytosterols are another important chemical component of medicinal seed in lowering blood cholesterol and reducing the incidence of certain types of cancer (Pillips *et al*., 2005).

It has been cultivated in Iraq and most of its regions in the spring and autumn, as well as the cultivation of green houses in the winter (Matlub *et al*., 1989). Plant growth is affected by many environmental factors as well as agricultural service factors, including planting dates, following modern agricultural processes and cultivating varieties suitable for environmental conditions in the region. One of the ways to increase productivity is the use of modern technologies in agriculture, including modern nutrition and varieties, which is one of the means of increasing growth and production (Esho and Saeed, 2014). In selecting the appropriate category, it is important that the performance of varieties under different environmental conditions is consistent to determine their adaptation to these conditions, since there are significant differences between species within the same group or species (Nerson, 2005). This is confirmed by Murie *et*

al. (2016) that pumpkin varieties differ genetically in terms of the nature of vegetative, flowering and fruit growth.

Some organic compounds can be used to increase pumpkin productivity and improve its quality, since there is a real need for natural growth and development as it activates the enzymatic system as a key part of controlling the metabolism. Ascorbic acid is one of the essential ingredients necessary in high-end plants to maintain their natural growth. As it performs several functions inside the plant tissues, including reducing the stress caused by high temperature and toxins and stimulate breathing and division of cells and increase the effectiveness some of enzymes. As well as its participation in the system of transport of electrons and preserves the chloroplast of oxidation as one of the factors that counteract them, as well as preserves the cell components, especially chlorophyll from optical oxidation and protection from reactive oxygen species, which consists of photosynthesis and breathing (Conklin and Barth, 2004; Logan *et al*., 2006). And plays an important role in controlling the timing of flowering and aging (Barth *et al*., 2006).

From another side, Jassem (2012) found that spraying with ascorbic acid with a concentration of 40 mg. L^{-1} and chelate iron concentrate 600 mg. L^{-1}, led to an increase of vegetative and flowering growth and increased yield of squash, they given highest yield per plant was (1.1840, 2.084) kg.plant^{-1} and the highest productivity was (7.233, 8.187) ton.Donm^{-1} for both ascorbic acid and chelate iron respectively.

El-Tohamy *et al*. (2008) found that eggplant plants with ascorbic acid were sprayed a month after planting with concentrations of 100 and 200 mg/L and twice. The period between them 15 days led to improved vegetative growth characteristics of the plant represented by the height and number of leaves and branches and soft and dry plant. Also It was found that spraying with ascorbic acid at a concentration of 100 mg/L increased the yield of the lettuce and improved its properties by increasing the number of total leaves, total leaves weight, dry matter ratio and plant leaf area compared to other concentrations of zero, 50, 200 mg (Jerry *et al*., 2011).

Based on the above, the aim of the experiment was to know the suitable concentration of ascorbic acid spraying in the vegetative growth characteristics and qualitative characteristics of two varieties of squash and which one of these varieties most responsive to foliar sparing of ascorbic acid.

Materials and Methods

The experiment was carried out in one of plastic houses the area of this house was 504m2 (56m^2 length and 9m^2 width) in the research station belong to the Department of Horticulture and Landscaping, College of Agriculture, Diyala University during the season 2017-2018.

Table 1 : Soil physical and chemical parameters of greenhouses.

Value	Unit	Parameter
7.18		pH
3.71	Ds.m^{-1}	EC
1.86	gm.Kg^{-1}	Total Carbonate
11.53		OM
64.78	mg.Kg^{-1}	Available N
12.56		Available P
209.35		Available K
210	gm.Kg^{-1}	Sand
415		Loam
375		Clay
SCL	**Texture**	

The green house was prepared by performing perpendicular plowing of the land, as well as solar sterilization of the soil. Samples of the green houses soil were taken to study their chemical and physical characteristic (table 1). Decomposed organic fertilizer (poultry manure) was add at an average of 8 m^3. greenhouse^{-1}. Half the recommended amount of chemical fertilizer of the amount of 400 Kg N.h^{-1}. 100 Kg P_2O_5.h^{-1} and 100 Kg K.h^{-1} was added on three stages through the growth season. The land was divided to lines the distance between which is 75 cm. with a width of 50 cm. Dripping irrigation pipes were extended on the sides of the line. The seeds of the hybrids (Carisma F1) and Alexandria F1 seeds were planted directly on the ground on 1/11/2017 with an distances 40 cm between each plant and the other on the sides of the line. With two seeds in one hole and then reduced seedlings after a week of germination to one plant. The structure of the house was covered with transparent polyethylene to protect the plants from cold damage Management practices were performed, such as Irrigation and removal of weeds was same for all treatments.

First factor: Two varieties of (*Cucurbita pepo*. L)

- The experiment included six factors:

1- The Control V_1, V_2

2- Treatment of ASA Spray (Concentration of 50 mg/L^{-1} + First Var. ($S_1 \times V_1$)

3- Treatment of ASA Spray (Concentration of 100 mg/ L^{-1} +First Var. ($V_1 \times S_3$) ($V_1 \times S_2$)

4- The Control ($S_2 \times V_2$) 5-Treatment of ASA Spray (concentration of 50 mg/L^{-1} + Second Var. ($S_1 \times V_2$)

6- Treatment of ASA Spray (Concentration of 100mg/L^{-1}+Second Var.) ($S_3 \times V_2$)

The experiment was carried out according to Randomized Complete Block Design (R.C.B.D). The number of treatments was 6 and 3 replicates, thus the number of experimental units was 18 units. The experimental unit included 10 plants. The averages were compared using the least significant Duncan test. At a level of probability of 5% (Alrawi and Khalaf allah, 2000).

Ascorbic acid was sprayed on leaves twice during the growing season, the first after one month of planting and the second after 15 days of the first spray.

Study parameters

Vegetative growth parameters

Five plants were chosen from each experimental unit and the following measures were taken:

1. Plant height (cm): This was measured at the end of the growing season by measuring the length of the main stem of the plant from the surface level of the soil to the developing summit and according to the average.

2. The number of leaves: The number of leaves was calculated at the end of the growth season.

3. Leaf area (m^2): Measured by Leave area meter.

4. Relative chlorophyll quantity in leaves (SPAD unit) : chlorophyll was estimated by a Chlorophyll meter SPAD-504m based on Jemison and Williams (2006).

5. Dry weight of the vegetative system (gm) : Dry the vegetative system for five plants at 75°C and weight after drying.

Fruit qualitative characteristics

6- Estimate of the N element: by Micro-Kjeldahl (Jackson, 1958).

7- Estimate of the P element: by a spectrophotometer at 882 nanometers.

8- Estimate of the K element: by Flame photometer.

Results and Discussion

Vegetative growth characteristics

The results of table 2 shows that V_2 superiority over V_1 in the plant height and relative chlorophyll quantity in the leaves showed values (22.07 cm, 34.96 units (SPAD) respectively, while there were no significant differences between the two types in the number of leaves and leaf area. As for the effect of Ascorbic acid spraying, it was observed that spraying at 100 mg / L^{-1} (S_3) had the highest rate of plant height and relative chlorophyll quantity in the leaves it was (22.28 cm, and 37.37 units (SPAD), respectively. There were no significant differences between this concentration (100 mg/L^{-1}) and the Ascorbic acid concentration of 50 mg/L^{-1} for the other vegetative traits, However they were superior to the control treatment which is recorded the lowest rate of all these characteristics. And this is agree with Jassem (2012) when spraying with ascorbic acid concentration of 40 mg. L^{-1} and chelate iron concentrate 600 mg. L^{-1} was led to a significant increase in the vegetative growth index of the squash plant.

The results of the interaction between each verity and spraying in the same table indicate that there were no significant differences in plant height, number of leaves and leaf area, But the interaction treatment V_2S_3 recorded the highest rate of chlorophyll relative quantity to 37.83 units (SPAD), which did not differ significantly from the treatment of V_1S_3 and these treatments were superior to the other treatments in this trait.

The reason for the superiority of V_2 to genetic factors that led to its superiority in most of vegetative growth characteristics, about significant superiority of the effect of ascorbic acid in most vegetative growth Characteristics may be due to the interaction of its physiological roles in the stimulation of active growth as it enters Co enzyme in the enzymatic reactions of metabolism of carbohydrates and proteins and has a role in the processes of breathing and photosynthesis (Smirnoff and Wheeler, 2000), which increased the construction and therefore reflected positively on all traits of vegetative growth.

Qualitative characteristics

The results of table 3 showed that V_2 was superior to V_1 in all the qualitative characteristics of dry weight of the vegetative system and the percentage of (N, P, K), which was 42.26 g/plant^{-1}, 0.389%, 0.038% and 0.146%, respectively. The results in the same table indicated that the spray treatment of ascorbic acid S_3 was higher in percentage of the major mineral elements (N, P, K) with the highest rate (0.399%, 0.043% and 0.146%) respectively, but did not differ significantly from the treatment of spraying with ascorbic acid S_2 (concentration of 50 mg/L^{-1}) in the dry weight of the vegetative system, they were superior to the control treatment, which is recorded the lowest rate of all these qualitative characteristics. As for the interaction between the variety

Table 2 : Effect of variety and spraying of ascorbic acid on the vegetative growth traits.

Parameters / Treatments	Plant height(cm)	Number of leaves	Leaf area(m)	Relative chlorophyll quantity (SPAD)
V_1	b 21.79	a 20.76	a 1.84	b 34.00
V_2	a 22.07	a 20.88	a 1.83	a 34.96
Ascorbic acid average				
S_1	b 21.65	b 19.93	b 1.74	b 32.68
S_2	b 21.87	a 21.08	a 1.86	b 33.39
S_3	a 22.28	a 21.45	a 1.90	a 37.37
Interaction (Ascorbic acid and variety)				
$S_1 \times V_1$	a 21.63	b 19.96	b 1.73	b 32.16
$S_2 \times V_1$	a 21.65	a 20.90	a 1.88	b 32.93
$S_3 \times V_1$	a 22.11	a 21.42	a 1.89	a 36.92
$S_1 \times V_2$	a 21.68	b 19.91	b 1.75	b 33.21
$S_2 \times V_2$	a 22.09	a 21.26	a 1.85	b 33.85
$S_3 \times V_2$	a 22.45	a 21.48	a 1.91	a 37.83

Table 3 : Effect of variety and spraying of ascorbic acid on the qualitative traits.

Parameters / Treatments	Dry weight of vegetative system (gm)	N(%)	P(%)	K (%)
V_1	41.74 b	0.349b	0.031b	0.143b
V_2	42.26 a	0.389a	0.038a	0.146a
Ascorbic acid average				
S_1	41.17 b	0.335c	0.028 b	0.143b
S_2	42.21 a	0.373b	0.032b	0.144b
S_3	42.62 a	0.399a	0.043a	0.146a
Interaction (Ascorbic acid and variety)				
$S_1 \times V_1$	40.99 c	0.322 d	0.026 b	0.141b
$S_2 \times V_1$	41.81 bc	0.347cd	0.026b	0.142b
$S_3 \times V_1$	42.42 ab	0.380bc	0.042a	0.146a
$S_1 \times V_2$	41.36 c	0.348 cd	0.031 b	0.145a
$S_2 \times V_2$	42.61 a	0.400ab	0.039a	0.147a
$S_3 \times V_2$	a 42.82	0.419a	0.044a	0.147a

and the spray, the treatment of V_2S_3 was the highest in the qualitative characteristics (42.82 g/plant^{-1}, 0.419%, 0.044% and 0.147%), respectively.

The reason V_2 is superior to V_1 in all qualitative characteristics is due to differences in genotypes between the two species. It is also noted from the table that the percentage of nitrogen was not significantly affected in the interference coefficients between the variety and spraying with ascorbic acid, noting that the V_2S_3 gave the highest rate (0.419%), this result coincided with Jariene *et al*. (2007), who reported that the percentage of nitrogen in squash plants increased when foliar fertilization, but did not reach the significantly. It is also noted that the percentage of phosphorus did not reach the significantly in the interaction between the variety and spraying as a result of the effect of squash species used in the experiment and this result coincided with what Al-Dusky (2010) that squash varieties did not differ significantly among them in the percentage of phosphorus. Ascorbic acid treatment with a concentration of 100 mg/L^{-1} gave the highest percentage of phosphorus (0.043%), And this significantly differed from the treatment of the first variety and spray with ascorbic acid concentration (50 mg/L^{-1}). This indicates that squash plants have optimally responded to ascorbic acid concentration (100 mg/L^{-1}) to absorb phosphorus. As for the percentage of potassium, there were no significant differences between the binary interference treatments, all of which were superior to the V_1S_2 and the control treatments, which were not significantly different from each other.

References

Al-Dusky, J. A. E. (2010). Effect of variety and number of level spray of seaforcel on growth and yield of squash (*Cucurbita pepo* L.). *M.Sc. Thesis*. The Coll. of Agric. And For. At Univ. of Mosul. Iraq (in Arabic).

Al-Mohamady, F. M. H. (1991). *Agriculture protectorate*. High Education Publication. Ministry of High Education and Scientific research. Iraq.

Alrawi, Khasha Mahmoud and Khalaf Allah (2000). Design and analysis of agricultural experiments. Dar Al Kutub Printing & Publishing Est, University of Al Mosul, Iraq.

Barth, C., M. De Tullio and P. L. Conklin (2006). The role of

ascorbic acid in the control of flowering time and the onset of senescence. *Journal of Exp. Bot*., **57(8)** : 1657-1665.

Conklin, P. L. and C. Barth (2004). Ascorbic acid ,a familiar small molecule intertwined in the response of plants to ozone, pathogens, and the onset of senescence. *Plant, cell and Environment*, **27**: 959-970.

El-Tohamy, W. A., H. M. El-Abagy and N. H. M. El-Greadly (2008). Studies on the effect of putrescine, yeast and vitamin C on growth, yield and physiological responses of eggplant (*Solanum melongena* L.) under sandy soil conditions. *Australian Journal of Basic and Applied Sciences*, **2(2)** : 296-300.

Esho, Kamal Benyamin and Safwan Hazim Saeed (2017). Effect of planting Date and Humic acid on the flowering growth N,P and K concertation of three summer squash cultivars (*Cucurbita pepo* L.). *Al - Furat Journal of Agricultural Sciences*, **9(2)** : 76-95.

Francois, G., B. Nathalie, V. J. Pierre, P. Daniel and M. Didier (2006). Effect of roasting on tocopherols of gourd seeds (*Cucurbit pepo* L.). *Grasas y Aceites*, **57(4)**: 409-414.

Jackson, M. L. (1958). *Soil chemical analysis*. Univ. Wisconsin.

Jariene, E., H. D. Anilcenko, J. Kulaitiene and M. Gajewski (2007). Effect of fertilizer on oil pumkin seed crde fat, fiber and protein quantity. *Agronomy Research*, **5(1)**:43-49.

Jassem, Hatef Hammoud (2012). Effect of spraying with ascorbic acid and chelate iron in the growth and yield of squash (*Cucurbita pepo* L.). *Basra Journal of Agricultural Sciences*, **22(1)** : 25-28.

Jemison, J. and M. Williams (2006). *Potato-Grain Study Project Report*. Water Quality Office. University of Maine, Cooperation Extension http://www.umext.main.edu.

Jerry, AwatifN, Abdullah A. Abdullah and Khyuon A. Alderawy (2011). Effect of foliar of ascorbic acid on yield and quality of lettuce (*Lactuca sativa* L.) growth in southern Iraq. *Basra J. Agric. Sci*., **24(1)** : 13-24.

Kamal-Eldin, A. and R. Andersson (1997). A multivariate study of the correlation between tocopherol content and fatty acid composition in vegetable oils. *J. Am. Oil Chem. Soc*., **74** : 375-386.

Logan, B. A., D. Kornyeyev, J. Hardison and A. S. Holaday (2006). The role of antioxidant enzymes in photo protection. *Photosynthesis Res*., **88**:119-132.

Matlub, Adnan Nasser, AzzELdine Sultan and Karim Saleh Abdoul (1989). *Vegetable Production*. The second part. First Edition. Ministry of Higher Education and Scientific Research. Iraq. 337 pages.

Murie, Abdulmohsen Khaleel, Mohammad Yahya Muaaalla and Mitiadi George Burass (2016). Heterosis for seed Yield and its Compponents seed characters and its quality of squash (*Cucurbita pepo* L.). *Syrian J. of Agric.Research*, **3 (1)** : 81-95.

Nerson, H. (2005). Effect of fruit shape and plant density on seed and quality of squash. *Scientia Hort. Abst*., **105(3)**: 293-304.

Phillips, K. M., D. M. Ruggio and A. M. Khorassani (2005). Phytosterol composition of muts and seeds commonly consumed in the united state. *J. Agric Food Chem*., **53(24)**: 9436-45.

Smirnoff, N. and G. L. Wheeler (2000). Ascorbic acid in plant: biosynthesis and function. *Biochemistry and Molecular Biology*, **35(4)** : 291- 314.