

## **EFFECT OF GROWTH REGULATOR (GIBBERELIC ACID) ON SOME BIOCHEMICAL OF GLOBE ARTICHOKE AND ITS RELATION TO POPULATION DENSITY OF SOME ASSOCIATED PESTS.**

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### **ABSTRACT**

Experiment was conducted at Giza governorate during two successive seasons 2002 / 2001 and 2001 / 2002 to study the effect of Gibberellic acid (GA3) on earliness, carbohydrates, total nitrogen, soluble solids, total acidity, sugar fractions and Inulin. The obtained data indicated that treatment with GA3 increased the population of *Aphis gossypii* Glover; *Myzus persicae* Sulzer; *Bemisia tabaci* Genn. Paradoxically the population of *Acanthiophilus helianthi* Rossi and *Thrips tabaci* Lind. was decreased. GA3 gave a highly significant in earliness of blooming; early and total yield and carbohydrate fractions in growing shoots in both seasons. Also, reducing and total sugar percentages were increased.

On the other hand, C/N ratio; total nitrogen content in leaf, total soluble solids; acidity; inulin and non reduced sugar were no affected for both early and total yield.

### **INTRODUCTION**

Globe artichoke (*Cynara scolymns* L) is becoming one of the most important vegetable crops grown for both local consumption and export Mansour, (1983) . The most important pests are the piercing sucking ones, aphids (*Aphis gossypii* Glover, *Myzus persicae* (Sulz.) ) white fly (*Bemisia tabaci* Genn.), thrips (*Thrips tabaci* Lind.) and artichoke fly (*Acanthiophilus helianthi* Rossi ) Bitton and Nakash (1986) ; Goh and Lange (1989) ; Howard *et al* (1994); Sengonca *et al* (2001) and Schrameyer (2002).

Gibberellic acid is a plant hormones which causing earliness of flowering heads and maturity of artichoke, Pochard (1964) Snyder *et al* (1971) ; Foury *et al* (1977) and Mansour (1983). The present study was carried out at Giza governorate to evaluate the effect of GA3 (Gibberellic acid ) on the biochemical composition of artichoke plant and the side effect on the above mentioned pests.

### **MATERIALS AND METHODS**

Experiment was carried out at Nahia district, Giza, Governorate during plantation of the two successive seasons 2000 / 2001 and 2001 / 2002. An area of ¼ feddan was cultivated with Artichoke the French variety cultivar on August 15<sup>th</sup> during the two seasons, respectively. Treatment was sprayed GA3 (at the rate of 20 PPM ) twice at 15 days intervals starting two months after planting the off shoots. A control treatment was sprayed with water. Weekly inspection for pest infestation on treated and untreated area was done one week after treatment, on 21<sup>st</sup> of October until April 26<sup>th</sup> by

picking 100 leaves at random and carefully transferred to laboratory for examination. Number of adult and nymphs of *A. gossypii*; *M. persicae*; *T. tabaci* and nymphs of *B. tabaci* were counted and recorded on 3 inches of each leaf.

At 120 days after planting, leaves of artichoke was collected randomly from both treated and untreated plant and then were subjected to the following chemical analysis:

- 1- Determination of total nitrogen was determined according to the method of micro kjeldahl as described by Peach and Tracy (1956).
- 2- Total carbohydrates were determined according to Forsee (1941).

The following determination in the edible part of the capitula for to the early and total yields Artichoke were carried out.

Total soluble solids (T.S.S) and total acidity were determined with Abbe refractometer according to the method described by A.O.A.C (1965). Reducing non-reducing and total sugars were determined according to Forsee (1941) and Morell (1941). Inulin was determined according to the method of Winton and Winton (1958).

The artichoke yields were determined throught the experimental period according to Mansour (1983). All the aforementioned data were statistically analyzed according to Sendecor and Cochran (1967).

## **RESULT AND DISCUSSION**

### **1- Effect on some artichoke pests:**

As shown in Table (1), treatment with GA3 increased the population of *Aphis gossypii* *Myzus persicae*, and *B. tabaci*. On the other hand GA3 decreased the population of *T. tabaci* and *A. helianthi* during the two seasons.

The mean number of *A. gossypii* in treated plants was 76.9 and 93.8 individuals / 3 inches in 2000 / 2001 and 2001/ 2002 respectively. The corresponding data in untreated plants were 74.6 and 82.5 individuals / 3 inches. In treated plants the mean number of was 185 and 207.5 individuals / 3 inches and *B. tabaci* was 104.3 and 245.2 individuals / 3 inches in the first and the the second seasons respectively. The corresponding data in untreated plants were 99.4 and 101.2 individuals / 3 inches for *M. persicae* and 102.6 and 118.3 individuals / 3 inches in the first and the second seasons respectively. Differences between averages of all insects in both seasons were insignificant.

**Table (1): Effect of GA3 on some important pests population on artichoke plant during two successive seasons, 2000/2001 and 2001/2002 at Giza governorate.**

Pests	Mean No. of individuals / 3 inch			
	Treated		Untreated	
	2000/2001	2001/2002	2000/2001	2001/2002
<i>phis gossypii</i> (Glover)	76.9	93.8	74.6	82.5
<i>lyzus persicae</i> (Sulzer)	185	207.5	99.4	101.2
<i>emisia tabaci</i> (Genn.)	104.3	245.2	102.6	118.3
<i>hrips tabaci</i> (Lind)	23.56	38.69	35.1	49.4
<i>Acanthiophitus helanthei</i> (Rossi)	3.9	6.2	4.53	9.1

Non significant level at 0.05

The results in Table (2) cleared that GA3 gave a highly significant increase in earliness of blooming in both seasons. Treated plant with GA3 at 20 PPM were 33.25 and 31.75 days earlier than the control in the first and second seasons, respectively. El-Shal *et al* (1977) found that the greatest effect of GA3 on earliness.

**Table (2): Effect of GA3 on artichoke earliness during 2000 2001 and 2001 / 2002 seasons at Giza governorate.**

Treatment	Mean number of days until 25 % blooming		
	2000/2001	2001/2002	Mean
GA3	117.5	114.75	116.1
Control	150.75	146.5	148.6
Earliness	33.25	31.75	32.5

Data related to early and total yield are presented in Table (3), the early yield recorded as number of heads produced per plant was significantly increased by foliar spraying with GA3 (20 PPM) in both seasons compared to the control. The number of heads of the early yield produced by this treatment 19.62 and 27.7 % of the total yield in the two seasons, respectively. El-Shal *et al*. (1977) mentioned that GA3 at 20.100 PPM sprayed one to three times had insignificant effect on total yield and number of artichoke heads.

**Effect on biochemical content:**

Data presented in Table (4) show the total carbohydrates, total nitrogen and C/ N ratio in artichoke leaves as affected by foliar spray with GA3. It is clear that total carbohydrates significantly affected by GA3. On the other hand the C / N ratio and total nitrogen, not be affected by this regulator. Bhattacharjee *et al* (1978) found variable effect of GA3 on leaf nitrogen content of dahlia plants.

**Table (3) : Effect of Gibberellic acid on early yield and total yield of globe artichoke at Giza governorate during 2000/ 2001 and 2001 / 2002 seasons.**

Treatment	year	Heads /Plant	Kg / plant	Head wt.g
GA3	Early yield			
	A	1.35	0.265	190.68
Control	B	1.37	0.380	202.61
	A	0.62	0.105	170.73
GA3	B	0.34	0.062	184
	Total yield			
GA3	A	10.58	2.015	189.53
	B	5.00	0.878	175.72
Control	A	8.59	1.650	192.7
	B	4.10	0.712	173.70

A = 2000 - 2001  
B = 2001 - 2002

**Table (4): Effect of Gibberellic acid on biochemical component of globe artichoke leaves at Giza governorate.**

Treatment	Total Carbohydrates (c)	Total N %	C/ N ratio
GA3	9.19 a	2.56	3.6
Control	8.0 b	2.42	3.3
L.S.D 05%	0.953	-	-

The effects of GA3 on total soluble solids, total acidity, sugar fractions and Inulin percentage are presented in Table (5).

**Table (5): Effect of Gibberellic acid on biochemical component of globe artichoke heads at Giza governorate.**

Treatment	T.S.S %	Acidity mg / 100	Sugar fractions %		Total	Inulin %
			Reducing	Non reducing		
GA3	Early yield					
	16.1	0.36	0.80	0.06	0.86	0.37
Control	16.2	0.37	0.70	0.09	0.79	0.35
GA3	Total yield					
	15.9	0.39	1.06	0.10	1.16	0.41
Control	15.18	0.39	0.98	0.11	1.09	0.4

	R	R	R	R	R
<i>A. gossypii</i>	0.69	0.23	0.49	0.41	0.34
<i>M. persicae</i>	0.88	0.48	0.56	0.61	0.46
<i>B. tabaci</i>	0.32	0.13	0.86	0.53	0.97
<i>T. tabaci</i>	0.96	0.48	0.57	0.69	0.55
<i>A. helianthi</i>	0.79	0.211	0.58	0.62	0.71

R = simple correlation

The total soluble solids and total acidity were not affected by GA3 for both early and total yield in two seasons compared to control. The total sugar and reducing percentages were significantly increased by GA3 in the early yield. Similar results for GA3 were obtained by Vereecke and Boesman (1974) and El-Shal *et al.* (1977) dealing with grapes and globe artichoke at 20 PPM., respectively, found that GA3 decreased the total soluble solid. Also, data show in Table (5) indicate that there were significant correlation between the total soluble solid, total acidity, sugar fraction, Inulin and the *A. gossypii*, *M. persicae*, *B. tabaci*, *T. tabaci* and *A. helianthi* population

## REFERENCES

- Association Official Agricultural Chemists (1965). Official methods of analysis, Washington.
- Bitton, S. and Nakash, J. (1986). Control of red spider mites and some pest by the predacious mite *Phytoseilus persimilis* in open fields of egg plants and artichokes (globe). Hassadeh. 66 : 4 , 682 – 684.
- Bhattacharjee, S. K.; Mukhopadhyay, and Bose, T. K. (1978). Interaction of auxin and gibberlin with growth retardant on growth and flowering dahlia variables (C.F Avalanche and Molvaviscus konzattii. Indian Agriculturist, 20 : 193 – 199.)
- El-Shal, M.A., Abdel Fatah, M.A. and Saied, S. (1977). Studies on the effects of gibberellic acid on earliness, yield and quality of two globe artichoke cultivars under the north part of Egypt. *J. Agric. Sci. Mansoura Univ.* 1: 233 –246.
- Forsee, W.T.; Jr. (1941). Determination of sugars in plant materials, a photochlorimetric method. *Indus Eng. Chem Anal* 10<sup>th</sup> ed: 411 – 418.
- Foury, C.; Cadilhac, B. and Abert, S. (1977 ). Trials on gibberellic acid application to aspring crop of globe artichoke (*Cynara scolymus* L.) ( C.F Blanc hyerois. *Annales de 1 Hmelioration des plantes*, 27 : 411 –426 .)
- Goh, K.S. and Lange, W. H. (1989). Microarthropods associated with insecticide, treated and untreated artichoke fields in California. *J. Econ. Entom.* 82 : 2, 621 – 625.
- Howard, R. J.; Garland, J. A. and Seaman, W.L. (1994). Diseases and pests of vegetable crops in Canada an illustrated compendium, xxii + 554 pp. Also available in Fr; 2 pp.
- Mansour, A. S. (1983). Effect of some growth regulators on some Physiological characters and the yield of globe Artichoke. Msc. Thesis, Fac. Agric. PP. 69 – 80 .
- Morell, S.A. (1941). Rapid determination of reducing sugars. *Indus. Eng. Chem. Anal.* 13<sup>th</sup> ed., 249 – 510 .
- Peach, K. and Tracy, M.V. (1956). *Modern methods of plant analysis.* Springer Vailage, Berlin 1 : 479 – 481.

- Pochard, E. (1964). Changes in the growth and development of the globe artichoke induced by gibberellin, Ann. Ame. Plantes, 14 : 219 – 225.
- Schrammeyer, K. (2002). Pests of artichokes. Gemuse – Munchen, 38 : 3, 16-18 .
- Sengonca, C.; Liu, B. and Zhu, Y.J. (2001). Efficiency of the mixed biocide GCSC., B.T.A. against vegetable pests of different arthropod orders in the South eastern China. Anzeiger – Fur – Schadlings Kgskunde, 74 : 2, 33 – 36.
- Sendecor, G.W. and Cochran, W. (1967). Statistical methods. Sixth Ed. Iowa state Univ. Press , Ames, U.S.A 593 pp.
- Snyder, M.J.; Welch, N.C. and Rubatzky, V.E. (1971). Influence of Gibberellin on time of bud development in globe artichokes . Hort. Science, 6 : 484 – 485.
- Vereecke, M. and Boesman G. (1974). The effect of gibberellin on the quality of various seeded grape varieties. Med..Fac. Land bouwwet. Rijks Univ. Gent, 39 : 273 – 279.
- Winton, A. L. and Winton, K.B. (1958). The analysis of foods. John Wiley and Sons, Inc. London, P. 857

**تأثير استخدام منظم النمو (حامض الجبرليك) على المكونات الحيوية والكيميائية  
في نبات الخرشوف وعلاقتها بالكثافة العددية لبعض الآفات المرتبطة بالنبات  
حورية على عبد الوهاب**

معهد بحوث وقاية النباتات – الدقى – الجيزة

- أجريت هذه التجربة في محافظة الجيزة خلال موسمين متتاليين ٢٠٠٠ – ٢٠٠١ و  
٢٠٠١ / ٢٠٠٢ م لدراسة تأثير حامض الجبرليك من حيث التبرير والمكونات الحيوية الكيميائية  
مثل الكربوهيدرات والنيتروجين الكلى في الأوراق ونسبة المواد الصلبة الكلية الذاتية والحموضة  
الكلية للجزء الداخلى من النورة ونسبة السكريات المختزلة والكلية في الخرشوف والأنبولين وكذلك  
على تعداد أهم الآفات المرتبطة بنبات الخرشوف. وقد لوحظ الآتى :
- ١- المعاملة بحمض الجبرليك أدت الى زيادة أعداد من القطن ومن الخوخ الأخضر وذباب القطن  
البيضاء وعلى العكس فان هذه المعاملة أدت الى خفض أعداد ذباب الخرشوف وتربس  
القطن.
  - ٢- المعاملة بحمض الجبرليك أعطت فرق معنوى عالى في تبرير الأزهار، المحصول المبكر  
والمحصول الكلى والكربوهيدرات في الأوراق في كلا الموسمين ، أيضا زادت نسبة  
السكريات المختزلة والكلية.
  - ٣- من ناحية أخرى نسبة الكربون للنيتروجين ، النيتروجين الكلى في الأوراق ، المواد الصلبة  
الكلية الذاتية ، الأنبولين ، الحموضة الكلية والسكريات الغير مختزلة لم تتأثر في المحصول  
المبكر والكلى.