

Population Plants Density of Main Pests Infesting Artichoke and Their Predators at Dakahlia Governorate, Egypt

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Abstract: Globe artichoke is one of the most important vegetable crops which contains much vitamins and minerals benefits the human body. In this study, field experiments were conducted at Dakahlia Governorate during two successive seasons 2017/2018 and 2018/2019 to the population density of the pests infesting globe artichoke plantations, predators affecting on these pests and classification of these pests and predators. The results revealed that the pests were belonged to different orders which were: Homoptera (family: Aphididae) were recorded *Capitophorus horni* Born., *Aphis gossypii* (Glover) and *Aphis fabae* Scop; *Bemisia tabaci* Genn. (family: Aleyrodidae) and *Empoasca discipiens* Poali (family: Cicadellidae), Hemiptera, family: Pentatomidae. The green bug, *Nezara viridula* Linn., Lepidoptera, these insect pests were *Spodoptera littoralis* (Biosd.), *Autographa gamma* L. and *Chrysodiexis chalcites* Esper. which belonged to family: Noctuidae. *Vanessa cardui* L. belonged to family: Nymphalidae and *Pieris rapae* L. belonged to family: Pieridae, Hymenoptera, and family: Formicidae *Monomorium pharanis* L., Orthoptera, family: Acrididae, *Eyprepocnemis plorans* and Tetranychoidae, *Tetranychus urticae*. However the predators were belonged to different orders as: order: Coleoptera. (Family: Coccinellidae, these predators were *Coccinella undecimmaculata* L., *Exochomus nigromaculatus* Goeze, *Cydonia nilotica* Muls. and *Orius albidipennis* Reut.). *Paederus alferii* Kach.(Family:Staphylinidae)., Dictyoptera., family: Mantidae, *Calidomantis savignyi* Saunss and order: Neuroptera, family: Chrysopidae, *Chrysoperla carnea* (Steph.)

Key words: Artichoke • Pests and predators

INTRODUCTION

Globe artichoke (*Cynara scolymus* L.) belongs to family Asteraceae (Compositae) is becoming one of the most important vegetable crops grown for both local consumption and export [1, 2]. Since ancient time globe artichoke has been used in traditional medicine for its recognized therapeutic affects i.e. hepatoprotective, anticarcinogenic, antioxidative, antibacterial, urinate, anticholesterol, glycaemia reduction [3 -5]. The economic use of the globe artichoke includes mainly the consumption of the edible immature flower heads, eaten as a fresh, frozen or canned delicacy. The use of the plant is not restricted to its edible part, but also to the leaves, stem and roots that are utilized as sources of: forage for livestock; extraction of inulin; feedstock for the extraction

of secondary metabolites; lignocellulosic biomass for energy and paper pulp; seed oil for biodiesel fuel production and alcoholic beverages [6, 7]. Throughout the growing season, globe artichoke plants infested by phytophagous pests belonged to many orders and families. Most of the density of pests occupied by different kinds of aphids such as *Capitophorus horni* Born which considered the most common and important insect pest of globe artichoke plants. In heavy infestation, these pests are causing serious damage to plants, leading to great reduction in the yield [8]. Sucking pests play an important role as a vector of plant viruses and produce honeydew [9]. Therefore, the purpose of this work was to study the population density of main pests infesting globe artichoke and their predators at Dakahlia Governorate.

MATERIALS AND METHODS

The experiments were carried out in the farm of Agriculture Research Center at Baramoon, Dakahlia Governorate during two successive seasons 2017/ 2018 and 2018/ 2019. An area (about feddan), divided into nine replicates, was planted with globe artichoke (Balady variety), on 1st November and 2nd October during the 1st and 2nd seasons, respectively. Every two weeks randomly samples of 10 leaves from 10 plants from each replicate were collected and put in paper bags and taken to the laboratory, where carefully examined by the aid of a stereoscopic-microscope for counting the pests and the predators. The whole area was free from any pesticides treatment.

The classification of the pests and predators were made by the aid of Department of Taxonomy in Science College (for girls), Al- Azhar University.

Statistical Analysis: Data were analyzed by using one-way ANOVA followed by least significant difference (LSD) at probability level of 0.05. Regression analysis was also performed. All analyses were performed using CoHort Software [10].

RESULTS AND DISCUSSION

Main Pests Attacking Globe Artichoke Plants 2017/2018 and 2018/2019 Seasons: The data presented in Tables (1) and (2) showed that, the plants infested with the sucking pests which belonged to order: Homoptera (family: Aphididae) were recorded *Capitophorus horni*

Born., *Aphis gossypii* (Glover) and *Aphis fabae* Scop; *Bemisia tabaci* Genn. (family: Aleyrodidae) and *Empoasca discipiens* Poali (family: Cicadellidae).

Meanwhile, the data cleared that the population of the aphids and *B. tabaci* was obviously higher on young plants than the older one, but *E. discipiens* prefers the higher plants than the younger ones. These results were in the two seasons of study and in agreement with Barbagallo [11].

Also, the obtained data assured that, the globe artichoke infested with *Nezara viridula* Linn. which belonged to order: Hemiptera, family: Pentatomidae. The green bug, *N. viridula* infested the older plants than the younger ones in the two seasons.

The obtained results recorded certain insects infested the globe artichoke plants from order: Lepidoptera, these insect pests were *Spodoptera littoralis* (Biosd.), *Autographa gamma* L. and *Chrysodixis chalcites* Esper. which belonged to family: Noctuidae. *Vanessa cardui* L. belonged to family: Nymphalidae and *Pieris rapae* L. belonged to family: Pieridae. All of these pests infested the old plants globe artichoke in the two seasons. These results were agreement with Rina [12].

The globe artichoke old plants infested also in the two seasons with *Euprepocnemus plorans* (Charp.) which belonged to order: Orthoptera and family: Acrididae.

In the two seasons, *Monomorium pharanis* L. infested the old plants which belonged to order: Hymenoptera and family: Formicidae.

Table 1: Population density of main pests infesting globe artichoke and their classification during 2017/ 2018 season

Sampling date	Plant age (days)	Mean no. pests/ 10 leaves														
		O. Homoptera			O. Hemiptera	O. Lepidoptera				O. Orthoptera	O. Hymenoptera	O. Trompittiformes				
		F. Aphididae			F. Cicadellidae	F. Aleyrodidae	F. Noctuidae			F. Nymphalidae	F. Pieridae	F. Acrididae	F. Formicidae	F. Tetranychoidae	F. Eriophidae	
		<i>C. Horni</i>	<i>A. Gossypii</i>	<i>A. fabae</i>	<i>E. discipiens</i>	<i>B. tabaci</i>	<i>N. viridula</i>	<i>S. littoralis</i>	<i>A. gamma</i>	<i>C. chalcites</i>	<i>V. cardui</i>	<i>P. rapae</i>	<i>E. plorans</i>	<i>M. pharanis</i>	<i>T. urticae</i>	<i>E. neocynarae</i>
25/11/2017	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9/12/2017	30	334	185	20	11	2	0	0	0	0	0	0	0	0	0	
23/12/2017	44	1101	10	88	0	0	0	0	0	0	0	0	0	0	0	
6/1/2018	58	1941	59	19	0	0	0	0	0	0	0	0	0	0	0	
20/1/2018	72	1839	69	15	0	0	0	0	0	0	0	0	0	0	0	
3/2/2018	86	1339	84	11	0	0	0	0	0	0	0	0	0	0	0	
17/2/2018	100	1036	34	56	0	5	0	0	0	0	0	0	0	0	0	
2/3/2018	114	770	17	24	0	19	0	0	0	0	0	0	0	0	0	
16/3/2018	128	505	59	36	0	9	0	0	0	0	0	0	0	0	0	
30/3/2018	142	1566	11	0	0	0	0	0	0	0	0	0	0	4	0	
13/4/2018	156	1396	16	1	0	0	5	0	10	0	2	0	0	8	3	
27/4/2018	170	46	0	0	0	0	0	12	18	1	1	0	0	12	1	
11/5/2018	184	5	0	0	24	0	7	1	6	0	2	0	0	9	2	
25/5/2018	198	0	0	0	40	0	3	1	10	2	0	0	1	0	7	
8/6/2018	212	0	0	0	146	0	8	3	10	0	0	0	0	4	2	
22/6/2018	226	0	0	0	137	0	49	4	8	0	1	0	2	3	10	
6/7/2018	240	0	0	0	38	0	6	1	12	0	0	0	3	7	2	
Total		11878	544	270	396	35	78	22	74	3	4	2	6	10	56	
Average		798.94 ± 194.42	34 ± 12.32	16.88 ± 6.23	24.75 ± 11.91	2.19 ± 1.28	4.88 ± 3.03	1.38 ± 0.77	4.63 ± 1.48	0.19 ± 0.08	0.25 ± 0.09	0.13 ± 0.07	0.38 ± 0.11	0.63 ± 0.26	3.5 ± 1.09	0.63 ± 0.26

Table 2: Population density of main pests infesting globe artichoke and their classification during 2018/ 2019 season.

Sampling date	Plant age (days)	Mean no. pests/ 10 leaves														
		O. Homoptera					O. Hemiptera	O. Lepidoptera					O. Orthoptera	O. Hymenoptera	O. Trompfitiformes	
		F. Aphididae			F. Cideiidae	F. Aleyrodidae	F. Pentatomidae	F. Noctuidae			F. Nymphalidae	F. Pieridae	F. Tettigoniidae	F. Formicidae	F. Tetranychidae	F. Eriophidae
		<i>C. hormi</i>	<i>A. Gossypii</i>	<i>A. fabae</i>	<i>E. discipens</i>	<i>B. tabaci</i>	<i>N. viridula</i>	<i>S. littoralis</i>	<i>A. gamma</i>	<i>C. chalcites</i>	<i>V. cardui</i>	<i>P. rapae</i>	<i>E. plorans</i>	<i>M. pharaonis</i>	<i>T. urticae</i>	<i>E. neocynarae</i>
4/11/2018	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
18/11/2018	47	101	12	2	0	3	0	0	0	0	0	0	0	0	0	
2/12/2018	61	111	6	3	0	0	0	0	0	0	0	0	0	0	0	
16/12/2018	75	124	3	2	0	3	0	0	0	0	0	0	0	0	0	
30/12/2018	89	118	4	1	0	2	0	0	0	0	0	0	0	0	0	
13/1/2019	103	113	2	1	0	0	0	0	0	0	0	0	0	0	0	
27/1/2019	117	129	2	0	0	0	0	0	0	0	0	0	0	0	0	
10/2/2019	131	128	3	0	0	0	0	0	0	0	0	0	0	0	0	
24/2/2019	145	178	6	0	0	0	0	0	0	0	0	0	0	0	0	
10/3/2019	159	209	1	0	0	8	0	0	0	0	0	0	0	0	1	
24/3/2019	173	334	0	2	5	0	0	0	0	0	0	0	0	0	1	
7/4/2019	187	738	0	0	15	0	0	0	3	2	0	0	2	0	0	
21/4/2019	201	134	0	0	2	0	1	2	14	0	1	0	0	13	3	
5/5/2019	215	16	0	0	1	0	0	0	46	0	0	0	0	15	0	
19/5/2019	229	1	0	0	1	0	2	0	8	0	0	1	0	39	3	
2/6/2019	243	14	0	0	2	0	3	2	18	0	0	1	0	37	2	
16/6/2019	257	1	0	0	3	0	0	7	50	0	0	0	0	2	0	
Total		2449	39	11	29	16	6	11	139	2	1	1	4	106	10	
Average		153.06±44.38	2.44±0.83	0.69±0.25	1.81±0.95	1±0.54	0.38±0.22	0.69±0.45	8.69±4.08	0.13±0.07	0.06±0.065	0.06±0.065	0.06±0.065	0.02±0.09	6.63±3.28	0.63±0.27

Table 3: Population density of the predators inhabiting globe artichoke plants and their classification during 2017/ 2018 season.

Sampling date	Plant Age (days)	Mean no. predators/ 10 leaves							
		O. Coleoptera				O. Neuroptera O. Dictyoptera			
		F. Coccinellidae		F. Staphylinidae		F. Chrysopidae	F. Mantidae		
		<i>C. undecimpanctata</i>	<i>E. nigromaculatus</i>	<i>C. nilotica</i>	<i>O. albidipennis</i>	<i>P. alferii</i>	<i>C. carnea</i>	<i>C. savignyi</i>	
25/11/2017	16	0	0	0	0	0	0	0	0
9/12/2017	30	0	0	0	0	0	0	0	0
23/12/2017	44	0	0	0	0	0	0	0	0
6/1/2018	58	0	0	0	0	0	0	0	0
20/1/2018	72	0	0	0	0	0	0	0	0
3/2/2018	86	0	0	0	0	0	0	0	0
17/2/2018	100	0	0	0	0	0	0	0	0
2/3/2018	114	0	0	0	0	0	0	0	0
16/3/2018	128	8	0	0	0	0	0	0	0
30/3/2018	142	0	0	0	0	0	0	2	0
13/4/2018	156	3	6	0	0	0	0	1	0
27/4/2018	170	1	1	0	0	0	0	19	0
11/5/2018	184	2	1	0	0	0	0	9	0
25/5/2018	198	6	0	0	8	1	0	21	0
8/6/2018	212	1	0	0	7	2	0	4	0
22/6/2018	226	2	1	0	6	3	0	5	1
6/7/2018	240	0	0	1	5	4	0	1	0
Total		23	9	1	26	10	0	62	1
Average		1.44±0.50	0.56±0.38	0.06±0.065	1.63±0.74	0.63±0.26	0.06±0.065	3.88±1.60	0.06±0.065

Table 4: Population density of the predators inhabiting globe artichoke plants and their classification during 2018/ 2019 season.

Sampling date	Plant Age (days)	Mean no. predators/ 10 leaves							
		<i>O. Coleoptera</i>				<i>O. Neuroptera</i>		<i>O. Dictyoptera</i>	
		<i>F. Coccinellidae</i>			<i>F. Staphylinidae</i>	<i>F. Chrysopidae</i>	<i>F. Mantidae</i>		
		<i>C. undecimpanctata</i>	<i>E. nigromaculatus</i>	<i>C. vicina</i>	<i>O. albidipennis</i>	<i>P. alferii</i>	<i>C. carnea</i>	<i>C. savignyi</i>	
4/11/ 2018	16	0	0	0	0	0	0	0	
18/11/2018	30	0	0	0	0	0	0	0	
2/12/ 2018	44	0	0	0	0	0	0	0	
16/12/ 2018	58	0	0	0	0	0	0	0	
30/12/ 2018	72	0	0	0	0	0	0	0	
13/1/ 2018	86	0	0	0	0	0	0	0	
27/1/ 2019	100	0	0	0	0	0	0	0	
10/2/ 2019	114	0	0	0	0	0	0	0	
24/2/ 2019	128	0	0	0	0	0	0	0	
10/3/ 2019	142	1	0	0	0	0	0	0	
24/3/ 2019	156	2	2	0	0	0	3	0	
7/4/2019	170	8	1	0	0	3	4	0	
21/4/2019	184	11	1	0	3	0	21	0	
5/5/2019	198	5	4	0	1	0	8	0	
19/5/ 2019	212	2	0	1	1	0	4	0	
2/6/2019	226	1	0	0	4	0	10	1	
16/6/ 2019	240	1	0	0	0	0	1	0	
Total		31	8	1	9	3	51	1	
Average		1.94± 0.82	0.5± 0.27	0.06±0.065	0.56± 0.30	0.19±0.08	3.19± 1.42	0.06±0.065	

The old globe artichoke plants attracted in the two seasons with *Tetranychus urtica* Koch. (family: Tetranychoidae) and *Eriophyes neocynarae* Keifer (family: Eriophidae) which belonged to order: Trompitiiformes. The obtained results are in agreement with Goh [13].

Predators Inhabiting Globe Artichoke Plants During 2017/2018 and 2018/2019 Seasons: In Tables (3) and (4), results indicated that, most predators of the globe artichoke plants belonged to order: Coleoptera. These predators were *Coccinella undecimpanctata* L., *Exochomus nigromaculatus* Goeze, *Cydonia nilotica* Muls. and *Orius albidipennis* Reut. (Family: Coccinellidae). *Paederus alferii* Kach. (Family:Staphylinidae) . They were found on the old plants in the two seasons and these results are in agreement with Barthes [14].

Chrysoperla carnea (Steph.) (order: Neuroptera, family: Chrysopidae) were found also on the old plants in the two seasons of study and these results are agreement with Maisonneuve [15]. *Calidomantis savignyi* Saunss

(Order: Dictyoptera, family: Mantidae) were found on the old plants in the two seasons of investigation. All obtained results were in agreement with Abd- Allah [16] who studied all the pests that infested the globe

artichoke and the predators proved that the difference of plant age affected on the presence of pests and predators.

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