SEASONAL ABUNDANCE OF THE WHITEFLY, *Siphoninus phillyreae*(HALIDAY) (HEMIPTERA : ALEYRODIDAE) AND ITS PARASITOID, *Encarsia inaron* (WALKER) (HYMENOPTERA : APHELINIDAE) WITH PRODUCTIVITY AND ECONOMIC INDICATORS FOR THE POMEGRANATE CROP IN EGYPT

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ABSTRACT

The pomegranate whitefly, *Siphoninus phillyreae* (Haliday) (Hemiptera : Aleyrodidae) attacking different host economic plant species. Heavy infestation caused leaf wilt, early leaf drop and smaller fruit. The seasonal abundance of the pomegranate whitefly, *Siphoninus phillyreae* (Haliday) (Hemiptera : Aleyrodidae) and its parasitoid, *Encarsia inaron* (Walker) (Hymenoptera : Aphelinidae) was conducted for two successive years from January, 2013 till December 2014 on pomegranate in Assuit Governorate . The results showed that, the insect population exhibited the lowest density in the beginning of March and disappeared during December, January and February. At the beginning of May the population increased gradually to reach maximum in 3400 individuals /80 leaves during Oct.1st (first year) and 3526 individuals /80 leaves during Oct.15th (second year). It is concluded that, *S. phillyreae* occurred all year round on pomegranate except It is disappearing during December, January and February of the period of study. The results indicated that the activity period have three overlapping generations the first one reached maximum populations during the first of July , the second one reached maximum populations during the mid of August and the third one reached maximum populations during the first of October in the first year . While in the second year the activity period have also three generations the first one reached maximum populations during the mid of June , the second one reached maximum populations during the mid of August and the third one reached maximum populations during the mid of October.The parasitoid, *E.inaron* recorded attacking this pest on pomegranate trees in Assuit with maximum and minimum populations were 29 and 2 individuals / 80 leaves during 1st August and 1st November (first year). In the second year, maximum and minimum populations were 33 and 3 individuals / 80 leaves during 1st August and 1st November. The results indicated that the activity period have three overlapping generations the first one reached maximum populations during the first of July , the second one reached maximum populations during the mid of August and the third one reached maximum populations during the first of October in the first year . While in the second year the activity period have also three generations the first one reached maximum populations during the mid of June , the second one reached maximum populations during the first of August and the third one reached maximum populations during the first of October. Productivity and economic indicators for the pomegranate crop in Egypt, also was studied.

INTRODUCTION

The pomegranate whitefly, *Siphoninus phillyreae* (Haliday) (Hemiptera : Aleyrodidae) attacking 60 host economic plant species including, apple,

pear, citrus and olive. It is distributed in Palaearctic region. Heavy infestation caused leaf wilt, early leaf drop and smaller fruit (Bellows *et al.* 1990, Abd-Rabou & Ahmed, 2006 and 2007).

Viggiani and Battaglia (1983), Bellows *et al.* (1990) and Gould *et al.* (1992) studied the population dynamics , parasitoids and predators of *S. phillyreae* in California and Italy , respectively including the parasitoid, *Encarsia inaron* (Walker) (Hymenoptera : Aphelinidae). Biological control of pomegranate whitefly, *S. phillyreae* studied by Viggiani and Mazzone (1980), McDonald *et al.* (1996), Hackney *et al.* (1997) and Abd-Rabou and Simmons (2010). In Egypt, the host plants, distribution, parasitoids, predators and biological control studies were carried out by Abd-Rabou, 1997, 1998,1999,2001a, 2001b, 2002, 2003, 2006 , Abd-Rabou & Abou-Setta, 1998 and Abd-Rabou & Ahmed, 2007.

This work aims to study the seasonal abundance of the pest, *S. phillyreae* and its parasitoid, *E. inaron* on pomegranate in addition to study the productivity and economic indicators for the pomegranate crop in Egypt.

MATERIALS AND METHODS

1-Abundance of the pomegranate whitefly, *Siphoninus phillyreae* population on pomegranate in Egypt:

Seasonal abundance of *S. phillyreae* was carried out on pomegranate in Assuit Governorate from January, 2013 till December 2014. The plant area selected for these investigations had not any received chemical control measures for several years. About 30 trees of pomegranate , almost similar in age, shape and size were randomly chosen for sampling two times a month (at biweekly intervals). Each sample consists of each sampling, 80 leaves were chosen at random. Thereafter, the leaves were kept in a closed paper bags and transferred to the laboratory to estimate the total number of immature stages under a binocular microscope.

The number of generations was determined using the obtained data throughout the two successive years using Jacob (1977) technique per sample over the year.

2. Abundance of the parasitoid, *Encarsia inaron* populations associated with *Siphoninus phillyreae* on pomegranate in Egypt:

The whitefly*, S. phillyreae* second, third and fourth larval stages were sampled from pomegranate in Assuit Governorate. Leaves of pomegranate were collected two times a month during January, 2013 till December 2014 (80 leaves per sampl*e*) and transferred to the laboratory. *S. phillyreae* eggs and first larval stage were eliminated, as well as any other insect species. The second, third and fourth larval stages were recorded per leaf. Each leaf was kept in well ventilated emergence glass tubes and monitored daily till parasitoids emergency.

The number of generations was determined using the obtained data throughout the two successive years using Jacob (1977) technique per sample over the year.

3. Productivity and economic indicators for the pomegranate crop in Egypt:

This study relied to achieve its objectives on the methods of descriptive statistics and econometric analysis (Fisher,1976 and Gujarati,1995) applied to estimate for example studying the equations of Time trend (function of linear, function of the exponential) (Ali, 2000).

RESULTS AND DISCUSSION

1: Seasonal abundance of the pomegranate whitefly, *Siphoninus phillyreae* population on pomegranate in Egypt:

The results of *S. phillyreae* population on pomegranate trees over 2013 and 2014 years are presented in Tables (1 and 3). The Average number of immature stages were 1055 and 1174.8 of *S.phillyreae* individuals /80 leaves during 2013-2014, respectively. Immature stages density reached its maximum on October 1st and 15th, showing 3400 and 3526 individuals /80 leaves during 2013-2014 respectively. Lowest density occurred during the period of March 1st showing 50 and 35 individuals /80 leaves during the two years under consideration, respectively.

Table (1) : Half monthly counts of immature stages of *Siphoninus phillyreae* arranged according formula suggested by Audemard&Millaire (1975)and Jacob (1977) during 2013 season.

Inspection dates	Accumulated days of inspection	Half monthly count	Accumulated half monthly count	Accumulated %
1/1/2013	0	0	0	0
15/1	15	0	0	0
1/2	30	0	0	0
15/2	45	0	0	0
1/3	60	50	50	0.19
15/3	75	102	152	0.60
1/4	90	175	327	1.29
15/4	105	289	616	2.43
1/5	120	518	1134	4.47
15/5	135	960	2094	8.27
1/6	150	1245	3339	13.18
15/6	165	1800	5139	20.29
1/7	180	2100	7239	28.59
15/7	195	1950	9189	36.29
1/8	210	1590	10779	42.57
15/8	225	2410	13189	52.09
1/9	240	2050	15239	60.0
15/9	255	2780	18019	71.16
1/10	270	3400	21419	84.59
15/10	285	2800	24219	95.65
1/11	300	980	25199	99.52
15/11	315	120	25319	100
1/12	330	0	25319	100
15/12	345	0	25319	100
Total			25319	100

Table (3) : **Half monthly counts of immature stages of *Siphoninus phillyreae* arranged according formula suggested by Audemard&Millaire (1975) and Jacob (1977) during 2014 season.**

Inspection dates	Accumulated days of inspection	Half monthly count	Accumulated half monthly count	Accumulated %
1/1/2014	0	0	0	0
15/1	15	0	0	0
1/2	30	0	0	0
15/2	45	0	0	0
1/3	60	35	35	0.1
15/3	75	77	112	0.4
1/4	90	98	210	0.7
15/4	105	195	405	1.4
1/5	120	345	750	2.7
15/5	135	760	1510	5.4
1/6	150	1579	3089	10.6
15/6	165	2212	5301	17.3
1/7	180	1966	7267	24.5
15/7	195	1925	9192	31.9
1/8	210	2100	11292	39.4
15/8	225	2530	13822	48.1
1/9	240	2422	16244	56.9
15/9	255	2635	18879	66.4
1/10	270	3210	22089	77.9
15/10	285	3526	25615	90.7
1/11	300	1850	27465	97.3
15/11	315	730	28195	100
1/12	330	0	28195	100
15/12	345	0	28195	100
total	345	-	28195	100

Obtained trend over both years indicated the occurrence of three overlapping generations per year for *S.phillyreae* on pomegranate of this location. In the first year, the first generation started from the mid of March till the mid of June about 18 weeks, the second generation started from the first of August till the mid of September about 8 weeks and the third generation started from the first of October till the end of season about 8 weeks (Fig.1). While during the second year, the first generation started from the first of March till the mid of June about 16 weeks, the second generation started from the first of July till the mid of September about 12 weeks and the third generation started from the first of October till the end of the season about 8 weeks (Fig. 3).

During the present work, three overlapping generations per year for *S.phillyreae* on pomegranate in Assuit were recorded over both years under consideration. While Elwan (1982) in Giza Governorate reported from four to five successive overlapping generations.
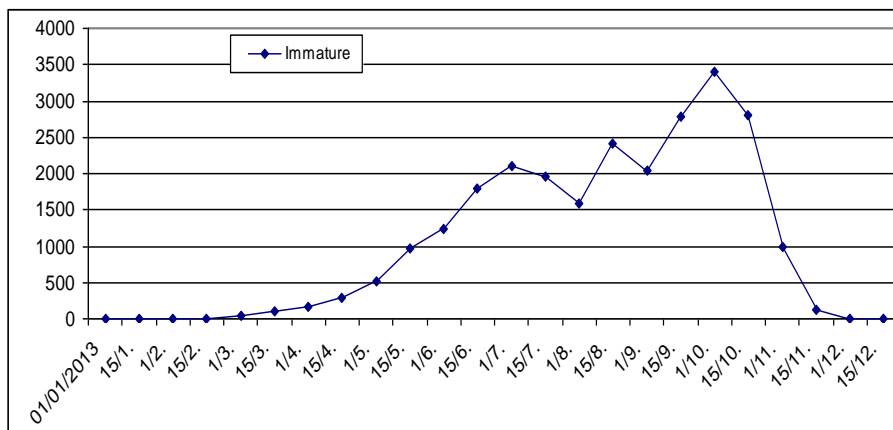
Fig. (1): Abundance of immature stages of *Siphoninus phillyreae* infested pomegranate trees in Assuit Governorate during 2013
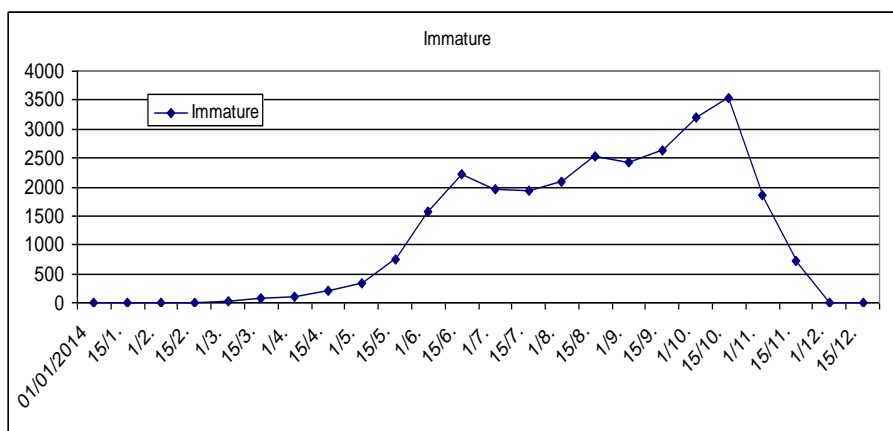

Fig. (3): Abundance of immature stages of *Siphoninus phillyreae* infested pomegranate trees in Assuit Governorate during 2014.

2.Seasonal abundance of *Siphoninus phillyreae* parasitoid, *Encarsia inaron* on pomegranate in Egypt:

One species of hymenopterous parasitoid was reared from samples of *S. phillyreae* on pomegranate. This parasitoid namely, *E. inaron*.

The averages of the population by *E. inaron* were 6.8 and 10.8 individuals /80 leaves during the first and second years, respectively. The population of parasitoid reached its maximum of 29 and 33 individuals /80 leaves by *E. inaron* during 1st of August in the first and second years, respectively (Tables, 2 & 4).

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Table (2): Half monthly counts of *Siphoninus phillyreae* parasitoid *Encarsia inaron* arranged according formula suggested by Audemard&Millaire (1975) and Jacob (1977) during 2013 season.

Inspection dates	Accumulated days of inspection	Half monthly count	Accumulated half monthly count	Accumulated %
1/1/2013	0	0	0	0
15/1	15	0	0	0
1 / 2	30	0	0	0
15/2	45	0	0	0
1/3	60	0	0	0
15/3	75	0	0	0
1 / 4	90	0	0	0
15/4	105	5	5	3.4
1/5	120	6	11	7.4
15/5	135	11	22	14.9
1/6	150	20	42	30.4
15/6	165	12	54	39.1
1/7	180	11	65	47.1
15/7	195	10	75	51.0
1/8	210	29	104	70.7
15/8	225	15	119	80.9
1/9	240	10	129	87.7
15/9	255	9	138	93.8
1/10	270	23	145	98.6
15/10	285	2	147	100
1/11	300	0	147	100
15/11	315	0	147	100
1/12	330	0	147	100
15/12	345	0	147	100
Total	-	-	147	100

Obtained trend over both years indicated the occurrence of three overlapping generations per year for the parasitoid, *E. inaron* on pomegranate in Assuit. In the first year the first generation started from the mid of April till the mid of June about 8 weeks, the second generation started from the first of June till the mid of August about 8 weeks and the third generation started from the first of October till the end of the season about 8 weeks (Fig.2). While during the second year, the first generation started from the mid of March till the mid of June about 12 weeks, the second generation started from the first of June till the first of September about 8 weeks and the third generation started from the mid of September till the end of the season about 6 weeks (Fig.4).

Table (4): Half monthly counts of *Siphoninus phillyreae* parasitoid *Encarsia inaron* arranged according formula suggested by Audemard&Millaire (1975) and Jacob (1977) during 2014 season.

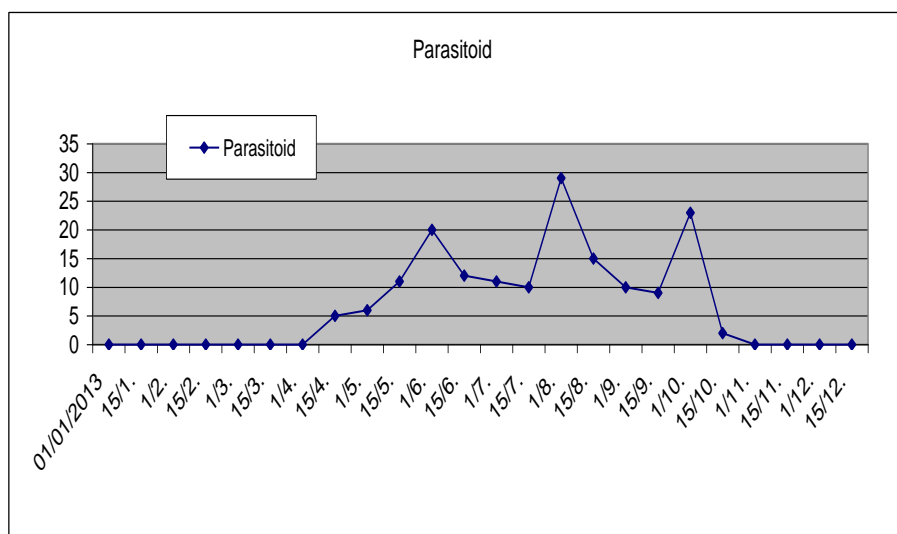| Inspection dates	Accumulated days of Inspection	Half monthly count	Accumulated half monthly count	Accumulated %
1/1/2014	0	0	0	0
15/1	15	0	0	0
1 / 2	30	0	0	0
15/2	45	0	0	0
1/3	60	0	0	0
15/3	75	2	2	0.76
1 / 4	90	4	6	2.2
15/4	105	8	14	5.3
1/5	120	11	25	9.6
15/5	135	15	40	15.3
1/6	150	19	59	22.6
15/6	165	29	88	33.8
1/7	180	26	114	43.8
15/7	195	20	134	51.5
1/8	210	33	167	64.2
15/8	225	20	187	71.9
1/9	240	19	206	79.2
15/9	255	16	222	85.3
1/10	270	27	249	95.7
15/10	285	8	257	98.8
1/11	300	3	260	100
15/11	315	0	260	100
1/12	330	0	260	100
15/12	345	0	260	100
Total	345	-	260	100

Fig.(2) : Abundance of *Siphoninus phillyreae* parasitoid *Encarsia inaron* on pomegranate trees in Assuit Governorate during 2013.
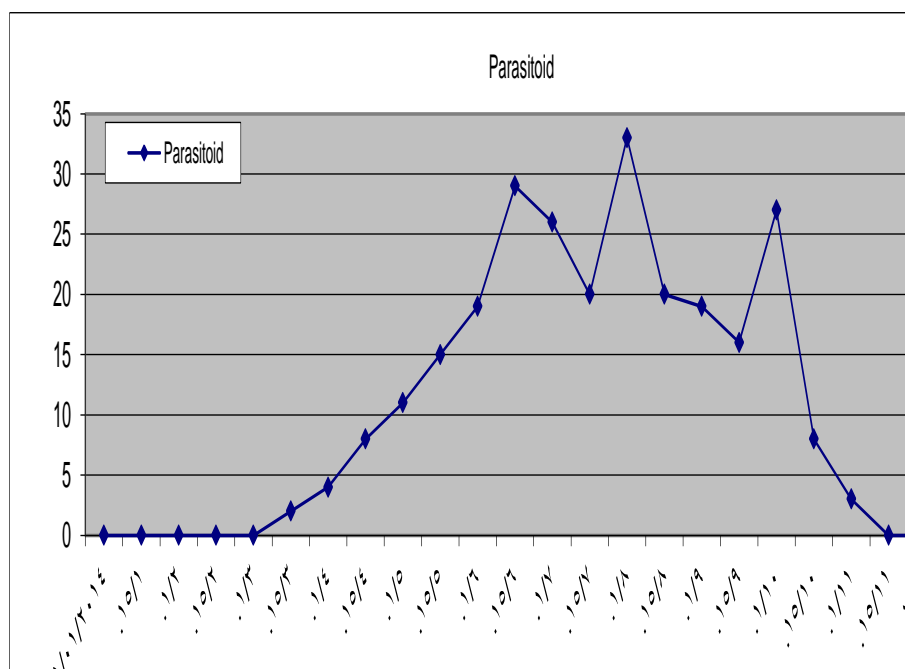
Fig.(4) : Abundance of *Siphoninus phillyreae* parasitoid, *Encarsia inaron* on pomegranate trees in Assuit Governorate during 2014.

Abd-Rabou and Abou-Setta (1998) recorded seven parasitoids attacking *S. phillyreae* these are *Encarsia davidi* Viggiani and Mazzone, *E. galilea* Rivany, *E. inaron* (Walker), *E.lutea* (Masi), *Eretmocerus corni* Haldeman, *E. diversicilatus* Silvestri and *E. mundus* Mercet. They stated that *E. inaron* is the effective parasitoid attacking this pest with maximum parasitism percent of 78% . The effective role of *E. inaron* in controlling the pomegranate whitefly in USA, North Carolina, also studied by McDonald *et al.* (1996) and Hackney *et al.* (1997) . The variation between our results and others may be attributed to the variation of weather factors and /or host plant species.

3.Productivity and economic indicators for the pomegranate crop in Egypt:

The Total area of the pomegranate crop:

Study of the total area of the pomegranate crop in Table (5) indicated that they have increased from 4.256 thousand Feddans in 2000 to 34.450 thousand Feddans in 2013, an average of 10.236 thousand Feddans during the period of study.

Studying the equations of time trend of the evolution of the total area of the crop pomegranate during the period (2000-2013), showing that it took years a growing trend reached 1.7 thousand tons for the function of linear, and 0.14% for the function of the exponential, has proven moral statistical these increasing rates.

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Table (5): Area productivity and production of pomegranate crop during the period (2000-2013) . Area (Feddan), Productivity (tons / Feddans), Production (tons).

Production	Productivity	Fruitful area	Total Area	Years
23994	6.44	3724	4256	2000
24312	6.5	3742	4758	2001
24881	6.55	3797	4496	2002
22123	6.57	3369	4409	2003
25510	7.03	3628	5013	2004
27196	7.04	3865	5399	2005
36958	8.37	4417	6002	2006
42934	8.83	4860	8080	2007
47499	8.71	5456	8008	2008
51299	9.016	5690	7893	2009
51150	8.487	6027	10171	2010
64574	9.569	6748	13521	2011
89035	9.136	9746	26851	2012
106260	9.042	11752	34450	2013
45551.8	7.9	5487.2	10236.2	Average

Source: Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Agricultural Economics bulletins, various publications.

Fruitful area for harvest pomegranate:

Fruitful area for pomegranate crop during the period (2000-2013) ranged between a minimum of 3369 Feddans in 2003, and a maximum 11.752 thousand Feddans in 2013, while the average for the period amounted to 5.487 thousand Feddans (Table,5).

Studying the equations of time trend of linear and exponential evolution of the productive area of the crop pomegranate showing their increase at a rate of 507.9 Feddans of linear function and 8.37% of the exponential function. Statistical morale of those rising rates has proved to be at different levels of morale.

Pomegranate crop productivity:

Study productivity of Feddans crop pomegranate during the period (2000-2013) shows that it amounted to 6.44 tons / Feddan in 2000, such as the minimum productivity during that period, and increased productivity to reach a maximum of 9.569 tons / Feddans in 2011, and an average of about 7.95 tons / Feddan during that period.

The results of time trend of the temporal evolution of the pomegranate crop productivity rates to take statistically significant increased rate is estimated at 0.26 tons / Feddans linear function and about 3.36% of the exponential function.

Pomegranate crop production:

Table (5) showed that pomegranate crop production in Egypt during the period (2000-2013) ranged between a minimum totaled 22.123 thousand tons in 2003, reached a maximum of 106.260 tons in 2013, and an average during that period amounted to 45.551 thousand tons.

The results of the equations of the time trend of the evolution of the production of pomegranate as explained during the period studied to take year's statistically significant increasing trend rate of about 5.577 thousand tons of linear equation, and about 11.7% of the exponential function (Table,6).

Table (6):Time trend of area , productivity and production of pomegranate crop in Egypt during the period (2000-2013)

F	R^2	T	الدالة	type function	البيان
19.23	0.61	4.38	Yi = -2644 + 1717Xi	Linear	Total area
57.29	0.82	7.57	LN Yi = 7.90 + 0.144Xi	Exponential	
32.38	0.73	5.7	Yi = 1677 + 507.9Xi	Linear	Fruitful area
61.0	0.83	7.81	LN Yi = 7.90 + 0.083Xi	Exponential	
72.08	0.85	8.49	Yi = 5.99 + 0.26Xi	Linear	Productivity
72.81	0.86	8.53	LN Yi = 1.81 + 0.033Xi	Exponential	
51.75	0.81	7.19	Yi = 3722 + 5577Xi	Linear	Production
129.0	0.91	11.35	LN Yi = 9.71 + 0.117Xi	Exponential	

Source:Results spreadsheet analysis.

The Relative importance of area and yield of crop production and pomegranate on the level of the provinces of Egypt:

Examine the relative importance of total area planted pomegranate at the level of the provinces of Egypt during the period (2011-2013) showed that Nubaria region accounted for about 48.89% of the average total of the total area of the crop at the level of Egypt, and then followed by the province of Assiut, where about 34.34%, representing both about 83.23% the average of the total cultivated crop area during that period, have divided the remaining space on the rest of the governorates of Egypt.

A study of the relative importance of a fruitful area for harvest pomegranate on the level of the provinces of Egypt during the period (2011-2013) showed that the Assiut province accounted for about 69.59% of the average total productive area of the crop at the level of Egypt, followed by Nubaria area of about 16.24% as representing both about 85.84% of the average total productive area of the crop during that period, divided the remaining space on the rest of the governorates of Egypt.

The Study of the pomegranate crop productivity showed that the province of Assiut achieves the productivity of about 10.87 tons / Feddans any excels at about 17.50% for the average productivity of Egypt and of about 9.25 tons / Feddans during that period.

Also studying the relative importance of the pomegranate crop production at the level of the provinces of Egypt during the period (2011-2013) showed that the province of Assiut acquired alone at about 82.37% of the average total production of the crop at the level of Egypt, followed by Nubaria area of about 11.09%, where together representing about 93.46% .Average total production of the crop during that period, while the remaining amount was distributed to the rest of the production Governorates (Table ,7).

Table (7):The relative importance of the area, productivity and production of pomegranate crop in Egypt During the period (2011-2013).

Production		Productivity		Fruitful area		Total Area		Governorates / Years
relative importance	Average	relative importance	Average	relative importance	Average	relative importance	Average	
0.14	125	64.47	5.96	0.22	21	0.17	42	Alexandria
0.35	305	70.16	6.49	0.50	47	2.99	745	Behera
0.00	0	0.00	0.00	0.00	0	0.02	6	Gharbia
0.00	0	0.00	0.00	0.00	0	0.16	39	Kafr-El Sheikh
0.00	0	0.00	0.00	0.00	0	0.01	3	Damietta
0.32	280	71.21	6.59	0.45	43	0.41	103	Sharkia
0.30	256	50.38	4.66	0.58	55	2.19	545	Ismailia
0.00	0	0.00	0.00	0.00	0	0.04	10	Port Said
0.15	129	36.51	3.38	0.40	38	1.52	378	Suez
0.00	0	0.00	0.00	0.00	0	0.01	3	Qalyoubia
0.02	15	23.17	2.14	0.07	7	0.03	7	Cairo
0.86	741	59.61	5.51	1.43	134	0.56	139	Giza
0.74	642	81.69	7.56	0.94	89	1.48	369	Beni Suef
0.07	58	45.05	4.17	0.15	14	0.06	14	Fayoum
0.73	636	56.87	5.26	1.29	121	0.74	184	Menia
82.37	71347	117.50	10.87	69.59	6552	34.34	8565	Assuit
0.95	820	73.27	6.78	1.29	121	0.55	137	Suhag
0.04	36	44.95	4.16	0.09	9	0.06	16	Qena
0.06	54	24.00	2.22	0.26	24	0.34	86	Luxor
0.20	175	24.08	2.23	0.84	79	0.41	103	Aswan
0.63	546	27.15	2.51	2.37	223	2.47	616	New Valley
0.10	88	26.28	2.43	0.39	36	0.30	75	Matruh
0.76	659	34.00	3.14	2.23	210	1.03	258	North Sinai
0.11	99	16.88	1.56	0.67	63	1.22	305	South Sinai
11.09	9610	68.47	6.33	16.24	1529	48.89	12194	Noubaria
100	86623	100	9.25	100	9415	100	24941	Total

Source: Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Agricultural Economics bulletins, various publications.

REFERENCES

Abd-Rabou, S. (1997): Hosts, distribution and vernacular names of whiteflies (Homoptera : Aleyrodidae) in Egypt. Annals of Agric. Sci. Moshtohor, 35 (2): 1029-1048.

Abd-Rabou, S. (1998): The efficacy of indigenous parasitoids in the biological control of *Siphoninus phillyreae* (Homoptera: Aleyrodidae) on pomegranate in Egypt. Pan-Pacific Entomolgists, 74 (3): 169-173.

Abd-Rabou, S. (1999): Parasitism of *Eretmocerus siphonini* (Hymenoptera : Aphelinidae) in Egypt. Boll. Lab. Ent. Agr. Filippo-Silvestri , 55: 27-31.

Abd-Rabou, S. (2001a): Role of *Encarsia inaron* (Walker) (Hymenoptera: Aphelinidae) in biological control of some whitefly species (Homoptera: Aleyrodidae) in Egypt. Shashpa,7(2):187-188.

Abd-Rabou, S. (2001b): Whiteflies of Egypt : Taxonomy, biology, ecology and means of their control. Adv. Agric. Res. In Egypt, Vol. 3 (1): 1-74.

Abd-Rabou, S. (2002): Biological control of two species of whiteflies by *Eretmocerus siphonini* (Hymenoptera : Aphelinidae) in Egypt. Acta Phytopathologica et Entomologica Hungerica, 37(1-3):257-260.

Abd-Rabou, S. (2003): First record of pomegranate whitefly, *Siphoninus phillyreae* (Haliday) (Homoptera : Aleyrodidae) on olive in North Sinai, Egypt. Egypt. J. of Agric. Res. 81(4): 1577-1579.

Abd-Rabou, S. (2006): Biological control of the pomegranate whitefly, *Siphoninus phillyreae* (Homoptera: Aleyrodidae: Aleyrodinae) by using the bioagent, *Clitostethus arcuatus* (Rossi)(Coleoptera : Coccinellidae). Journal of Entomology, 3(4): 331-335.

Abd-Rabou, S. and Abou-Setta, M. (1998): Parasitism of *Siphoninus phillyreae* (Homoptera : Aleyrodidae) by aphelinid parasitoids at different locations in Egypt. J. of Hym. Res., 7 (1): 57-61.

Abd-Rabou, S. and Ahmed, N. (2006): Seasonal abundance of the pomegranate whitefly, *Siphoninus phillyreae* (Homoptera : Aleyrodidae) and its natural enemies on olive trees in Egypt. J.Agric. Sci. Mansoura Univ.,31(9): 6029-6035.

Abd-Rabou, S. and Ahmed, N. (2007): Survey on host plants, distribution and natural enemies of the pomegranate whitefly, Siphoninus phillyreae (Haliday) (Homoptera : Aleyrodidae) J. Agric. Res.85(5): 1695-1701.

Abd-Rabou, S. and Evans,G. (2002): The *Eretmocerus* Haldeman of Egypt (Hymenoptera: Aphelinidae). Mitt.internat.entomol.Ver.27(3/4):115-123.

Abd-Rabou, S. and Simmons, A. (2010): Augmentation and evaluation of a parasitoid, *Encarsia inaron,* and a predator, *Clitostethus arcuatus*, for biological control of the pomegranate whitefly, *Siphoninus phillyreae*. Archives of Phytopathology and Plant Protection,34(13): 1318-1334.

Ali , M.A. (2000): An introduction to time series analysis, an introduction to statistic for business, Ain Shams University, Faculty of Commerce Department of Statistic.

Audemard, H. and H.G. Milaire (1975): Le piegeape du carpocapsa (*Laspeyresia pomonella* L.) avec une pheromone sexuelle de synthese : premiers resultants utilisables pour L 'stimation de populations et la conduite de la lutte. Ann. Zool. Ecol. Anim.,7(1): 61-80.

Bellows, T.S.; Paine, T.D.; Arakawa, K.Y.; Meisenbacher, C.; Leddy P. and Kabashimo J. **(**1990)**:** Biological control sought for ash whitefly. California Agriculture 44: 4-6.

Elwan, E. A. (1982): Biological and ecological studies on the pomegranate whitefly, *Siphoninus phillyreae* (Hal.) (Hemiptera : Aleyrodidae). M. Sc. Thesis, Fac. Agric. Cairo Univ. pp. 97.

Fisher, F.M. (1976): The identification problem in econometrics, McGraw-Hill, New York, 2nd edition.

 Gould, J.R.; Bellows, T.S. and Paine, T.D. **(**1992**):** Population dynamics of *Siphoninus phillyreae* in California in the presence and absence of a parasitoid, *Encarsia partenopia*. Ecol. Entomol., 17:127-134.

Gujarati, A.(1995): Basic econometrics. 3rd edition, McGraw-Hill, Inc.

Hackney, G.D.; Kidd, K.A.; McDonald, R.C. and Robbins, N.S. (1997): Ash whitefly biological control in North Carolina. NCDA Benef. Insect lab. Ann. Rep. of Activities, 33-35.

Iacob N. (1977): Un model metameric pentruu stabilirea economice de toleranta a atacului moli fructeior, in Iupta intgrata Analela. I.C.P.P., 179, Romania.

McDonald, R.C.; Robbins, N.S. ; Baker, J.R. and Bellows, T.S. (1996): Release and colonization of *Encarsia inaron* (Walker) (Homoptera: Aleyrodidae), in North Carolina. NCDA Benef. Insect lab Ann. Rep. of Activities, 37-45.

Viggiani G and Mazzone P. (1980): *Encarsia pseudopartenopea* n.sp., parassita di *Siphoninus phillyreae* (Haliday) (Hom. Aleyrodidae). Bollettino el Laboratorio di Entomologia Agraria 'Filippo Silvestri' , 37: 9-12.

Viggiani G and Battaglia D. (1983): Le specie italiane del genere *Eretmocerus* Hald. (Hymenoptera: Aphelinidae). Bolletino del Laboratorio di Entomologia Agraria 'Filippo Silvestri' , 40: 97-101.

التوزيـع الموسمى لذبابـة الرمـان البيضـاء والطفيل المصـاحب لهـا على الرمـان مـع دراسة المؤشرات الإنتاجية والاقتصادية لمحصول الرمان في مصر

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ذبابة الرمان البيضاء تهاجم العديد من المحاصيل الأقتصادية الهامة و الأصابة الشديدة بها تؤدى الى تدهور الأوراق وسقوطها و ايضا الثمار تكون صغيرة الحجم.   تم دراسة التوزيعى الموسمى لذبابة الرمان البيضاء والطفيل المصاحب لها على الرمان فى مصر لعامين متتاليين اثناء الفترة من يناير 2013 حتى ديسمبر 2014 فى محافظة أسيوط وقد أظهرت النتائج أن هذة الآفة بدأ تعدادها بأعداد قليلة فى شهر مارس ثم أختفت فى شهور ديسمبر و يناير و فبراير . وفى بدايات شهر مايو زاد التعداد تدريجيا حتى وصل أعلى تعداد لهذه الآفة فى الأول من أكتوبر فى السنة الأولى (3400 فرد لكل 80 ورقة) و النصف الثانى من أكتوبر فى السنة الثانية (3526 فرد لكل 80 ورقة) على الترتيب. ويستنتج من هذه النتائج ان هذه الآفة متواجدة طوال العام ولكنها تختفى فى شهور ديسمبر و يناير و فبراير. يتضح من منحنى النشاط الموسمى فى السنة الأولى ان لهذه الآفة ثلاث أجيال مـ تداخ لة الجيل الأول وصل الى أعلى   تعداد له فى 15 يونية بينما الجيل الثانى قد حصل على أعلى تعداد له فى 15 أغسطس فى حين ان الجيل الثالث سجل اعلى تعداد فى 15 أكتوبر. أما السنة الثانية كان أيضا لهذه الآفة ثلاث أجيال الجيل الأول وصل الى أعلى   تعداد له فى الأول من يونية بينما الجيل الثانى قد حصل على أعلى تعداد له فى 15 أغسطس فى حين ان الجيل الثالث سجل أعلى تعداد فى الأول من أكتوبر ,اثناء هذه الدراسة تم تسجيل طفيل أنكارسيا أنارون مصاحب لهذه الآفة فى محافظة أسيوط . وقد تم دراسة التوزيع الجغرافى لهذا الطفيل وقد اشارت النتائج الى أن أعلى و اقل تعداد كان 29 و 2 فرد لكل 80 ورقة فى الأول من أغسطس و نوفمبر على الترتيب فى السنة الأولى أما السنة الثانية فكانت 33 و 3 فرد لكل 80 ورقة فى الأول من أغسطس و نوفمبر على الترتيب . يتضح من منحنى النشاط الموسمى فى السنة الأولى ان لهذا الطفيل ثلاث أجيال مـ تداخ لة الجيل الأول وصل الى أعلى   تعداد له فى الأول من يوليو بينما الجيل الثانى قد حصل على أعلى تعداد له فى 15 أغسطس فى حين ان الجيل الثالث سجل اعلى تعداد فى الأول من أكتوبر. أما السنة الثانية كان أيضا لهذه الآفة ثلاث أجيال مـ تداخ لة الجيل الأول وصل الى أعلى   تعداد له فى15 يونية بينما الجيل الثانى قد حصل على أعلى تعداد له فى الأول من أغسطس فى حين ان الجيل الثالث سجل أعلى تعداد فى الأول من أكتوبر.وقد تم أيضا دراسة المؤشرات الإنتاجية والاقتصادية لمحصول الرمان في مصر.