

Seasonal Abundance of the Sun Wax Scale Insect, *Ceroplastes africanus* Green (Homoptera: Coccidae) and Its Parasitoids in Upper Egypt

Morsi, G. A.

Biological Control Res. Dept. Plant Protection Res. Inst., Agric. Res. Center, Giza, Egypt

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ABSTRACT

Seasonal fluctuations of the population density of the sun wax scale insect, *Ceroplastes africanus* Green (Homoptera: Coccidae) at Qena Governorate, Egypt and its parasitism were estimated on guava from May 2006 until April 2008. The parasitoid species, *Anicetus africanus*, *Bothriophrine tenuicornis*, *Microterys* sp., *Scutellista cyanea*, *Eublemma scitula* and *Marietta* sp. were recovered from the scale insect. The sun wax scale insect showed three annual peaks of abundance in the first year of study on June 20th; October, 20th and March 20th. In the second season of investigation, only two peaks were observed on July 20th and November 20th. Evaluations of mortality rates caused by the afore-mentioned parasitoids were estimated. Concerning the percentage of parasitism, the peaks were recorded on June 20th; August 5th; October 20th, 2006 and March 20th, 2007 in the first season. Throughout the second year, the same trend was followed as four peaks of parasitism occurred on July 5th; September 5th; November 5th, 2007 and March 5th, 2008.

Key words: Sun wax scale insect, *Ceroplastes africanus*, parasitoids, Seasonal abundance, Egypt.

INTRODUCTION

The sun wax scale insect, *Ceroplastes africanus* Green (Homoptera: Coccidae) is considered as the most serious pest attacking: sunt, *Acacia arabica*, *Albizia lebbekh*, and *Tamarix* sp. trees in Egypt. It causes defoliation, drying up of young twigs and branches. The old adult female appears very highly convex, almost spherical, except where it is in contact with the host plant; opaque waxy white with sometimes, but by no means always, a nipple-shaped prominence either centrally or sub-centrally. Stigmatic areas marked by slight indentations bearing opaque white points and generally faintly tinged with pink; they are very inconspicuous and just extend beyond the margin. The scale insects are usually found crowded on the stems of the plant and the waxy covering of adjacent individuals becomes confluent, rendering it difficult to ascertain the real form. In the young adult females, the nipple is always present and is quite marked whilst in very young specimens appears almost pyramidal and suffused with pink (Hall, 1922).

The available literature concerning the natural enemies of the sun wax scale insect, *C. africanus* is rare, however, Priesner and Hosny (1940) recorded *Anicetus africanus* Gir. (Encyrtidae), *Blastothrix erythrostethus* Walk. (Encyrtidae), *Bothriophrine tenuicornis* Merc. (Encyrtidae), *Coccidiphaga scitula* Ramb. (Noctuidae), *Perissopteus zebratus* Merc (Aphelinidae), *Scutellista cyanea* Motch. (Pteromalidae). Soyka (1950) reported that, *Alaptus preisneri* (Mymaridae) parasitized on the sun wax scale insect. Annecke (1962) reared *Microterys pudaspidis* on *Acacia karroo*. Hamed and Hassani, Fawzia (1991) mentioned that both *S. cyanea* and *Anicetus* sp. were reared from

C. africanus on *Acacia arabica*.

Fluctuations of population density of the sun wax scale insect and the role of natural enemies in regulating its abundance have not been studied up till now in Egypt.

The present study was initiated with the aim of contributing some of the needed information on the following aspects:

- 1- Survey of the parasitoids and predators of *C. africanus*,
- 2- Seasonal abundance of the pest on sunt trees at Qena Governorate, and
- 3- Evaluation of the mortality rate of the scale insect by parasitoids.

MATERIALS AND METHODS

I- Survey of *C. africanus* natural enemies

A survey of the sun wax scale insect, *C. africanus* parasitoids and predators was carried out in Beni-Suif, and Qena Governorates throughout two years, extending from May 2006 till April 2008.

Samples of infested branches with the sun wax scale insect, *C. africanus* from sunt, *Acacia arabica* L. trees were randomly collected from different areas through the year round. The samples were packed in paper bages and transferred to the laboratory for examination. The specimens were carefully examined and all insects were removed except the sunt scale insect to survey its natural enemies. The specimens were confined in plastic jars of 15cm. diameter and 20cm. height covered with muslin held in position by a rubber band and kept under preferential conditions for securing any emerging parasitoids or associated predators. The parasitoids were collected, classified into species

and preserved in vials containing 70% ethanol and 5% glycerin, additional to prepared mounting slide specimens were used for identification. The parasitoids were identified to the species levels at the Biological Control Res. Dept., Plant Prot. Res. Institute, Agric. Res. Center, Giza, Egypt.

II- Seasonal fluctuations of the population of *C. africanus*

Population density and seasonal abundance of *C. africanus* was carried out at Naga- Hamadi District, Qena Governorate for 2 years (May, 2006 until April, 2008).

Some trees of the sunt, *A. arabica* grown on the edges of water canals were heavily infested with the sunt wax scale, *C. africanus* and were chosen for this study. At 15-day intervals, 30 branches (20 cm each) with different stages of *C. africanus* were collected randomly from different directions of the trees. The branches represented different sides, peripheral, inner zones, lower and middle strata of the tree. These branches were kept in paper bags and transferred to the laboratory for careful examination and counting of the sunt wax scale insect. The stages of scale insect considered in counting process were:

- a- Nymphs (2nd and 3rd instars).
- b- Adult females (virgin and ovipositing).

The quotient of increase was obtained by dividing the population of each month according to (Abdella, 1981)

III- Rate of the parasitism

Rates of parasitism on different stages of *C. africanus* infesting sunt trees were estimated throughout two successive years extending from May 2006 to April 2008. Heavily infested branches from sunt trees were selected at random from cardinal directions and central cores of the trees. Half- monthly samples (each consisted of 100 randomly selected scales) were collected. Each sample was divided into 4 replicates, with 25 scales each. Scales in each sample were dissected under a binocular stereo-microscope, and classified as follows, alive un-parasitized individuals, parasitized individuals having (larvae, pupae and emergence holes). Total percentages of parasitism of the sunt wax scale insect were estimated.

RESULTS AND DISCUSSION

I- Survey of *C. africanus* natural enemies

Obtained results showed that, the natural enemies of *C. africanus* are:

Four primary parasitoid species, three species belong to family Encyrtidae, one to Pteromalidae and a noctuid predator. Respective species were;

Anicetus africanus Gir., *Bothriophrine tenuicornis* Merc., *Microterys* sp., *Scutellista cyanea* Motch and *Eublemma scitula* Ramb. One hyperparasitoid, *Marietta* sp. (Aphelinidae) was also recorded in the present study.

Obtained results are in agreement with those obtained by Priesner and Hosny, 1940; and Hamed and Hassanien, Fawzia (1991).

II- Seasonal fluctuation of the population of *C. africanus*

Half- monthly counts of the different stages of the sunt wax scale insect, *C. africanus* on branches of sunt trees are given in Tables 1 and 2.

It is obvious that this insect species had three annual peaks of abundance in the first year of investigation on June 20th, October 5th and March 20th, where the population index reached 1763, 1704 and 1117 individuals per 30 branches, respectively. Highest peak was that of June. A sharp decline in the population index occurred in May. The average annual fluctuation as calculated by dividing the maximum population by the minimum is 2.72. The quotient of increase showed that the favorable time for insect development was June 20 and its value was 1.79 (Table 1).

In the second season of investigation (2007/08), 2 peaks of 1315 and 1562 scales per 30 branches were recorded on July 20th and November 20th. A sharp decline in the population index occurred in August. The average annual fluctuation as calculated by dividing the maximum population by the minimum was 5.05. The quotient of increase showed that the favorable time for insect development was September 5 and its value was 2.32 (Table 2).

III: Percentage of parasitism

As present in Fig. (1), the lowest total percentage of parasitism in 2006/2007 season was on February 5th (17%) while the highest was in August, 5th (56%). Respective values in 2007/08 season were on May 5th (12%) and September 5th (64%).

C. africanus parasitoids were presented in all months during the two years. In the first year, percentages of parasitism (Fig.1) showed four peaks of activity on June 20th; August 5th; October 20th, 2006 and March 20th, 2007. Respective percentages of parasitism at these peaks were 48, 56, 49 and 43 %.

Throughout the second year of investigation, the same trend with minor modification was followed showing the four peaks, 61, 64, 45 and 38% that occurred on July 5th, September 5th; November 5th.

Table (1): Population fluctuation of the sunt scale insect, *C. africanus* per 30 sunt branches at Qena Governorate, Egypt in year 2006/07.

Sampling date	2 nd Nymphs	3 rd Nymphs	Total	% of Nymphs	Virgin females	Ovipositing females	Total population	Quotient of increase
5/5/2007	194	205	399	61.57	122	127	648	-----
20/5	211	134	345	40.35	245	265	855	1.32
5/6	268	165	433	44.13	236	312	981	1.15
20/6	410	543	953	54.05	412	398	1763	1.79
5/7	355	456	811	52.79	328	397	1536	0.87
20/7	295	312	607	42.44	423	400	1430	0.93
5/8	211	123	334	45.87	129	265	728	0.51
20/8	197	154	351	55.01	145	142	638	0.87
5/9	217	239	456	55.40	111	256	823	1.28
20/9	412	489	901	73.07	200	132	1233	1.49
5/10	512	478	990	58.09	315	399	1704	1.38
20/10	223	473	696	51.12	303	360	1359	0.79
5/11	231	231	462	48.78	309	176	947	0.69
20/11	114	234	348	45.72	200	213	761	0.81
5/12	234	198	432	54.75	170	187	789	1.03
20/12	211	123	334	41.13	200	278	812	1.03
5/1/2008	199	200	399	47.21	245	201	845	1.04
20/1	167	256	423	66.93	109	100	632	0.74
5/2	272	254	526	57.61	289	98	913	1.44
20/2	327	266	593	64.31	221	108	922	1.01
5/3	215	134	349	51.02	206	129	684	0.74
20/3	328	298	626	56.04	278	213	1117	1.63
5/4	211	115	326	45.91	187	197	710	0.63
20/4	180	98	278	40.00	120	297	695	0.97

Table (2): Population fluctuation of the sunt scale insect, *C. africanus* per 30 sunt branches at Qena Governorate, Egypt in year 2007/08.

Sampling date	2 nd Nymphs	3 rd Nymphs	Total	% of Nymphs	Virgin females	Ovipositing females	Total population	Quotient of increase
5/5/2007	120	138	258	81	40	22	320	----
20/5	218	190	408	70	100	172	580	1.8
5/6	321	219	540	56	70	140	630	1.09
20/6	266	134	400	62	100	150	650	1.03
5/7	304	146	450	61	142	140	732	1.13
20/7	416	311	727	55	288	300	1315	1.79
5/8	118	123	241	57	86	99	426	0.47
20/8	126	76	202	65	42	65	309	0.73
5/9	213	267	500	70	98	120	718	2.32
20/9	315	285	600	51	302	280	1182	1.65
5/10	416	384	800	66	211	200	1211	1.02
20/10	389	411	800	63	227	233	1260	1.04
5/11	400	312	712	64	198	208	1118	0.89
20/11	305	301	696	38	500	566	1562	1.39
5/12	248	340	584	63	146	200	930	0.88
20/12	216	124	340	48	165	205	710	0.76
5/1/2008	234	166	400	78	80	34	514	0.72
20/1	126	134	260	62	85	75	420	0.82
5/2	98	47	145	38	70	71	386	0.92
20/2	48	96	134	43	80	86	310	0.80
5/3	92	47	139	49	60	87	286	0.92
20/3	61	37	98	46	75	52	215	0.75
5/4	92	58	150	47	72	97	316	1.47
20/4	122	95	217	53	95	99	411	1.30

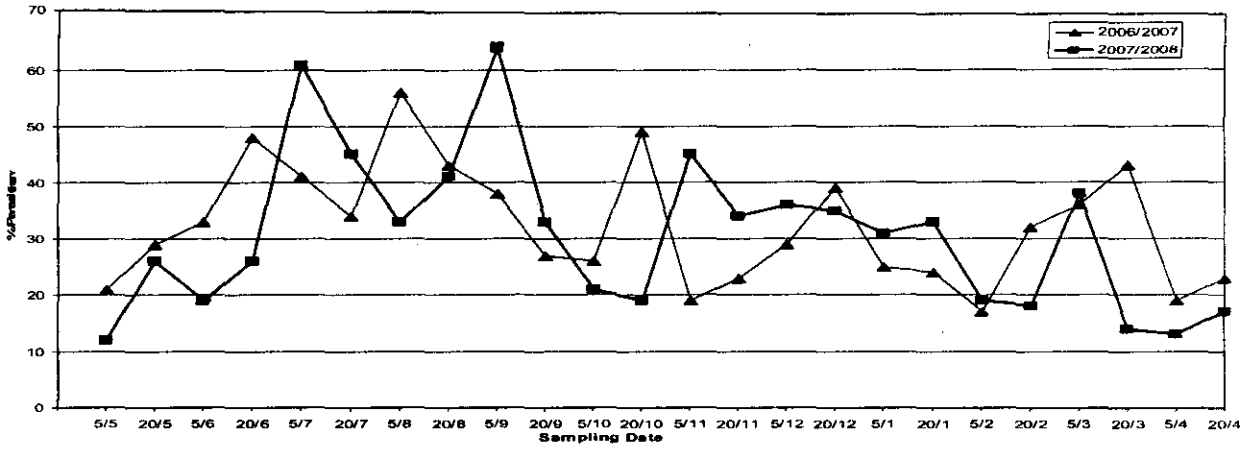


Fig. (1): Percentages of total parasitism on the sunt wax scale, *C. africanus* infesting sunt trees during 2006/07 & 2007/08 seasons. (Based on 100 dissected scale insects)

2007 and March 5th, 2008. The lowest percentage of parasitism (12 %) was recorded during the first week of April.

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