

## Population Abundance of the African Scale Insect, *Lecanodiaspis africana* Newst. and its Parasitoid, *Scutellista cyanea* Motch. in Upper Egypt

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### ABSTRACT

Seasonal fluctuations of the population density of the African scale insect, *Lecanodiaspis africana* Newst (Homoptera: Lecanodiaspididae) at Qena Governorate, Egypt and its parasitoid were estimated on guava trees from May 2006 until April 2008. The parasitoid species, *Anagyrus pseudococci*, *Microtyres flavus*, *Allotropa kamburovi*, *Scutellista cyanea* and *Eublemma scitula* were found associated with *L. africana*. The predators, *Pharoscyrnus varius* and *Scymnus syriacus* were found feeding upon this scale insect. The African scale insect had two annual peaks of abundance in the first year of study on July 20<sup>th</sup> and November 20<sup>th</sup>. In the second year of investigation, three peaks were observed on June 5<sup>th</sup>; October 20<sup>th</sup> and March 20<sup>th</sup>. Rate of mortality caused by the parasitoids was estimated. Percentage of parasitism with the pteromalid, *Scutellista cyaneae*, peaked on June, 20<sup>th</sup>; August 5<sup>th</sup>; October 20<sup>th</sup>, 2006 and March 5<sup>th</sup>, 2007 and on July 5<sup>th</sup>; September 5<sup>th</sup>; November 5<sup>th</sup> and March 5<sup>th</sup> in the second year 2007/08.

**Key words:** African scale insect, *Lecanodiaspis Africana*, parasitoids, Population abundance, Egypt.

### INTRODUCTION

The African scale insect, *Lecanodiaspis africana* Newst. (Homoptera: Lecanodiaspididae) is considered as the most serious pest attacking; guava (*Psidium guajava*), fig (*Ficus carica*), sunt (*Acacia Arabica*), henna (*Lawsonia inermis*), *Ficus* spp., casuarina (*Casuarina equisetifolia*) and nebkh (*Zizyphus spina*). It causes defoliation, dryness of young twigs and branches, poor blossoming, premature dropping and small size of fruits together with lack in juice in case of heavy infestation. Hall (1922) described morphological characteristics of *L. Africana*.

Concerning the natural enemies of the African scale insect, *L. africana* in Egypt, Priesner and Hosny (1940) recorded the parasitoids; *Enargopelta nigra* Merc. (Pteromalidae), *Scutellista cyanea* Motch. (Pteromalidae), *Protyndarichus coccidiphagus* Merc. (Encyrtidae), and the predator *Eublemma scitula* Ramb. (Noctuidae). Morsi (1999) surveyed *Allotropa kamburovi* Annecke & Prinsloo (Platygastridae), *Microtyres flavus* (Howard) (Encyrtidae), *Haprolepis aspidioti* Compere & Annecke (Encyrtidae), *Cheiloneurus* sp. (Encyrtidae) and *Anagyrus pseudococci* Gir. (Encyrtidae) and the predator, *Scymnus syriacus* Mars. (Coccinellidae). Abd-Rabou (2004) surveyed the pest's parasitoids but did not find any. Al-Ahmed and Badawi (1992) recorded *Lakshphagus hautfeulli* (Mahd.), *Parechthrodrynus combretae* Risb. and *Scutellista* sp. (Pteromalidae) as parasitoids on *L. Africana* in Riyad, Saudi Arabia.

Fluctuations of the population density of the African scale insect and the role of its natural enemies in regulating its abundance have not been studied until now in Egypt and no records have been

found in the literature.

Therefore, the present study was initiated to enrich information on the following aspects:

- 1- Survey of the parasitoids and predators of *L. Africana* on guava trees in Beni-Suif and Qena Governorates, Egypt,
- 2- Seasonal changes in the population of the African scale insect on guava trees in Qena Governorate.
- 3- Evaluation of the mortality rate of *L. africana* caused by the parasitoids.

### MATERIALS AND METHODS

#### I- Survey of *L. africana* natural enemies

A survey of the African scale, *L. africana* 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 *L. africana* from guava, *Psidium guajava* L. trees were randomly collected monthly from different orchards throughout the year round. The samples were packed in paper bags and transferred to the laboratory for examination.

The specimens were carefully examined and all insects were removed except only the African 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 rubber bands and kept under laboratory 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. Other specimens were also mounted on slides for identification. In addition, the associated predacious species were separated from the collected branches

during the initial examination. Feeding tests were run to ensure that predators prey on this scale insect. The parasitoids and predators 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 *L. africana*

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

An orchard of about 2 feddans, cultivated with 15 years old guava trees, heavily infested with the pest was chosen for this study. The orchard was not exposed to any chemical treatment before or during the investigation.

At 15-day intervals, 10 branches (each of 15cm long) infested with different stages of *L. africana* were collected randomly from different directions of the orchard. The branches represented the different sides, the peripheral & inner zones and the lower & middle strata of the tree. These branches were kept in paper bags and transferred to the laboratory for careful examination and counting of the African scale insect. The stages of the scale insect considered in counting process were:

- a. Nymphs (2<sup>nd</sup> and 3<sup>rd</sup> instars).
- b. Males (prepupal & pupal stage).
- c. Adult females (virgin and ovipositing).

## III- Rate of parasitism

Rates of parasitism on different stages of *L. africana* infesting guava trees were estimated throughout the two successive years of study. Heavily infested branches from guava trees were selected at random from cardinal directions and central cores of the trees.

Half- monthly samples (each consisted of 100 randomly selected female scales) were chosen. Male scales are not parasitized, and thus they were excluded in this investigation. Each sample was divided into 4 replicates of 25 scales each. Scales in each sample were dissected under a binocular stereomicroscope, and classified as follows, alive unparasitized individuals, parasitized individuals having (larvae, pupae or emergence holes). Total percentages of parasitism of the African scale insect were estimated.

## RESULTS AND DISCUSSION

### I- Survey of *L. africana* natural enemies

Obtained results showed that, the natural enemies of *L. africana* were:

#### a: Parasitoids

Four primary parasitoid species; two species belong to family Encyrtidae and one to each of Platygasteridae, Pteromalidae. These species were *Anagyrus pseudococci* Gir., *Microtyres flavus* (Howard), *Allotropa kamburovi* Annecke & Prinsloo, *Scutellista cyanea* Motch and *Eublemma scitula* Ramb. The pteromalid, *S. cyanea* was the most abundant primary parasitoid species of the pest on guava at Qena. Adults' emergence took place throughout all months of the year.

The present results agree with those obtained by Priesner and Hosny (1940).

#### b. Predators:

Larvae and adults of two species of Coccinellidae; *Pharoscyrnus varius* Kirsch. and *Scymnus syriacus* Mars. the noctuid and larvae of *C. scitula* were found feeding on different stages of this insect pest. In this respect, Priesner and Hosny (1940) recorded *S. syriacus* as a predator on this insect pest.

## II- Seasonal fluctuation of the population of *L. africana*

Half- monthly counts of the different stages of the African scale insect, *L. africana* on branches of guava trees are summarized in Tables (1 and 2).

It is obvious that this insect species had two annual peaks of abundance in the first year of study on July 20<sup>th</sup> and November 20<sup>th</sup>, where the population index reached 904 and 912 individuals per 10 branches, respectively. A sharp decline in the population index occurred in April. The average annual fluctuation as calculated by dividing the maximum population by the minimum is 5.21. The quotient of increase as calculated by dividing the population of each month by that of preceding one (Abdella, 1981) showed that the favorable time for insect development is July 20 and its value was 3.89, (Table, 1).

In the second season of investigation 2007/08, the three peaks of 578, 825 and 550 scales per 10 branches were recorded on June 5<sup>th</sup>, October 20<sup>th</sup> and March 20<sup>th</sup>. A sharp decline in the population index occurred in January and February. The average annual fluctuation as calculated by dividing the maximum population by the minimum is 5.06. The quotient of increase showed that the favorable time for insect development was May 20 and its value was 1.97 (Table 2).

### III: Role of parasitoids as mortality factor

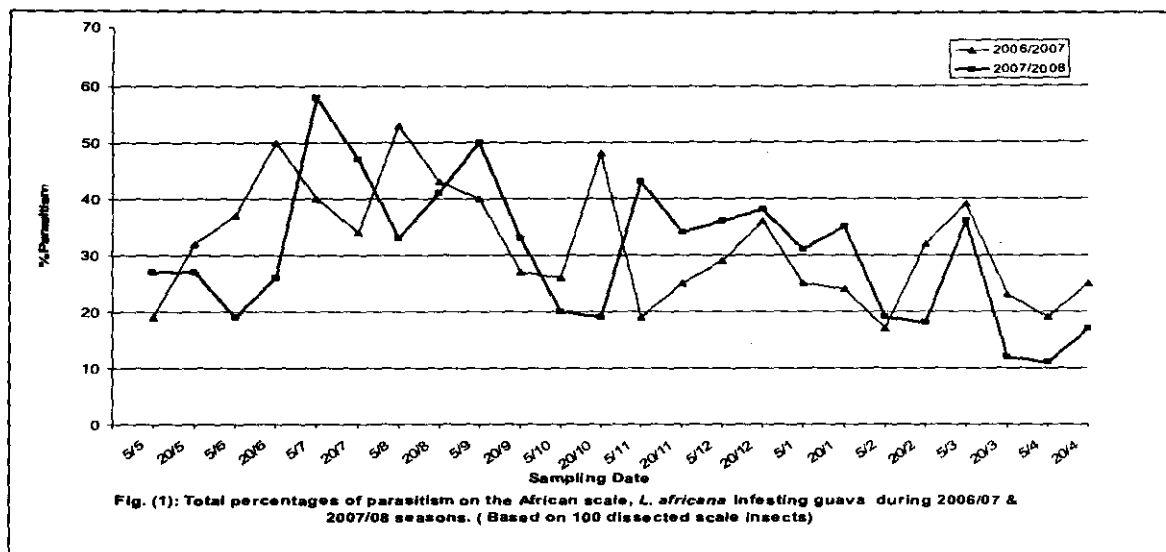
As has been mentioned before, the parasitoids secured other than *S. syanaeae* were scarce in the samples collected. Therefore, the pteromalid seemed

Table (1): Population fluctuation of the African scale insect, *L. africana* per 10 guava stems at Qena Governorate, Egypt in season 2006/07

Sampling date	2 <sup>nd</sup> Nymphs	3 <sup>rd</sup> Nymphs	Total	% of Nymphs	Virgin females	Ovipositing females	Males' pupae	Total population	Quotient of increase
5/5/2006	7	10	17	8.63	45	123	12	197	-----
20/5	12	13	25	7.57	23	266	16	330	1.67
5/6	10	4	14	5.09	30	224	7	275	0.83
20/6	12	4	16	6.86	15	193	9	233	0.84
5/7	76	22	98	42.24	2	99	33	232	0.99
20/7	264	189	453	50.11	97	202	152	904	3.89
5/8	190	120	310	78.88	45	25	13	393	0.43
20/8	40	98	138	45.09	98	34	36	306	0.77
5/9	28	182	210	51.47	86	45	67	408	1.33
20/9	15	18	33	7.44	128	277	5	443	1.08
5/10	207	13	220	41.19	29	250	35	534	1.20
20/10	289	42	331	58.27	20	198	19	568	1.06
5/11	339	32	371	65.54	19	98	78	566	0.99
20/11	741	43	784	85.76	49	42	37	912	1.61
5/12	65	573	638	84.95	86	15	12	751	0.82
20/12	643	89	732	83.37	78	12	56	878	1.16
5/1/2007	324	124	448	78.59	62	45	15	570	0.64
20/1	260	78	338	79.15	46	17	26	427	0.75
5/2	75	54	129	50.19	76	7	45	257	0.60
20/2	33	26	59	68.87	45	35	38	177	0.68
5/3	19	34	53	25.00	37	98	24	212	1.19
20/3	12	46	58	24.26	34	109	38	239	1.12
5/4	24	11	35	22.29	67	38	35	175	0.73
20/4	45	98	143	42.81	29	139	23	334	1.90

Table (2): Population fluctuation of the African scale insect, *L. africana* per 10 guava stems at Qena Governorate, Egypt in season 2007/08

Sampling date	2 <sup>nd</sup> Nymphs	3 <sup>rd</sup> Nymphs	Total	% of Nymphs	Virgin females	Ovipositing females	Males' pupae	Total population	Quotient of increase
5/5/2007	12	35	47	27.97	35	54	32	168	-----
20/5	17	12	29	8.76	23	267	12	331	1.97
5/6	123	124	247	42.73	56	258	17	578	1.74
20/6	45	13	58	27.75	17	89	45	209	0.36
5/7	20	32	52	31.51	12	67	34	165	0.78
20/7	87	19	106	37.45	9	45	123	283	1.71
5/8	187	30	217	58.02	15	123	19	374	1.32
20/8	198	167	365	69.65	57	68	34	524	1.40
5/9	45	67	112	27.93	121	123	45	401	0.76
20/9	13	78	91	19.86	139	201	27	458	1.14
5/10	324	97	421	63.98	34	168	35	658	1.43
20/10	332	234	566	68.60	8	198	53	825	1.25
5/11	387	154	541	78.17	29	99	23	692	0.83
20/11	402	123	525	74.15	98	29	56	708	1.02
5/12	265	112	377	77.41	85	13	12	487	0.69
20/12	162	45	207	56.71	132	3	23	365	0.75
5/1/2008	98	76	174	62.36	96	5	4	279	0.76
20/1	39	23	62	38.03	88	2	11	163	0.58
5/2	98	22	120	59.11	76	4	3	203	1.24
20/2	123	68	191	66.78	69	8	18	286	1.32
5/3	224	89	313	70.33	75	12	45	445	1.55
20/3	345	46	391	71.09	49	45	65	550	1.23
5/4	256	25	281	54.99	47	98	85	511	0.93
20/4	176	127	303	64.33	33	79	56	471	0.92



to represent the most limiting factor of *L. africana* in Egypt. Concerning the role of parasitoids in suppressing *L. africana* populations on guava trees. Data in Fig. (1) indicated that, *L. africana* parasitoids were present in all months during the two years. In the first year, percentages of parasitism, (Fig. 1) showed four peaks appearing on June, 20<sup>th</sup>; August, 5<sup>st</sup>; October, 20<sup>th</sup>, 2006 and March, 5<sup>th</sup>, 2007. The percentages at these peaks were 50, 53, 48 and 39 %, respectively. Parasitized scale insects, harboring living stages of the parasitoid represented an important part of the peaks of the total percentage of parasitism. The lowest percentage of parasitism (17 %) was recorded during the first week of February 2006.

Throughout the second year of investigation, approximately the same trend of population abundance occurred (Fig.1). Four peaks of 58, 50, 43 and 36 % occurred on July 5<sup>th</sup>; September 5<sup>th</sup>; November 5<sup>th</sup>, 2007 and March 5<sup>th</sup>, 2008. The lowest percentage of parasitism (11 %) was recorded during the first week of April 2008.

Concluding the abovementioned results, the African scale insect showed either two or three periods of activity (generation) during the first and second seasons, respectively. The highest peak counts were observed during autumn (October and November). On the other hand, the parasitoids

activity appeared in four periods in both seasons.

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