Egypt. Acad. J. Biolog. Sci., 5(3): 79 -87 (2012) A. Entomology
Email: egyptianacademic@yahoo.com ISSN: 1687–8809
Received:15/ 5 /2012 www.eajbs.eg.net

Abundance and generation determination of *Lepidosaphes beckii* (Hemiptera: Diaspididae) on sour orange at Qalubyia Governorate.

El-Amir, S.M[1].; Abou-Setta, M.M[1].; Abd El-Ghaffar, M.M.[2]; Ibrahim, I.L.[2] and Mahmoud,G.H.[1]

1- Plant Protection Research Institute, Agriculture Research Center, Dokki, Giza, Egypt.

2- Fac. Agric., Al- Azhar Univ., Cairo, Egypt.

ABSTRACT

Lepidosaphes beckii (Newman) (Hemiptera: Diaspididae) seasonal abundance on sour-orange, *Citrus aurantium* trees was carried out in Kafr El-Sohaby, at Qalubyia Governorate, Egypt, starting April, 2004 to March 2006. Population dynamics indicated mean population as 46.25, 49.20 individuals/leaf over 2004/2005 and 2005/2006 years, respectively. The mean number per leaf was 4.97, 18.96, 5.97, 8.06 and 8.30 individuals for crawlers, pre-adults, females, gravid females and male pupae, respectively over 2004/2005. The relative means were 7.51, 21.30, 5.56, 8.93 and 5.90 individuals/leaf, for 2005/2006, respectively. Both north and east directions harbored the heaviest infestation (i.e. 64.4 and 61.6 scales/leaf for north and 49.7 and 62.2 scales/leaf for east over the two years, respectively). The upper leaf surface harbored heavier infestation compared with the lower one in both years. Four generations per year for *L. beckii* were determined in this location using age-structure method (i.e. percent proportion of each stage population over the total).The first generation extended from Jun. 3, to Aug. 12, 2004. The second generation started there after and continued until Oct. 21, 2004. Third generation continued until Feb. 24, 2005. The last generation started Feb. 24, 2005 and continued to Jun. 10, 2005. This means that both first and second generations continued over 70 days each compared with the third generation which continued for 126 days. The fourth one continued over 106 days. Similar results were obtained for the second year (2005/2006). Three periods for chemical control of this pest on citrus at this location was recommended (where the relative abundance of immature stages was the most). The first period was during Apr. 15 to 30. The second was Jul. 15 to 30 and the third during Sept. 15 to 30. The parasitoids recorded from *L. beckii* on sour-orange were the primary parasitoid *Aphytis diaspidis* Howard (Hymenoptera: Aphelinidae) and the secondary one, *Chartocerus niger* (Ashmead) (Hymenoptera: Signiphoridae). Parasitism by *A. diaspidis* ranged between 0 to 24.6% with mean of 11.9% over the two years.

Keywords: Abundance, *Lepidosaphes beckii*, sour orange, Qalubyia

INTRODUCTION

Citrus orchards in Egypt are subject to infestation with serious different species of diaspidids. *Lepidosaphes beckii* (Newman) (Hemiptera: Diaspididae) is one of the most important ones. It infests leaves and fruits mainly. Understanding the relation between ecological factors and population dynamics of an insect and its

generation's occurrence around the year is an important step in integrated pest management of this insect.

Three to four generations for this scale was reported, with highest peak of population to occur in Oct. and lowest in Jul (Salama, 1962;, Hafez and Salama, 1969). Rawhy (1966) recorded three overlapping broads for *L. beckii* to occur in spring (Feb.–Jun.) overlapping with second in summer which started in Jun and third to occur in autumn. Four annual generations of *L. beckii* were reported to occur in May, Aug., Nov. and Feb. at Qalubyia, Egypt (Amin, 1970 and Habib *et al*., 1971).

Rawhy *et al*., (1976) reported that nymphs' population of *L. beckii* reached peak numbers in Sept., Nov., Mar. and May. Adult female populations did so in Oct., Mar. and May. Lowest nymph populations occurred during Jun., Oct., Jan. and Apr. The data indicated that Jul. or Oct. was the best time for controlling the scale.

Abdel-Fattah, *et al*. (1978) reported three annual peaks of abundance of *L. beckii* which were obvious in Dec., Apr., and Jul., with three annual generations at the same intervals during two successive years at Shebin El-Kom. Rodrigo and Garcia-Mari (1994) studied the seasonal variation of populations of *Aonidiella aurantii*, *L. beckii* and *Parlaroria pergandii* (Hemiptera: Diaspididae) and their distribution in different parts of trees in an orange orchard in El Puig, Valencia, Spain, during 1990-91. The population density of all 3 species reached its peak in winter and decreased considerably during spring. Populations were at their lowest level in summer. All 3 species of diaspidids preferred the upper side of the leaves where 60-70% of individuals were found.

The present work was carried out to study ecological aspects of *L. beckii* to determine its generations under the studied conditions using age-structure method and the proper timing for its control.

MATERIALS AND METHODS

Abundance of *L. beckii* on sour orange, *Citrus aurantium* trees was carried out in Kafr EL-Sohaby, Qalubyia Governorate, starting April 8, 2004 to March 23, 2006. The selected orchard did not receive any chemical control for two years before starting these studies and within studying period. All trees received the same horticultural practices. Ten trees were selected at the grove infested with this scale insect. Selected trees were similar in size, shape, height and vegetation. Samples were picked up at two-week intervals throughout the study. Samples size was 50 leaves presenting cardinal directions and tree core. The samples were packed in polyethylene bags with minute holes and transferred directly to the laboratory for examination, using stereoscopic microscope binocular. All alive insects found on each leaf surface were assorted and recorded as: crawlers, pre-adults, adult females, gravid females and male (pre-pupae and pupae).

Obtained data was pooled for each inspection, direction and leaf surface. Any parasitized individual observed was recorded and counted. Identification of scale and their parasitoids were carried out by taxonomy specialists at the Department of Scale Insects and Mealybugs, Plant Protection Research Institute, Giza, Egypt .To calculate the age- structure per sample, the mean number of each stage was divided by the total and multiplied by 100. This way gave each stage a percent proportion of the total per sample regardless the total number of presented insects (i.e. population density). The number of generations was determined using the obtained data throughout the two successive years.

Generation was defined, as the time required for an insect to complete its life cycle (i.e. egg to egg). In the case of diaspidids, eggs are oviposited under the female shield until they hatch and crawl out. The only way to detect ovipositon was by removal of the female shield. Gravid females were defined as females that have their eggs under their shields. The presence of gravid females (i.e. the transformation of adult females to gravid females) was considered in this study as presence of the egg stage. This phenomenon was used to determine the end of each generation and the beginning of the next one.

RESULTS

Results of *L. beckii* population dynamics on sour-orange over 2004/2006 years are illustrated in Figs. (1and2). Results showed that the mean population per sample was 46.25, 49.20 individuals over 2004/2005 and 2005/2006 years, respectively. Over 2004/2005 year, the mean number was 4.97, 18.96, 5.97, 8.06 and 8.30 individuals for crawlers, pre-adults, females, gravid females and male pupae of *L. beckii* per sample/leaf, respectively. Crawlers' density per sample was the highest on Jun 17, 2004 showing 14.44 crawlers/leaf. Less abundance as 9.24, 12.12, 9.88, 9.56 and 10.58 crawlers/leaf occurred on Apr. 22, Jun. 3, Aug. 26, Nov.4, 2004 and Mar. 24, 2005, respectively. However the lowest population was record on Jul. 15 to 29, Sept. 9, Dec. 2 to 30, 2004 and Jan. 13 to Feb. 10, 2005.

Pre-adult females reached its maximum on May 6, 2004, showing 50.46 pre-adults/leaf. Another period for pre-adults high density occurred on Apr 8 to 22, May 20, Dec. 16, 2004 and Jan. 13, 2005 as 26.36, 37.82, 28.98, 24.35 and 24.04 pre-adults/leaf, respectively. However the lowest population was record on Jul. 29, Sept. 9 and Oct. 21, 2004. Females' density was the highest on May. 6, 2004 as 18.60 females/leaf. Another period for females high density occurred on May 20, Jun. 3, 2004 and Mar.10 to 24, 2005 showing 15.20, 13.52, 8.96 and 8.50 females/leaf, respectively. The lowest females' density occurred on Jul. 29, Aug. 26, Sept. 9 to 23 and Oct. 21, to Dec. 2, 2004.

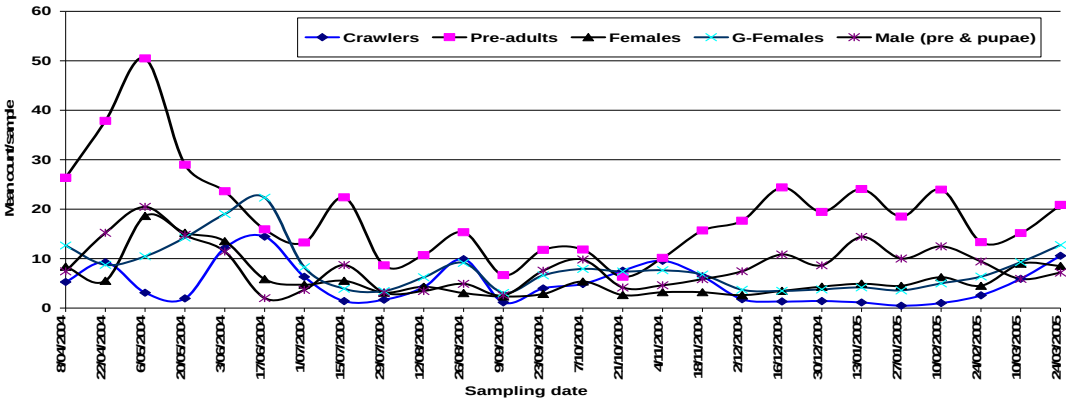

Fig.1. Mean counts per leaf of *L. beckii* on *C. aurantium* during 2004/2005 season.

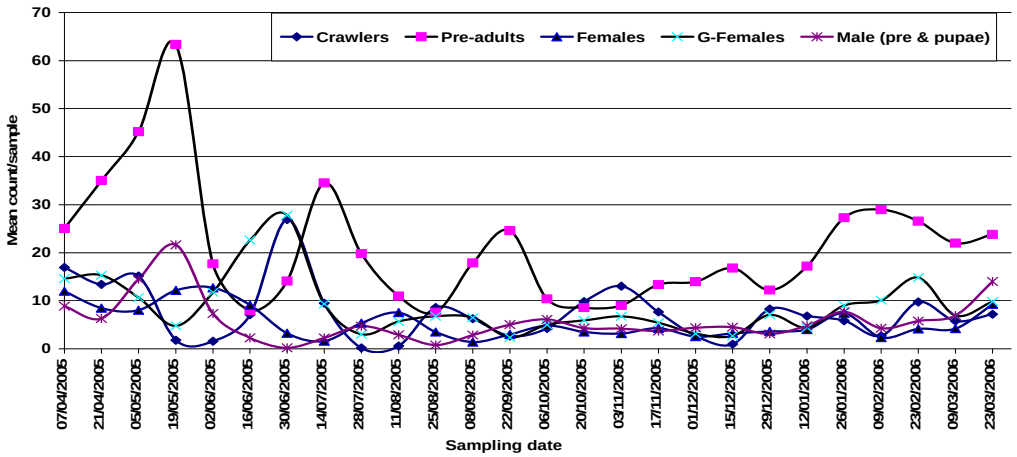

Fig.2. Mean counts per leaf of *L. beckii* on *C. aurantium* during 2005/2006 season.

Gravid females' density was the highest on Jun. 17, 2004 as 22.32 females/leaf. Another period for gravid females high density occurred on Apr. 8, May 20, Jun. 3, 2004 and Mar. 24, 2005 as 12.64, 14.24, 19.00 and 12.74 females/leaf respectively. Less abundance as 10.46, 9.12, and 9.28 occurred on May 6, Aug. 26, 2004 and Mar. 10, 2005 respectively. The lowest population of gravid females was observed during Jul. 15 to 29, Sept. 9, Dec. 2 to 30, 2004 and Jan. 27, 2005. Male pupae density was the highest on May 6, 2004 reaching 20.44 male pupae/leaf. Less abundance as 15.22, 14.80, 14.38, and 12.48 male pupae/leaf occurred on Apr.22, May 20, 2004, Jan. 13 and Feb. 10, 2005 respectively. However the lowest population was observed on Jun 17, to Jul. 1, Jul. 29, to Aug. 12, and Sept. 9, 2004.

The variance in different stages of abundance reflected on the total mixed population per leaf which had maximum values of 76.52, 103.04, 75.16, and 79.64 individuals/leaf on Apr. 22, May 6 to 20 and Jun. 3, 2004, respectively. The lowest mixed insect population occurred on Jul. 29, to Aug. 12, Sept. 9 and Oct. 21, 2004, respectively. Over 2005/2006 year, the mean insect number per leaf was 7.51, 21.30, 5.56, 8.93 and 5.90 individuals of crawlers, pre-adults, females, gravid females and male pupae, respectively. Crawlers' density per leaf was the highest on Jun 30, 2005 showing 26.90 crawlers/leaf. Less abundance as 16.92, 13.40, 15.16, and 13.04, crawlers/leaf occurred on Apr. 7, to May 5, and Nov. 3, 2005, respectively. The lowest population (less than one individual/leaf) was recorded on Jul.28, Aug.11, and Dec. 15, 2005. Pre-adults density reached its maximum on May 19, 2005, showing 63.36 pre-adults/leaf. Another period for pre-adults high density occurred on Apr.7, to 21, May 5 and Jul. 14, 2005 as 25.06, 35.02, 45.22 and 34.52 pre-adults/leaf, respectively. Less abundance was recorded on Jul. 28, Sept. 22, 2005 and Jan. 26, to Mar. 23, 2006. The lowest population was observed during Jun. 16, Aug. 25, Oct. 20, and Nov. 3, 2005 as 7.96, 7.62, 8.54, and 9.02 pre-adults/leaf, respectively.

Females' density was the highest on Jun. 2, 2005 as 12.70 females/leaf. Another period for female high density occurred on Apr. 7, May 19, Jun. 16, 2005 and Mar. 23, 2006 as 12, 12.16, 9.12 and 9.24 females/leaf, respectively. Less abundance was recorded on Apr. 21, May 5, Aug. 11, 2005 and Jan. 26, 2006. The lowest population was observed during Jul. 14, Sept. 8, Dec. 1, 2005 and Feb. 9, 2006. Gravid females' density was the highest on Jun. 30, 2005 as 27.82 females/leaf. Another period for gravid females' high density occurred on Apr.7 to 21, Jun. 16, 2005 and Feb. 23, 2006. Less abundance as 10.66, 11.74, 10.12, and 9.80 females/leaf occurred on May 5, Jun. 2, 2005, Feb. 9, and Mar. 23, 2006, respectively. The lowest population was observed during Jul. 28, Sept. 22, Dec. 1 to 15, 2005.

Male pupae density was the highest on May 19, 2005 as 21.64 male pupae/leaf. Less abundance as 8.86, 14.50, and 14, male pupae/leaf occurred Apr.7, May 5, 2005 and Mar. 23, 2006, respectively. The lowest population (less than one individual/leaf) was observed on Jun. 30, and Aug. 25. The obtained dynamics of different stages reflected on the total mixed population per leaf. Total mixed individuals per leaf had maximum values of 77.44, 78.48, 93.58 and 103.72 on Apr.7, to 21, and May 5, to 19, 2005 respectively. The lowest mixed population occurred during Aug. 11, to 25, and Dec. 1, to 15, 2005.

The results of applying the age-structure technique to the seasonal abundance data of *L. beckii* obtained from the Qalubyia location over the two years on sour-orange are graphically illustrated in Figs. (3 and 4). Obtained trend over both years indicated the occurrence of four generations per year for *L. beckii* on sour-orange at Qalubyia location. Over the first year the over wintering generation continued (mainly as adult females) up to May 19, 2004 where part of them started to oviposit

(i.e. transformation to gravid females). Therefore this generation was determined to end by May 30, 2004.

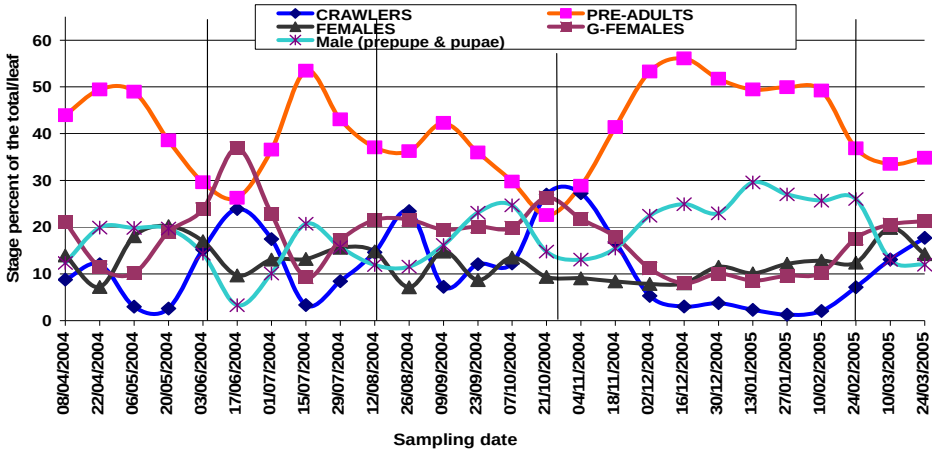

Fig. (3): Age structure of *L. beckii* on *C. aurantium* during 2004/2005.

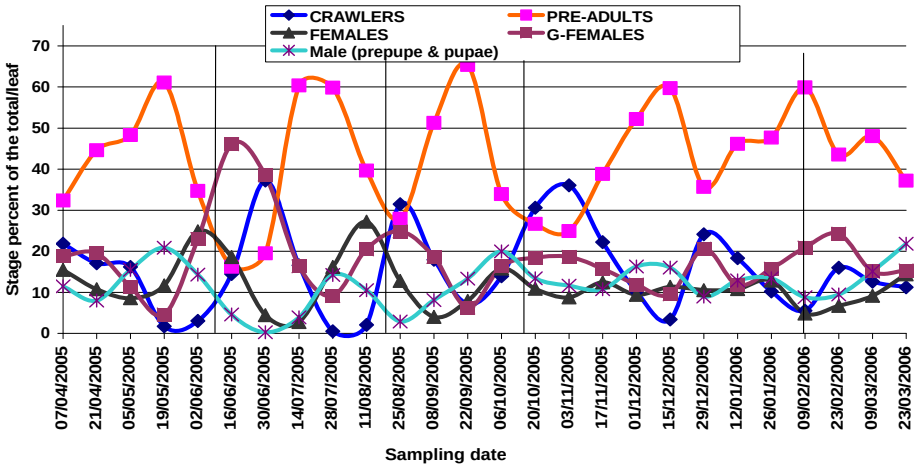

Fig. (4): Age structure of *L. beckii* on *C. aurantium* during 2005/2006.

The first generation started Jun. 3 until Aug.12, 2004 (marked by maximum population of adult females). The following count showed that most of these females were in ovipositing stage in a much synchronized fashion (which indicates the optimal conditions for the development of *L. beckii*). The date of Aug.12, 2004 was considered as the terminal for the first generation. The second generation started there after and continued until re-emergence of gravid females on Oct. 21, 2004. Therefore the date of Oct. 21, 2004 was considered as the end point of this generation and the start point for third generation which continued until Feb. 24, 2005. The last generation started Feb. 24, 2005 and continued to Jun. 10, 2005. This means that both first and second generations continued over 70 days each compared with the third generation which continued for 126 days, and the fourth one continued over 106 days.

Over the second year of study similar results were obtained with little delay (Fig. 4). The relevant dates were Jun. 10, Aug. 16, and Oct. 18, 2005. These obtained results suggested 67, 63, 109, days for first, second and third generations, respectively. The fourth generation continued to the next year.The effect of cardinal directions on the population density of *L. beckii* on sour-orange during 2004/2006 revealed that both north and east directions harbored the heaviest infestation (i.e. 64.4 and 61.6 scales/leaf for north direction and 49.7 and 62.2 scales/leaf for east

direction over the two years, respectively). The core came second (i.e. 42.1 and 41.2 scales/leaf over the two years, respectively). Both south and west directions were the least (i.e. 39.1 and 50.1 scales/leaf for south direction and 36.0 and 31.2 scales/leaf for west direction over the two years, respectively).

The upper leaf surface was heavier compared with the lower one (i.e. 36.45 and 38.79 scales/leaf for the two years, respectively). The lower surface values were 9.81 and 10.43 scales/leaf for the two years, respectively. The main primary parasitoids recorded from *L. beckii* on sour-orange were the ectoparasitoid *Aphytis diaspidis* Howard (Hymenoptera: Aphelinidae) and the hyperparasitoid *Chartocerus niger* (Ashmead) (Hymenoptera: Signiphoridae). Results are illustrated in Figs (5 and 6). They indicated that percent parasitism of *L. beckii* during first year (2004/2005) by *Aphytis diaspidis* and *C. niger* had an average rate of 11.91 and 0.36 %, respectively. *A. diaspidis* was recorded with maximum parasitism rates of 24.63 % on Jul. 1, 2004. Another dates for parasitism rate as 20.59, 23.23, and 17.94 % parasitism occurred on Jun. 3 to 17 and Dec. 30, 2004, respectively. Less parasitism rates of 15.67, 13.50 and 15.55 occurred on Nov.4 and Dec. 2 to 16, 2004. The lowest parasitism rates occurred on Jul. 15, Aug. 12, Sept. 9, and Oct. 21, 2004, respectively.

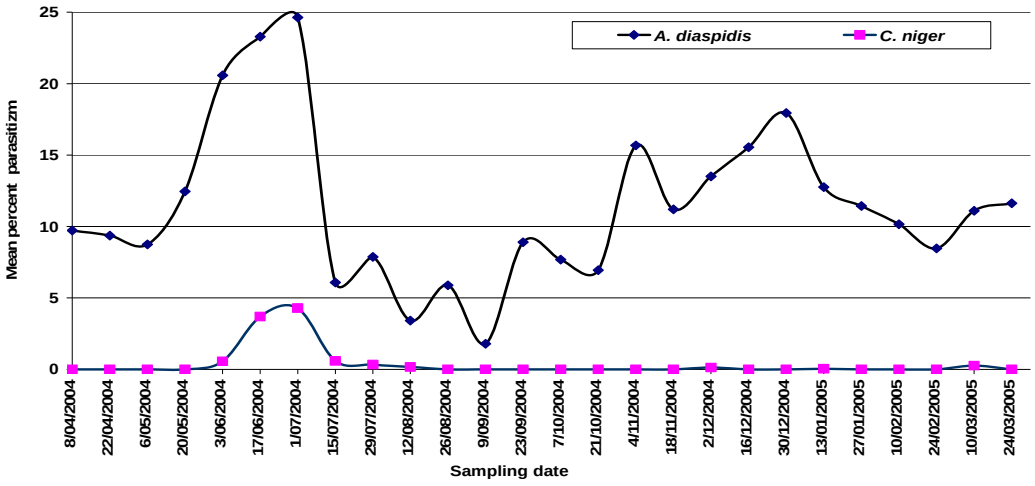

Fig. 5. Mean percent parasitizm of *L. beckii* on *C. aurantium* during 2004/2005 season.

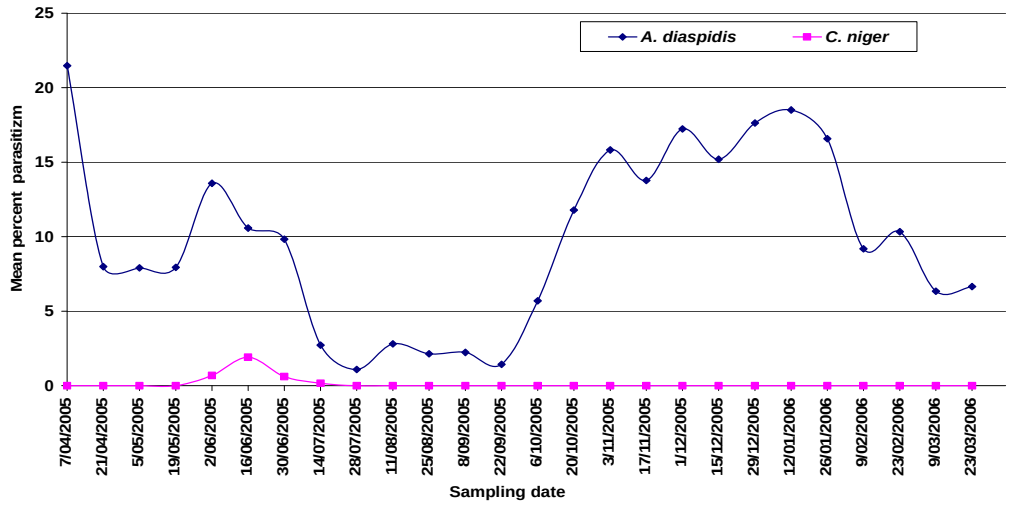

Fig. 6. Mean percent parasitizm of *L. beckii* on *C. aurantium* during 2005/2006 season.

The hyperparasitoid *C. niger* was recorded with maximum rates of 3.69 and 4.28% on Jun. 17 and Jul. 1, 2004, respectively. Out of the 26 inspections 17 of them had zero values and 4 had values over the general mean (i.e. 0.36%).During the second year (2005/2006), *A. diaspidis* was recorded with maximum parasitism rate of 21.48% occurred on Apr.7, 2005. Other dates for high parasitism rates (i.e. 13.59, 15.82, 13.77, 17.24, 15.21, 17.63, 18.50 and 16.58) occurred on Jun. 2, Nov.3, to 17, Dec. 1, to 29, 2005 and Jan.12, to 26, respectively. Less parasitism rates of 10.59, 9.83, 11.79, 9.19, and 10.34 % occurred on Jun. 16 to 30, Oct. 20, 2005 and Feb. 9, to 23, 2006, respectively. The lowest parasitism rates occurred on Jul. 28, and Aug. 11 to Sept. 22, 2005. The hyperparasitoid *C. niger* was recorded with maximum rate of 1.91% on Jun.16, 2005. Out of the 26 inspections 22 of them had zero values and 3 had values over the general mean rate (i.e. 0.14%).

DISCUSSION

Egyptian wide it has been reported that *L. beckii* had three to four generations depending on the host plant and the location. Obtained results in this study indicated four generations for *L. beckii* on *C. aurantium* using the age-structure method. These results are in agreement with Salama (1962); Hafez and Salama (1969); Amin (1970) and Habib *et al*. (1971), they mentioned three to four generations for this scale.

Horizontal distribution of *L. beckii* on *C. aurantium* trees indicated that the north and east harbored the heaviest infestation compared with other direction in both years with preference to the upper leaf surface. The result is in agreement with Rodrigo and Garcia–Mari (1994), they reported that populations were at their lowest level in summer and preferred the upper side of the leaves where 60-70% of individuals were found. *Hemiberlesia latania* (Signort) (Homoptera: Diaspididae) at Ismailia on olive trees preferred north and west directions over east or south ones of the trees (Mohamed, 1999). *Parlatoria oleae* (Colvee), (Homoptera: Diaspididae) on olive was found to be heaviest infestation at the east direction of the tree compared with other directions (El-Amir 2002). *Pseudaulacaspis pentagona* (Targioni–Tozzeti) (Hemiptera: Diaspididae) on peach at Qalubyia preferred the north direction followed by west (Moharum 2006). Abdel-Ghaffar *et al.* (2008) reported that east direction was preferred by *Chrysomphalus aonidum* at the same location and host.

Using age structure method for determining the generations for scale insects has been reported. This method is proper in case of existing all developmental stages at the stages at the same niche. The advantage of this method over using the absolute population counts, that it overcomes sampling errors. This method also is useful in determining the proper time for introducing control measurements being biological or chemical. This fact is based on introducing these measurements when the most susceptible stage is the most relative abundance. Using age structure method for determining the generations El-Amir (2002) reported three generations for *P. oleae* on olive at Ismailia (regardless of olive variety). Serag (2005) used the same technique on fig at northern cost of Egypt and reported three generations for both *Lepidosaphes ficus* (Signort) and *H. lataniae* while reported two generations only for *Russellaspis pustulans* (Cockerell) (Hemiptera: Diaspididae) on the same host. Moharum (2006) using age structure of *P.pentagona* on peach at Qalubyia, plum at Giza and apple at El-Behara to determine its generations. She reported three generations on peach and plum while two generations only on apple. Four generations were reported for *Chrysomphalus aonidum* (Linnaeus) (Hemiptera: Diaspididae) using age structure method on sour orange (Abd El-Ghaffar *et al*., 2008).

Using our findings three periods is recommended for control of this insect population (depending on scouting and population determination). The first period is during Apr. 15 to 30 to compact the first generation coming out of over wintering one. The second is during Jul. 15 to 30 to protect the new formed fruits. The third is during Sept. 15 to 30 to reduce the over wintering ones. In this respect Helmy (1975) reported that Jul. was the proper time for chemical control of *L. beckii*. Rawhy, *et al*. (1976) indicated that Jul. or Oct. was the best time for controlling *L. beckii* on orange grove at Qalyubia Governorate, Egypt. El-Amir (2002) recommended three periods for control of *P. oleae* on olive. The first was during Apr. The second is from 15 to 30, Jun and the third during Oct. Abdel-Ghaffar *et al.* (2008) recommended similar dates for controlling *C. aonidum*. The main primary parasitoid recorded from *L. beckii* on sour-orange was *A. diaspidis*. Percent parasitism was 11.91% and 9.81% over the two years, respectively. Hafez *et al*. (1987) stated that, the main parasitoid of *L. beckii* was *A. lepidosaphes*. Total parasitism of the diaspidid was recorded at the main peak in Oct.-Dec. (29.7-40.2%), with additional moderate peaks in Jan. as21.6%, May as 16.1% and Jul. as 15.4%. Moraes and Silva (1987) mentioned that parasitism of *L. beckii* was found to be highest from Aug. to Nov. and the rate was not affected by climatic factors. The dominant parasitoid was *A. lepidosaphes*. Abbas (1992) reported that *L. beckii* was attacked by the parasitoid *A. lepidosaphes* which may play a considerable role in regulating its population. Soares, *et al*. (1997) revealed that *Encarsia citrina* (Crawford) (Hymenoptera, Aphelinidae) contributed considerably to the biological control of *L. beckii*, in summer and spring, these seasons of high parasitic activity on citrus orchard.

ACKNOWLEDGEMENT

This work was a part of Ph. D. requirements of the first author.

REFERENCES

Abbas, M.S.T. (1992): Comparative rates of infestation by four scale insects on citrus trees with special reference to rates of parasitism on the purple scale *Lepidosaphes beckii*. Egypt. J Agric. Res., 70(2): 477-486.

Abdel-Fattah, M.I.; El-Minshawy, A.M. and Darwish, E.T. (1978): Biology of the zizyphus scale, *Parlatoria zizyphus* (Lucas) in Egypt. (Homoptera: Diaspididae). Proc. Fourth Conf. Pest Control, Sept. 30-Oct.3, Part-I: 49-56.

Abdel-Ghaffar, M. M.; Abou-Setta, M. M.; Ibrahim, I. L.; Mahmoud,G. H. and El-Amir, S. M. (2008): Abundance and generation determination of *Chrysomphalus aonidum* (Hemiptera: Diaspididae) on Sour-Orange at Qalubyia Governorate. Egypt. J. Agric. Res, 86(1):341-352.

Amin, A.H. (1970): Studies on the population dynamics of certain scale insect in relation to their control. Ph.D. Thesis, Fac. Agric., Ain-Shams Univ., Egypt, 180 pp.

El-Amir, S.M. (2002): Environmental safe approaches for controlling some scale insects infesting olive trees in new reclaimed areas. M. Sc. Thesis, Institute of Environmental Studies and Research, Ain-Shams Univ., 84 pp.

Habib, A.; Salama, H.S. and Amin, A.H. (1971): Population studies on scale insects infesting citrus trees in Egypt. Zeit. Angew. Entomol., 69(3): 318-330.

Hafez, M. and Salama, H.S. (1969): Biology of the citrus purple scale, *Lepidosaphes beckii* Newm., in Egypt (Hemiptera-Homoptera: Coccoidea). Bull. Soc. Entoml. Egypte., 53: 517-532.

Hafez, M.B.; El-Minshawy A.M. and Donia, A.R. (1987): Parasitic efficiency of some hymenopterous *Aphytis* spp. on the purple scale insect *Lepidosaphes beckii* Newm. J Appl. Entom. 103(2): 135-138.

Helmy, E.I. (1975): Evaluation of certain synthesis insecticides for the control of scale insects in A.R.E. M.Sc. Thesis, Fac. Agric., Ain-Shams Univ., Egypt, 118 pp.

Mohamed, G.H. (1999): Studies on scale insects infesting olive trees. Ph. D. Thesis, Fac. Agric. Al-Azhar Univ., Egypt, 234 pp.

Moharum, F.A. (2006): Ecological and morphological studies on the white peach scale *Pseudaulacaspis pentagona* (Targioni-Tozzetti) and its natural enemies (Homoptera: Diaspididae). Ph. D. Thesis, Fac. Agric., Moshtohor, Benha Univ., 192 pp.

Moraes, L.A.H.de and Silva, R.F.P.da. (1987): Rate of parasitism of *Mytilococcus beckii* (Newman, 1869) (Homoptera, Diaspididae) in oranges of the cultivar Valencia (*Citrus sinensis* (L.) Osbeck) in the Taquari region, RS. Agronomia-Sulriograndense., 23(1): 41- 47.

Rawhy, S.H. (1966): Studies on the control of certain scale insects infesting citrus trees in Egypt. Ph.D. Thesis, Fac. Agric., Ain- shams Univ., Egypt., 170 pp.

Rawhy, S.H.; Zidan, Z.H.; Abul-Ghar, M.R. and Helmy, E.I. (1976): Biological studies on the purple scale, *Lepidosaphes beckii* (New.) at Qalyubia. Agric. Res. Review., 54(1): 171-175.

Rodrigo, E. and Garcia-Mari, F. (1994): Study of the abundance and distribution of some scale insects on citrus. Boletin Sanidad Vegetal, Plagas., 20(1): 151-164.

Salama, H.S. (1962): Ecological, biological and behavioral studies on the sugar cane mealy bug *Saccharicoccus sacchari* CKLL. and the citrus purple scale, *Lepidosaphes beckii* (Newman). Ph.D. Thesis, Fac. Sci., Cairo Univ., Egypt.

Serag, A. M. (2005): Ecological and toxicological studies on some pests attacking fig trees in Egypt. Ph. D. Thesis, Fac. Sci. Ain-Shams Univ., Egypt, 234 pp.

Soares, A.O.; Elias, R.B. and Schanderl, H. (1997): *Encarsia citrina* (Crawford) (Hymenoptera, Aphelinidae), a parasitoid of *Unaspis citri* (Comstock) and *Lepidosaphes beckii* (Newman) (Homoptera, Diaspididae) in citrus orchards of Sao Miguel Island (Azores). Boletin Sanidad Vegetal, Plagas., 23(3): 449-456.

ARABIC SUMMARY

التغيرات الموسميه وتحديد أجيا ل الحشرة القشرية المحارية على أشجار النارنج بمحافظة القليوبية

صلاح الدين محمد الأمير[1] و محمد محمد أبو ستة[1] و محمد عبد الغفار محمود[2] وإبراهيم لبيب إبراهيم[2]
جمال الدين حسين محمود[1]
1- معهد بحوث وقاية النباتات- مركز البحوث الزراعية - الدقى- جيزة- مصر.
2- كلية الزراعه جامعة الأزهر- القاهرة- مصر.

اجريت دراسة الكثافة العددية للحشرة القشرية المحارية على أشجار النارنج بمنطقة كفر الصهبى بمحافظة القليوبية (بمزرعة خاصة لإستخلاص الزيوت العطرية)- اعتباراً من ابريل 2004 حتى مارس 2006 – حيث تم أخذ عينات دورية من اشجار مصابة كل اسبوعين ممثلة للأتجاهات الأصلية الأربعة بالإضافة إلى قلب الشجرة. وكان حجم العينة عبارة عن خمسون ورقة ممثلة للإتجاهات الأصلية الأربعة بالاضافة إلى قلب الشجرة. معمليا تم فحص هذه العينات مع تسجيل أعداد الحشرات الحية إلى أطوار متحركة- أطوار غير كاملة – إناث كامله و إناث واضعة للبيض- عذارى الذكور- كذلك حالات التطفل.تم تحديد الأجيال بناءاً على ظهور الإناث الواضعة للبيض حيث يتم وضع البيض وحضانتة تحت قشرة الأم حيث أوضحت الدراسة أن لهذه الحشرة أربعة أجيال بالعام. من دراسة التراكيب العمرية للحشرة على اشجار النارنج بمنطقة الدراسة يمكن التوصيه بأفضل توقيتات المكافحة وهى تتواءم مع تواجد اكبر نسبة من المجتمع فى صورة أفراد غير كاملة وهى 15 - 30 أبريل و 15- 30 يوليو و 15 – 30 سبتمبر على الا يتم العلاج الا بعد الاستكشاف وتحديد مستوى الاصابه.