

Ecological and morphological studies on the white peach scale *Pseudaulacaspis pentagona* (Targioni-Tozzetti) and natural enemies

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This study included: world and local literature surveys, distribution and host plants of the white peach scale, *Pseudaulacaspis pentagona* (Targioni — Tozzetti) in Egypt, description of male, nymphal instars, population dynamics and natural enemies (at three locations over two years), determination of generations, effect of cardinal direction on the level of infestation and the effect of ecological factors on the population density.

I- Morphological studies: The investigated material of the species *P. pentagona* belongs to the true scale insects or the so-called "armoured scales", i.e., family Diaspididae. This choice is based upon the wide distribution and the economic status of this species. The use of immatures as promising tools in coccid taxonomy is now regarded as a common concept among coccidologists. Therefore additional information in this direction was the principal motive of the present work. Full-illustrated descriptions are given for all the immature forms. The work extended to present the adult male. Changes in the covering scale were traced throughout the course of development for nymphal stage of the species. The idea was to correlate between the appearance of the scale and the form of insect beneath. Scales are presented in verbal descriptions. Results were, in general, indicative. The developmental pattern of the species become obvious through the disappearance or degeneration of certain characters, and appearance or increase in others. Sexual dimorphism became recognizable after the first moult, i.e., in the second nymphal instar. Only one symptom of such dimorphism did occur during the first nymphal instar.

Following is a summary of the obtained results:

- 1-Full illustrated description were given for the first time for all nymphal instars (first - second female - second male - prepupa — pupa).
- 2-Full illustrated description was given for adult male for the first time.
- 3-A key to differentiate the nymphal instars was constructed.
- 4-Developmental pattern of nymph became obvious through the disappearance or increase of certain characters.
- 5-A key to sexual dimorphism in the second nymphal instars is constructed.

II- Distribution and host plants of *P. pentagona* in Egypt: Based on the world survey twelve fruit trees (i.e. apple, apricot, fig, kiwi, grapes, mulberry, olive, palm, peach, pear, pecan and plum) were considered in Egypt for infestation with the white peach scale, *P. pentagona*. Most important production areas of these 12 crops were considered in 11 governorates (i.e. El-Dakahlia, El-Beheira, El-Fayium, El-Gharbia, El-Minya, El-Monofia, El-Sharkia, Giza, Ismailia, North Sinai and Qalyobia). Sampling schedule expanded over 1999 to 2003. Samples were picked up in paper bags and transferred to the laboratory for examination. Identification of *P. pentagona* was carried out at Plant Protection Research Institute, Dokki, Giza, Egypt, using the insect collection. This study revealed the occurrence of *P. pentagona* on 6 host plant species (i.e. apple, apricot, grapes, mulberry, peach, and plum) out of twelve host plants surveyed. Four of these species (apple, grapes, mulberry and plum) are new recorded in Egypt as host plant for this insect. In this study *P. pentagona* wasn't record on fig, kiwi, olive, palm, pear, and pecan. Maximum host plants infested with this scale were . reported from Qalyobia, governorate. The insect was dominant only on mulberry in other governorates.

III- Ecological Aspects:

- 1- Population dynamics of *P. pentagona*: *P. pentagona* population dynamics studies were carried out on peach, at Kafr Shokr, Qalyobia governorate (Dec. 1, 1999 to Nov. 15, 2001), on plum at El-Saff, Giza governorate

(Feb. 15, 2000 to Feb. 1, 2002) and on apple at El-Noubaria, El-Beheira governorate (Mar. 1, 2001 to Feb. 15, 2002) on ten trees per cite. Samples were picked up twice a month throughout the two successive years of study from cardinal directions (north, south, east and west) and tree core of each selected tree. Sample size was 10 cm of 4-6 mm in diameter primary branches and 5 cm of 9-11 mm in diameter secondary branch. Samples were replicated four times. Alive stages found on each sample were assorted and recorded as: crawlers, pre-adult females, females, ovipositing females (gravid females) and pre-adult males.

1.1- Population dynamics on peach: Over 1999/2000 year, the mean insect count per sample was 89.79, 61.69, 74.59, 32.18 and 45.28 individuals for crawlers, pre-adult females, females, gravid females and pre-adult males, respectively. Crawlers' density per sample was highest on Sep. 15, 2000 (336.42 crawlers /sample). High abundance as 174.73 and 136.34 crawlers/sample occurred on Mar.15 and Jul. 1, 2000, respectively. Low populations were recorded on Dec. 1, 1999, May 1 and Aug. 1, 2000. Pre-adult females' density was highest on Oct. 1, 2000 as 259.76 pre-adult females/sample. Similar and earlier peaks occurred on Apr. 1 and Jul. 15, 2000. Lowest population of pre-adult females was observed during Dec. 1, 1999. Female's density reached its maximum on Oct. 15, 2000 as 200.21 females/sample.

Another period for female's high density occurred on Apr. 15 and Aug. 1, 2000 as 96.31 and 109.49 females/sample, respectively. Lowest females' density occurred during Dec. 1, 1999, May 15 and Sept. 1, 2000. Gravid female density was highest on Sept. 1, 2000 as 85.34 females/sample. Similar and earlier peaks occurred on Feb. 15, and May 15, 2000. Pre-adult males maximum density was recorded on Oct. 1, 2000 as 196.46 pre-adult males/sample. Another maximum density occurred on Apr. 1 and Jul. 15, 2000 as 101.58 and 75.86 pre-adult males/sample, respectively. Mean of total population per sample had maximum values of 840.34, 441.09 and 385.28 individuals/sample on Oct. 1, Apr. 1 and Jul. 15, 2000, respectively. Lowest total population occurred on Dec. 1, 1999 May 1, and Nov. 15, 2000, respectively.

Over 2000/2001 the mean insect's count per sample was 103.6, 77.53, 82.66, 28.18 and 43.83 individuals/sample of crawlers, pre-adult females, females, gravid females and pre-adult males, respectively. Crawlers' density per sample was highest on Oct. 1, 2001 as 334.49 individuals/sample, respectively. Fewer crawlers' abundance (as 0.2, 36.54 and 43.96 crawlers/sample) occurred on Dec. 15, 2000; May 15 and Aug. 15, 2001, respectively. Pre-adult female's density was highest on Oct. 15, 2001 as 278.34 pre-adult females/sample. Similar and earlier peaks occurred on Apr. 15 and Jul. 1, 2001, respectively. Lowest population of pre-adult female was observed during Dec. 15, 2000. Another depression was observed during Jul. 1 and Aug. 15, 2001. Females' density reached its maximum on Nov. 1, 2001 as 218.73 females/sample. Another period for female's high density occurred on May 1 and Aug. 1, 2001 as 118.36 and 100.46 females/sample. Lowest females' density occurred during the periods of Dec.15, 2000, Jun. 1 and Sept. 15, 2001. Gravid female's density was highest on Sept. 1, 2001 as 152.10 females/sample. Similar and earlier peak occurred during Mar. 1, 2001 and another one on May 15, 2001. Lowest population of gravid females was observed during Dec. 15, 2000. Another depression was observed during Apr. 15 and Jun. 15, 2001. Pre-adult male counts were maximum occurrence was on Oct. 15, 2001 as 162.31 pre-adult males/sample. Another maximum occurrence was on Apr. 15 and Jul. 15, 2001 as 73.58 and 76.16 pre-adult males/sample, respectively. Total population per sample had maximum values of 897.93, 444.45 and 428.92 on Oct. 15, Apr. 1 and Jul. 15, 2001, respectively. Lowest mixed population occurred during Dec. 1, 2000 to Feb. 1, 2001.

1.2- Population dynamics on plum: The obtained means of insect counts on plum were less than the observed on peach. Over 2000/2001 the mean number per sample was 69.81, 62.91, 57.08, 22.01 and 32.81 individuals/sample of crawlers, pre-adult females, females, gravid females and pre-adult males of *P. pentagona*, respectively. Crawlers' density per sample was highest on Sept. 1, 2000 as 271.15 individuals/sample. High densities also occurred on Mar. 1 and Jun. 1, 2000 as 145.24 and 129.04 individuals/sample. Less abundance as 23.76, 28.56 and 0.15 crawlers/sample occurred on Apr. 15, 2000, Jul. 15 and Dec. 15, 2000, respectively. Pre-adult female density was highest on Sept. 15, 2000 as 213.69 pre-adult females /sample. Similar and earlier peaks occurred on Mar. 15, and Jun. 15, 2000. Low population of pre-adult females was observed on Jun. 1, Nov. 15, 2000 to Feb. 1, 2001.