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Biology of scale insects (Hemiptera: Coccoidea) in Egypt

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ABSTRACT

Scale insects are one of the most important pests of orchard trees in Egypt. The present review includes the Egyptian literatures of biological studies conducted on scale insects.

Keywords: Biology, scale insects, Egypt**.**

INTRODUCTION

Scale insects are considered as dangerous pests of different horticulture crops (e,g. apple, apricot, citrus, grape and pear) in Egypt. Scales cause damage by sucking the juices from the plants sap. Scales feeding on the undersides of leaves may cause yellow spots to appear on the top sides. These spots become larger as the scales continue to feed. Scales feed on leaves, trunks and stems of plants. Soft scales insects excrete large amounts of honeydew, which is rich in sugars. The honeydew excretion is an excellent medium for the growth sooty mold. This sooty mold coats the top side of leaves, interfering with photosynthesis and makes the plants unattractive. This review article dealt with the literatures of the main families of scale insects in Egypt (armored scale insects, soft scale insects, mealybugs and pit scales).

RESULTS

1. Armored scale insects (Hemiptera : Diaspididae):

The life history of armored scale insects (Diaspididae) is represented by crawler, first instar (settled stage), second instar, third instar; second instar, prepupa, pupa and adults. Habib *et al.* (1969) stated that the female of *Parlatoria oleae* (Clovee) usually laid eggs beneath the scale in regular rows. Parthenogenesis does not occur and males are necessary for ovipostion. The duration of the pre-oviposition and oviposition periods of this insect deceased with the temperature increase and eggs the production also decreased with temperature increase, being 126±1.47 and 105.1±1.31 eggs per female at 24 and 30ºC, respectively. The longevity of both sexes was influenced by temperature variations. The shortest longevity was being 49.8±0.49 and 1.8±0.07 days for females and males, respectively. El-Minshawy *et al.* (1971) studied the biology of *Hemiberlesia lataniae* (Sig.). The egg duration stage ranges from 5 to 8 hours and averages 6.16±0.17 hours at 25ºC and 65% R.H. under the average laboratory conditions of 24.6ºC and 61% R.H., the first larval stage (crawlers) lasted from 11 to 14 days with an average of 12.08±0.26 days. The adult female of *H. latania* laid its eggs parthenogenetically (since no males were observed). The duration of the whole life cycle varied according to experimental conditions. At 24.6ºC and 61%R.H., the total period among various individuals occupied from 101 to 110 days with an average of 108.76±0.44 per female. Under 50% R.H. and 27ºC, the duration of the whole life cycle showed a period of 64 to 76 days with an average of 72.55±0.81 days. Salama and Hamdy (1973) studied the biology of *Insulaspis pallidula* (Green) under field conditions. The egg production was varied in different months of

the year. The largest batches of eggs were obtained in May and August being 32.5± 6.2 and 31.9 ± 4.10 eggs female, respectively, under temperature ranged 23.4-25.7ºC and 49-67% relative humidity range. The egg production reached its minimum during winter months (December, 1968-February, 1969). It ranged from 14.3±5.4 to 19.6±4.9 eggs/female in January, 1969; and in December, 1968, respectively. The temperature during these periods ranged from 12.5-14.8ºC and the relative humidity ranged from 57-73%. The immature stages and the adult female were reared in the laboratory on pumpkins, on the leaves of *Hedera helix* (Ivy) and *Ficus nitida.* The life cycle averaged 178.9, 137.3 and 141.8 days on the three hosts, respectively, at temperatures of 21-25ºC and 65-75 % RH. The immature stages were found to be sensitive to high temperature and low humidity and the optimum conditions were 20-31ºC and 60-75% R H (El-Minshawy and Osman, 1974). Biology of the olive scale insect, *Leucaspis riccae* Targ. was studied under laboratory conditions by Rizk and Ahmed (1981). They found that pre-oviposition period of the insect took an average of 32.2±0.81 days. Mean number of eggs laid by a female was 19.4±0.51. The incubation and oviposition periods averaged 4.2±0.79 and 30.8±0.68 days, respectively with 86.57% egg hatching. The life span of the adult male of *Leucaspis riccae* Targioni-Tozzetti averaged only 4.2±0.35 hours. Males usually die after mating. On the other hand, adult females lived for longer period, 78.5±1.36 and 216.6±1.20 days in the two generations, respectively. Seweilem *et al.* (1985) studied the biology of *Parlatoria ziziphi* (Lucas) on sour orange. The number of eggs per female averaged 34.3. Females developed on the fruits laid more eggs than feeding on branches or leaves. The shortest incubation period under controlled conditions was 4.4 days at 27ºC and 65% RH. At insectary temperatures of 8.4-34.6ºC, the incubation period varied from 5.4 to 12.1 days, the nymphal stage varied likewise from 23.5 to 34.8 days for females and from 28.6 to 49.4 days for males and the adult lifespan from 50.8 to 88.2 days for females and from 1.4 to 3.4 days for males. The life cycle of *Chrysomphalus dictyospermi* Morgan was studied by Serag (1998). He recorded average preoviposition, oviposition and postoviposition periods as 6.79, 6.38 and 5.56 days, respectively. The average longevity of adult female was 18.73 days. The respect to the fecundity of female, each female found to lay about 88.07 eggs throughout an oviposition period about 6.38 days (i.e. 13.96 egg/day). Abd El-Razzik (2000) studied the biology of *Parlatoria blanchardii* under laboratory conditions (22.5 to 25.5ºC and 70-80% RH). He recorded the life cycle of this pest, incubation period, 1st instar female nymph and 2nd instar female nymphs with ranged 6-13, 7-18 and 9-26 days, respectively, while fecundity ranged 28-59 days.

2. Soft scale insects (Hemiptera : Coccidae):

The soft scales reproduce sexually or parthenogenitically and some species have both bisexual and parthenogentici strains. The females have a simple metamorphosis, whereas the males have a complete metamorphosis. There are 3 or 4 instars in the females and 5 instars in the male. The duration of different developmental stages of *Ceroplastes floridensis* Comstock averaged 17.8±0.18 and 24.1±1.4 days, for the first and second nymphal instars, respectively. The mean durations for the pre-oviposition, oviposition and post-oviposition periods were 26.6±1.1, 128.6±6.3 and 19.8 days, respectively (Habib *et al.* 1971). Moursi (1974) and El-Minshawy and Moursi (1976) studied the biology of *Coccus longulus* (Douglas) and pointed out that the adult gave birth to crawlers (475.4±50.3 individuals/female daily under 19.6ºC and 64.5% RH on pumpkin. Males were not observed and the females reproduced parthenogenetically. The longevity of first, second and third instars was 29.5, 43.4 and 59 days with a total life cycle of 134.4 days. El-Minshawy and Moursi (1976) found that, the egg stage of *Pulvinaria psidii* (Maskell) hatched after 11 to 28 days, the first instar (crawlers) failed to settle on pumpkin fruits,

while, the second and third instar females succeeded to settling. The adult female deposits 200.4 eggs as an average. The whole life cycle lasted from 180 to 210 during winter. Serag (1998) studied life history of *Coccus hesperidum* L.on squash. He mentioned the crawlers live beneath the mother scale to protect themselves without feeding for 3-4 days, they were settled on the squash within 1-2 days. Most crawlers (85%) were settled within the 1st day, this pest has two nymphal instars. The average duration's of these instars were 7.62 and 10.74 days, respectively. No males were encountered in the present study. This means that *C. hesperidum* is an oviparous insect and the female reproduce pathogenically. The average duration of the total development period of *C. hesperidum* was 41.4 days. This means that *C. hesperidum* has a short generation cycle as compared to many other coccides. The average pre-oviposition, oviposition and post-oviposition periods of this insect were 7.85, 5.61 and 9.59 days. The total duration of this insect was 41.4 days. The daily egg production of *C. hesperidum* (about 8.6 eggs) is small. The egg bursted after a short period and the nymphs emerges, so this species may be called ovoviviparous. The fecundity of this insect was 47.67 eggs in 5.61 days. Recently, Moustafa and Abd-Rabou (2010) studied the life cycle of guava soft scale inset, *P. psidii* on guava, grape and mango. Results showed that at 30ºC (which was the most adequate tested temp.) were 67.0±0.79, 67.0±7.88 and 79.8±1.95 days, respectively. These results indicated that *P. psidii* prefers guava, followed by grape and mango trees.

3. Mealybugs (Hemiptera: Pseudococcidae):

Hafez and Salama (1969) studied the biology of the sugarcane mealybug, *Saccharicoccus sacchari* (Ckll.) and showed that, the pre-oviposition and oviposition periods are greatly influenced by temperature variations, where the duration increases with the temperature decrease. Parthenogenesis dose not occur. The largest egg production occurs at 24 ºC as 185.7±6.1 eggs per female. At 30 and 35ºC, the egg production was greatly reduced. High humidity's increased, the egg production. The life cycle was shorter for the male than the female. The insect passed through 4-5 annual generations. This species had five generations in the laboratory, within one year, the incubation period of eggs averaged 2.11-2.62 hours. Hatchability of eggs ranged from 96.2 to 99.1%. The total nymphal duration in females averaged 43.2-92.6 days, at 28.9, 16.6ºC and 71 and 54.8% RH, respectively. Parthenogenic females, reared at 17.5-28.9ºC and 56.5-70% RH, had an average (adult) longevity of 50-63.6 days in ovipositing females and 10.4-56.2 days for non-ovipositing ones. Parthenogenic, ovipositing females reared at 17.5-28.9ºC and 56.5-70% RH, had an average pre-oviposition period of 27.5-43.2 days, an average oviposition period of 13.7-20.9 days and an average post-oviposition period of 2.5-5.6 days. These females laid an average of 64.1-78 eggs, producing 61.6-67.6 nymphs/female. Average number of eggs/female/day was 3.4-4.5 eggs. This pest had three annual generations of Ferrisia Virgata (Cockerell) appear to occur on *Acalypha shrubs* in Giza. These generations probably start on 1st June, 1st July and 1st August (Rashad, 1975). The effect of five degrees of temperature (15, 20, 25, 30 and 35ºC); each combined with 55-60% RH on the bioactivity of *F. virgata* reared on sprouted potato tubers was achieved by Attia and Kawiz (2006). The conditions of 30ºC and 55-60% RH were the most suitable conditions for either development or reproduction. Life table parameters showed that the highest value of net reproductive rate (R_0 = 68.56), high intrinsic rate of natural increase (rm = 0.105, highest finite rate of increase) (exp. = rm = 1.11) and the shortest population doubling time (6.623) were achieved at 30ºC associated with relative humidity of 55-60%. Awad Allah *et al.* (2004) studied the biology of *Planococcus ficus* (Sogn.) on potato sprouts and pumpkin fruit. Time of population doubling varied with the host plant used, being 5.54 and 7.24 days on potato sprouts and pumpkin fruit, respectively.

4. Pit scale (Hemiptera: Asteroleacaniidae):

Habib (1943) studied the biology of *Asterolecanium pustulans* Ckll. Which the duration of the whole generation, taken from the date of settling larvae under observation to the date of settling of the first crawling larvae in the next generation, was found to be 108 days, varying from 104 to 113 days. El-Minshaway and Osman (1974) studied the biology of the fig scale, *A. pustulans* reared on fig and peach trees in Alexandria district. They found that in winter, the female laid an average of 113.13 eggs on peach twigs and about 90.33 eggs on fig trees. In summer the average number of eggs produced on fig trees was as high as 194.73. They also showed that under natural conditions, the duration of the whole life cycle comprised 250.4 days in the over wintering broad, while it was 105.4 days in the summer. Two annual generations were recorded for the fig scale, the first lasted from October until May and the second began in June and lasts until October. The insect over winters as an non-gravid females.

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ARABIC SUMMARY

الدراسات البيولوجية للحشرات القشرية فى مصر

جمال الدين حسين محمد و عادل سراج و مروة سند
معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى- جيزة – مصر

الحشرات القشرية من الآفات الهامة على بساتين الفاكهة فى مصر. تضمن هذا المقال المراجع المصرية للدراسات البيولوجية للحشرات القشرية فى مصر.