

BIOLOGICAL CONTROL OF THE PARLATORIA DATE PALM SCALE, *Parlatoria blanchardii* (TARGIONI-TOZZETTI) BY USING PARASITOID, *Encarsia lounsburyi* BERD. ON DATE PALMS IN RIYADH, SAUDI ARABIA

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ABSTRACT

The parasitoid, *Encarsia lounsburyi* Berd. (Aphelinidae: Hymenoptera), an important parasitoid of the Parlatoria date palm scale, *Parlatoria blanchardii* (Targioni-Tozzetti) (Homoptera : Coccoidea), plays an important role in reducing the population density of this scale insect on date palms. *E. lounsburyi* was released (one time), at mid-April 2005 and repeated in 2006 at rates of 2 and 4 individuals/tree. During the first season (2005), the reduction percentages in the population of scale insect increased gradually with elapse of time reaching the maximum. Achieved average reductions of scale insect population were 60.96 and 79.92% for the two releasing levels in the first release, respectively. However, the same trend was achieved in the second season (2006).

Finally, the population of *E. lounsburyi* was correlated to the build up of the scale insect population. This work is an important step toward to replacing the chemical insecticides used by environmentally friendly biocontrol agents. Also, direct to the control of this serious pest on date palms considered the exportation crop of high economic importance.

INTRODUCTION

Armored scale insects, constituting the large family Diaspididae (Homoptera : Coccoidea) are highly evolved, specialized plant parasites. These have a fascinating life history being legless, wingless and eyeless. Sap feeding females are covered by waxy shields incorporating the exuviae, while motile males do not feed as adults (Rosen, 1990). Armored scale insects are notorious plant pests, particularly on perennials. They are especially serious pests on fruit and nut trees, on ornamental shade trees, shrubs and on ground covers, on forest trees, in greenhouses and on indoor plantings. Polyphagous pest species that were introduced to new geographic areas are usually of higher economic importance. Main injury caused by these insects is the ingestion of plant sap. Their damage is manifested in reducing the number of healthy plant. Severely infested plants grow poorly and may drop leaflets prematurely and suffer dieback of twigs and branches. Diaspididae is the largest and most specialized of the dozen or so currently recognized families which compose the Superfamily Coccoidea. *P. blanchardi* has two annual generations on date palm (Salama, 1972). Saad (1980) stated that *P. blanchardi* had 4-5 overlapping generations annually. Kasim (1995) mentioned that there was two generations of *P. oleae* a year on plum and peach in Beheira. *P. blanchardi* on date palms in Bahira Oases had three distinct peaks in October, March and July, whereas in Giza the three peaks occur in November, February and May (Hussain, 1996). Morad and Zanuncio (1998) stated that, the scale insect, *P. blanchardi* preferred the upper surface

of leaflets and there were four generations per year at both sides. Abd El-Razzik (2000) studied the population fluctuation of *P. blanchardii* in North Sinai. Who recorded 4 overlapping successive generations annually on date palms and the south-east direction was more preferable to the pest. Recently, also he studied the biology of *P. blanchardii* under laboratory conditions of (22.5 to 25.5°C and 70-80% RH). He found that life cycle of this pest, (incubation period, 1st instar female nymph and 2nd instar female nymphs) lasted 6-13, 7-18 and 9-26 days, respectively, while fecundity range 28-59 days.

The aim of this work to clarify the importance of importation introduction and establishment of the given the parasitoid, *Encarsia lounsburyi* Berd. (Aphelinidae: Hymenoptera) for control the Parlatoria date palm scale, *Parlatoria blanchardii* (Targioni-Tozzetti) (Homoptera : Coccoidea) and to evaluate the efficacy of introduced parasitoids in control this pest on date palms.

MATERIALS AND METHODS

1. Laboratory rearing:

Adult of *E. lounsburyi* parasitoids of *Parlatoria blanchardii* (Targioni-Tozzetti) infesting date palms were collected from field and re-identified for confirmation then imported individuals were reared for one generation prior to release from quarantine. Then this laboratory bred colony was utilized for release in Riyadh, Saudi Arabia during 2005-2006. *E. lounsburyi* obtained from the field was reared under greenhouse conditions on *P. blanchardii* to initiate a greenhouse culture on this host. Parasitoid emerging from greenhouse rearing was utilized for field release.

2. Field releasing:

Releasing study was conducted on date palms, in Riyadh, Saudi Arabia during 2005 and 2006 years. The selected date palms for the present investigation were away from any pesticide contamination. The trees were similar in size, age, shape, height and vegetation as possible. They were infested by *P. blanchardii* aged about 12 years old.

Two levels of *E. lounsburyi* adults; first level (2 individuals/tree) and the second level (4 individuals/tree). The parasitoid was released (one time), by the beginning of Mid-April 2005 and repeated in the same time in 2006 years. Date palms were divided into 4 replicates each replicate consists of 16 trees (64 trees) for each treatment. Another 64 trees were selected to be as a check treatment. Parasitoids were released as adults by fixing vials or cups containing these parasitoids and allowing adults to walk out of the pest.

Samples were randomly taken bi-weekly and counting started from the mid-April till the beginning July, which consider as the best time for release (Saad, 1980).

Five leaflets were selected at random from the tree, and kept in paper bags and transferred to the laboratory for examination. The alive nymphs, adult graved and non-graved females, also the parasitoides adults were counted under a stereomicroscope. Samples were microscopically inspected to estimate individuals as well as the number of parasitoids.

Rates of parasitism of parasitoid in these samples were recorded so as to provide comparisons to future parasitoids samples after being introduced. In consequence it all become time before maximal levels of impact of these parasitoids will be reached.

3. Statistical analysis:

The percent reduction of scale insect population after *E. lounsburyi* released was calculated according to Henderson and Tilton (1955).

RESULTS AND DISCUSSION

Two levels of *E. lounsburyi* adults; first level (2 individuals/tree) and the second level (4 individuals/tree). The parasitoid was released (one time) at of the second years 2006. The obtained results during the first season 2005.

I.1. First level of release (2 individuals/tree):

In first level of release, the pre-count of scale insect in the releasing area was 158 individuals/leaflet, while it was also 164 individuals/leaflet in (check trees).

The results in Fig. (1) indicated that the scale insect population in the 1st release treatment decreased gradually from 158 at mid-April to 141, 132, 125, 117 and 88 at first-May, mid-May, first-June, mid-June and first-July, respectively as compared with check treatment (scale insect population changed from 164 individuals/plant on mid-April to 187, 194, 217, 225 and 234 individuals/plant at the same dates, respectively). In addition to, the results showed that the reduction percentages of scale insect in 1st release treatment increased gradually to reach 21.73, 29.37, 40.21, 46.03 and 60.96% at first-May, mid-May, first-June, mid-June and first-July, respectively.

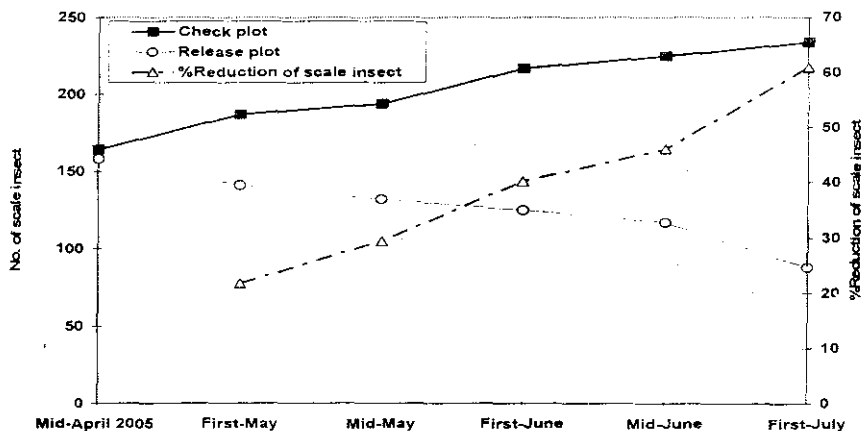


Fig. (1): Population fluctuation of the parlatoria date palm scale, *Parlatoria blanchardii* (Targioni-Tozzetti) (Homoptera : Coccoidea) in the 1st plot release at level of (2 individuals/tree) and the corresponding %reduction of scale insect density on date palm trees during 2005.

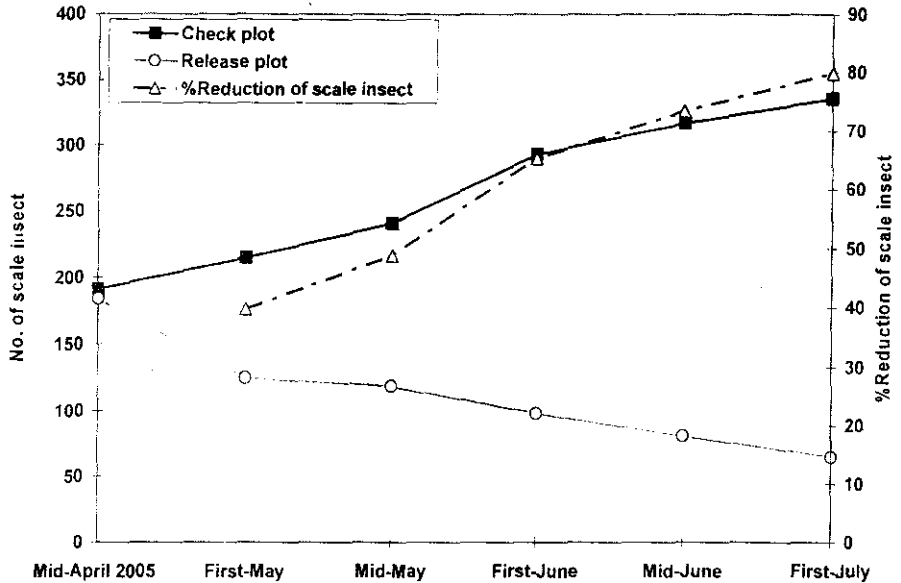


Fig. (2): Population fluctuation of the parlatoria date palm scale, *Parlatoria blanchardii* (Targioni-Tozzetti) (Homoptera : Coccoidea) in the 1st plot release at level of (2 individuals/tree) and the corresponding %reduction of scale insect density on date palm trees during 2005.

I.2. Second level of release (4 individuals/tree):

In second level of release, the pre-count scale insect in the releasing area was 184 individuals/leaflet, while it was 191 individuals/leaflet in (check trees).

The results in Fig. (2) indicated that the scale insect population in the 2nd release treatment decreased gradually from 184 at mid-April to 125, 119, 98, 81 and 65 individuals at first-May, mid-May, first-June, mid-June and first-July, respectively compared with check treatment (scale insect population changed from 191 individuals/plant at mid-April to 215, 241, 293, 317 and 336 individuals/tree in the same dates, respectively). In addition to, the results show that the reduction percent of scale insect in 1st release treatment increased gradually to reach 39.65, 48.74, 65.28, 73.48 and 79.92% at first-May, mid-May, first-June, mid-June and first-July, respectively.

These results are in agreement with those obtained by (Saad, 1980) he found that two hymenopterous parasitoids were obtained from date palm scale, *Parlatoria blanchardii* (Targioni-Tozzetti) (Homoptera : Coccoidea) on the date palm in Giza. These were *Aphytis* sp. and *Encarsia lounsburyi* Berd. (Aphelinidae: Hymenoptera) parasitism mostly occurred during March, April, June, August and October. The obtained results during the second season 2006.

II.1. First level of release (2 individuals/tree):

In first level of release, the pre-count of scale insect in the releasing area was 111 individuals/leaflet, while it was also 123 individuals/leaflet in (check trees).

As shown in Fig. (3) obtained data indicated that the number of scale insect population in the 1st release plot decreased gradually from 158 on beginning mid-April to 111, 91, 78, 66, 49 and 38 at first of May, mid-May, first-June, mid-June and first-July, respectively as compared to check treatment (scale insect population changed from 164 individuals/plant on mid-April to 123, 135, 142, 153, 164 and 173 individuals/plant in the same dates, respectively). In addition to, the results show that the reduction percentage of scale insect in 1st release plot increased gradually to reach 25.31, 39.13, 53.20, 66.89 and 75.66% at first-May, mid-May, first-June, mid-June and first-July, respectively.

II.2. Second level of release (4 individuals/tree):

In second level of release, the pre-count of scale insect *P. blanchardii* releasing area was 94 individuals/leaflet, while it was also 102 individuals/leaflet in (check trees).

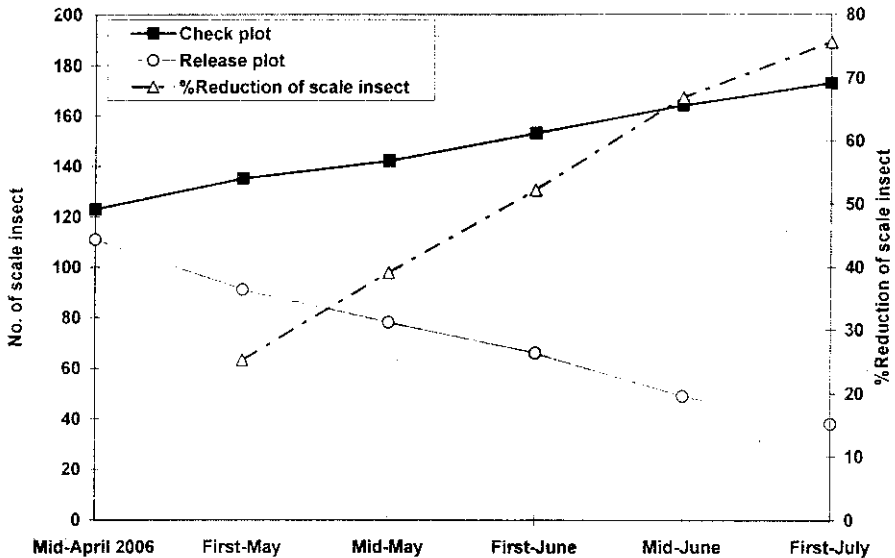


Fig. (3): Population fluctuation of the parlatoria date palm scale, *Parlatoria blanchardii* (Targioni-Tozzetti) (Homoptera : Coccoidea) in the 1st plot release at level of (2 individuals/tree) and the corresponding %reduction of scale insect density on date palm trees during 2006.

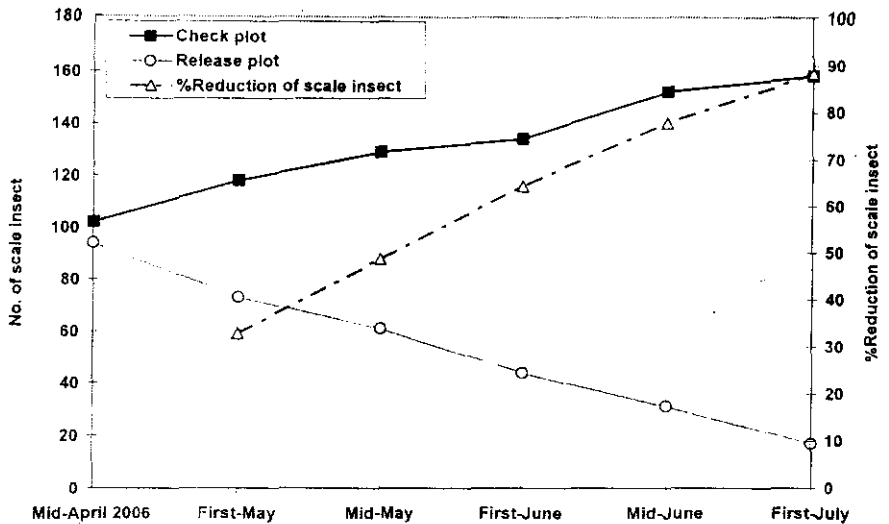


Fig. (4): Population fluctuation of the parlatoria date palm scale, *Parlatoria blanchardii* (Targioni-Tozzetti) (Homoptera : Coccoidea) in the 1st plot release at level of (2 individuals/tree) and the corresponding %reduction of scale insect density on date palm trees during 2006.

These results are in agreement with those obtained by (Abd El-Razak 2000) who mentioned that the natural enemies may keep aphid populations at low levels, preventing economical damages on cereal cultures.

Population of *E. lounsburyi* was correlated to build up of the scale insect population. This work is an important step toward to replacing the chemical insecticides used by environmentally friendly biocontrol agents. Direct to the control of this serious pest on date palms considered the exportation crop of high economic importance.

The presence of this pest on these economic plants was usually controlling through application of organophosphorus insecticides. This control methodology hosted to environmental pollution and toxic residues. Biological technologies to apply it become essential safe. It was found that one of the known parasitoids namely *Encarsia lounsburyi* Berd. (Hymenoptera: Aphelinidae) plays a prominent role for reduction the infestation by *Parlatria* date palm scale, *Parlatoria blanchardii*.

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المكافحة الحيوية لحشرة النخيل القشرية *PARLATORIA* *ENCARSIA LOUNSBURYI* باستخدام طفيل *BLANCHARDII*

علي نخيل البلح في المملكة العربية السعودية

وفا عبد الله إبراهيم المجرين

قسم الحيوان - كلية البنات - صندوق بريد ٢٥٧٠١ - الرياض ١١٤٧٦ - المملكة العربية السعودية

تعتبر حشرة النخيل القشرية من أهم الآفات التي تصيب نخيل البلح في المملكة العربية السعودية. يرتبط بهذا النوع من الحشرات القشرية طفيل قوي وهو إنكارسيا لونزبيرري حيث أجري هذا البحث لتقييم مستويين من الإطلاق (٢، ٤ أفراد/شجرة) في خفض تعداد الحشرة القشرية علي نخيل البلح بالرياض خلال موسمين متتاليين ٢٠٠٥، ٢٠٠٦.

أدي إطلاق هذا الطفيل لمرة واحدة سنويا في موسم ٢٠٠٥ وكرر الإطلاق مرة ثانية في السنة الثانية ٢٠٠٦ الي زيادة في خفض نسبة الإصابة بحشرة النخيل القشرية بمرور الوقت. ووصلت نسبة الخفض في التعداد ٦٠،٩٦، ٧٩،٩٢% في مستوي الإطلاق خلال عام ٢٠٠٥. في الموسم التالي ٢٠٠٦، أدي إطلاق الطفيل بالمستويين السابقين الي نفس النتائج تقريبا.

ومن النتائج السابقة يمكن أن نستنتج أنه زادت أعداد الطفيل وأدي الي خفض تعداد حشرة النخيل القشرية مع مرور الوقت. كما أنه يمكن استخدام الطفيل بنجاح كأحد عناصر مكافحة البيولوجية الفعاله في برامج مكافحة المتكاملة لحشرة النخيل القشرية علي نخيل البلح.