

**BIOLOGICAL CONTROL OF THE CITRUS MEALYBUG,
PLANOCOCCUS CITRI (HOMOPTERA: PSEUDOCOCCIDAE)
INFESTING CITRUS TREES BY SUCCESSIVE RELEASING WITH
DIFFERENT LEVELS OF THE GREEN LACEWING, *CHRYSOPERLA
CARNEA* (NEUROPTERA: CHRYSOPIDAE)**

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Abstract

The green lacewing, *Chrysoperla carnea* Steph (Neuroptera: Chrysopidae) was successively released (with three levels), 5, 10 and 15 larvae/tree at late April, late May and late June 2006 and repeated in the same times during 2007 at Gharbia Governorate. During the first season (2006), the reduction percentages in the population of the citrus mealybug, *Planococcus citri* (Risso) increased gradually with elapse of time. The achieved average reductions in mealybug population were 66.08, 82.75 and 98.66% at the end of July for the three releasing levels, respectively in the first year (2006). However, the same trend was achieved in the second season (2007) and reduction percentages were 56.14, 80.86 and 93.92%, respectively.

Statistical analysis revealed differences in responses to the three successive releasing levels of *C. carnea* for management *P. citri* during 2006 and 2007 seasons that proved no significant among the two seasons.

The present work has shown that *C. carnea* can be used successfully as a biocontrol agent in an integrated program for controlling *P. citri* attacking citrus trees.

INTRODUCTION

The citrus mealybug, *Planococcus citri* (Risso) (Homoptera : Pseudococcidae) is one of the most common pests on citrus. This pest has a pan tropical and subtropical region distribution. The citrus mealybug attacks citrus, cotton, vines, mango, banana and ornamental plants (Hill, 1983 & Baker, 1998). Mealybug has become a more serious pest in recent years and difficult to control with conventional sprays because the adult is protected by a waxy covering. Female usually deposits from 200 to 600 eggs. Eggs are laid in groups covered by a dense, fluffy, white mass of wax called the ovisac; therefore, the mealybugs are not easy to be controlled by pesticides. The citrus mealybug has a toxin in its saliva, which causes drop of leaves and buds of its host plants. Infested plants usually die unless this pest is controlled (Baker, 1998). Large infestations cause fruit drop and reduce yields, but their greatest damage is by secretion of honeydew on fruit and leaves. Sooty moulds often grow on the honeydew causing

infested plants to turn black and associated sooty mould fungus reduce fruit quality and vitality of citrus trees (Cartwirth and Browning, 1999).

The green lacewing, *Chrysoperla carnea* Steph. (Neuroptera: Chrysopidae) is an aphid's predator very common in nature. Only the larval stages can feed on different insect species, (larvae have a ferocious appetite for aphids, mealybugs, immature scales and whiteflies, thrips, spider mites and other plant pests), while the adult usually feeds on nectar, honeydew and other sugar sources. The adult female lay eggs right in the middle of an insect colony, the larvae are pale brown or grey and start preying after emergence (Ridgway and Vinson, 1977).

The present work aimed to evaluate successive releasing of the green lacewing, *C. carnea* to management the citrus mealybug, *P. citri* on citrus trees at Gharbia Governorate.

MATERIALS AND METHODS

1. Rearing of *chrsoperla carnea*

C. carnea adults were collected from the field by insect sweeping net and brought to the laboratory. The collected adults were put in chimney glass (17 cm height, 7 cm top diameter and 8.5 cm bottom diameter). The bottom of each chimney cage was placed on a Petri-dish and its top was covered with black muslin for laying their eggs and kept in position by rubber bands (Ali, 2003).

The artificial diet for adults was prepared by adding yeast oxido : fructose sugar: water as a ratio 5 : 6 : 10 and put together in a beaker, which mixed with a mixer. The diet should be a viscous pulp, which is easy to spread using a brush or spatula. A piece of cotton with the mixture (artificial diet) was offered to adults. Adults laying their eggs on the muslin cloth on their stalks glued. Eggs were collected daily by scissors and newly black muslin cloth was replaced. The larvae are fed preferable with fresh eggs of *P. citri* which was supplied until pupation.

2. Successive release of *C. carnea*

The 2nd larval instars of *C. carnea* were released. Envelops (A4 size) were used for transporting the predator, each envelop containing a white A4 paper sheets displaying the predator and facing of papers each other, so that reduce the cannibalism between them and the larvae could be freely; each envelope containing the accurate number of the 2nd larvae instars (L₂). Three levels of *C. carnea* (5, 10 and 15 larvae/tree) were released by brushing the L₂ on the infesting sites of the tree using a fine and smooth camel's brush. In each level three times of release evere made according to the obtained results from each one, at late April, late May and late

June 2006 and repeated in the same times during 2007. Successive releasing study was conducted on citrus trees, at Gharbia Governorate. The selected trees for the present investigation were away from any pesticide contamination. The trees were about 20 years old, with about 5-6 meters in height, similar in size, age, shape, and vegetation as possible and had approximately similar infestation by *P. citri*.

The citrus trees were divided into 4 replicates; 4 trees each (16 trees) for each plot. Another 16 trees were selected to be as a check plot.

Leaf samples (30 leaves/sample) were selected at random from all parts of the tree. Leaves were kept in paper bags and transferred to the laboratory for stereomicroscopic examination. The upper and lower leaf surfaces were inspected and the alive nymphs and adult females and their predators were counted.

3. Statistical analysis

The reduction percentage of infestation by mealybugs and number of predators was calculated according to the equation of Henderson and Tilton (1955). The data was subjected to analysis of variance (ANOVA) and the means were compared by L.S.D. test at 0.05 level using SAS program (SAS Institute, 1988).

RESULTS AND DISCUSSION

The mealybugs are not easy to control by pesticides because the eggs are enmeshed in the waxy fluff, it is difficult to get a pesticide through to kill them (Baker, 1998) therefore in this work *chrysoperla carnea* predator was released with different levels to management the infestation by the mealybug, *P. citri*.

1. First year (2006)

1.1. First level of release (5 larvae/tree)

The first level of release was occurred on the late April the 1st releasing time. The pre-count in the releasing area with mealybug was 55.7 individuals/leaf, while it was also 61.8 individuals/leaf in check trees.

The results in Fig. (1) indicated that the number of *P. citri* in the 1st release plot decreased gradually from 55.7 on late April to 52.3, 50.1, 48.7 and 45.2 individuals/leaf after 1st, 2nd, 3rd and 4th week of May, respectively as compared to check plot where mealybug populations changed from 61.8 individuals/leaf on late April to 66.4, 71.6, 78.5 and 79.2 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 1st release plot increased gradually to reach 12.61, 22.36, 31.17 and 36.68% on the 1st, 2nd, 3rd and 4th week of May, respectively.

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The second releasing time was occurred (after finishing the last inspection of the 1st release level) on late May; the pre-count in the releasing area with mealybug was 45.2 individuals/leaf, while it was 79.2 individuals/leaf in check trees. The results in Fig. (1) indicated that the number of *P. citri* in the 1st release plot decreased gradually from 45.2 on late May to 41.8, 31.2, 21.8 and 14.7 individuals/leaf on the 1st, 2nd, 3rd and 4th week of June, respectively as compared to check plot (where mealybug populations changed from 79.2 individuals/leaf on late May to 82.4, 74.5, 66.7 and 55.6 individuals/leaf in the same dates, respectively). In addition, the results show that the percent reduction of mealybug population in 1st release plot increased gradually to reach 11.11, 26.62, 42.73 and 53.67% on the 1st, 2nd, 3rd and 4th week of June, respectively.

Also, the third releasing time occurred (after finishing the last inspection of the 2nd release level) on late June; the pre-count in the releasing area with mealybug was 14.7 individuals/leaf, while it was also 55.6 individuals/leaf in check trees. The results in Fig. (1) indicated that the number of *P. citri* in the 1st release plot decreased gradually from 14.7 on late June to 9.8, 7.9, 6.8 and 5.3 individuals/leaf on the 1st, 2nd, 3rd and 4th week of July, respectively as compared to check plot where mealybug populations changed from 55.6 individuals/leaf on late June to 42.8, 46.7, 53.2 and 59.1 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 1st release plot increased gradually to reach 13.39, 36.02, 51.65 and 66.08% on the 1st, 2nd, 3rd and 4th week of July, respectively.

The results agreed with those obtained by (Anonymous, 2006) who found control of the light mealybug infestation by releasing the 2nd larval instars with rate 2-3 larvae/m² or 10-12 larvae/m² for control of heavy mealybug populations and make 3-4 releases at 2-3 week intervals. Also found that *C. carnea* do best in warm, humid conditions. In addition, the results agreed with finding Ortu and Marras, (1999) who found that *C. montrouzieri* are particularly efficient at controlling the mealybugs where insecticides do not easily penetrate.

1.2. Second level of release (10 larvae/tree)

In second level, the 1st releasing time occurred on late April; the pre-count in the releasing area with mealybug was 41.9 individuals/leaf, while it was also 43.7 individuals/leaf in check trees.

The results in Fig. (2) indicated that the number of *P. citri* in the 2nd release plot decreased gradually from 41.9 on late April to 36.5, 25.8, 23.1 and 19.4 individuals/leaf on the 1st, 2nd, 3rd and 4th week of May, respectively as compared to check plot where mealybug populations changed from 43.7 individuals/leaf on late April to 48.2, 52.4, 56.1 and 63.7 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 2nd release plot increased gradually to reach 68.24% on May.

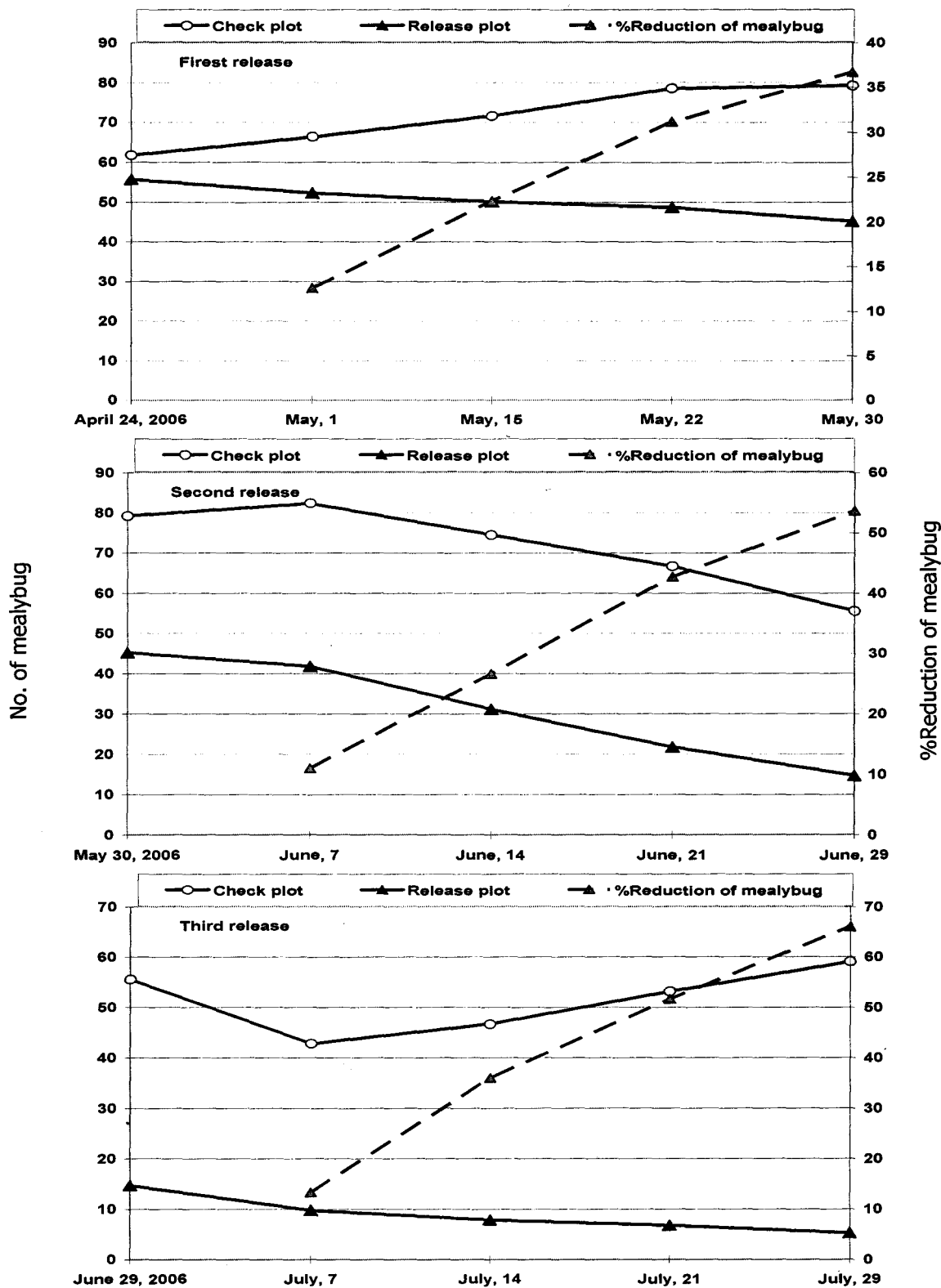


Fig. 1. Population fluctuation in the population numbers of the citrus mealybug, *Planococcus citri* (Risso) (Homoptera : Pseudococcidae) in the 1st plot release at level (5 larvae/tree) of the green lacewing, *Chrysoperla carnea* Steph. (Neuroptera: Chrysopidae), and the corresponding %reduction of the mealybug density on citrus trees during 2006.

The second releasing time was occurred (after finishing the last inspection of the 1st release level) on late May; the pre-count in the releasing area with mealybug was 19.4 individuals/leaf, while it was also 63.7 individuals/leaf in check trees.

The results in Fig. (2) indicated that the number of *P. citri* in the 2nd release plot decreased gradually from 19.4 on late May to 17.3, 11.3, 9.4 and 6.8 individuals/leaf on the 1st, 2nd, 3rd and 4th week of June, respectively as compared to check plot where mealybug populations changed from 63.7 individuals/leaf on late May to 61.7, 52.8 and 47.6 individuals/leaf in the same dates, respectively.

In addition, the results show that the percent reduction of mealybug population in 2nd release plot increased gradually to reach 53.09% on June.

Also, the third releasing time occurred (after finishing the last inspection of the 2nd release level) on late June; the pre-count in the releasing area with mealybug was 6.8 individuals/leaf, while it was also 47.6 individuals/leaf in check trees. The results in Fig. (2) indicated that the number of *P. citri* in the 3rd release plot decreased gradually from 6.8 on late June to 4.6, 3.1, 2.2 and 1.4 individuals/leaf on the 1st, 2nd, 3rd and 4th week of July, respectively as compared to check plot where mealybug populations changed from 47.6 individuals/leaf on late June to 44.1, 46.6, 53.2 and 56.8 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 2nd release plot increased gradually to reach 82.75% on July.

1.3. Third level of release (15 larvae/tree)

In third level of release, the first releasing time occurred on late April; the pre-count in the releasing area with mealybug was 53.2 individuals/leaf, while it was also 55.6 individuals/leaf in check trees.

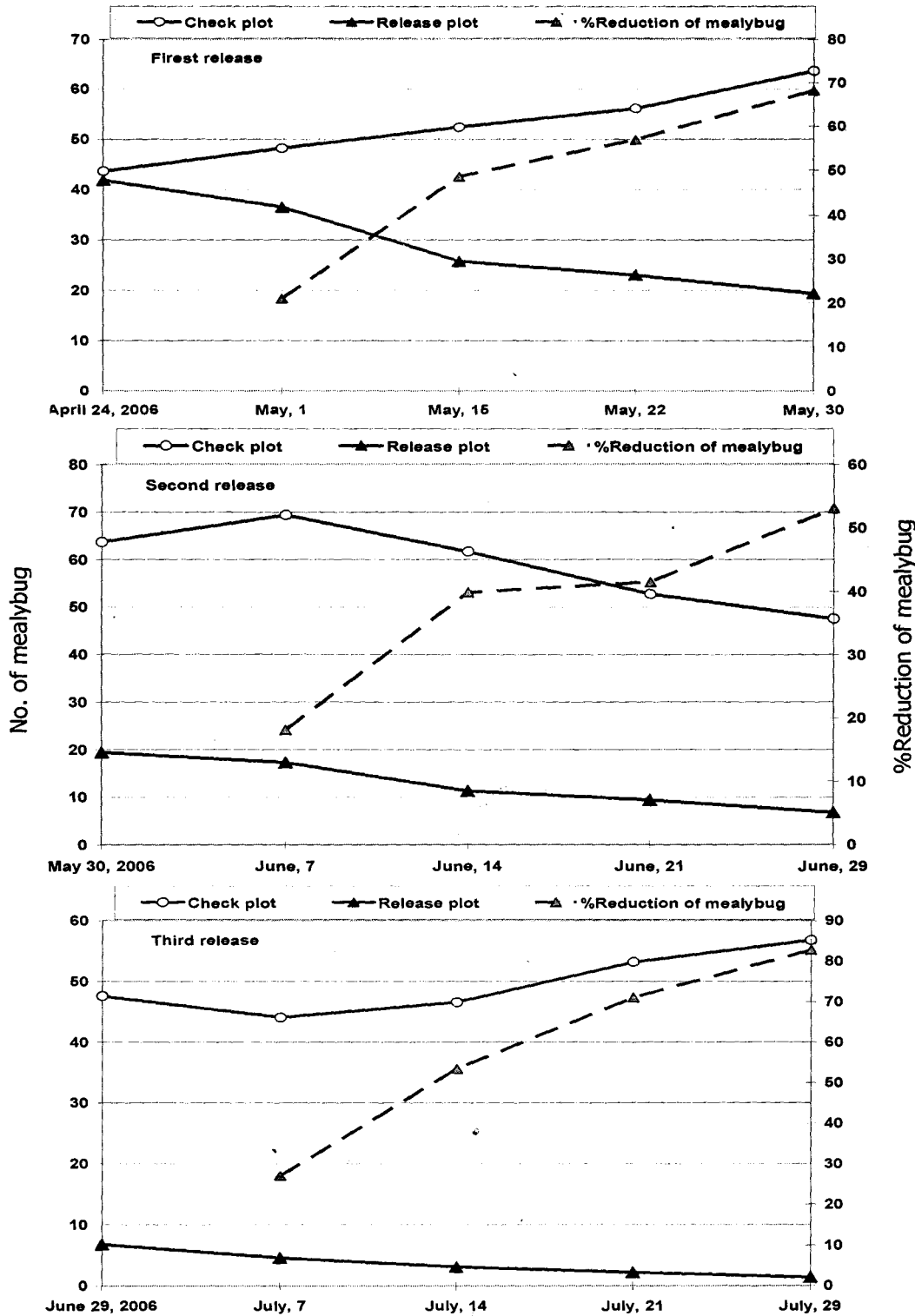


Fig. 2. Population fluctuation in the population numbers of the citrus mealybug, *Planococcus citri* (Risso) (Homoptera : Pseudococcidae) in the 2nd plot release at level (10 larvae/tree) of the green lacewing, *Chrysoperla carnea* Steph. (Neuroptera: Chrysopidae), and the corresponding %reduction of the mealybug density on citrus trees during 2006.

The results in Fig. (3) indicated that the number of *P. citri* in the 3rd release plot decreased gradually from 53.2 on late April to 38.1, 27.5, 21.3 and 18.7 individuals/leaf on the 1st, 2nd, 3rd and 4th week of May, respectively as compared to check plot where mealybug populations changed from 55.6 individuals/leaf on late April to 58.9, 64.8, 69.7 and 67.4 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 3rd release plot increased gradually to reach 71.00% on May.

The second releasing time occurred (after finishing the last inspection of the 1st release level) on late May; the pre-count in the releasing area with mealybug was 18.7 individuals/leaf, while it was also 67.4 individuals/leaf in (check trees).

The results in Fig. (3) indicated that the number of *P. citri* in the 3rd release plot decreased gradually from 18.7 on late May to 14.8, 11.8, 9.1 and 5.1 individuals/leaf on the 1st, 2nd, 3rd and 4th week of June, respectively as compared to check plot where mealybug populations changed from 67.4 individuals/leaf on late May to 61.9, 54.8, 48.7 and 41.5 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 3rd release plot increased gradually to reach 55.71% on June.

The third releasing time occurred (after finishing the last inspection of the 2nd release level) on late June; the pre-count in the releasing area with mealybug was 5.1 individuals/leaf, while it was also 41.5 individuals/leaf in (check trees).

The results in Fig. (3) indicated that the number of *P. citri* in the 3rd release plot decreased gradually from 5.1 on late June to 2.7, 1.1, 0.8 and 0.1 individuals/leaf on the 1st, 2nd, 3rd and 4th week of July, respectively as compared to check plot where mealybug populations changed from 41.5 individuals/leaf on late June to 52.4, 57.3, 59.4 and 60.9 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 3rd release plot increased gradually to reach 98.66% on July.

Mendel *et al.* (1998) found the possibility of managing *P. citri* populations in citrus plantations by inundative releases of predators and parasitoids such as *chrysoperla montrouzieri*, *Symphorobius sanctus*, *Leptomastix dactylopii* and *Anagyrus pseudococci*.

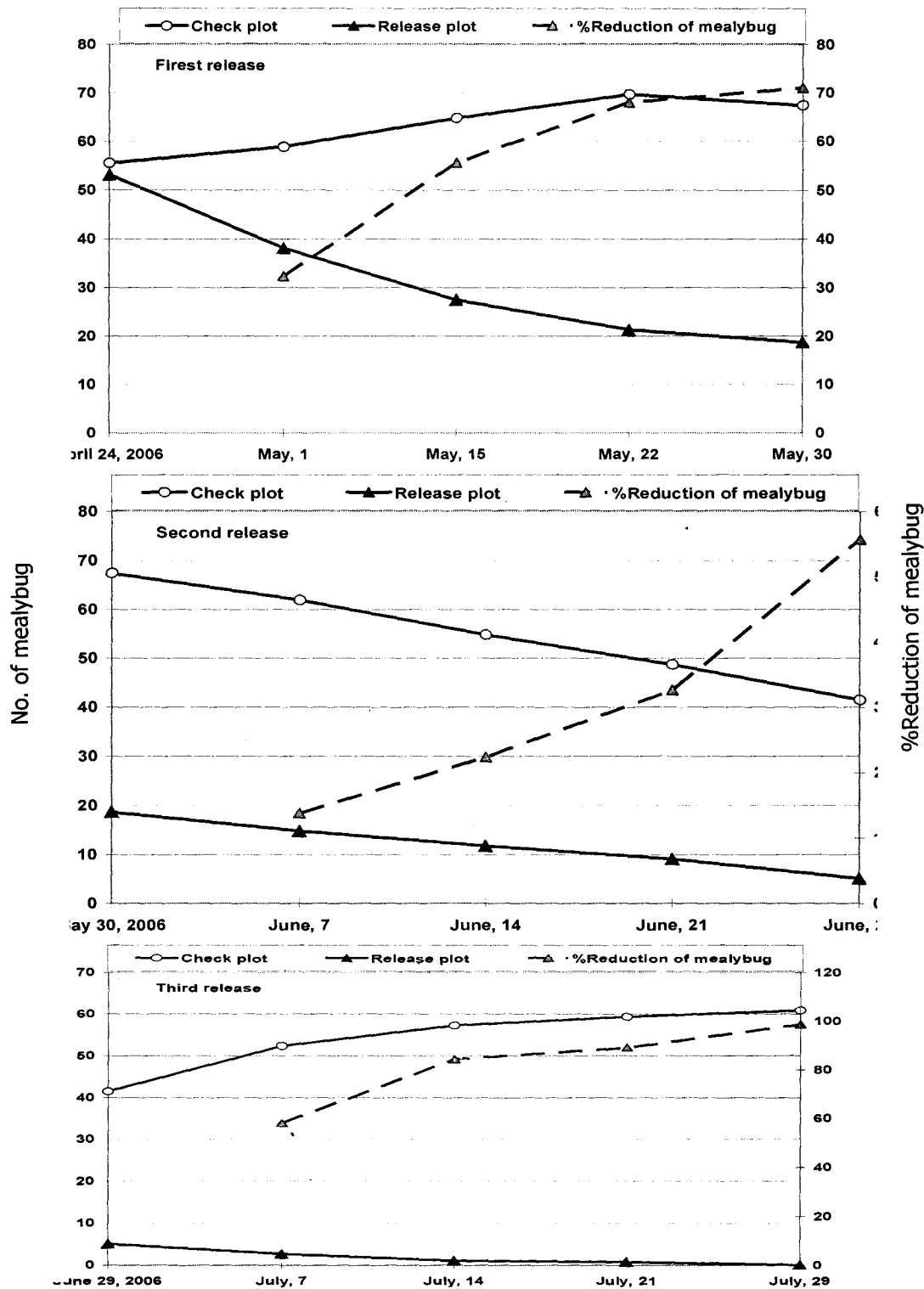


Fig. 3. Population fluctuation in the population numbers of the citrus mealybug, *Planococcus citri* (Risso) (Homoptera : Pseudococcidae) in the 2nd plot release at level (15 larvae/tree) of the green lacewing, *Chrysoperla carnea* Steph. (Neuroptera: Chrysopidae), and the corresponding %reduction of the mealybug density on citrus trees during 2006.

2. 1. Second year (2007)

2.1. First level of release (5 larvae/tree)

In first level of release, the 1st releasing time occurred on the late April; the pre-count in the releasing area with mealybug was 46.8 individuals/leaf, while it was also 51.2 individuals/leaf in check trees plot. The results in Fig. (4) indicated that the number of *P. citri* in the 1st release plot decreased gradually from 46.8 on late April to 43.1, 40.4, 39.6 and 36.4 individuals/leaf on the 1st, 2nd, 3rd and 4th week of May, respectively as compared to check plot where mealybug populations changed from 51.2 individuals/leaf on late April to 57.4, 63.1, 71.6 and 75.7 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 1st release plot increased gradually to reach 47.39% on May.

The second releasing time occurred (after finishing the last inspection of the 1st release level) on late May; the pre-count in the releasing area with mealybug was 45.2 individuals/leaf, while it was also 79.2 individuals/leaf in check trees. The results in Fig. (4) indicated that the number of *P. citri* in the 1st release plot decreased gradually from 36.4 on late May to 29.1, 25.4, 17.8 and 14.1 individuals/leaf on the 1st, 2nd, 3rd and 4th week of June, respectively as compared to check plot (mealybug populations changed from 75.7 individuals/leaf on late May to 71.9, 63.2, 59.7 and 54.3 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 1st release plot increased gradually to reach 45.99% on June.

Also, the third releasing time occurred (after finishing the last inspection of the 2nd release level) on late June; the pre-count in the releasing area with mealybug was 14.1 individuals/leaf, while it was also 54.3 individuals/leaf in check trees. The results in Fig. (4) indicated that the number of *P. citri* in the 1st release plot decreased gradually from 14.1 on late June to 11.2, 8.7, 6.7 and 5.9 individuals/leaf on the 1st, 2nd, 3rd and 4th week of July, respectively as compared to check plot where mealybug populations changed from 54.3 individuals/leaf on late June to 59.2, 61.7, 55.2 and 51.8 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 1st release plot increased gradually to reach 56.14% on July.

Mangoud (2006) under green house conditions in Germany reached to similar results and reported the efficiency of *Leptomastix dactylopii* Howard (Hymenoptera : Encyrtidae) and *Cryptolaemus montrouzieri* (Mulsant) (Coleoptera : Coccinellidae) in reducing the population of the citrus mealybug, *Planococcus citri* (Risso) (Homoptera : Pseudococcidae) on citrus trees.

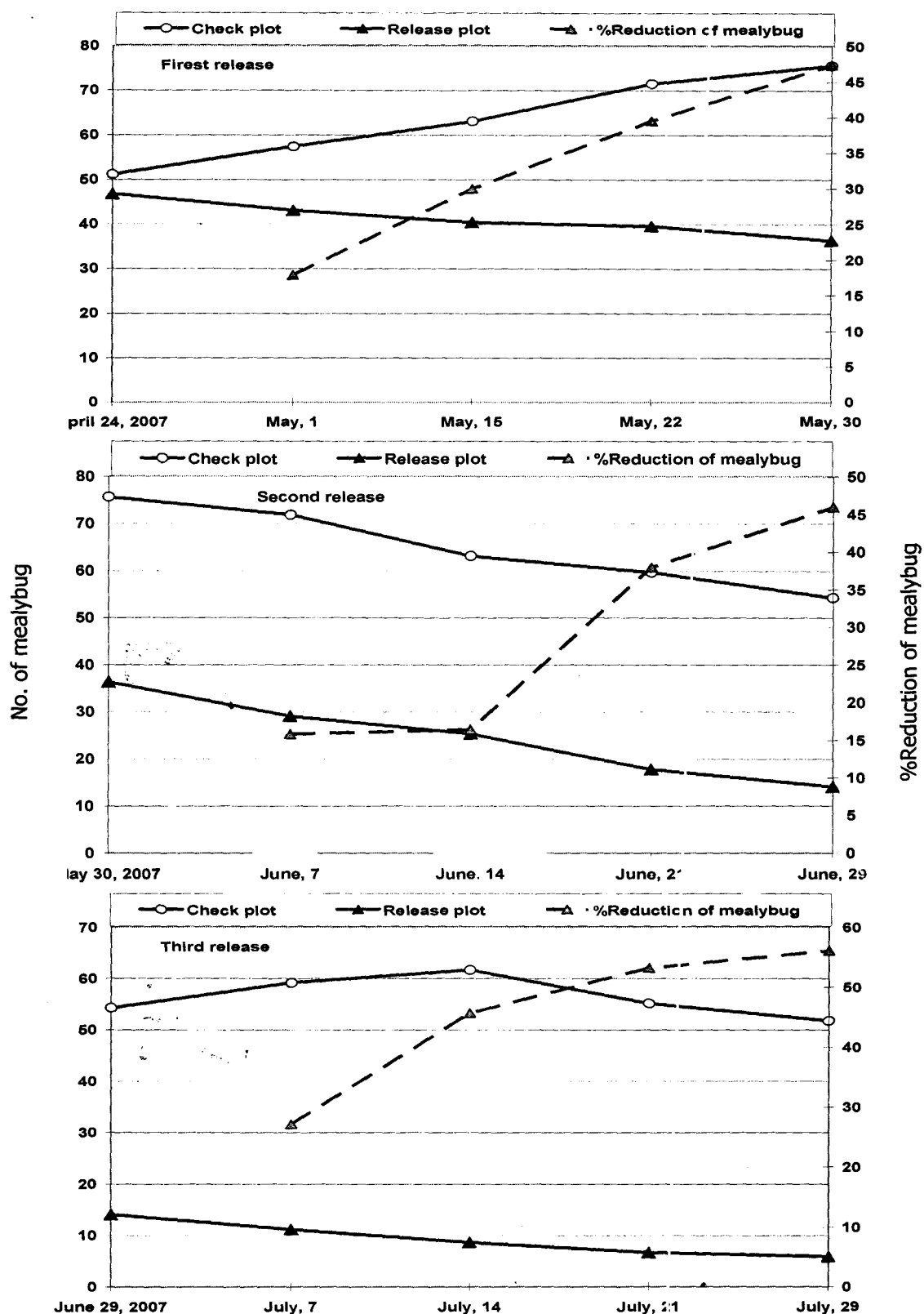


Fig. 4. Population fluctuation in the population numbers of the citrus mealybug, *Planococcus citri* (Risso) (Homoptera : Pseudococcidae) in the 1st plot release at level (5 larvae/tree) of the green lacewing, *Chrysoperla carnea* Steph. (Neuroptera: Chrysopidae), and the corresponding %reduction of the mealybug density on citrus trees during 2007.

1.2. Second level of release (10 larvae/tree)

In second level, the 1st releasing time occurred (after finishing the last inspection of the 1st release level) on late April; the pre-count in the releasing area with mealybug was 52.1 individuals/leaf, while it was also 56.4 individuals/leaf in (check trees). The results in Fig. (5) indicated that the number of *P. citri* in the 2nd release plot decreased gradually from 52.1 on late April to 41.6, 33.2, 29.3 and 25.1 individuals/leaf on the 1st, 2nd, 3rd and 4th week of May, respectively as compared to check plot where mealybug populations changed from 56.4 individuals/leaf on late April to 60.9, 66.1, 70.8 and 78.5 individuals/leaf in the same dates, respectively.

In addition, the results show that the percent reduction of mealybug population in 2nd release plot increased gradually to reach 26.05, 45.63, 55.20 and 65.39% on the 1st, 2nd, 3rd and 4th week of May, respectively.

The second releasing time occurred (after finishing the last inspection of the 1st release level) on late May; the pre-count in the releasing area with mealybug was 25.1 individuals/leaf, while it was also 78.5 individuals/leaf in check trees plot.

The results in Fig. (5) indicated that the number of *P. citri* in the 2nd release plot decreased gradually from 25.1 on late May to 17.5, 12.2, 10.7 and 7.2 individuals/leaf on the 1st, 2nd, 3rd and 4th week of June, respectively as compared to check plot where mealybug populations changed from 78.5 individuals/leaf on late May to 69.1, 61.5, 55.6 and 41.8 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 2nd release plot increased gradually to reach 46.13% on June.

Also, the third releasing time occurred (after finishing the last inspection of the 2nd release level) on late June; the pre-count in the releasing area with mealybug was 7.2 individuals/leaf, while it was also 41.8 individuals/leaf in check trees plot. The results in Fig. (5) indicated that the number of *P. citri* in the 3rd release plot decreased gradually from 7.2 on late June to 5.4, 4.7, 3.4 and 2.1 individuals/leaf on the 1st, 2nd, 3rd and 4th week of July, respectively as compared to check plot where mealybug populations changed from 41.8 individuals/leaf on late June to 49.2, 54.3, 59.1 and 63.7 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 2nd release plot increased gradually to reach 80.86% on July.

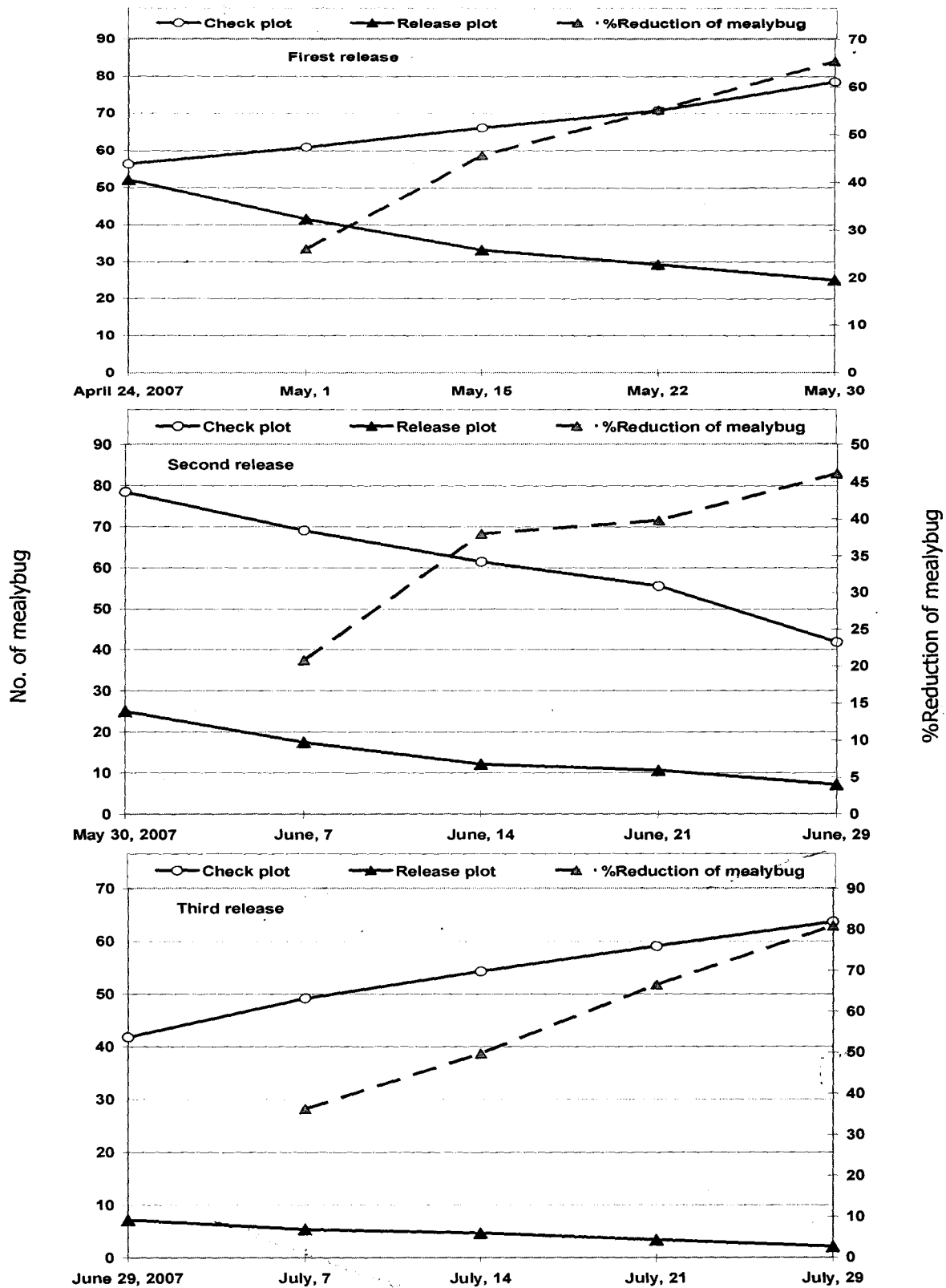


Fig. 5. Population fluctuation in the population numbers of the citrus mealybug, *Planococcus citri* (Risso) (Homoptera : Pseudococcidae) in the 2nd plot release at level (10 larvae/tree) of the green lacewing, *Chrysoperla carnea* Steph. (Neuroptera: Chrysopidae), and the corresponding %reduction of the mealybug density on citrus trees during 2007.

1.3. Third level of release (15 larvae/tree)

In third level of release, the first releasing time occurred on the late April; the pre-count in the releasing area with mealybug was 47.4 individuals/leaf, while it was also 46.8 individuals/leaf in check trees plot. The results in Fig. (6) indicated that the number of *P. citri* in the 3rd release plot decreased gradually from 47.4 on late April to 37.1, 28.1, 21.4 and 17.3 individuals/leaf on the 1st, 2nd, 3rd and 4th week of May, respectively as compared to check plot where mealybug populations changed from 46.8 individuals/leaf on late April to 54.6, 57.8, 64.5 and 67.5 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 3rd release plot increased gradually to reach 32.91, 51.99, 67.24 and 74.69% on the 1st, 2nd, 3rd and 4th week of May, respectively.

The second releasing time occurred (after finishing the last inspection of the 1st release level) on late May; the pre-count in the releasing area with mealybug was 17.3 individuals/leaf, while it was also 67.5 individuals/leaf in check trees. The results in Fig. (6) indicated that the number of *P. citri* in the 3rd release plot decreased gradually from 17.3 on late May to 11.8, 7.2, 5.1 and 4.1 individuals/leaf on the 1st, 2nd, 3rd and 4th week of June, respectively as compared to check plot (mealybug populations changed from 67.5 individuals/leaf on late May to 72.8, 61.7, 58.4 and 51.2 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 3rd release plot increased gradually to reach 68.76% on June.

Also, the third releasing time occurred (after finishing the last inspection of the 2nd release level) on late June; the pre-count in the releasing area with mealybug was 4.1 individuals/leaf, while it was also 51.2 individuals/leaf in check trees plot.

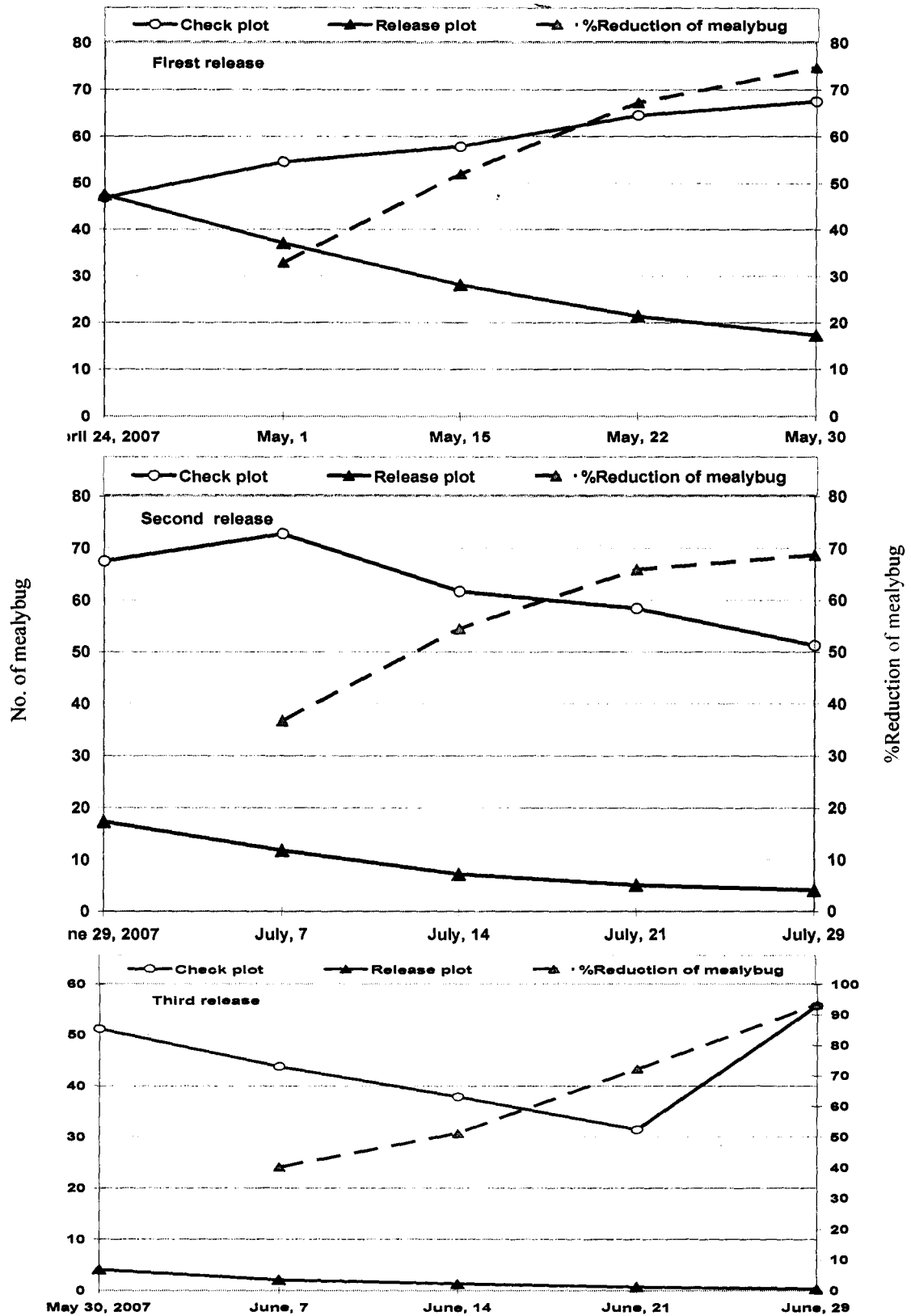


Fig. 6. Population fluctuation in the population numbers of the citrus mealybug, *Planococcus citri* (Risso) (Homoptera : Pseudococcidae) in the 2nd plot release at level (15 larvae/tree) of the green lacewing, *Chrysoperla carnea* Steph. (Neuroptera: Chrysopidae), and the corresponding %reduction of the mealybug density on citrus trees during 2007.

The results in Fig. (6) indicated that the number of *P. citri* in the 3rd release plot decreased gradually from 4.1 on late June to 2.1, 1.3, 0.7 and 0.3 individuals/leaf on the 1st, 2nd, 3rd and 4th week of July, respectively as compared to check plot where mealybug populations changed from 51.2 individuals/leaf on late June to 43.8, 37.9, 31.4 and 55.8 individuals/leaf in the same dates, respectively. In addition, the results show that the percent reduction of mealybug population in 3rd release plot increased gradually to reach 93.29% on July.

Table 1. Percent reduction in the citrus mealybug, *Planococcus citri* (Risso) (Homoptera : Pseudococcidae) after the successive releasing levels (5, 10 and 15 larvae/tree) of the green lacewing, *Chrysoperla carnea* Steph. (Neuroptera: Chrysopidae) on citrus trees during 2006 and 2007.

Release level	Release time	% Reduction in mealybug population		Average
		2006	2007	
5	Late April	36.68	47.39	42.04
	Late May	53.67	45.99	49.83
	Late June	66.08	56.14	61.11
10	Late April	68.24	65.39	66.82
	Late May	53.09	46.39	49.74
	Late June	82.75	80.86	81.81
15	Late April	71.00	74.69	72.85
	Late May	55.71	68.76	62.24
	Late June	98.66	93.29	95.98
F 0.05 =	-	0.009 ns		-
LSD =		-		-

Statistical analysis in Table (1) revealed differences in responses to the three successive releasing levels of *Chrysoperla carnea* for management *P. citri* during 2006 and 2007 seasons that proved no significant among the two seasons (F= 0.009, P<0.05).

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المكافحة الحيوية لبق الموالح الدقيقي عن طريق إطلاق مستويات مختلفة لمفترس أسد المن على أشجار الموالح

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في هذا العمل وجد أن مفترس أسد المن لعب دور هام في خفض تعداد بق الموالح الدقيقي الذي يصيب أشجار الموالح. أجري هذا البحث لتقييم ثلاث مستويات لإطلاق أسد المن (٥، ١٠، ١٥ يرقة أسد المن/شجرة) في نهاية أبريل ونهاية مايو ونهاية يونيو في خفض تعداد بق الموالح الدقيقي على أشجار الموالح بمحافظة الغربية خلال موسمين متتاليين ٢٠٠٦، ٢٠٠٧.

أوضحت النتائج أن معدل الخفض في تعداد البق الدقيقي تزايدت بمرور الوقت حتي وصلت الي أقصاها عند مستوي الإطلاق الثالث (١٥ يرقة/شجرة) حيث وصلت نسبة الخفض في التعداد الي ٦٦،٠٨، ٨٢،٧٥، ٩٨،٦٦% في نهاية شهر يوليو عند الثلاث مستويات من الإطلاق علي الترتيب وذلك خلال موسم ٢٠٠٦. وعلي نفس المنوال كانت نتائج العام التالي ٢٠٠٧ حيث وصلت نسبة الخفض في التعداد الي ٥٦،١٤، ٨٠،٨٦، ٩٣،٩٢% ٦٦،٠٨، ٨٢،٧٥، ٩٨،٦٦% في نهاية شهر يوليو عند الثلاث مستويات من الإطلاق علي الترتيب. كمت أوضحت النتائج أيضا عدم وجود فروق معنوية بين الثلاث إطلاقات وبين الموسمين (٢٠٠٦، ٢٠٠٧).

ومن النتائج السابقة يمكن استخدام المفترس أسد المن بنجاح كأحد عناصر المكافحة البيولوجية الفعالة في برامج المكافحة المتكاملة لبق الموالح الدقيقي على أشجار الموالح.