



Short communication

Evaluation of Australian ladybird beetle *Cryptolaemus montrouzieri* Mulsant against green shield scale *Chloropulvinaria psidii* (Maskell) on some medicinal plants

M. Mani* and A. Krishnamoorthy

Division of Entomology and Nematology
Indian Institute of Horticultural Research, Bangalore -560 089, India
E-mail: mmani1949@yahoo.co.in

ABSTRACT

Severe infestation of green shield scale *Chloropulvinaria psidii* (Green) was observed during 2003-04 on the medicinal plants namely *Withania somnifera*, *Madhuca longifolia*, *Mimusops elengi* and *Wrightia tinctoria*. The Australian ladybird beetle *Cryptolaemus montrouzieri* Mulsant was released @ 20 larvae/plant. Following the release of *C. montrouzieri*, the scale population declined from 173.48 to 4.35 /plant on *W. somnifera*, 30.49 to 1.20/plant on *M. longifolia*, 90.20 to 3.57/plant on *M. elengi* and 240.86 to 4.92/plant on *W. tinctoria*. There was 89.13 to 97.96% reduction in scale population 45-75 days after release of *C. montrouzieri* on the above medicinal plants. No other natural enemy, except *C. montrouzieri*, was recorded on *C. psidii*. There was no correlation between temperature, relative humidity or rainfall and scale population. Hence, the reduction in population of green shield scale was attributed mainly to the action of *C. montrouzieri*.

Key words: *Chloropulvinaria psidii*, *Cryptolaemus montrouzieri*, *Withania somnifera*, *Madhuca longifolia*, *Mimusops elengi*, *Wrightia tinctoria*

In recent years, the green shield scale *Chloropulvinaria psidii* (Green), has become a serious pest of several medicinal plants in India. Severe infestation of *C. psidii* was observed in June 2003 on *Withania somnifera* and in February 2004 on *Madhuca longifolia*, *Mimusops elengi* and *Wrightia tinctoria* at the IIHR farm. The scale insects suck cell sap resulting in loss of vigour in medicinal plants. Nymphs and adults excrete 'honeydew' resulting in development of sooty mold, thereby hindering photosynthetic activity of the scale-infested plants. Although some insecticides have been recommended for control of *C. psidii* (Pawar *et al*, 1981; Visalakshi *et al*, 1981), it is difficult to achieve perfect control of the green shield scales with conventional insecticides, mainly due to the mealy covering over their bodies (Chatterji and Datta, 1974). Eggs of the scales, protected by a waxy filamentous secretion of the ovisac, are almost impossible to reach with insecticides. On the other hand, scale insects (being sessile in nature) are more amenable to biological control. The Australian ladybird beetle, *Cryptolaemus montrouzieri* Mulsant, has been reported to be effective against various species of green shield scales (Mani and Krishnamoorthy, 1997a). The present study was conducted to evaluate the impact of *C. montrouzieri* in suppression of *C. psidii* on

the above mentioned four medicinal plants.

Culture of *Cryptolaemus montrouzieri*

Cryptolaemus montrouzieri was multiplied on mealy bug infested pumpkin fruits (*Cucurbita moschata* Linn.) as described by Chacko *et al* (1978) at 26±2°C and 60-70% RH in the laboratory.

Selection of experimental area

The study was conducted at the IIHR farm, Bangalore Rural District, on four medicinal plants during 2003-04. Only plants infested with the green shield scale were selected for the study.

Field release of *C. montrouzieri*

Ants afforded protection to the green shield scale from natural enemies, resulting in increase in the scale population (Briese, 1982). In the present study, ants were controlled by applying chlorpyrifos @ 0.05% in the ant holes, as suggested by Tumminelli *et al* (1997). Application of insecticides on the medicinal plants was arrested a fortnight prior to the release of *C. montrouzieri*. Larvae of *C. montrouzieri* @ 20 /plant were released on scale-infested plants.

*Present address: National Research Centre for Grapes, Pune-412307.

Table 1. Population of *Chloropulvinaria psidii* and *Cryptolaemus montrouzieri* on *W. somnifera*

Date	Mean population/plant ± S.D.			% reduction in scale population in biocontrol
	Check	Biocontrol		
	<i>C. psidii</i>	<i>C. psidii</i>	<i>C. montrouzieri</i>	
22-06-2003	150.48 ± 6.56	173.48 ± 10.24	—	—
08-07-2003	164.16 ± 5.96	162.84 ± 8.64	4.68 ± 3.40	6.16
23-07-2003	185.74 ± 9.82	110.50 ± 7.80	6.62 ± 2.02	36.30
07-08-2003	180.88 ± 6.43	60.25 ± 5.94	9.46 ± 5.60	65.27
22-08-2003	214.66 ± 12.38	4.35 ± 2.87	4.28 ± 2.65	97.49

S.D = Standard deviation

Table 2. Population of *Chloropulvinaria psidii* and *Cryptolaemus montrouzieri* on *Madhuca longifolia*

Date	Mean population/plant ± S.D.			% reduction in scale population in biocontrol
	Check	Biocontrol		
	<i>C. psidii</i>	<i>C. psidii</i>	<i>C. montrouzieri</i>	
12-02-2004	42.14 ± 6.36	30.49 ± 6.32	—	—
27-02-2004	53.85 ± 7.28	26.64 ± 4.64	2.46 ± 1.84	12.62
11-03- 2004	65.27 ± 5.83	10.40 ± 3.80	6.89 ± 2.85	65.89
22-03-2004	80.69 ± 6.28	1.20 ± 0.68	4.64 ± 1.96	96.06

S.D = Standard deviation

Table 3. Population of *Chloropulvinaria psidii* and *Cryptolaemus montrouzieri* on *Mimusops elengi*

Date	Mean population/plant ± S.D.			% reduction in scale population in biocontrol
	Check	Biocontrol		
	<i>C. psidii</i>	<i>C. psidii</i>	<i>C. montrouzieri</i>	
12-02-2004	80.45 ± 6.24	90.20 ± 10.42	—	—
27-02-2004	96.17 ± 7.94	86.83 ± 8.45	3.58 ± 2.40	3.74
11-03- 2004	125.65 ± 10.42	65.32 ± 5.28	6.82 ± 3.80	27.58
22-03-2004	158.90 ± 12.94	30.54 ± 4.82	5.50 ± 3.50	66.14
12-04-2004	172.64 ± 10.68	3.57 ± 0.94	4.78 ± 0.95	89.13

S.D = Standard deviation

Sampling and evaluation

Scale population was recorded at fortnightly intervals on 10 randomly selected plants infested with scales during the study. In each plant, five shoots were selected for counting the green shield scales. Activity of locally occurring natural enemies, if any, was studied by collecting the scale - infested shoots and keeping the same in cages for emergence.

Data on weather parameters, viz., maximum and minimum temperature (°C), relative humidity (%) and rainfall (mm) were collected during the period of study. Correlation between the green shield scale and weather factors was worked out to determine influence of weather on green shield scale population present on these medicinal plants.

Results on population trend in green shield scale *C. psidii* on *W. somnifera* are presented in Table 1. Pre-release count of 173.48 scales / plant was observed on 22nd June, 2003. The scale population declined to 110.50/plant one month after the release of *C. montrouzieri*. The population of *C. montrouzieri* ranged from 4.68 to 9.46 per

plant during the study period. Plants released with the predator had 4.35 scale insects in the last week of August 2003 as compared to 214.66 on check plants. The coccinellid predator *C. montrouzieri* was found preying on *C. psidii* on *W. somnifera* plants throughout the study period.

The trend of scale population on *M. longifolia* is presented in Table 2. Pre-release count of 30.49 scales/plant was observed on 12th February, 2004. The scale population declined to 10.40/plant one month after the release of *C. montrouzieri*. The population of *C. montrouzieri* ranged from 2.46 to 6.89 /plant during the study period. Plants released with the predator had 1.20 scale insects in the third week of March 2004 as compared to 80.69 on check plants.

Similar results were obtained on *M. elengi*. Plants released with the predator had 3.57 scales as compared to 172.64 on check plants, two months from release of *Cryptolaemus* (Table 3). On *W. tinctoria* also, the scale population was effectively reduced to 4.92 as compared to 265.40 scales on check plants (Table 4).

Table 4. Population of *Chloropulvinaria psidii* and *Cryptolaemus montrouzieri* on *Wrightia tinctoria*

Date	Mean population/plant \pm S.D.			% reduction in scale population in biocontrol
	Check	Biocontrol		
	<i>C. psidii</i>	<i>C. psidii</i>	<i>C. montrouzieri</i>	
12-02-2004	194.27 \pm 8.56	240.86 \pm 14.57	—	—
27-02-2004	210.86 \pm 9.46	154.25 \pm 7.64	5.00 \pm 3.40	35.96
11-03- 2004	234.84 \pm 12.60	124.63 \pm 8.0	9.40 \pm 4.80	48.26
22-03-2004	256.80 \pm 10.58	73.24 \pm 6.94	8.40 \pm 3.86	69.59
12-04-2004	248.95 \pm 9.80	43.64 \pm 4.26	8.62 \pm 3.02	81.88
27-04-2004	265.40 \pm 14.40	4.92 \pm 1.46	3.68 \pm 0.86	97.96

S.D = Standard deviation

In the present investigation, there was a reduction of 97.49%, 96.06%, 89.13% and 97.96% in the green shield scale population after 60, 45, 60 and 75 days of *Cryptolaemus* release on *W. somnifera*, *M. longifolia*, *M. elengi* and *W. tinctoria*, respectively. There was no correlation between weather factors like temperature, humidity and rainfall and population of the green shield scale. No other natural enemy, except *C. montrouzieri* was recorded on *C. psidii* during the study period and reduction in the population of green shield scale was attributed mainly to action of the predator *C. montrouzieri* on all the four medicinal plants studied.

Cryptolaemus montrouzieri gave control of several species of *Chloropulvinaria* on many crops. *Cryptolaemus montrouzieri* was found to be effective in suppressing *Chloropulvinaria aurantii* (Ckll.) and *Chloropulvinaria floccifera* (Westw.) (Kolotov, 1939), *Chloropulvinaria polygonata* (Ckll.) on mango (Mani and Krishnamoorthy, 1998) and *C. psidii* on lemon, guava, sapota and fig (Mani and Krishnamoorthy, 1999; Mani and Krishnamoorthy, 1990; Mani and Krishnamoorthy, 1997b; Kumar and Prakasam, 1984) and *Chloropulvinaria maxima* (Valt.) on neem (Tirumala Rao and David, 1958).

ACKNOWLEDGEMENT

The authors are grateful to Director, IIHR, for providing facilities to conduct the study. Technical help rendered by Mr. G.L. Pattar is also gratefully acknowledged.

REFERENCES

- Briese, D.T. 1982. Damage to saltbush by the coccid *Pulvinaria maskelli* Olliff and the role played by an attendant. *J. Austr. Entomol. Soc.*, **21**:293-294
- Chacko, M.J., Bhat, P.K., Rao, L.V.A., Deepak Singh, M.B., Ramanarayan, E.P. and Sreedharan, K. 1978. The use of the ladybird beetle *Cryptolaemus montrouzieri* for the control of coffee mealybugs. *J.*

Coffee Res., **88**:14-19

- Chatterji, A. and Datta, A.D. 1974. Bionomics and control of mango mealy scale, *Chloropulvinaria (Pulvinaria) polygonata* (Cockerell) (Hemiptera: Coccidae) *Ind. J. Agril. Sci.*, **44**:791-795
- Kolotov, D.G. 1939. Results of the experiment with the application of *Cryptolaemus* for the control of the mealybug in Abkhazia. *Rept. Sci. Meet. Leningrad Institute of Agriculture, Cf RAE* (1939) p. 454
- Kumar, M.G. and Prakasam, C.B. 1984. The recovery of *Cryptolaemus montrouzieri* Muls. on the coffee green scale, *Coccus viridis* (Green), on the Shevroy Hills. *Ind. J. Agril. Sci.*, **14**:34-35
- Mani, M. and Krishnamoorthy, A. 1990. Evaluation of the exotic predator *Cryptolaemus montrouzieri* Muls. (Coccinellidae, Coleoptera) in the suppression of green shield scale *Chloropulvinaria psidii* (Maskell) (Coccidae, Homoptera) on guava. *Entomon*, **15**:45-48
- Mani, M. and Krishnamoorthy, A. 1997a. Australian ladybird beetle, *Cryptolaemus montrouzieri*. *Madras Agri. J.*, **84**:237-249
- Mani, M. and Krishnamoorthy, A. 1997b. Biological suppression of the soft green scale, *Coccus viridis* (Green), and the green shield scale, *Chloropulvinaria psidii* (Maskell), on sapota. *Pest Mgt. Hortl. Ecosyst.*, **3**:114-116
- Mani, M. and Krishnamoorthy, A. 1998. Biological control studies on the mango green shield scale, *Chloropulvinaria polygonata* (Ckll.) (Homoptera: Coccidae), in India. *Entomon*, **23**:105-110
- Mani, M. and Krishnamoorthy, A. 1999. Suppression of green shield scale, *Chloropulvinaria psidii* (Maskell), with Australian ladybird beetle on lemon. *Insect Envir.* **4**:116-117
- Pawar, M.B., Teli, U.S. Ambekar, J.S. and Kalbhoor, S.E.

1981. Efficacy of some organophosphorus insecticides of guava scale *Pulvinaria psidii* Maskell on guava. *Pestology*, **5**:21-29
- Tirumala Rao, V. and David, L.A. 1958. The biological control of a coccid pest in South India by the use of beetle, *Cryptolaemus montrouzieri* Muls. *Ind. J. Agril. Sci.*, **28**:545-552
- Tumminelli, R., Saraceno, F. and Conti, D. 1997. Ants in citrus groves. *Inform. Agrar.*, **53**:57-60
- Visalakshi, A., Beevi, S.N., Mathai, S. and Nair, M.R.G.K. 1981. On the occurrence of *Pulvinaria psidii* Maskell (*Coccidae: Hemiptera*) as pest of clove. *Entomon*, **6**:180

(MS Received 16 June 2008, Revised 6 November 2008)