Journal of Biological Control, 29(4): 179-182, 2015

Research Article

First host record for *Dichrogaster fulvescens seminigra* Townes (Hymenoptera: Ichneumonidae, Cryptinae), a parasitoid of *Mallada desjardinsi* (Navas) (Neuroptera: Chrysopidae) associated with tea ecosystem

K. K. SRIKUMAR*, A. P. RANJITH[1], B. S. KUMAR and B. RADHAKRISHNAN
Department of Entomology, UPASI Tea Research Foundation, Tea Research Institute, Valparai- 642 127, Tamil Nadu, India
[1]*Department of Zoology, University of Calicut, Malappuram – 673 635, Kerala, India*
Corresponding authors E-mail: sreeku08@gmail.com

ABSTRACT: The larva of green lacewing, *Mallada desjardinsi* (Navas) is an important predator of red spider mite (RSM) *Oligonychus coffeae*, infesting tea. *Mallada desjardinsi* is reported as potential biological control agent of *O. coffeae*, but the report on its parasitoids is scarce. Here we report the parasitism of *M. desjardinsi* by a species of ichneumon wasp. *Mallada desjardinsi* is the first host report for *Dichrogaster fulvescens seminigra* Townes, a sub species of *Dichrogaster fulvescens*. Five field collected larvae of *M. desjardinsi* were being found to be parasitized by this parasitoid. *Dichrogaster fulvescens* emerged after 9.5 days of pupal period.

KEY WORDS: *Oligonychus coffeae,* predator, parasitoid, tea, *Mallada desjardinsi*

(Article chronicle: Received: 03-10-2015; Revised: 30-10-2015; Accepted: 04-11-2015)

INTRODUCTION

The larvae of green lacewings are important predators largely used as biological control agents. They feed on many insect pests of economically important plants (McEwen *et al.,* 2001). Green lacewing adults are not predatory and feed mostly on nectar and pollen (Coppel and Mertins, 1977). Red spider mite (RSM), *Oligonychus coffeae* Nietner (Acari. Tetranychidae) is one of the major pests of tea, *Camellia sinensis* L. (O. Kuntze) causing 17-46 % crop loss in South India (Das, 1959, Muraleedharan *et al*. (2005) and Radhakrishnan, 2014). *Oligonychus coffeae* initially attack the upper surface of mature leaves, piercing and sucking the sap. Infestation ultimately leads to severe defoliation. Entire tea bush appear in red color under severe RSM infestation (Selvasundaram and Muraleedharan, 2003).

Mallada desjardinsi (Navas) (= *boninensis*) (Neuroptera: Chrysopidae), is reported as important predator of *O. coffeae* (Babu *et al*., 2004, Vasanthkumar and Babu, 2013). It is also considered as a generalist predator and reported as an important natural enemy of a variety of pests such as mealy bugs (Mani and Krishnamoorthi, 1987), white flies (Selvakumaran *et al*., 1996), bollworms and aphids (Kabissa *et al*., 1996). Although generalist predators lack prey specificity, they can exert a substantial impact on various pest complexes (Symondson *et al*., 2002).

Biological control measures are being adopted worldwide in order to overcome the problems caused by the application of conventional pesticides (Gillespie *et al*., 2000). In this context, several studies have been conducted on the green lacewing, *M. desjardinsi* especially on its biology, mass rearing and life table (Babu, *et al*., 2004, Vasanthakumar *et al*., 2012 and Vasanthkumar and Babu, 2013). But there is hardly any study on the parasitoids existing in tea ecosystem of this important predator. Here, we report the first cryptine ichneumonid parasitoid of *M. desjardindi* from south India.

MATERIALS AND METHODS

Recent surveys conducted at UPASI Experimental Farm of Anamallais (Coimbatore District, Tamil Nadu) (10º22´N, 76º58´E and 1065ma.s.l) could record several specimens of *M. desjardinsi* in red spider mite infested fields. These larvae were brought to laboratory and reared for the possible emergence of parasitoids. The parasitoid emerged from the *M. desjardinsi* pupae was identified at Department of Zoology, University of Calicut (DZUC).

Morphological terminology is mostly based on Gauld (1991). Images of the specimen were taken with a Leica DFC 295 camera attached to a Leica S8 APO Stereo zoom trinocular microscope. Image stacks were combined into a single image using Leica Auto montage Software V4.2. Composite images were edited using Adobe Photoshop CS8 to remove artifacts from stack processing and standardize background colour.

RESULTS AND DISCUSSION

In a total of 25 larvae of *M. desjardinsi* that pupated in the laboratory, five were found to be parasitized by *Dichrogaster fulvescens seminigra* Townes (Hymenoptera: Ichneumonidae). This is the first host report for *D. fulvescens seminigra*, a sub species of *D. fulvescens* and also the first host record of *Dichrogaster* on *M. desjardinsi. Mallada desjardinsi* life stages are portrayed in the Figure 1. *Dichrogaster fulvescens* emerged after 9.5 ± 0.8 days of pupal period. The cryptine ichneumonid genus *Dichrogaster* has been reported as external idiobionts of chrysopids and hemerobiids in cocoons (Clancy, 1946; Judd, 1950; Carlson, 1979; Pantaleoni, 1987; Schwarz and Shaw, 2000). Out of 44 world species, eight species were recorded from India (Townes 1983; Yu *et al*., 2012). The species can be easily identified by the combination of characters, a short, deep propodeum, broad head and opened areolet.

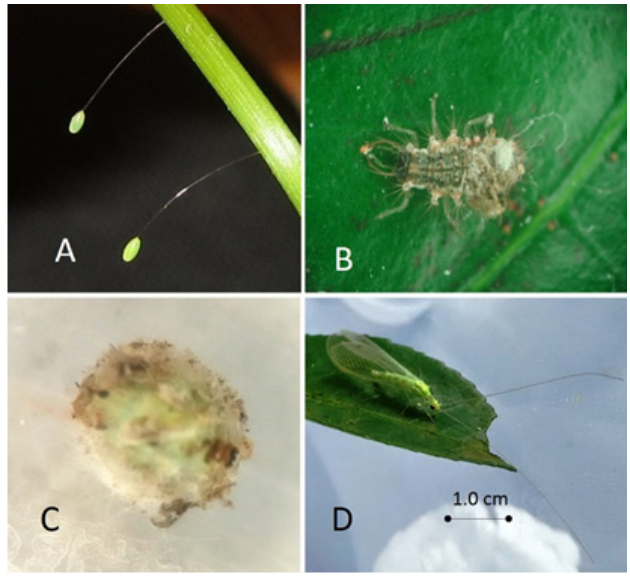

Fig. 1. ***Mallada desjardinsi*, A. Eggs, B. Larva, C. Pupa, D. Adult**

***Dichrogaster fulvescens seminigra* Townes.**

Diagnosis: Head black (Fig. 2A), scape, pedicel and mouth parts white. Flagellum blackish, brown basally. Propleuron, front and middle trochanters and hind first trochanter white. Pronotum brown with collar and large hind corner white (Fig. 2D). Mesoscutum black with large white

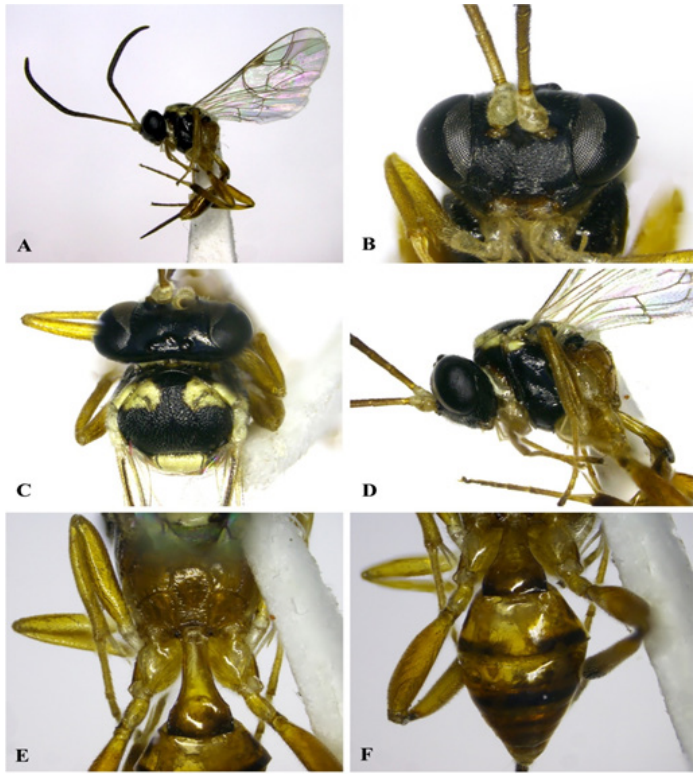

Fig. 2. ***Dichrogaster fulvescens seminigra* female A. Habitus, lateral view, B. Head, anterior view, C. Mesoscutum, dorsal view, D. Head and mesosoma, lateral view, E. Propodeum and tergite 1, dorsal view and F. Metasoma, dorsal view.**

humeral mark (Fig. 2C). Sub tegular ridge white (Fig. 2D). Propodeum, front and middle legs beyond trochanters, hind femur and abdomen pale fulvous. Wings hyaline.

Distribution. India (Jharkhand, Tamil Nadu (present record))

Host. *Mallada desjardinsi* (Navas)

Indiscriminate use of synthetic chemicals and improper execution of pest control measures have led to various problems, such as a resurgence of primary pests, destruction of natural enemies, development of resistance, undesirable residues on prepared tea and contamination of environment. Augmentation of natural enemies of RSM by effective mass culture of *M. desjardinsi* is one of the strategies to overcome these problems. A broader understanding of the tritrophic level interactions that encompasses parasitoid-predator can enhance our ability to design effective biological control strategies.

ACKNOWLEDGMENT

APR is thankful to Kazuhiko Konishi, Ehime University, Japan for sending invaluable literature of *Dichrogaster.*

REFERENCES

Babu A, Selvasundaram R, Muraleedharan N, Sasidhar R. 2004. A new predator of red spider mites. *News letter*. *UPASI Tea Res Foundation* **14**: 1–2.

Carlson RW. 1979. Ichneumonidae, pp. 315-710. In: Krombein KV, Hurd PD, Smith DR, Burks BD. (Eds). *Catalogue of Hymenoptera in America North of Mexico 1*, Smithsonian Institution Press, Washington, DC.

Clancy DW. 1946. *The insect parasites of the Chrysopidae* (*Neuroptera*). University of California Publications, Berkeley.

Coppel HC, Mertins J.W. 1977. *Biological insect pest suppression*. Springer, Berlin.

Das GM. 1959. Bionomics of the tea red spider, *Oligonychus coffeae* (Nietner). *Bull Entomol Res*. **50**: 265–274. http://dx.doi.org/10.1017/S0007485300054572

Gauld ID. 1991. The Ichneumonidae of Costa Rica, 1. Introduction, keys to subfamilies, and keys to the species of the lower Pimpliform subfamilies Rhyssinae, Poemeniinae, Acaenitinae and Cylloceriinae. *Mem Am Entomol Ins*. **47**: 1–589.

Gillespie DR, Opit G, Roitberg B. 2000. Effects of temperature and relative humidity on development, reproduction and predation in *Feltiella acarisuga* (Vallot) (Diptera: Cecidomyiidae). *Biol Control* **17**: 132-138. http://dx.doi: 10.1006/bcon.1999.0782

Judd WW. 1950. Emergence of the lacewing, *Chrysopa harrisii* Fitch (Neuroptera) and three hymenopterous parasites from the cocoon. *Ann Entomol Soc Am*. **42**: 461-464.

Kabissa JCB, Yarro JC, Kayumbo HY, Juliano SA. 1996. Functional responses of two chrysopid predators feeding on *Helicoverpa armigera* (Lep.: Noctuidae) and *Aphis gosssypii* (Hom.: Aphididae). *Entomophaga* **41**: 141–151. http://dx.doi: 10.1007/BF02764242

Mani M, Krishnamoorthy A. 1987. Feeding potential and development of lacewings, *Mallada boninensis* (Okamota) on the grape mealy bug, *Maconellicoccus hirsutus* (Green). *Entomon* **14**: 19-21.

McEwen P, New TR, Whittington AE. 2001. *Lacewings in the crop environment*. Cambridge University Press, Cambridge.

Muraleedharan N, Sudarmani DNP, Selvasundaram R. 2005. Bioecology and management of the red spider mite infesting tea in south India, pp. 756-766. In: *Proceedings of International symposium on innovation in tea science and sustainable development in tea industry. China Tea Science Society, Hangzhou China.*

Pantaleoni RA. 1987. Studi sui parassitoidi (Hym. Ichneumonidae et Pteromalidae) di *Chrysoperla carnea* (St.) (Neur. Chrysopidae) che ricercano ed aggrediscono gli staid racchiusi nel bozzolo. *Instisuto di Entomologia "Guido Grandi" dell'Universita di Bologna* **41**: 241–255.

Radhakrishnan, B. 2014: Recent advances in tea research. *Planter Chronic*. **110**: 32-37.

Schwarz M, Shaw MR. 2000. Western Palaearctic Cryptinae (Hymenoptera: Ichneumonidae) in the National Museums of Scotland, with nomenclatural changes, taxonomic notes, rearing records and special reference to the British check list. Part 3. Tribe Phygadeuontini, subtribes Chiroticina, Acrolytina, Hemitelina and Gelina (excluding Gelis), with descriptions of new species. *Entomol Gaz.* **51**: 147-186.

Selvakumaran S, Kallil M, Devasahayam S. 1996. Natural enemies of two major species of scale insects infesting black pepper (*Piper nigrum* L.) in India. *Pest Manag Horti Eco*. **2**: 79-83.

Selvasundaram R, Muraleedharan N. 2003. *Red spider mite biology and control*. UPASI Handbook of Tea Culture. UPASI Tea Research Foundation.

Symondson WOC, Sunderland KD, Greenstone MH. 2002. Can generalist predators be effective biocontrol agents?. *Ann Rev Entomol*. **47**: 561-594. http://dx.doi: 10.1146/*Ann Rev Entomol.* 47.091201.145240

Townes H. 1983. Revisions of twenty genera of Gelini (Ichneumonidae). *Memoir Am Entomol Inst.* **35**: 1–281.

Vasanthakumar D, Kumar RA, Rahman JV, Kumar P, Sundaravadivelan C, Babu A. 2012. Enhancement of reproductive potential of *Mallada boninensis* Okamoto (Neuroptera: Chrysopidae), a predator of red spider mite infesting tea: an evaluation of artificial diets. *Arch Biol Sci*. **64**: 281–285. http://dx.doi: 10.2298/ABS1201281V

Vasanthkumar D, Babu A. 2013. Life table and efficacy of *Mallada desjardinsi* (Chrysopidae: Neuroptera), an important predator of tea red spider mite, *Oligonychus coffeae* (Acari: Tetranychidae). *Exp Appl Acarol*. **61**: 43-47. http://dx.doi: 10.1007/s10493-013-9664-z.

Yu DS, van Achterberg C, Hortsmann K. 2012. *Home of Ichneumonoidea*. Available from: http://www.taxapad.com (accessed 19 September 2015).