J. Entomol. Res. Soc., 20(3): 67-73, 2018
Print ISSN:1302-0250

Research Article
Online ISSN:2651-3579

First Record of *Termatophylum orientale* Poppius (Hemiptera: Miridae: Deraeocorinae) from India with Biological Note

Richa VARSHNEY[1]* Yeshwanth H. M.[2]

[1] ICAR-National Bureau of Agricultural Insect Resources, P.B. No. 2491, H.A. Farm Post, Bellary Road, Hebbal, Bangalore-560024, INDIA. e-mail: *richavarshney84@gmail.com
[2] Department of Entomology, University of Agricultural Sciences, GKVK, Bangalore-560065 INDIA. e-mail: hmyeshwanth@gmail.com

ABSTRACT

Termatophylum orientale Poppius is being reported for the first time from India. It was collected from *Mangifera indica* (Mango, Anacardiaceae), *Carica papaya* (Papaya, Caricaceae) and *Peltophorum pterocarpum* (Copperpod, Fabaceae) where it shares niche along with other predators like anthocorids, geocorids and pests like thrips, mites and lepidopteran larvae. For the first time rearing protocol and biology has been given for this mirid.

Key words: Mango, Miridae, Deraeocorinae, Termatophylini, *Termatophylum orientale*, Thrips.

Varshney, R., Yeshwanth, H.M. (2018). First record of *Termatophylum orientale* Poppius (Hemiptera: Miridae: Deraeocorinae) from India with biological note. *Journal of the Entomological Research Society,* 20(3), 67-73.

INTRODUCTION

Mirid bugs of the tribe Termatophylini are known to inhabit inflorescences, moth larval galleries or rolled bark. They are known to feed on thrips, besides feeding on nectar and pollen (Cassis, 1995; Cassis *et al*., 2011; Yasunaga *et al*., 2001). Three species of the genus *Termatophylidea* Reuter and Poppius were reported to attack on the cacao thrips, occupying the niche shared by anthocorids. It is assumed that these mirids are obligate predators and feed exclusively on thrips. Both immature stages and adults of *Termatophylidea maculate* Usinger were reported to feed on cacao thrips present on the underside of the leaves of cacao and cashew (Callan, 1975). However, biology of *T. maculate* is unknown.

From India, so far two species of *Termatophylum* Reuter and one species of *Termatophylina* Carvalho have been reported in the tribe Termatophylini of the subfamily Dereaocorinae (Cassis, 1995). So far fifteen species of *Termatophylum* have been reported worldwide (online catalogue Schuh, 2002-2013). During recent field work, *Termatophylum orientale* Poppius was collected from mango (Anacardiacae), papaya (Caricaceae) and flowers of copper pod tree (*Peltophorum pterocarpum*) (Fabaceae) wherein it was found associated with thrips and other predators. Earlier it was reported from Taiwan and later from Japan by Nakatani (1997). Current study reports this species for the first time from India. The present note provides the host plants details, diagnosis of the species with illustrations of genitalia, rearing protocol and biology.

MATERIAL AND METHODS

Mirids were collected from the above mentioned host plants and brought to the laboratory. The specimens were studied under stereo zoom binocular microscope. Illustrations of male genitalia were drawn using a Leica DM2000 attached to a camera lucida. Photographs of different nymphal instars and adult were taken using a Leica M205C. Attempts were made to rear and study its biology in the laboratory on eggs of *Corcyra cephalonica* (Stainton) (Lepidoptera, Pyralidae) (National Accession number: NBAII-MP-PYR-01).

Rearing protocol

Termatophylum orientale was reared in the laboratory on bean pods and UV-irradiated *C. cephalonica* eggs. Pearlpet® plastic containers (500 ml capacity) were used for multiplication. The floor of containers was provided with tissue paper. In each container, 5-6 pieces of bean pods were placed as oviposition substrate for egg laying along with cotton lint (to avoid cannibalism) and *C. cephalonica* eggs were sprinkled on it. A swab of cotton soaked in water was stuck to the wall of the container. One container could hold up to 30 adults.

Adult bugs laid their eggs inserted into the sides of the bean pods in small groups (usually 3-4) or singly, with only the operculum of the eggs visible. After 24 hours, the bean pods with eggs were removed and placed in small, round, ventilated plastic containers (diameter 6.5 cm and height 2.5 cm). After 3-5 days when the nymphs

hatched, they were shifted to pearlpet® jars provided with *Corcyra cephalonica* eggs on bean pods. *C. cephalonica* eggs were provided for feeding on every alternate days till the nymphs developed into adults. Once they developed into adults the freshly moulted adults were shifted to the jars for mating and egg laying with pieces of bean pods for oviposition. Containers were kept in an incubator at 25°C, 60-70% RH, and a photoperiod of 12:12 (L: D) h.

Species, *T. insigne* Reuter from Egypt was reared in the laboratory on larvae of *Tribolium confusum* Jacquelin du Val, *Lasioderma serricornae* (Fabricius) and *Stegobium paniceum* (Linnaeus) (Awadallah *et al*., 1986). They found a higher reproductive potential on *T. confusum* than on other storage pests.

Biological parameters and morphometry

Termatophylum orientale, with the above discussed rearing method or technique, was reared successfully and continuously till date of manuscript submission. To study biology of this mirid, one pair of adult was released into each pearlpet plastic container (200 ml) covered with black cloth. Ten such sets were maintained. Each container was provided with UV-irradiated *C. cephalonica* eggs as feeding and bean pieces (2-3) for egg laying. After every 24 h, bean pods were collected and observed under microscope to record number of eggs laid. Eggs were collected, counted and beans with eggs were placed in small, round, ventilated plastic boxes (diameter 6.5 cm and height 2.5 cm) for hatching separately.

The number of nymphs, which hatched from total eggs collected from each container, was counted for calculating per cent hatching. Ten freshly hatched nymphs per set were kept individually in plastic boxes provided with UV-irradiated *C. cephalonica* eggs. Observations were recorded on total number of instars, duration of each instar and total nymphal period. When adults were formed, they were collected and observed under microscope to differentiate the sex. Per cent adults formed was calculated based on the number of healthy adults developed from the total number of nymphs which hatched in each set. Longevity of adult *T. orientale* was recorded. Morphometrics of nymphal and adult stages were measured by using ocular and stage micrometers. The measurements indicated in the text are expressed in millimeters.

Taxonomy

Tribe Termatophylini Reuter, 1884

Genus *Termatophylum* Reuter, 1884

***Termatophylum* Reuter, 1884: 218. Type species: *Termatophylum insigne* Reuter, 1884.**

***Termatophylum orientale* Poppius 1915 (Figs. 1A, 1B and 1C)**

Key diagnostic characters

Easily recognized by dark brown to black coloration of dorsum, large eyes and strongly projecting apex of head and a longitudinal depression on the vertex. Male

genitalia with left paramere blade like; right paramere reduced or vestigial; vesica without sclerites.

Brief description

Colouration: Body dark brown to black; head, pronotum, scutellum dark brown; membrane smoke grey; antennal segment III, IV, labium and legs pale yellow; embolium and apical half of cuneus tinged with red. Body complete shining with dorsum covered with evenly distributed elongate shining golden yellow setae. Head moderately produced in front with frons and vertex moderately punctuate, vertex with a shallow longitudinal impression; eyes large occupying entire height of the head in lateral view. Antennal segment I tubular, slightly longer than the tylus; segment II basally narrow and rest portion enlarged or tubular, slightly shorter or subequal to length of segment II and IV together; segments III and IV narrow, subequal in length; labium long reaching mesocoxae. Pronotum with narrow anterior and posterior regions, with a prominent neck as wide as width of vertex; anterior pronotal region with a prominently marked calli, posterior pronotal margin nearly straight, lateral margins weak sinuate; scutellum short broadly triangular; scent gland with a prominent peritreme. Hemelytra short, broad, with prominent embolium, cuneus prominent, wider and broadly triangular; membrane with a single large primary cell; legs elongate, all femora cylindrical, all tibia elongate, fore legs widely separated from middle legs; mid and hind legs very close, claws cleft at apex.

Male genitalia: Genital capsule short and broad (Fig. 1A); left paramere with a well developed sensory lobe with elongate setae, hypophysis flattened, blade like towards the apex (Figs. 1B and C), right paramere vestigial, vesica membranous without any spicules.

Distribution: Japan, Taiwan, and India (new record).

Material examined: INDIA: Karnataka: Kanakapura, 4 ♂♂, 4 ♀♀, 16.11.2016, Richa Varshney, on Mango tree; Bagalur, Richa Varshney, on Copperpod tree (*Peltophorum pterocarpum*).

All specimens have been deposited in the insect museum of ICAR- National Bureau of Agricultural Insect Resources, Bangalore, India.

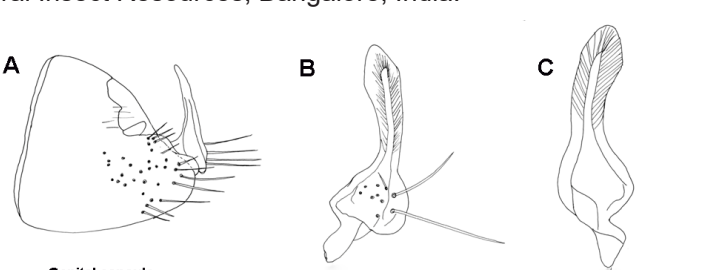

Fig. 1. Male genitalia of *Termatophylum orientale* Poppius A) Genital capsule B) Left paramere (dorsal view) C) Left paramere (ventral view).

Host Plants: In mango, it was collected from leaf web made by leaf webber *Orthaga exvinacea* (Hampson) larvae where it was found to feed on thrips and other arthropods. However its feeding on neonates of mango leaf webber is not clear. The same niche

is shared by other predatory hemipterans *viz*. anthocorid, geocorids, etc. Immature stages of this mirid were found inside the inflorescence and leaf webs.

In mango, population of this mirid was observed during December and continues to multiply till March in dried inflorescence. Similar observations were made by Rafeeq and Ranjini (2013) on two species of mirids i.e. *Termatophylina indiana* Carvalho (Dearaecorinae) and *Charagochilus* sp. (Mirinae) in dried larval web formed by *Orthaga exvinacea* in Mango.

In *Peltophorum* (copperpod tree, Fabaceae), *T. orientale* along with anthocorid, *Blaptostethus pallescens* Poppius was observed in the yellow inflorescence infested with thrips. In papaya it was found to be associated with other anthocorids along with papaya mealy bug *Paracoccus marginatus* Williams and Granara de Willink (Pseudococcidae).

Biology: It was observed that this mirid on an average laid 45-50 eggs singly or in group of 3 and 4 eggs embedded on the side of bean pod. Eggs are white, ovoid with red opercula exposed on the surface. Two silvery white thread like structures are present at both the side of operculum (Figs. 2A and B). After 3-5 days nymphs start emerging. The newly hatched nymphs when fed on UV -irradiated eggs of *Corcyra cephalonica*, undergo five nymphal instars and became adults in about 16-21 days.

First instar: Total length-0.97, width-0.34, antennal length-0.41, labium-0.43, pronotum width-0.22.

Newly hatched nymph is light orange in colour. Immediately after hatching, for few hours they feed on beans. After 1 -2 days nymph turns to brown red. Antennae are 4 segmented. First two segments are dark brown and swollen, remaining two segments are thread like. Two chocolaty brown shields appear on thorax on third day. Abdomen is swollen. Duration of first nymphal instar is 3-5 days (Fig. 2C).

Second instar: Total length-1.05, width-0.47, antennal length-0.51, labium-0.51, pronotum width-0.28.

Second instar nymph is dark red in colour. Eyes become more prominent and occupy mid lower portion. Coxae and femur are brownish red. Duration of second instar is 2-3 days (Fig. 2D).

Third instar: Total length-1.59, width-0.54, antennal length-0.59, labium-0.65, pronotum width-0.36.

Wing pad starts developing and occupying upper 1/3rd area of abdomen. The average duration of third instar nymph is 2.6 days (Fig. 2E).

Fourth instar: Total length-1.95, width-0.70, antennal length-0.72, labium-0.77, pronotum width-0.44.

Wing pads become prominent. After 2-4 days 4th instar nymph moults into 5th instar.

Fifth Instar: Total length-2.57, width-0.93, antennal length-0.90, labium-0.85, pronotum width-0.55. The fifth instar moults to become an adult with full black body and fully developed wings in 3-4 days. Average nymphal and developmental period for this mirid were 15.2 and 18.8 days, respectively when reared on *C. cephalonica* eggs. Average percent hatchability was 67.2.

Adult male: Total length-2.67, width-0.98, antennal length-0.99, labium-0.93, pronotum width-0.81; Adult female: Total length-3.06, width-1.16, antennal length-1.00, labium-0.97, pronotum width-0.97 (Fig. 2F).

Mating occurs after 1-2 days of emergence. Female continues to lay eggs till the death. Adult longevity is 15-20 days (Table 1). Sex ratio was 1.25:1.00 (female:male) indicating balanced sex ratio in the laboratory and thus as ideal candidate for mass rearing in insectaries. Female is larger in size than male.

The study indicated that this insect can be intensively cultured, without encountering problems of cannibalism and excessive handling. Furthermore investigation is being carried out to understand its feeding preferences and its interactions with other predators and pests which share same niche. Their behavior, whether they are obligatory or facultative predator, needs to be investigated.

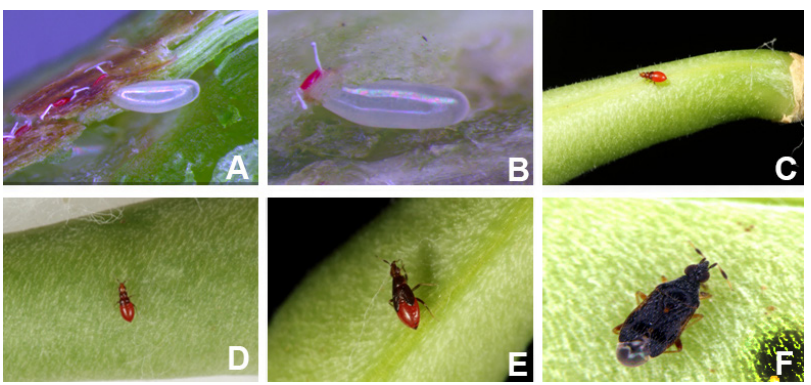

Fig. 2. Different stages of *Termatophylum orientale* Poppius. a Eggs laid in row with operculum exposed b. Larger view of egg c. First instar d. Second instar e. Third Instar f. Adult.

Table 1. Biology of *Termatophylum orientale* reared on *Corcyra cephalonica* eggs.

Stage	Mean±SE	Range
Incubation period	3.6±0.4	3-5
First instar	3.8±0.37	3-5
Second instar	2.6±0.24	2-3
Third instar	2.6±0.24	2-3
Fourth instar	2.8±0.37	2-4
Fifth instar	3.4±0.24	3-4
Total nymphal duration	15.2±0.86	13-18
Total developmental period	18.8±0.96	16-21
Adult longevity	17.8±1.77	15-20
Eggs/female	47.2±0.97	45-50
Per cent eggs hatched	67.2±1.85	62-72

ACKNOWLEDGEMENTS

The Authors are grateful to Director, National Bureau of Agricultural Insect Resources, Bangalore, India and the Indian Council of Agricultural Research, India, for the facilities provided for conducting the study. Authors are also thankful to Dr. Ankita gupta, Scientist, NBAIR for her valuable comments on the manuscript and to Dr. Y. Lalitha for providing *Corcyra cephalonica* eggs.

Conflict of Interest: The authors declare that they have no conflict of interest because this paper is a part of project. The collection, rearing and biological study was done by first author. Second author made the description of the species.

REFERENCES

Awadallah, K. T., Tawfik, M. F. S., El-Husseini, M. M., Afifi, A. I., 1986, Biocycle of termatophilid predator, *Termatophylum insigne* (Reut.) reared on major insect pests of stored drug material. *Bulletin of the Entomological Society of Egypt*, 66: 35-41.

Callan, E. McC., 1975, Miridae of the genus Termatophylidea (Hemiptera) as predators of cacao thrips. *Entomophaga*, 20: 389-391.

Cassis, G., 1995, A reclassification and phylogeny of the Termatophylini (Heteroptera: Miridae: Deraeocorinae), with a taxonomic revision of the Australian species, and a review of the tribal classification of the Deraeocorinae. *Proceedings of the Entomological Society of Washington*, 97: 258-330.

Cassis, G., Tatarnic, N., Symonds, C., 2011, Systematics of the moth larval-feeding genus *Kundakimuka* Cassis (Heteroptera: Miridae: Deraeocorinae: Termatophylini). *Heteropterus Revista de Entomologia*, 11: 215-225.

Nakatani, Y., 1997, Taxonomic study of the genus *Termatophylum* Reuter from Japan (Heteroptera, Miridae). *Japanese Journal of Entomology*, 65: 593-599.

Rafeeq, A. P. M. M., Ranjini, K. R., 2013, Field survey of associated mirid fauna of the mango leaf webber pest, *Orthaga exvinacea* Hampson (Lepidoptera: Pyralidae). *Journal of Experimental Zoology, India,* 16(2): 705-708.

Reuter, O. M., 1884. Genera nova Hemipterorum. IV. Thermatophylina nova subfamilia Anthocoridarum ex Aegypto. *Wiener Entomologische Zeitung*, 3: 218-219.

Schuh, R. T., 2002-2013, On-line Systematic Catalog of Plant Bugs (Insecta: Heteroptera: Miridae). Available from: http:// research.amnh.org/pbi/catalog/ (accessed 16 June 2017).

Yasunaga T., Takai, M., Kawasawa T., 2001, *A field guide to Japanese bugs II*. Zenkoku Noson Kyoiku Kyokai Publ. Co. Ltd., Tokyo, 350.

Received: July 17, 2017 *Accepted: March 16, 2018*