https://doi.org/10.33307/entomon.v47i2.720
ENTOMON 47(2): 179-182 (2022)
Short communication No. ent. 47213

Record of *Coranus siva* Kirkaldy (Hemiptera: Reduviidae) on coffee berry borer, *Hypothenemus hampei* Ferrari (Coleoptera: Curculionidae) in India

R. Kiran[#] and Melally G. Venkatesha[*]

Insect Science Laboratory, Department of Zoology, Bangalore University, Bengaluru 560056, Karantaka, India.
[#]Present address: Central Sericulture Research and Training Institute, Central Silk Board, Pampore192121, Jammu and Kashmir, India.
Email: kiranrmv1990@gmail.com; venkatmelally@gmail.com

ABSTRACT: The coffee berry borer, *Hypothenemus hampei* (Ferrari) (Coleoptera: Curculionidae) is a serious pest affecting coffee worldwide. The present study provides the first report of the natural predation of *Coranus siva* Kirkaldy on *H. hampei*. As of now, there is no report on the genus *Coranus* or other reduviid predation on coffee pests from India or form other coffee growing countries. The predator captured the adult and sucked the body fluid. The predator found to paralyze many adults of *H. hampei* whenever more prey adults were provided. Predation of *C. siva* and its sequence of behavioural events are reported.

KEYWORDS: Predation, first report, behaviour, biological control agent

Efforts towards the elimination of chemical based pest control methods have led to the identification of important ecosystem service provided by natural enemies (Naylor and Ehrlich, 1997). Members of Reduviidae (Hemiptera) have been recorded as natural enemies of various groups of agricultural pests worldwide (Ambrose, 2003; Sahayaraj, 2014). About 7,000 known species and sub-species from 913 genera belonging to 25 sub-families make them the largest group of predators among terrestrial bugs (Froeschner and Kormilev, 1989; Cassis and Gross, 1995). Reduviid predatory species from the genus *Coranus* are known for their effective role as biological control agents (Wallace, 1953; Ambrose, 1988; Kumar *et al.*, 2011).

Hypothenemus hampei (Ferrari) (Coleoptera: Curculionidae) is one of the major insect pests that attacks arabica coffee, *Coffea arabica* L. and robusta coffee, *C. canephora* Pierre ex A. Froehner (Rubiaceae) and causes a loss of about US$ 500 million annually (Vega *et al.*, 2002). An excessive reliance on insecticide endosulfan 35EC coupled with labour intensive cultural practices have long been a main hurdle in *H. hampei* management. Although several parasitoids, entomopathogens and nematode parasites have been used in the biological control of *H. hampei*, its life cycle within coffee berries has resulted in a limited success (Damon, 2000; Jaramillo *et al.*, 2006). No native predators or parasitoids are recorded on *H. hampei* until now in India**.** Thus, the study aimed to search for the new natural enemies from the field and document their impact on *H. hampei*. *Coranus siva* (Kirkarldy) (Hemiptera: Reduviidae) has long been recognized as a generalist predator regulating pests affecting different crops.

* Author for correspondence

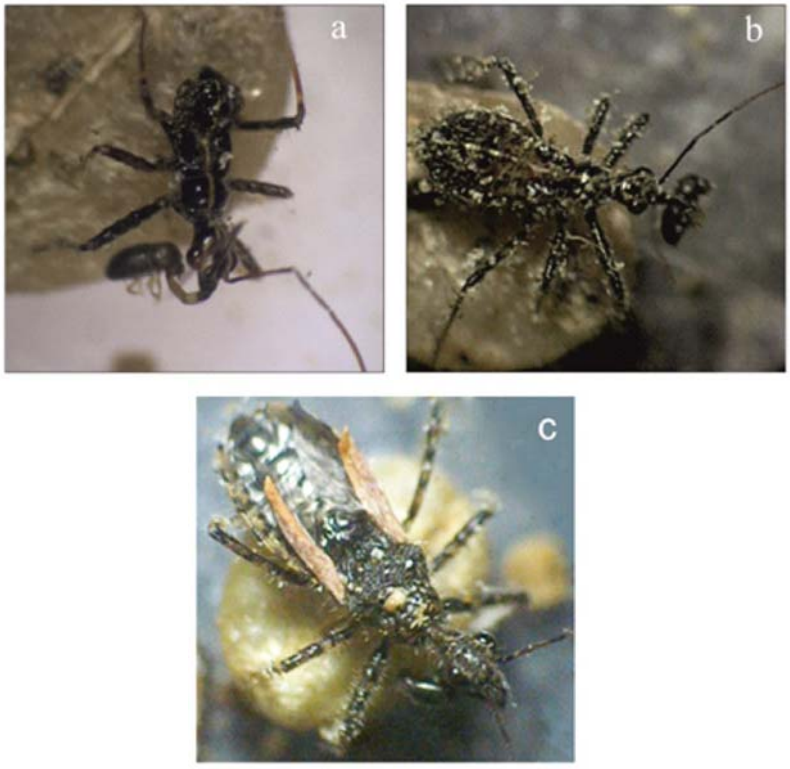

Fig. 1 Predation of *Coronus siva* on *Hypothenemus hampei* --
a) Predator nymph attacking at anterior region of *C. siva* adults
b) Predator nymph attacking at middle region of *C. siva* adults
c) Adult predator attacking C. siva adult

Field surveys were conducted for assessing the *H. hampei* population in an arabica coffee plantation in the Chikkamagaluru region (13°26'41.4"N: 075°48'29.5"E, 1067m elevation), Karnataka, India. A few nymphs of reduvid bug feeding on *H. hampei* adults in the field were brought to the laboratory along with *H. hampei* infested coffee berries. The predator and *H. hampei* infested coffee berries were initially kept in a nylon mesh covered plastic tray (21 x 15 x 10cm). The tray was maintained in a growth chamber (GC-300TLH, Jeiotech, Korea) at 25±1ºC and 70±5% RH. The nymphs were fed on *H. hampei* adult females emerging from infested coffee berries in the tray.

The reduvid bug was identified as *C. siva*. For making observations on predation by *C. siva*, five fresh females of *H. hampei* emerging from infested coffee berries and the nymph of *C. siva* were released into a vial (3cm diameter x 5cm height). Predation behavioural events of *C. siva* on *H. hampei* adults were observed under a stereo zoom microscope (Lawrence and Mayo, Trinocular Research Microscope).

In the presence of *H. hampei* adults in the vial**,** the antennae of *C. siva* pointed forward, and it remained stationary for a while until the potential prey displayed any motion. Once the prey made a slight body movement, the predator captured the prey with its first two legs, rendering it immobile. Then the predator scanned the prey by rolling the body to an appropriate site to insert its stylet. The coffee berry borer adults triggered a response by continuous leg movements in defence to the predator attack. However, the defence appeared futile as the prey was lifted off the substratum with the predator's support of a long rostrum. The predator inserted the stylet either at the anterior

(base of the antennae), median (junction of the head and thorax) or posterior (anal segments) region (Fig. 1) and the activity of the prey ceased after it was paralysed. Subsequently, the predator sucked the body fluid off the prey. After the exhaustion of the body fluid of the prey at a particular region, the predator changed its original site and selected a new site for feeding on body fluid. The predator survived on *H. hampei* for over 70 days.

Coranus siva, a generalist predator recorded to feed on pests i.e., *Pectinophora gossypiella* Saunders (Lepidoptera: Gelechiidae), *Helicoverpa armigera* Hubner, *Earias insulana* Boisduval (both Lepidoptera; Noctuidae), *Oxycarenus hyalinipennis* Costa (Heteroptera: Oxycarenidae) and *Odontotermes obesus* Rambur (Isoptera: Termitidae) (Kumaraswami, 1991; Kumar, 1993).

In this study, observations were also made to quantify the attack rate on different prey adults when there was an increase in the prey density to simulate the outbreak of *H. hampei*. It was observed that even after making a successful attack on *H. hampei* adult, on the sight of another actively moving adult, the predator made a shift by attacking a new prey while abandoning the previously attacked one. The same behaviour of paralyzing many individuals of *H. hampei* would eventually suppress the infestation rate of coffee at a higher prey density in the field. Attacking many individual preys can induce increased prey mortality. The visual stimulus of an active prey was one of the major factors for the initiation of a quick orientation towards a prey. The response of the predator was dependent on the activity of the prey and its abundance. This predatory behaviour of *C. siva* can be considered as the most desirable feature in biological pest suppression.

This study provides the first record of natural predation of *C. siva* on *H. hampei*. It is worth noting that there is no report on the genus *Coranus* or other reduviid predation on coffee pests from India or other coffee-growing countries. In addition, Reduviids from sub-family Harpactorinae are known to prey on soft-bodied caterpillars, grubs and termites (Resh and Cardé, 2009). However, in the present study, the first evidence of Reduviid *C. siva* was found feeding on hard coleopteran adult *H. hampei*.

ACKNOWLEDGEMENT

The authors thank Dr C.A. Viraktamath, Department of Entomology, University of Agricultural Sciences, Bengaluru, India, for the identification of the predator.

REFERENCES

Ambrose D.P. (1988) Biological control of insect pests by augmenting assassin bugs (Insecta: Heteroptera: Reduviidae). In: Bicovas proceedings, Loyola College, Madras, India. pp 25–40.

Ambrose D.P. (2003) Bio control potential of assassin bugs (Hemiptera: Reduviidae). Indian Journal of Experimental Zoology 6(1): 1–44.

Cassis G and Gross GF. (1995) Hemiptera: Heteroptera (Coleorrhyncha to Cimicomorpha). In: *Zoological Catalogues of Australia*, Vol. 27.3A. (Eds. Hosuton WWK. and Maynard GV.), CSIRO, Melbourne, Australia. pp 506.

Damon A. (2000) A review of the biology and control of the coffee berry borer, *Hypothenemus hampei* (Coleoptera: Scolytidae). Bulletin of Entomological Research 90: 453–465.

Froeschner R.C. and Kormilev N.A. (1989) Phymatidae or ambush bugs of the world: a synonymic list with keys to species, except *Lophoscutus* and *Phymata* (Hemiptera). Entomography 6: 1–76.

Jaramillo J., Borgemeister C. and Baker P. (2006) Coffee berry borer *Hypothenemus hampei* (Coleoptera: Curculionidae): searching for sustainable control strategies. Bulletin of Entomological Research 96(03): 223–233.

Kumar A.G., Rajan K., Rajan S.J. and Ambrose D.P. (2011) Predatory behaviour of an assassin bug, *Coranus spiniscutis* (Reuter) on rice meal moth, *Corcyra cephalonica* (Stainton) and leaf armyworm, *Spodoptera litura* (Fabricius). In: National Conference on Insect Pest Management, A Current Scenario, St. Xavier's College, Palayamkottai, India. pp 404–408.

Kumar S.P. (1993) Biology and behaviour of chosen assassin bugs (Insecta: Heteroptera: Reduviidae) (Doctoral thesis). Madurai Kamaraj University, Madurai, India.

Kumaraswami N.S. (1991) Bioecology and ethology of chosen predatory bugs and their potential in biological control (Doctoral thesis). Madurai Kamaraj University Madurai, India.

Naylor R. and Ehrlich P.R. (1997) Natural Pest Control Services and Agriculture. In: Nature's Services: Societal Dependence on Natural Ecosystems (Ed. Daily G.), Island Press, Washington, DC, USA. pp 151.

Resh V.H. and Cardé R.T. (2003) Encyclopedia of insects. Academic Press, Elsevier Science, San Diego, California, USA.

Sahayaraj K. (2014) Reduviids and their merits in biological control. In*:* Basic and Applied Aspects of Biopesticides (Ed. Sahayaraj K.), Springer, India. pp 195–214.

Vega F.E., Franqui R.A. and Benavides P. (2002) The presence of the coffee berry borer, *Hypothenemus hampei*, in Puerto Rico: fact or fiction? Journal of Insect Science 2(1): 1-3.

Wallace H.R. (1953) Notes on the biology of *Coranus subapterus* de geer (Hemiptera: Reduviidae). Proceedings of the Royal Entomological Society of London. Series A, General Entomology 28: 100–110.

(Received December 23, 2021; revised ms accepted June 29, 2022; published June 30, 2022)