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A REPORT ON THE PREDATORY BEHAVIOUR OF STINK BUG EOCANTHECONA FURCELLATA WOLFF (HEMIPTERA: PENTATOMIDAE) ON THE EGGS AND GRUBS OF HENOSEPILACHNA VIGINTIOCTOPUNCTATA

Kalaiyarasi L., Ananthi Rachel Livingstone* and Miracline S.F

Department of Zoology, Madras Christian College, Chennai – 600 059, Tamil Nadu, India

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ABSTRACT

Henosepilachna vigintioctopunctata (Coleoptera: Coccinellidae) is a threat to commercial plantations of *Solanum melongena* species in Asia and there are no effective strategies for its control. We report here for the first time, the occurrence of the predatory stink bug *Eocanthecona furcellata* (Hemiptera: Pentatomidae) nymphs and adults effectively feeding on *H. vigintioctopunctata* eggs and grubs. *Eocanthecona furcellata* is a native generalist predator that is easily reared in the laboratory and may be utilized as a biological control agent. Thus, *E. furcellata* can be used as a natural enemy in biological control programs targeting the pest on brinjal.

INTRODUCTION

Henosepilachna vigintioctopunctata F. is a polyphagous plant feeder and most destructive pest of many cultivated (brinjal, tomato, potato, tobacco, melon, cucumber, gourds, and pumpkin) and wild crops (Ahmad *et al*, 2001; Rath, 2005). It can be easily identified by its 28 spots on its dorsal body. It is also known as Hadda beetle or Ladybird beetle. This beetle is fairly common and cause damage to the Solanaceous and Cucurbitaceous crops (Khan *et al*, 2000). The peak infestation period of this pest varies from region to region. Both adult beetles and grubs feed on the epidermal tissue of the leaves by scrapping on the leaf surface. This results in the leaves becoming dry and eventually shed. Sometimes it is called leaf scrapping Coccinellid beetle (Imura and Ninomiya, 1978). In severe cases, even the calyx of the fruits may also be infested (Varma and Anandhi, 2008). The growth and development of the plants are greatly hampered and the yield is markedly reduced by the attack of this pest. (Alam, 1969). The increasing pest status and abundance of hadda beetle has raised a number of questions regarding the factors responsible for its development, its natural enemy complex and management under natural conditions.

Biological control is recognized as one of the best alternatives to the use of chemical insecticides for controlling insect pests. Pest control with natural enemies is growing in popularity and heteropteran predators are important agents of biological control in integrated pest management programs (Molina *et al*, 1997; Lemos *et al*, 2003). Thus, biological control, such as the introduction or enhancement of populations of predators, parasitoids and pathogens, is important (Silva, 2000). Heteropteran predators are important biological control agents on leaf worms (De Clercq *et al*, 2003; Lemos, 2003), beet armyworms (De Clercq and Degheele, 1994), Colorado potato beetles (Biever and Chauvin, 1992; Hough-Goldstein and McPherson, 1996; Tipping *et al*, 1999; Westich and Hough-Goldstein, 2001), and southern green stinkbugs, respectively (De Clercq *et al*, 2002) on soybean caterpillars (Marston *et al*, 1978).

The most common pest management activity that negatively impacts beneficial organisms in agroecosystem is pesticide application. As a result, modifications of pesticide use practices are the most commonly implemented form of conservation biological control (Ruberson *et al*, 1998), and have long been considered an important component of integrated pest management programs (Stern *et al*, 1959; Debach, 1964; Newsom and Brazzel, 1968). Pesticide use can be modified to

Corresponding author:* **Ananthi Rachel Livingstone
Department of Zoology, Madras Christian College, Chennai – 600 059, Tamil Nadu, India

favour natural enemies in a variety of ways, including treating only when economic thresholds dictate, use of active ingredients and formulations that are selectively less toxic to natural enemies, use of the lowest effective rates of pesticides, and temporal and spatial separation of natural enemies and pesticides (Hull and Beers, 1985; Poehling, 1989; Ruberson *et al*, 1998). Decisions regarding pesticide use for insect pests in IPM programs are typically based on sampling pest populations to determine if they have reached economic threshold levels (Pedigo, 1989).

E. furcellata has been reported from Southeast Asia, Japan, India, and Taiwan, and has been preying on Lepidopteran, Coleopteran and Heteropteran insects (Ahmad *et al*, 1996; Chu 1975; Chang, 2002; Jakhmola 1983; Prasad *et al*, 1983). However, there is no publication available on the predation efficacy of *Eocanthecona furcellata* with regard to *H. vigintioctopunctata* larvae feeding on any host plants. From this study, we observed that *E. furcellata* reached the adult stage when it fed only on *H. vigintioctopunctata* eggs and grubs, which suggest that could keep this prey population in control.

MATERIALS AND METHODS

Third nymphal instars of predatory stink bug *Eocanthecona furcellata* were originally collected from the brinjal field at MCC Farm, Chennai, Tamilnadu, India. The collected nymphal instars were carefully introduced into an insect cage. Meanwhile eggs, second and third grub stages of *Henosepilachna vigintioctopunctata* were also collected from the brinjal field and were served as feed for the nymphal instars of *Eocanthecona furcellata* every morning and themorphological changes from third nymphal in star into adult were observed in the laboratory condition too. The experiment was conducted under the room temperature (32^{o}C). Each stages of the predatory bug were easily identified by its exuviae, and also the colour variation on its dorsal surface.

Species Identification

The identified predator species was confirmed by determining them using the keys and descriptions (Distant, 1902; Ananthi Rachel and Gladstone, 1993) as *Eocanthecona furcellata*, (Wolff). 16mm long, 8mm broad, elongately ovate, brownish, ochraceous, densely darkly punctate, punctures bronzy.

Head: Almost as long as broad across the eyes; frontal and loral lobes almost at the same level apically, loral lobes expanded and rounded; two piceous longitudinal lines, the inner one terminating at the middle of the frons and the outer one extending up to the vertex; antennae five jointed, basal joint not passing head, apical two segments with basal stramineous rings; eyes dark brown; ocelli brick red, close to the eyes; rostrum reaching the metasternum; apical two joints piceous; basal two joints ochraceous, slightly incrassated.

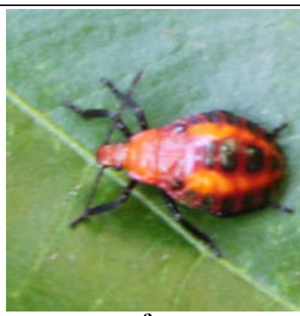
Thorax: Pronotum with broken transverse brownish fascia anteriorly; disc darkly coarsely punctate, marginally sinuate; anterolateral angles minutely tuberculate; lateral margins of anterior lobe minutely dentate; posterolateral angles of the disc spinously produced, spine bifid, anterior ramus longer; piceous; scutellum elongately triangular, bronzy black at base, basilateral angles with lavigate spot, posteriorly tapering as lavigate spatulate tip, reaching the sixth abdominal segment; corium with bronzy black suffusions; membrane transparent with elongate brown marking basally and medially, extending far beyond the abdomen; legs reddish ochraceous; junctions of joints piceous; thoracic sternites, and connexivum coarsely punctate with large subquadrate bronzy black spots; marginal spots to abdomen, a central black spot at the sternite of genital segment.

RESULT AND DISCUSSION

From this it was observed that, the eggs and grubs of H. *vigintioctopunctata* is edible and a natural prey for this predator bug (Table 1, Fig 1). During the study, when the grubs were introduced into the rearing cage of *E. furcellata* nymphs, the process of feeding started by sucking the haemolymph of grubs continuously and finally skeletonizing them. In case of prey's egg, they made a hole on the top of eggs surface and made them into empty shell. Yasuda, 1997 and 2000 proved that *E. furcellata* located their prey by chemical cues emanating from their prey. According to (Khin 2008) the predatory bug *E. furcellata* may detect the prey by vibrations caused by feeding. Khin 2008, have studied that the predation efficacy of *E. furcellata* was tested with American Bollworm from four different host plants (Cabbage, cotton, chickpea and tomato plants). The majority of *E. furcellata* (30-60%) directly approached towards cotton plants sucking on *H. armigera* larvae. Most probably, *E. furcellata* responded to (E)- phytol, which is produced by larvae when feeding on the chlorophyll in their food plants. *E. furcellata* prefers to feed on larvae fed with a chlorophyll-rich diet rather than with a chlorophyll-poor diet (Yasuda, 1997, 1998a, 1998b).

Table 1 Normal life cycle of *E. furcellataon H. vigintioctopunctata*

S.No	Stage	Longevity	Given as prey
1	3rd nymphal instar	3-4 days	Grubs
2	4th nymphal instar	3-4 days	Grubs & egg batches
3	5th nymphal instar	5-6 days	Grubs & egg batches
4	Adult	20-25 days	Grubs, egg batches, semi looper caterpillars, larvae of *Leucinodes orbonalis*



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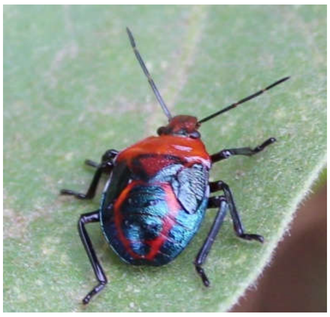

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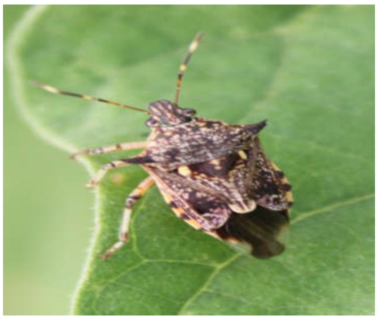

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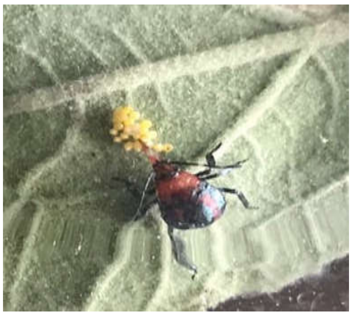

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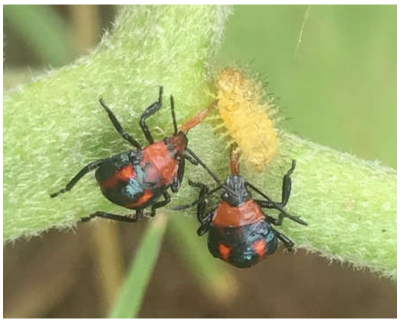

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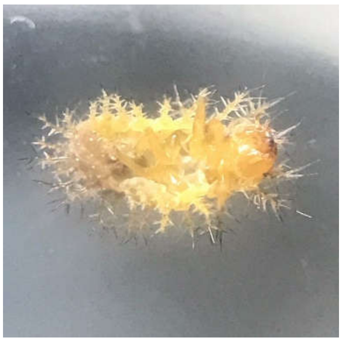

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Fig 1 A- Third nymphal instar of *E. furcellata*, B- Fourth nymphal instar, C- Fifth nymphal instar, D- Adult of *E. furcellata*, E- Exuviae, F- Normal egg of *H. vigintioctopunctata*, G- nymphal instar feeds egg batches, H- empty egg batches, I- nymphal instars feeds grub of *H. vigintioctopunctata*, J- skeletonized body of grub.

References

Ahmad M., Singh,A. P., Sharma,S., Mishra,R. K. and AhmadM. J.(1996). Potential estimation of the predatory bug *Canthecona furcellata* Wolff (Hemiptera: Pentatomidae) against popular defoliator *Clostera cupreata* (Lepidoptera: Notodontidae). Annals of Forestry 4: 133-138.

Ahmad, M., Ahmad, M.D.J., Afroze, S. and Mishra, R. K. (2001). First record of Coccinellid beetles (Coleoptera: Coccinellidae) on poplar, *Populus deltoides* from north India, Indian Forester, 12 (8): 891-897.

Alam, M.Z., (1969). Insect pest of vegetables and their control in East Pakistan. *Agril. Inf. Serv*., Department of Agriculture, R.K. Mission Road, Dakha, 149.

Ananthi Rachel, L. and Gladstone, M. (1993). Biodiversity of Pentatomid fauna of the scrub ecosystem of Madras Christian College, MCC Campus, Tambaram, India, Magazine, Research Vol- LVIII (1): 57-72.

Biever, K. D. and Chauvin, R. L. (1992). Suppression of the Colorado potato beetle (Coleoptera: Chrysomelidae) with augmentative releases of predaceous stinkbugs (Hemiptera: Pentatomidae). *J. Econ. Entomol*. 85: 720-726.

Chang, C-P., (2002). Mass rearing and utilization of the predatory stink bug *Eocanthecona furcellata*. *Formosan Entomologist* 3: 175-181.

Chu, Y. (1975) Rearing density of *Eocanthecona furcellata*, with special consideration to its mass production (Asopinae: Pentatomidae). Rostria 24:135-140.

De Clercq, P. and Degheele D. (1994) Laboratory measurements of predation by *Podisus maculiventris* and *P. sagitta* (Hemiptera: Pentatomidae) on beet armyworm (Lepidoptera: Noctuidae) *J. Econ. Entomol*. 87: 76-83.

De Clercq, P., Peeters,I., Vergauwe,G. and Thas,O. (2003) Interaction between *Podisus maculiventris* and *Harmonia axyridis*, two predators used in augmentative biological control in greenhouse crops. *BioControl* 48: 39-550.

De Clercq, P., Wyckhuys, K., De Oliveira, H.N., and KlapwijkJ. (2002) Predation by *Podisus maculiventris* on different life stages of *Nezara viridula*. *Florida Entomologist* 85(1):197-202.

DeBach, P. (1964). *Biological Control of Insect Pests and Weeds*. Chapman and Hall, London, 844.

Distant, W.L.,(1902). The fauna of British India including Ceylon and Burma, Rhynchota Vol-I, Taylor and Francis London, 1-330.

Hough-Goldstein, J. and McPherson, D. (1996) Comparison of *Perillus bioculatus* and *Podisus maculiventris* (Hemiptera: Pentatomidae) as potential control agents of the Colorado potato beetle (Coleoptera: Chrysomelidae). *J. Econ. Entomol*. 89: 1116-1123.

Hull, L.A. and Beers, E.H. (1985). Ecological selectivity: Modifying chemical control practices topreserve natural enemies. In: Hoy, M.A. and Herzog, D.C. (eds), *Biological Control in AgriculturalIPM Systems*. Academic Press, Orlando, FL, pp. 103-122.

Imura, O. and Ninomiya, S. (1978). Quantitative measurement of leaf area consumed by *Epilachnavigintioctopunctata* (Fabricius) (Coleoptera: Coccinellidae) using image processing. *Appl. Ent. Zool.* 33(4): 491-495.

Jakhmola, S. S. (1983). Natural enemies of *Til* leafroller and capsuleborer, *Antigastra catalaunalis* (Dup.). *Bull. Entomol.* 24 (2): 147-148.

Khan, M.H., Islam, B.N., Rahman, A.K., and Rahman, M.L. (2000). Life table and the rate of foodconsumption of *Epilachna* beetle, *Epilachna decastigma* (Wied.) on different host plant species in laboratory condition. *Bangladesh J. Ent.* 10 (1-2): 63-70.

Khin Thein Nyunt, (2008). Potential of the predatory Pentatomid *Eocanthecona furcellata* (Wolff) as a biocontrol agent on American bollworm in cotton in Myanmar, Georg- August University Gottingen, Germany, pp. 16-21.

Lemos, W. P., Ramalho, F. S., Serrao, J. E., and Zanuncio, J. C. (2003). Effects of diet on development of *Podisus nigrispinus* (Dallas) (Het., Pentatomidae), a predator of the cotton leafworm. *J. Appl. Entomol*. 127: 389-395.

Marston, N. L., Schmidt, G. T., Biever, K. D. and Dickerson,W. A. (1978). Reaction of five species of soybean caterpillars to attack by the predator, *Podisus maculiventris*. *Env. Entomol*. 7: 53-56.

Molina-Rugama, A. J., Zanuncio, J. C., Torres, J. B., and Zanuncio, T. V. (1997). Longevidady fecundidad de *Podisus nigrispinus* (Heteroptera: Pentatomidae) alimentado con *Musca domestica* (Diptera: Muscidae) y frijol. *Rev. Biol. Trop*. 45: 1125–1130.

Newsom, L.D. and Brazzel, J.R. (1968). Pests and their control. In: Elliot, F.C., Hoover, M. andPorter, W.K. (eds), *Advances in Production and Utilization of Quality Cotton: Principles and Practices*. Iowa State Univ., Ames, pp. 367-405.

Pedigo, L.P. (1989). *Entomology and Pest Management*. Macmillan, New York, p. 646.

Poehling, H.M. (1989). Selective application strategies for insecticides in agricultural crops. In: Jepson, P.C. (ed), *Pesticides and Non-Target Invertebrates*. Intercept, Wimborne, pp. 151-175.

Prasad, D., Singh, K. M., Singh, R. N. and Mehto, D. N. (1983). A new predator of new pest of jasmine in Delhi. *Bull. Entomol.* 24: 140-141.

Rabb, R. L. (1974). Naturally occurring biological control in theeastern United States, with particular reference to tobaccoinsects. In: Huffaker, C.B. (ed.). Biological control. PlenumPubl. Co. New York, 294-309.

Rath, L. K. (2005). Antibiosis mechanism in eggplant against Epilachna beetle, *Henosepilachna vigintioctopunctata* (Fabr.), *Indian Journal of Plant Protection*, 33 (1): 82-84.

Ruberson, J.R., Nemoto, H. and Hirose, Y. (1998). Pesticides and conservation of natural enemies inpest management. In: Barbosa, P. (ed), *Conservation Biological Control*. Academic Press, SanDiego, CA, pp. 207-220.

Ruberson, J.R., Nemoto, H. and Hirose, Y. (1998). Pesticides and conservation of natural enemies inpest management. In: Barbosa, P. (ed), *Conservation Biological Control*. Academic Press, SanDiego, CA, pp. 207-220.

Silva, C. A. D. (2000). Microorganismos entomopatogenicos associados a insetos e acaros do algodoeiro. EMBRAPA-CNPA, Campina Grande, Paraíba. Doc. No. 77.

Stern, V.M., Smith, R.F., Van den Bosch, R. and Hagen, K.S. (1959). The integrated control concepts. *Hilgardia* 29:81–101.

Tipping, P. W., Carol A. Holko, Aref A. Abdul-Baki, and Jeffrey R. Aldrich (1999), Evaluating *Edovum puttleri Grissell* and *Podisus maculiventris* (Say) for augmentive biological control of Colorado potato beetles in tomatoes. *Biological Control*, 16 (1), 35-42.

Varma, S. and Anandhi, P. (2008). Seasonal incidence of brinjal hadda beetle, *Henosepilachna vigintioctopunctata* (Fabr.) andits natural enemies. *Indian Journal of Entomology*,70(1):31-39.

Westich, R. and Judith Hough-Goldstein, (2001). Temperature and host plant effects on predatory stink bugs for augmentative biological control. *Biological Control,* 21 (2): 160-167.

Yasuda, T. (1997) Chemical cues from the *Spodoptera litura* larvae elicit preylocating behaviour of generalist predatory stink bug *Eocanthecona furcellata*. *Entomol. Exp.Appl*.82: 349-354.

Yasuda, T. (1998a) Effects of (E)- Phytol of several lepidopteran species in preylocating behaviour of generalist predatory stink bug *Eocanthecona furcellata* (Heteroptera: Pentatomidae). *Entomol.Sci*. 1:159-164.

Yasuda, T. (1998b) Role of chlorophyll content of prey diets in prey- locating behaviour of generalist predatory stink bug *Eocanthecona furcellata*. *Entomol. Exp.Appl*.86: 119-124.

Yasuda, T. (2000) Role of semiochemicals in prey- locating behaviour of a generalist predatory stink bug *Eocanthecona furcellata* (Heteroptera: Pentatomidae). *Jpn. Agri. Res. Q*. 34:15-20.

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