Indian Journal of Entomology 85(1): 257-259 (2023) DoI. No.: 10.55446/IJE.2022.445

NATURAL ENEMIES ASSOCIATED WITH SORGHUM SHOOT BUG *PEREGRINUS MAIDIS* (ASHMEAD)

Saicharan Dharavath*, S S Karabhantanal and S B Jagginavar

Department of Agricultural Entomology, University of Agricultural Sciences Dharwad, College of Agriculture, Vijayapur 586101, Karnataka, India
*Email: charan.dharavath@gmail.com (corresponding author)

ABSTRACT

This study on the potential natural enemies associated with sorghum shoot bug *Peregrinus maidis* (Ashmead) revealed that among the predators, the predatory bug [*Creontiades* sp. and *Tytthus parviceps* (Reuter)] and neuropterans [*Chrysoperla* sp. and *Micromus timidus* (Hagen)] were found predating over eggs and nymphs. Beetles of Coccinellidae [*Cheilomenes sexmaculata* (Fab.)] and Chrysomelidae [*Monolepta signata* (Olivier)] were also found predating but only on nymphs. Six spiders were observed predating over nymphs and adults- these include *Callitrichia* sp. (Linyphiidae), *Cheiracanthium approximatum* (Cheiracanthiidae), *Marengo* sp. (Salticidae), *Neoscona* sp. (Araneidae), *Plexippus petersi* (Salticidae) and an unidentified Linyphiidae. A parasitoid *Anagrus* sp. (Hymenoptera: Mymaridae) was on the eggs and a mite *Erythraeus* sp. (Trambidiformes: Erythridae) was noticed adhering to the adults. This study is the first record of *Creontiades* sp.

Key words: *Peregrinus maidis*, sorghum, *Cheilomenes sexmaculata*, *Creontiades*, *Erythraeus*, *Marengo*, *Monolepta signata*, *Neoscona*, parasitoid, *Tytthus parviceps*

Shoot bug *Peregrinus maidis* (Ashmead) (Hemiptera: Delphacidae) is a major sucking pest of sorghum in the northern dry zone of Karnataka, given only minor importance earlier, but now it is a major pest status in rabi sorghum causing direct and indirect loss. The nymphs and macropterous females are more efficient transmitters of maize stripe virus of sorghum (MStV-S), maize mosaic virus of sorghum (MMV-S) and sorghum stripe disease virus (SStdv) compared to its males. The occurrence of MStV-S was first reported in India during the 1990s (Peterschmitt et al., 1991). The use of insecticides to tackle *P. maidis* in rabi sorghum by small and marginal farmers under rainfed situations is not a reasonable option because of its prohibitive cost and low returns in addition to toxicity hazards to the environment (Sharma et al., 2003). Unlike brown plant hopper *Nilaparvatha lugens* (Stal.), the natural enemies associated with *P. maidis* under field situation and their role in supressing shoot bug population was not fully understood although they belong to the same family. Further, the reports relating to natural enemies are scanty and need to be focused. The present study identifies the natural enemies associated with *P. maidis* to enable biological control.

MATERIALS AND METHODS

This study was done at Vijayapura in the Northern Dry Zone (Region-II, Zone-3) of Karnataka (16º 49'N, 77º20'E, 398.37 masl) during rabi 2020-21 on the Hathi Kunta, a susceptible sorghum variety. The crop was sown under unprotected conditions in 20 m^2 plots in three locations at the Regional Agricultural Research Station (RARS), Vijayapur. The parasitoids and predators observed associated with *P. maidis* at different intervals were recorded, collected, and preserved. These were evaluated for predation under laboratory conditions. The collected specimens were sent to the Department of Agricultural Entomology, University of Agricultural Sciences, GKVK, Bangalore and NBAIR, Bangalore for identification.

RESULTS AND DISCUSSION

Results of the present study on the natural enemies of *P. maidis* revealed a parasitoid fairy fly, *Anagrus* sp. (Hymenoptera: Mymaridae) collected from the parasitized eggs (Table 1). The adult was very small, 1 mm in width (Fig. 1a), like a miniature ant with reddish brown coloured body and hardly noticeable with naked eyes. *Anagrus* sp. parasitizes the eggs which were already inserted inside the midribs of sorghum leaves by inserting its ovipositor (Fig. 1b). The adult parasitoid parasitized one egg/ min. Similar observations were made by Guppy (1914) who reported hymenopteran parasite *Anagyrus flaveolus* (Watern) parasitising eggs of *P. maidis* to the extent of 75 to 80%. Muir (1917) and Perkins (1905) also reported that the eggs were

parasitised by *Paranagrus* sp. The predators collected from the sorghum ecosystem revealed that predatory bug, *Creontiades* sp. (Fig. 2) predates on the eggs and nymphs in the sorghum whorls. Several mirid bugs had been earlier reported as egg predators but this study observed *Creontiades* sp. as both egg and nymphal predator. The predation was high in case of egg stage with ten eggs/ min whereas, it fed only single nymph for more than a minute. The adult was 13 to 15 mm long and 3-5 mm in width, with abdomen being 7-9 mm long; adult is slender, pale green with translucent wings; antennae longer than the body and similarly, the wings also ascend the abdomen which bears membranous part apically black; abdomen is telescopic in which the segmentation was clearly distinct. Another predatory bug *Tytthus parviceps* (Reuter) (Hemiptera: Miridae) (Fig. 3) was found predating on both eggs and nymphal stages during the vegetative and flowering stages; the former is larger than the latter with more predation being from *Creontiades* sp. Neuropteran predators viz., *Chrysoperla* sp. (Chrysopidae) and *Micromus timidus* (Hagen) (Hemerobiidae) predate on nymphs. Similar observations on two mirid bugs i.e., *Tytthus mandulus* Bredd. and *T. parviceps* (Reut.) predating over the eggs of *P. maidis* was made in sorghum- Swezey (1936), Carnegie and Harris (1969), and Napompeth (1973); Swezey (1936) reported *Chrysoperla basalis* Walker (Neuroptera: Chrysopidae) predating on both nymphs and adults. Rioja et al. (2006) observed *Chrysoperla* sp.and *Chrysoperla 7-punctata* var. brucki on nymphs.

The Coccinellidae predators such as *Cheilomenes sexmaculata* (F) and the Chrysomelidae *Monolepta signata* (Olivier) were observed on the nymphs, found all the three crop growth phases; the coccinellids were highly polyphagous over soft bodied insects, and were found feeding on aphids; their grubs are very active and predated all body parts including head; but the chrysomelid was found feeding only on the soft body parts i.e., the abdomen of nymphs. These results corroborate with those of Singh et al. (1993) on *C. sexmaculata*. Predatory mite *Erythraeus* sp. (Trambidiformes: Erythridae) (Fig. 4b) was noticed on the adults and found adhering or clinging on the thoracic region (Fig. 4a). Kulkarni et al. (1979) from Dharwad identified the predacious mite *Erythraeus* sp. feeding on *P. maidis*. Some spiders found feeding on the nymphal and adult stages include- *Callitrichia* sp. (Araneae: Linyphiidae) (Fig. 5), *Cheiracanthium approximatum* (Araneae: Cheiracanthiidae) (Fig. 6), *Marengo sp.* (Araneae: Salticidae) (Fig. 7), *Neoscona* sp. (Araneae: Araneidae) (Fig. 8) and *Plexippus petersi* (Araneae: Salticidae) (Fig. 9)- these were found predating on nymph and adult stages. Of these *Callitrichia* sp. was smaller, and found abundantly with high predation rate. Similar findings were also made by Napompeth (1973) who reported *Hasarius adansoni* (Aud.) of Araneidae predating on both adult and nymph in Hawaii. This study further hinted a rich community of spiders belonging to the families Lycosidae, Linyl phiidae and Tetragnathidaea as potential predators of nymphs and adults.

ACKNOWLEDGEMENTS

The authors thank Dr Yashwanth H M, Taxonomist, Department of Agricultural Entomology, University of

Table 1. Parasitoids and predators observed on *P. maidis*

Species identified	Order	Family	Stage of predation	No. of eggs/ nymphs predated/ min
Anagrus sp.	Hymenoptera	Mymaridae	Egg (parasitisation)	1 egg
Cheilomenes sexmaculata (Fabricius)	Coleoptera	Coccinellidae	Nymphs	1 nymph
Creontiades sp.	Hemiptera	Miridae	Egg & nymphs	10 eggs & 1 nymph
Tytthus parviceps (Reuter)	Hemiptera	Miridae	Egg & nymphs	5 eggs & 1 nymph
Chrysoperla sp.	Neuroptera	Chrysopidae	Nymphs	1 nymph
Micromustimidus Hagen	Neuroptera	Hemerobiidae	Nymphs	1 nymph
Monolepta signata (Olivier)	Coleoptera	Chrysomelidae	Nymphs	1 nymph
Erythraeus sp.	Trombidiformes	Erythridae	Adults	----
Callitrichia sp.	Araneae	Linyphiidae	Nymphs & adults	1 nymph/ adult
Cheiracanthium approximatum	Araneae	Cheiracanthiidae	Nymphs & adults	1 nymph/ adult
Marengo sp.	Araneae	Salticidae	Nymphs & adults	1 nymph/ adult
Neoscona sp.	Araneae	Araneidae	Nymphs & adults	1 nymph/ adult
Plexippus petersi	Araneae	Salticidae	Nymphs & adults	1 nymph/ adult
Unidentified	Araneae	Linyphiidae	Nymphs & adults	1 nymph/ adult

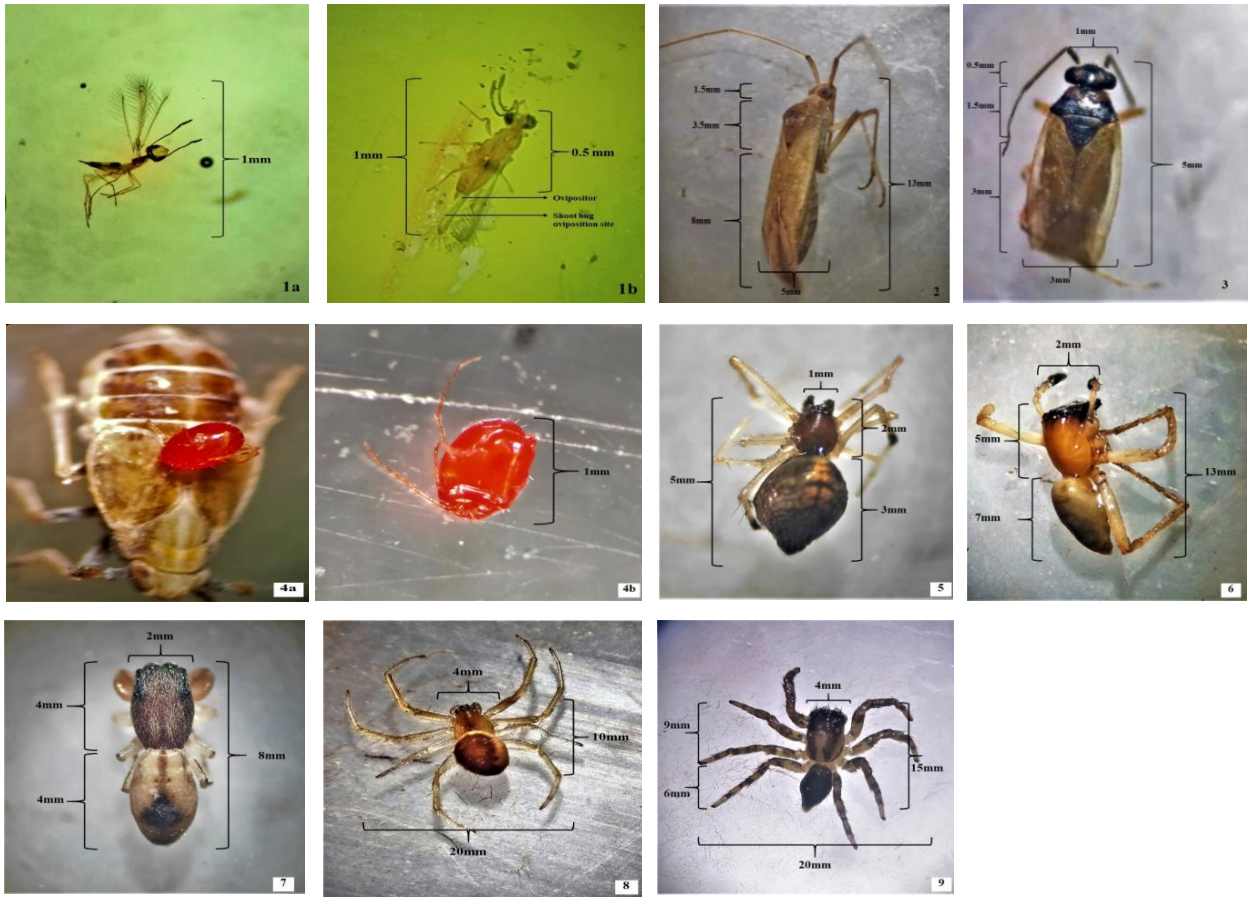

Fig. 1a. *Anagyrus* sp. 1b. *Anagyrus* sp. parasitizing shoot bug egg; 2. *Creontiades* sp.; 3. *Tytthus parviceps*; 4a. *Erythraeus* sp. clinging to thoracic region of shoot bug; 4b. *Erythraeus* sp.; 5. *Callitrichia* sp.; 6. *Cheiracantheum approximatum*; 7. *Marengo* sp.; 8. *Neoscona* sp.; 9. *Plexippus petersi*

Agricultural Sciences, GKVK, Bangalore; Dr Sampath Kumar M, Scientist (Agricultutural Entomology), ICAR-NBAIR Bengaluru, and Biswamitra Reang, PG Student, IGKV, Raipur for identification of samples.

REFERENCES

Carnegie A J M, Harris R H G. 1969. The introduction of mirid egg predators (Tytthus sp.). Proceedings of South African Sugar Technology Association 43: 113-116.

Guppy P L. 1914. Birds and their value to the agriculturist. Bulletin Department of Agriculture, Trinidad and Tobago 13: 148-156.

Kulkarni K A, Holihosur S N, Nageshchandra B K. 1979. A predaceous mite on the sorghum shoot bug *Peregrinus maidis* (Homoptera: Delphacidae) at Dharwad. Proceedings. First all India symposium on acarology. pp.33-34.

Muir F. 1917. On the synonymy of *Delphax maidis* Ashm. Cannadian Entomologist 49: 147.

Napompeth B. 1973. Ecology and population dynamics of the corn planthopper, *Peregrinus maidis* (Ashmead) (Homoptera: Delphacidae) in Hawaii. PhD Thesis, University of Hawaii, Honolulu, Hawaii. 257 pp.

Perkins R C L. 1905. Leafhoppers and their natural enemies (Part I: Dryiniae). Hawaii Sugar Planters Assoc, Hawaii Experimental Station Bulletin 1: 1-69.

Peterschmitt M, Ratna A S, Sacks W R, Reddy D V R, Mughogho L K. 1991. Occurrence of an isolate of maize stripe virus on sorghum in India. Annals of Applied Biology 118: 57-70.

Rioja T M, Vargas H E, Bobadilla D E. 2006. Biology and natural enemies of *Peregrinus maidis* (Ashmead) (Hemiptera: Delphacidae) in the Azapa valley. IDESIA (Chile) 24: 41-48.

Sharma H C, Taneja S L, Kameswara Rao N, Prasada Rao K E. 2003. Evaluation of sorghum germplasm for resistance to insect pests. Information Bulletin no. 63. Patancheru, Andhra Pradesh, India: ICRISAT. 184 pp.

Singh S P, Rao N S, Henneberry T J. 1993. Leafhoppers and their natural enemies, Vol 6. Tech. Bull. (Project Directorate of Biological Control, ICAR, India). 65 pp.

Swezey O H. 1936. Biological control of the sugarcane leafhopper in Hawaii. Hawaii Plant Recordings 40: 57-101.

(Manuscript Received: November, 2021; Revised: March, 2022;
Accepted: March, 2022; Online Published: April, 2022)
Online First in www.entosocindia.org and indianentomology.org Ref. No. e21244