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Research Note

First report of hyperparasitoids of *Anagyrus dactylopii* (Howard) from India

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ABSTRACT: **Two hyperparasitoids, *Prochiloneurus aegyptiacus* (Mercet) and *P. testaceus* (Agarwal), were recorded for the first time on *Anagyrus dactylopii* (Howard), a primary parasitoid of pink mealybug, *Maconellicoccus hirsutus* (Green) infesting grapes at Bangalore, India. Hyperparasitism to the tune of 11% exerted by them could be detrimental to the primary parasitoid in countering the rate of increase of *M. hirutus* in vineyards.**

KEY WORDS: *Anagyrus dactylopii*, hyperparasitoid, *Maconellicoccus hirsutus*, *Prochiloneurus aegyptiacus*, *Prochiloneurus testaceus*.

Pink mealybug, *Maconellicoccus hirsutus* (Green) (Hemiptera: Pseudococcidae) has been reported as a serious pest of grapevine in India (Manjunath, 1985; Mani and Thontadarya, 1987). Among the natural enemies of *M. hirsutus*, *Anagyrus dactylopii* (Howard) (Hymenoptera: Encyrtidae), a potential indigenous parasitoid was found to parasitize the pink mealybug in grape vineyards in and around Bangalore (Mani *et al.,* 1987). Generally, this parasitoid along with other predators could keep the mealybug population under check (Mani, 1989). In recent times, it has been observed that at certain critical crop stages, the mealybug was not effectively kept under control despite the presence of *A. dactylopii* in the field. This was attributed to a possible lack of synchronization between the appearance of *A. dactylopii* and the occurrence of pest. In this context, a study was conducted to investigate the possible limiting factors of biological control of grape mealy bug by *A. dactylopii*. Selective sampling was done in a six-year-old vineyard where black seedless grape cultivar Arka Neelamani (Black Champa x Thomson seedless) was grown with all recommended package of practices at the Indian Institute of Horticultural Research, Bangalore. Mealybug-infested plant parts of the grapevine (aerial roots, bark and berries) were taken at weekly intervals from bud burst stage in January till the harvesting of grapes in April 2008. Samples were brought to the laboratory and parasitized and unparasitized mealybugs were separated and counted. Parasitized mealybug larvae and mummies were kept on fresh grape plant materials (leaf / stem / berry) in ventilated plastic boxes at room temperature of 25 ± 2° C. The boxes were checked daily for parasitoid emergence. All parasitoids which emerged were sorted, counted and preserved in 70% ethanol for identification.

Maconellicoccus hirsutus accounted for virtually all the mealybugs collected from all parts of grapevines throughout the study period. The mealybugs undetectable under the loose barks in January made their appearance at low density once flowering started. Infestation level increased with the berry development. Initially the movement of the crawlers was observed from the loose bark to the growing tip of the aerial roots, where they completed one generation before moving to the berries. A total of 960 mealybugs were counted on aerial root, bark and berry samples collected during the study period. In the present study, 288 adults of *A. dactylopii* were reared from the mealybug samples which accounted for 30% parasitism and the level of parasitism appeared to be low compared to 60-70% parasitism reported earlier (Mani *et al.,* 1987). Further, frequent colour variations among the parasitoids emerged raised the doubt of possible existence of hyperparsitoids. Detailed taxonomic studies of the parasitoids revealed that 36 such parasitoids which emerged from the mummified mealybugs belonged to the genus *Prochiloneurus* Silvestri with a distinct bunch of hairs on the scutellum. Species of this genus are known to be hyperparasitoids of encyrtids and pteromalids and primary parasitoids of coccids, pseudococcids and coccinellids (Noyes and Hayat, 1984), and other records as primary parasitoids are probably erroneous. These hyperparasitoids which emerged from the mummified mealybugs belonged to two different species, *P. aegyptiacus* (Mercet) and *P. testaceus* (Agarwal). Among them, *P. aegyptiacus* was the dominant one (28/36 hyperparsitoids emerged from the mummies held). This is the first report of hyperparasitoids on *A. dactylopii* from India. *Prochiloneurus aegyptiacus* was reported as a hyperparasitoid of *M. hirsutus* (Abd-Rabou and Hendawy, 2005). Studies in West Africa revealed that

one of the most abundant indigenous hyperparasitoids of encyrtids, *P. insolitus* (Alam) parasitized pseudococcids on various host plants (Goergen and Neuenschwander, 1990; Hamond and Neuenschwander, 1990; Agricola and Fischer, 1991). Its host range included *Gyranusoidea indica* Shafee from *M. hirsutus, G. tebygi* Noyes from *Rastrococcus invadens* Williams, *Epidinocarsis lopezi* De Santis from cassava mealybug, *Phenacoccus manihoti* Matile-Ferrero, *Blepyrus insularis* (Cameron) from *Ferrisia virgata* (Cockerell) and many other unidentified *Anagyrus* species. The present study revealed the presence of more than one species of hyperparasitoid in the ecosystem with the record of *P. testaceus*, though they were recorded in limited numbers. The distribution of *P. testaceus* is limited to India and only on secondary hosts such as *Coccus viridis* (Green), *Planococcus citri* (Risso), *R. iceryoides* Green, *R. invadens* and several other undetermined coccids (Agarwal, 1965). From India, *P. aegyptiacus* (as *P. indicus* Shafee *et al.*), *Promuscidea unfasciativentris* Girault, *Marietta leopardina* (Motschulsky) and *Aprostocetus purpureus* (Cameron) were earlier identified as hyperparasitoids of *Leptomastix dactylopii* Howard, a primary parasitoid of citrus mealybug, *P. citri* (Krishnamoorthy and Mani, 1996). From the number of hyperparasitoids emerged in the laboratory, it was evident that these hyperparasitoids could exert an extent of 11 % hyperparasitism in the field. But, some hyperparasitoids can play beneficial, and others detrimental roles (Noyes and Hayat, 1984; Neuenschwander *et al*., 1987). Detailed information on the interactions between these hyperparasitoids in the field is scarce. Further studies are needed to establish their impact on the population of the primary parasitoid, *A. dactylopii* to counter the potential rate of increase of *M. hirsutus* in vineyards.

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