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Research Note

First report of the mite *Schizoglyphus* (Acari: Schizoglyphidae) on white grub larvae from India

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ABSTRACT: White grubs cause serious yield losses in high-value crops, mainly sugarcane, groundnut, maize and potato, and biological control through entomopathogenic fungi and nematodes is by far the most sustainable management strategy available. In our investigations on the factors causing mortality of white grub larvae (Coleoptera: Scarabaeidae) during rearing, we found an undermined species of the soil-dwelling mite *Schizoglyphus* sp. associated with the grubs. This is the first report of the occurrence of this mite from India and of its association with scarab larvae. The potential of this mite as a biocontrol agent has to be explored.

KEYWORDS: Biocontrol, first report, mite, Scarabaeidae, white grubs

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White grubs, the C-shaped larvae of scarab beetles (Coleoptera: Scarabaeidae), feed on the roots, rootlets and underground parts of plants. The infested plants show wilting symptoms initially and dry up eventually, leading to serious yield losses in a range of high-value and staple crops, including sugarcane, groundnut, maize and potato (Sreedevi *et al*., 2014, 2017a; Kumar *et al*., 2017a, 2017b). In India, around 2,500 scarab species are known to occur (Ali, 2001) with two-thirds of them belonging to white grubs that fall under the subfamilies Melolonthinae, Rutelinae, Sericinae and partly Dynastinae. The predominant genera are *Holotrichia*, *Lepidiota* and *Sophrops* in Melolonthinae; *Maladera* in Sericinae; and *Anomala* and *Adoretus* in Rutelinae. Of these, the most speciose is *Holotrichia*, *Maladera* and *Anomala.* Being subterranean with overlapping generations, white grubs occur in abundance. They are known to cause annual yield losses of 20–70%, depending on the species and crop, but unfortunately, there are no reliable or sustainable management strategies to contain them. Management of these white grub species has therefore become a major challenge, but several biocontrol agents such as the entomopathogenic fungi, *Metarhizium* and *Beauveria*, and the entomophilic nematodes, *Heterorhabditis* and *Steinernema*, are increasingly being used by farmers. Apart from these, soil-dwelling mites are now being investigated as potential biocontrol agents of white grubs. Mortality of five laboratory-reared white grub species, viz. *Holotrichia nagpurensis* Khan and Ghai, *Anomala bengalensis* (Blanchard), *Anomala dimidiata* (Hope), *Maladera insanabilis* (Brenske) and *Lepidiota mansueta* Burmeister, was observed due to the occurrence of the mite *Sancassania karnatakaensis* (Krishna Rao and Ranganath), indicating the biocontrol potential of this mite. The mortality was 9-21% in all observed white grub species except *L. mansueta* in which it was 98% (Sreedevi *et al*., 2017a).

In our investigations on the factors causing the mortality of several species of white grubs during rearing, mite infestations were often encountered. The occurrence of one such mite species with a white grub species is reported here.

Several species of white grubs were reared continuously in the laboratory at the Division of Germplasm Collection and Characterization, ICAR–National Bureau of Agricultural Insect Resources, Bengaluru, for determination of developmental period and documentation of morphological characters of the larvae. Two methods were used to rear the white grubs: collecting adult beetles from the field, determining the species and rearing on potato pieces and sprouts in the laboratory; and bringing the field-collected larvae to the laboratory and rearing until emergence. Both methods were carried out for rearing of the collected scarab

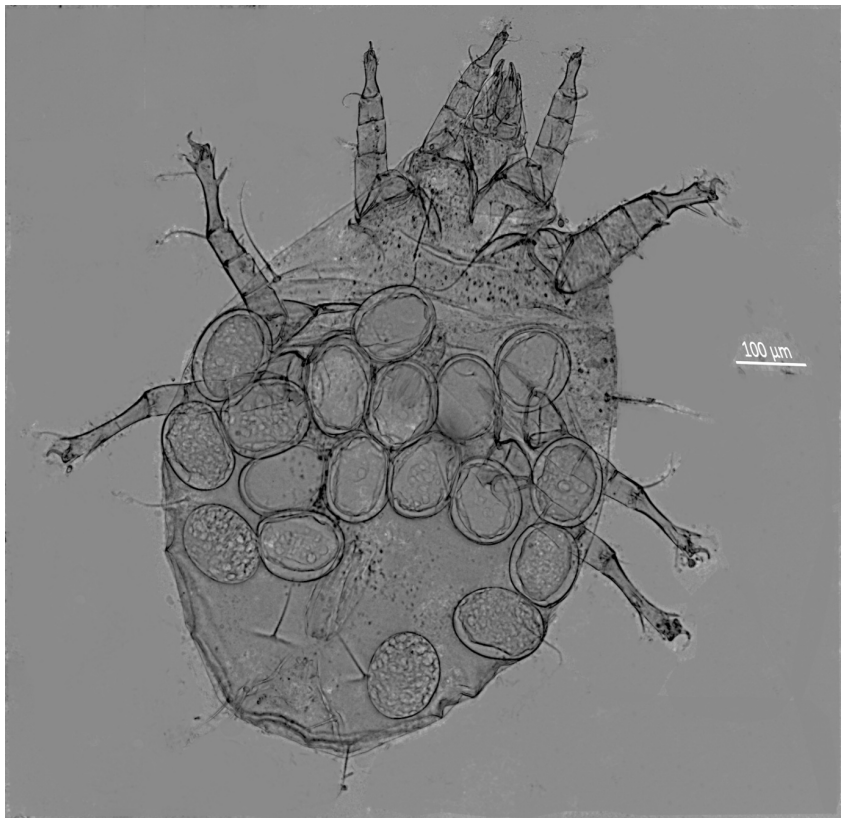

Figure 1. Adult female of *Schizoglyphus* sp. with multiple eggs.

species during 2019-2022. The larvae were observed daily for mortality factors during diet replenishment. In the process, mite infestation on grubs were noticed and individual larvae were examined under a stereozoom microscope (Leica). The larvae collected from potato fields at the Central Potato Research Station, Muthorai, Udhagamandalam, Nilgiris district, Tamil Nadu, were observed to be infested with mites. The mites were picked up with a camelhair brush from the larval body carefully and individual mites were slide-mounted in Hoyer's medium and dried on a hot plate at 45 °C for 3–5 days. The specimens were identified under a phase-contrast microscope (Olympus BX41) and images were captured using an upright research microscope (Zeiss Axio Imager Z2).

Large numbers of an undetermined species of a mite were observed on the sericine larvae of Scarabaeidae leading to the mortality of white grub species. Based on the anal slit and raster pattern along with the observations of mouth parts, and the emerged adults, the larvae were identified as sericine species belonging to the genus *Maladera.* The mite could be identified as *Schizoglyphus* sp. (Figure 1) belonging to the monotypic family Schizoglyphidae of Acariformes. This genus was first found associated with the darkling beetle, *Tagalus tibialis* Kaszab (Coleoptera: Tenebrionidae) (Mahunka, 1978).

Superorder Acariformes Zachvatkin, 1952

Order Sarcoptiformes Reuter, 1909

Suborder Oribatida van der Hammen, 1968

Hyporder Astigmata Canestrini, 1891

Family Schizoglyphidae Mahunka, 1978: 115 Catalogue of Schizoglyphidae.

Type genus: *Schizoglyphus* Mahunka, 1978

Type species: *Schizoglyphus biroi* Mahunka, 1978

Type locality: Geelvink Bay (now, Cenderawasih Bay)

Distribution: Indonesia (Western New Guinea)

Host: *Tagalus tibialis* (Coleoptera: Tenebrionidae)

Examination of adult mites under a research microscope indicated the presence of genital valves with four pairs of minute setae, palpi with two freely articulated segments and vestiges of 3rd attachment organ with conoidal setae, p1 and p2 setae vestigial, tarsus II with two solenidia, tarsal setae foliate, three pairs of genital papillae.

The astigmatid genus *Schizoglyphus* has several plesiomorphic character states (3-segmented palps, 3 pairs of genital papillae) (OConnor, 2009), suggesting that it is sister to all other extant Astigmata, but in comparison with *Levantoglyphus*, its gnathosoma is reduced (similar to other Astigmata) and tarsal setae *aa* II and *ba* III–IV are absent (Beron, 2021).

The Astigmata lineage though originated within oribatid mites (OConnor, 1984; Norton, 1998), species of the group inhabit a wide array of patchy and ephemeral habitats, through associations with invertebrate and vertebrate hosts (OConnor, 1982, 2001, 2009; Houck & OConnor, 1991).

The mite *Schizoglyphus* could be one of the mortality factors of sericine species which needs further confirmatory studies. The mites were found in abundance on larval bodies colonised extensively around the spiracles. This is the first report of *Schizoglyphus* from India and also of its association with scarab larvae. Together with species level identification, the potential of this mite as a biocontrol agent needs to be explored with more intensive studies.

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