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Two new records of Acaridae (Acari: Astigmata) mites from India

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Abstract
The present paper reports two new records of Astigmata mites of the family Acaridae from India. *Tyrophagus curvipenis* Fain & Fauvel, 1993 and *Tyrophagus perniciosus* Zakhvatkin, 1941 are documented here for the first time in the country. Diagnostic characteristics, locality details, and habitat information are provided.

Keywords: India, Tyrophagus, new record, mites, Astigmata

Introduction
The family Acaridae, the largest group within the superfamily Acaroidea, consists of 541 species classified into 88 genera and is distributed globally (Schatz et al., 2011). Members of this family are particularly abundant in stored foods, animal nests, and plant material. Several species are recognized as pests of agricultural and medical importance (O'Connor, 2001) [8]. Literature indicates that Acaridae mites are commonly found in decomposing food matter as well as in soil habitats. Acaroid mites, especially in storage environments, proliferate under favorable conditions such as high temperature, humidity, low ventilation, and light, which leads to both quantitative and qualitative deterioration of stored grains and other foodstuffs.
The genus *Tyrophagus* currently includes approximately 35 valid species worldwide. In India, only two species *Tyrophagus putrescentiae* (Schrank, 1781) and *Tyrophagus longior* (Gervais, 1844) had previously been recorded, both from grain storage facilities in West Bengal (Gupta & Chatterjee, 2004; Walia & Mathur, 1995; Mukherjee *et al*., 2008) [3, 6, 13]. A search of surrounding regions, particularly Pakistan, reveals the presence of *Tyrophagus bisetosus* Bashir *et al*., 2014 [1].

Materials and Methods
Mite samples were collected from the Deccan Plateau, a region representing a significant portion of the Indian peninsula, known for its diverse biological richness. Extraction of mites was conducted using Berlese-Tullgren funnels. Collected mites were preserved in 70% ethanol and sorted manually under a LEICA EZ4 binocular microscope.
Specimens were temporarily mounted in lactic acid and examined under a NIKON H600L compound microscope fitted with a Nikon DS-R12 camera. Measurements and photographs were taken using NIS-Elements software (version BR 5.20). Figures and labeling were prepared in Adobe Photoshop CS 8.0. All measurements are taken in micrometers (µm). Taxonomic identification follows Robertson (1961) and Fan & Zhang (2007) [2, 10].
The newly reported species are deposited in the National Zoological Collection, Acarology Section, Zoological Survey of India, and Government of India.

Taxonomic Account
Family: Acaridae Latreille, 1802
Genus: *Tyrophagus* Oudemans, 1924 [9]
Species: Tyrophagus curvipenis Fain & Fauvel, 1993

Original Description: Fain & Fauvel, 1993. International Journal of Acarology, 19(1): 95–100.
Tyrophagus curvipenis Te Aitanga Pepeke, K. *Fauna of* New Zealand, 28, 226 (1993)
Tyrophagus curvipenis Nguyen, Thi-Thu, *et al*, Scientific **Reports 13.1 (2023) [7]:** 9469.
Type Locality and Habitat: Orchids cultivated in a greenhouse, Portugal.
Materials Examined: Vatpara village, Amravati district, Maharashtra (20°26'42.0"N, 79°23'39.7"E); 10 females; collected on 13.02.2023 from wheat field soil. Collector: D.N. Adagale, Voucher No: 7630/17 ZSIHQ.

Distribution
India: Present study (first record).
Elsewhere: Australia, New Zealand, Portugal, Korea
Diagnosis: Setae scx narrow with 3 to 4 pairs of short pectinations (Fig 1-b). Tarsus I ω1 slender, cylindrical and slightly widened at apex; tarsus II ω slender, almost cylindrical (Fig 1-c). Setae w and r of tarsus IV setiform.

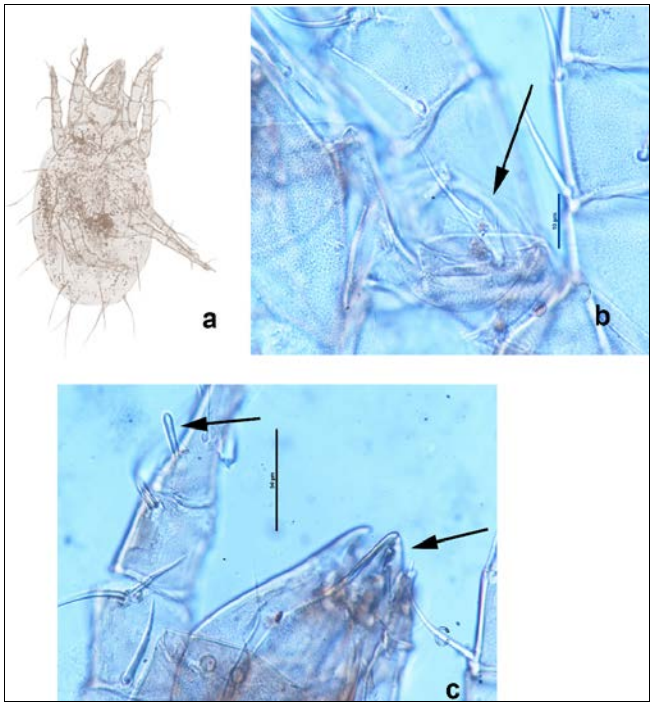

Fig 1: a - *Tyrophagus curvipenis* Fain & Fauvel, 1993; b - supracoxal seta; c - solenidia of tarsus I and chelicera

Species: *Tyrophagus perniciosus* Zakhvatkin, 1941 [14]
Tyrophagus perniciosus Leal, Walter Soares, *et al. Agricultural and biological chemistry* 53.4 (1989) [5]: 1193-1196
Original Description: Zakhvatkin, 1941 [14]. American Institute of Biological Sciences, Washington DC. 573, 83, 132–136.
Type species: *Acarus putrescentiae* Schrank, 1781
Type Locality and Habitat: Not specified.
Materials Examined: Sidhapath Watch Tower, Jharkhand (23°51'01.5"N, 84°10'58.3"E); 1 male; collected on 24.10.2021 from wheat field soil. Collector: D.N. Adagale, Voucher No: 7586/17 ZSIHQ.

Distribution
India: Present study (first record).
Elsewhere: Australia, Bulgaria, U.K, Germany, Japan, Kazakhstan, Netherlands, Russia, Turkey, U.S.A.
Diagnosis: scx strong, tapering from base to tip or slightly widened (Fig 2-c). Tarsus I ω1 stout and clavate; tarsus II ω stout, slightly clavate. Setae w and r of tarsus IV spiniform. Genital opening and anus with ps3 setae (Fig 2-d). Chelicera long (Fig 2-e).

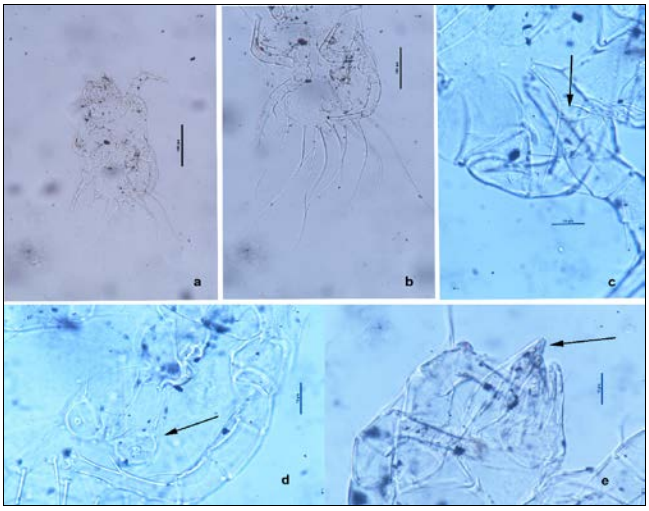

Fig 2: d - *Tyrophagus perniciosus* Zakhvatkin, 1941[14]; e - Hysterosomal region; f - supracoxal seta; g - genital opening and anus; h - chelicera.

Discussion
These study discoveries represent considerable range extensions for both species, previously known from diverse global regions of world. While Tyrophagus putrescentiae (Schrank, 1781) and Tyrophagus longior (Gervais, 1844), were previously recorded from grain storage facilities in West Bengal, Tyrophagus curvipenis Fain & Fauvel, 1993 and Tyrophagus perniciosus Zakhvatkin, 194, as new records for India represents a crucial step forward in understanding the country's rich but underexplored acarine fauna. These findings emphasize for continued, biodiversity surveys especially in agricultural landscapes.

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