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Poultry litter mites from Mahrashtra, India

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Abstract
Fortnightly regular study was carried out to record the mites found in intramural poultry litter. 48 litter samples were collected from two poultry houses and screened using a simple pickup method. A total of eight species of mites were identified from poultry litter.

Keywords: Acari, arachnida, arthropoda, fortnightly, intramural

Introduction

Mites are small unsegmented, microscopic animals placed in the phylum Arthropoda and class Arachnida along with scorpions, false scorpions, spiders, Harvestmen, etc. Due to their microscopic size and their great adaptability to the different environments, they can exploit and reach extreme habitats where other animals cannot.

The Poultry industry occupies an important role in providing animal protein, meat, and egg to people and generally plays an important role in the national economy. India is the third-largest egg producer and the sixth-largest producer of broilers globally (Sahoo, 2014) [14]. In India, village peoples use these chickens as an immediate money source. Poultry production in different parts of Asia is still distinctively grouped into commercialized and village enterprise subsectors, each with its peculiarities (Nnadi and George, 2010) [10].

Several species of mites are serious pests of poultry birds worldwide. Saviour infestation of mites in chickens leads to retard growth, low vitality, damaged plumage, reduced egg production, and sometimes causes death (Bishopp, 1942) [1]. Some mite species burrow in the skin epithelium, which causes tissue proliferation and scab formation, and also attacks the feather follicles and destroys the feather base (Singh, 2002) [15].

Diverse species of parasitic and non-parasitic mites have been recorded from poultry litter from different parts of the world. Most poultry litter consists of straw, wood chips, corn cobs, grain husk, and fecal matter. In other words, this litter contains floor covering material, including wood shavings and any other absorbent material contaminated with spilled feed and bird feces (Rueda and Axtell, 1996). Byng, 1963 [4] discussed the four different possible ways of import of mites into the fresh litter could be through air, insects, birds, and the poultry feed.

Several families of mites such as Uropodidae, Microchelidae, Urodinychidae, Trematuridae, Parasitidae, Laelapidae, Cheyletidae, Acaridae, Acarophenacidae, Eremulidae, Glycyphagidae, Digamasellidae, Dermanyssidae, Ascidae, Erythraeidae, Chortoglyphidae, Anystidae, Cunaxidae, Liroaspidae, Phytoseidae, Uropodidae, Pyroglyphidae, etc., have been recorded to poultry litter from different parts of the world (Brady, 1970; Rueda & Axtell, 1996; Byng, 1963; Ronald & Enns, 1971; Thete, 2020; Bansod *et al*., 2015) [2, 4, 13].

From the last few decades, poultry litter mites have been gained the attention of many researchers due to the fact mites present in the poultry litter might affect poultry birds badly by their different internal or external activities, or they may act as a vector of different diseases, and they may cause annoyance to poultry workers (Brady, 1970) [2]. Also, Brady, 1970 [2] has been noted evidence of an indirect effect of non-parasitic mites in the poultry litter act as a vector of poultry diseases.

So far as India is concerned, very few research efforts have been taken in India to explore poultry litter mite fauna and their ecology. So, it was an opportunity to lift this lagging microscopic study.

Materials and Methods

Study of mites fauna inhabit in poultry litter were carried out for two consecutive years, from June 2018-2019 to June 2019-2020. The two different locations of poultry farms in Shevgaon, district Ahmednagar, Maharashtra (Latitude: 19.3546496 and Longitude: 75.2219175) were selected for this study. Out of them, one poultry farm selected had pure breed birds and the second had broiler birds. Along with this random sampling of broiler poultry litter was carried out from four diffrent tehsils of Ahmednagar districts. The poultry houses were 10-20 m wide and 100-125 m long with 6000-10000 birds.

The litter samples from poultry houses were collected fortnightly during morning time manually in clean and sterilized sampling bottles. Poultry litter consiststing of straw, wood chips, grain husk, corn cobs and bird fecal matter. The samples were collected from different locations inside the poultry farm, like four corners, the center, under the feeder pot (this sample contains poultry feeds), the entrance door, and below the birds where they stay at one place in the group for a long time. Each standard sample of litter weighed 15 gm. Mites were separated from poultry litter using a simple pickup method (Jogdand, 1988). Large particles and fibrous material in the poultry litter were separated by sieving through a special brass sieve. The sample was examined by taking one gram of sieved litter, spread uniformly in a clean and sterile petri dish, and observed under a Stereo binocular dissecting microscope.

Isolation of Mites: The mites were picked from the sample using a fine needle or fine camel brush moistened in 4% lactic acid.

Clearing and Mounting: Isolated mites from the sample were made clear by keeping them in 4% lactic acid for 3-5 days or at least for one day, depending upon the thickness of the cuticle. When they cleared, mounted Ventral side facing up on clean slide at a center in a drop of melted glycerin jelly. Slides were dried at N.T.P and were preserved as permanent slides.

Morphometry and photography: The photographs and measurements of specimens were taken using a Leica trinocular research microscope with an attached camera.

Ecological Parameters: The humidity and temperature (max/min) were recorded using a mini temperature humidity meter HD-303.

Identification

Each mite was identified using the authentic key and figured descriptions given by Hughes (1976) [6].

Result and discussion

Reported acari fauna from poultry litter is listed in Table 1. Which revealed the presence of 8 species belonging to 3 orders, namely Astigmata, Mesostigmata, and Prostigmata, under 8 families. Previously, these species were reported from different states of India. Out of which 6 species marked with one asterisk and one genus (*Scutacarus*) marked with two asterisks are recorded here for the first time in poultry litter from the state of Maharashtra. The genus *Scutacarus* was reported in few regions of India, in West Bengal by Modak *et al*., (2004) [9] & Roy *et al*., 2016, in Kerala by Parveen & Gupta (2020) [11]. Interestingly, the species *Blomia freemani* recorded from two different habitats that is in poultry litter and house dust.

Morphometry (Table 2.) and photography for these recorded species are provided. The impact of environmental parameters was also observed on a total load of mites. The maximum density (30-40 mites/ gm of litter sample) was observed during monsoon when there was a record of high humidity, moderate temperature, and significant rainfall. However, the number of mites declined in the winter.

Table 1: The following is the list of mites arranged as per their taxonomic position.

Phylum Arthropoda Class Arachnida Lamarck, 1802 Subclass Acari Leach, 1817	Order Astigmata Canestrini, 1891	Family Acaridae Ewing & Nesbitt, 1942	*Acarus siro* Linnaeus, 1758
		Family Glycyphagidae Berlese, 1887	**Blomia freemai* Hughes, 1948
	Order Mesostigmata Canestrini, 1891	Family Uropodidae Kramer, 1881	**Leiodinychus krameria* G. & R. Canestrini, 1882
		Family Ameroseiidae Evans, 1963	**Kleemannia plumosus* Oudemans, 1902
	Order Prostigmata Kramer, 1877	Family Cheyletidae Leach, 1815	*Cheyletus eruditus* Schrank, 1781
		Family Tarsonemidae Kramer, 1877	**Tarsonemus granaries* Lindquist, 1972
		Family Acarophenacidae Cross, 1965	**Acarophenax tribolii* Newstead and Duvall, 1918
		Family Scutacaridae Oudemans, 1916	***Scutacarus sp.* Gros, 1845

Table 2: Mean length and width (in µm) of mites recorded from poultry litter (N = 05).

Species	Male		Female	
	Mean body length	**Mean body Width**	**Mean body length**	**Mean body Width**
Acarus siro	271.8	147.2	364.8	190.8
L. krameri	631.6	456.2	721.8	510.4
C. eruditus	313.8	217.2	447.4	287.4
A. tribolii	172.4	129.6	214.8	143.4
T. granarius	103.0	71.6	157	99.6
K. plumosus	322.2	204.8	391.2	231.6
B. freemani	291.6	259.4	325.4	254.4

Fig 1: *Acarus siro* Female

Fig 2: *Acarus siro* Male

Fig 3: *Cheyletus eruditus*

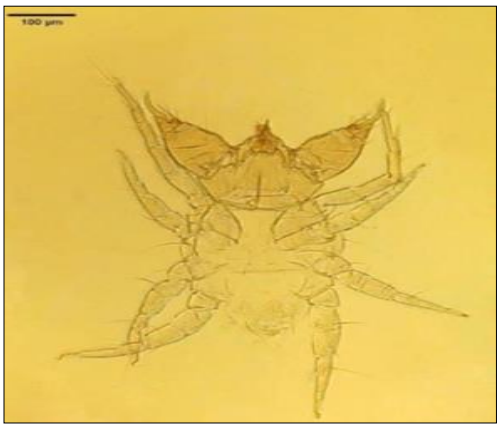

Fig 4: *Cheyletus eruditus*

Fig 5: *Tarsonemus granarius* Female

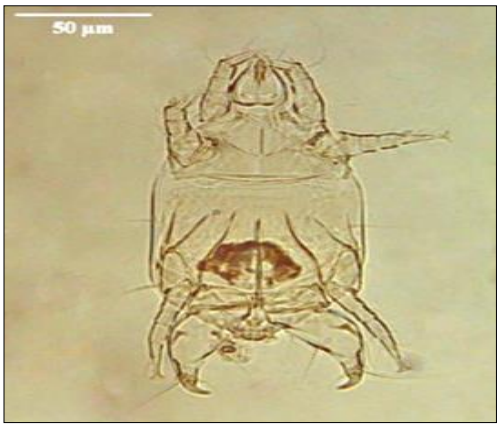

Fig 6: *Tarsonemus granarius* Male

Fig 7: *Acarophenax tribolii* Female

Fig 8: *Acarophenax tribolii* Male

Fig 9: *Scutacarus sp*.

Fig 10: *Leiodinychus krameri* Male

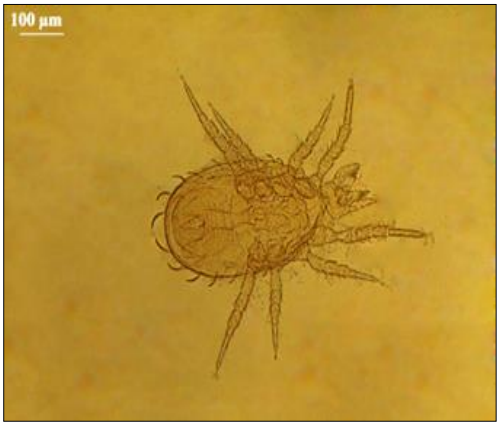

Fig 11: *Kleemannia plumosus*, Female

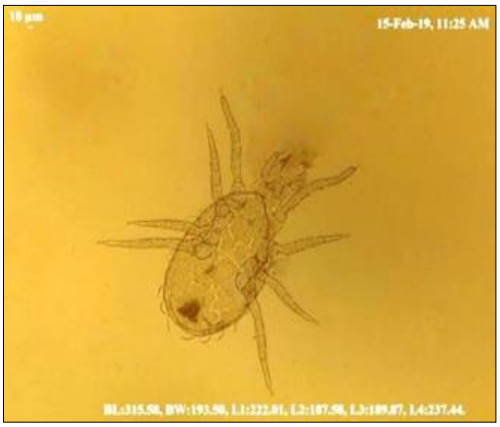

Fig 12: *Kleemannia plumosus*, Male

Fig 13: *Blomia freemani* Female

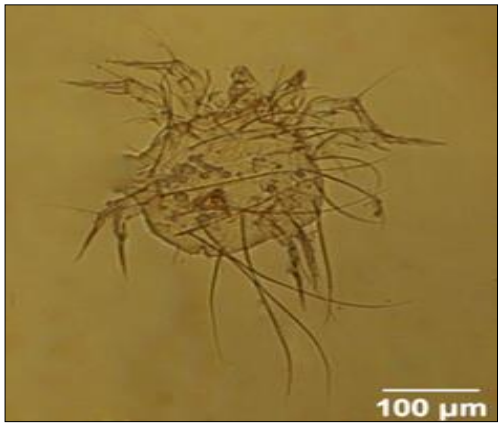

Fig 14: *Blomia freemani* Male

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