



## A report of insects and mites on mushrooms and mushroom beds from some areas of south 24 parganas, West Bengal

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### Abstract

The present paper reports the occurrence of 6 species of insects belonging to 3 orders, 6 families and 6 genera as well as 25 species of mites under 3 orders, 12 families and 18 genera from mushrooms and mushroom beds from some areas of South 24 Parganas district of West Bengal. As far as the insects are concerned, excepting one (*Cyllodes bifacies*), which is of uncertain association, the rest are all damage causing to the mushrooms as well as mushroom beds. Among the mites, 9 species were damage causing while 10,3,3 species were predatory, fungal feeding and uncertain association, respectively. As regards abundance, *Isotoma fasciata*, under Collembola, was the most abundant insect followed by larvae of *Megaselia halterata* and *Musca domestica*. Among the mites, the most abundant species were- *Acarus siro*, *A. gracilis*, *Hypoaspis vacua*, *H. aculifer* and *Histiostoma heinemanni*. The occurrence of the remaining species was relatively low.

**Keywords:** Mushroom, Mites and Insects, Diversity, South 24 Parganas district, West Bengal

### Introduction

Since ancient time mushrooms are intimately associated with man and are consumed for their delicacies. It is rich with proteins, vitamins, minerals, fibers, trace elements, amino acid, other nutrients and are relatively free from calories, cholesterol, sugar, etc. (Gupta [15], 2012; Gupta and Mondal, 2021 and Dutta [14] et al. 2022). It has therapeutic values also and many of the tribal communities use mushrooms as folk medicines. Mushrooms and mushroom beds are attacked by a large number of mites and insects and some of those do enormous economic loss threatening mushroom cultivation. Some of the works done by earlier workers from India and outside are, India: Mukherjee [23], Gupta and Sana, 2010; Singh and Sharma, 2016; Somchowdhury [30], Das, and Mukherjee, 1987; Parveen [25] and Gupta, 2019, 2020 and from outside India: Davis, 1934, 1937, 1944; Wuest [31] and Bengston, 1982, etc. Some areas of South 24 Parganas including RK Mission, Narendrapur are maintaining 4-5 types of mushrooms. In addition, some other wild mushrooms were also examined and the insects and mites occurring on those were also collected, identified and documented along with the damage symptoms produced by those. The present paper is based on results of that study.

### Materials and Methods

The mushroom unit of RK Mission, Narendrapur and some other areas of South 24 Parganas (Sonarpur, Baruipur, Patuli, Canning, Jharkhali, Kakdeep), maintain different species of mushrooms and the collection of mites and insects occurring on those mushrooms was done during January, 2023 to January, 2024. The insects and mites were collected following heat desiccation method through Tullgren's apparatus and those were preserved in 70% ethyl alcohol. Identification was done by the junior author (SKG). Damage done, if any, was recorded at the time of sampling.

### Results and Discussion

The extraction of mites and insects from mushrooms and mushroom beds revealed the occurrence of 6 species of insects under 6 genera, 6 families and 3 orders (Table-1) as well as 25 species of mites under 18 genera, 12 families, 3 orders (Table-2). Out of 6 species of insects, 5 were damage causing and out of 25 species of mites, 9 were damage causing to mushroom and mushroom beds while 10 species of mites belonged to predatory groups. In addition, 3 species of mites each were fungal feeding and of uncertain association.

**Table 1:** List of Insects occurred on Mushrooms and mushroom beds

Name of Insect	Name of Host Mushroom	Locality	Date of Collection	Remarks
<b>Order- Diptera Family- Phoridae</b>				
<i>Megaselia halterata</i> (Wood) (Damage causing)	<i>Agaricus bitorquis</i> (Quel)	Narendrapur	04.04.2023	It is a most damage causing insect. The larvae fed on the mycelium in the compost and made tunnels, affected gills which turn yellow.
<b>Family- Sciaridae</b>				
<i>Bradysia diformes</i> Frey (Damage causing)	<i>Calocybe indica</i> P&C and <i>Lentinula edodes</i> (Berk.)	Jharkhali	10.05.2023	The fly larvae damaged mushroom by consuming mycelium and spawns. The mushroom turned light brown appearance.
<b>Family- Muscidae</b>				
<i>Musca domestica</i> L. (Damage causing)	<i>Calocybe indica</i> P&C	Jharkhali Canning	10.05.2023 08.06.2023	Fly fed on lamellae causing loss to mycelium.
<b>Order- Coleoptera Family- Nitidulidae</b>				
<i>Nitidula</i> ( <i>Cyllodes</i> )	<i>Agaricus bitorquis</i> (Quel)	Sonarpur	19.09.2023	This beetle was found on damaged compost

<i>bifacies</i> Walker) (Uncertain association)		Baruipur	12.11.2023	and fruiting bodies.
<b>Family- Staphylinidae</b>				
Staphylinid beetle larva ( <i>Dalotia coriaria</i> (Athela)) (Damage causing)	<i>Calocybe indica</i> P&C	Jharkhali Narendrapur	10.05.2023 02.07.2023	Some larvae of this beetle were found from the extraction of mushroom bed and damaged mushroom, it may be a predator of Acarid mites.
<b>Order- Collembola Family- Isotomidae</b>				
<i>Isotoma fasciata</i> Borner	<i>Pleurotus ostreatus</i> L.	Narendrapur Baruipur	04.04.2023 10.01.2024	Huge number of this collembola was found in the straw bed of mushroom and the affected beds turned brown.

**Table 2:** List of Mites occurred on Mushrooms and mushroom beds

Name of the Mite	Name of host Mushroom	Locality	Date of Collection	Remarks
<b>Order- Sarcopiformes Suborder- Oribatida Family- Acaridae</b>				
<i>Tyrophagus putrescentiae</i> (Schrank)	<i>Pleurotus ostreatus</i> L. and <i>Russula delica</i> Fr. (wild mushroom)	Jharkhali Narendra-pur	10.05.2023 02.07.2023	Collected from Oyster mushroom bed, found feeding on mycelium and the infestation caused complete damage. Its number was in plenty. In case of unidentified wild mushroom, it was found attacking stocks.
<i>Tyrophagus longior</i> (Gervais)	Wild mushroom ( <i>Lentinula edodes</i> )	Sonarpur Narendra-pur Baruipur	04.04.2023 19.09.2023 12.11.2023	Some dipteran maggots were found associated with it. The damage included making holes in the cap.
<i>Tyrophagus dimidiatus</i> Hermann	<i>Calocybe indica</i> P&C	Jharkhali	10.05.2023	This mite made the stalk hollow, making the mushroom unsuitable for marketing. It was abundantly found on the mentioned mushroom.
<i>Acarus siro</i> Linn.	Oyster mushroom ( <i>Pleurotus ostreatus</i> ) and White milky ( <i>Calocybe indica</i> ) mushroom (bed)	Narendra-pur Canning Sonarpur Baruipur	04.04.2023 08.06.2023 19.09.2023 12.11.2023	Large number of this mite was recovered. The infested mushroom turned brownish.
<i>Acarus gracilis</i> Hughes	<i>Volvariella volvacea</i> (Bull.) Singer	Jharkhali Narendra-pur Kakdeep	25.03.2023 02.07.2023 10.10.2023	It was an unusual occurrence on mushroom hence the association is uncertain, it is more common in stored product.
<i>Rhizoglyphus echinopus</i> (Fumouze and Robin)	<i>Lentinus sajor-caju</i> (Fr.) Fr.	Baruipur	12.11.2023 10.01.2024	Made stalk holes on mycelium malts, also affected fruit bodies. The basal area of the attacked mushroom becomes pointed. Turning the colour to yellowish-brown.
<i>Caloglyphus berlesei</i> (Michael)	<i>Auricularia auricula</i> (L.)	Patuli	19.09.2023	The mushroom bed turned blackish and subsequently became fully damaged.
<b>Family- Histiotomatidae</b>				
<i>Histiotoma heinemanni</i> Hill and Diah	<i>Pleurotus ostreatus</i> L.	Patuli Jharkhali Narendra-pur	04.04.2023 10.05.2023 02.07.2023	It attacks the mycelia, preventing to reach to the fruiting body.
<b>Family- Suidasiidae</b>				
<i>Suidasia nesbitti</i> Hughes	<i>Calocybe indica</i> P&C	Sonarpur Kakdeep	04.04.2023 10.10.2023	The occurrence of this mite on mushroom bed occurred due to contamination through dipteran flies. This is an important pest mainly of stored products, but on mushroom it causes no damage.
<b>Family- Glycyphagidae</b>				
<i>Glycyphagus domesticus</i> (De Geer)	<i>Agaricus bitorquis</i> (Quel)	Canning Kakdeep	08.06.2023 10.10.2023	Some members of this mite were observed in the mushroom and mushroom bed extracts. Fungal associated.
<b>Order- Trombidiformes Suborder- Prostigmata Family- Cunaxidae</b>				
<i>Cunaxoides</i> sp.	<i>Lentinula edodes</i> (Berk.)	Patuli Baruipur	19.09.2023 10.01.2024	This species appears to be interesting because it is very uncommon on mushroom on one hand and on the other hand it is likely to be a new one because the characteristics of the species do not totally with other known species.
<b>Family- Pygmephoridae</b>				
<i>Pygmephorous mesembrinae</i> Canestrini	<i>Lentinus sajor-caju</i> (Fr.) Fr. and <i>P. ostreatus</i> L.	Canning	08.06.2023	It fed on mycelium, below the casing, as well caps which turned yellowish-brown, gradually the mushroom was destroyed.
<b>Order- Mesostigmata Family- Laelapidae</b>				
<i>Hypoaspis miles</i> Berlese	<i>Agaricus bitorquis</i> (Quel)	Jharkhali Canning Kakdeep	10.05.2023 08.06.2023 10.10.2023	This mite was abundantly found in the damaged fruit body and beds and constituted about 60% of mesostigmatid mites collected from mushrooms; this is a predatory mite on <i>Suidasia</i> mites.
<i>Hypoaspis aculifer</i> (Canestrini)	<i>Calocybe indica</i> P&C	Jharkhali Baruipur	10.05.2023 10.01.2024	One or two specimens of this species were collected from extraction of mushrooms, likely to be a predatory species.
<i>Hypoaspis vacua</i> (Michael)	<i>Agaricus bitorquis</i> (Quel)	Narendra-pur Canning Narendra-pur	04.04.2023 08.06.2023 19.09.2023	This was found feeding on mycelium, they made tunnels inside the mushroom buds and such buds turned brownish and dried up.

		Baruipur	12.11.2023	
<b>Family- Phytoseiidae</b>				
<i>Typhlodromus</i> sp.	<i>Pleurotus ostreatus</i> L.	Narendra-pur	02.07.2023	A good population of this mite was collected from bed of Oyster and the taxonomic character of this species did not matched with any of the known species of this genus and therefore it appears to be a new species and will be published after confirmation of novelty.
<b>Family- Parasitidae</b>				
<i>Parasitus consanguineus</i> Oudemans and Voigts	<i>Agaricus bisporus</i> (Lge.) Sing.	Canning Baruipur	08.06.2023 10.01.2024	This was found to be a very common mite and many specimens of this species were found in the extracted bed and mushroom sample. This mite was observed both on mushroom bed as well as on the fruit body. This is a predatory mite and when infested mushrooms were examined under Stereo-binocular microscope was found associated with <i>Tyrophagus</i> mite.
<b>Family- Macrochelidae</b>				
<i>Macrocheles muscaedomesticae</i> (Scopoli)	<i>Auricularia auriculata</i> (L.)	Baruipur Narendra-pur	12.11.2023 04.04.2023	The extracted material of mushroom revealed the occurrence of mite. The nature of association is unknown.
<b>Family- Ascidae</b>				
<i>Asca garmani</i> Hurlbutt	<i>Russula delica</i> Fr. (wild mushroom)	Jharkhali	25.03.2023	Some specimens of this species were seen in the extracted mushroom sample and it is known to be a predatory species.
<i>Lasioseius parberlesei</i> Bhattacharyya	<i>Agaricus bitorquis</i> (Quel)	Narendra-pur	02.07.2023	Known to be predatory mite of acarid mites.
<i>Lasioseius quadrisetosus</i> Chant	<i>Calocybe indica</i> P&C	Jharkhali Kakdeep	10.05.2023 10.10.2023	Collected from extraction of white milky mushroom bed, it was earlier reported as predatory mites of Acarids (Parveen and Gupta, 2019).
<i>Lasioseius mcgregori</i> Chant	<i>Plutus umbonate</i> (wild mushroom)	Jharkhali Canning	10.05.2023 08.06.2023	The extraction of mushroom revealed the presence of this mite. It belongs to predatory group.
<i>Gamasellodes bicolor</i> Berlese	<i>Russula delica</i> Fr.	Narendra-pur	19.09.2023	Its nature of association with mushroom is unknown, may be a predatory species.
<b>Family- Uropodidae</b>				
<i>Fuscuropoda marginata</i> Koch	<i>Pleurotus ostreatus</i> L.	Jharkhali Baruipur	25.03.2023 10.01.2024	Abundantly found in the extracted mushroom bed and mushroom. It is known to be fungal feeding species.
<i>Leiodinychus krameri</i> (Berlese)	<i>Volvariella volvacea</i> (Bull.) Singer	Narendra-pur	02.07.2023	Occurrence was abundant like <i>Fuscuropoda marginata</i> , known to be fungal associate one.

No in-depth study on insects and mites associated with mushroom and mushroom beds had been done earlier and whatever works are available are few and far between. Some of the important works in this area are- Mukherjee and Somchaudhury, 1972; Chandler<sup>[3]</sup> (2009-2010); Kotwal<sup>[21]</sup> and Roni, 1999; Acharya<sup>[1]</sup> and Pradhan, 2017<sup>[1]</sup>; Aiswarya<sup>[2]</sup>, Gupta and James, 2018; Lau<sup>[22]</sup> et al. 2017; Hussey, 1963; Das et al. (1986-1988); Gyaneswaran<sup>[17]</sup> and Vijayagunasekhara, 1999; Dey<sup>[13]</sup>, 2020; Kantaratanakul, Chaiwat, and Prayoonrat, 1989; Jonathan et al. 2012; Clift<sup>[4]</sup>, 1979, etc.

Among mites, *Typhlodromus* sp. and *Cunaxoides* sp. are likely to be new species. *Tyrophagus putrescentiae*, *Histiostoma heinemanni*, *Pygmephorous mesembrinae*, *Suidasia nesbitti*, were found to be highly damage causing to mushroom cultivation in the areas surveyed. Since these are edible items, application of chemical pesticides cannot be done and hence attempts need to be done to control those with green pesticides as well as conserving the beneficial predatory mites.

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