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## ***Torrubiella pruinosa*, a teliomorph of an entomopathogenic fungus *Hirsutella versicolor* of mango hopper (*Idioscopus clypealis*) from India**

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*Torrubiella pruinosa*, a teliomorph of an anamorphic entomopathogenic fungus *Hirsutella versicolor* on mango hopper (*Idioscopus clypealis*) was observed. On the infected mango hopper, tiny pin head signs of ascomata were observed. Ascomata of *T. pruinosa* is pale brown or tawny brown, crowded, immersed in stroma, wall dark golden brown, 260–320 × 230–260 µm, asci clavate, hyaline and thin walled. The ascospores of *T. pruinosa* are fusiform, distoseptate with a faint tint of pigmentation, 17.5–25.0 × 5.0–7.5 µm. The anamorph stage of *H. versicolor* fungal hyphae is hyaline, septate and profusely branched, and conidiogenous (phialides) cells are hyaline, pear-shaped and smooth-walled with single or double sterigmata and rarely, multiple sterigmata. Each sterigmata bears single conidia which are hyaline, oval to pear-shaped.

**Keywords:** entomopathogenic fungus; *Torrubiella pruinosa*; teliomorph; ascomata; *Hirsutella versicolor*; mango hopper

Increasing awareness regarding the hazardous effect of chemical pesticides has posed serious threat to environment leading to disturbed biodiversity and contamination of food chain in the ecosystem (Lyon et al. 1995). Entomopathogenic fungi are an important and most prevalent component of ecosystems which play a major role in maintaining the threshold level of pest population. Keeping these in view, researchers are in search of novel entomopathogenic fungi for the biological management of insect pest. In this connection, several entomopathogenic fungi viz. *Tolypocladium cylindrosporum*, *Verticillium lecanii*, *Beauveria bassiana*, *Metarrhizium anisopliae*, *Isaria farinosa* (*Paecilomyces farinosus*), *Hirsutella* sp, *Hirsutella versicolor* were reported by several workers (Chakravarti 1966; Vänninen 1995; Klingen et al. 2002; Aung et al. 2008; Choudhary et al. 2012).

Among all mango pests, hoppers *Idioscopus clypealis* (Lethierry), *Idioscopus nitidulus* (Walker) and *Amritodus atkinsoni* (Lethierry) (Hemiptera: Cicadellidae) are considered to be the most serious and widespread pests, with a potential to cause up to 100% loss in India, the world's largest producer of mango (Choudhary et al. 2012). Among the mango hopper, *I. clypealis* L. is an important and most prevalent pest of mango in Eastern India which is highly active during the flowering and fruiting period and causes

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severe damage to growing twigs and panicle of the flower by sucking the cell sap. Moreover, during the remaining period they remain confined to abaxial surface of leaves, away from light and moist areas of the plants. During the survey of mango orchard, a large number of dead leaf hoppers (*I. clypealis*) infected with *H. versicolor* were observed on abaxial surface of leaves in the months of September–November 2011. When, the infected hopper was observed it was noted that the fungal mycelia were radiating from the body of the infected hopper and the fungus was identified as *H. versicolor*. Identification of the fungus infecting mango hopper was carried out using standard laboratory procedures (Humber 1997) and based on earlier literature (Jones 1997). For morphological studies, fungal hyphae and sexual fruiting bodies were mounted with lactophenol cotton blue and then examined under a phase contrast microscope (type 020–519.503 LB 30T, Leica, Germany) equipped with a photomicrographic camera. Measurements of conidia and sexual fruiting bodies were carried out by an ocular micrometre calibrated with a stage micrometre.

Survey and collection of mango hopper infected with *H. versicolor* at different locations (Gumla, Khunti, Lohardaga and Ranchi) of Jharkhand (India) were done. Five mango plants from each orchard were selected. The numbers of dead and live mango hopper were counted on 20 twigs without any disturbance of the twigs and then mortality/infection (%) was calculated. It has been observed that the infection of fungus/mortality (%) of hoppers varied from place to place and cultivar to cultivar. The maximum infection/mortality (%) of hopper was observed in the Ranchi district (63.11%) followed by Gumla (56.64), Lohardaga (47.86) and Khunti (12.73%) district of Jharkhand (Table 1). Among the cultivars, the maximum mango hopper mortality was observed in Mallika followed by Dashahari, Lagra, Chusa, Amrapali and Himsagar cultivars. However, the teliomorph (ascomata) of *H. versicolor* was observed in infected hopper in Ranchi and Gumla (except the Lohardaga and Khunti) areas of Jharkhand. The perfect stage (ascomata) of the fungus was observed during the last week of October to first week of November 2012 on the infected hopper. A tiny pin head sign (ascomata) of the fungus was observed above the body of infected hopper. When these signs were critically observed microscopically, it was identified as the ascomata of *Torrubiella pruinosa*, a perfect stage of the fungus *H. versicolor*. Choudhary et al. (2012) described the anamorph stage of *Hirsutella* sp. as fungal hyphae are hyaline, septate and profusely branched, and conidiogenous (phialides) cells are hyaline, pear-shaped and smooth-walled with single or double sterigmata and rarely, multiple sterigmata (three). Each sterigmata bears single conidia which are hyaline, oval to pear-shaped (Figure 1).

The teliomorph stage of *H. versicolor* is *T. pruinosa* which had pale brown or yellowish-brown ascomata, sexual fruiting bodies which were crowded, immersed in

Table 1. Survey and occurrence of *H. versicolor* on mango hopper from different locations of Jharkhand.

Locations/ Districts	Latitude	Longitude	No. of mango hopper observed	No. of mango hopper infected	% mortality/ infection
Gumla	23.0°N	84.5°E	2235	1266	56.64
Lohardaga	23.4°N	84.6°E	1876	898	47.86
Ranchi	23.4°N	85.2°E	2619	1655	63.11
Khunti	23.1°N	85.2°E	903	115	12.73

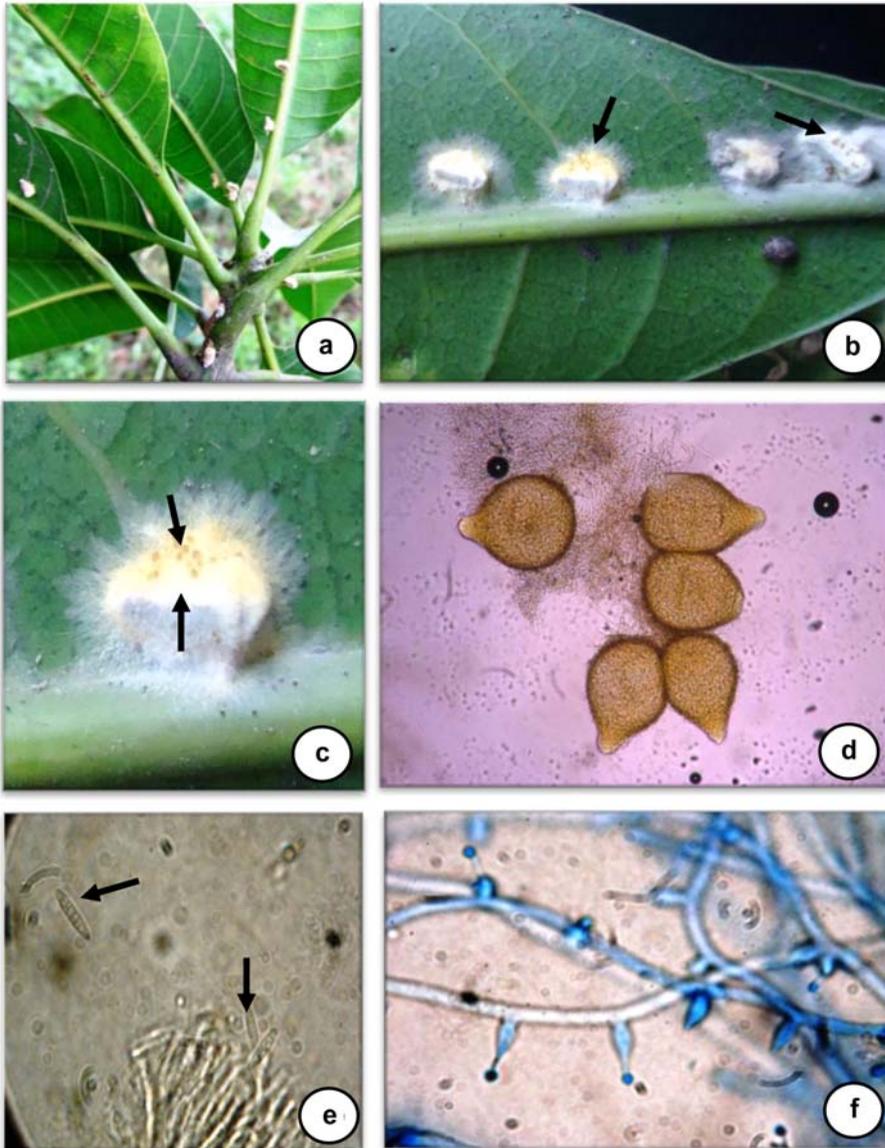


Figure 1. Infected mango leaf hoppers with *H. versicolor* (a), dead leaf hoppers on abaxial surface of mango leaf, arrow showing the ascomata (b, c), ascomata of *T. pruinosa* (d), arrow showing ascospores of *T. pruinosa* (e), mycelium of *H. versicolor* with conidia and phialides.

stroma, ovoid with dark golden brown walls and  $260\text{--}320 \times 230\text{--}260 \mu\text{m}$  in dimension. The asci were clavate, hyaline and composed of eight ascospores, which are distoseptate. Each ascospores have eight cells (seven septa) at maturity with  $17.5\text{--}25.0$  ( $n=25$ )  $\times$   $5.0\text{--}7.5 \mu\text{m}$  ( $n=25$ ) of length and width, respectively.

Petch (1932) reported a teliomorph of *T. pruinosa* from the leaf hopper of bamboo in Sri Lanka and named the anamorph stage *H. versicolor* and he also reported that in the Thai specimens the teliomorph was always associated with the *Hirsutiella* state except one collection where the teliomorph was absent and only anamorph was present

which also supported the similar finding. Kobayasi (1982) and Kobayasi and Shimizu (1982) reported that all the *Torrubiella* sp. has hyaline, thin walled, filliform ascospores which usually separate into part-spores. The ascospores of *T. pruinosa* are fusiform, distoseptate with a faint tint of pigmentation.

*T. pruinosa*, a teliomorph of an entomopathogenic fungus *H. versicolor* on mango hopper (*I. clypealis*) is reported for the first time from India.

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