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Jaipal Singh Choudhary, Chandra Shekhar Prabhakar, Sudarshan Maurya, Ritesh Kumar, Bikash Das & Shivendra Kumar

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New report of *Hirsutella* sp. infecting mango hopper *Idioscopus clypealis* from Chotanagpur Plateau, India

Jaipal Singh Choudhary ·
Chandra Shekhar Prabhakar ·
Sudarshan Maurya · Ritesh Kumar · Bikash Das ·
Shivendra Kumar

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Abstract An entomopathogenic fungus belonging to the genus *Hirsutella* was found infecting the mango hopper, *Idioscopus clypealis* (Lethierry) (Hemiptera: Cicadellidae), for the first time in India in September 2011. The report of a natural control agent of mango hopper during the off season has special significance because its outbreak depends upon its residual hibernating population.

Keywords Biocontrol · Entomopathogenic fungus

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. Large numbers of nymphs and adult hoppers puncture and suck sap out of the tender parts of the plants, thereby reducing their vigor (Ganga Visalakshy *et al.* 2010; Rahman and Kuldeep 2007; Varshneya and Rana 2008).

In September 2011, dead adults of *I. clypealis* were observed attached to the lower surface of mango

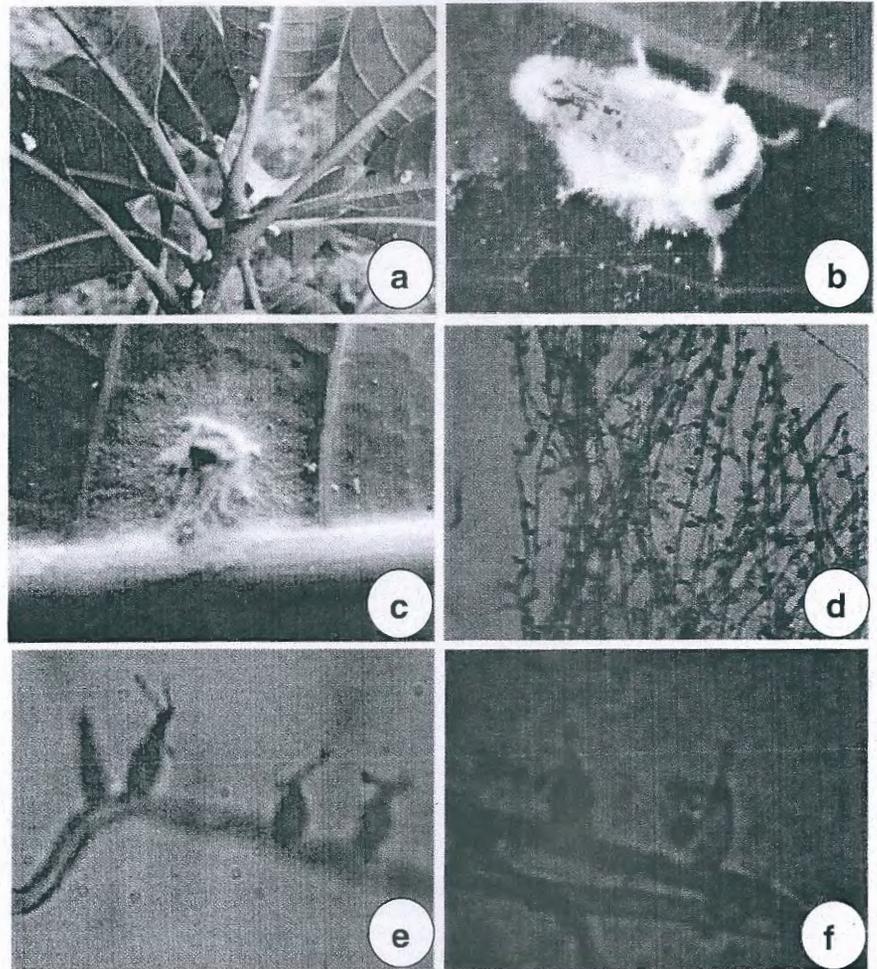
leaves in the orchards of the National Germplasm Repository of Sub-tropical Fruit Crops, at ICAR Research Complex for Eastern Region Research Centre, Ranchi, Jharkhand, India (23° 45' N latitude, 85° 30' E longitude, elevation 620 m AMSL). The dead mango hoppers were collected and kept under laboratory conditions to investigate the cause of their mortality.

The fungal infection was observed after microscopic examination of dead mango hoppers. An extensive survey was then conducted to collect dead mango hoppers on different mango cultivars ('Dasheri', 'Chausa', 'Amarpali', 'Langra' and 'Himsagar') at the research center. During the survey, it was observed that the infected mango hoppers showed three stages of symptoms under field conditions: (i) white mycelia growth around the body of adult mango hoppers; (ii) the white mycelia changed color to orange—light yellow and finally brown; and (iii) mycelia attached the dead adult hoppers to leaves (Fig. 1).

Identification of the fungus infecting mango hopper, *I. clypealis*, was carried out using standard laboratory procedures (Humber 1997) and based on earlier literature (Hywel-Jones 1997; Mains 1951). For morphological studies, conidia and cadavers were mounted in lactophenol cotton blue. Semi-permanent slide mounts were prepared and examined under a phase contrast microscope (type 020–519.503 LB 30T, Leica, Germany) equipped with a photomicrograph camera. Measurement of conidia was carried out using an ocular micrometer calibrated with a stage micrometer.

J. S. Choudhary · C. S. Prabhakar · S. Maurya · R. Kumar ·
B. Das · S. Kumar (✉)
ICAR Research Complex for Eastern Region Research Centre,
Plandu,
Ranchi, Jharkhand, India 834 010
e-mail: sk_harp@yahoo.co.in

Fig. 1 *Hirsutella* sp. **a.** Dead mango hopper infected with *Hirsutella* sp. on mango twig, **b.** Early stage of infection, **c.** Later stage of infection, **d.** Fungal mycelium with conidiophores and conidia, **e.** and **f.** Conidiophores, single and multiple phialides bearing conidia



On the basis of morphological characteristics, the fungus infecting mango hopper was identified as *Hirsutella* sp. (Fig. 1). The fungal hyphae are hyaline, septate and profusely branched. Mycelium thickness was approximately 4.75 μm (range 4.25–6.25 μm ; $n=25$). Conidiogenous cells are hyaline, pear-shaped and smooth-walled with a pointed apex. The average length of conidiogenous cells (phialides) was 10.25 μm (range 7.50–12.00 μm ; $n=25$) and width was 4.25 μm (range 3.75–5.00 μm ; $n=25$). Most conidiogenous cells (phialides) bear single or double sterigmata, but 7.25 % ($n=25$) of them bear multiple sterigmata (three). Moreover, the conidia are hyaline, oval to pear-shaped and vary in size from 2.34–3.75 μm ($n=25$).

This is the first record of *Hirsutella* sp. infecting mango hopper, *I. clypealis*, in India, to the best of our knowledge. Earlier reports on *Hirsutella* sp. infecting

mango hoppers are from Malaysia and Thailand (Hywel-Jones 1997; Lim and Chung 1995). In India, other entomopathogenic fungi, such as *Beauveria bassiana*, *Verticillium lecanii*, *Metarrhizium anisopliae* and *Entomophthora* sp. have been reported on mango hoppers (Ganga Visalakshy *et al.* 2010; Srivastava and Tandon 1986). Further investigation on *Hirsutella* sp. is needed, including laboratory and field evaluation of its effectiveness as a bio-control agent of mango hoppers.

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