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CAPNODIUM VARIEGATUM – A NEW FOLIICOLOUS SPECIES OF SOOTY MOULD INFECTING *BAUHINIA VARIEGATA* L. FROM CHHATTISGARH, INDIA

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ABSTRACT

A survey for the study of foliicolous fungal forms of Ambikapur, north Chhattisgarh was conducted in November 2018, and came across an interesting fungal form of sooty mould infecting living leaves of *Bauhinia variegata* L. which upon detailed mycotaxonomic treatment proved to be an undescribed species of *Capnodium.* Sooty mould diminish photosynthesis of host plant. Capnodiaceae is the most specialized family of sooty mould which includes 5 genera,149 species from the world and only 10 species described from India. Phenotypic observations, microscopic and Scanning Electron Microscopic investigation revealed the drastic differences with the earlier known allied taxa so much so to dispose it as a new taxon of species rank *Capnodium variegatum* sp.nov.

Keywords: *Bauhinia variegata, Capnodium,* fungal biodiversity, new species, sooty mould

INTRODUCTION

Frequent and periodic survey for the collection, identification and study of fungal biodiversity of Ambikapur, Chhattisgarh was conducted during the month of November 2018 and of large gathering of fungal specimens a novel fungal form of sooty mould was collected infecting living leaves of *Bauhinia variegata* L. a highly medicinal and economical significant plant belonging to family Fabaceae. Capnodiaceae is probably the most special and common family of sooty moluds (Hongsanan *et al.,* 2016) Kirk *et al.,*(2008) stated 26 genera, Lumbsch and Huhndorf (2010) stated 11 genera and Chomnunti *et al.,* (2014) stated 5 genera. 149 speciesincluding 10 species described from India namely *C. batistae* D.K. Kulk. & U.K. Kulk. (1977),*C. carissae* D.K. Kulk. & U.K. Kulk. (1978),*C. cassiae* D.K. Kulk. & U.K. Kulk. (1978),*C. cryptolepidis* M.S. Patil (1980), *C. hibiscicola* A. Pande (2008), *C. jasmine* D.K. Kulk. & U.K. Kulk. (1978),*C. kamatii* D.K. Kulk. & U.K. Kulk. (1977),*C. loranthi* D.K. Kulk. & U.K. Kulk. (1978),*C. nudicum* D.K. Kulk. & U.K. Kulk. (1981) and *C. phyllanthi* D.K. Kulk. & U.K. Kulk. (1981) (www.indexfungorum.org and www.mycobank.org).

The genus *Capnodium* is peculiarized by black, easily removable colonies, superficial mycelium, straight to flexuoussynnemata, sometimes branched, conidiomata pycnidial flask-shaped, simple, erect to branched, single to double, stalk and neck short to long, often with two necks, olivaceous brown to dark brown, ostiole at the apex of pycnidia, hyphae continuing upwards to the tapered neck terminating in an ostiole. Conidia small, ellipsoid, hyaline to olivaceous brown (Chomnunti *et al.,* 2011;Chomnunti *et al.,* 2014;Abdollahzadeh *et al.,* 2020).

MATERIALS AND METHODS

Infected leaves were collected from the survey field with proper information tag i.e location, date, and scientific or local name of the host plant. Clear photographs of the host plant, infected leaves, and infected portion were clicked by Sony cyber shot DSC-WX500 camera. Samples were scrupulously pressed between blotting papers in the Herbarium press, in a proper interval of time blotting papers were changed until leaves are completely dried. Slides were prepared by scraping fungal lesions by needle from leaves on a slide-mounted with cotton blue and lactophenol (Dubey *et al.,* 2019; Khalkho *et al.,* 2020). A detailed study was performed under Olympus CX21i Trinocular light microscope and several images of mycelium, synemmata, ostiole, conidia were captured by MIcap. Micrometry of mycelium, synemmata, ostiole, conidia was clicked at 400x magnification. For precise observation Scanning electron microscope images were clicked. Due to dry samples preparative treatment were not given(Bhardwaj *et al.,* 2020). Specimens are deposited at Ajrekar Mycological Herbarium (AMH-10297), Agharkar Research Institute Pune, Maharashtra, India for holotype, and (RAH 168) an isotype in Mycology Laboratory, Department of Botany, Dr. Harisingh Gour University, Sagar, M.P. India.

Taxonomic Details

Capnodium variegatum A. D. Khalkho, A. N. Rai and S.

Figure 1. Symptoms of *Capnodium variegatum* sp. nov. on *Bauhinia variegata*(L.) (Holotype AMH- 10297) (a) Early stage of infection (b) Late stage of infection.

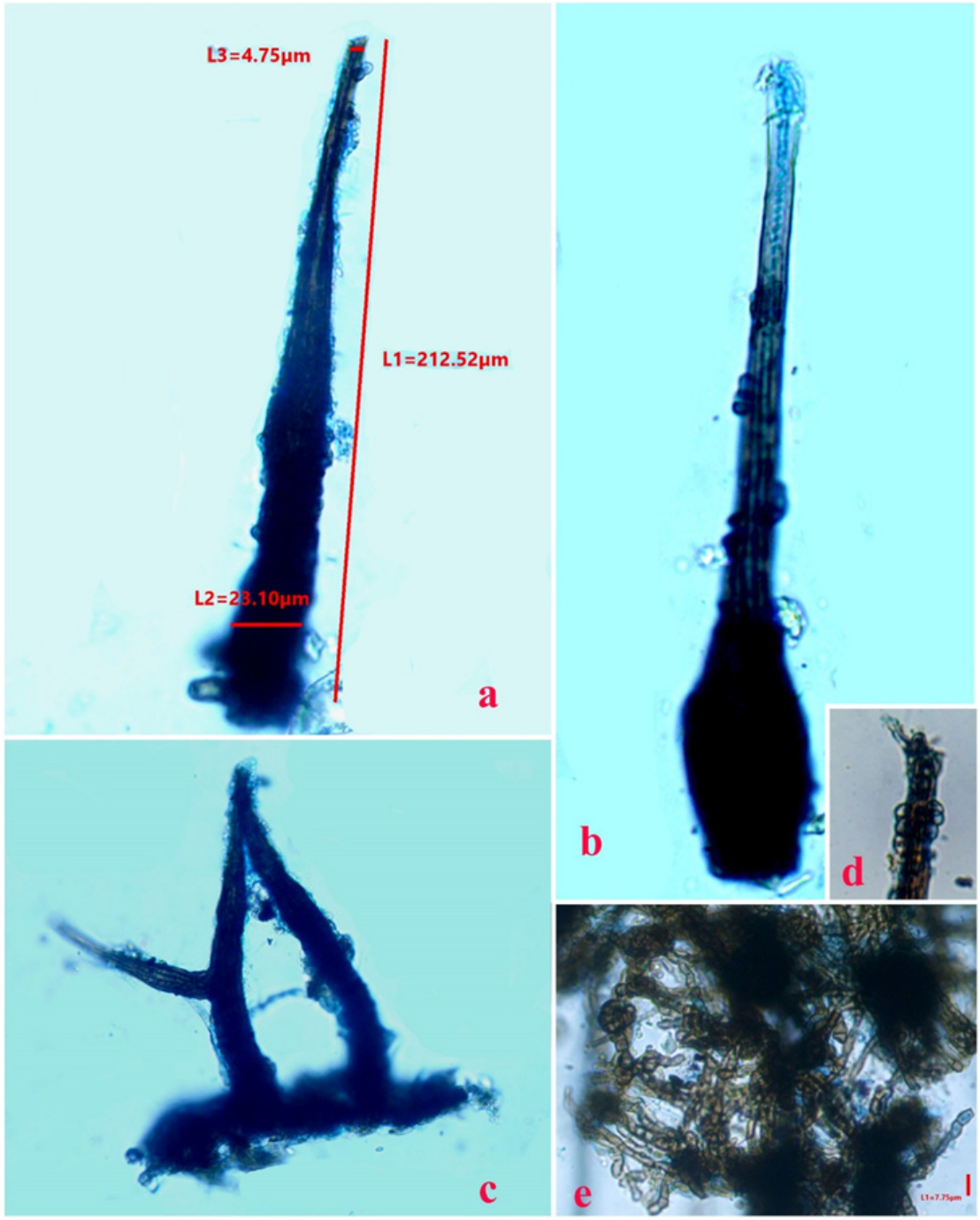

Figure 2. Microphotographs of *Capnodium variegatum* sp. nov. on *Bauhinia variegata*(L.) (Holotype AMH- 10297) (a) Synemmata (b) Synemmata with flask shape (c) Branched synemmata (d) Bunch of conidia (e) Mycelium

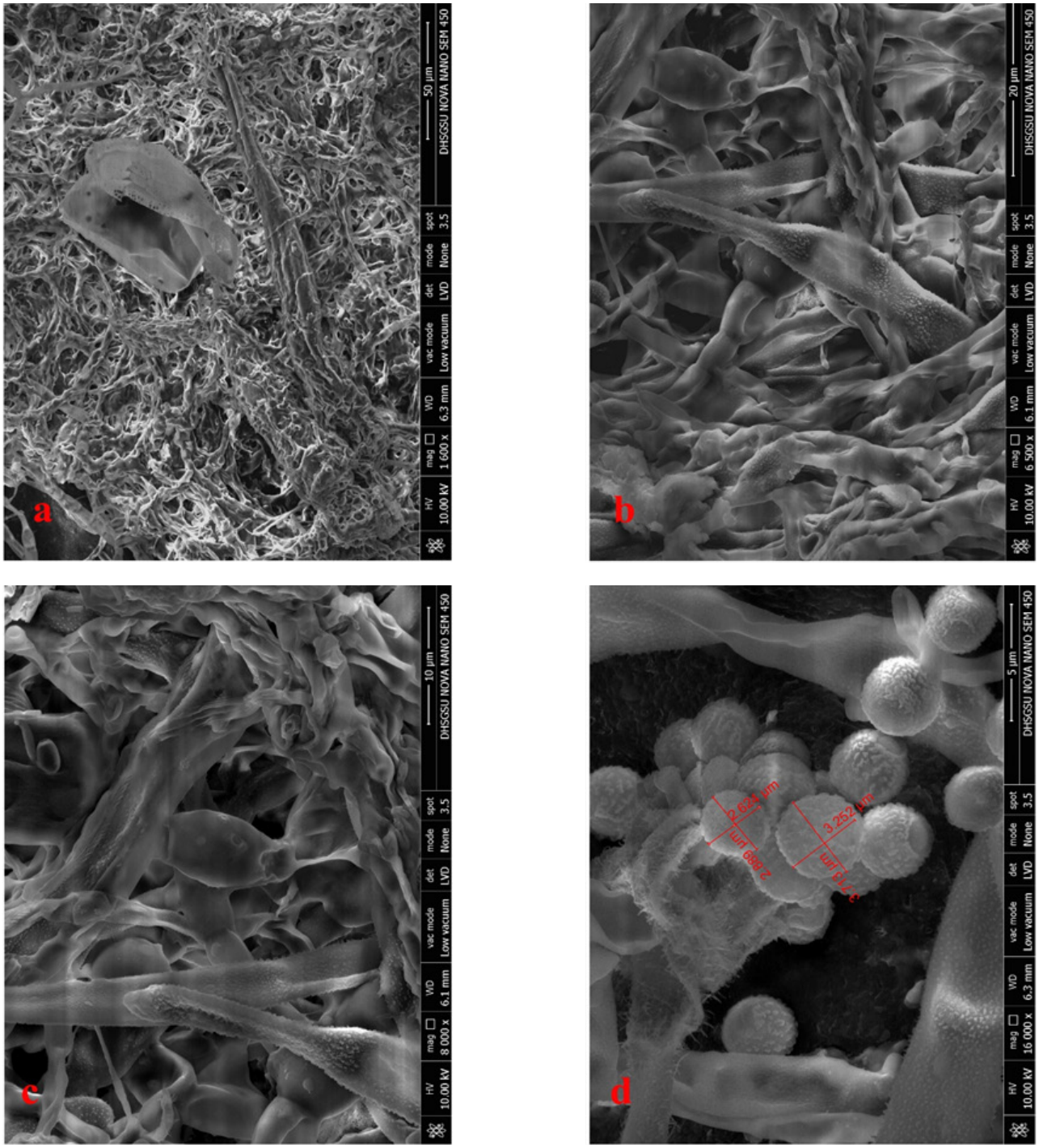

Figure 3. Scanning electron microscopic images of *Capnodium variegatum* sp. nov. on *Bauhinia variegata*(L.) (Holotype AMH- 10297) (a-b) synemmata (c) Ostiole (d) Bunch of conidia

Bhardwaj sp. nov.

Etymology

Latin *variegatum* isderived from the name of the host species.

Diagnosis

The novel named species *Capnodium variegatum* differs from related *Capnodium* species by its symptomatology, synnemata structure, color, size and conidial dimension.

Taxonomic depiction

Leaf lesions epigenous and black. Colonies epiphyllous, spread all over the leaves on the upper surface, black easily removable from the upper side of host leaves. Mycelium superficial, olivaceous brown to dark brown, branched, hyphae smooth, 2.37 – 5.81 µm wide. Synnemata straight to flexuous, sometimes branched, conidiomata pycnidial, flask-shaped, simple, erect to branched, single to double, stalk and neck short to long, often with two necks, olivaceous brown to dark brown, synnematous 119-248 µm long, central part of the flask 16.50-25 µm dm, neck 4-10 µm dm. Ostiole at the apex of pycnidia, hyphae continuing upwards to the tapered neck terminating in an ostiole. Conidia small, ellipsoid, hyaline to olivaceous

brown and aseptate 2.80-4 x 2.60-3.50 µm

Specimen examined

On living leaves of *Bauhinia variegate* (L.) family Fabaceae, Gandhi nagar, Ambikapur, Chhattisgarh, India, November 2018 leg. A. D. Khalkho, (Holotype AMH-10297, Isotype RAH 168).

RESULTS & DISCUSSION

A thorough survey of the literature shows that a large number of *Capnodium* species are reported from the globe. However, of all the species recorded so far, the present fungal form may be compared with *Capnodiumberberdis* (Gautam, A. K. &Avasthi, S. 2019) and *Capnodiumblackwelliae (*Abdollahzadeh *et al.,* 2020) (Table 1). The tabular data clearly indicate that besides symptomatology and generic characters the proposed species show only a little bit of similarities but at the same showing great differences in bearing very long synnemata with narrow neck along with smaller and wider conidia. It is also noteworthy that no *Capnodium* species has ever been recorded on the host plant *Bauhinia variegata* (L.). Therefore, the description and illustration of *Capnodium variegatum* as a new species seems fully justified.

Species	Spot, colonies & Mycelium	Synnemata			Conidia		
		Structure	Colour	Size (µm)	Structure	Colour& septation	Size
Capnodiumberberdis(Gautam &Avasthi 2019)	Lesions dark brown, superficial mycelium septate, brown to dark brown, 3-5 µm wide	Superficial, cylindrical, swollen at central part, ostiole present	Blackish brown	Synnemata 155-185 µm long, central region 15-22 µm, ostiole 15-18 µm wide	Cylindrical to oblong, ends round, smooth walled	Brown, end hyaline	4-7 x 1-3 µm
Capnodiumblackwelliae(Abdollahzadeh*et al.,* 2020)	Mycelium superficial or immersed, smooth, hyaline to brown, septate, branched	Superficial or immersed, simple or branched, slender or flask shaped, single or in group	Medium to dark brown	Synnemata 42-119 µm long, central region 24-143 x 19- 55 µm, neck 22 – 102 x 10 – 37 µm.	Small, oblong to ellipsoid	Hyaline & aseptate	3.9- 4.8 x 1.4 - 2 µm.
Capnodium variegatum sp. nov.	Lesions epigeous and black. Colonies epiphyllous, spread on upper surface all over the leaves, black and easily removable from upper side of host leaves.Mycelium superficial, brown, branched, hyphae septate, smooth, 2.37 – 5.81 µm wide	Synnemata straight to flexuous, sometime branched, conidiomata pycnidial, flask shaped, erect to branched, occur single to double, stalk short to long, short to long neck, often with two necks	olivaceous to dark brown	Synnemata 119-248 µm long, flask shaped central part 13.50-25 µm dm, neck 4.50-10 µm dm.	Small, ellipsoid.	Hyaline to olivaceous brown and aseptate	2.80-4 x 2.60-3.50 µm

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