

***Crousobrauniella*, an interesting new foliicolous hyphomycetous genus from Uttar Pradesh, India**

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(Submitted on January 12, 2018; Accepted on May 10, 2018)

ABSTRACT

Crousobrauniella longispora gen. et. sp. nov., discovered on living leaves of *Shorea robusta* (Dipterocarpaceae) from the Terai forest (subtropical forest) of Uttar Pradesh, India, is described, illustrated and discussed. This genus is characterized by pleuriseptate, long-necked conidiophores with flask-shaped basal cells that develop as lateral branches from superficial hyphae, giving rise to long, flexuous, euseptate conidia. This new taxon is compared with all the similar asexual hyphomycetous genera.

Keywords: Fungal diversity, foliicolous, morphotaxonomy, new genus, new species.

INTRODUCTION

India is one of the 17 mega biodiversity-rich countries of the world, and shares 2% of the global biodiversity. This country is very rich in fungal biodiversity as well, and about one third of the world's fungi are so far documented from India. The present collection site (Bhinga forest) is part of the Terai region (subtropical) of Uttar Pradesh. In this region the climate generally remain humid that promote profuse growth of phanerogamic vegetation. Such a climate is also quite favourable for development of foliar infections caused by hyphomycetous fungi.

Recently, a number of novel taxa of foliicolous hyphomycetes have been described from this region (Kamal, 2010; Kumar *et al.*, 2007; 2008; 2012a; b; Kumar and Singh, 2015a; b; c; 2016; Singh and Kamal, 2011; Singh and Kumar, 2016; Singh *et al.*, 2007a; b; 2008; 2011; 2012; 2013a; b; 2014). Nevertheless, further surveys continue to reveal a vast number of undescribed fungi.

During the exploration of foliicolous hyphomycetous fungi from Terai forests of Uttar Pradesh, India, several microfungus specimens were collected for taxonomic study. Upon critical examination one of them turned out to be an ovel fungus with multiseptate, long-necked conidiophores with flask-shaped basal cells, developed as lateral branches from superficial hyphae, giving rise to long, flexuous, obclavate to obclavate-cylindrical, multi-septate conidia. Since this specimen being unique, cannot be assigned to any of the presently known hyphomycetous genera. It is there fore described as *Crousobrauniella longispora* gen. et. sp. nov.

MATERIAL AND METHODS

During the field survey fresh specimens with disease symptoms were collected from Bhinga forest of Uttar Pradesh in 2007. Photographs of the leaf spots were taken by using a Sony DSC-5730 camera. The collected samples were taken to the laboratory in a zip lock polythene bag and processed by following standard techniques (Castañeda-Ruiz, 2005; Hawksworth, 1974; Savile, 1962). To begin with the sun dried and pressed specimens were wrapped in blotting paper sheets and placed in air-tight polyethylene bags. After this the material was packed in paper envelopes along with collection

details. The microscopic observations on the specimens were made from the hand sections cut through the diseased portion of the material. Macroscopic and microscopic description of the specimen are based on the visual observations made on the diseased material and the slide preparations mounted in both lactophenol-cotton blue, and glycerin. For taking observations Olympus BX-51 light microscope having Syntek USB camera and LEO-430 scanning electron microscope were used. For SEM micrography facilities available at Birbal and Sahni Institute of Palaeobotany, Lucknow, India was used. For this purpose the specimens were coated with a thin layer of gold-paladium using a POLARON Sputter coater (180 seconds in nitrogen atmosphere of 20 mA, 30mm distant from the electrode) and examined by a LEO-430 Scanning Electron Microscope. Detailed observations of morphological characters and line drawings were carried out at different magnification through LM (400× and 1000×) and SEM (~ up to 6000×). For taking measurements as many as 30 conidia, hila, and conidiophores and 20 external hyphae of variable dimensions were considered. In the description the extremes of their measurements are depicted in parentheses. The holotype has been deposited in the Herbarium Cryptogamiae Indiae Orientalis (HCIO), Indian Agricultural Research Institute (IARI), New Delhi, India; and an isotype was retained in the mycological herbarium of the Department of Botany of D.D.U. Gorakhpur University (GPU). The taxonomy and nomenclature of plant families, genera and species are based on the "Angiosperm Phylogeny Website" (<http://www.mobot.org/mobot/research/apweb/>), Tropicos database (<http://www.Tropicos.org/>), and The Plant List (<http://www.theplantlist.org>). Taxonomy and nomenclatural details were deposited in MycoBank.

TAXONOMY

Crousobrauniella Sham. Kumar, Raghv. Singh, Dharmendra & Kamal, gen. nov.

Figs 1-29

MycoBank MB 811166

Diagnosis-The genus differs from other morphologically similar taxa due to the formation of long-necked



Figs 1-2. *Crousobrauniella longispora* on leaves of *Shorea robusta* (HCIO 48660, holotype). 1. *Shorea robusta*. 2. Symptoms on the lower surface of leaf. Bar (2) = 10 mm.

conidiophores with flask-shaped basal cells.

Etymology: The generic epithet *Crousobrauniella* is composed of two components, *Crouso* and *Brauniella*, in honor of two renowned mycologists, Prof (Dr.) P.W. Crous (Westerdijk Fungal Biodiversity Institute, Uppsala, Utrecht, The Netherlands) and Prof (Dr.) Uwe Braun (Martin Luther University, Halle (Saale), Germany), respectively.

Teleomorphic Stage: Undetermined

Anamorphic Stage: Fungus hyphomycetous, foliicolous, leaf spots hypogenous. Colonies hyphophyllous, usually effuse, brown. Mycelium superficial, branched, euseptate, smooth, pale to dark brown. Stromata absent. Conidiophores arising singly as lateral branches from superficial hyphae, semi-macronematous, mononematous, frequently branched, euseptate, long-necked, with flask-shaped basal cells, erect to prostrate, smooth, thick-walled, brown. Conidiogenous cells integrated, terminal, monoblastic, scars thickened. Conidia solitary, simple, acropleurogenous, straight to curved, rostrate, smooth, thick-walled, euseptate, oval to obclavate to obclavate-cylindrical, dark brown, scars thickened and darkened.

Culture characteristics: unknown.

Type species: *Crousobrauniella longispora* Sham. Kumar, Raghv. Singh, Dharmendra & Kamal

Known distribution: India (in this paper)

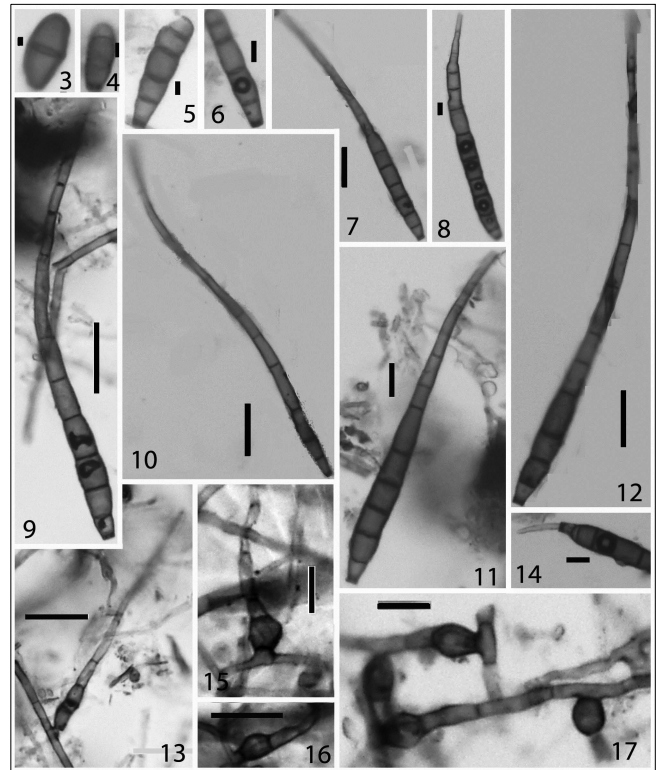
Material examined: INDIA, Uttar Pradesh, Shravasti, Bhinga Forest, on living leaves of *Shorea robusta* Gaertn. (*Dipterocarpaceae*), 11th September 2007, coll. D.P. Singh & Shambhu Kumar, HCIO 48660 (holotype), GPU 244 (isotype).

Crousobrauniella longispora Sham. Kumar, Raghv. Singh, Dharmendra & Kamal, sp. nov.

Figs 1-29

Mycobank MB 811167

Diagnosis-*Crousobrauniella longispora* is unique in the presence of long-necked conidiophores and long flexuous, euseptate conidia.



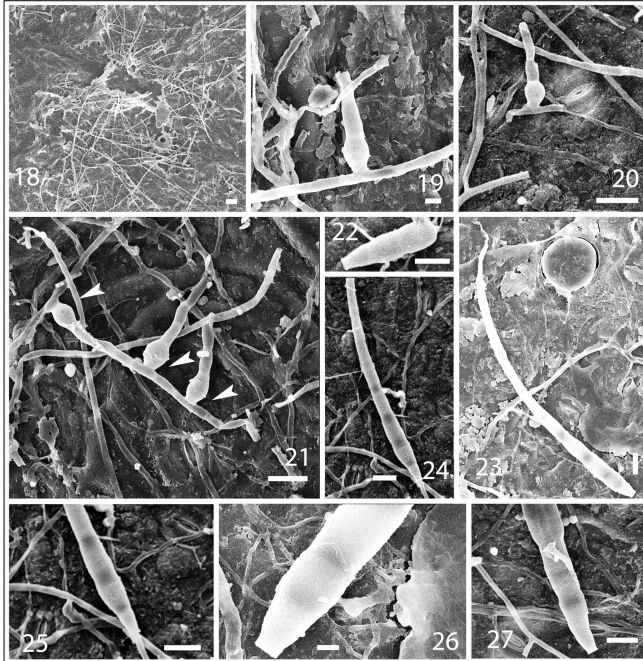
Figs 3-17. *Crousobrauniella longispora*, microscopic characteristics (HCIO 48660, holotype). 3-6. Shorter conidia. 7-12. Longer conidia with rostrate tip. 13. Conidia with conidiophore. 14. Germinated conidium. 15-16. Conidiophores on external hyphae. 17. Branched conidiophore. Scale bars (35) 2 µm, (6) 5 µm, (7) 20 µm, (8) 5 µm, (9-10) 20 µm, (11) 10 µm, (12-13) 20 µm, (14-15) 10 µm, (16) 20 µm, (17) 10 µm.

Etymology: The species epithet *longispora* and refers to its long, flexuous conidia.

Teleomorphic Stage: Undetermined.

Asexual fungus: Fungus hyphomycetous, foliicolous, infection spots hypogenous, initially localized but later spreading, covering the entire leaf surface. Colonies hyphophyllous, usually effuse, brown. Mycelium superficial, branched, euseptate, smooth, pale to dark brown, 2-3 µm in diam. Stromata absent. Conidiophores arising singly as a lateral branches from superficial hyphae, semi-macronematous, mononematous, frequently branched, (0)1-4(6) euseptate, long-necked (15-61 µm), with flask-shaped basal cell (5-8 × 4-8 µm), erect to prostrate, smooth, thick-walled, brown, 20-68 × (1.5)2-3(4) µm. Conidiogenous cells integrated, terminal, monoblastic, scars thickened, (1.5)2-3 µm wide. Conidia solitary, simple, acropleurogenous, straight to curved, rostrate (1.5-2 µm wide), smooth, thick-walled, euseptate, constricted at the septa; septa thick-walled, single to pleuriseptate, oval to obclavate to obclavate-cylindrical, dark brown, 15-420 × 9-12 µm, with truncate base and narrow apex, hilum thickened, 1.5-3.5 µm wide.

Material examined- INDIA, Uttar Pradesh, Shravasti, Bhinga Forest, on living leaves of *Shorea robusta* Gaertn.



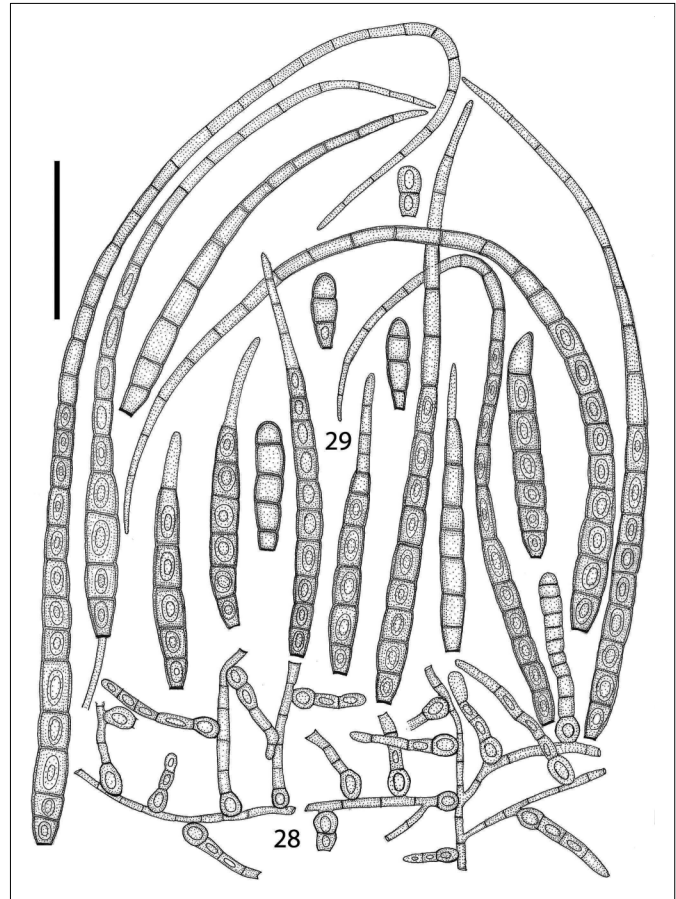
Figs. 18-27. *Crousobrauniella longispora*, SEM characteristics (HCIO 48660, holotype). 18. Superficial mycelium. 19-20. Simple conidiophores. 21. Branched conidiophores (white arrows). 22-23. Variation in conidia. 24-25. Germinated conidia. 26-27. Hila of conidia. Scale bars (18) 20 μ m, (19) 3 μ m, (20-25) 10 μ m, (26) 3 μ m, (27) 10 μ m.

(*Dipterocarpaceae*), 11th September 2007, coll. D.P. Singh and Shambhu Kumar, HCIO 48660 (holotype), GPU 244 (isotype).

DISCUSSION

Literature survey indicated that the morphology of the present foliicolous hyphomycete is quite unique. At generic level this taxon needs to be compared with morphologically similar genera viz. *Ceratophorum* Sacc. (Saccardo, 1880), *Clasterosporium* Schweinitz (Schweinitz, 1832), *Corynespora* Gussow (Gussow, 1906), *Corynesporella* Munjal & Gill (Munjal and Gill, 1961), *Distoseptispora* Hyde et al. (Su et al., 2016), *Drechslera* Ito (Ito, 1930), *Ellisemia* Subramanian (Subramanian, 1992), *Exosporium* Link (Link, 1809), *Hansfordiella* S. Hughes (S.J. Hughes, 1951), *Linkosia* Hern. & Sutton (Hernández and Sutton, 1997), *Mycocentrospora* Deighton (Deighton, 1972), *Phaeomycocentrospora* Crous et al. (Crous et al., 2012), *Sirosporium* Bubák & Serebrian. (Bubák, 1912), *Sporidesmajora* Batzer & Crous (Yang et al., 2010), *Sporidesmiella* P.M. Kirk (Kirk, 1982), *Sporidesmium* Link (Link, 1809), *Stanjehughesia* Subramanian (Subramanian, 1992), *Stigmina* Sacc. (Saccardo, 1980) and *Tretospora* Ellis (Ellis, 1976).

The presently proposed genus *Crousobrauniella* can be easily distinguished from the other closely allied genera namely, *Ceratophorum*, *Corynespora*, *Corynesporella*, *Drechslera*, *Distoseptispora*, *Exosporium*, *Ellisemia*, *Linkosia* and *Tretospora* because of the presence of long-necked conidiophores with flask-shaped basal cells and long, flexuous, euseptate conidia, which forms a strong basis for the



Figs 28-29. Camera Lucida drawings of *Crousobrauniella longispora* (HCIO 48660, holotype). 28. Simple and branched conidiophores with superficial mycelium. 29. Conidia. Scale bar 50 μ m.

erection of a new genus.

Although the newly proposed genus *Crousobrauniella* shows some similarities with *Clasterosporium*, however, from this it differs due to the absence of stroma, hyphopodia, unbranched conidiophores and rugose or verrucose conidia.

Phenotypically the genus *Crousobrauniella* also seems to be quite close to some of the hyphomycetous genera, namely *Hansfordiella*, *Houjia* and *Sirosporium* except for the absence of both transverse and oblique conidial septa, conidiophores are mostly reduced to conidiogenous cells in *Hansfordiella*, *Houjia* and *Sirosporium*. In comparison the proposed genus *Crousobrauniella* is unique in having solitary, long-necked conidiophores with flask-shaped basal cells.

Mycocentrospora and *Phaeomycocentrospora* are other allied genera which differ from *Crousobrauniella* due to presence of their conidiophores which could be seen emerging solitary or in small fascicles through the stomata which produce geniculate-sinuously hyaline to faintly pigmented conidia, often with a characteristically zigzag configuration. The presence of long necked flask shaped basal cell in conidiophores in the presently proposed genus *Crousobrauniella* also takes it away from the other two

closely allied genera *Sporidesmaja* and *Sporidesmium*.

Another genus *Stanjehughesia* is totally different from *Crousobrauniella* due to its reduced conidiophores which may also be altogether absent sometimes. The genus *Stigmia* (= *Pseudocercospora*) also differ from *Crousobrauniella* due to its stromatic nature, and conidiophores forming sporodochia and smooth or verruculose conidia as well as conidiophores.

ACKNOWLEDGEMENTS

We are much obliged to the Head, Department of Botany, Gorakhpur University, Gorakhpur and the Directors of both the institutes KFRI, Peechi and BSIP, Lucknow for necessary facilities. We thank the technical staff, Dr. Subodh Kumar of BSIP, Lucknow for scanning electron microscopy, and the Curator, HClO, New Delhi, for accepting the holotype specimen and providing an accession number. Authors are much obliged to the reviewers for useful suggestions for the improvement of the manuscript. We also acknowledge the Science and Engineering Research Board (SERB), Department of Science and Technology (DST), Government of India, New Delhi for financial assistance to SK as Fast Track Young Scientist Start-up Project Grant (SB/YS/LS-288/2013).

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