



Diversity, distribution and taxonomy of *Corynespora* associated with *Cannabaceae* and *Ulmaceae*

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Kumar S, Singh R. 2016 – Diversity, distribution and taxonomy of *Corynespora* associated with *Cannabaceae* and *Ulmaceae*. Plant Pathology & Quarantine 6(2), 225–231, Doi 10.5943/ppq/6/2/11

Abstract

Corynespora tremae sp. nov. was discovered on dead twigs of *Trema orientalis* (*Cannabaceae*) on the campus of DDU Gorakhpur University, Gorakhpur, Uttar Pradesh (U.P.) India. It is described, illustrated, discussed and compared with morphologically similar taxa reported on *Cannabaceae* and *Ulmaceae*. A comparative table to species of *Corynespora* on *Cannabaceae* and *Ulmaceae* is provided. Descriptions and nomenclatural details are deposited in MycoBank.

Key words – anamorphic fungi – *Corynespora* – morphotaxonomy – new species

Introduction

The hyphomycetous genus *Corynespora* (*Ascomycota*, *Dothideomycetes*, *Pleosporales*, *Corynesporascaceae*) was established by Güssow (1906). The genus causes diseases on plants, predominantly in the tropics and subtropics, including India. The fungus is characterized by producing distoseptate conidia with or without a distinct hilum and monoblastic conidiogenous cells. Most of the species of the genus are phytopathogenic while some species are reported as endophytes and saprobes.

To date, almost 200 species of *Corynespora* have been recorded (www.Indexfungorum, 30 October 2016). In the past decade, Indian mycologists have described several novel species (Kumar et al. 2007, 2008, 2012, 2013, Pal et al. 2007, Singh & Kamal 2011, Singh et al. 2000a, b, 2007a, b, 2013, 2014). McKenzie (2010) and Siboe et al. (1999) provided synoptic tables for the main morphological features of *Corynespora* spp.

A hyphomycete, corresponding to the current concept of *Corynespora*, was collected on *Trema orientalis* from Gorakhpur University Campus, Uttar Pradesh, India during micro-mycological surveys in 2014. It was clearly different from morphologically similar *Corynespora* species previously described on *Cannabaceae* and *Ulmaceae*, and it is therefore proposed here as a new species, *Corynespora tremiae*.

Materials & Methods

Specimens with clear visible symptoms of fungi on the dead twigs were collected. The

samples were carried to the laboratory and processed by following the standard techniques (Hawksworth 1974, Savile 1962). The dried and pressed specimens were placed in polyethylene bags and then kept in paper envelopes along with collection details. Photographs of infection spots on host twigs were taken using a Sony DSC-5730 camera. Usually more than one photograph was taken for each fungal propagule and merged together into a single photograph in Photoshop (Ver. 7.0) using calibrated scale. The specimens for microscopic observation were prepared by hand sectioning and scraping. Morphological descriptions are based on slide preparations mounted in 4% KOH, lactophenol (0.01%) and cotton blue (Kirk et al. 2008) from infected area of the twigs. Observations were made using an Olympus BX-51 light microscope and a connected Syntek USB camera. The microphotographs were stored in electronic format (TIF). Detailed observations of morphological characters were carried out at different magnifications (400× and 1000×). Measurements were made of 30 conidia, hila, and conidiophores. Morphotaxonomic determinations were made with the help of current literature and available resident expertise. The holotype has been deposited in the Ajrekar Mycological Herbarium (AMH), Agharkar Research Institute (ARI), Pune, Maharashtra (MS), India and an isotype was retained in the mycological herbarium of Birbal Sahni Institute of Palaeobotany (BSIPMH), Lucknow for further reference. The systematics of the taxon is given in accordance with Ellis (1971, 1976), Cannon & Kirk (2007), Kirk et al. (2008), Seifert et al. (2011), Farr & Rossman (2015). Faces of fungi numbers are provided (Jayasiri et al. 2015).



Fig 1 – *Corynespora tremae* (AMH 9703, holotype). a, Symptoms on dead twigs of *Trema orientalis*, b, Colonies enlarged view. – Bar b = 20 mm.

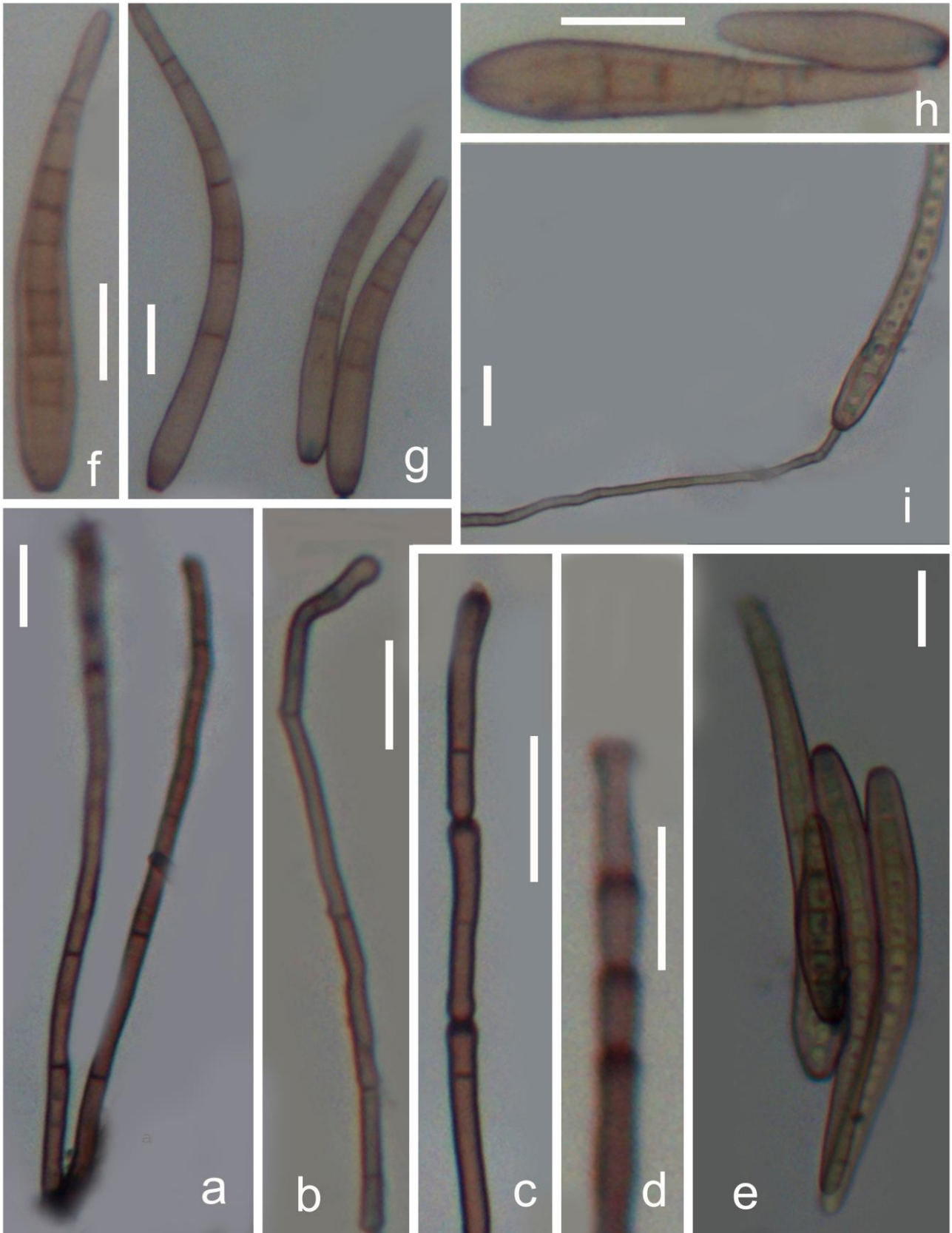


Fig 2 – *Corynespora tremae* (AMH 9703, holotype). a–d, Conidiophores, e–h, Conidia, i, Germinating conidium. – Bars = 20 μ m.

Table 1 Conidiophores and conidial morphology of *Corynespora* spp. recorded on Cannabaceae and Ulmaceae.

Fungus	Conidiophores	Conidia	Host
<i>C. cassiicola</i> (Wei 1950)	unbranched, up to 9 successive cylindrical proliferations, pale to mid brown, 110–850 × 4–11 µm	unbranched, 4–20-distoseptate, subhyaline to pale olivaceous, 40–220 × 9–22 µm, hilum thickened	<i>Trema micrantha</i> (L.) Blume (<i>Cannabaceae</i>)
<i>C. holoptetae</i> (Jain et al. 2002)	branched, up to 5 successive cylindrical proliferations, mid olivaceous, 49–314 × 5–9 µm	branched, up to 17-distoseptate, mid olivaceous, 23–234 × 3.6–19.5 µm, hilum thickened	<i>Holoptelea integrifolia</i> Planch. (<i>Ulmaceae</i>)
<i>C. holopteleicola</i> (Kumar et al. 2012)	branched, 2–4-euseptate with 0–4 successive cylindrical proliferations, brown, 120–255 × 5–20 µm	unbranched, 0–11-distoseptate with 0–2 distinct septa, olivaceous brown, 33–148 × 5–20 µm, hilum unthickened	<i>Holoptelea integrifolia</i> (<i>Ulmaceae</i>)
<i>C. tremae</i>	unbranched, 3–5-septate with 2–4 successive cylindrical proliferations, brown, 120–180 × 3–4.5 µm	unbranched, 5–20-distoseptate, olivaceous brown to light brown, 50–160 × 4–12 µm, hilum thickened	<i>Trema orientalis</i> (L.) Blume (<i>Cannabaceae</i>)
<i>C. tremicola</i> (Sharma et al. 2002)	branched, 3–9-septate with 0–11 successive cylindrical proliferations, light olivaceous brown, 190–612 × 7.5–8.5 µm	unbranched, 1–12-distoseptate, light olivaceous brown, 104–296 × 11–16 µm, hilum unthickened	<i>Trema orientalis</i> (<i>Cannabaceae</i>)
<i>C. ulmacearum</i> (Singh et al. 2000)	branched, 1–3 successive cylindrical proliferations, light olivaceous, 43–161 × 3.5–4.8 µm	unbranched, 2–16-distoseptate, sub hyaline to light olivaceous, 15–106 × 3.5–10 µm, hilum unthickened	<i>Trema orientalis</i> (<i>Cannabaceae</i>)

Results

Taxonomy

Corynespora tremae Sham. Kumar & Raghv. Singh, **sp. nov.**

Figs 1–2

MycoBank 814535; Facesoffungi number: FoF 02664

Etymology – *tremae* in reference to the host genus.

Asexual morph, hyphomycete, Infection spots discrete on dead twigs, brown to blackish. Colonies effuse, greyish to blackish. Mycelium internal, thin-walled, smooth, branched, olivaceous to brown. Stromata absent. Conidiophores arising singly as lateral branches from superficial hyphae, solitary or in fascicle of 2, macronematous, mononematous, cylindrical, erect to procumbent, straight to flexuous, unbranched, smooth, thick-walled, 4–6-septate with 2–4 successive cylindrical proliferations, brown, 120–180 × 3.5–4.5 µm, basal cell swollen. Conidiogenous cells integrated, terminal, monotretic, scars unthickened, 2.5–4.5 µm. Conidia acrogenous, dry, solitary, simple, thin-walled, smooth, straight to slightly curved, usually obclavate

to obclavate-cylindrical, 5–20-distoseptate with 2–6 transverse band-like eusepta, light brown to brown, 50–160 × 4–12 µm, apex obtuse to rounded, hilum thickened, 2.5–5 µm, germinating conidium present, germ tubes 2 × 115 µm long. Sexual morph: Undetermined.

Known distribution – India (this paper).

Material examined – India, Uttar Pradesh, DDU Gorakhpur University, Gorakhpur, University Campus, 26° 45' N, 83° 24' E, on dead petiole of *Trema orientalis* (L.) Blume (*Cannabaceae*), 16 November 2014, Shambhu Kumar, AMH 9703 (holotype), BSIPMH 047 (isotype).

Discussion

Corynespora tremae is compared with *Corynespora* species reported on both families *Cannabaceae* and *Ulmaceae* because some *Corynespora* hosts have been transferred from *Ulmaceae* to *Cannabaceae* on molecular grounds. Literature survey revealed that five species of *Corynespora* have been described on different hosts of these families (Table 1).

The conidia of *C. tremae* are shorter and thinner than those of *C. cassiicola*, *C. holopetae* and *C. tremicola* but longer and thicker with a thickened hilum when compared to *C. ulmacearum*. The conidiophores of *C. tremae* are much shorter and thinner when compared to *C. cassiicola*, *C. holopetae* and *C. tremicola* and longer than *C. ulmacearum*.

The conidia of *C. tremae* show resemblance to *C. holopteleicola* but differ due to presence of thinner, more septation and thickened hila. The conidiophores of *C. tremae* are much shorter and thinner than those of *C. holopteleicola*.

Acknowledgements

The authors express their sincere gratitude to the Director, Kerala Forest Research Institute, Peechi, Kerala for encouragement and necessary facilities. The authors thank anonymous reviewers for reviewing the manuscript. Thanks are also due to the Curator, Ajrekar Mycological Herbarium (AMH), Agharkar Research Institute (ARI), Pune (MS) for depositing fungal specimens and providing accession numbers. Science and Engineering Research Board (SERB), Department of Science & Technology (DST), Govt. of India, New Delhi is very much acknowledged for financial assistance to author SK as Fast Track Young Scientist Start-up Project grant (SB/YS/LS-288/2013).

References

- Cannon PF, Kirk PF. 2007 – Fungal Families of the World. Wallingford, UK, CAB International. pp. 456.
- Ellis MB. 1971 – More Dematiaceous Hyphomycetes, Commonwealth Mycological Institute, Kew, Surrey, England. pp. 608.
- Ellis MB. 1976 – More Dematiaceous Hyphomycetes, Commonwealth Mycological Institute, Kew, Surrey, England. pp. 507.
- Farr DF, Rossman AY. 2015 – Fungal Databases, Systematic Mycology and Microbiology Laboratory, ARS, USDA, retrieved April 30, 2015, <http://nt.ars-grin.gov/fungalatabases/>
- Güssow, HT 1906 – Über eine neue Krankheit aliquot Gurken in England (*Corynespora mazei*, Güssow gen. et sp. nov.). Zeitschrift für Pflanzenkrankheiten 16, 10–13.
- Hawksworth DL. 1974 – Mycologist's Handbook. Commonwealth Mycological Institute, Kew. pp. 231.
- Index Fungorum 2015 – Index Fungorum, accessed 30 April 2015, <http://www.indexfungorum.org>
- Jain S, Rai AN, Mehta P. 2002 – Additions to the genus *Corynespora* from India. Indian Phytopathology 55, 51–56.

- Jayasiri SC, Hyde KD, Ariyawansa HA, Bhat J, Buyck B, Cai L, Dai YC, Abd-Elsalam KA, Ertz D, Hidayat I, Jeewon R, Jones EBG, Bahkali AH, Karunarathna SC, Liu JK, Luangsa-ard JJ, Lumbsch HT, Maharachchikumbura SSN, McKenzie EHC, Moncalvo, JM, Ghobad-Nejhad M, Nilsson H, Pang KA, Pereira OL, Phillips AJL, Raspé O, Rollins AW, Romero AI, Etayo J, Selçuk F, Stephenson SL, Suetrong S, Taylor JE, Tsui CKM, Vizzini A, Abdel-Wahab MA, Wen TC, Boonmee S, Dai DQ, Daranagama DA, Dissanayake AJ, Ekanayaka AH, Fryar SC, Hongsanan S, Jayawardena RS, Li WJ, Perera RH, Phookamsak R, de Silva NI, Thambugala KM, Tian Q, Wijayawardene NN, Zhao RL, Zhao Q, Kang JC, Promputtha I. 2015 – The Faces of Fungi database: fungal names linked with morphology, phylogeny and human impacts. *Fungal Diversity* 74(1), 3–18, Doi:10.1007/s13225-015-0351-8.
- Kirk PF, Cannon PF, Minter DW, Stalpers JA. 2008 – *Dictionary of the Fungi*. 10th ed. Wallingford, UK, CAB International. pp 402.
- Kumar S, Singh R, Gond, DK, Saini DC. 2012 – Two new species of *Corynespora* from Uttar Pradesh, India. *Mycosphere* 3, 864–869, Doi.org/10.5943/mycosphere/3/4/3.
- Kumar S, Singh A, Singh R, Dubey NK. 2013– *Corynespora bombacina* causing foliar disease on *Bombax ceiba* from Sonebhadra forest of Uttar Pradesh, India. *Canadian Journal of Plant Protection* 1(2), 76–77.
- Kumar S, Singh R, Pal VK. 2007–Three hitherto undescribed species of *Corynespora* from North-Eastern Uttar Pradesh. *Journal of Basic Applied Mycology* 6(I&II), 39–43.
- Kumar S, Singh R, Saini DC, Kamal. 2012– A new species of *Corynespora* from terai forest of northeastern Uttar Pradesh, India. *Mycosphere* 3, 410–412.
- Kumar S, Singh R, Singh DP, Pal VK, Agarwal DK. 2008– Additions to new species of *Corynespora* Güssow from North-Eastern Uttar Pradesh. *Indian Phytopathology* 61, 111–117.
- McKenzie EHC. 2010 – Three new phragmosporous hyphomycetes on *Ripogonum* from an 'ecological island' in New Zealand. *Mycotaxon* 111, 183–196.
- MycoBank. 2015 – MycoBank (Fungal databases nomenclature and species banks), accessed 30 April 2015, <http://www.mycobank.org>
- Pal VK, Akhtar M, Agarwal DK, Chaudhary RK, Ahmad N. 2007. Diversity of foliar fungi in the forest flora of North-Eastern U.P: five new species of *Corynespora* Güssow. *Indian Phytopathology* 60: 330–340.
- Savile DBO. 1962 – Collection and care of botanical specimens. Canadian Department of Agriculture, Publication, Research Branch 1113, 1–124.
- Seifert K, Morgan-Jones G, Gams W, Kendrick B. 2011 – The genera of hyphomycetes. CBS-KNAW Fungal Biodiversity Centre, Utrecht, Netherlands. CBS Biodiversity Series 9, 1–997.
- Sharma N, Chaudhary S, Kamal. 2002 – Three new species of genus *Corynespora*. *Indian Phytopathology* 55, 178–181.
- Siboe GM, Kirk PM, Cannon PF. 1999 – New dematiaceous hyphomycetes from Kenyan rare plants. *Mycotaxon* 73, 283–302.
- Singh R, Kumar S, Pal VK, Upadhyaya PP, Agarwal, DK. 2007a – New taxa of foliicolous hyphomycetes – *Cercospora*, *Corynespora* and *Phaeotrichochonis* from North Eastern U.P. India. *Indian Phytopathology* 60, 506–512.
- Singh R, Kumar S, Shukla K, Agarwal DK. 2007b – Three hitherto undescribed species of *Corynespora* Güssow from North Eastern U.P. *Indian Phytopathology* 60, 513–519.
- Singh A, Bhalla K, Dubey R, Singh SK. 2000a. Additions to *Corynespora* from India. *Journal of Indian Botanical Society* 79, 185–190.
- Singh A, Singh SK, Kamal. 2000b – Three new species of *Corynespora* from India. *Journal of Mycology & Plant Pathology* 30, 44–49.
- Singh A, Kumar S, Singh R, Dubey NK. 2013 – *Corynespora clerodendrigena* sp. nov. causing foliar disease on *Clerodendrum viscosum* from Sonebhadra forest of Uttar Pradesh, India. *Plant Pathology & Quarantine* 3(1), 15–17.

- Singh A, Kumar S, Singh R, Dubey NK. 2014–A new species of *Corynespora* from Sonebhadra forest of Uttar Pradesh, India. *Current Research in Environmental & Applied Mycology* 4(1), 149–151.
- Singh A, Singh SK, Kamal. 2000 – Three new species of *Corynespora* from India. *Journal of Mycology & Plant Pathology* 30, 44–49.
- Singh R, Kamal. 2011–Two new species of *Corynespora* from northeastern U.P., India. *Mycotaxon* 118, 123–129. <http://dx.doi.org/10.5248/118.123>
- Wei CT. 1950– Notes on *Corynespora*. *Mycological Papers* 34, 1–10.