

***Zygosporium chinensis*- A new foliicolous species infecting *Litchi chinensis* in Chhattisgarh, India**

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ABSTRACT

During the survey of protected forest areas of Ambikapur in north Chhattisgarh in India for foliicolous fungi during the month of January 2018, an interesting fungal form was found infecting both attached living and dried leaves of *Litchi chinensis* Sonn. Based on phenotypic, microscopic, SEM based investigations and comparison with other allied taxa a new species of *Zygosporium* Mont. namely *Zygosporium chinensis* has been described. The new species shows difference in setiform conidiophore septation.

Keywords: Follicolous, hyphomycetous, *Litchi chinensis*, SEM, *Zygosporium*

INTRODUCTION

During the survey of Ambikapur forested area a large number of fungal forms were collected on medicinally and economically important plants and one of them was *Litchi chinensis* Sonn., belonging to family Sapindaceae. It is a well known economically important fruit plant with variety of medicinal uses (Kilari and Putta, 2016). During the survey it was observed that fungal infection in the plant starts from tip of the leaf and finally covering it entirely. All such infected leaves start drying in due course which are then shed off from the parent plant after they have completely dried. Due to the severe fungal infection on the foliage the fruit size and the yield as a consequence reduces appreciably. Thirty species of *Zygosporium* Mont. (www.mycobank.org; www.indexfungorum.org) are reported so far from all over the world. As compared only five species of this genus (www.mycobank.org, www.indexfungorum.org), namely *Z. anupamvarmae* Manoharachary, D.K. Agarwal, Suresh Kumar, Sharanth & Kunwar (Manoharachary *et al.*, 2006), *Z. cocos* Rashmi Dubey (Dubey, 2014), *Z. dilleniae* Rashmi Dubey (Dubey, 2014), *Z. tuberculatum* Subramanian & Bhat (Subramanian and Bhat, 1987) and *Z. verticillatum* S.B. Thakur & Udipi (Thakur and Udipi, 1976) are documented from India. When the cause of the infection was studied using the microscopic and SEM based investigations, the both living and dried leaves were found infected by a hyphomycetous fungus *Zygosporium*. The diagnostic features of this taxon were quite unique based upon which a new species *Z. chinensis* sp. nov. is being described.

The genus *Zygosporium* is characterized by thin to effuse, grey to black colonies, setiform conidiophores macronematous, smooth, swollen, curved dark brown single vesicle from setiform conidiophore, upper part terminating in a knob, conidiogenous cell monoblastic, ampulliform, conidia developing from conidiogenous cells, hyaline to brown, smooth to verruculose. (Ellis, 1971)

MATERIALS AND METHODS

Infected leaves were collected from study area, into clean polythene bags with information tags tied i.e area, date of collection, location, and plant identification. A detailed information was maintained in a note book. Samples were properly dried and pressed in blotting paper. Samples showing fungal lesions were scratched on to a slide,

mounted with lactophenol + cotton blue and a coverslip was carefully placed for slide preparation (Dubey *et al.*, 2019). For detailed study of the morphological features, the microscopic observations were made under an Olympus CX21i Trinocular light microscope and images were captured by Mlcap. Micrometry of conidiophores and conidia were recorded at 400X magnification. For detailed investigations scanning electron microscope (SEM) was used. Because of being dried the samples could not be given the preparative treatment for undertaking SEM studies (Bhardwaj *et al.*, 2019). The specimens were coated with a thin layer of gold-palladium using Denton Vacuum and examined using NOVA NANO SEM 450. The holotype of the specimen (AMH-10051) has been deposited in Ajrekar Mycological Herbarium (AMH), Agharkar Research Institute Pune, India and an isotype at RA Herbarium (RAH), Botany Department Dr. Hari Singh Gour Vishwavidyalaya, Sagar, M. P. India.

TAXONOMIC DETAILS

Zygosporium chinensis A.D. Khalkho, S. Bhardwaj, A. Dubey, S. Jain & A.N. Rai, sp. nov. **Figs. 1 & 2.**

Mycobank No.: MB 834791

Etymology: The epithet refers to the host species name.

Diagnosis: The newly described species *Zygosporium chinensis* (Holotype: AMH-10051) differs from the other *Zygosporium* species by its symptomatology, nature, dimensions of setiform conidiophores, vesicular conidiophores, conidia and septation in setiform conidiophores which is of rare occurrence.

Taxonomic description: Leaf lesions initiating from tip, amphigenous, small to large, irregular. Colony hyphophyllous, dark brown to black, colony present in all infected portions. Mycelium immersed. Conidiophores macronematous, scattered, unbranched or dichotomously branched, straight to flexuous, subulate, brown, smooth, 36-56×2.5-3 µm., bearing a single vesicle, sterile, setiform, upper part terminating in a knob, slightly swollen, curved vesicle 9-18.5×6-11.5 µm., dark brown, aseptate or singly septate. Conidiogenous cells monoblastic, ampulliform, dark brown. Conidia solitary, acrogenous, simple spherical or ellipsoidal, hyaline to pale brown, smooth to verruculose, 4.9-6.4×3.5-5 µm.

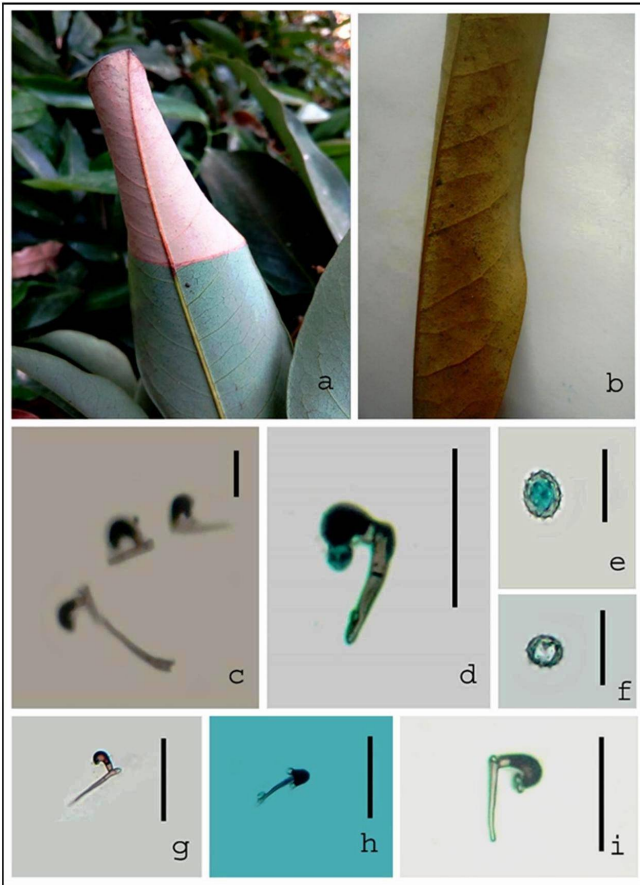


Fig. 1 *Zygosporium chinensis*: (a). Symptoms on healthy leaves, (b). Symptoms on dry leaves, (c). Setiform conidiophores, (d). Attachment of conidium with setiform conidiophore, (g). Single setiform conidiophore. (h-i). Setiform conidiophore with conidia (e-f). Conidia. Scale: (c,d,g,h,i). 20µm. (E-f). 10 µm.

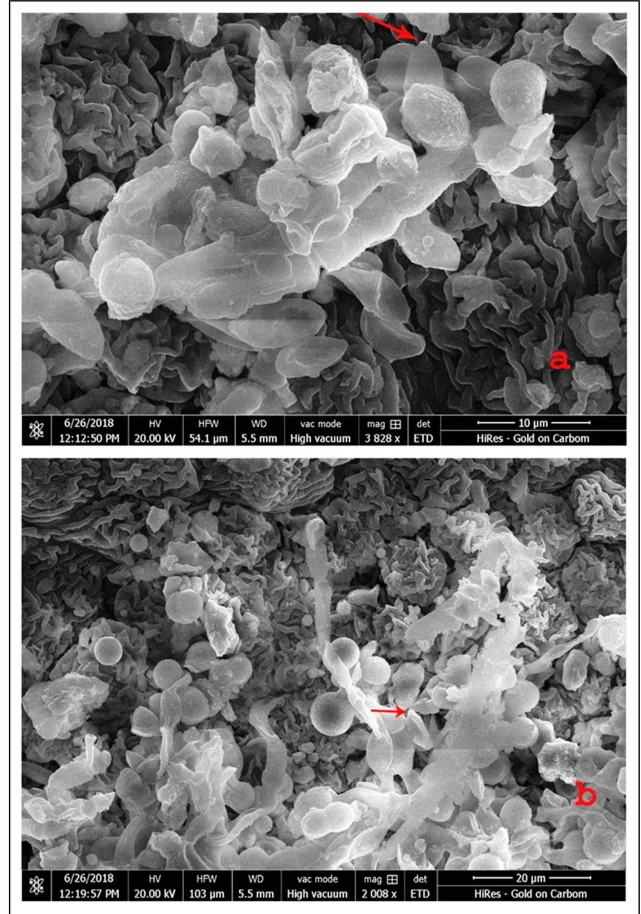


Fig. 2 *Zygosporium chinensis*: SEM images (a-b). Conidium with scar. Conidium at 3,828X and 2008X magnification, respectively.

Table 1: Comparative account of *Litchi chinensis* sp. nov. with similar taxa in the genus

Species	Leaf spots and colonies	Setiform conidiophore			Vesicular conidiophore		Conidia	
		Structure	Colour & septation	Size in (µm)	Structure & Colour	Size in (µm)	Structure & Colour	Size in (µm)
<i>Zygosporium oscheoides</i> Mont. (Ellis, 1971)	On decaying leaves, effuse to compact	Subulate	3-4	80×3-4	-	9-18× 7-9	Ellipsoid, smooth to minutely verruculose, hyaline to pale brown	7-12.5×4-9
<i>Z. pandanicola</i> (Whitton et al., 2003)	On decaying leaves, effuse to compact	Clavate and smooth at the apex	Hyaline to dark brown, 3-4	67-86×4-5.5	Cylindrical, dark brown	15.5-16× 8.5-9	Spherical, tuberculate to capitate, raised areas flattened, brown	11-14.5
<i>Z. bioblitzi</i> (McKenzie et al., 2007)	On dead leaves, effuse to compact	Subulate	Brown, 3	40-75×2-3	Circular, cylindrical, brown	8-10.5×3.5-5.5	Ellipsoidal to oval, brown	14-21×7.5-11
<i>Z. chinensis</i> sp. nov.	Healthy & dry leaves, hyphophyllous, brown to black	Subulate	Brown, 0-1	36-56×2.5-3	Circular, cylindrical, dark brown	9-18.5×6-11.5	Ellipsoidal to spherical, hyaline to pale brown	4.5-6.4×3.5-5

Specimen examined: On living and dried but attached leaves of *Litchi chinensis* (*Sapindaceae*), from Ambikapur (Chhattisgarh) India, January 2018, leg. Anshu Deep Khalkho (Holotype AMH-10051; Isotype RAH Herbarium- 83).

DISCUSSION

The new species *Zygosporium chinensis* is morphologically different from previously described species of *Zygosporium*. Some of its closely allied species includes *Z. oscheoides* Mont. (Ellis, 1971), *Z. pandanicola* Whitton, McKenzie & K.D. Hyde (Whitton *et al.*, 2003), *Z. pacificum* Whitton, McKenzie & K.D. Hyde (Whitton *et al.*, 2003), *Z. bioblitzii* McKenzie, Thongk. & Lumyong (McKenzie *et al.*, 2007) and *Z. geminatum* San-Blas, Moreno, Calcagno & San-Blas (San-Blas *et al.*, 1998) but latter shows a distinct septate setiform conidiophore with smaller vesicular conidiophore and conidia as compared to other species (**Table 1**). Literature survey reveals that no species of *Zygosporium* has previously been reported on *Litchi chinensis* Sonn. (<https://nt.ars-grin.gov/fungalatabases/>). In view of the significant differences with the already known species of *Zygosporium* and uniqueness, *Z. chinensis* sp. nov. is proposed to accommodate the presently examined fungus infecting *Litchi chinensis* in the forests of Chhattisgarh.

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