



# *Thielavia gigaspora*, a new thermotolerant ascomycete from Egypt

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## Summary

*Thielavia gigaspora* sp. nov. from herbivore dung is described and illustrated. The new taxon by comparison with previously known species is distinguished by relatively large ascospores (25–38 × 15–21 μm), each showing an apical, protuberant germ pore and a longitudinal dark band. A brief comparison with morphologically related species is given.

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## Introduction

During a survey of ascosporic fungi of various habitats in Egypt an interesting coprophilous ascomycete characterized by hairy, non-ostiolate ascomata, broad-fusiform, brown ascospores, was reported several times on camel dung. Ascomata were showing some resemblance to those of *Chaetomidium* due to the presence of dark-pigmented hairs and translucent ascomata but close examination of hairs, ascomatal wall-thickness, and surface appearance of textura showed that it should be assigned to the genus *Thielavia*. Pure cultures were obtained and growth–temperature relations were tested on various agar media. By comparison with previously described species,

ascospores of the new isolate are definitely the largest among all described species. They are further characterized by the presence of a longitudinal dark band or stripe-like, a character which has not previously been reported for the genus. Such distinguishing features are sufficient to warrant the introduction of a new taxon.

## Materials and methods

### Location and climate

El-Sheikh Zweid is a small city located in the northern part of Sinai Peninsula, lying on the east coast of Mediterranean (31°10'25"N, 34°10'17"E). Sinai, as a whole, is an arid desert having a climate belonging to the "Arabian Type" which characterized by aridity, winter precipitation and moderate

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temperature (Danin, 1978). The monthly mean of temperature of cold months (December–January) ranges between 13 and 15 °C while the monthly mean of hot months (July–September) ranges between 24 and 26 °C. The rain fall ranges between 16 and 28 mm in winter months (December–February), being between 11 and 13 mm in spring (March–April), and nil in summer (May–September). The relative humidity show values almost of the same order throughout the year (fluctuating between 67% and 73%).

## Sampling and sample preparation

Dry samples of camel dung (*Camelus dromedaries* L.) were collected from El-Sheikh Zweid, North Sinai, March 2002. Small pieces were placed on sterile, damp-filter paper and kept in glass humid chambers near diffuse light and examined regularly over 6 weeks. Between the third and fourth week, an ascomycete having round, non-ostiolate ascospores covered with branched, dark pigmented hairs was reported several times. Pure cultures were prepared by using various media supplemented with chloramphenicol at 50 ppm. Growth and sporulation were studied on: Difco potato carrot agar (PCA), potato dextrose agar (PDA), oat meal agar (OMA), malt extract agar (MEA), Czapek's yeast agar (CYA), vegetable 8 agar (V8), tap-water agar (TWA), at the following temperatures: 10, 25, 35, 40 and 50 °C. Descriptions were based on water mounts examined by Leitz microscope, model Laborlux S.

## Results

### Species description

*Thielavia gigaspora* Moustafa et Abdel-Azeem sp. nov. (Figs. 1 and 2).

**Fimicolous.** *Coloniae* in PCA celeriter crescent, optime 28 °C, hyphae ariae primum griseae, deinde fusco-nigrae, 5–6 µm latae; exsudatum adest, reversum hyalinum. *Ascospores* 15 diebus maturantia, dispersa, superficialia, globosa, tomentosa, nonostiolata, 250–350 µm diam. *Capilli myceliales* ramose, undulati, septati, 5.5–7.5 µm lati. *Asci* cylindrici, octospori, 50–70 × 20–25 µm, evanescentes. *Paraphysis* nullis. *Ascospores* uniseriatae, unicellulares, fuscae, late fusiformes, (25) 27–30 (38) × (15) 17–19 (21) µm, vel interdum lineate, porogerminati singulo, conspicuo, apicali, protuberante. *Status conidialis* nullus.

**Typus:** IMI exiccatus 391315, CBSnr 112062 *Iso-latus* ex *Camelus dromedarius* dung.

In El-Sheikh Zweid, North Sinai, Egypt, 2002, A. F. Moustafa.

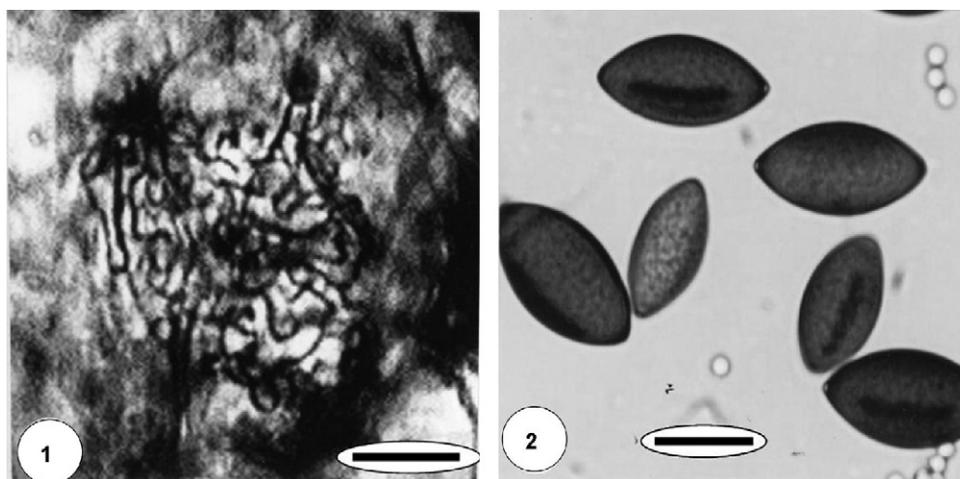
**Etymology:** Greek, *giga*-(giant) and *-spora* (spore), referring to the exceptionally large spores.

Colonies on PCA fast-growing attaining 80 mm diam after 7 days at 28 °C; with aerial mycelium white at first, turning quickly into grayish-black and finally fuscous-black (Rayner, 1970), composed of hyaline or brownish, septate, smooth hyphae, 5–6 µm wide; reverse and exudate absent. *Ascospores* mature within 15 days, superficial, spherical, non-ostiolate, 250–350 µm diam, walls thin, translucent, textura epidermoidea, covered with brown, septate, undulate, branched hairs, up to 200 µm long and 5.5–7.5 µm wide. *Asci* cylindrical, very often sinuate, evanescent, non fasciculate, 8-spored, 65–90 × 12–17 µm. *Ascospores* uniseriate, broadly fusiform, brown, sometimes inequilateral, (25) 27–30 (38) × (15) 17–19 (21) µm, showing when young one or two large globules and when mature a dark, longitudinal stripe and an apical protuberant germ pore. Anamorph unknown.

**Type:** IMI 391315, CBS 112062, isolated from camel dung, collected from El-Sheikh Zweid, North Sinai, Egypt, by A.F. Moustafa, Egypt, 2002.

Since dung is a thermogenic substrate and thermophily is a common feature in many species of *Thielavia*, it was felt necessary to focus on the temperature requirements of *T. gigaspora*. Growth and sporulation were tested on various agar media at different temperatures. The results indicated that *T. gigaspora* can be regarded as thermotolerant according to the definition of Cooney and Emerson (1964). It is able to grow between 25 and 45 °C with maximum at 35 °C. No growth was reported at 10 and 50 °C. Growth and fructification were greatly affected by the type of medium and temperature of incubation. Both of growth and fructification were good at 35 °C on PCA, OMA, CYA, PDA but being best only on the former two media. Other media namely V8, MEA, TWA supported only vegetative growth.

On the basis of some characters, the two genera *Thielavia* Zopf and *Chaetomidium* (Fuck.) Zopf are very related. Both genera produce translucent, non-ostiolate, very often tomentose ascospores, evanescent asci, one-celled, dark pigmented ascospores showing one apical to subapical germ pore. The two genera, however, can be distinguished by; (a) the surface nature of peridial cells (textura) which is distinctly angularis or cephalothecoid in *Chaetomidium* and being typically epidermoidea in *Thielavia*, (b) the ascospore shape which tend to be limoniform, bilaterally flattened



Figures 1–2. *Thielavia gigaspora* IMI 391315, CBS 112062. (1) Textura. (2) Ascospores. Scale bars: 1 = 8 and 2 = 20  $\mu\text{m}$ .

Table 1. Comparison between *Thielavia* species with dark-pigmented colonies and hairy ascomata.

Parameter	Species				
	<i>T. gigaspora</i>	<i>T. arenaria</i>	<i>T. hyrcaniae</i>	<i>T. microspora</i>	<i>T. subthermophila</i>
Ascospore size ( $\mu\text{m}$ )	25–38 $\times$ 15–21	9–12 $\times$ 6–7	12–16 $\times$ 6–8	8–10 $\times$ 5.5–6.5	14–19 $\times$ 8–10
Germ pore	Apical	Subapical	Subapical	Apical	Subapical
Anamorph (Chlamydo-spores)	Absent	Present	Absent	Present	Present

in *Chaetomidium* and usually fusiform to ellipsoid in *Thielavia*. Ascomatal hairs in both genera are very distinct from vegetative hyphae in view of pigmentation and thickness. While vegetative hyphae are usually narrow and nearly hyaline to subhyaline, ascomatal hairs are broader and showing prominent pigmentation. The last features namely thickness and pigmentation give ascomatal hairs an intermediate position between vegetative hyphae and true appendages (or setae) like those of *Chaetomium* Kunze or *Kernia* Nieuwland or *Lophotrichus* Benjamin. Mouchacca (1973) and Arx (1975) used the term “appendage-like” to refer to this type of hairs. In this connection it is worthy to mention that Malloch and Cain (1973) regarded the presence or absence of hairs on the ascomata of some species of *Thielavia* as a criterion of insufficient taxonomic value and based on this reason they considered *Chaetomidium* as a synonym of *Thielavia*.

Up to the present, 19 species are known (Malloch and Cain, 1973; Mouchacca, 1973; Arx, 1975; Arx et al., 1988; Moustafa and Abdul-Wahid, 1990; Ito et al., 1998; Stchigel et al., 2002, 2003). All of the so far described species produce ascospores less than 20  $\mu\text{m}$  long except for *T. hyalocarpa* Arx, therefore it could be the nearest to the new taxon in view of ascospore size, however, its ascospores by compar-

ison with those of *T. gigaspora* are smaller, measuring 22–26  $\times$  12–14  $\mu\text{m}$  and more important, colonies of *T. hyalocarpa* are white to yellowish and hairs covering ascomata are also hyaline. Cylindrical asci are considered an exceptional character for the genus *Thielavia* (Stchigel et al., 2003) however; they are present in several species like *T. tetraspora* (Lodhi and Mizra) Arx, *T. octospora* (Natrajan) Arx, *T. hyalocarpa* Arx, *T. antarctica* Stchigel and Guarro, *T. tortuosa* Udagawa and Sugiyama, *T. terrestris* (Apinis) Malloch and Cain. Furthermore, asci in the last two species are usually sinuous.

*Thielavia gigaspora* may be related to some other species especially those producing dark pigmented mycelium and brownish-black, hairy ascomata like: *T. arenaria* Mouchacca, *T. hyrcaniae* Nicot, *T. microspora* Mouchacca and *T. subthermophila* Mouchacca. However, apart from ascospore size, other features such as position of germ pores and presence or absence of anamorphs might also be used as distinctive features to differentiate between species as shown in Table 1.

It is worthy to be mentioned that, in addition to the present new taxon, other species are well known members of the Egyptian mycobiota. Some were introduced as novel taxa such as *T. arenaria*, *T. microspora*, *T. subthermophila* by Mouchacca

(1973), from desert soils, and *T. aegyptiaca* by Moustafa and Abdul-Wahid (1990) from cultivated soils, still some others reported by several investigators, as casual taxa during routine isolations viz. *T. hyalocarpa* (Mouchacca, 1974), *T. hyrcaniae* (Abdel-Hafez, 1986), *T. coactilis* (Abdul-Wahid, 1990), *T. terrestris* (El-Abyad, 1997), and *T. terricola* (Krug and Khan, 1999).

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