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## Two New Records of *Chaetomium* Species Isolated From Soil under Grapevine Plantations and a Checklist of the Genus in Iraq

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Abdullah, S. K. and Azzo, N. M. (2015). Two new records of chaetomium species isolated from soil under grapevine plantations and a checklist of the genus in Iraq. International Journal of Agricultural Technology 11(7):1571-1579.

**Abstract** During the course of study soil micro fungi from grapevine plantations in Iraq, two species of *Chaetomium* were reported for the first time in Iraq. These include *C.longicolleum* and *C.madrasense*. Brief description and photographic plates are provided for the newly recorded species. A checklist that included 21 species of *chaetomium* were previously reported from various habitats in Iraq has been provided.

**Keywords:** Soil fungi, *Chaetomium*, Ascomycota, Taxonomy, Iraq.

### Introduction

The genus *Chaetomium* Kunze (Chaetomiaceae: Ascomycota) is characterized by superficial ostiolate ascomata covered with terminal and lateral hairs and attached to the substrate by rhizoidal hyphae. Asci are usually clavate to fusiform or sometimes cylindrical, thin-walled without apical structure, evanescent. Ascospores are aseptate with one or two germ pores, brown to grey-brown (Arx *et al.*, 1986).

Species in *Chaetomium* are widespread and occupied different ecological niche. They are commonly isolated from soil, seeds, decaying plant materials, herbal drugs, sugarcane and dung (Skolko and Groves, 1953, Horie *et al.*, 1990, Watanabe 2002, Domsch *et al.*, 2007, Abdullah and Saleh, 2010, Mungai *et al.*, 2012, Doveri 2013). Some are plant endophytes (Syed *et al.*, 2009, Sharma *et al.*, 2013) and others are human pathogens (De Hoog *et al.*, 2009, Hubka *et al.*, 2011).

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Several species in *Chaetomium* have been reported as producers of several secondary metabolites used in important applications in agriculture and medicine (Kanokmedhakul *et al.*, 2001, Soyong *et al.*, 2001, Li *et al.*, 2008, Khan *et al.*, 2012, Sibounnavong *et al.*, 2012).

The genus comprises more than 150 species (Arx *et al.*, 1986, Rodriguez *et al.*, 2002, Asgari and Zara, 2011, Doveri 2013, Wang *et al.*, 2014).

During the course of study soil fungi from grapevine plantations in Iraq, we have isolated several *Chaetomium* species; two of them are identified as new additions to the genus in Iraq. Representative strains of the newly recorded species were deposited at the culture collection of the Biology Department, Faculty of Science, University of Zakho, (CUZ).

## Materials and methods

**Soil collection:** Twenty soil samples were collected in several grapevine plantations at Salahddin province, middle of Iraq during October; 2012. Approximately 200 g of soil was removed with a sterile trowel from a depth of 2-10 cm at each site after first removing the upper 0-2 cm of surface soil (Abdullah *et al.*, 2010). Soil samples were stored in polythene bags at 5 °C in the dark and were processed after six months of collection.

**Isolation and identification of fungi:** three isolation methods were used, soil treatment with acetic acid (Furuya and Naito,1979), treatment with 2%phenol (Furuya and Naito,1980) and direct plating method (Warcup 1960). Two types of media were used to isolate *Chaetomium* species *viz* malt extract agar (MEA) (Himedia laboratories, India), and oat meal agar (OT) (30g oat, 20g agar 1L distilled water). Chloromphenicol (250g/L) was added to each medium to suppress bacterial growth. Plates for methods and media (four replicates) each were incubated at 25 °C and 40 °C in the dark. After 10 days incubation, characteristic ascomata of *Cheatomium* were picked up and placed on glass slide with a drop of 2% sodium hypochlorite for 1 min., then transferred to slide glass with a drop of sterilized water and then plated on appropriate media. Pure cultures were identified according Natarajan (1971) and Arx *et al.* (1986).

## Results and discussion

### *Brief notes on newly recorded species*

*Chaetomium longicolleum* Krzemien&Badura, ActaSoc.Bot, Poloniae 23:748, 1954. Fig.1A

Colonies on MEA are growing slowly reaching a diameter of 40 mm in 10 d at 25 °C. Mycelium is mainly submerged, grey with yellowish white reverse. Aerial mycelium is sparse, white. Chlamydospores are pale yellowish, globose to subglobose 11-13 µm wide. Ascumata are superficial, dark brown to black, dispersed, elongate pyriform 190-220 X 50-65 µm. Ascumatal wall is composed of angular or irregular cells 9-12 µm. brown. Terminal hairs are in bundle, fused originating around the ostiole forming cylindrical thread-like beak, separated at tip, smooth up to 1.2 mm long. Lateral hairs are shorter, up to 350 µm long and 3-5µm wide, septate, brown with a swollen base. Asci are evanescent, not seen. Ascospores are subglobose to liminiform, olivaceous brown, smooth, 9-12 X 8-10 µm with slightly sub apical germ pore.

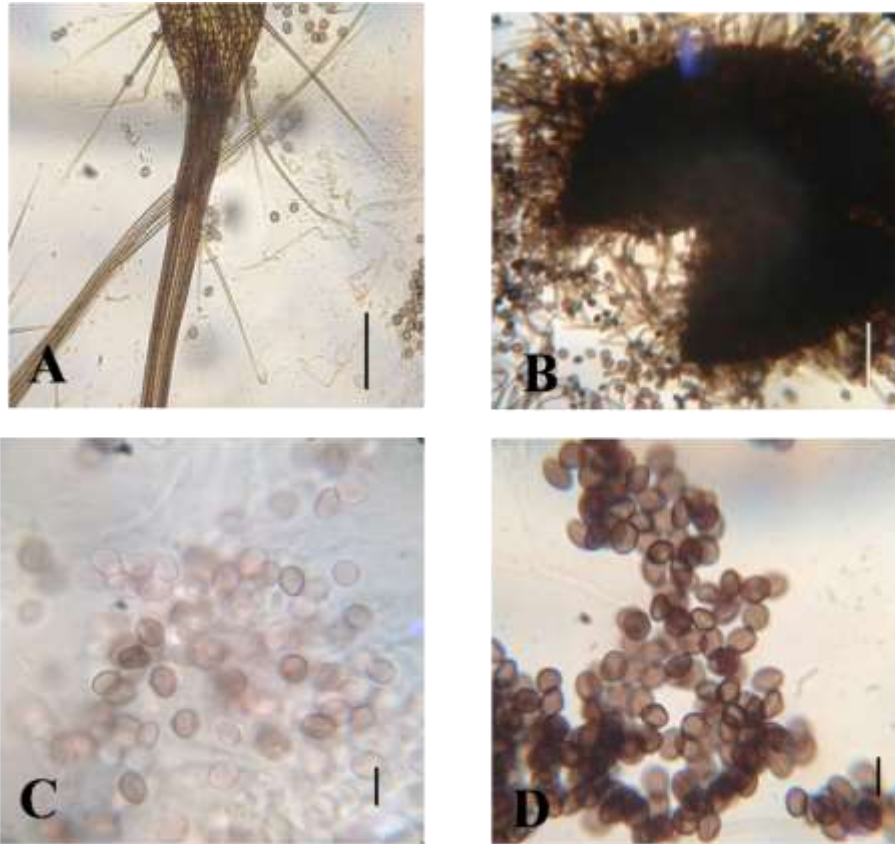
Specimen examined: (CUZ 22), isolated from soil at grapevine plantation, Balad, Salahddinprovine, middle Iraq, 22 October, 2012.

This species is characterized by its elongate pyriform ascumata with a long elongated ostiolar beak terminating with a bundle of fused terminal hairs separated at tip.*C.malaysiense* (D.Hawksworth)V.Ar. is very close but differs by its short cylindrical ostiolar beak.

*Chaetomium madrasense* Natarajan.Proc.IndianAcad.Sci.B 74:255, 1971.Fig. 1 B-D. Colonies on MEA are olive green reaching a diameter of 50 mm in 10 d. at 25 °C. Colonies on OT medium are growing faster reaching a diameter of 65 mm in 10 d at 25 °C with abundant ascumata. Ascumata are globose to subglobose, ostiolate 270-350 X 200-300 µm attached to the substrate by rhizoid-like hyphae. Ascumatal wall is dark brown composed of 2-3 layers. Terminal hairs are abundant, undulate to loosely spirally coil above with up to 5 coils, finely verrucose, 2-3 µm wide. Lateral hairs are similar to the terminal hairs but with fewer spiral coils. Asci are clavate with long stalk, thin-walled, evanescent, 8-spored 45-55 X 12-15 µm. Ascospores are aseptate, smooth, brown at maturity liminiform or irregularly shaped, bilaterally flattened, usually with an distinct bulge at one side with an apical germ pore, 8-10 X 7-8 µm.

Specimen examined: (CUZ 28), isolated from soil at grapevine plantation, Dhuluaia, Salahddin Province, middle Iraq, 22 October, 2012.

The species is characterized by a liminiform or irregularly shaped ascospores usually with distinct bulge at one side.



**Figure 1.** *Chaetomium longicolleum*, A: perithecium and ascospores (Bar=100 µm). *C. madrasense* B: perithecium (Bar=50 µm), C: asci and young ascospores (Bar=10 µm), D: mature ascospores (Bar=10 µm).

#### ***Checklist of Chaetomium species previously reported from Iraq***

##### ***Chaetomium atrobrunneum* Ames**

Substrates: soil, sediment, medicinal plants, *seeds*, sugarcane leaves.

References: Abo-Mejdad (2013), Abdullah and Al-Bader (1990), Abdullah and Zora (1993a), Abdullah *et al.* (2000), Abdullah and Al-Mosawi (2006, 2010), Abdullah and Abbas (2008), Abdullah and Saleh (2010), Abdullah *et al.* (2007, 2009, 2010).

***Chaetomium aureum*** Chivers

Substrate: soil.

Reference: Al-Doory *et al.* (1959), Abdullah *et al.* (2007).

***Chaetomium bostrychodes*** Zopf

Substrate: Soil, sediment, dung

Reference: Abdullah (1982), Abdullah and Abbas (2008), Abdullah *et al.* (2000, 2007).

***Chaetomium brasiliense*** Batista & Pontual

Substrate: soil

Reference: Abdullah and Zora (1993a).

***Chaetomium chiversii*** (J.C.Cooke) Carter

Substrate: herbal drugs

Reference: Abdullah *et al.* 2002

***Chaetomium circinatum*** Chivers

Substrate: dung

Reference: Abdullah (1982).

***Chaetomium convolutum*** Chivers

Substrate: Sugarcane stem

Reference: Abdullah and Saleh (2010).

***Chaetomium elatum*** Kunze

Substrate: soil, seeds, sediment, herbal drugs, sugarcane leaves

Reference: Abdullah and Zora (1993a), Abdullah and Abbas (2008), Abdullah and Al-Mosawi (2006, 2010), Abdullah and Saleh (2010), Abdullah and Saadullah (2013), Abdullah and Atroshi (2014), Abdullah *et al.* (2002, 2007).

***Chaetomium funicola*** Cooke

Substrate; medicinal plants

Reference: Abdullah *et al.* (2009).

***Chaetomium fusiforme*** Chivers

Substrate: soil

Reference: Abu-Mejdad (2013).

***Chaetomium fuisporum*** G.Smith

Substrate: herbal drugs

Reference: Abdullah *et al.* (2002).

***Chaetomium gelasinosporum*** Aue & Muller

Substrate: herbal drugs

Reference: Abdullah *et al.* (2002).

***Chaetomium globosum*** Kunze

Substrate: soil. Sediment, seeds, herbal drugs, dung, submerged plant debris, sugarcane stem.

Reference: Abdullah (1982), Abu-Mejdad(2013), Juber and Al-Salahe (2006), Abdullah and Abbas (2008), Abdullah and Al-Mosawi (2006, 2010), Abdullah and Saleh (2010), Abdullah and Atroshi (2014), Al-Saadoon and Al-Dossary (2014), Abdullah *et al.* (1986, 2002, 2007, 2008, 2009, 2010).

***Chaetomium indicum*** Corda

Substrate: sediment, herbal drugs, medicinal plants.

Reference: Abdullah and Abbas (2008), Abdullah *et al* (2002, 2009).

***Chaetomium mesopotamicum*** Abdullah & Zora

Substrate: soil

Reference: Abdullah and Zora (1993b)

***Chaetomium murorum*** Corda

Substrate: soil, sediment, dung, herbal drugs, sugarcane stem.

Reference: Abdullah (1980), Abdullah and Zora (1993a), Abdullah and Abbas (2008), Abdullah and Saleh (2010), Abdullah *et al.* (2007, 2009).

***Chaetomium piluliferum*** Daniels

Substrate: soil

Reference: Abdullah *et al.* (2007).

***Chaetomium spiralotrichum*** Lodha

Substrate: Sugarcane leaves

Reference: Abdullah and Saleh (2010).

***Chaetomium subcurvisporum*** Abdullah & Al-Bader

Sustrate: soil, sediment.

Reference: Abdullah and Al-Bader (1989), Abdullah and Abbas (2008).

***Chaetomium succineum*** Ames

Substrate: sediment

Reference: Abdullah and Abbas (2008).

***Chaetomium thermophilum*** La Touche

Substrate: soil

Reference: Abdullah *et al.* (1986).

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(Received: 15 September 2015, accepted: 25 October 2015)