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Wakefieldia, A New Hypogeous Basidiomycete Genus Record for Turkey

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ABSTRACT
The hypogeous basidiomycete genus, *Wakefieldia* is given as new record for Turkish mycobiota based on the collection and identification of *Wakefieldia macrospora* from İstanbul. Brief description, photographic images related to its micro and macromorphologies and the collection locality of the species were provided.

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Wakefieldia, Türkiye İçin Yeni Bir Toprakaltı Bazidiyomiset Cins Kaydı

ÖZET
Toprak altı bazidiyomiset cinsi olan *Wakefieldia*, *Wakefieldia macrospora*'nın İstanbul'dan toplanıp teşhis edilmesine bağlı olarak Türkiye mikobiyotası için yeni kayıt olarak verilmiştir. Türün kısa betimlemesi, makro ve mikromorfolojisine ilişkin fotoğrafları ve toplanma lokalitesi verilmiştir.

Araştırma Makalesi

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INTRODUCTION

Wakefieldia Corner & Hawker is a hypogeous basidiomycete genus in the family *Boletaceae* (Kirk et al., 2008). The genus contains two species and characterized by globose to irregular gasterocarp, thin, whitish and smooth peridium; minute and crowded chambered loculate gleba, statismosporic, orthotropic, globular spores ornamented with broad verrucae or irregular ridges (Pegler et al., 1993).

Genus *Wakefieldia* was erected by Corner and Hawker (1953) based on the description of *Wakefieldia striaespora* Corner and Hawker, and Hawker (1954) assigned the genus to Hydnangiaceae. Later on Pegler & Young (1979) proposed to move it to *Octavianinaceae* (Krakhmalnyi et al., 2014). Kirk et al. (2008) lists this genus in *Boletaceae.* The ITS and nuc-LSU sequence based data gathered by Kaounas et al. (2011) from Greek collections of hypogeous fungi bear a close relation of *Wakefieldia* Corner & Howker to the *Hebeloma* (Fr.) P. Kumm. in *Hymenogastraceae.* Though the systematic position of the genus still remains in dispute, here we follow Kirk et al. (2008) and Index fungorum (accessed on 20 May 2019) and regard it in *Boletaceae.*

Only one hypogeous member of *Boletaceae* within the genus *Octaviania* Vittad. has been reported from Turkey (Türkoğlu et al., 2015; Kaygusuz et al., 2018). Current checklists on Turkish macromycota (Solak et al. 2015; Sesli and Denchev 2014) and the contributions published after the checklists (Sadullahoğlu and Demirel, 2018; Uzun et al., 2018; Acar et al., 2019; Keleş, 2019; Uzun and Kaya, 2019a,b; Yakar et al., 2019) indicate that *Wakefieldia macrospora* (Hawker) Hawker hasn't so far been reported from Turkey. The study aims to contribute to the Turkish mycobiota.

MATERIALS and METHODS

Wakefieldia samples were collected during a field trip in Şile district of İstanbul province on 26th December

2018. Photographs of fruit bodies were taken in their natural habitats and characteristics related morphology and ecology were noted. Further studies were carried out on dry specimens. Microscopic slides were prepared in water and Melzer's reagent. Microscopic study was performed under Nikon Eclipse Ci-S trinocular light microscope, coupled with a Nikon DS-Fi2 camera. A Hitachi SU5000 scanning electron microscope were used for SEM images. Identification was conducted with the help of Hawker (1951, 1954), Hintz and Winterhoff (1984), Pegler et al. (1993), Montecchi and Sarasini (2000), Calonge et al. (2003), Kaounas et al. (2011) and Krakhmalnyi et al. (2014). The sample was kept in Biology Department of Science Faculty of Karamanoğlu Mehmetbey University.

RESULTS

Basidiomycota R.T. Moore

Boletales E.-J. Gilbert

Boletaceae Chevall.

Wakefieldia macrospora (Hawker) Hawker

Syn: [*Sclerogaster macrosporus* Hawker]

Macroscopic and microscopic features: Basidiomata (0.8-)10-20 mm in diam, gasterocarpic, hypogeous, globose, subglobose to irregular or lobate, smooth, with a thin mycelial strands at the base, initially white to dingy white with ochraceous yellow tones, later ochraceous to pale sulphur yellow. Peridium 0.2-0.3 mm thick, white when cut, not easily seperable from gleba. Gleba whitish gray to pale greyish when young, greyish brown, brown to cacao-brown at maturity (Figure 1), with blackish spots when dry. Odor not distinctive. Basidiospores 12-16 µm in diam, globose to fig, pear or whipping top shaped, with a distinct hilar appendage of 1-4 µm, yellowish brown, covered with rough and rugged and irregularly ridged ornamentation of squat and flat, nearly circular verrucae (Figure 2).

Ecology: *Wakefieldia macrospora* was reported to grow in soil in broadleaf forest (mostly oak and beech) on calcareous soils during winter and spring (Montecchi and Sarasini, 2000; Kaounas et al., 2011; Krakhmalnyi et al., 2014).

Specimen examined: İstanbul, Şile, Sofular Village, in soil under *Quercus* sp., 41°08′N-29°28′E, 140 m, 26.12.2018, Yuzun 7122.

Figure 1. Basidiocarps of *Wakefieldia macrospora*
Şekil 1. Wakefieldia macrospora'nın bazidiyokarpları

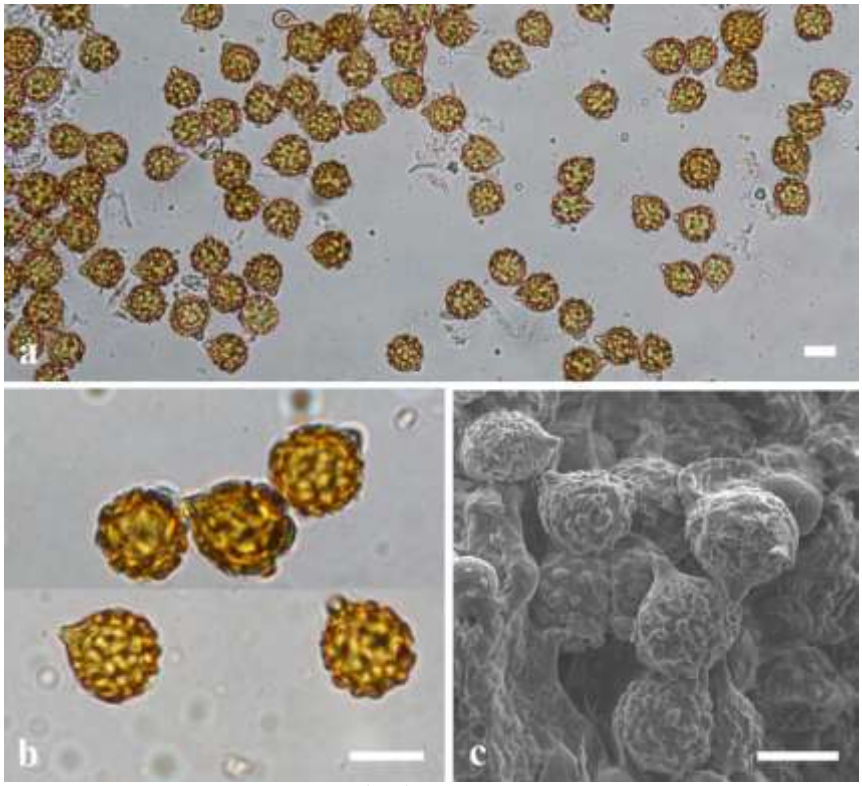

Figure 2. Light microscope (a,b) and scanning electron microscope (c) images of basidiospores of *Wakefieldia macrospora* (bars: 10 µm) (a: in water, b: in Melzer)

Şekil 2. *Wakefieldia macrospora*'nın bazidiyosporlarının ışık mikroskobu (a,b) ve taramalı elektron mikroskobu (c) görüntüleri (barlar: 10 µm) (a: su, b: Melzer)

DISCUSSION

Wakefieldia macrospora is a rare species (Montecchi and Sarasini, 2000; Kaounas et al., 2011). It has been reported from Czech Republic, Belgium, Germany, Italy, Greece, Spain, United Kingdom, Switzerland, Israel (Krakhmalnyi et al., 2014). This was the first finding of this noteworthy species in Turkey, and the second in Asia. Though it was first collected under beech (Hawker, 1954), and Watling (2008) proposed that it could be mycorrhizal with beech, Kaounas et al. (2011) mentions about the probable association with oaks, based on four Greek collections. Turkish specimens of *W. macrospora* were also collected under *Quercus* L. sp.

The macro and micromorphological features of Turkish specimens of *W. macrospora* are in agreement with those given in literature (Hawker, 1954; Montecchi and Sarasini, 2000; Pegler et al., 1993; Calonge et al., 2003; Kaounas et al., 2011; Krakhmalnyi et al., 2014). Montecchi and Sarasini (2000) reports a potato like odour at maturity, but we couldn't notice a distinct odor. Gasterocarps of *W. macrospora* may be confused by some species of the genus *Hymenogaster* Vittad., but the spore shape and ornamentation, especially the prominent conical hilar appendages on basidiospores distinguishes it from such *Hymenogaster* species.

Other than *W. macrospora,* only one conformed member*, W. striaespora* Corner & Hawker, of the genus *Wakefieldia* is known to exist, and differs from *W. macrospora* with smaller (10-11 µm), striately ornamented spores without a distinct hilar appendage.

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Statement of Conflict of Interest

Authors have declared no conflict of interest.

Author's Contributions

The contribution of the authors is equal.

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