

A New Record and a New Locality for the Genus *Chlorophyllum* Masee in Turkey

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ABSTRACT

This paper was carried out on two secotioid macrofungi taxa within the order *Agaricales*. One of them, *Chlorophyllum lusitanicum* G. Moreno, Muñ.-Moh., Manjón, Carlavilla & Altés is reported as new record for Turkish and Asian mycobiota. A new locality was given for the second one, *Chlorophyllum agaricoides* (Czern.) Vellinga, which is also a rare taxon in Turkey. *Chlorophyllum lusitanicum* was described briefly, and the localities, voucher numbers are provided together with macro and micro photographs of fruit bodies and basidiospores of both taxa. A synoptic key for Turkish *Chlorophyllum* was also prepared.

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Türkiye'deki *Chlorophyllum* Masee Cinsi İçin Yeni Bir Kayıt ve Yeni Bir Lokalite

ÖZET

Bu makale *Agaricales* takımına ait iki sekotioid makromantar taksonu üzerinde gerçekleştirilmiştir. Bunlardan birisi, *Chlorophyllum lusitanicum* G. Moreno, Muñ.-Moh., Manjón, Carlavilla & Altés, Türkiye ve Asya mikobiyotası için yeni kayıt olarak rapor edilmiştir. Türki'de nadir yayılış gösteren ikinci takson, *Chlorophyllum agaricoides* (Czern.) Vellinga, için ise Trabzon'dan yeni bir lokalite verilmiştir. *Chlorophyllum lusitanicum* kısaca betimlenerek her iki taksona ait lokaliteler, toplayıcı numaraları, fruktifikasyon organları ve bazidiyosporlara ilişkin makro ve mikro fotoğraflar ile birlikte verilmiştir. Türkiye'deki *Chlorophyllum* cinsine ait sinoptik anahtar da hazırlanmıştır.

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INTRODUCTION

Chlorophyllum Masee is a genus within the family *Agaricaceae*. Members of the genus are characterized by agaricoid to secotioid, or gasteroid habit; white, green, brownish or brown spore deposit; basidiospores without germ pore or with a germ pore caused by a depression in the episporium without a hyaline covering (Ge and Yang 2006; Crous et al. 2015, Carlavilla et al. 2018; Ge et al. 2018; Alves et al. 2019).

The genus was first typified by *Chlorophyllum molybdites* (G. Mey.) Masee. Later on some species from the genera *Chlorophyllum* Masee, *Endoptychum* Czern., *Lepiota* (Pers.) Gray and *Macrolepiota* Sing. were transferred to the genus based on morphological similarities and molecular evidences (Carlavilla et al. 2018; Ge et al. 2018; Alves et al. 2019).

Kirk et al (2008) reports the existance of 16 members

of *Chlorophyllum*, but Index Fungorum (Accessed 15 December 2020) currently lists 26 conformed species of the genus. Until the end of 2020, four species, *C. agaricoides* (Czern.) Vellinga (Işıloğlu, 1994), *C. brunneum* (Farl. & Burt) Vellinga (Aşkun and Işıloğlu, 1997), *C. molybdites* (G. Mey.) Masee (Demirel and Uzun, 1997), *C. rhacodes* (Vittad.) Vellinga (Vlaev, 1915), of the genus have so far been reported from Turkey. According to the checklists (Sesli and Denchev, 2014; Solak et al., 2015) on Turkish higher fungi and the latest contributions (Akata et al., 2014; Dizkırıcı et al., 2019; Keleş, 2019; Işık, 2020; Kaya and Uzun, 2020; Çağlı and Öztürk, 2020; Sesli, 2020; Sesli et al., 2020) *C. lucitanicum* hasn't been reported before from Turkey.

The study, reports the first record of *C. lusitanicum* and a new distribution locality for *C. agaricoides* and aims to make a contribution to the mycobiota of Turkey.

MATERIALS and METHOD

The study materials were collected in 2018 during routine field trips in Kemalpaşa district of İzmir province and Of district of Trabzon province. First they were photographed at their natural habitats, and notes were taken related to their ecology, morphology and geographic position etc. After collection, the fruit bodies were put in paper boxes and transferred to the fungarium. Microscopic investigations were carried out in fungarium. A Nikon Eclipse Ci-S trinocular microscope was used for microscopic investigation and a DS-Fi2 digital camera was used to obtain microstructural photographs. A Hitachi SU5000 scanning electron microscope were used for SEM images. The samples were identified according to Ge and Yang (2006), Dörfelt and Gube (2007), Crous et al., (2015), Carlavilla et al., (2018), Ge et al. (2018) and Loizides et al. (2020). The samples are kept at Karamanoğlu Mehmetbey University, Kamil Özdağ Science Faculty, Department of Biology.

RESULTS

Basidiomycota R.T. Moore

Agaricales Underw.

Agaricaceae Chevall.

Chlorophyllum lusitanicum G. Moreno, Muñ.-Moh., Manjón, Carlavilla & Altés, in Crous et al., Persoonia 35: 297 (2015) (Turkish name: Çayır yumurtası).

Macroscopic and microscopic features: Basidiocarps 16-33 mm in diam., globose, subglobose to pyriform. Stipe absent or rudimentary with a thick whitish mycelial cord that includes sandy substrate. Peridium whitish to light brownish cream, smooth or breaking into polygonal to irregular patches at maturity, some with small brownish scales. Columella white, variable in length and morphology, up to 8 mm wide in some samples. Gleba whitish at first, then whitish cream to pale yellowish or straw coloured (Figure 1). Taste and odor not detected. Basidia 33-44 × 15-18 µm, clavate to broadly ellipsoid. Basidiospores (8.6)9-12(13) µm, globose to subglobose, more rarely ovoid to ellipsoid, germ pore absent, hyaline, smooth with a hilar appendix (Figure 2).

Ecology: Grassland areas used for cattle grazing, where oaks (*Quercus ilex* L. subsp. *ballota* (Desf.) Samp. and *Q. suber* L.) are the dominant trees (Crous et al., 2015).

Specimen examined: İzmir, Kemalpaşa, Nazarköy Village, meadow, 38°22'N-27°26'E, 300 m, 13.10.2018, Yuzun 6779.



Figure 1. Basidiocarps of *Chlorophyllum lusitanicum*
Şekil 1. *Chlorophyllum lusitanicum*'ün bazidiyokarpları.

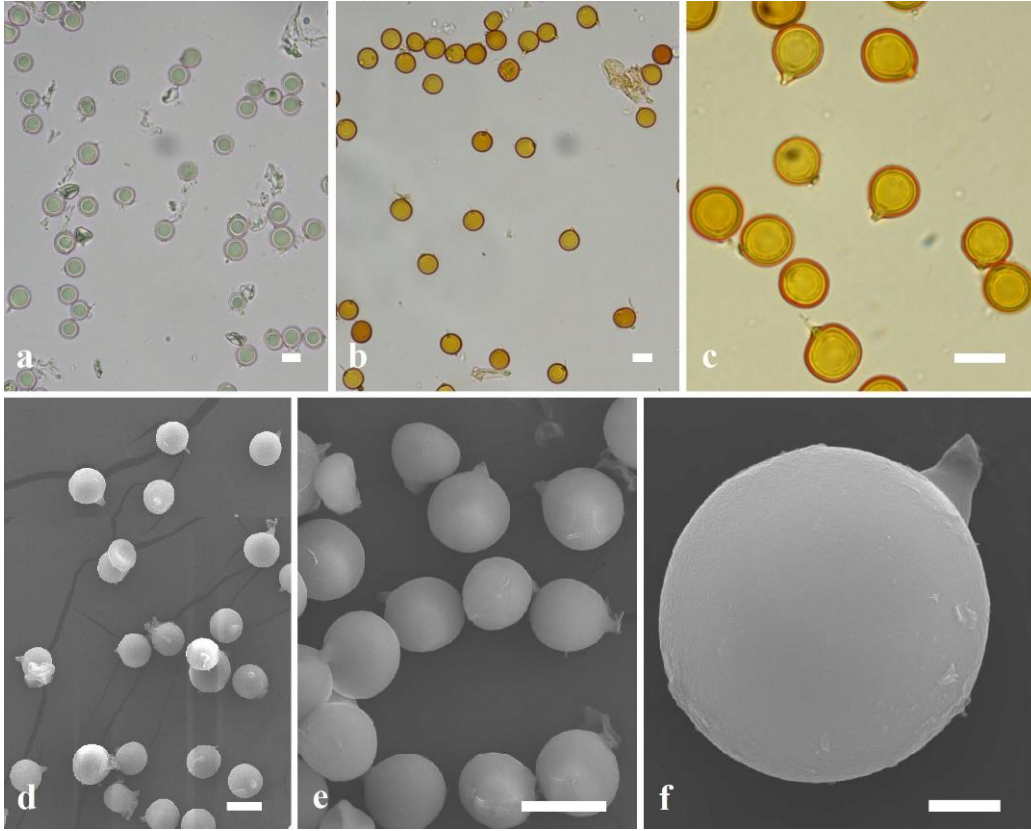


Figure 2. Light microscope (a-c) and scanning electron microscope (d-f) images of basidiospores of *Chlorophyllum lucitanicum* (a: in water, b-c: in Melzer) (Bars, a-e: 10 µm, f: 2 µm)

Şekil 2. *Chlorophyllum lucitanicum*'ün bazidiyosporlarının ışık mikroskobu (a-c) ve taramalı elektron mikroskobu (d-f) görüntüleri (a: su, b-c: Melzer) (Barlar, a-e: 10 µm, f: 2 µm)

Chlorophyllum agaricoides (Czern.) Vellinga, Mycotaxon 83: 416 (2002) (Turkish name: Koç yumurtası)

Syn.: *Endoptychum agaricoides* Czern., *Secotium agaricoides* (Czern.) Hollós,

Specimen examined: Trabzon, Of, Yazlık Village, meadow, 40°54'N-40°14'E, 130 m, 23.02.2018, Yuzun 6221.

Previous collections in Turkey: Mersin (Işıloğlu, 1994); Van (Demirel et al., 2015; Demirel and Koçak, 2016); Bingöl (Uzun et al., 2017).

Key to species of *Chlorophyllum* in Turkey:

- 1 Fruit bodies sequestrate (either secotioid or gasteroid) 2
- 1 Fruit bodies agaricoid 3
- 2 Basidiocarps secotioid, the margin of the pileus does not break free from the stipe, hymenophore (gleba) labyrinthiform to sub-lamellate *C. agaricoides*
- 2 Basidiocarps gasteroid, stipe absent or rudimentary with a thick whitish mycelial cord *C. lusitanicum*
- 3 Fruit bodies small to large; lamellae white or brownish with age; spore print, never green 4
- 3 Fruit bodies large; lamellae becoming greenish when mature; spore print green. *C. molybdites*
- 4 Stipe abruptly to marginately bulbous at the base; annulus simple, apices of spores often truncated; cheilocystidia clavate, to narrowly clavate *C. brunneum*

4 Stipe widened at the base, annulus complex, with double crown; apices of spores rounded or truncated; cheilocystidia clavate to broadly clavate. *rhacodes*.

DISCUSSION

Chlorophyllum lusitanicum was added as new record for the mycobiota of Turkey. This is the fifth member of the genus to be reported in Turkey. In general, the macro and micromorphological characteristics of our collection are in agreement with Moreno et al. (2015) and Carlavilla et al., (2018). Both *C. lusitanicum* and *C. agaricoides* have sequestrate habits and close to each other, but the latter species differs from *C. lusitanicum* by its stipitate to percurrent basidiomata, well-developed columella, dark brown gleba at maturity, and greenish to yellowish brown, ellipsoid spores, not larger than 10 µm long (Crous et al. 2015).

So far four members of the genus *Chlorophyllum* have been reported from Turkey. Among them *C. agaricoides* was reported from Mediterranean (Işıloğlu, 1994) and Eastern Anatolian (Demirel et al., 2015, 2016; Uzun et al., 2017) regions. This will be the first report of *C. agaricoides* from Black Sea Region of Turkey. *Chlorophyllum brunneum* seems to exist only in Marmara Region (Aşkun and Işıloğlu, 1997) while *C. molybdites* was reported from Aegean



Figure 3. Basidiocarps of *Chlorophyllum agaricoides*
Şekil 3. *Chlorophyllum agaricoides*'in bazidiyokarları

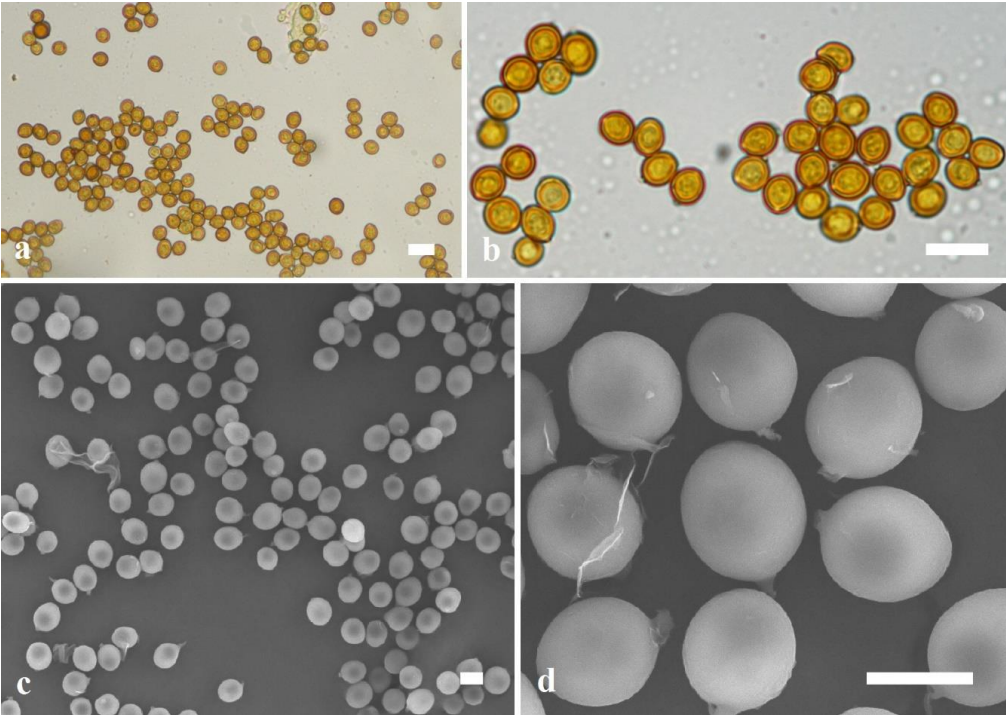


Figure 4. Light microscope (a-b) and scanning electron microscope (c-d) images of basidiospores of *Chlorophyllum agaricoides*
(a-b: in Melzer) (Bars, a-c: 10 μ m, d: 5 μ m)

Şekil 4. *Chlorophyllum agaricoides*'in bazidiyosporlarının ışık mikroskobu (a-b) ve taramalı elektron mikroskobu (c-d) görüntüleri (a-b: Melzer) (Barlar, a-c: 10 μ m, d: 5 μ m)

(Demirel and Allı, 2019) and Black Sea (Demirel and Uzun, 1997) regions. *Chlorophyllum rhacodes* is the most common member of the genus in Turkey and it was reported from almost all regions except Southeastern Anatolian Region

With the addition of *C. lusitanicum*, current taxa number of the genus *Chlorophyllum* in Turkey increased to five.

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Author's Contributions

Authors declares the contribution of the authors is equal.

Statement of Conflict of Interest

Authors have declared no conflict of interest.

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