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Araştırma Makalesi

A study on the spore morphology of gasteroid fungi collected from Trabzon

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Abstract

Fruiting bodies were collected in Trabzon province in 2009 and 2010. Macroscopic and microscopic studies were performed on the dried specimens. Surface structures of the spores of *Geastrum rufescens* Pers. (*Geastraceae* Corda), *Lycoperdon molle* Pers. and *L. umbrinum* Pers. (*Agaricaceae* Chevall.) were illuminated under scanning electron microscope. Color photos were taken in the field and new localities were determined. New descriptions of the Turkish collections were given and the spore structures of them were ilustrated for the first time.

Key Words: Gasteroid fungi, Scanning electron microscope, taxonomy, Trabzon, Turkish Mycota

Trabzon'dan toplanan gasteroid mantarların spor morfolojisi üzerinde bir çalışma

Özet

Fruktifikasyon organları 2009 ve 2010 Yıllarında Trabzon il sınırları içerisinden toplandı. Makroskopik ve mikroskobik çalışmalar kurutulmuş örnekler üzerinde gerçekleştirildi. *Geastrum rufescens* Pers. (*Geastraceae* Corda), *Lycoperdon molle* Pers. ve *L. umbrinum* Pers. (*Agaricaceae* Chevall.) sporlarının yüzey yapıları taramalı elektron mikroskobu altında aydınlatıldı. Renkli resimler arazide çekildi ve yeni lokaliteler saptandı. Türkiye'den toplanan örneklerin yeni tanımları verildi ve spor yapıları ilk kez aydınlatıldı.

Anahtar Kelimeler: Gasteromycetes, Taramalı elektron mikroskobu, taksonomi, Trabzon, Türkiye Mikotası

Introduction

Nowadays it is known that gasteromycetes, those fungi better known as puffballs, earthstars, stinkhorns, bird's nest fungi, false truffles, and gastroid agarics, is really an artificial group included in Basidiomycota. The most known fungi in this group are the puffballs and earthstars which they bear spores in a case. The fruiting body of earthstar is roundish to oval when young and its outer peridium splits into starlike segments. The inner peridium is a sac which sometimes is borne on a stalk. The sterile tissue inside the inner peridium is called columella (Sunhede, 1989).

Scanning electron microscopic studies of spores are very important for the identification of gasteromycetes, as we can confirm in the genus *Tulostoma* (Moreno et al., 1997).

The aim of the present study was to illuminate the spore morphology of *Geastrum rufescens* Pers., *Lycoperdon molle* Pers. and *L. umbrinum* Pers. under Scanning electron microscope. Although, these fungi have been reported for Turkish mycota, this is the first detailed study including short descriptions, photos, localities and surface structure of the spores.

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Materials and methods

The materials were collected in Trabzon province of Turkey in 2009 and 2010. The collections were deposited in a personal fungarium in the Karadeniz Technical University and some duplicates in the Herbarium of the Universidad de Alcalá, Spain (AH). Author names and fungal names were given according to Index Fungorum (www.indexfungorum.org) and Mycobank (www.mycobank.org). Microscopical studies and preparation of the specimens for light microscopy were made according to Clémençon (2009). Microscopic characters (i.e. spore size, which includes ornamentation) were observed with a Nikon Eclipse 80i on material mounted in Hoyer's medium. Scanning electron microscope studies of spores were made with a Zeiss DSM-950 (Universidad de Alcalá). The spores of dried specimens were rehydrated with 50% ammonium hydroxide for 24 h, fixed in 3% glutardialdehyde in water, dehydrated in a series of aqueous ethanol solutions of increasing concentration (70%, 80%, 90% and 100%) for 15 min in each, and thereafter immersed in acetone for at least 2 h. The spores were then critical point dried, deposited onto an aluminium stub, and coated with gold-palladium in a Polaron E-5000 sputter coater for 120 sec at 1.4 kV and 18 mA in an argon atmosphere creating an approximately 500 Å thick metal coating.

Identifications were made according to Breitenbach & Kränzlin (1986), Sunhede (1997), Sarasini (2005) and Calonge (1998).

Descriptions

Geastrum rufescens Pers. 1801

(Syn; *G. schaefferi* Vittadini 1842 = *G. vulgatum* Vittadini 1842)

Material studied:Sevinç village (Maçka –Trabzon), decayed *Picea orientalis* log, 26.07.2010 (*Sesli* 2788); ibidem, 15.08.2009 (*Sesli* 2676).

Fruiting bodies 3–8 cm diam (Figure 1), consist of a well developed outer and inner peridium, even in the immature collection. The thick fleshed outer peridium is pale flesh colored when young and it turns pink brown or reddish in mature. The inner peridium which contains the gleba is spherical, 3 cm diam, short stalked and shows hirsute surface (Sunhede, 1997; Breitenbach and Kränzlin, 1986). We found out that the material shows a well developed columella around which are radially arranged the capillitium and the powdery mass of spores. Spores verrucose, 3-6 µm diam. Under scanning electron microscope the spore ornamentation appears formed by numerous columnar processes, some anastomosed (Figure 2), very similar of those observed by Sunhede (1997).

Geastrum rufescens is common in Turkey. The total number of species of *Geastrum* recorded in Turkey to date is 17 (Sesli & Denchev, 2008).

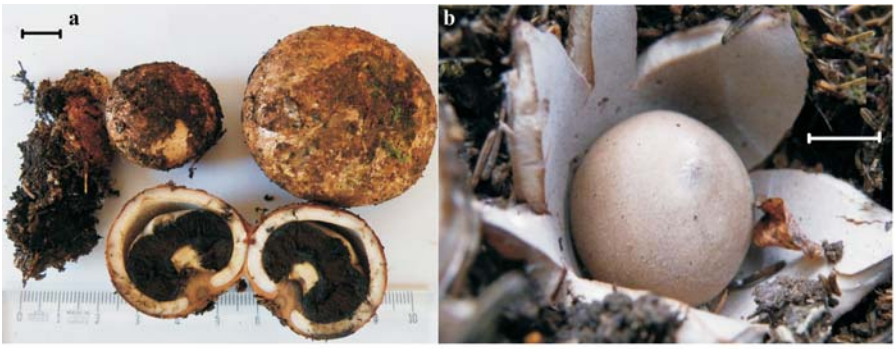

Figure 1. Fruiting bodies of *Geastrum rufescens*, showing different degrees of maturation: a. *Sesli* 2788; b. *Sesli* 2676 (bars: 1 cm)

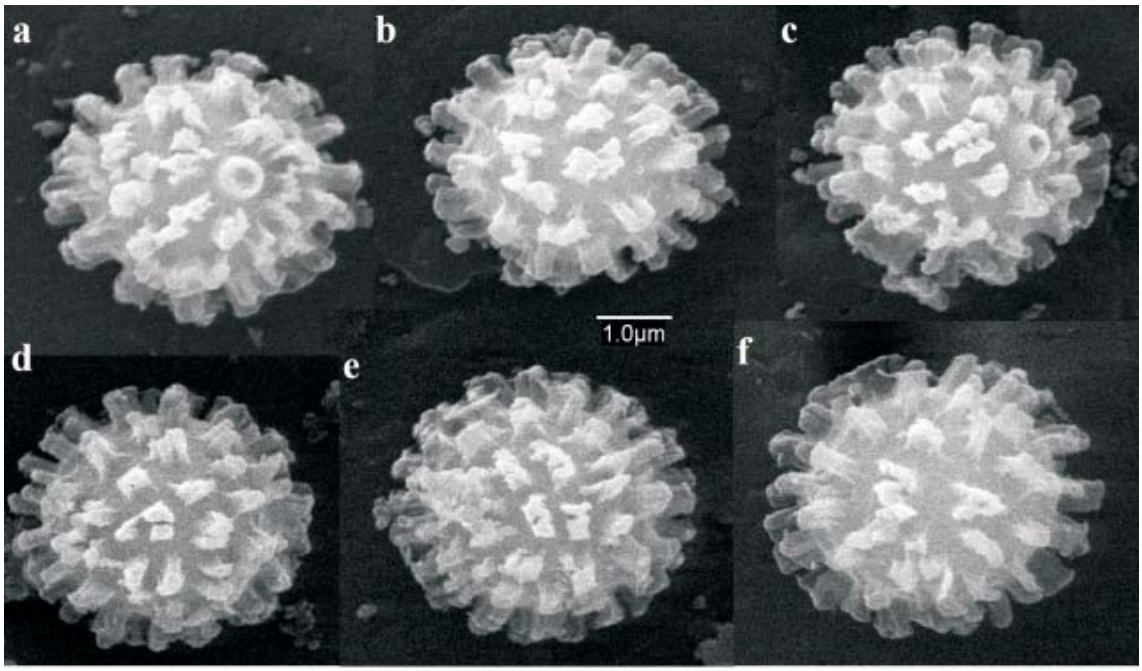

Figure 2. Spore ornamentation of *G. rufescens* under Scanning electron microscope (*Sesli* 2788)

Lycoperdon molle Pers. 1801

Material studied: Karaçam (Akçaabat – Trabzon), under *Picea orientalis*, 17.09. 2010 (*Sesli* 2911).

Gregarious, fruiting bodies spherical to prolonged, 3–8 cm high, and spore sacs 3–6 cm diam. Exoperidium granulose and persistent; bluish colored in the young basidiocarps, changing to brown color when mature (the material was collected immature in the field, and matured during the drying process in the lab) (Figure 3). Subgleba well developed, chambered, olivaceous. Spores verrucose, 5-6,5 µm diam. Under scanning electron microscope the ornamentation is formed by rather cylindrical warts, with flattened apex (Figure 4). Capillitium with pits of aprox. 0,5 µm diam; abundant sterigmata debris present.

The genus *Lycoperdon* is common in Turkey. The total number of species recorded in Turkey to date is about 18 (Sesli & Denchev, 2008).

Figure 3. Fruiting bodies of young *Lycoperdon molle* (*Sesli* 2911; bars: 2 cm)

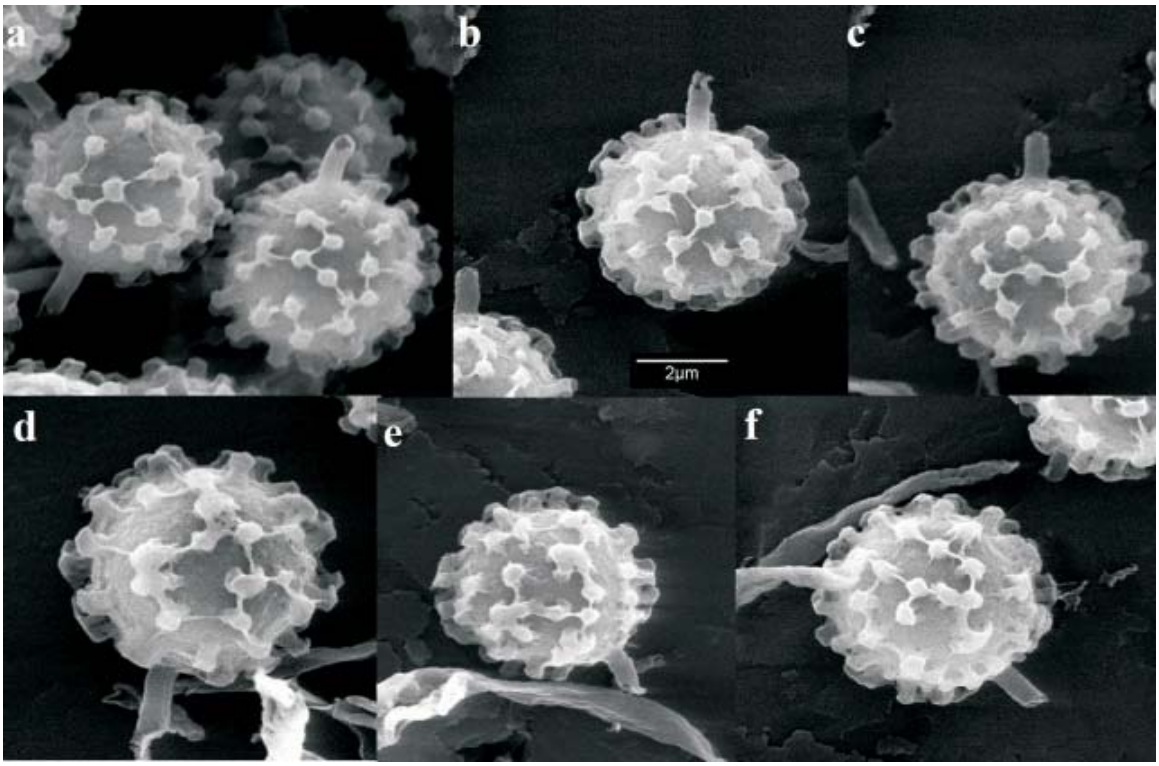

Figure 4. Spore ornamentation of *Lycoperdon molle* under Scanning electron microscope (*Sesli* 2911)

Lycoperdon umbrinum Pers.:Pers. 1801

Material studied: Hıdırnebi (Akçaabat –Trabzon), under *Picea orientalis*, 15.10.2010 (*Sesli* 3018).

Fruiting bodies spherical, tuberous or pyriform (Figure 5), 8 cm high, and spore sacs 7 cm diam. Exoperidium formed by connivent spines, regularly arranged. Stoma well delimited, circular. Subgleba well developed, chambered. Gleba olivaceous. Spores 4,5-5,5 µm diam. Under Scanning electron microscope the spore ornamentation is formed by less developed and more separated verrucae than those of *L. molle Sesli* 2911 (Figure 6). Capillitium scantily branched and apparently not septate, with pits of about 0,5 µm diam; some sterigmata debris in the gleba. *Lycoperdon umbrinum* belongs to the *L. molle* morphological species complex, together with *L. lambinonii*, but they are well distinguished by molecular analysis (Larsson & Jeppson, 2008).

Figure 5. Fruiting bodies of *L. umbrinum* (a. *Sesli* 3018, b. *Sesli* 3038; bars: 2 cm)

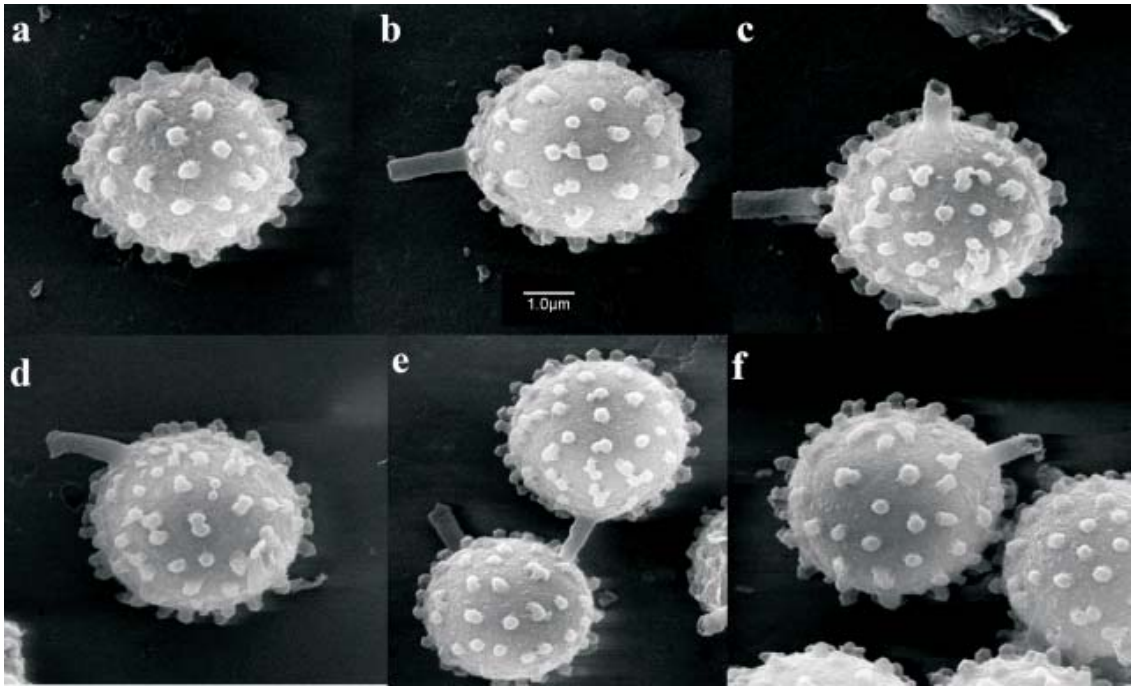

Figure 6. Spore ornamentation of *Lycoperdon umbrinum* under Scanning electron microscope (*Sesli* 3018)

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