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The Smut Fungi Determined in Aladağlar and Bolkar Mountains (Turkey)

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Abstract: In this study, 17 species of smut fungi and their hosts, which were found in Aladağlar and Bolkar mountains were described. The research was carried out between 2013 and 2016. The 17 species of microfungi were observed on a total of 16 distinct host species from 3 families and 14 genera. The smut fungi determined from the study area are distributed in 8 genera, 5 families and 3 orders and 2 classes. *Melanopsichium eleusines* (Kulk.) Mundk. & Thirum was first time recorded for Turkish mycobiota.

Key words: smut fungi, biodiversity, Aladağlar and Bolkar mountains, Turkey

Aladağlar ve Bolkar Dağları (Türkiye)'nden Belirlenen Sürme Mantarları

Öz: Bu çalışmada, Aladağlar ve Bolkar dağlarında bulunan 17 sürme mantar türü ve konakçıları tanımlanmıştır. Araştırma 2013-2016 yılları arasında gerçekleştirilmiş, 3 aile ve 14 cinsten toplam 16 farklı konakçı türü üzerinde 17 mikrofungus türü gözlenmiştir. Çalışma alanından belirlenen sürme mantarları 8 cins, 5 aile ve 3 takım ve 2 sınıf içinde dağılım göstermektedir. *Melanopsichium eleusines* (Kulk.) Mundk. & Thirum ilk kez Türkiye mikrobiyotası için kaydedilmiştir.

Anahtar kelimeler: Sürme Mantarları, Biyoçeşitlilik, Aladağlar ve Bolkar Dağları, Türkiye

Introduction

Aladağlar and Bolkar Mountains are situated in the Eastern region of the Central Taurus Mountains complex resides in the Southern Anatolia and surrounded by Mersin in the south, Adana in the southeast, Niğde and Ereğli in the northwest, Kayseri in the northeast and Karaman in the west (Figure 1). The southern slopes of the study area exhibit characteristics of the Mediterranean climate, while the northern slopes of the study area show the semi-arid climate (Kabaktepe and Akata, 2018).

Smut fungi are multicellular fungi characterized by teliospores, and they are the second important obligate biotrophic plant parasitic group after the rust fungi. The

group contains roughly 1200 fungi species infecting over 4000 species of Angiosperms, mainly the families *Poaceae* and *Cyperaceae* (Vánky, 2012).

According to the literature (Akata et al., 2019; Bahçecioğlu and Yıldız, 2005; Bahçecioğlu et al., 2006; Bremer et al., 1947; 1952; Gobelez, 1962; Kabaktepe and Bahçecioğlu 2006; 2012; Kabaktepe et al., 2016, 2018; Karel, 1958; Kırbağ, 2003; Magnus, 1899; Petrak, 1953; Sert, 2009; Sert et al., 2004; Şahin and Tamer 1998; Vasighzadeh et al., 2014) on Turkish smut fungi, 62 species belonging to 15 genera within 5 families were previously recorded in different regions of Turkey but there is not any detailed mycological study on smut fungi in Aladağlar and Bolkar Mountains.

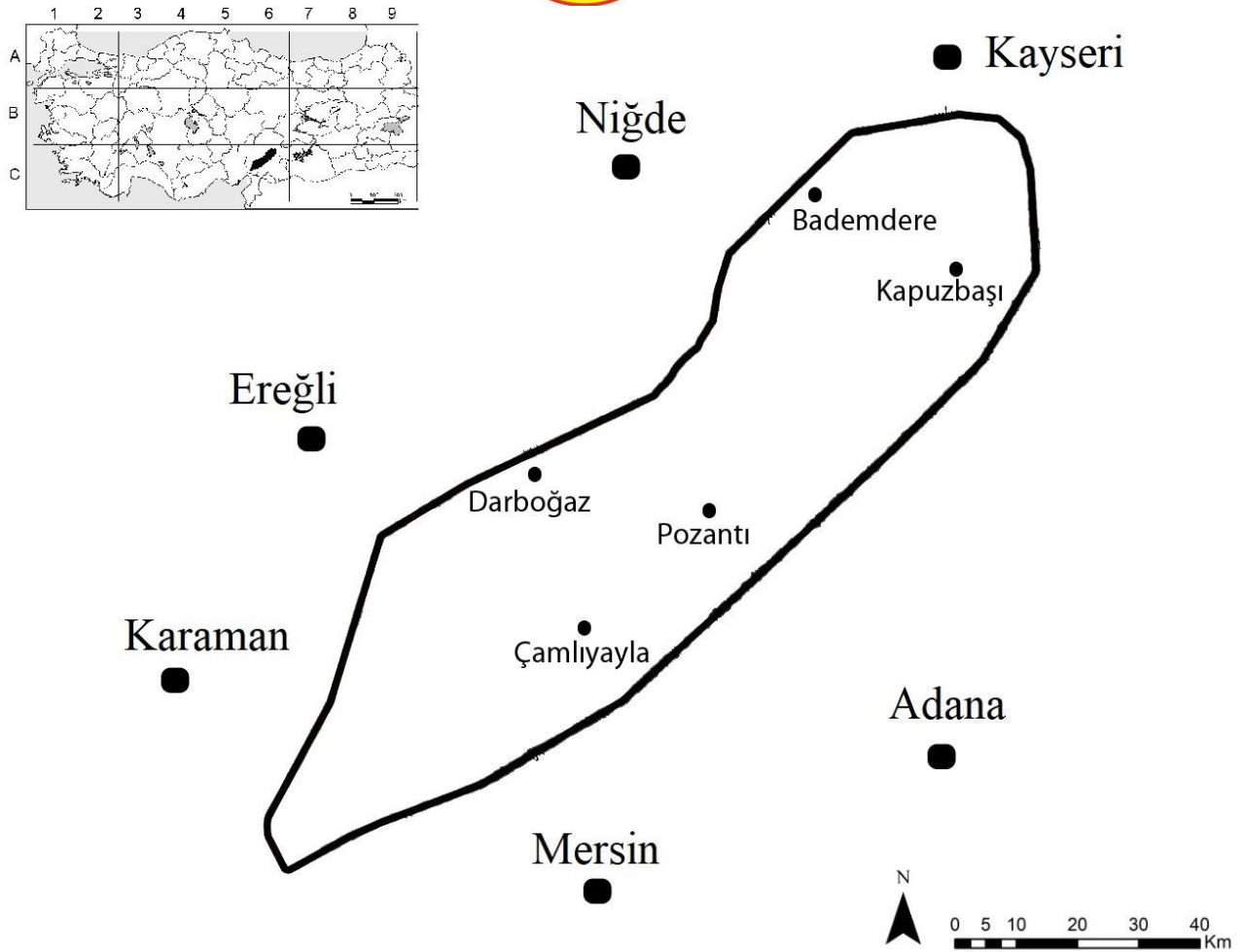


Figure 1. Map of the research area (Kabaktepe and Akata, 2018).

Materials and Methods

Infected plant samples were collected from Aladağlar and Bolkar mountains (Kayseri, Niğde, Konya, Karaman, Mersin, Adana) in Turkey between 2013 and 2016. The Flora of Turkey (Davis, 1965-1985; Davis et al., 1988) was the main source used for the identification of the host specimens. The fungal specimens were isolated from the plant materials either by scraping, or thin sections were obtained with a razor blade. The fungal specimens were examined microscopically. Macro photographs were taken under a stereomicroscope (Novex trinocular zoom stereo microscope RZT-SF). Micro photographs were taken under a light microscope (Noveks B series 1000). Analysis LS Starter software was used for sizing the spores and sporophores. While systematic of the fungal taxa were in accordance with Kirk et al. (2008), and Index fungorum (www.indexfungorum.org), current names of the host plant taxa were confirmed according to the plant list (www.theplantlist.org). Identification of the fungal

samples was performed according to Vanky (2012). The identified samples were kept at the İnönü University herbaria (INU).

Results

Fungi

Basidiomycota

Ustilaginomycetes

Urocystidales

Urocystidaceae

Urocystis ixiolirii Zaprom.: On *Ixiolirion tataricum* (Pall.) Schult. & Schult.f. (*Ixioliriaceae*) Mersin, Çamlıyayla, between Papazın bahçesi and Olukkaya, Kanlı Obruk location, 1850 m, 18.07.2014, Kabaktepe & Akata 7692.

Ustilaginales

Anthracoideaceae

Anthracoidea irregularis (Liro) Boidol & Poelt: On *Carex halleriana* Asso (*Cyperaceae*) Niğde, Çamardı, Emli valley, 1800 m, 25.06.2015, Kabaktepe & Akata 8125.



Anthracoidea pratensis (Syd.) Boidol & Poelt: On *Carex flacca* Schreb. (Cyperaceae) Mersin, Çamlıyayla, Kadıncık valey, Cevzlioluk, 900 m, 26.06.2015, Kabaktepe & Akata 8129; Mersin, Çamlıyayla, Kadıncık valley, Kuzbağı location, 1350 m, 26.06.2015, Kabaktepe & Akata 8139; Mersin, Çamlıyayla, Kadıncık valley, Kale location, 1600 m, 26.06.2015, Kabaktepe & Akata 8148.

Melanopsichiaceae

Melanopsichium eleusines (Kulk.) Mundk. & Thirum.: On *Eleusine indica* (L.) Gaertn. (Poaceae) Adana, Aladağ, Büyüksöfölu village, 700 m, 25.08.2015, Kabaktepe & Akata 8185. Sori in spikes, scattered in the inflorescence, firstly grey after dark brown, the surface is covered by peridia, surface powdery. Spores grouped, 7–16 × 9–13 µm, yellowish brown, wall 0.5–1 µm thick, verrucose-smooth (Figure 2).

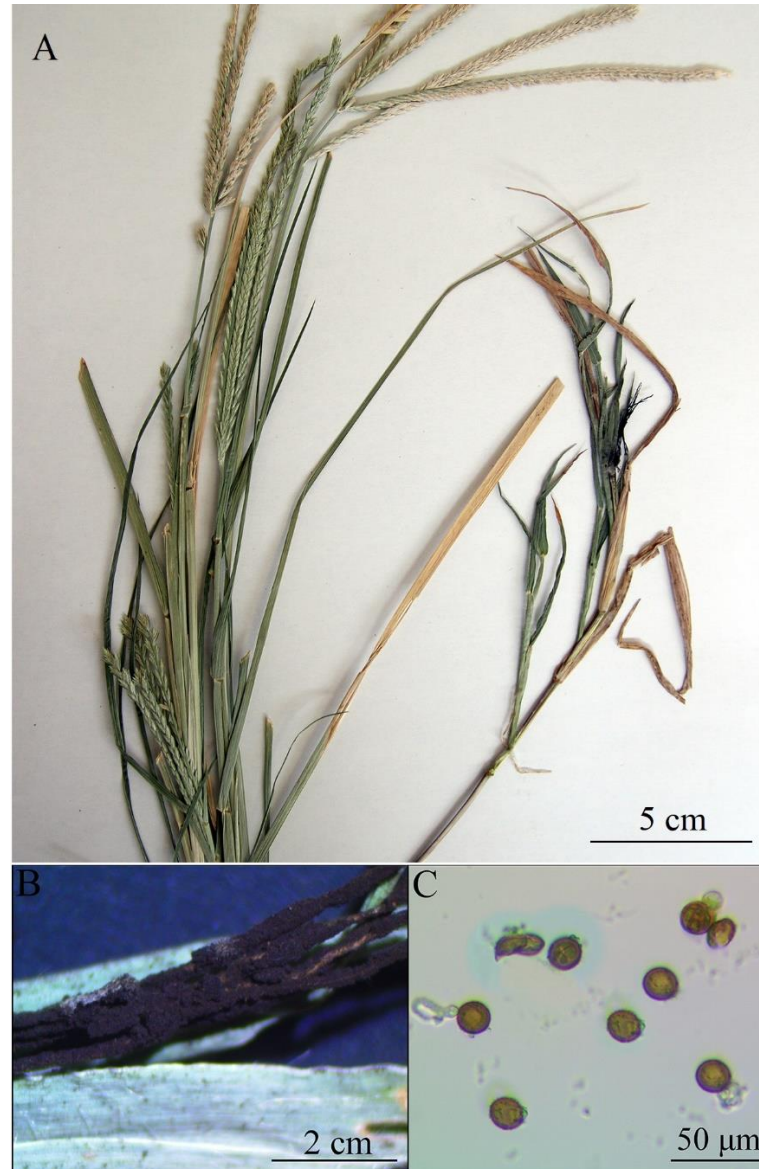


Figure 2. *Melanopsichium eleusines*, **A**. dried herbarium specimen, **B**. SM view of *M. eleusines* on sori, **C**. LM view of spores.

Ustilaginaceae

Anthracocystis penniseti (Rabenh.) McTaggart & R.G. Shivas: On *Pennisetum orientale* Rich. (Poaceae) Kayseri: Yahyalı, İlyaslı village, 1250 m, 26.09.2013,

Kabaktepe & Akata 7185; Mersin, Tarsus, Gülek village, 1240 m, 08.10.2013, Kabaktepe & Akata 7318.

Sporisorium cruentum (J.G. Kühn) Vánky: On *Sorghum halepense* (L.) Pers. (Poaceae) Mersin, Tarsus,



Gülek village, 1100 m, 08.10.2013, Kabaktepe & Akata 7308.

Tranzscheliella hypodytes (Schltdl.) Vánky & McKenzie: On *Elymus hispidus* (Opizi) Melderis (*Poaceae*) Kayseri, Yahyalı, Kayapınar plateau, 1650 m, 23.06.2015, Kabaktepe & Akata 8082; On *Piptatherum miliaceum* (L.) Coss. (*Poaceae*), Konya, Halkapınar, south İvriz village, 1300 m, 15.10.2015, Kabaktepe & Akata 8383.

Tranzscheliella williamsii (Griffiths) Dingley & Versluys: On *Stipa* L. (*Poaceae*) Mersin, Sebil, Cehennem deresi, 620 m, 23.05.2014, Kabaktepe & Akata 7520.

Ustilago avenae (Pers.) Rostr.: On *Avena sterilis* L. (*Poaceae*) Adana, Pozantı, between Ömerli and Kamışlı, 1200 m, 20.05.2014, Kabaktepe & Akata 7430; Kayseri, Yahyalı, Çamlıca village, 900 m, 21.05.2014, Kabaktepe & Akata 7477; Kayseri, Yahyalı, between Çamlıca and Ulupınar, 1400 m, 16.07.2014, Kabaktepe & Akata 7642.

Ustilago bulgarica Bubák: On *Sorghum halepense* (L.) Pers. (*Poaceae*) Konya, Halkapınar, between İvriz and Ereğli, 1100 m, 28.08.2015, Kabaktepe & Akata 8266.

Ustilago bullata Berk.: On *Bromus sterilis* L. (*Poaceae*) Niğde, Ulukışla, Emirler village, 1800 m, 13.07.2014, Kabaktepe & Akata 7526.

Ustilago cynodontis (Pass.) Henn.: On *Cynodon dactylon* (L.) Pers. (*Poaceae*) Mersin, Değirmendere village, 1080 m, 25.04.2014, Kabaktepe & Akata 7386; Kayseri, Yahyalı 1100 m, 21.05.2014, Kabaktepe & Akata 7458; Adana, Pozantı, Horoz mountain pass, 1000 m, 30.10.2014, Kabaktepe & Akata 7918.

Ustilago hordei (Pers.) Lagerh.: On *Avena barbata* Pottex Link (*Poaceae*) Adana, Akçatekir plateau, 950 m, 22.05.2014, Kabaktepe & Akata 7503.

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Ustilago maydis (DC.) Corda: On *Zea mays* L. (*Poaceae*) Kayseri, Yahyalı, Çamlıca village, 1100 m, 16.07.2014, Kabaktepe & Akata 7655; Kayseri, Yahyalı, Derebağ waterfall, 1270 m, 17.09.2014, Kabaktepe & Akata 7769.

Ustilago phrygica Magnus: On *Taeniatherum caput-medusae* (L.) Nevski (*Poaceae*) Kayseri, Yahyalı, Derebağ waterfall, 1270 m, 17.09.2014, Kabaktepe & Akata 7765.

Ustilago tritici (Pers.) C.N. Jensen: On *Triticum turgidum* L. (*Poaceae*) Kayseri, Yahyalı, between Çamlıca and Ulupınar, 1050 m, 21.05.2014, Kabaktepe & Akata 7469.

Exobasidiomycetes

Tilletiales

Tilletiaceae

Tilletia laevis J.G. Kühn.: On *Triticum turgidum* L. (*Poaceae*) Adana: Aladağ, Yetimli village, 27.09.2013, Kabaktepe & Akata 7250.

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Discussion

As a result, 17 species belonging to 2 classes, 3 order, 5 families and 8 genera were listed. The list includes 16 *Ustilaginomycetes* (*Ustilaginaceae* 12, *Anthracoideaceae* 2, *Urocystidaceae* and *Melanopsichiaceae* 1) and 1 *Exobasidiomycetes* (*Tilletiaceae* 1). Additionally, *Melanopsichium eleusines* (Kulk.) Mundk. & Thirum. (*Melanopsichiaceae*) was reported for the first time from Turkey at the family level and the number of Turkish smut fungi species, genus and family reached to 63, 16 and 6 respectively.



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