

***Cordyceps militaris*, The First Record From Family *Cordycipitaceae* in Turkey**

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Abstract

In the current study, *Cordyceps militaris* (L.) Fr. was reported for the first time at family level in Turkey. A short description and figures of the species based on the collected materials are provided.

Keywords: *Cordyceps militaris*, *Cordycipitaceae*, New record, Turkey

***Cordyceps militaris*, *Cordycipitaceae* Familyası'ndan Türkiye'den İlk Kayıt**

Özet

Mevcut çalışmada, *Cordyceps militaris* (L.) Fr. Türkiye'den ilk defa ve familya düzeyinde rapor edilmiştir. Türe ait mantar örneklerinin kısa tanımı ve şekilleri verilmiştir.

Anahtar Kelimeler: *Cordyceps militaris*, *Cordycipitaceae*, Yeni kayıt, Türkiye

Introduction

Cordycipitaceae is a family of the order *Hypocreales* within the division *Ascomycota*. Members of the family produce pallid or brightly pigmented and fleshy stromata or subiculum, superficial to completely immersed perithecia, and oriented at right angles to the surface of the stroma, cylindrical asci with thickened apex, cylindrical and multiseptate spores disarticulating into part-spores or remaining intact at maturity (Kirk et al., 2008; Sung et al., 2007).

Cordyceps is the largest genus of the family and it contains more than 400 species. It is well known as a rare and exotic medicinal genus which has been a highly regarded corner stone of Chinese medicine for centuries. The members of the genus includes a broad range of compounds that are considered nutritional and a various bioactive constituents such as antimicrobial, antiinflammatory, antioxidant, immunomodulatory or antitumor agents have been reported from *Cordyceps* species (Holliday and Cleaver, 2008; Das et al., 2010).

Cordyceps militaris (L.) Link is the type species of the genus which is an obligatory parasite on larva or pupa of lepidopteran insects (Wang et al., 2008). It is reported

many parts of the world, from sub-tropical to temperate regions. *C. militaris* contains a number of active components such as cordycepin, polysaccharides, ergosterol, and mannitol. Due to its biological and pharmaceutical activities, *C. militaris* has long been known as a one of the most important medicinal fungi (Patel and Ingalhali, 2013; Reis et al., 2013).

According to the recent checklist (Sesli and Denchev, 2008; et al., 2015) on Turkish macromycota, there are no records for Turkey of members belonging to family *Cordycipitaceae*.

The aim of the study is to a make contribution to Turkish mycobiota.

Materials and methods

Fungi samples were collected from İstanbul in 29th December 2015. During field studies, necessary morphological and ecological features of the samples were noted and they were photographed. Thereafter they were taken to the fungarium for necessary macroscopic and microscopic investigations. Identification was performed with the aid of the literature (Breitenbach and Kränzlin, 1984; Hansen and Knudsen, 2000). The identified samples were deposited at Ankara University Herbarium (ANK).

Results

Divisio: *Ascomycota*

Subdivisio: *Pezizomycotina*

Classis: *Sordariomycetes*

Subclassis: *Hypocreomycetidae*

Ordo: *Hypocreales*

Genus: *Cordycipitaceae*

Species: *Cordyceps militaris* (L.) Fr. (1818)

Syn.: *Clavaria granulosa* Bull.(1791), *C. militaris* L.(1753), *Cordyceps militaris* f. *alba* Kobayasi & Shimizu ex Y.J. Yao (1995), *C. militaris* var. *sphaerocephala* J.C. Schmidt (1817), *Corynesphaera militaris* (L.) Dumort. (1822), *Hypoxyton militare* (L.) Mérat (1821), *Sphaeria militaris* (L.) J.F. Gmel. (1792), *Torrubia militaris* (L.) Tul. & C. Tul. (1865), *Xylaria militaris* (L.) Gray (1821).

Macroscopic and microscopic features

Stromata club or clavate shaped, divided into fertile and sterile parts (Figure1, 2).

Fertile part 10-30 × 5-12 mm, reddish to dark orange, roughened by ostioles from the orange perithecia (Figure 3). **Sterile part** 30-40 × 5-10 mm, yellow, pale o red orange, sometimes mottled with orange. **Perithecia** 550-700 × 250-400 µm. broadly ovoid, semi-immersed, **Asci** 350-400 × 3~4 µm, narrowly cylindrical, eight-spored, breaking part into many individual spores (Figure 4). **Ascospores** filamentous and septate, smooth and hyaline. up to 300× 1 µm, part of spores 3-4 × 1 µm, cylindrical to fusiform (Figure 5).

Ecology: Autumn, parasite on larva or pupa of lepidopteran insects (Wang et al., 2008).

Specimen examined: TURKEY-İstanbul: Ataşehir, Kayışdağı, on buried butterfly pupae, among mosses, near pine, 40° 57'N-29°11' E, 400 m, 29.12.2015, Akata 6405.

Discussion

Cordyceps militaris is an entomopathogenic species that parasitizes larva or pupa of lepidopteran insects and grows in mosses, leaf litters or the uppermost soil layer. It is characterized by its production of superficial to completely immersed perithecia on stipitate, clavate, orange to red colored fleshy stromata and ascospores that disarticulate into part-spores at maturity. This is a widespread species and reported in North America, South America, Europe and Asia (Patel and Ingallhalli, 2013; Sung et al., 2007).

C. militaris macroscopically resembles other orange to red-coloured *Cordyceps* species (*C. cardinalis* and *C. pseudomilitaris*) but it is easily separated from others by being size and morphology of ascospores. Like many *Cordyceps* species, the ascospores of *C. cardinalis* and *C. pseudomilitaris* do not disarticulate into partspores as do those of *C. militaris* (Sung and Spatafora, 2004).

With the current study, *Cordyceps militaris* is reported for the first time from Turkey at family level and it will be the first member of Turkish *Cordycipitaceae*.

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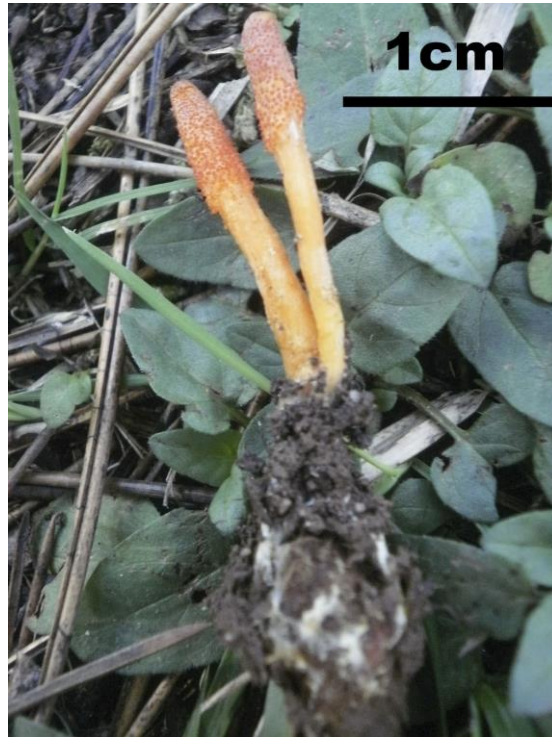


Figure1. Fresh stromata of *Cordyceps militaris*



Figure 2. Dry stromata of *Cordyceps militaris*



Figure 3. Fertile part of *Cordyceps militaris*

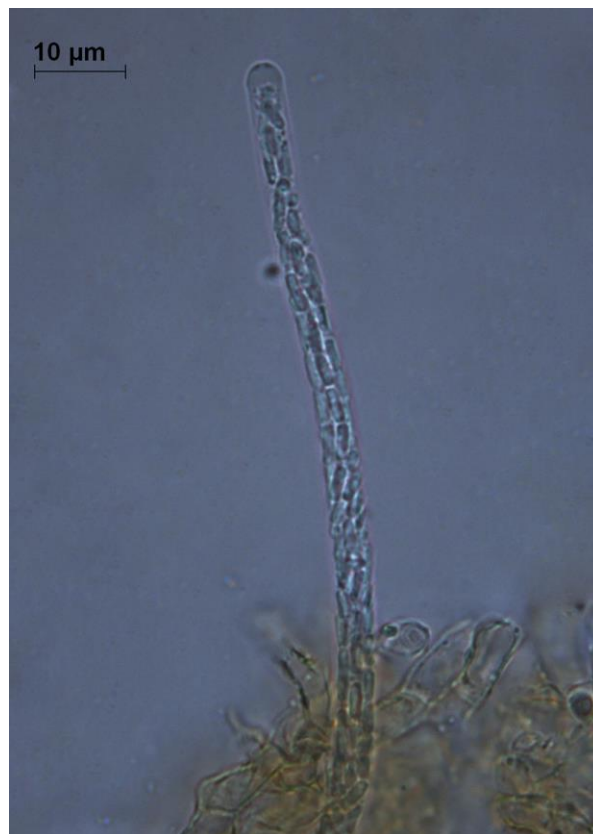


Figure 4. A single ascus of *Cordyceps militaris*

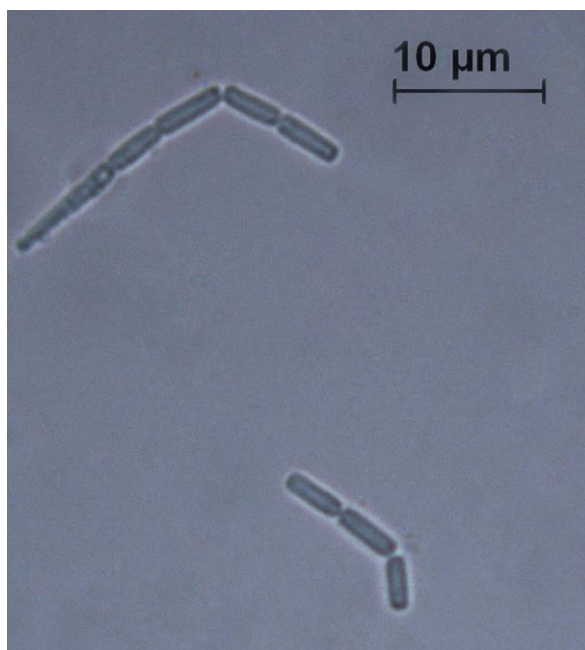


Figure 5. Ascospores of *Cordyceps militaris*

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