

Article de recherche

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Two new Geoglossaceae for Algeria

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ملخص

نتج عن بحث ميداني في غابة باينيم المتموقعة شمال غرب الجزائر العاصمة، جمع فطرين ينتميان الى لسانيات الارض أو ما يعرف بالجيوجلوسيات *Geoglossum barlae* و *Trichoglossum hirsutum* لأول مرة في الجزائر. تم العثور على هذان الفطرين بين الأعشاب وطحالب من نوع سفاجنم. يقدم هذا البحث نتائج جديدة حول الفطريات الجيوجلوسية في الجزائر، توزيعها وبيئتها. كما تم اقتراح مفتاح التعرف على لسانيات الأرض الجزائرية. الكلمات الدالة: فطريات زقية، التنوع البيئي، رتبة الجيوجلوسال، الجيوجلوسيات، فطريات مهددة بالانقراض، شمال افريقيا.

Abstract

A field research in Baïnem forest in northwestern Algiers, resulted in the collection of two Geoglossaceae : *Geoglossum barlae* and *Trichoglossum hirsutum* for the first time in Algeria. The fruitbodies were found growing on soil, and *Sphagnum spp.* This paper presents new findings on the geoglossaceous fungi of Algeria, their distribution and their ecology. A key for Algerian Geoglossaceae is proposed.

Key words: Ascomycota , Biodiversity, Geoglossales, Geoglossomycetes, Endangered fungi, North Africa.

Résumé

Une recherche de terrain dans la forêt de Baïnem au nord-ouest d'Alger, a abouti à la collecte de deux Geoglossaceae: *Geoglossum barlae* et *Trichoglossum hirsutum* pour la première fois en Algérie. Les ascomata récoltés poussaient sur le sol, et sur des *Sphagnum spp.* Cet article présente de nouvelles données sur les Geoglossaceae en Algérie, leur répartition et leur écologie. Une clé de détermination des Geoglossaceae en Algérie est proposée.

Mots clés : Ascomycètes , Biodiversité , Geoglossales , Geoglossomycètes , Champignons en voie de disparition, Afrique du Nord.

1. Introduction

The Geoglossaceae family was created by Corda in 1838, to gather species of ascomycetes that are generally terrestrial, stipitate, claviform or capitate, usually dark or blackish in color, with gymnocarpic development, inoperculate asci and with spores from long elliptical to cylindrical or claviform in shape, usually multiseptate and sooty in color at maturity. They are traditionally known as earth tongues, a literal translation of the scientific name *Geoglossum* (Arauzo & Iglesias, 2014).

Earth tongues are among the most widespread fungi in the Ascomycota division, particularly common in temperate regions where they grow on various substrates (Zhuang, 1998; Hustad et al. 2011; Wang et al. 2011). They are also known as « grassland fungi » a term established to describe species from a taxonomically diverse group of seemingly ecologically related species growing in waxcap grasslands (Nitare, 1988; Noordeloos, 1992; Jordal, 1997; McHugh et al. 2001).

In the last century, the family Geoglossaceae has been treated as a member of Leotiomyces (Korf, 1973 ; Spooner, 1987). However, in 2009 Schoch et al. created the class Geoglossomycetes and the order Geoglossales. The establishment of these two taxa was supported by the results of a six-gene phylogeny study, including ribosomal DNA and protein-coding genes. The authors delimited the family to three genera : *Sarcoleotia*, *Trichoglossum* and *Geoglossum*. Later, Hustad et al. (2011, 2013) included the genus *Nothomitra* and created the genera *Sabuloglossum* and *Glutinoglossum*. Today the family comprises eight (08) genera, after the addition in 2014 by Arauzo and Iglesias, of two new genera *Hemileucoglossum* and *Leucoglossum*, to accomodate *Geoglossum littorale* (Rostr.) Nannf. and *Trichoglossum leucosporum* Benkert & Hardtke, respectively.

Based on the Catalogue of the Algerian Fungi published by Keddad & Bouznad (2019), only one geoglossaceous species *Geoglossum glabrum*, has been recorded in Algeria by Roussel around Algiers. The record has been published by Montagne in 1838, however the exact date and location of the record have not been precised. Almost two centuries later, our study adds two new species to the Algerian Geoglossaceae, *Geoglossum barlae* and

Trichoglossum hirsutum as first records for Algeria.

2. Materials and methods

2.1. Specimen collection

Specimens were collected inside the National Institute of Forest Research in Bainem forest, (northwestern Algiers) in the winter season. *G. barlae* was collected in 6465, while *T. hirsutum* was collected in 2017, 2018, 2019 and 2021. *In situ* photographs were taken, and the morphological and ecological data were recorded.

2.2. Specimen examination

The identification of the collected specimens was based on macroscopic and microscopic observations of fresh ascomata, following the descriptions of Boudier (1889), Baral & Marson (2003) and Geesteranus & De Vries (1964), for *Geoglossum barlae* and the descriptions of Boudier (1907), Nannfeldt (1942), Arauzo & Iglesias (2014), for *Trichoglossum hirsutum*. Morphological characters were examined using a Leica S8AP0 stereomicroscope. Thin hand sections were performed with a razor blade and mounted in Melzer's reagent, for microscopic examination using an Optika T3-I5A scientific microscope equipped with a Moticam-2000 camera for photomicrography. Measurements of the different microscopic elements were performed using Mycomètre free license software. The studied material is conserved at the Forest Pathology and Mycology Laboratory (INRF-Algiers).

3. Results and discussion

3.1. Taxonomy

Geoglossum barlae Boud.,
Bull. Soc. Mycol. Fr. 4(3): 76(1889)

Figure 1

TYPE: France, Nice, Barla in Hb. Boudier (Museum d'Histoire Naturelle, Paris).
= *Cibalocoryne barlae* (Boud.) S. Imai, Botanical Magazine Tokyo 56: 526 (1942)



Figure 1. *Geoglossum barlae*, in Meltzer's reagent.

(a) Ascomata; (b) Asci and paraphyses (total magnification = x 100); (c) Ascus with ascospores; (d) Ascospores; (e) Asci reaction to Melzer's reagent; (f) Paraphyses. (c, d, e, f total magnification = x 400).

Ascomata, up to 3.5 cm in height and 0.8 cm in width in the clavula. Solitary, scattered, typically linguiform or slenderly lanceolate, generally with a more or less deep and large groove that sometimes sections the clavula in two halves under the tip. Smooth, entirely black in color. Flesh black in color and brittle.

Asci, clavate cylindrical 215-245 x 17-25 µm, rounded apex or somewhat fusiform with a pore bluing in Melzer's reagent; eight spored; spores arranged in parallel.

Ascospores, 53-69 x 5-6 µm, almost cylindrical to fusiform, with 7 septa, more or less hyaline with droplets when young, sooty in color at maturity, slightly curved and tapering towards one end.

Paraphysis, crozier-like, twisted, « duck-head » shape, multiseptate at the apex, formed by curved and tortuous « articles », hyaline to slightly brownish, dense and strongly intertwined at the apex, very difficult to dissociate.

Habitat, on mosses and on soil among grasses, near Japanese cheesewood (*Pittosporum tobira*), sharing the habitat with *Trichoglossum hirsutum*, at 170 m asl. Uncommon, known only from within INRF-Bainem.

SPECIMEN EXAMINED : **ALGERIA, Algiers, INRF-Bainem**, on mosses and on soil, among grasses, under Japanese cheesewood (*Pittosporum tobira*), 36°48'16.8" N 2°57'25.9" E, 170 m asl, 05.01.2021.

Trichoglossum hirsutum var. *hirsutum* (Pers.) Boud., Hist. Classific. Discomyc. Europe: 86(1907) **Figure 2**

TYPE : *Trichoglossum hirsutum* (Pers.: Fr.) Boud. = *Geoglossum hirsutum* Pers.: Fr. Syst. Myc. 1: 488. (1821)

Ascomata scattered to gregarious, black, minutely velvety, 3-5 cm in height, clavate to lanceolate, capitate; Clavula tapering towards the stipe. Stipe 0.3-0.4 cm thick, cylindrical, black, hirsute with a dry surface. Flesh black and brittle.

Asci 201-227 x 20-25 µm, cylindrical to clavate, eight spored, amyloid pore;

Ascospores 124-132 x 5-6 µm, bacilliform, smooth, sooty in color, with 15 septa.

Paraphyses straight to curved, butt shaped, hyaline, densely arranged, septate, dark in the apex and lighter at the base.

Hymenial setae abundant, 170-205 x 6-12 µm, thick walled, acuminate, dark brown to black, aseptate.

Habitat on sphagnum and on soil, among grasses, under bald cypress (*Taxodium distichum*) and Japanese cheesewood (*Pittosporum tobira*), sharing the habitat with *Geoglossum barlae*, at an elevation of 170 m asl. Uncommon, known only from within INRF-Bainem.

SPECIMEN EXAMINED : **ALGERIA, Algiers, INRF-Bainem**, on sphagnum and on soil, 36°48'16.8"N 2°57'25.9"E, 170 m asl, 05.01.2021.

3.2. Comments

Earth tongues are often overlooked, because of their discrete fruitbodies and specific habitats. Indeed, no records of Geoglossaceae fungi were made in Algeria for almost two centuries. According to Kučera and Lizon (2012) they are very difficult to assess, because of the irregularity of their fruiting. Based on our field surveys, in Algeria their occurrence falls between the months of January and March, where climatic conditions are cold and wet. They can grow on mosses, on *Sphagnum* spp, and on soil.

Geoglossum barlae has been recorded in several European countries, however based on literature, the species has been variously interpreted by mycologists. Our description of the species corresponds to several descriptions in the consulted literature (Boudier, 1889; Geesteranus & De Vries, 1964; Baral & Marson, 2003). The species is easily differentiated from its close related species *G. cookeanum*, and *G. umbratile*, by its paraphyses typically head-duck-shaped, as reported by Boudier (1889). The author describes the taxon as relatively robust and characterized by having the apex of the paraphyses formed by several thickened elements (articles) irregularly curved and tortuous, and sooty in color.

Based on generic circumstriptions studies, Hustad et al. (2013) suggest that *G. barlae* form a species complex along with *G. nigritum* and *G. umbratile*. The authors state that species delimitations within this complex are ambiguous.

In the other hand, and based on the the same study, comparison of the ITS locus of several collections of *G. glabrum* and *G. cookeanum* has revealed less than 2% variation in the genetic sequence of the entire gene region, suggesting that these two taxa are one single species (Hughes et al. 2009). According to the same authors, there will be taxonomic changes in the future, that will inevita-



Figure 2. *Trichoglossum hirsutum* var. *hirsutum*, in Melzer's reagent.
(a) Ascomata; (b) Ascus with ascospores; (c) Ascospores; (d) Setae; (e) Paraphyses.
(Total magnification: b & d = x 100; c & e = x 400)

bly produce proposals for additional taxa and new synonymies within the geoglossomycetes.

Trichoglossum hirsutum is cosmopolitan, and it has been reported from all continents. It is the most common and abundant species of the family Geoglossaceae. [Hustad et al. \(2013\)](#), indicate that this species is very diverse, and that their preliminary phylogeographic studies show that the species is not monophyletic suggesting that cryptic speciation has probably occurred in this species complex.

T. hirsutum often grows in waxcap grasslands, among *Sphagnum* spp. under both coniferous and deciduous forests ([Breitenbach & Kränzlin, 1984](#); [Akata & Kaya, 2013](#); [Arouzo & Iglesias 2014](#), [Ekanayaka et al. 2017](#)). Since waxcap grasslands are endangered in many parts of Europe, the species has been listed as endangered in several European countries ([Krisai, 1986](#); [Arnolds, 1989](#); [Benkert et al. 1992](#); [Wojewoda & Lawrynowicz, 1992](#); [Antonín et al. 1995](#); [Kučera et al. 2008](#)). According to [Kaya-gusuz et al. \(2020\)](#), the potential distribution of *T. hirsutum* might be affected with global climate change and more extreme climatic conditions.

[Kučera et al. \(2008\)](#), suggest that geoglossaceous fungi might serve as indicator species for habitats evaluation and conservation of sites of mycological importance. In Algeria, further field surveys are needed to explore the diversity of earth tongues, and assess the state of their habitats. We provide herein a first identification key to earth tongues species in Algeria:

A Fruit body black with bristles (hirsute)
.....*Trichoglossum* 1

1 Ascospores bacilliform mostly with 15 septa
..... *Trichoglossum hirsutum*

B Fruit body black or dark brown, with no
bristles (smooth).....*Geoglossum* 2

2 Paraphyses typically duck-head-shaped, or crosier-shaped, with curved and tortuous apical elements, ascospores cylindrical to fusiform sooty in color with 7 septa at maturity.....*Geoglossum barlae*

2' Paraphyses straight, moniliform, multiseptate, clavate; ascospores cylindrical with 7 septa black in NaCl.....*Geoglossum glabrum*

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