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Podaxis pistillaris (Gasteromycetes) from the desert of southern Iraq, an addition to the known mycota of Iraq

Tawfik M Muhsin, Abass F Abass and Ekhlas K Al-Habeeb

Department of Biology, College of Education, University of Basrah, Iraq
Email: *tmuhsin2001@yahoo.com*
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Abstract

The desert gastroid mushroom *Podaxis pistillaris* (L. ex Pers.) Fr. collected from sandy desert habitat in southern Iraq was identified for the first time from this region. A detailed description and photographs are provided in addition to some information on its world distribution and traditional medicinal significances are discussed based on the available literature.

Key words: Desert mushroom, folk medicine, *Podaxis*, Iraq

1. Introduction

Podaxis is a gastroid mushroom within the family Agaricaceae (Basidiomycota) which is morphologically identical to stalked-puffballs and widely distributed in desert soils of arid and semi-arid over the world [1,2]. In spring after rainfall, the fruit bodies of this mushroom appear singly or in groups. Taxonomically, about 50 species have been described within this genus, nonetheless, many of them may represent morphotypes of *Podaxis pistillaris* [1]. It has been speculated that *Podaxis* was related to the genus *Coprinus* [3], which recently has been confirmed through the use of DNA sequencing techniques [4]. *Podaxis* has been used in traditional folk medicine in many countries such as in Yemen for the treatment of skin diseases [5], in South Africa against sunburn [6], and in Mali for wound-healing [7]. In addition, it has been used as face paint and to darken white hair by aborigines in Australia [8] and used as food in countries such as India, Afganistan [9] and Saudi Arabia [10].

The southern desert of Iraq is a vast arid area dominated by sandy coarse alkaline soils. Sodium chloride contributes to the salinity level reaching 14.8 mmohs/cm [11].Plants communities cover the desert mainly xerophytic, xerotolerant and xerohalophytic species [11]. Despite *P. pistillaris* is quite common in the southern desert of Iraq there is a lack of information, however, regarding this mushroom and there is only a single report on some other mushrooms in southern Iraq [12]. In the present report a description of *P. pistillaris* as a first record in Iraq is provided.

2. Materials and method

Fruiting bodies of *P. pistillaris* were collected from sandy soils in Basrah province, southern Iraq (latitude 30 N and longitude 47 E) during February of 2009 and 2010 after recent rain fall. Samples were placed in paper bags and brought to the laboratory and immediately examined, described and identified according to the available literature. Specimens from our collections were also confirmed by Dr. Michael A. Castellano, United State Department of Agriculture, Corvallis. USA.

3. Results and discussion

3.1. Taxonomy

Podaxis pistillaris (L. ex Pers.) Fr.

Figures (1-2)

BASIDIOMATA (Gasterocarps) up to 15 cm in height, 0.8-1.6 cm in diam., whitish at early stages becoming yellowish to rusty-brown in color at maturity, covered with scales when young. PILEUS cylindrical to ellipsoidal, 5-9 cm in length, 1-2 cm in diam., white becoming yellowish-brown in color.

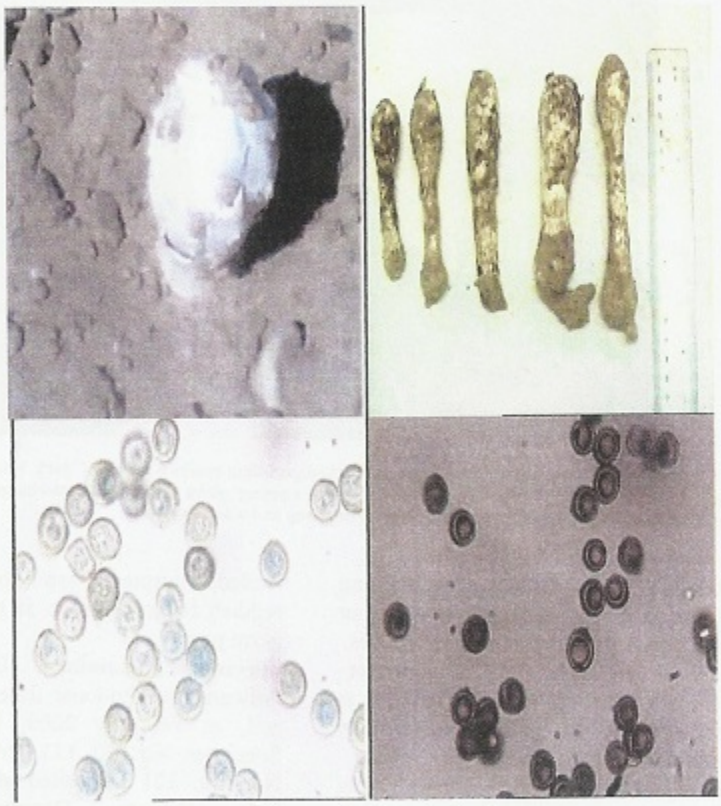

Figure 1. A. Field habit of fruit body of *P. pistillaris* growing in sandy desert, B. Different stages of fruit bodies, C. Spores at immature stage (40 x magnification), D. Mature spores with brown color and germ pores (40 x magnification).

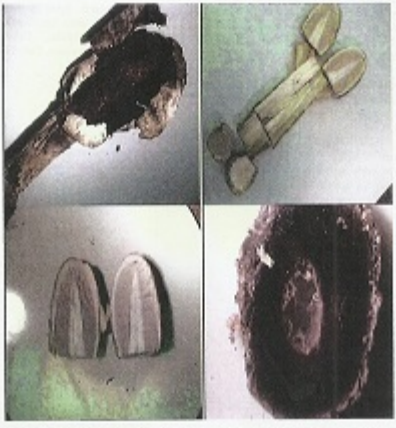

Figure 1. A. Mature fruit body of *P. pistillaris* with cracked peridium covers a mass of dark brown spores, B. Longitudinal section of young fruit body, C. Section shows a young gleba with pinkish colored spores, D. Transverse section of the stipe with a reddish mycelia tissue and a hollow.

PERIDIUM non-dehiscent and remaining fused with the stipe (secotioid), cracking or splitting when dried to release spores. STIPE 3-14 cm long, 0.8-1.3 cm diam., white to yellow-brown, straight, bulbous at the base, possessing a fibrous to woody texture, hollow in the centre when mature. GLEBA pink in color when young becoming reddish to brown at maturity. BASIDIOSPORES 10-14 x 9-13 um, globose to subglobose, smooth, thick-walled, purple when young becoming reddish to dark brown at maturity, with a germ pore.

Specimens examined: Collected from Safwan and Um-kasir desert sandy coarse soil, at February 2009, February 2010. Specimen No 110, 111 TMM, AFA. Slide No 120, 121 Deposited at the Mycology Lab, Biology Department, Basrah University, Iraq.

3.2. Remarks

The morphological characteristics of *P. pistillaris* inhabiting the desert region of southern Iraq is similar to the other specimens described elsewhere. [1,2,13,14,15] with minor variations such as spore shape in our collections being mostly globose compared with those previously described.

In comparison with reports from nearby desert areas, the specimen from southern Iraq it looks morphologically identical with those reported from Kuwait [16] and Qatar [17], however, no microscopic details were given by those authors.

This species is not uncommon as a saprophyte in sandy ecosystems (Dr. Michael Castellano, pers. comm.). Although *P. pistillaris* is considered by many authors to be a stalked puffball but it is more closely allied with the shaggy mane (*Coprinus comatus* (Mull.) Pers. than with puffballs [4].

Physiological studies on *P. pistillaris* using heavy metals indicated that the growth of this mushroom is affected by amending cadmium and lead in culture medium [10]. Temperature effects on the growth of this fungus have been also conducted [18]. Cultivation of fruiting bodies of this desert mushroom has also been reported [19]. Medicinally, this species has been used in many traditional folk treatments (Table 1) and recently it has been demonstrated that *P. pistillaris* exhibits a bioactive compounds against bacteria [5,20]. The edibility of this mushroom in some places over the world has also been reported [5,10,21]. Moreover, chemically, the fruiting bodies of *P. pistillaris* contain 76% moisture, 5% total nitrogen, 22-37% total crude protein, 18.5% carbohydrates, 2.3% total lipids and 2.4% ash [22]. It is worth mentioning that this desert mushroom is eaten by local inhabitants living in the southern Iraq. Seemingly, this mushroom possesses a unique life strategy to ensure its survival under extreme desert environments. Therefore, more research is needed to investigate the tolerance of this fungus to such a harsh habitat and whether it lives as a saprophyte or behaves as an ectomycorrhizal partner in association with some desert inhabiting plants.

Table 1. Distribution and significances of the desert mushroom *P.pistillaris* over the world

Geographical locations	Local names	Significances	References
Afghanistan		Edible	Jinkani [2001] [9]
Africa		Folk medicine	Dring (1964) [2]
Argentina			Martinez (1971) [23]
Australia	Desert shaggy mane	Darkon the white hair in the whiskers and face paint	Cleland & Johnston (1933) [8]
Brazil			Bastos & Galvao (2002) [15]
China		Inflammation treatment	Mao (2000) [24]
India	Khumbiaki	Edible	Jinkani (2001) [9]
Iran			Watling and Gregory (1977) [25]
Pakistan			Sultana et al. [2007] [26]
Mexico			Martin et al. (2005) [27]
South Africa		Folk medicine against sunburn	Bottomley [1948] [6]
South Africa (Sahara)		Poisonous	Walleyn & Rammeloo (1994) [28]
Saudi Arabia	Al-Arjoon	Edible	Hashem & Al-Kahtani, (1993) [10]
Kuwait	Al-Arjoon		Moustafa (1975) [16]
Qatar	Al-Arjoon		Al-Thani (2010) [17]
Yemen		Treatment of skin disease	Al-Fatimi et al. (2006) [5]
USA	Desert shaggy mane		Brasfield (1937) [13]
Iraq	Kama?	Edible	Present study

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