Mini Review

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Current and potential use of the desert fungus *Podaxis pistillaris* (l.) fr. (*Agaricaceae*)

Abstract

Information on nutraceutical (edible), medicinal and cosmoceutic traditional uses of *Podaxis pistillaris* (L.) Fr. (*Agaricaceae*, Basidiomycota) is discussed based on the available literature. This desert mushroom has potential uses in those areas, besides as probiotic. Specimens photographs from two Mexico's localities are provided.

Keywords: desert mushroom, edible, traditional medicine, cosmoceutic, probiotic

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Introduction

The current use of a natural resource refers to the local or regional employment that a particular social group has discovered about it through traditional ecological knowledge. The current use is studied by Ethnobiology. In the other hand, the potential use is conceptualized as the possibility of applying knowledge about the properties of a given organism reported in the literature.

Fungi have been considered as an important source of bioactive substances used in current food and medicine -human and animal- as well as in the development of new medicines and foods. This work focuses on the desert fungus *Podaxis pistillaris* (L.) Fr. (*Agaricaceae*). The current ethnomicological uses of the fungus were investigated and information available in specialized libraries and the electronic academic network was analyzed. The objective of the present review is provide an overview of the current and potential uses of *P. pistillaris*.

Discussion

Podaxis pistillaris, with an oval-shaped periodium, rigid and woody stipe and very dark spores 10-15mm in diameter, grows in various desert areas of the planet.[1,2] Figure 1 shows fresh and dry specimens from Cuicatlán, Oaxaca, Mexico, an area considered to be one of the southernmost semi-desert in the Neartic.[3]

Figure 1 *Podaxis pistillaris* from Santiago Dominguillo, Cuicatlán, Oaxaca, México, July 2017 (Photos of José Alberto Lascarez Fierro).

Figure 2 *Podaxis pistillaris* from Mapimí Desert, Durango, México, July 2017 (Photos of Alejandro Flores Manzanero.

The actual and potential uses of podaxis pistillaris

Edible

P. pistillaris is considered a culinary specialty or gourmet food.[4] It has been used as food in countries such as Afghanistan, India, Iraq, Saudi Arabia, Yemen and Mexico,[5–10] among others. The nutritional value of this fungus is high, since it contains 41.4% of amino acids.[11] *P. pistillaris* is rich in proteins and carbohydrates and low in fat content hence can form an important constituent of supplementary food. In relation with the proximate composition and energy value, Podaxis has this noticeable values: 32.9% of protein (n=14.54±0.18g/100g dw), fat content (1.97±0.16 /100g dw), total carbohydrates (77.79±0.39g/100g dw) and 387.05±0.28kCal/100g dw of energy value.[12]

Regarding their nutraceutical composition, the mushroom contains: phenols (0.97±0.11mg of GAE /g of the extract) and flavonoids(0.64±0.06mg of quercitin equivalents per g of dw). The number of steroids documented is 1.57±0.01g/100g dw s and 0.85±0.12g/100g the amount of alkaloids. The level of β-carotene is 0.75±0.02µg/g dw and 0.02±0.02µg/g dw lycopene. Presence of secondary metabolites such as phenols, flavonoids, steroids, β-carotene and lycopene make it an important antioxidant source.[12]

Medicinal

The species studied forms part of the traditional pharmacopoeia in several countries.[7] By example, it has been employed for the treatment of skin diseases in Yemen,[9] for wound-healing in Mali, against sunburn in South Africa, and versus inflammation in China.[13–15] In relation to

the medicinal properties of *P. pistillaris*, its antibacterial effects have been verified experimentally.[9,16] These properties confirm that it is a nutraceutic species whose consumption promotes health.

Cosmoceutic

A cosmeceutical product is one that when applied for aesthetic purposes, helps to preserve the skin or hair. This is the case of *P. pistillaris*. In the northeastern region of Colombia known as La Guajira, women of the Wayuu ethnic group use their spores as an efficient sunscreen.[17] Older are the records of their uses by the native groups of Australia and Africa to protect the skin and as hair dye.[18,19] In Colombia and Australia the facial painting with the spores of Podaxis also plays an important role in the mortuary ritual.[17,18]

Probiotic

A probiotic is "a live microbial feed supplement, which beneficially affects the host animal by improving its intestinal microbial balance".[20] *P. pistillaris* presents fibrolitic activity.[21] Exogenous fibrolytic enzymes are natural biocatalysts produced by living cells and have been used to eliminate antinutritional factors in foods of monogastric and ruminant species.[22,23]

Three species of microscopic ascomycetes have been commercially used as the source of these enzyme products for ruminant diets: *Aspergillus niger, A. oryzae* and *Trichoderma longibrachiatum*.[24] However, basidiomycetes such as *Peniophora lycii, Agrocybe pediades* or *Trametes pubescens*[25] also have potential in this biotechnology area.

Conclusion

Podaxis pistillaris is a desert fungus used in different countries as a nutraceutical (edible), medicinal and cosmoceutic resource, and has potential use as a probiotic.

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Conflict of interest

The author declares no conflict of interest.

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