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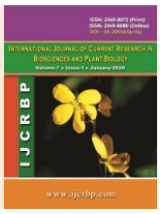

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Identification of wild macrofungi from Southern West of Saudi Arabia

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ABSTRACT

Macro-fungi (Mushrooms) considered a great potential natural bio-resource of basidiomycetes; also, source of proteins and vitamins for human. In the present study twelve mushrooms were identified and one of *Terfezia* sp. The importance of mushroom all over the world, give a push to many mycologists to study the wonderful macro-fungi. The different ecological conditions, affects on the wild fungus especially humidity and temperature degrees. The morphological characteristics as the stalk height, diameter, cap size and fresh weight of mushrooms were considered as a parameter for differentiation between different types. Twelve species of mushrooms belonging to different genera were collected and identified from three locations in Jazan governorate southern of Saudi Arabia; Harub, Al-Aridhah and Samtah, which found a suitable area for this kind of macro fungi in Saudi Arabia. In addition, in Al-Sahalil Jazan region the *Terfizia* sp. Was recorded underground with some wild plants.

Introduction

The wonderful fungi (mushrooms) are cultivated in many countries and wild species are a good source for human food and medicinal uses. Besides its role in recycling of agricultural organic waste and plant debris, wild mushrooms are nutritious for human food. Mushrooms have been recognized recently for their important role in recycling of organic wastes (Abu El-Souod et al., 2000; Mohamed et al., 2018). Production of oyster mushroom (*Pleurotus ostreatus*) has received special attention in many countries all over the world due to its ease cultivation. Different aspects in mushroom production were studied (Mohamed et al., 2011 and 2014). The high contends of nutritional, bioactive compounds and antioxidants in fruiting bodies are very important materials (Mohamed and Farghaly, 2014). The fungus mushrooms has an important medication usage, as the red mushroom (*Ganoderma lucidum*) is cultivated strictly for its medicinal benefits. Survey of wild edible and medicinal mushrooms all over the world in the recent times was stated by the Agriculture and Food Organization (FAO). In different countries many investigators has been attracted for studying the edible and medicinal mushrooms types. A large number of wild mushroom species were identified and their amino acid composition was studied (Mdachi et al.,

2004). Different wild mushroom species was found to be a potential source of essential amino acids (Mdachi et al., 2004). Fourteen species of mushrooms belonging to nine genera from seven localities in Al-Taif Governorate of Saudi Arabia were collected and identified by Abou-Zeid and Altalhi (2006) and Gray (1997) reported that *Agaricus campestris* is common wild mushrooms in America and Europe. A total of 142 species of wild commercial mushrooms were identified and recorded on the wild fungus markets in Yunnan, China by Wang et al.2004.More than eight hundred macro-fungal species of 175 genera were recognized and reported from Yunnan province of southwestern China where wild edible mushrooms have become a very important income for the people in mountain forest and countryside areas (Liu, et al., 2009), and Abu El-Souod et al. (2000). reported thirteen species of mushrooms belonging to ten genera (*Agrocybe, Armillaria, Coprinus, Drosella, Hebeloma, Hygrophorus, Lepiota, Leptonia, Panaeolus* and *Tricholoma*).

Three species of wild mushrooms collected during the wintertime from Alexandria city (Egypt) and identified them as being *Agaricus campestris, Agaricus rodmani* and *Collybia* sp. by Liu et al. (2009) and Zakhary et al. (1983). The aim of the present work was to identify some of wild macro fungi of mushrooms in different locations in Jazan region in southern west of Saudi Arabia.

Materials and methods

Source of wild mushroom samples

Different genera of mushrooms were collected from three localities in Jazan Governorate during the period from September 2019 to December 2019. Localities are shown in Fig. 1. Samples were found in wet places after rain and low temperature degrees or on the decayed plants and the leaves of trees as organic natural materials. Mushroom samples were photographed and collected from their natural sites and kept for further laboratory identification and laboratory studies under 5°C in refrigerator .

Laboratory studies

The collected fruiting bodies were identified according to Ellis and Ellis (1990), Verma et al. (2017) and Phillips (1981). Some lab studies were made for macrofungus identification by free hand sections and microscopic examinations under ×25 and ×40 magnification.

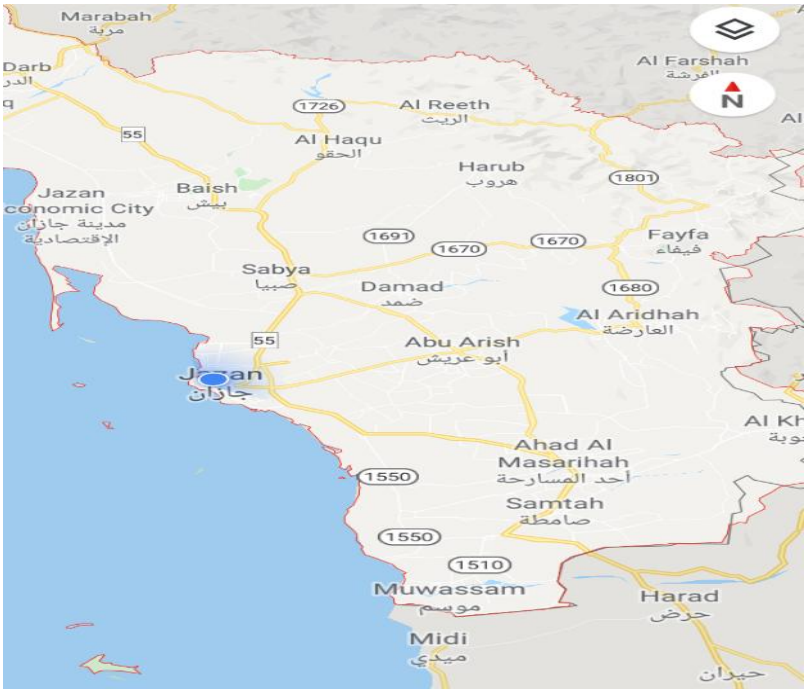


Fig. 1: Showing the location of collecting samples in Harub, Al-Aridhah and Samtah (Jazan Region) southern west of Saudi Arabia (Source: Google Maps).

Results and discussion

Mushroom types

During the course of the present study 12 mushrooms spp. and one *Terfezia* sp. were collected from different regions in Jazan and identified as the following data (Fig. 2 A-V):

(A) *Agaricus* sp.: white, cap, subglobose becoming, silky, button shape, turning pinkish and eventually blackish, it is edible.

(B) *Agaricus moelleri*: Cap, white then rose brownish when mature, fleshy, globose or hemispherical then convex. Gills rose-white in young, then brownish in mature fungi. Stipe, white sometimes rose in young specimens.

(C) *Ganoderma applanatum*: *Ganoderma* means having a "shiny or lustrous skin"; *applanatum* means "flattened" and refers to the flat, shelf-like appearance (applanate) of the fungus, useful for medicinal industries.

(D) *Coprinus* sp.: A common fungus often seen growing on lawns, along gravel roads and waste areas. The fruit bodies first appear as white emerging from the ground, and then the bell-shaped caps open out. The small gills beneath the cap are white, then pink, and finally turn black and secrete a black liquid filled with spores.

(E) Wild *Ganoderma* sp.: includes a genus of polypore fungi in the family *Ganodermataceae* that includes about 80 species, many from regions all over the world. This fungus is used for medicinal purposes.

(F) *Coprinus atramentarius*: Saprobic; clustered in grass, on decaying wood or on the ground from buried wood; May through September. The diminutions the Caps are 5-7.5 cm wide; stipes are 4-15 cm long and 1-2 cm thick. The cap is dry, gray to gray-brown; with shallow grooves on the margin (radially lined or striate). Small scales may form near the center.

(G) *Podaxis pistillaris*: *Podaxis* sp. in the open field is whitish at early stages becoming yellowish to rusty-brown in color at maturity, covered with scales when young. Pileus is ellipsoidal, 5-8 cm in length, 1-2 cm in diam., white becoming yellowish-brown in color. It is fragile, leathery, and woody at maturity, stipitate and pileate and odorless. Ali and El-Wakil (2015) reported *Podaxis pistillaris* in Jazan region for the first record.

(H) *Lepiota procera*: Cracked, brown. Gills whitish, hollow when mature, with brown stripes and coarse scales along its entire length. Edible.

(I) Wild *Coprinus* sp.: Clustered in grass, on decaying wood or on the ground from buried wood; May through September. The dimensions the Caps are 5-7.5 cm wide; stipes are 4-15 cm long and 1-2 cm thick as reported by Lehmann and Khazam (1992).

(J) *Lepiota cristata*: Saprobic; growing scattered or gregariously, often in disturbed ground areas like paths, ditches, lawns, and so on, but also on the forest floors under hardwoods or conifers; summer and fall; apparently widely distributed all over the world (Zamora and Neito, 1995; Alofe et al., 1996).

(K) *Agaricus bisporus:* Scattered on pizzas, gregarious on salads, densely clustered in grocery stores—and occasionally scattered to gregarious on manured soil, compost piles, in lawns, and so on, as a native species and as an escapee from cultivation (Gan et al., 2001; Chen et al., 2005; Rapoir, 1997).

(L) Earlier growth of *Agaricus* sp.: It shows the earlier face of the fungus growing stage it is scattered on pizzas, gregarious on salads, densely clustered in grocery stores and occasionally scattered to gregarious on manure soil as reported by Taylor (2010) and Benchawattananon (2016).

Terfezia species

Desert truffles are socio-economically important fungi and are being utilized in Arabian gulf countries including Saudi Arabia and several other countries of the world, for both food and medicine for many countries (El-Enshasy et al., 2013: Manzelat, 2019). Many studies showed that the desert truffle extracts have antibacterial properties against bacteria and pathogenic organisms by Richards (1997). This fungus was observed during January 2019, after rain fall in

Harub region (Jazan) with different growing stages, and these results are similar to that reported by Sharma and Doshi (1996).

Conclusion

Wild Macro-fungi considered a great nutritious for human. Mushrooms have been recognized recently for their important role. The wonderful Macro-fungi need more and more research to cover all the wild species all over the kingdom and in other countries to study the environmental conditions, which affects on their growth and reproduction.

(A) *Agaricus sp.*

(B) *Agaricus moelleri*

(C) *Ganoderma applanatum*

(D) Natural wild *Coprinus* sp.

(E) Wild *Ganoderma* sp.

(F) *Coprinus atramentarius*

(G) *Podaxis pistillaris*

(H) *Lepiota procera*

(I) Wild *Coprinus* sp.

(J) *Lepiota cristata*

(K*) Agaricus bisporus*

(L) Earlier growth of *Agaricus* sp.


(M) The fungus under the soil


(N) The mature fungus in the soil

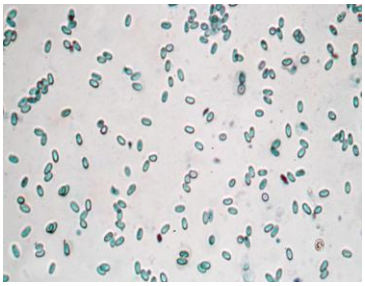

(O) The fungus area in Al-Sahalil


(P) The growing area in Al-Sahalil region beside wild plant root system


(Q) The fruit in mature shape


(R) The fruit in mature shape


(S) Cross section of fruit body.


(T) Spores of the fungus X 25

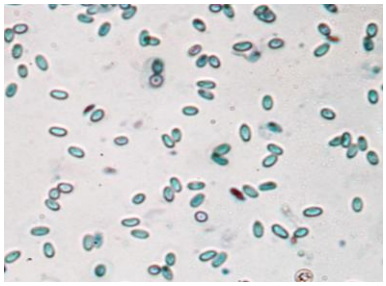

(U) Spores of the fungus X 40

Fig. 2: Macrofungi distribution in different regions in Jazan.

Conflict of interest statement

Authors declare that they have no conflict of interest.

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