

## Survey and Identification of Wild Mushrooms in Eastern Region of Libya

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### ABSTRACT

Mushrooms are a large and important class of higher Basidiomycetes fungi. Mushrooms are fleshy, sometimes tough, umbrella like shape. Some mushrooms types are edible whils, others are nonedible or poisonous called toad stool. Survey method have been carried out in eastern part of Libya, starting from Benghazi west until Shahat east city. The total regions are 10 (Sidi Khalifa, Almhada, Albakour, Farzogha, Almarij, Wadi alkouf, Alwardia, Massa, Alwasitta and Shahat). 12 different mushroom samples were collected in three months' time. All samples are immediately kept in sterile plastic bags and brought to mycology laboratory.

Classification and identification have been done by using Macroscopic characters specific books and references. Essential criteria and characters have been followed for identification: Structure of the fruit body, shape, size and colour, cap shape, Stalk, Gills and Teethes or Tubes are the first major key of identification. 9 mushrooms species have been identification only from 12 samples collected as following: *Boletus erythropus*, *Russula cyanoxantha*, *Amanita phalloides*, *Amanita fulva*, *Mycena Pura*, *Agaricu ssilvaticus*, *Agaricus silvicola*, *Agaricus campestris*, *Coprinus plicatilis*.

**Keywords:** Fruitbody, Mycophagy, Poisonous mushrooms, Macroscopic and microscopic characters.

### 1. Introduction

The Romans attributed the appearance of mushrooms and truffles to lightning hurled by Jupiter to the earth. Even in modern times, the peoples of Mexico believe that the appearance of certain mushrooms like *Amonita muscaria* (fly agaric) is correlated with thunder and lightning. The role that mushrooms play in the religion and mythology (Wasson, 1980). The important role of some mushrooms in ecosystems act as decomposers in forest ecosystems, some types of mushrooms are pathogenic and causing wood-rot and decay (Gilbertson, 1980).

Historically, a number of mushrooms like bracket fungi have been used in herbal medicine, other mycelial mat mushrooms *Fomitopsis sp.* from decayed wood were used by lumberjacks to stop bleeding from wounds. Variety of different cultivated and wild mushrooms has been used as human food mushrooms cultivated in Europe appears to have begun in France in 1950s (Chang, 1993). Since then, the commercial production of mushrooms has become a very large and profitable industry.

The world production of cultivated edible mushrooms over 4.5 million metric tons per year in USA (Chang, 1993). *Agaricus* accounts for less than 50% of worldwide production it is worth more than \$800 million per year. However, other varieties of mushrooms like shiitake, Oyster and straw mushrooms have been grown commercially (Buswell and chang, 1993). In addition to fasting well, mushrooms are significant nutritional value contain essential amino acids which higher than all vegetables.

However, most people who enjoy collecting, identifying and in some cases, eating wild mushrooms are exposure to many mutable identification which led to mushroom poisoning. In regard to wild mushrooms, we need to emphasize that not all species are good to eat and that a number are actually poisonous (Lincoff and Michel, 1977; Ammirati *et al.*, 1985; Bresinkly and Besl, 1990). Wild mushrooms are considered one of the natural resources,

which need more study and investigations. Little information are available about the Libyan wild mushrooms, due to lack of field researches and special mycologist, this beneficial scientific field is still virgin.

### 1.1. Aim of Study

This recent study aimed to focus and highlighted the important of wild mushrooms, habitat, distribution and classification to species level in the large part of Libyan map.

## 2. Materials and Methods

### 2.1. Site of Study

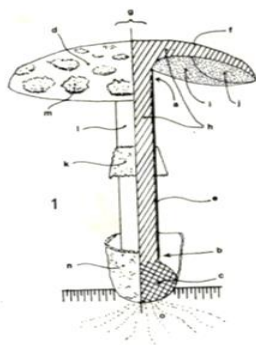
The surveyed areas were located in the eastern part of Libya 10 regions have been surveyed. Onset from Benghazi west following eastern coast until Shahat with range 300 km long. The survey carried out from first of January 2019 until March 2019.

### 2.2. Sample Collection

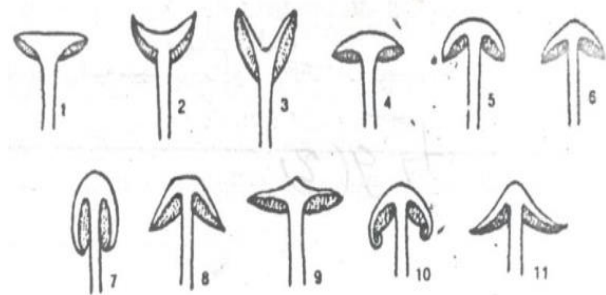
12 mushrooms samples were collected from eastern regions photographed before picked, and then collected carefully taking the whole fruit body of each one. Immediately the fruit bodies of each similar mushroom kept in sterile plastic bag than sealed and placed in plastic container. Essential information have been recorded: Name of region, type of soil, and type of vegetation near by the growing mushroom and collection time.

### 2.3. Macroscopic Characters

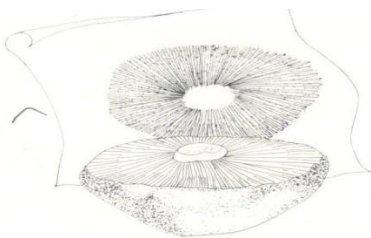
Sets of major morphological characters should be done first : The shapes that the fruit body may assume, size, colour, cap thickness, shape; stem or strip remnant of veil, spore - bearing surface, gills, pores, folds; tubes or teeth, presence or absence of ring, volva and bulbous base (Ragner, R., 1979; Signer R.,1986), (Figures 1-4).



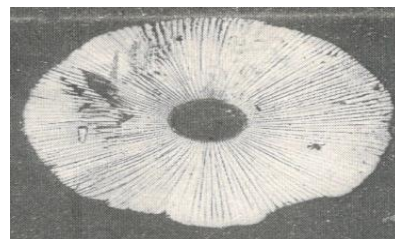
**Fig.1.** Morphological characters of fruit-bodies



**Fig.2.** Shapes of the fruit body



**Fig.3.** Cross section of cap fruit showing gills



**Fig.4.** Arrangement of gills

### 3. Results

The results of the first time survey study of the Libyan wild mushrooms in eastern part of Libya. From 12 mushroom samples only nine samples were identified based on morphological characters and named as follow:

**1. *Boletus erythropus*** Cap 5-16 cm across, bay, umber or snuff-brown with olive tints, flattened convex; surface smooth, slightly sticky in wet weather. Tubes lemon-yellow to greenish, turning dark blue on cutting. Pores round, small, orange-red to orange, bruising dark blue. Stem 5-14cm x 2-5cm, cylindrical, base sometimes swollen, yellowish but densely dotted with orange-red to scarlet. Flesh yellow, immediately dark blue on cutting. Fairly common under broad-leaved trees but especially in coniferous woods, Albakour, clay calcareous soil (Fig.5).

**2. *Russula cyanoxantha*** Cap 5-15 cm across, sometimes one colour but usually a mixture of colors, such as dullish lilac, purplish, wine - coloured, olive, greenish or brownish, sometimes entirely green, at first globose, later flattening, firm to hard, greasy when moist, with faint, branching veins radiating from the center. Gills whitish or very pale cream and rather narrow, at times forked, flexible, oily to the touch. Stem 5-10cm x 1.5-3cm, white but sometimes flushed purple, hard, giving no, or a slightly greenish, reaction when rubbed with iron alum, not salmon as with most russulas. Spores whitish occurs under broad-leaved trees, Wadi alkouf, and heavy clay soil (Fig.6).

**3. *Amanita phalloides*** Cap 7-10 cm, greenish or yellowish dive, but sometimes paling to almost white, streaked with radiating fibres within the surface, somewhat slimy when moist, sometimes with flat, white skin-like patches of the veil; the skin of the cap may be easily peeled as in the edible mushroom! Gills white, free and rather closely spaced. Stem 8-12cm x 1.5-2cm, white or coloured like the cap but paler, smooth, or the surface cracking into very thin, fringed patches, solid at first then hollow, narrowing upwards, with a prominent skirt-like ring near the top. The base of the stem is bulbous and enclosed in a goblet-shaped, White, skinny bag. Odour when old sickly. Occurs under broad-leaved trees especially beech and oak, Shahat, clay calcareous soil, frequent. Very poisonous. The symptoms which are intense abdominal pain, vomiting and diarrhea, do not commence until six to fifteen hours after consumption (Fig.7).

**4. *Amanita fulva*** Cap 4-10 cm, bright orangey brown to- date-brown, well-shaped, later convex with a broad, low umbo, sometimes with whitish patches of the veil: margin strongly striate. Gills white or tinged yellowish and free. Stem 7-20cm x 5-10mm, tinged tawny but paler than the cap, slightly scaly, without a ring but with a membranous, loosely sheathing, yellowish volva at the base. Occurs under broad-leaved trees especially birch on acid soils, Massa, clay soil (Fig.8).

**5. *Mycena Pura*** Cap 2-8 cm across, typically various shades of lilac but varying to rose-pink, broadly bell-shaped, later flattening; margin striate. Gills whitish to pink, adnate with a decurrent tooth, broad; bases connected by veins. Stem 3-10cm x 2-6mm, the same colour as the cap or paler, smooth, polished, cartilaginous, and hollow: base white-woolly. Odour and taste of radish. Spores amyloid. Occurs amongst dead leaves in woods, especially of beech, Alwasitta, clay soil (Fig.9).

**6. *Agaricus silvaticus*** Cap 7.5-11 cm across, reddish to umber-brown, rounded at first then convex and finally flattened; surface densely covered with fibres and splitting into flattened scales. Gills whitish, later reddish and

finally dark brown, free and closely spaced. Stem 6-9 cm -1.5 cm, dingy white becoming brownish, fibrillose to slightly scaly below the membranous, spreading ring which is white above and greyish or brownish below. Flesh white becoming slowly pinkish, then brownish in the stem when cut or when old. Occurs in woods, Wadi alkouf, clay calcareous soil (Fig.10).

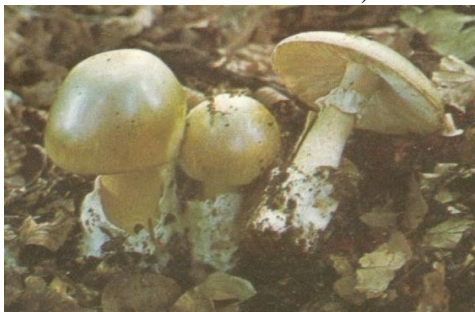
**7. *Agaricus silvicola*** Cap 5-15 cm across, creamy white, rounded or somewhat bell shaped, later flattening, smooth, becoming yellow when bruised or old. Gills pale brownish violet-grey, later chocolate, free. Stern 5-15cm x 1.5-2.5cm, white, becoming yellowish brown, hollow; base bulbous. Ring membranous, broad and skirt-like, white above, with soft, brownish patches below. Flesh whitish, becoming brownish in the stem, not yellowing. Odour of aniseed occurs in woods, especially with conifers, Alwardia, clay soil (Fig.11).



**Fig.5. *Boletus erythropus*** (This figure is copyrighted by The Hamlyn Publishing Group Limited 1979 - *Mushrooms and Toadstools* - Ronald Rayner - pp:43 ISBN: 0 600 36283 3)



**Fig.6. *Russula cyanoxantha*** (This figure is copyrighted by The Hamlyn Publishing Group Limited 1979 - *Mushrooms and Toadstools* - Ronald Rayner - pp:59 ISBN: 0 600 36283 3)



**Fig.7. *Amanita phalloides*** (This figure is copyrighted by The Hamlyn Publishing Group Limited 1979 - *Mushrooms and Toadstools* - Ronald Rayner - pp:67 ISBN: 0 600 36283 3)



**Fig.8. *Amanita fulva*** (This figure is copyrighted by The Hamlyn Publishing Group Limited 1979 - *Mushrooms and Toadstools* - Ronald Rayner - pp:71 ISBN: 0 600 36283 3)



**Fig.9. *Mycena pura*** (This figure is copyrighted by The Hamlyn Publishing Group Limited 1979 - *Mushrooms and Toadstools* - Ronald Rayner - pp:89 ISBN: 0 600 36283 3)



**Fig.10. *Agaricus silvaticus*** (This figure is copyrighted by The Hamlyn Publishing Group Limited 1979 - *Mushrooms and Toadstools* - Ronald Rayner - pp:109 ISBN: 0 600 36283 3)



**Fig.11.** *Agaricus silvicola* (This figure is copyrighted by The Hamlyn Publishing Group Limited 1979 - *Mushrooms and Toadstools* - Ronald Rayner - pp:109 ISBN: 0 600 36283 3)



**Fig.12.** *Agaricus campestris* (This figure is copyrighted by The Hamlyn Publishing Group Limited 1979 - *Mushrooms and Toadstools* - Ronald Rayner - pp:111 ISBN: 0 600 36283 3)



**Fig.13.** *Coprinus plicatilis* (This figure is copyrighted by The Hamlyn Publishing Group Limited 1979 - *Mushrooms and Toadstools* - Ronald Rayner - pp:117 ISBN: 0 600 36283 3)

**8. *Agaricus campestris*** Cap 5-12 cm across, white, later tinged brownish especially in the center, convex, later flattening, smooth or with a few flattened, brownish, fibrous scales; margin incurved. Gills pink at first, later chocolate-brown, free and closely spaced. Stem 4-8cm x 2-4cm, white, bruising brownish, smooth, solid at first, but later with a narrow cavity. Ring narrow, thin and membranous, soon disappearing. Odour pleasant. Occurs in old meadows and on lawns, sometimes growing in rings, Wadi alkouf, clay calcareous soil (Fig.12).

**9. *Coprinus plicatilis*** Cap 1-3 cm across, dull pale brownish oval at first, later rounded and broadly conical; finally, almost fiat, very thin and translucent, often still brownish in the center but grey elsewhere, grooved almost to the centre and appearing as if radially pleated. Gills grey, later blackish, attached to a thickened, flattish ring of tissue around the top of the stem, narrow, widely spaced, not liquefying but withering away. Stem 2.5-7.5cm x 1-2mm, whitish and somewhat translucent, slender, smooth and fragile. Solitary amongst grass on lawns, in fields or by road-sides, Almarj, clay soil (Fig.13).

#### 4. Discussions

In this recent study provide a scientific prominence through survey and investigation the wild mushrooms in eastern part of Libya. This study open vast research field in mycology particularly macro fungi. 50 new recorded samples have been found in these multi environmental areas and three samples cannot identify collected from Wadi alkouf (one sample) and Massa (Two samples). The habitat of the identified mushroom specimens are show quit variations depending on weather conditions, temperature, soil texture, humidity, rain fall and type of plant vegetation close the growing mushrooms (Chapela, J. H. and P. Lizon, 1993). All identified mushroom genera are belonging to phylum Basidiomycota. Many People hunt mushrooms either for food or as a hobby. Mycologists

have written many books and articles dealing with the identification of edible and poisonous species. In this regard, the epitome of mushroom manuals was reached in 1978 By Smith, A. H. Singer's (1986) is the authoritative treatise for the identification of wild mushrooms species as alluded earlier the variation of mushrooms: shapes, size, colour and delicateness it depends to the niching adaptation survival and the a abundance of dropped and deposited spores in or on soil (Chroll, G. and D. T. Wicklow, 1992). Some wild mushrooms are tremendously important to human food, *Agaricus spp.* are the common used and consumed edible fungi about 14 species are cultivates for food . Edibility is the key issue for investigation and identification of unknown wild mushrooms. Edible equal mycophagy means people can eat the edible mushroom safety. In recent years there increasing concern about eating nonedible or poisonous mushrooms around the world, so for this reason it is probably a good idea to avoid collecting wild mushrooms for consumption in certain areas. The genus *Amanita* is the most severe and harmful types of mushrooms poisoning (Litten, W. 1975).

Now a days recent and modern technique has been used through application and sequencing of DNA methods for more easily, quick and accurate results for mushrooms. Classification, identification and nomenclature (Bruns, T. D. and et al, 1990; Lincoff and Michel, 1977), divided the major types of mushroom poisoning into four categories based on the physical effects of the toxins and the time of elapsing from consumption of the mushroom to the appearance symptoms. At the end of this discussion further research and investigations are more urgent as sources and expedite needed to open abroad varsity. Exploitation of natural food resources are like useful wild mushrooms of food storages. Exploitation of natural human food resources with high nutrients quality like wild mushrooms may be one of the contributing and sharing factor for food shortages and starvation in poor countries, instead of using meets as protein source.

## 5. Conclusions

From this open field study show the importance survey of wild mushrooms in large scale region of eastern part of Libya wild mushrooms are one of the uncultivated types growing naturally on open areas in particular period of time onset form January 2019 until the end of March 2019. Rainfall and temperature is mean limiting factor for growth. 10 different regions have been surveyed. 12 mushroom samples have been collected in three month time. 9 mushroom samples have been identified based on scientific criteria of Macroscopic characters.

## 6. Recommendations

Through the studies and analyzes that we have done in this research, we recommend the following:

- (1) We recommend other researches to study the microscopic characters of these genera.
- (2) Survey the western part of Libya, in addition, to complete the survey from Shahat to Tubruq.
- (3) Test of chemical materials of these genera on the medical branch.

## Declarations

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### ***Competing Interests Statement***

*The authors declare no competing financial, professional and personal interests.*

### ***Consent for publication***

*Authors declare that they consented for the publication of this research work.*

### ***Availability of data and material***

*Authors are willing to share data and material according to the relevant needs.*

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