

Full Length Research Paper

# Identification and chemical properties of popular wild edible mushrooms from northern Iran

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The sponge mushroom (morels), chanterelles, oyster mushroom, *Macrolepiota procera*, *Amanita caesarea* and *Russula paludosa* are the main edible wild mushrooms in northern Iran. Little is known about commercial potential of these mushrooms in this area. In this research we found 3 genres of morels including *Morchella esculenta*, *Morchella delisiosa* and *Morchella crassipes*. *Pleurotus ostreatus* grows in all season in mountain regions. The nutritive value of edible wild mushrooms (*Cantharellus cibarius*, *pleurotus osteriatus*, *M. procera*, *A. caesarea* and *R. paludosa*) was determined. The highest mineral contents, dry matter and ash were measured as 8.5, 31.7, 1.4, 1.4, 1.8 mg/kg (dry weight basis), 14 and 2% for P, K, Na, Ca, Mg, dry matter and ash in young *M. procera* cap, mature *Amanita caesarea* cap, mature *A. caesarea* stalk and mature *M. procera* stalk respectively.

**Key words:** Wild edible mushroom, chemical properties, Guilan province.

## INTRODUCTION

Guilan province located in northern Iran has a mild and rainy climate in spring and autumn, providing nearly ideal conditions for fungal growth, with temperatures ranging between 8 and 25 C. Only some people in this province knows edible wild mushrooms and are able to identify them. It is necessary to have some basic information to avoid the poisoning associated with some of the mushrooms.

Wild edible mushrooms consumption has been increased during recent years due to their delicate flavors and textures as well as their high content of trace minerals (Kalac and Svoboda, 2000). Mushrooms are valuable health foods, low in calories and high in vegetable proteins, vitamins, iron, zinc, selenium, sodium, chitin, fibers and minerals (Racz et al., 1996; Mendil et al., 2004; Ouzouni, 2004). In other hand mushrooms have been reported as therapeutic foods, useful in preventing disease such as hypertension, hypercholesterolemia and cancer (Bobek and Galbavy, 1999; Bobek, Ozdyn and Kuniak, 1995). The content of metals is related to species of mushroom, collecting site of the sample, age of fruiting bodies and mycelium, and distance from sources of pollution (Kalac et al., 1991). It is also influenced by species

physiology and particularly by fungi ecosystem pattern (Turkecul et al., 2004).

The sponge mushrooms (morels) are the early spring types in these regions. Morels (*Morchella* species) are highly prized and commercially harvested as wild edible mushrooms in the world (Jung et al., 1993; Pilz et al., 2004). However it is almost unknown and growth from mid April to mid May mainly in Astaneh Ashrafiye (30 km far away from the capital of Guilan province) and people collect it for their own personal use. Morels frequently occur in a variety of habitats but there are several reports on increased frequency of *Morchella esculenta* in the vicinity of elm tree destroyed by fire or disease (Mc Lain et al., 2005; Tiffany et al., 1998), certainly the most common habitats are in deciduous and mixed woods and forest plantations (Smith and Weber, 1980).

The main objective of this study is to promote the sustainable use of natural resources by using of wild edible mushrooms, as a means to improve the mushroom identity and to extend knowledge on nutritional value of wild edible mushrooms. This is the first study on the nutritional value of wild edible mushrooms collected from native forest in northern Iran (Table 1).

## MATERIALS AND METHODS

Field data sheets were developed for crews to record significant

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features of the fresh specimens. The characters included habit, size of cap, ribs, pits and stalk. Character states known to us at the start of the study were listed. For the specimens collected offsite, standard techniques were used (Smith and Weber, 1980; Huffman et al., 1989; Huffman and Tiffany, 2001). The regions that we collect mushrooms were Astaneh Ashrafiye, Rasht (Lakan and Saravan), Khomam, Somea Sara and Masal of Guilan province in northern Iran. By measuring the morphological factors and in view of several research materials listed in references we suggest descriptions for mushroom identification in our region.

A sample of each part was weighed before and after drying in an oven at 60°C for 2 days to determine dry matter content. K and Ca were determined by flame photometer, P and Mg by spectrometry (Latiff et al., 1996). 1 g of dry matter was ashed in a Gallenkamp furnace at 550°C for 6 h (Gbolagade et al., 2006).

## RESULTS AND DISCUSSION

We collect all morels from regions near the Populus trees. It seems that all trees are from nursery garden of Astana Ashrafiye (main region for our morel collection).

Morphological analysis shows that main morels species in Guilan is *M. esculenta*. In Astana Ashrafiye *M. deliciosa* and *M. crassipes* were also found. Lakan forest is 1 of 2 major regions in Rasht (Capital of Guilan province) for mushroom hunting. We also found in this area rarely *Cantharellus cibarius*, and *Russula paludosa*. In Saravan which is another major mushroom hunting region, we collect oyster mushroom from mountain region.

### Description of mushroom finding in Guilan province

By measuring the morphological factors and in view of several research materials listed in references we suggest the following description:

#### *Morchella deliciosa*

Common name, gray Morel or white Morel Head is 2 - 3 cm long, 1.0 - 2 cm wide, cylindrical to conic with a blunt apex; its pits are elongated and grayish to black within with the ridges regularly anatomizing and whitish to gray. The stalk is 2 - 4 cm long and 1 - 2 cm wide, color whitish to cream and hollow. Produce a light yellow spore print is considered a choice edible. Some think it is merely an early form of *M. esculenta*. We find this species only in Astana Ashrafiye near healthy Populus trees near the road.

#### *Morchella esculenta*

Common name, Sponge mushroom or yellow Morel. Head is 3 - 9 cm long, 2 - 5 cm wide, its pits are irregularly arranged to radically elongate and grayish to yellow brown with the ridges paler. Stalk is 4 - 6 cm long and 1.5 - 3 cm wide usually not more than 2/3 that of the head, it is slightly larger at the base, longitudinally depressed in places, dry to granulose on the surface, cream to white and hollow.

Produce a light yellow spore print. The most common of the edible and choice morels. Some have had gastrointestinal upset from this species. This is main species in Guilan and we find it in all regions near the Populus trees.

#### *Morchella crassipes*

Common name, thick-footed Morel or big foot. Head is 5 - 18 cm long, 4 - 8 cm wide, sub conical, its pits are somewhat rounded to irregularly elongate, grayish becoming tan with age with the ridges pallid to cream or darker with age. Stalk is 6 - 13 cm long and 3 - 6 cm wide, massive and often columnar to fold at the base, pale to cream with reddish stains at the base with age and hollow. Produce a cream spore print. Individual fruiting bodies of this sponge mushroom have been reported in excess of 4 pounds. It is edible and choice, but like the other morels there have been reports of gastrointestinal upset. This is main species in Guilan and also we find this in Astana Ashrafiye. This species grow near the healthy Populus trees.

#### *Cantharellus cibarius*

The cap is 2 - 12 cm across. Flat at first with a broken margin, it later becomes quite fluted with a central depression. The colour can range from very pale to deep yellow, fading a little with age. Stem is 3 - 8, very solid and tapered towards the base. The yellow gills are blunt, narrow, irregular and run down the stem. The yellowish flesh has a lovely faint fragrance of apricots, another important identification feature. The spore print is pale cream colour. In the spring a few of this species founded in oak forest which have open mossy cleaning.

#### *Pleurotus ostreatus*

The cap is 6 - 12 cm across. They have no stem. The gills run down the stem pure white at first, they turn cream with age. The flesh is white with a pleasant smell. The spore print is lilac. These occur in large clusters on standing trees or on the stumps of fallen trees in Saravan mountain regions in spring and all another season of year.

#### *Russula paludosa*

Cap convex to plane, diameter 8 - 10 cm, red-brown gills close, partially forked, whitish to butter-yellow or ochre, with red edge, flesh white, spore print butter-yellow to light ochre. We are excited when we find these mushroom at Lakan oak forest in land covered with moss in spring because this almost appear near coniferous trees in old woodland.

#### *Macrolepiota procera*

The cap, which is 10 - 25 cm or more, starts by being ve-

**Table 1.** Chemical properties of wild edible mushrooms in Guilan province, Iran.

Mushroom samples	P (mg. g <sup>-1</sup> DM <sup>1</sup> )	K (mg. g <sup>-1</sup> DM)	Na (mg. g <sup>-1</sup> DM)	Ca (mg. g <sup>-1</sup> DM)	Mg (mg. g <sup>-1</sup> DM)	DM (%)	Ash (%)
Mature <i>Macrolepiota procera</i>	4.0	27.5	0.5	0.5	1.4	9.61	0.96
Mature <i>M. procera</i> Stalk	5.5	23.9	0.9	0.1	0.9	12.61	2
Young <i>M. procera</i> cap	8.5	23.4	1.1	1.4	1.8	12.09	1.46
Young <i>M. procera</i> cap stalk	8.0	21.8	0.3	0.1	0.6	10.57	1.05
<i>Cantharellus cibarius</i>	5.9	34.5	1.1	0.3	0.9	11.23	1.57
<i>P. osteratus</i>	4.5	21.5	0.6	1.3	1.7	7.84	0.47
Matur <i>Amanita caesarea</i> cap	4.8	31.7	1.4	0.1	0.8	6.23	0.74
Matur <i>A. caesarea</i> stalk	1.7	29.3	0.5	0.1	0.8	14.95	1.19
<i>A. caesarea</i> (closed)	3.8	30.2	0.4	0.2	1.1	9.7	0.78
Matur <i>Russula paludosa</i> cap	1.7	23.7	0.8	0.4	0.9	13.46	0.81
Matur <i>R. paludosa</i> stalk	5.9	28.4	1.0	0.2	0.7	8.51	0.85
<i>A. bisporus</i>	7.5	34.0	0.8	0.3	1.6	8.83	0.91

1 dry matter

very spherical, but soon flattens out though retaining a prominent centre. It is pale buff in colour and covered with symmetrical patterns of dark shaggy scales. The stem is 15 - 30 cm, white and has a large ring, the gills are white. The spore print is white. We found this mushroom in Rasht forest in large number.

### *Amanita caesarea*

This mushroom has a tawny cap with a yellow stem and gills. It may be seated in a cup-like volva (remnant of universal veil) and have the remains of a partial veil hanging from the stipe. The base of the stipe is thicker than the top. The spores are white. This mushroom favours oak woodland, sometimes mixed with conifers.

### Nutritional analyses

In the mushroom samples, the highest mineral concentration, dry matter and ash were measured as 8.5, 31.7, 1.4, 1.4, 1.8 mg/kg (dry weight basis), 14 and 2% for P, K, Na, Ca, Mg, DM and ash in young *Macrolepiota procera* cap, mature *Amanita caesarea* cap, young *Macrolepiota procera* cap, mature *A. caesarea* stalk and mature *M. procera* stalk. The highest amount of P (8.5 mg. g<sup>-1</sup>) was found in the mature *M. procera* cap followed by young *M. procera* stalk (8 mg. g<sup>-1</sup>) and cultivated *Agaricus bisporus*

(7.5 mg.g<sup>-1</sup>). This result agrees with the report of Oso (1977) that mushrooms are rich in essential food nutrients. The highest amount of K (34.5 mg. g<sup>-1</sup>) was found in the mature *Cantharellus cibarius* followed by *A. bisporus* (34 mg. g<sup>-1</sup>) and mature *A. caesarea* cap (31.7 mg. g<sup>-1</sup>). The highest amount of Na (1.4 mg. g<sup>-1</sup>) was found in the mature *A. caesarea* cap followed by young *M. procera* cap (1.1 mg. g<sup>-1</sup>) and *C. cibarius* (1.1 mg. g<sup>-1</sup>). The highest amount of Ca (1.4 mg. g<sup>-1</sup>) was found in the young *M. procera* cap followed by *Pleurotus ostreatus* (1.3 mg. g<sup>-1</sup>) and mature *M. procera* cap (0.5 mg. g<sup>-1</sup>). Fasidi and Kadiri (1993) and Fasidi and Ekuere (1993) reported high amount of calcium in wild edible mushrooms previously. The preponderance of calcium in the fruit bodies of these mushrooms may be due to the absorption and accumulation of this element from their habitat.

The highest amount of Mg (1.8 mg. g<sup>-1</sup>) was found in the young *Macrolepiota procera* cap followed by *P. ostreatus* (1.7 mg. g<sup>-1</sup>) and *A. bisporus* (1.6 mg. g<sup>-1</sup>). The highest percent of dry matter (14.95) was found in the mature *A. caesarea* stalk followed by *Russula paludosa* cap (13.46) and mature *M. procera* stalk (12.61). High moisture content is an indication that fresh mushrooms cannot keep for long time. This is because high water activity enhances microbial growth (Latiff et al., 1996). Similar observations was made by Fasidi (1996) for *V. esculenta*, Leon Guzman et al., (1997) for mushrooms of Queretaro Mexi-

co, Sanmee et al. (2003) for Thailand mushrooms and Gbolagade et al. (2006) for southern Nigeria mushrooms. The highest ash (2%) was found by the mature *M. procera* stalk followed by *Cantharellus cibarius* (1.57%) and young *M. procera* cap (1.46%).

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