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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 genuses 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 identity them. It is necessary to have some basic information to avoid the poisoning associated with some of the mush-rooms.

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 (Turkekul 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 vici-nity 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 iden-tity 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 for-est 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 furnance 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 col-lect 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 consi-dered 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, harrow, 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^{-1} DM^{1})	K (mg. g^{-1} DM)	Na (mg. g^{-1}DM)	Ca (mg. g^{-1}DM)	Mg (mg. g^{-1}DM)	DM (%)	Ash (%)
Mature *Macrolepiota procera*	4.0	27.5	0.5	0.5	1.4	9.61	0.96
Mature *M. procera* Stalk	5.5	23.9	0.9	0.1	0.9	12.61	2
Young *M. procera* cap	8.5	23.4	1.1	1.4	1.8	12.09	1.46
Young *M. procera* cap stalk	8.0	21.8	0.3	0.1	0.6	10.57	1.05
Cantharellus cibarius	5.9	34.5	1.1	0.3	0.9	11.23	1.57
P. osteratus	4.5	21.5	0.6	1.3	1.7	7.84	0.47
Matur *Amanita caesarea* cap	4.8	31.7	1.4	0.1	0.8	6.23	0.74
Matur *A. caesarea* stalk	1.7	29.3	0.5	0.1	0.8	14.95	1.19
A. caesarea (closed)	3.8	30.2	0.4	0.2	1.1	9.7	0.78
Matur *Russula paludosa* cap	1.7	23.7	0.8	0.4	0.9	13.46	0.81
Matur *R. paludosa* stalk	5.9	28.4	1.0	0.2	0.7	8.51	0.85
A. bisporus	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^{-1}) was found in the mature *M. procera* cap followed by *young M. procera* stalk (8 mg. g^{-1}) and cultivated *Agaricus bisporus* (7.5 mg.g^{-1}) . 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^{-1}) was found in the mature *Cantharellus cibarius* followed by A. bisporus (34 mg. g^{-1}) and mature *A. caesarea* cap (31.7 mg. g^{-1}) . The highest amount of Na (1.4 mg. g^{-1}) was found in the mature *A. caesarea* cap followed by young M. proce-ra cap (1.1 mg. g^{-1}) and C. cibarius (1.1 mg. g^{-1}). The highest amount of Ca (1.4 mg. g^{-1}) was found in the young *M. procera* cap followed by *Pleurotus ostreatus* (1.3 mg. g^{-1}) and mature *M. procera* cap (0.5 mg. g^{-1}). Fa-sidi and Kadiri (1993) and Fasidi and Ekuere (1993) reported high amount of calcium in wild edible mushooms 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^{-1}) was found in the young *Macrolepiota procera* cap followed by *P. ostreatus* (1.7 mg. g^{-1}) and A. bisporus (1.6 mg. g^{-1}). 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%).

REFERENCES

Bobek P, Galbavy S (1999). Hypercholesterolenic and antiatherogenic effect of oyster mushroom (*pleurotus ostereatus*) in rabbit. Nahrung 43(5): 339-342.

Bobek P, Ozdyn L, Kuniak L (1995). The effect of oyster mushroom (*pleurotus ostereatus*) ethanolic extract and extraction residues on cholesterol levels in serum lipoproteins and liver of rat. Nahrung 39: 98- 99

Fasidi IO (1996). Studies on Volvariella esculenta (Mass) Singer: Cultivation on agricultural wastes and proximate composition of stored mushrooms. Food Chem. 55: 161-163.

Fasidi IO, Kadiri M (1993). Effect of sporophores maturity on chemical composition of *Volvariella esculenta* (Mass) Singer, a Nigerian edible mushroom. Die Nahrung. 37: 269-273

Fasidi IO, Ekuere UU (1993). Studies on pleurotus tuber-regium (Fr) Singer: Cultivation, Proximate composition and mineral contents of sclerotia. Food Chem. 48: 255-258.

Gbolagade J, Ajayi A, Oku I, Wankasi D (2006). Nutritive value of common wild edible mushrooms from southern Nigeria. Global J. biotechnol. 1(1): 19-21.

Huffman DM, Tiffany LH (2001). Spring Morels and false Morels of midcontinental U.S., Morels and False Morels 27 (4).

Huffman DM, Tiffany LH, Knaphus G (1989). Mushrooms and other Fungi of the midcontinental United States, Iowa State Univ. Press, Ames p. 326.

Jordan P (2000). The mushroom guide and identifier. Joanna Lorenz. London. p.128.

Jung SW, Gessner RV, Kendell KC, Romano MA (1993). Systematic of *Morchella esculenta* complex using enzyme-linked immunosorbent assay. Mycologia 85: 677-684.

Kalac P, Svoboda L (2000). A review of trace element concentration in edible mushrooms. Food Chem. 69: 273-281.

Kalac P, Burda J, Staskova I (1991). Concentrations of lead, cadmium, mercury and copper in mushrooms in the vicinity of a lead smelter. Sci. Total Environ. 105: 109-119.

Keizer GJ (1998). The complete encyclopedia of mushrooms. Rebo Int. Netherland pp. 286.

Kellner H, Renker C, Buscot F (2005). Species diversity within the *Morchella esculenta* group (*Ascomycota: Morchellaceae*) in Germany and France Organisms, Divers. Evol. 5: 101–107.

Latif LA, Daran ABM, Mohamed AB (1996). Relative distribution of minerals an pileus and stalk of some selected mushroom. Food Chem. 56: 115-121.

Leon-Guzman MF, Silva I, Lopez MG (1997). Proximate chemical composition, free amino acid contents of some wild edible mushrooms from Queretaro Mexico. J. Agric. Food Chem. 45: 4329-4332.

McLain RJ, McFarlane EM, Alexander SJ (2005). Commercial Morel harvesters and buyers in western Montana: An exploratory study of the 2001 harvesting season. General Technical Report PNW-GTR p.643.

Mendil D, Uluozlu OD, Hasdemir E, Caglar A (2004). Determination of trace elements on some wild edible mushroom samples from Kastamonon. Turkey. Food Chem. 88: 281-285.

Oso BA (1977). Mushroom in Yoruba mythology and medicinal practices. Eco. Bot. 31: 367-371.

Ouzouni P (2004). Edible mushrooms: life food. Import E. Paulidou Publications, Berlin Schoneberg, Germany. 27: 66-67.

Pilz D, Weber NS, Carter MC, Parks CG, Molina R. (2004). Productivity and diversity of morel mushrooms in healthy, burned, and insect-damaged forests of northeastern Oregon. For. Ecol. Manag. 198: 367–386.

Racz L, Papp L, Prokai B, Kovacz ZS (1996). Trace element determination in cultivated mushrooms: an investigation of manganese, nickel, and cadmium intake in cultivated mushrooms using ICP atomic emission. Microchem. J. 54: 441-451.

Sanmee R, Dell B, Lumyong P, Izumori K , Lumyong S (2003). Nutritive value of popular wild edible mushroom from northern Thailand. Food Chem. 82: 527-532.

Smith AH, Weber NS (1980). The Mushroom Hunter's Field Guide. Univ. of Michigan Press, Ann. Arbor. p.316.

Tiffany LH, Knaphus G, Huffman DM (1998). Distribution and Ecology of the Morels and False Morels of Iowa. J. Iowa Acad. Sci. 105(1):1-15.

Turkekul I, Elmastas M, Tuzen M (2004). Determination of iron, copper, manganese, zinc, lead, and cadmium in mushroom samples from tokat' Turkey. Food Chem. 84: 389-392.