

**IDENTIFICATION OF COMMON EDIBLE MACROFUNGI IN WILD
STATUS FROM UPPER EGYPT**

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ABSTRACT

Macrofungi (Mushrooms, edible larger fungi) have been considered a great potential natural bio-resource for the human diet and medication. They may have a great impact on lessening the amino acid and other nutrient supply deficits prevalent in most developing countries. Mushrooms were regarded as early as the ancient Egyptian civilization era. Their role in recycling of organic wastes and relieving environmental pollution has been now well recognized. There are a number of field investigations conducted on assessment of wild edible macrofungi in Egypt that have exposed their high dietary value. *Agaricus campestris*, *Agaricus rodmani* and *Collybia* sp. have been reported to be detected in wild natural status in Egypt. However, the previous studies neither conducted in Upper Egypt nor have reported existence of *Agaricus arvensis* and/or *A. comtulus*. Herein we provide identification of two wild *Agaricus* species detected in field expedition in Assiut. Key macroscopic and microscopic morphological characteristic are identified and illustrated. It is anticipated that the present study would serve as initial step toward encouraging exploiting of potential wildy occurring edible mushrooms and their possible domestication for human nutritional needs.

Keywords: *Agaricus arvensis*, *A. comtulus*, human diet, mushroom, recycling of organic wastes.

INTRODUCTION

Mushrooms are nutritious human food and they were known since the ancient Egyptian (Soliman et al., 2012). Mushrooms have been recognized more recent for their important role in recycling of organic wastes (Mohamed et al., 2012), thereby relieving environmental pollution. Production of oyster mushroom (*Pleurotus ostreatus*) has received special attention in Upper Egypt due to its ease cultivation. Different aspects in oyster mushroom production were studied including use of raw substrates (Mohamed et al., 2011 & 2012) and composted cultivation substrates (Abdelgalil et al., 2012; Mohamed et al., 2016), contends of nutritional and bioactive compounds and antioxidants in fruiting bodies (Farghaly & Mohamed, 2015; Mohamed & Farghaly, 2014), media supplements (Soliman et al., 2011) and outdoor production as intercrop (Mohamed et al., 2014). In addition, mushrooms have a medication impact, for example, red mushroom (*Ganoderma*

Lucidum) is cultivated strictly for its medicinal benefits. Survey of wild edible and medicinal mushrooms worldwide in the recent times was summarized by the Agriculture and Food Organization of the United Nation (FAO, <http://www.fao.org/docrep/007/y5489e/y5489e12.htm>; <http://www.fao.org/docrep/007/y5489e/y5489e13.htm>; <http://www.fao.org/docrep/007/y5489e/y5489e14.htm>; <http://www.fao.org/docrep/007/y5489e/y5489e15.htm>)

Research for wild edible and medicinal mushrooms has attracted investigators in different regions in the world. Wild mushroom *Termitomyces robustus*, *Tricholoma lobayensis*, and *Volvariella esculenta* were identified by Alofe (1991) in Nigeria. Many Tanzanian wild mushroom species were identified and their amino acid composition was studied (Mdachi et al., 2004). Wild mushroom species was found to be a potential source of essential amino acids (Mdachi et al., 2004). Abou-Zeid & Altalhi (2006) collected fourteen species of mushrooms belonging to nine genera from seven localities in Al-Taif Governorate of Saudi Arabia. *Coprinus campatus* was identified in Spain (Garcia et al., 1998) and in Poland (Falandysz et al., 1994). *Tricholoma* spp. was reported by Richards (1997). Gray (1997) reported that *Agaricus campestris* is common wild mushrooms in Europe and America. A total of 142 species of wild commercial mushrooms were identified and recorded on the wild fungous markets in Yunnan, China by Wang et al. (2004). As much as 853 macro-fungal species of 172 genera were recognized and reported from Yunnan province of southwestern China where wild edible mushrooms have become more and more an important income for the people in mountain forest and countryside areas (Liu et al., 2009).

In Egypt, Assawah (1991) reported *Agrocybe* spp., *Hebeloma* spp., *Lepiota* spp. and *Tricholoma* spp. 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*). Zakhary et al. (1983) collected three species of wild mushrooms during the wintertime from Alexandria city and identified them as being *Agaricus campestris*, *Agaricus rodmani* and *Collybia* sp. However, no information is available about the wild mushrooms of Upper Egypt. The aim of the present investigation was to identify edible wild mushrooms in different places of Assiut province.

MATERIALS AND METHODS

Samples of the wild genus *Agaricus* mushrooms of the current study were collected from different locations in Assiut Governorate. The collected samples were found in damp places in Assiut University farms and campus, public gardens and citrus orchard. The expedition was carried out on the collected fruiting bodies. Samples were photographed, noted and reserved for laboratory assessment. The identification then was done according to Moser (1983) with help of Pei-Gui Liu of in Key Laboratory for Plant Diversity & Biogeography of East Asia, Kunming Institute of Botany (KIB), Chinese Academy of Sciences (CAS), Kunming 650204, Yunnan, P. R. China.

RESULTS AND DISCUSSION

Agaricus arvensis Schaeff. ex Fr. (Fig.1A, B and C), known as horse mushroom, has been reported to be an edible mushroom species having an aniseed smell fruit bodies. It grows in thickets, grassland and pasture media and produces large fruiting bodies. The macroscopic and microscopic characteristics includes: cap size is up to 10-15 (20) cm, almost smooth, bald and cream-white. The lamellae are pale flesh color in young stage, old becoming chocolate-brown, stipe 5-6 cm in diam 10-20 cm long. When fruiting bodies touched, the context turns yellowish to brownish. The spores are 6.5-8/4-5 μm . In the current assessment of fruiting bodies among the collected samples, there were samples that completely fulfilled the known characteristics (mentioned above) for *Agaricus arvensis* mushroom. The fruit bodies of the *A. arvensis* were found in grass shade moist areas in Assuit University farms and under citrus trees in countryside regions around Assiut City. Abou-Zeid & Altalhi (2006) collected fourteen species of mushrooms including *A. arvensis* in Al-Taif Governorate of Saudi Arabia. However, existence of *A. arvensis* in Upper Egypt is considered the first record.

In addition to large fruiting bodies producer mushroom such as *A. arvensis*, minors of small fruiting bodies producers such as *Agaricus comtulus* Fr. were also found in our expedition (Fig. 1 D, E and F). *Agaricus comtulus* looks like a diminutive *Agaricus arvensis*. Similarities include a cream colored cap that yellows slowly, a sweet anise odor, and a grassland habit. This minor (*A. comtulus*) usually produces caps of size under 6 cm and spores under 6 μm long. *A. comtulus* has been described to produce cap pure white that yellowing immediately when touched. The capes is about 2-4 cm in diameter and silky-fibrous. Lamellae are pale grey-lilac that then becomes purple-brown. The stipe is 5.4-5 long and the base slightly bulbous, white to yellowish. Its cape has smell of almonds. Their spores are 4.3-6/3.3-4 μm broadly ellipsoid, smooth, thick-walled, spores with a dark central body, hilar appendage inconspicuous and germ pore not evident. It is an edible mushroom but insignificant. The examination of our collected sample of *A. comtulus* satisfied its identification. Both species that reported here belong to kingdom Fungi; phylum Basidiomycota R.T. Moore; class Agaricomycetes Doweld; order Agaricales Underw; family Agaricaceae Chevall; genus *Agaricus* Linnaeus, 1753.

It is worth to mention that *Agaricus arvensis* and *A. comtulus* are not only edible but already have been used as human food and medication (Mao, 1998) while *A. arvensis* has been listed further for its medicinal uses (FAO, <http://www.fao.org/docrep/007/y5489e/y5489e15.htm>). Moreover, *A. arvensis* can be domesticated (FAO, <http://www.fao.org/docrep/007/y5489e/y5489e15.htm>). However, *Agaricus arvensis* and *A. comtulus* macrofungi have not been reported previously in Egypt (FOA) and they are considered the first record.

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RREFERENCES

- Abdelgalil, S.H., M. F. Mohamed, M.M.A. Abdalla and E. F.S. Refaei. 2012. Utilizing composted substrate upgrades yield and quality of oyster mushroom grown on rice straw. *Assiut J. Agric. Sci.* (special Issue), p100-112. The 6th Conf. Young Scientists, May 13, 2012, Faculty of Agriculture, Assiut Univ.
- Abou-Zeid, A.M. and A.E. Altalhi. 2006. Survey of Some Mushrooms in Al-Taif Governorate of Saudi Arabia. *World J. Agric. Sci.* 2 (1):01-05.
- Abu El-Souod, S.M., S. Assawah and M. Bedaiwy, 2000. Survey of mushrooms and polypores fungi in Delta region of Egypt. *Proc. 1st Intl. Conf. Biol. Sci. (ICBS) Faculty of Sci.Tanta Univ.* 7-8 May, 2000, 1: 525-545.
- Alofe, F. V. 1991. Amino acids and trace minerals of three edible wild mushrooms from Nigeria. *J. Food Composition and Analysis* 4:(2):167-174.
- Assawah, W.S., 1991. Biochemical studies on some mushrooms in Egypt. Ph.D. Thesis. Faculty of Science, Tanta University, Tanta, Egypt.
- Falandysz, J., H. Bona and D. Danisiewicz, 1994. Silver content of wild grown mushrooms from northern Poland. *Zeitschrift - fur - lebensmittel - Untersuchung und Forschung* , 199: 222-224.
- FAO. Wild edible fungi a global overview of their use and importance to people. Annex1 summary of the importance of wild edible fungi by region and country. <http://www.fao.org/docrep/007/y5489e/y5489e12.htm> (opened on 1/5/2015).
- FAO. Wild edible fungi a global overview of their use and importance to people. Annex 2 country records of wild useful fungi (edible, medicinal and other uses) <http://www.fao.org/docrep/007/y5489e/y5489e13.htm>,(opened on 1/5/2015).
- FAO. Wild edible fungi a global overview of their use and importance to people. Annex 3 a global list of wild fungi used as food, said to be edible or with medicinal properties. <http://www.fao.org/docrep/007/y5489e/y5489e14.htm>,(opened on 1/5/2015).
- FAO. Wild edible fungi a global overview of their use and importance to people. Annex 4 edible and medicinal fungi that can be cultivated. <http://www.fao.org/docrep/007/y5489e/y5489e15.htm>. (opened on 1/5/2015).
- Farghaly, F A. and Mohamed, E M. 2015. Nutritional value and antioxidants in fruiting bodies of *Pleurotus ostreatus* mushroom *Journal of Advances in Biology* 7(1):1144-1152.

- Garcia, M., J. Alonso, M. Fernandez and M.J. Melgar, 1998. Lead content in edible wild mushrooms in north-west Spain as indicator of environmental contamination. *Arch. Environ. Contam. and Toxicol.* 34: 330-335.
- Gray, W., 1997. The use of fungi as food processing. CRC Press, New York, USA., pp: 30.
- Liu Pei-Gui, Wang Xiang-hua et al., 2009, Fungous Kingdom: Yunnan of China and their ectomycorrhizal Macrofungi species diversity, *Acta Botanica Yunnanica Suppl.* 14:15-20.
- Mao Xiao-Lan, 1998. The macrofungi in China, Henan Sciences & technological press, 1-719.
- Mdachi, S.J.M. M. H. H. Nkunya, V. A. Nyigo and I. T. Urasa. 2004. Amino acid composition of some Tanzanian wild mushrooms. *Food Chemistry*, 86(2):179-182.
- Mohamed, E M and Farghaly, F A. 2014. Bioactive compounds of fresh and dried *Pleurotus ostreatus* Mushroom. *International Journal of Biotechnology for Wellness Industries*, 3:4-14.
- Mohamed, M. F., D. M.T. Nassef, E. A. Waly and A. M. Kotb. 2012. Earliness, Biological efficiency and basidiocarp yield of *Pleurotus ostreatus* and *P. columbinus* oyster mushrooms in response to different sole and mixed substrates. *Assiut J. Agric. Sci.* 43(4):91-114.
- Mohamed, M. F., D. M.T. Nassef, E. A. Waly and A. M. Kotb. 2014. Production of oyster mushroom (*Pleurotus* spp.) intercropped with field grown faba bean (*Vicia faba* L.) *Asian J. Crop Sci.* 6(1):27-37.
- Mohamed, M.F., A.G. Haridy, M.H. Aboul-Nasr and M.M.,Soliman. 2011. Prolonged water soaking for sawdust substrate and adding wheat bran enhance oyster mushroom productivity. *Assiut J. Agric. Sci.* 42(5):66-84.
- Mohamed, M.F., E.F.S. Refaei, M.M.A. Abdalla, S.H. Abdelgalil. 2016. Fruiting bodies yield of oyster mushroom (*Pleurotus columbinus*) as affected by different portions of compost in the substrate *Int J Recycl Org Waste Agricult* 5:281–288.
- Moser, M. 1983. Key to Agarics and Boleti (Polyporales, Boletales, Agaricales, Russulales), pp535.
- Richards, R.T., 1997. What the natives know: Wild mushrooms and forest health. *J. Forest.*, 95: 5-10.
- Soliman, M.M., M.F. Mohamed, M.H. Aboul-Nasr and A.G. Haridy. 2011. Influence of sucrose and blackstrap molasses supplemented to sawdust substrate on yield of oyster mushroom (*Pleurotus ostreatus*). *Assiut J. Agric. Sci.* 42:424-433 (special issue, The 5th conf. Young Scientists, Faculty Agric, Assiut University, May 8th 2011.
- Wang Xiang-hua, Liu Pei-Gui & Yu Fu-Qiang, 2004. Color atlas of wild commercial mushrooms in Yunnan, China. Yunnan Sciences & Technology Press 1-136.
- Zakhary, J. W., M Taiseer, A. Abo-Bakr, R. El-Mahdy, A. Shehata and M. El-Tabey. 1983. Chemical composition of wild mushrooms collected from Alexandria, Egypt. *Food Chemistry*, 11(1):31-41.

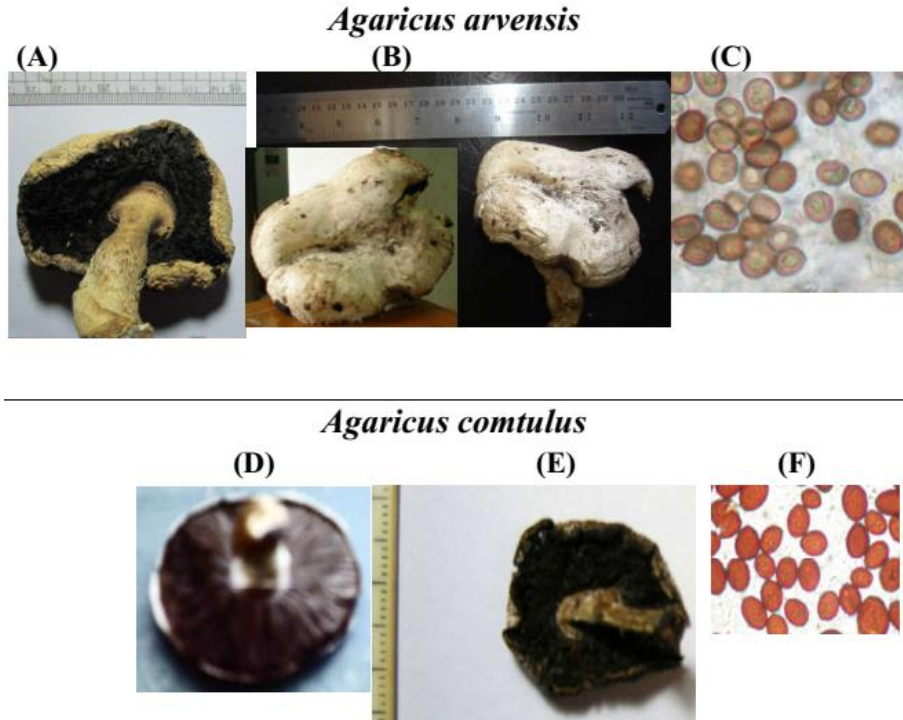


Fig. (1): Photograph showing fruiting bodies (Pileus, Lamellae and Stipe) and spores of *Agaricus arvensis* (Fig.1A, B and C) and *A. comtulus* (Fig.1D, E and F) mushrooms.

تعريف فطريات راقية صالحة للغذاء الأدمى نامية فى حاله بريه فى اسيوط

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الملخص :

تعتبر الفطريات الراقية (عيش الغراب) المزروع والبرى منه مصدرا جيدا للغذاء الأدمى والاستخدامات الطبية ، بالإضافة لما له من دور فى تدوير المخلفات العضويه الزراعيه. وقد تم من ذى قبل رصد وجود الأنواع التاليه فى حاله البريه فى مصر *Agaricus campestris*, *Agaricus rodmani* and *Collybia sp.* ، وكذلك تم توصيفها إلا أن هذه الدراسات لم تتم فى صعيد مصر ، فى الدراسه الحاليه نرصد وجود نوعان اضافيان للجنس *Agaricus* فى حاله البريه فى محافظة اسيوط وتوصيفهما توصيف مورفولوجى وميكروسكوبى دقيق ، وقد يمكن البناء على هذه الدراسه لإستئناس وانتخاب سلالات جديده من عيش الغراب للجنس *Agaricus* أكثر توائما مع الظروف البيئيه السانده فى صعيد مصر.