



Morphological Study of some Mushroom species distributed in District Charsadda, Khyber Pakhtunkhwa Province, Pakistan

T. YASEEN⁺⁺, M. SHAKEEL*, G. NAWAZ

Department of Botany, Bacha Khan University, Charsadda, Khyber Pakhtunkhwa Province, Pakistan

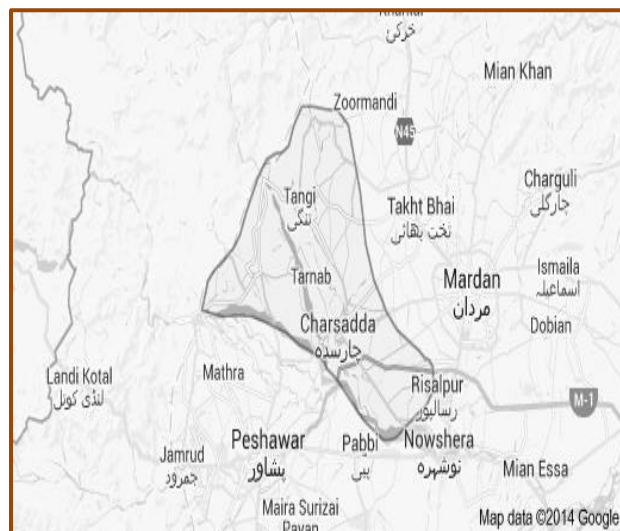
Received 6th March 2017 and Revised 17th August 2017

Abstract: The morphological study of Mushrooms found in District Charsadda have been ignored in past. The survey was arranged during 2014-15 in 4 sites of District Charsadda, Khyber Pakhtunkhwa (KP) province, Pakistan named, Islamabad no1, Hisara Yaseenzai, Shulgara, and Turangzai. Twenty three mushrooms belonging to 12 families were identified from District Charsadda. Among the selected mushrooms spp. *Agaricaceae* as the dominant genus (25%) while *Mycenaceae* (10%) as second major family represented by 2 species, *Polyporaceae* (10%) having 2 species while *Hymenogasteraceae*, *Pleurotaceae*, *Strophariaceae*, *Merullaceae*, *Lepiotaceae*, *Ganodermataceae*, *Bolbitaceae*, *Cantharalaceae*, *Psathyrellaceae* and *Marasmiaceae* having 1 spp each (5%). The present study also show a sharp differences in habit and habitat. Morphological surveys demonstrate that some spp. are edible while some are non-edible. This study provides important information about mushrooms morphology and their species richness in different locations of District Charsadda which may be useful for future research work on mushrooms.

Keywords: Charsadda, Mushrooms 23 species, 12 families, Morphological studies.

1. INTRODUCTION

Charsadda is seventeen miles away from Peshawar located in the West of KP and is bounded by Malakand District on the North and Mardan on the East. There are three rivers in Charsadda i.e. River Jindi, Kabul River, and Swat River which are the main sources of irrigation. The hottest month is June, with 11 mm of rainfall. The average temperatures vary by 22.9°C. January has the lowest average temperature of the year i.e. 10.4 °C.



Map

The word "mushroom" has been derived from French mouse which mean moss (*mousse*). Psilocybin mushrooms have psychedelic characters known as "magic mushrooms" or "shrooms", Psilocybin mushrooms facilitating life-changing insights often described as mystical experiences (Griffith *et al.*, 2008).

Edible mushrooms are used as a major food source in many countries especially in China. Recommended by nutritionist to use as a meat(s), vegetables, and mushrooms) (Hu, 2005). In the past, domestication and cultivation of Edible mushrooms were so difficult. In southern Asia, people collected them from woodlands (Yang *et al.*, 2008). Mushrooms are explored and investigated as their broad range of utilization i.e. as food, as medicine etc. (Alice and Kustudia, 2004). Edible mushrooms, *Pleurotus pulmonarius* and *Pleurotus ostreatus*, showed profound anti-inflammatory and immune modulatory properties because of their physiological and anatomical composition (Lavi *et al.*, 2010; Selegue *et al.*, 2009) and *Morchella elata* was found more remarkable scavenger (Kalvoncu *et al.*, 2010). *Grifolin* extracted from *Boletus pseudocalopus* composed of anticancer and scavenging properties (Song *et al.*, 2009). Some species of mushroom were used against bacteria like *Hedyotis* species, *P. ostreatus* and *M. giganteus*, were found to be active against bacteria and yeast (Kalvoncu *et al.*, 2010; Ahmad *et al.*, 2005). While some species like *Galerina autumnalis*, *G. marginatus*, *G. venenata*,

⁺⁺Corresponding author: email: sciences111@yahoo.com

*Department of Biotechnology, Bacha Khan University Charsadda, Khyber Pakhtunkhwa Province Pakistan

Lepiotajosserandii, *L. helveola*, *L. castanea*, and *Amanitasmithiana* were toxins (West *et al.*, 2009; Danel *et al.*, 2001). *Amanita phalloides* was having a haemolytic toxin (Erguven *et al.*, 2007). While *A. Phalloides* was found to more dangerous than others and it causes a cutemultiorgan failure. In Swat (Pakistan), am toxin was established which was responsible for gastrointestinal and renal failure (Hydzik *et al.*, 2005). Mushroom cultivation a rewarding agribusiness in Pakistan that might improve the economic status of farmers (Flores, 2006; Sher, 2006; Shah *et al.*, 2004; Alam and Raza, 2001). Different mycologist worked on about more than hundred hallucinogenic mushrooms (Guzmán, Allen and Garrtz, 2000). There was a great complexity found in the description of hallucinogenic mushrooms because of chemical constituent. Geographical distribution of various mushrooms spp. Has continuously been revised by mycologists (Courtecuise and Deveaux, 2004).

2. MATERIALS AND METHODS

Collection site

The studied Sites include Islamabad No1, Hisara Yaseenzai, Shulgara, Turangzaiis located in District Charsadda of the KP province, Pakistan. Its boundaries were larger than today lying between 34°2' and 34°32' N. and 71° 30' and 71° 56'E, with an area of 380 square miles (980 km²) and soil usefully sandy loam.

Mushroom collection

Various species adopted various fruiting bodies phonologies, which are different from season to season and locality to locality. Collections of mushrooms were made in different seasons (October-December) 2014-15. Mushrooms were collected carefully by using forceps and hands while the mushrooms growing on their host/habitat were collected along with them. The photographs were taken in their natural habitat. Every species was wrapped in the paper envelop along with date of collection, habitat, locality and specimen number.

Mushroom identification

The collected specimens were brought to the laboratory. The Phonological characters were recorded for identification and up to species level with the help of available literature, based on the mature mushroom characters (Kishwar, *et al.*, 2013).

Preservation

The mushroom species were preserved in Formalin solution, dried and some preserved in Formalin Acetic Acid solution.

3. RESULTS AND DISCUSSION

A survey was conducted in different sites of District Charsadda KP Province Pakistan i.e. Islamabad No 1, Hisara Yaseenzai, Shulgara and Turangzai during 2014-15. Twenty three species belonging to 12 families were selected (found) from District Charsadda. All the species identification was made on the basis of their morphology (Sultana *et al.*, 2013). Our results showed that some mushrooms were edible while some were non edible (**Table 1**). Our results agree with Kishwar *et al.*, 2007) who reported that there are about 400 spp. of mushrooms. About 44 were observed to be edible out of 56. Edible mushrooms have been considered to a best diet for obese peoples and for diabetic's persons to prevent hyperglycaemia (Khatun *et al.* 2011). This study revealed that family *Agaricaceae* was found as most dominant family comprising 8 spp. (35%) in the study area. Our results were supported by Farooq *et al.*, (2013), where 25 species belonging to 9 families and fourteen genera were investigated from the soon valley, among which *Agaricus* was predominant species (36%) then *Innocybe* (12%) and *Mycenaceae* (8.69%) as second major family represented by 2 species and followed by *Polyporaceae* (8.69%) having 2 spp. Our results match with the results of others (Bankole, and Adekunle, 2012) who stated that the mushrooms are abundant various parts of Lagos environs. Mushrooms may occur on variety of habitats i.e. soil, dung, wood etc. In this study, soil was found as major habitat as 7 species were explored growing on the trees/woods, while some species were identified growing on the dung and while remaining species were found on the ground in the research area. Our result match with the investigation of Sher *et al.*, (2011) who stated that the main factor affecting stalk height, stalk diameter and cap size in mushroom are the ecological temperature i.e. humidity, fresh air and compact material and also supported by Seymour, (2004) that the lowest temperature and drought condition reduced the stalk height and cap size of mushroom. Occurrence of mushroom greatly varies between different locations of the study area. Eight species were recorded from Hisara Yaseenzai, 5 species from Sholgara, 4 from Turangzai and 3 from Islamabad No 1. These variations may be due to soil composition, soil moistening, dead remains and proper temperature. Our results are in agreement with the earlier reports where environmental factors were demonstrated to affect the growth of mushroom (Alexander *et al.*, 2002). This variation in presence of mushroom species in different habitat was due to their particular mode of nutrition. Our results were also supported by Beharilalldhar *et al.*, (2011) who reported that all the mushroom species exhibited remarkable variation in terms of habitat, season and locations.

Table 1: Morphological Characteristic of Some Mushroom found at District Charsadda.

S. No	Scientific Name	Family	Location	Habitat	Season	Cap colour	Stipe colour
1	<i>Agaricuscampestris</i>	<i>Agaricaceae</i>	Charsadda	Fields and grassy areas	Rainy	White later pink	White
2	<i>Coprinuscomatus</i>	<i>Coprinusaceae</i>	Charsadda	Green areas	Spring	Blackish	White to Pink
3	<i>Agaricusarvensis</i>	<i>Agaricaceae</i>	Charsadda	Soil contain organic matter	Rainy	White colour becoming yellow	White to pink
4	<i>Agaricusbisporus</i>	<i>Agaricaceae</i>	Charsadda	Shady and wet soil	Rainy	Grayish	White
5	<i>Bolbitusedulis</i>	<i>Bolbitaceae</i>	Charsadda	The base of tree	Winter	Brown	White
6	<i>Cantharelluscitarius</i>	<i>Cantherelaceae</i>	Charsadda	Green areas	Winter	White	White
7	<i>Coprinellusmicaceus</i>	<i>Psathyrellaceae</i>	Charsadda	The hollow roots of tree	Spring	Brown	White to Brown
8	<i>Coprinuscomatus</i>	<i>Coprinusaceae</i>	Charsadda	Soil contain organic matter	Rainy	Blackish	White to Pink
9	<i>Coprinusmicaceus</i>	<i>Psathyrellaceae</i>	Charsadda	Dung	Winter	White	White to Brown
10	<i>Morchellaesculenta</i>	<i>Morchellaceae</i>	Charsadda	Attach with woodtree	Spring	Yellow - brown	white
11	<i>Lepiota specie</i>	<i>Agaricaceae</i>	Charsadda	Grass	Rainy	white	White
12	<i>Macrolepiotarachodes</i>	<i>Agaricaceae</i>	Charsadda	Wet soil among grass	Rainy	Brown	White
13	<i>Lycoperdonechinatus</i>	<i>Agaricaceae</i>	Charsadda	Grass	Rainy	White	White
14	<i>Macrolepiotarachodes</i>	<i>Agaricaceae</i>	Charsadda	Grass	Rainy	White	White
15	<i>Mycenaflavoalba</i>	<i>Mycenaceae</i>	Charsadda	Greenygrass under shade	Winter	ivory-white to yellowish	White to creamy
16	<i>Mycenapolygramma</i>	<i>Mycenaceae</i>	Charsadda	Dung/ organic matte	Winter	Gray-brown	Black
17	<i>Omphalotusolearius</i>	<i>Marasmiaceae</i>	Charsadda	Surface of dead trees	Rainy	Dark brown	Brown
18	<i>Bovistaplumbea</i>	<i>Agaricaceae</i>	Charsadda	Ground, among grasses	Rainy	Dark-brow	Brown
19	<i>Pholiotasquarrosa</i>	<i>Strophariaceae</i>	Charsadda	The bank of tree	Summer	Yellowish to Light brown	Brown
20	<i>Pleurotusostreatus</i>	<i>Pleurotaceae</i>	Charsadda	Base of tree trunk	Rainy	White or cream	greyish
21	<i>Polypurssquamosus</i>	<i>Polyporaceae</i>	Charsadda	Dead tree base	Winter	Yellowish	Brown to redish brown
22	<i>Psilocybesemilenceate</i>	<i>Hymenogastraceae</i>	Charsadda	Grass land	Winter/ Rainy	Yellow to brown	Light brown
23	<i>Trametesversecular</i>	<i>Polyporaceae</i>	Charsadda	The trunks tree	Spring	Brown and white	white in colour

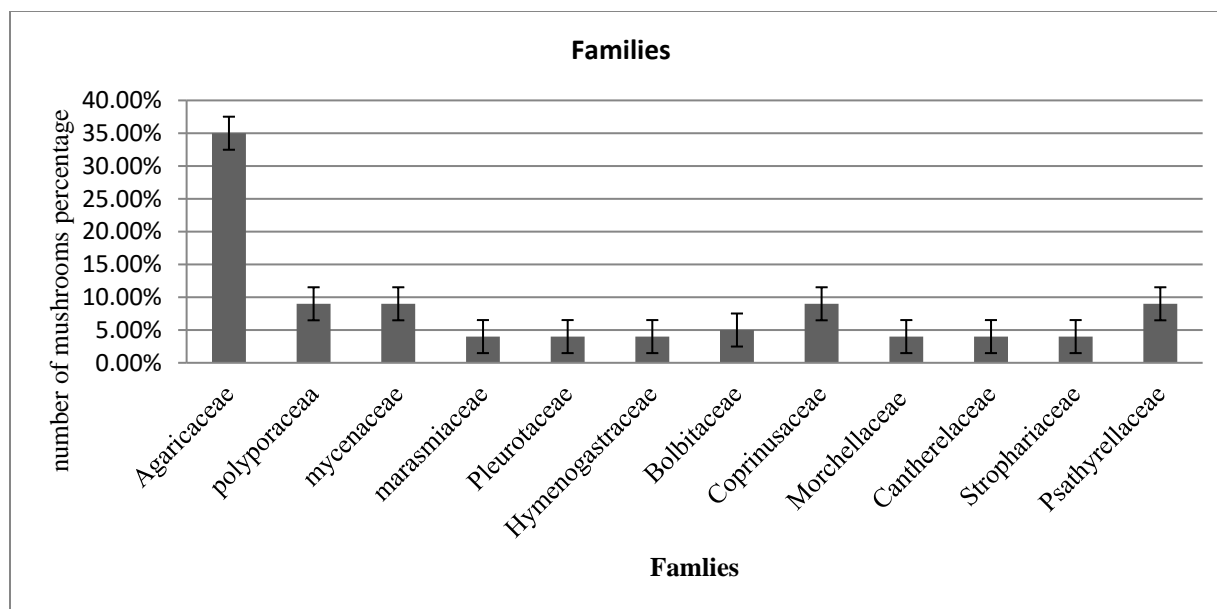


Fig.1:Percentage composition of Mushrooms families recorded during the study.

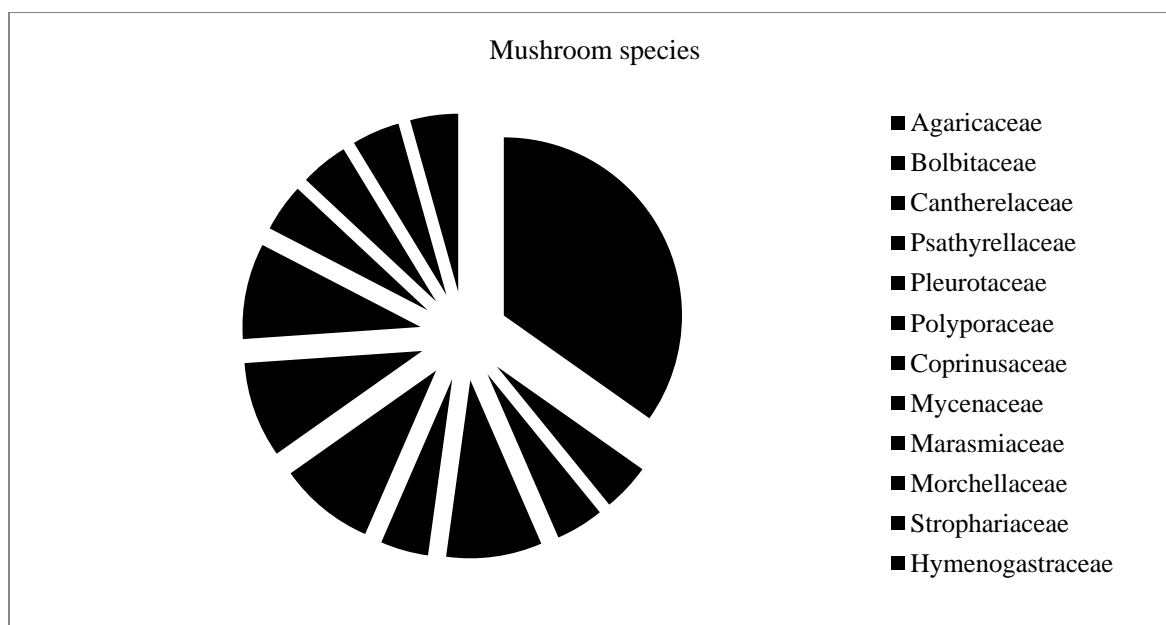


Fig.2:Distribution of Mushroom species in different families of District Charsadda, KP Province

REFERENCES:

- Ahmad, R., A. M. Ali, D. A. Israf, N. H. Ismail, K. Shaari and N. H. Lajis, (2005). Antioxidant, radical-scavenging, anti-inflammatory, cytotoxic and antibacterial activities of methanolic extracts of some *Hedyotis* species. *Life Sci.*, 76(17): 1953-1964.
- Alam, S. M and S. M. Raza, (2001). Importance of Mushrooms. Industry, NIA, Tandojam, Pakistan. Industry and Economy, issue 40.
- Alexander, S. J., J. F. Weig and K. A. Blatner, (2002). Value estimate of commercial mushroom and timber in the Pacific Northwest. *J Environ. Manage.*, 30(1): 129-141.
- Alice, B and K. Michael, (2004). Mushroom Cultivation and Marketing. *NCAT ATTRA.*, 087(75): 1-24.
- Bankole, P. O and A. A. Adekunle, (2012). Studies on biodiversity of some mushrooms collected in Lagos State, Nigeria using biotechnological methods. *Journal of Yeast and Fungal Res.*, 3(4): 37-48.
- Behari, L.D., S. Neeraj, K. Jitendra, T. Sonika and A. Priyanka, (2011). Cultivated Edible Specialty

- Mushrooms-Scope In India And EuCountries. Proceedings of the 7th International Conference on Mushroom Biology and Mushroom Products (ICMBMP7, Arcachon France 4-7 October Vol. 1, Oral Presentation.
- Courtecuisse, R. and M. Deveau, (2004). Mycology and toxicology of hallucinogenic mushrooms in Europe and America. *Annals of Toxicology Analytique.*, 15(1): 36-41.
- Danel, V. C., P. F. Saviuc and D. Garon, (2001). Main features of *Cartinarius* spp. Poisoning: a literature reviews. *Toxicol.*, 39(7): 1053-1060.
- Erguven, M., O. Yilmaz, M. Deveci, N. Aksu, F. Dursun, M. Pelit and N. Cebeci, (2007). Mushroom poisoning. *Ind. J. Pediatr.*, 74(9): 847-852.
- Flores, C., (2006). High-value wild mushrooms—A livelihood development strategy for earthquake affected Pakistan. *Agriculture Development Specialist, East-West Management Institute*, 575 Madison Ave, 25th floor, New York, USA. 10022, 1-8.
- Griffiths, R., W. Richards, M. Johnson, U. McCann and R. Jesse, (2008). "Mystical-type experiences occasioned by psilocybin mediate the attribution of personal meaning and spiritual significance 14 months later". *J. psychopharmacol.*, 22 (6):621-622.
- Guzmán, G., J. W. Allen and J. Garritz, (2000). 'A Worldwide Geographical Distribution of the Neurotropic Fungi, An Analysis and Discussion', *Annali dei Musei civici Rovereto, Italia*. 14:1890-280.
- Hassan, S., M. Al-Yemeni and K. Khan, (2011). Cultivation of the oyster mushroom (*Pleurotus ostreatus* (Jacq.) Kumm.) in two different agroecological zones of Pakistan. *Afri J Biotech.*, 10 (2):183-188.
- Hu, D, (2005). Project Report 5: Chinese Food Culture and Mushroom. The Agricultural Economics Institute (LEI) of Wageningen University: Wageningen, The Netherlands, 22.
- Hydzik, P., T. Gawlikowski, K. Ciszowski, N. Kwella, A. J. Sein, M. Wojcicki, J. Lubikowski and M. C. Zupravska, (2005). Liver albumin dialysis (MARS)-treatment of choice in *Amanita phalloides* poisoning? *Przegl. Lek.* 62(6): 475-479.
- Jan, M. A., T. S. Siddiqui, N. Ahmed, I. Ul-Haq and Z. Khan, (2008). Mushroom poisoning in children: clinical presentation and outcome. *J. Ayub Med. Coll. Abbottabad*, 20(2): 99-101.
- Kalvoncu, F., M. Oskay, H. Saglam, T. F. Erdogan and A. U. Tamer, (2010). Antimicrobial and antioxidant activities of 10 wild mushroom species. *J. Med. Food.* 13(2):415-419.
- Kishwar, S., K. Z. Shinwari and I. Farida, (2007). Diversity of edible mushroom in Pakistan. *Pakistan j. Agric. Res.*, (20): 1-2.
- Lavi, I., D. Levinson, I. Peri, Y. Hadar, B. Schwartz, (2010). Orally administered glucans from the edible mushroom *Pleurotus pulmonarius* reduce acute inflammation in dextran sulfate sodium-induced experimental colitis. *Br. J. Nutr.*, 103(3): 393-402.
- Muhammad, F., A. Akram, R. Afzal and K. Sultana, (2013). Ethno-Morphological Studies of Mushrooms Collected From Soon Valley. *IOSR J. Pharm. and Biolog. Sci.*, 8(5): 05-11.
- Seymour, G. K. (2004). Strategic Mushroom Pest and Disease management Down under. The Australian mushrooms growers association locked Bag 3, 2 Forbes St, Windsor, NSW, Australian. 373-378.
- Selegue, M., M. V. Putz and T. Rugea, (2009). Effect of the Polysaccharide Extract from the Edible Mushroom *Pleurotus ostreatus* against Infectious Bursal Disease Virus. *Int. J. Mol. Sci.*, 10(8): 3616-3634.
- Selima, K., I. Aminul, C. Ugur and C. Narayan Chatterjee, (2011). Research on Mushroom as a Potential Source of Nutraceuticals: A Review on Indian Perspective. *Ameri J Exp Agric.*, 2(1): 47-73.
- Shah, Z. A., M. Ashraf and M. Ishtiaq, (2004). Comparative study on cultivation and yield performance of oyster mushroom (*Pleurotus ostreatus*) on different substrates (Wheat straw, Leaves, saw dust). *Pak. J. Nutri.*, (3): 158-160.
- Sher, H., (2006). Ecological and economic evaluation of some Morels Mushroom (*Morchella* Spp). *J. Wild Mushroom.*, 33(4): 23-44.
- Song, J., M. M. Manir and S. S. Moon, (2009). Cytotoxic grifolin derivatives isolated from the wild mushroom *Boletus pseudocalopus* (Basidiomycetes). *Chem. Biodivers.* 6(9): 1435-1442.
- West, P.L., B. Z. Horowitz, (2009). *Amanita smithiana* mushroom ingestion: a case of delayed renal failure and literature review. *J. Med. Toxicol.*, 5(1):32-38.
- Yang, X., J. He, C. Li, J. Ma, Y. Yang and J. Xu, (2008). Matsutake trade in Yunnan Province, China: An overview. *Econ. Bot.*, (62): 269-277.