

RESEARCH ARTICLE

Exploring edible and medicinal mushrooms: Ethnomycological insights from Samarkand, Jizzakh and Kashkadarya regions of Uzbekistan

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ARTICLE HISTORY

Received: 19 March 2024

Accepted: 15 December 2024

Available online

Version 1.0 : 10 April 2025



Additional information

Peer review: Publisher thanks Sectional Editor and the other anonymous reviewers for their contribution to the peer review of this work.

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Indexing: Plant Science Today, published by Horizon e-Publishing Group, is covered by Scopus, Web of Science, BIOSIS Previews, Clarivate Analytics, NAAS, UGC Care, etc See https://horizonepublishing.com/journals/index.php/PST/indexing_abstracting

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CITE THIS ARTICLE

Ilyor MM, Olim KK, Dilovar TK, Malika MI, Zoirjon SI, Jamila PS. Exploring edible and medicinal mushrooms: Ethnomycological insights from Samarkand, Jizzakh and Kashkadarya regions of Uzbekistan. Plant Science Today (Early Access). <https://doi.org/10.14719/pst.3571>

Abstract

The knowledge about wild edible and medicinal mushrooms within local communities is passed from one generation to the next, this being one of the few fragile but effective ways of perpetuating knowledge. Documenting ethnomycological data is an important way to validate or correct the identification of specimens and the preservation of these natural resources with cultivation potential, thus improving their consumption and utilization for medicinal purposes. In recent years, there has been a growing focus on ethnobotanical and ethnomycological studies in Uzbekistan. Ethnomycological research carried out between 2022 and 2023 years in the Samarkand (SR), Jizzakh (JR) and Kashkadarya (KR) regions of Uzbekistan, presents valuable information about the most consumed and medicinally significant mushrooms. Uzbekistan does not have a rich traditional usage of Wild Edible and Medicinal Mushrooms (WEMMs) for culinary and medicinal purposes. Despite this fact, the existence of specific historically formed traditions on the use of wild edible and medicinal mushrooms in SR, JR and KR was reflected in the conducted ethnomycological research. Moreover, research aimed at collecting ethnomycological data based on interviews with informants has not previously been conducted in these regions. A total of 11 species of WEMMs belonging to seven families and ten genera *Morchella*, *Agaricus*, *Pleurotus*, *Inonotus*, *Stropharia*, *Lepista*, *Calvatia*, *Bovista*) are used by the inhabitants of the SR, JR and KR. Information regarding their traditional ethnomycological knowledge is provided.

Keywords

mushroom; edible; medicinal; ethnomycology; traditional knowledge

Introduction

Edible and medicinal mushrooms, predominantly classified under the Basidiomycetes class, alongside some species falling into the Ascomycetes class, have long served as essential components of human sustenance and health. Being abundant in protein, nutrients, vitamins and minerals has made them a staple in traditional diets and medical practices across cultures (1). As many as 2189 species of edible fungi have been reported to be in use worldwide (2, 3), but only around 25 species are widely accepted as food and few are commercially cultivated (4).

However, there is not an easy distinction between edible and medicinal mushrooms because many of the common edible species have therapeutic properties and several used for medical purposes are also edible (5).

Ethnomycology is a relatively new interdisciplinary field that investigates traditional knowledge, as well as cultural and environmental effects, of the association between human societies and fungi (6). Ethnomycological studies on wild edible and medicinal mushrooms have been carried out in different parts of the world (6-10).

In SR, JR and KR regions of Uzbekistan, several mycological studies were conducted in the field of the taxonomy and ecology of micro- and macrofungi (11-19). In recent years, there has been a growing focus on ethnobotanical and ethnomycological studies in Uzbekistan, highlighting the valuable research conducted by Mustafaev and others in the Jizzakh region, as well as the contributions of Gaffarov et al. (2023), particularly regarding the biodiversity of poroid fungi in the country (20, 21). These studies not only enhance our understanding of Uzbekistan's fungal diversity but also provide valuable ethnomycological insights gleaned from literature data (22-25).

Despite many benefits, the use of edible and medicinal mushrooms is not common in Uzbek society due to: (1) cases of food poisoning after consumption of toxic mushrooms, (2) urbanization and the shift from forestry to agriculture, decreased availability of wild edible mushrooms and (3) lack of a local guide to identify edible and poisonous mushrooms.

In this study, we present valuable information about the wild edible and medicinally significant mushrooms based on ethnomycological study in Samarkand (SR), Jizzakh (JR) and Kashkadarya (KR) regions of Uzbekistan, between 2021 and 2023. The main goal of the conducted research is to collect the ethnomycological information available among the people, to popularize this information among the scientific communities and to pass it on to the next generations.

Materials and Methods

Study area

Uzbekistan is divided into 12 provinces and one autonomous republic with desert and mountainous areas, where continental climate mainly prevails. It is one of the most diverse regions in the world with respect to both fauna and flora and it is considered a remarkable collection of many species of medicinal plants (26). The research was conducted in SR, JR and KR regions (Fig. 1).

The Samarkand region holds significant economic and cultural importance within the Republic of Uzbekistan, situated in the country's central region. The territory expands to 16.77 thousand km² (3.7 % of the total area of the republic, 7 th place in terms of area). The administrative center of the region is Samarkand, the second most populous city in Uzbekistan (more than 510 000 inhabitants) and one of the oldest existing cities in the world, has been in the UNESCO World Heritage List. Geographically, this territory is in the Zeravshan River basin, in its middle reaches. In geomorphological terms, there is a smaller flat part that occupies the center of the region (Zeravshan valley) and its south-west (Karnabchul). From the north, the Zeravshan valley is limited by the Nurata Mountains, consisting of two parallel mountain ranges separated by the intermountain Nurata valley. The Samarkand region includes the central part of the southern slope of the Nuratau ridge, the eastern part of the Aktau ridge, the Karakchitau ridge and the southern slope of the Khobduntau ridge. From the south, the Zeravshan valley is bordered by the Zeravshan ridge (the border of the region follows its watershed) and its western spurs - the low Zirabulak-Ziadin mountains, consisting of several low ridges (Makhmud-tau, Turytau, Beshtau, Mirkhaidar, Kyzbibibi, etc.). According to its natural and climatic conditions, the Samarkand region falls within a continental arid climate (27).

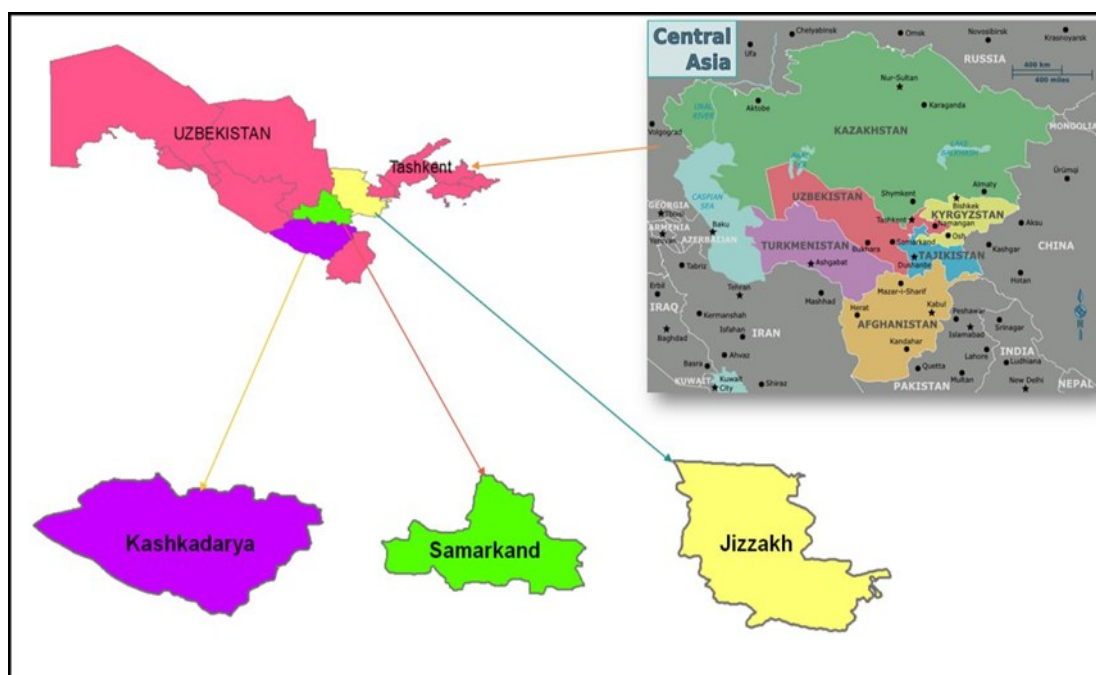


Fig. 1. Location map of the study area.

The Jizzakh region was established in 1973. The area of the region is 21.2 thousand km² (about 5 % of the country's territory). Geographically, the study area is in the interfluvium of the Syrdarya and Zeravshan. It includes the southeastern part of the Kyzylkum desert, the eastern half of the Aidar-Arnasay system of lakes, the western part of the Hungry Steppe, the eastern part of the Nurata Mountains with adjacent outcrops and the foothill plain (Farish steppe), the Malguzar ridge and the northern slope of the Turkestan ridge (28).

Kashkadarya region ranks 4th in area (28.4 thousand km²) and 3rd in population (more than 3 million people). Arable lands occupy 682.7 thousand hectares 24 % of the region's territory). The forested area is 109.58 thousand hectares (3.8% of the territory). In the north, the region borders with Samarkand, in the north-west with Bukhara, in the south-east with Surkhandarya region, in the south-west with Turkmenistan and in the east with Tajikistan. In physical and geographical terms, the territory of the region almost completely covers the drainage basin of the Kashkadarya River. The range of absolute altitudes in the area varies from 250-260 to 4,425 meters above sea level. This region is distinguished by great landscape and phytocenotic diversity and exceptionally rich flora. Almost the entire diversity of Uzbekistan's landscapes is represented here, from sandy, clayey and saline deserts to high mountain subnival and nival ecosystems (29).

Ethnomycological data collection

The ethnomycological study was carried out between 2022 and 2023 years. Sixty informants, aged between 40 and 70 years, were interviewed to gather ethnomycological data on WEMMs usage. All informants were interviewed at least twice for the collection of information regarding historical background, edibility status, traditional usage, methods of preservation, commercial importance of fleshy fungi and possible reasons for lower diversity of wild edible fungus in the region. The verification of the macrofungal species was done in the months of the rainy season and the informants were requested to escort us during the field visit to confirm the species and information thereof. The identification of specimens and photographs already in our possession was also utilized in the research. In addition, scientific names of wild edible and medicinal fungi were checked for potential synonyms in Index Fungorum and Mycobank (30, 31)

Results

Species' Diversity, Taxonomic Treatment and Folk taxonomy of WEMMs

This study reports the identification of 11 species of wild edible and medicinal mushrooms (WEMMs), classified under eight genera and seven families, utilized by local communities (Table 1, Fig. 1A-F, Fig. 2G-J). Fresh specimens were primarily collected between 2021 and 2023 from the mountainous regions of SR, JR and KR in Uzbekistan. The documentation includes ethnomycological data and

traditional knowledge regarding the uses of WEMMs, gathered from informants, of whom 28 % were female and 72 % were male.

Agaricaceae, Pleurotaceae and Morchellaceae with 1 genus and 2 species each, Lycoperdaceae with 2 genera and 2 species were the most represented families. In the present study, most of the local respondents did not come out with a good deal of descriptive vocabulary with respect to morphology, growth and habit of macrofungi. For this reason, we used the literature and our own data to give a brief morphological description of the species.

Agaricus bitorquis (Quél.) Sacc., Syll. fung. (Abellini) 5: 998 (1887) (Table 1. Fig. 2a)

Description: Pileus (30-)50(-70) mm in diam., thick, fleshy, convex when young, finally broadly convex-applanate, surface is silky to fibrillose, white when young, bruising ochraceous brown, with soil particles often adhering to surface; margin is thin, inrolled edge with remnants of veil when young; lamellae insertion free, thin, crowded, pink when young, finally moderate brown to dark brown, edge pale and sterile; trama is parallel to irregular. Stipe 25-45 x 10-30 mm, central, solid, cylindrical, to widening at center, base narrowing, surface smooth to fibrillose, white above annulus, browning below annulus. Annulus double: lower brownish, peronate, prominent; upper white, pendant, surface fibrillose, indistinct. Flesh slowly becoming reddish brown on cutting or on bruising; odour and taste pleasant (32).

Habitat: This species is primarily found in urban areas, growing in soil. It is good edible quality. Fruiting occurs mainly in spring, specifically from April to May. Local inhabitants commonly gather and consume it, often prepared as fried dishes.

Agaricus campestris L. [as 'campester'], Sp. pl. 2: 1173 (1753) (Table 1. Fig. 2A)

Description: Pileus is 60-100 mm diameter., medium thickness, fleshy, spherical when young, finally convex-applanate, surface is silky smooth, white (N9.5) when young, finally pinkish, bruising red; margin inrolled when young, finally straight, with remnants of veil; lamellae insertion free, thin, crowded, pale pink when young, finally stronger pink then brown; edge concolorous, fertile; trama is parallel to irregular. Stipe is 50-80 x 10-15 mm, central, solid, cylindrical, narrowing at base, surface smooth, floccose at apex, white, bruising reddish. Annulus is thin, wide, pendant, brownish above, white below, silky surface. Flesh is white, quickly reddening upon cutting or bruising; odour and taste are pleasant (32).

Habitat: Typically found in open areas within grasslands, abundant in humus-rich soil. It demonstrates high culinary quality and is considered palatable. It is predominantly observed in urban environments, particularly on soil.

Culinary use: Possesses good edible quality. Fruiting typically occurs in April-May during the spring season. It is locally referred to as "Oq zamburug" or "Qo`zidumba". This species is often gathered and consumed, with frying being a common method of preparation.

***Bovista plumbea* Pers., Ann. Bot. (Usteri) 15: 4 (1795) (Table 1. Fig. 2B)**

Description: Gasterocarps is usually in small groups, subglobose, compressed either from the sides or from top to bottom, 2-3.5 (up to 5) cm in height and 2-3 (up to 5.5) cm in width, with 0.5-0.7 cm rhizomorph binding soil particles. Exoperidium almost smooth, 3C to 5E in colour, sometimes with a reddish tint. After maturation, exoperidium becomes very thin and wears off like layers of old paint, revealing a mat 34 (Smoke grey) endoperidium. Mature gleba has 16 (Cigar brown), 17 (Snuff brown) to 26 (Sepia) endoperidium. Spore print is brown to sepia. Capillitium of "Bovista" type is light brown, with main branches up to 15-20 µm in diameter., thick-walled, non-poroid, non-septate. Basidiospores 4.5-6 × 4-5.5 µm, subglobose to ovoid, yellow to light brown, finely asperulate under light microscopy (33).

Habitat: Typically found among short grass in various open environments such as meadows, pastures, lawns, downlands and roadside verges. Occasionally it is observed in coastal turf and dunes and infrequently in open woodland areas.

Ethnomedicinal use: Ethnomycological surveys conducted in the Kattakurgan district of the Samarkand region revealed intriguing insights into local mushroom utilization practices. Predominantly among the elderly population, particularly women, the collection and preservation of mature fruiting bodies of *Bovista plumbea*, locally referred to as "eshakhina," were observed. These individuals attribute medicinal properties to the powdered form of this mushroom, believing it aids in treating burns and purulent wounds.

***Calvatia gigantea* (Batsch) Lloyd, Mycol. Writ. 1 (Lycoperd. Australia) 1: 166 (1904), (Table 1. Fig. 2C)**

Description: *Calvatia gigantea*, commonly called giant puffball, is widespread in the temperate zone. It develops one of the world's largest basidiomata from a single primordium. The exoperidium of *Calvatia* species is only one layer and it does not have the pseudoparenchymatous endostratum typical of all other Lycoperdaceae. This is the reason that peridia of *C. gigantea* are thin and light in weight, only taking less than 10% of the whole fruiting body weight (34).

Habitat: Typically found in meadows, gardens, fields, compost heaps and rich deciduous forests. It is also observed in open woodland areas.

Ethnomedicinal use: While collecting ethnomycological data, valuable insights were obtained from the mountainous people of the Forish district of the JR. Locally known as "Ilon telpak" (snake hat) in Uzbek and "Telpaki mor" in Tajik, this mushroom holds significance in traditional medicine practices. It is utilized for treating various types of wounds in horses and donkeys. The fruiting bodies are dried and stored in cloth bags. When required, the spore powders are meticulously mixed with ordinary Vaseline and applied to wounds.

***Inonotus hispidus* (Bull.) P. Karst., Meddn Soc. Fauna Flora fenn. 5: 39 (1879), (Table 1. Fig. 2D)**

Description: Basidiomes are annual, sessile, applanate, dimidiate, solitary rarely imbricate, effused up to 30 cm long and 8 cm thick; sterile surface is slightly undulating, hispid,

hirsute to rarely strigose, azonate, rough, watery, spongy, soft when fresh, reddish orange when young, dark reddish brown to dark brown to blackish when old, margin obtuse, concolorous with pilear surface; pore surface olivaceous yellow becoming brown to blackish-brown; pores angular and variable in size, 1-3 per mm, but often wider with thin and lacerate dissepiments. Large holes irregularly placed among pores, 2-4 mm wide, exude hyaline drops of liquid. Context is azonate, spongy, hygrophanous, fleshy when fresh, brittle when dry, reddish brown to dark brown, up to 5 cm thick; it turns black when exposed to potassium hydroxide (KOH); tube yellowish brown to dark brown, up to 10-20 mm thick (23).

Habitat: Typically found growing on living *Juglans* spp. (walnuts), *Morus* spp. (mulberries) and numerous other woody angiosperms. It is common and widespread in gardens, parks, orchards and forests.

Local handicraft use: Among the local population of the Forish district (JR), observations were made regarding the historical use of *Inonotus hispidus*, referred to as "Pukak" in Uzbek. This mushroom was previously utilized as a natural dye in the yarn dyeing process, highlighting its versatile applications beyond culinary or medicinal realms.

***Lepista personata* (Fr.) Cooke, Handb. Brit. Fungi 1: 193 (1871), (Table 1. Fig. 2E)**

Description: The fruit body of *L. personata* (Fig.1) is quite large, fleshy. It consists of a rounded cap and a central leg. The cap is 5-15 cm in diameter, initially convex, then flat-curved, smooth, white yellowish with pink tones. During wet weather it is yellowish-watery. The lower part of the cap bears a lamellar hymenophore. The gills are frequent, adnate, descending, cream-pink in hue. Spore powder is pink. The stem is cylindrical, thickening downwards, fibrous, dense, without a ring and volva, 3-8 cm long, 1.5-3 cm in diameter; covered with lilac-purple scales (see Fig. 1), which determine the color of the surface of the stem, which is a kind of differentia specific. The flesh of the fruit body is whitish with a flour smell (35).

Habitat: Typically found in deciduous forests, meadows, forest edges and pastures.

Culinary use: Mushrooms are lightly cooked in oil, then chopped onions are added and the mixture is cooked together.

***Morchella esculenta* (L.) Pers., Neues Mag. Bot. 1: 116 (1794), (Table 1. Fig. 2F)**

Description: *Morchella esculenta*'s pileus is about 3-9 cm long, 2-5 cm wide, round or irregular pits are present. It looks yellow, brown or pale. Stipe is about 2 to 5 cm long, 1.5 to 3 cm thick and hollow. It is whitish to pale grey but at maturity becomes greyish brown. Stipes are slightly enlarged at the base. In fresh form the size of it varies from 2 cm to 15 cm while on drying the size reduces to 1 to 10 cm.

Habitat: Found on soil beneath deciduous trees, often among short grass.

Culinary use: Edible after heat treatment.

Morchella steppicola Zerova, Bot. Zh., Kyiv (J. bot. Acad. Sci. Ukr.) 2(1): 155 (1941), (Table 1. Fig. 3G)

Description: The fruit body consists of a cap and a stem. The cap is spherical or angularly spherical, sometimes slightly flattened at the sides or at the apex, often somewhat saddle-shaped, with honeycomb appearance, 5-15 cm high, 5-15 cm in diameter. It is grayish brown in color, hollow and is tightly attached to the stem. The stem is short, thick, cylindrical, 4-9 × 4-6 cm, wrinkled, grayish white, at first dense, with several hollows throughout development, or almost hollow inside. The flesh is dense, without a special smell. Fruit bodies can reach a height of 25 cm and a weight of up to 2 kg (36).

Habitat: *Morchella steppicola* is found in the forest-steppe and steppe regions of Eastern Europe, as well as the steppe regions of Central Asia (36). In the Kyzylqum region of JR and KR, it is commonly observed during March and April, particularly during the rainy season.

Culinary use: *Morchella steppicola* is popular among locals for its taste and consumption. Furthermore, the esteemed reputation of *Morchella steppicola*, commonly known as the steppe morel, among the residents of the Jizzakh region was emphasized. This delectable edible mushroom is eagerly consumed by locals, drawing gastronomic enthusiasts from various regions to partake in its harvest. It is often cooked by frying in oil with onions and sometimes with potatoes after thorough washing in water.

Additionally, it is believed to confer notable health benefits, further enhancing its appeal and cultural significance in the region.

Pleurotus eryngii (DC.) Quél., Mém. Soc. Émul. Montbéliard, Sér. 2 5: 112 (1872), (Table 1. Fig. 2H)

Description: *Pleurotus eryngii* - known as the king oyster mushroom grows in association with different members of the family Apiaceae (Umbelliferae) when humidity and temperature conditions are favourable. The nature of the relationship between *P. eryngii* and other umbellifers is contentious. Although some mycologists consider *P. eryngii* to be a weak parasite, they acknowledge its primarily saprophytic nature, contrasting it with its potential pathogenic behavior (37, 38).

Habitat: *P. eryngii* grows in association with *Ferula* plant roots in the soil, particularly in mountainous regions at altitudes ranging from 1000 to 2500 meters during the spring in Uzbekistan.

Culinary use: *P. eryngii*, known as "Chanbush" among mountain locals in Uzbekistan, is a popular edible mushroom. Freshly collected mushrooms are chopped into small pieces and lightly cooked in oil. Chopped onions are then added and the mixture is cooked together.

Ingredients: A bowl of chopped mushrooms, oil, 1-2 onions, salt.

According to ethnographic data gathered from shepherds in the village of Avazchul, Mirishkor district, Kashkadarya region, the steppe porcini mushroom, scientifically known as *P. eryngii* (DC.) Quél., holds culinary significance. Locally referred to as "Chanbush" or White

desert mushroom, this species is utilized in traditional dishes such as "Bichak" (Samsa), a national Uzbek meal. First, the dough is prepared and dried fruits of *P. eryngii* are boiled in water for 15-20 min. Then, they are chopped into 1-1.5 cm pieces along with onions and a small amount of animal fat. These ingredients are mixed well and folded into the prepared dough, which is then baked in a "tandir" (a traditional clay oven) like bread.

Ingredients: A bowl of chopped mushrooms, flour (for dough), oil, 2-3 onions, small amount of sheep fat, salt.

Additionally, local population attribute therapeutic properties to this mushroom, particularly considering its perceived efficacy in managing diabetes.

Pleurotus ostreatus (Jacq.) P. Kumm., Führ. Pilzk. (Zerbst): 104 (1871), (Table 1. Fig. 2a)

Description: Basidiocarps are large. Pileus is 4-15(-25) cm in diameter, conchoid, spatulate to fan-shaped, convex then spreading, finely downy or pubescent white at point of attachment, smooth elsewhere, moist at first, soon dry, greyish-brownish at first, sometimes tan pale, cinnamon-beige, pale cinnamon-pink to dark brown or beige around edges, soon pale, yellowish to greyish-yellow, whitish when ripe. Margin rolled up at first and then slightly rolled up on right. Lamellae converging towards point of attachment, adnate to often decurrently, broad, 5-15 mm, sometimes anastomosing and sometimes forming a reticulum at point of attachment, with lamellae, close together to very close together, dull whitish to pale pinkish buff, tinged with gray, entirely awned at first, then eroded with age. Stipe absent, rudimentary or well developed, (0.5)1-4 × 0.3-3.5 cm, eccentric to lateral or even central, subequal or enlarged at both ends, stocky, firm, full, dry, whitish to yellow dark, pubescent to strigously white at base. Flesh up to 1-2 cm thick, firm, slightly fibrous, white (23).

Habitat: *P. ostreatus* is distributed all over the world except the arctic biomes. It grows in groups, less often - singly, on stumps, deadwood, dead or living trees of various deciduous (ash, aspen, birch, mountain oak, willow), very rarely conifers in deciduous and mixed forests, parks and gardens. It was successfully cultivated in Germany during the First World War and then it continued to be successfully cultivated in many places (39). In Uzbekistan, it is commonly found on the trunks and branches of willow, poplar and mulberry trees that grow alongside bodies of water.

Culinary use: Local people in Uzbekistan often fry this type of mushroom lightly in oil with onions and sometimes with potatoes. Then, they break eggs into the mixture and cook it together.

Ingredients: A bowl of chopped mushrooms, 1-2 eggs, oil.

Instructions: Heat oil in a pan, add the chopped mushrooms and cook them lightly in the oil, crack the eggs directly onto the mushrooms in the pan, cook until the eggs are done to your liking, serve hot.

Table 1. Ethnomycology and folk taxonomy of WEMMs of SR, JR and KR regions in Uzbekistan

No	Scientific name	Family	Folk name	Fruiting	Uses
1	<i>Agaricus bitorquis</i> (Quél.) Sacc.	Agaricaceae	Oq zamburugʻ	Apr-May	Culinary
2	<i>Agaricus campestris</i> L.	Agaricaceae	Oq zamburugʻ, Qoʻʻzidumba	Apr-May	Culinary
3	<i>Bovista plumbea</i> Pers.	Lycoperdaceae	Eshakxina	May-Sep	Medicine
4	<i>Calvatia gigantea</i> (Batsch) Lloyd	Lycoperdaceae	Ilon telpak	Jun-Sep	Medicine
5	<i>Inonotus hispidus</i> (Bull.) P. Karst.	Hymenochaetaceae	Pukak	May-Sep	Medicine
6	<i>Lepista personata</i> (Fr.) Cooke	Tricholomataceae	Shamgʻi oyoq	Apr-May	Culinary
7	<i>Morchella esculenta</i> (L.) Pers	Morchellaceae	Quziqorin	Mar-Apr	Culinary
8	<i>Morchella steppicola</i> Zerova	Morchellaceae	Qoʻʻziqorin	March	Culinary
9	<i>Pleurotus eryngii</i> (DC.) Quél.	Pleurotaceae	Chanbush	Apr-May	Culinary, Medicine
10	<i>Pleurotus ostreatus</i> (Jacq.) P. Kumm.	Pleurotaceae	Zamburugʻ	Mar-Apr	Culinary
11	<i>Stropharia coronilla</i> (Bull.) Quél.	Strophariaceae	Sariq zamburugʻ	Apr-May	Medicine

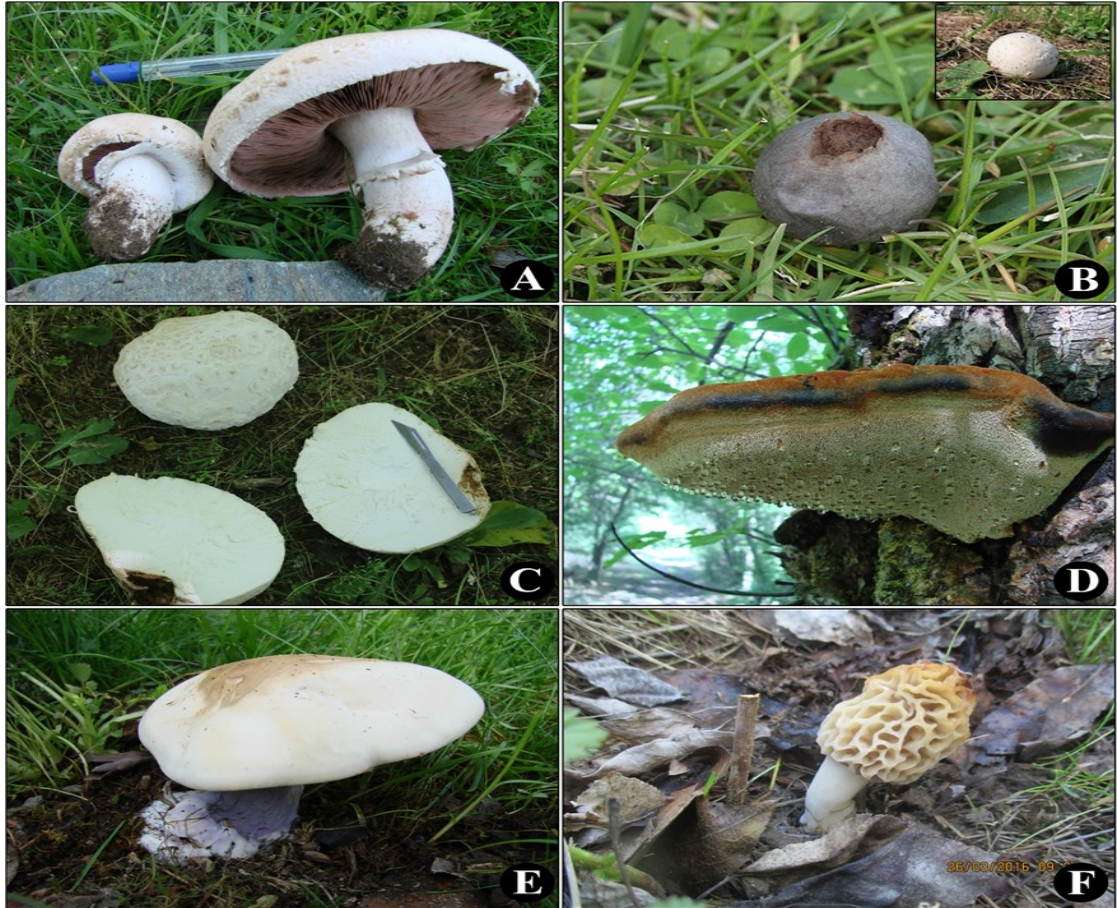


Fig. 2A-F:A-*Agaricus campestris* L., B-*Bovista plumbea* Pers., C-*Calvatia gigantea* (Batsch) Lloyd, D-*Inonotus hispidus* (Bull.) P. Karst., E-*Lepista personata* (Fr.) Cooke), F-*Morchella esculenta* (L.) Pers (Photos by Ilyor Mustafaev).



Fig. 3G-J:G-*Morchella steppicola* Zerova, H-*Pleurotus eryngii* (DC.) Quél., I-*Pleurotus ostreatus* (Jacq.) P. Kumm., J-*Stropharia coronilla* (Bull.) Quél. (Photos by Ilyor Mustafaev and Zoirjon Islomiddinov).

Stropharia coronilla (Bull.) Quél., *Mémoires de la Société d'Émulation de Montbéliard* ser. 2, 5:255 (1872) [MB#232954], (Table 1. Fig. 2a)

Description: Pileus is (16-)20-55 mm in diameter, hemispheric when young becoming convex to flattened or sometimes depressed in later stages; colour is yellow, frequently paler towards the margin; surface is smooth, subviscid in fresh basidiomata; margin is nonstriate, bearing velar remnants; context is fleshy, soft, white. Lamellae are adnate, with decurrent tooth, close; firstly light gray, to light brownish gray and finally black, with a whitish margin. Stipe (18-)37-51 × (3-)6-8(-12) mm, central, cylindrical, with a sub-bulbous base; colour white to cream; surface humid, striate above the annulus, squamulose towards the base; basal mycelium and rhizomorphs are white, abundant. Veil present: on pileus margin it forms whitish membranous remnants appendiculate; on stipe it produces a fleshy and grooved apical annulus. (40)

Habitat: Gregarious or solitary on soil among grass in lawns, forests and gardens.

Culinary use: While not popular among the general population in Uzbekistan, this mushroom is favored in the SR and JR, where it is collected in the spring and consumed fresh. It is typically fried in oil with onions.

Conclusion

This study is the first to document the knowledge of wild edible and medicinal mushrooms in JR, SR and KR based on ethnomycological surveys. A total of 60 interviewed informants reported 11 species of wild edible and medicinal mushrooms belonging to 6 families and 8 genera of wild edible and medicinal mushrooms. Despite the limited data, there is a risk of losing this knowledge due to climate change, reduction of natural mushroom growth areas, shortage of experts and lack of study materials in Uzbek. This risk is exacerbated by the fact that medicinal mushroom knowledge is primarily held by the elderly and its transmission is declining. Therefore, it is crucial to continue research and campaigns to preserve and pass down this information.

Acknowledgements

This work was supported by the Agency of Innovative Development of the Republic of Uzbekistan under projects "A-FA-2021-144" and "AL-572103212." The authors extend their heartfelt gratitude to the staff and foresters of the Nurata Nature Reserve for their invaluable assistance in fieldwork. Additionally, the authors express their deep appreciation to the anonymous reviewers for their constructive feedback, which significantly improved the manuscript.

Authors' contributions

OKK and DTK provided advice in preparing the article, IMM, MMI and JPS conducted detailed mycological analysis to identify fungi and gather ethnomycological data, ZSI collaborated with illustrations and mapped research areas.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interest to declare.

Ethical issues: None

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