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Distribution of *Volvariella bombycina* in Forest Communities of the Ural River Valley within the West Kazakhstan Region

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Abstract: The medicinal and edible mushroom, *Volvariella bombycina* (Schaeff.) Singer, belongs to the family *Pluteaceae*, order *Agaricales*, phylum *Basidiomycota*. *Volvariella bombycina* was collected during fieldwork in forest communities in the Ural River Valley of West Kazakhstan between 2020 and 2024. All information about the habitat and location (GPS data) of the mushroom in natural environments is given in detail. The taxon is morphologically described and anatomically characterized along with microphotographs and illustrations.

Keywords: *Volvariella bombycina*, West Kazakhstan, Ural River valley

Volvariella bombycina'nın Batı Kazakistan Bölgesi'ndeki Ural Nehri Vadisi Orman Topluluklarındaki Dağılımı

Öz: Yenilebilir ve tıbbi bir mantar olan *Volvariella bombycina* (Schaeff.) Singer, *Pluteaceae* familyasına, *Agaricales* takımına, *Basidiomycota* şubesine aittir. Batı Kazakistan Bölgesi'ndeki Ural Nehri Vadisi'ndeki orman topluluklarında 2020-2024 yıllarında yapılan arazi çalışmaları sırasında *V. bombycina* toplanmıştır. Mantarın doğal ortamlardaki habitat ve konum (GPS verileri) ile ilgili tüm bilgiler ayrıntılı bir şekilde verilmiştir. Takson morfolojik olarak tanımlanmış, anatomik olarak karakterize edilmiş, mikrofotoğrafları ve çizimleri yapılmıştır.

Anahtar kelimeler: *Volvariella bombycina*, Batı Kazakistan, Ural nehri vadisi

Introduction

West Kazakhstan is characterized by diverse landscapes, including steppes, semi-deserts, and forested areas, particularly along river valleys (Petrenko, 1998). The Ural River, flowing through this region, creates riparian forests that support a variety of fungal species,

such as *Volvariella bombycina* (Schaeff.) Singer. *Volvariella bombycina*, also known as the silky sheath, silky agaric, silver-silk straw mushroom, silky rosegill, or tree mushroom, is a member of the *Pluteaceae* family, *Agaricales* order, and *Basidiomycota* phylum. It is distinguished by its silky white cap and stem, as well as



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its volva, a characteristic sheath at the base of the stem. This mushroom, notable for its beauty and relatively rare occurrence, has a distinctive silky or fibrous cap and typically grows on decaying wood (Szczepkowski et al., 2013; Sarsenova et al., 2022). *Volvariella bombycina* is of interest not only for its culinary potential but also for its ecological role and potential medicinal properties. The mushroom is characterized by a silky, whitish to yellowish cap that can grow up to 15 cm in diameter. The cap surface is covered with fine, fibrous scales, giving it a silky appearance. The gills are free from the stem, crowded, and pinkish when young, turning brownish-pink as they mature. The stem is white, up to 20 cm long, and often covered with a sheath-like volva at the base, a key distinguishing feature. The spores are ellipsoid, smooth, and pinkish in mass (Adhikari, 2017). This species is saprophytic, primarily growing on decaying wood of deciduous trees. It is found in temperate and tropical regions worldwide, playing a significant role in wood decomposition and nutrient cycling in forest ecosystems (Szczepkowski et al., 2013; Sarsenova et al., 2022; Adhikari, 2017). *Volvariella bombycina* typically fruits during the warmer months, appearing singly or in small groups on fallen logs, stumps, or other woody debris (Papp et al., 2023).

The aim of this study is to determine the localization, hosts, and distribution of *V. bombycina* in forest communities of the Ural River Valley within the West Kazakhstan region.

Material and Method

Study area

The Ural River on the territory of Western Kazakhstan crosses two large botanical zones: the geographical Eurasian steppe and Sahara-Gobi Desert zones. On the territory of the study, the Eurasian steppe zone is divided into dry fescue-feathered grass steppes; their border extends to the Caspian lowland (Yanaikino-Bogatsk, West Kazakhstan region); to the south begin deserted sagebrush-fescue-feathered grass steppes, the border of which reaches the village of Atameken (West Kazakhstan region). The extreme southern part of Western Kazakhstan is occupied by sagebrush-biyurgun Caspian desert steppes. In the transverse profile, the floodplain of the Ural River distinguishes three genetic parts: riverbed, central, and terraced. In the near-riverbed part of the floodplain, gravel-sand banks are developed. Their width is within 300-700 m. In the central part of the floodplain, the transition is gradual. This part is characterized by an elevated plain relief. inter-ridge: crested low and crested relief. The width of the central floodplain varies from 3-5 to 12 m. The terraced part is undulating and flat; its width is 200-300 m. The terraced

floodplain passes into the floodplain terrace in places, forming 3-4 terraces. In the riverbed floodplain, native willow (*Salix alba*) communities are developed in combination with shrub willows (*S. triandra*, *S. viminalis*, and *S. acutifolia*). In the central floodplain there are poplar (*Populus alba*, *P. nigra*), elm (*Ulmus laevis*), and aspen (*Populus tremula*) forests, which form continuous forests from 5 km to 2 km wide. Such forests are characteristic of the middle reaches of the river to the Caspian lowland. Downstream of the Urals River, such forests fade and form small, separate groves from the same forest species. In addition to the widespread floodplain forest communities mentioned above. In the central floodplain on the crests there are local habitats of indigenous oak trees (*Quercus robur*) and alder forests (*Alnus glutinosa*). The place of burned poplars after 40–50 years is occupied by aspen (*Populus tremula*), maple (*Acer negundo*), and ash (*Fraxinus exilisior*) forests. In addition to the widespread floodplain forest communities mentioned above. In the central floodplain on the manes there are local habitats of indigenous oak trees (*Quercus robur*) and alder (*Alnus glutinosa*). The place of burned poplars after 40–50 years is occupied by aspen (*Populus tremula*), maple (*Acer negundo*), and ash (*Fraxinus exilisior*) forests. Of particular note are the ravine oak forests and birch forests, which are developed along ravines and gullies in the vicinity of the village of Kabyltobe, which flow into the floodplain forest of the Ural River.

Sample Collection

The fruit bodies of *Volvariella bombycina* (Schaeff.) Singer were collected from Ural River Valley within the West Kazakhstan region of the years 2020 to 2024. Fruit bodies were photographed at their natural habitats and characteristics related to their morphology, ecology, and geography. The macroscopic descriptions were based on morphological characters (appearance, shape, size, color, etc.) as well as other particularities of the cap and stipe (flavor, odor, etc.). Fresh samples were used to obtain macromorphological data, and micromorphological features were examined under a light microscope and identified (Shaffer, 1957; Ajana et al., 2017). The herbarium was prepared and stored at the Herbarium Laboratory, Department of General Biology and Genomics, L.N. Gumilyov Eurasian National University, Astana, Kazakhstan; and Herbarium V.V. Ivanov, Department of Biology and Ecology, Faculty of Natural Geography, M. Utemisov West Kazakhstan University, Uralsk, Kazakhstan.

Results

Morphology of the mushroom

Cap 8–14 cm in diameter and 6–9 cm high, at first ovoid, bell-shaped, gradually opening, and finally semiprostrate, with a protruding tubercle, whitish, straw-yellowish, fibrous-scaly, often almost smooth in the center (Figure 1). The gills are free, swollen, and expanded in the middle part, up to 1 cm wide, with an uneven jagged

edge, flesh-pink. Stem 7–16 x 1.5–4 cm, central, back club-shaped, coarse-fibred at the top and smooth at the base, dense. Volvo free, wide, with a lobed edge, leathery, white on the outside, skin-saffron color, brownish. The pulp is thick, white to yellowish. Spores 7–8 x 4.8–5.7 μ , ellipsoidal, smooth, with a spout and with a drop of oil. Cystidia 50–69 x 20–22.5 μ , pear-shaped, oblong-scapular.

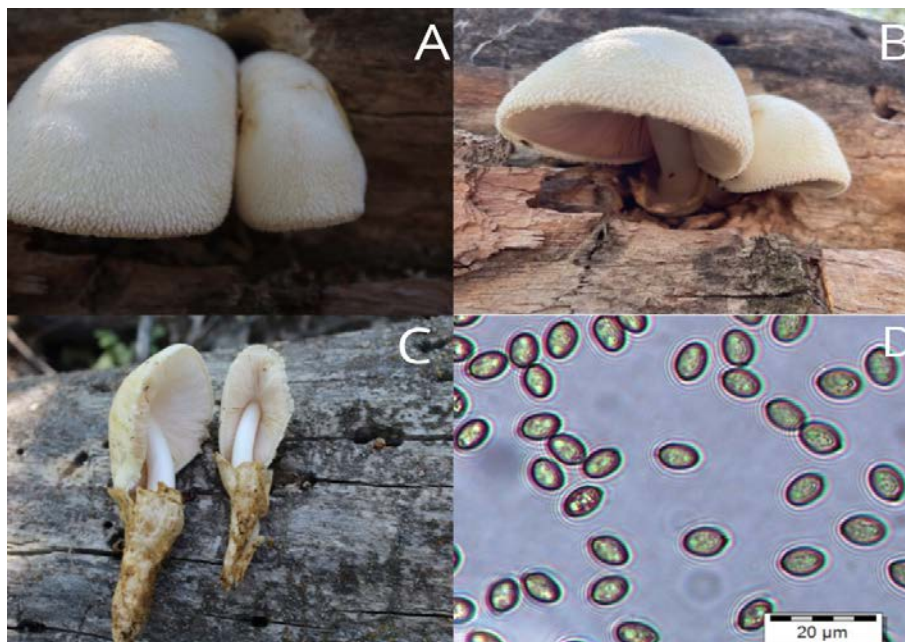


Figure 1. The cap (A) and (B), the lamellae, stipe, and volva (C), and basidiospores (D) of *Volvariella bombycina*.

Ecology: The fruit body of the macromycete *Volvariella bombycina* was found on the border of the steppe and desert zones within the West Kazakhstan region in forest communities in the lower reaches of the Ural River in the central floodplain along inter-ridge depressions in a small-leaved black poplar (*Populus nigra* L.) forest in combination with white poplar (*Populus alba* L.), willow (*Salix alba* L.), and elm (*Ulmus laevis* Pall.) groves on a fallen deadwood of European white elm in the vicinity of the village of Kogalytobek, near the relict lake Bobrovoye, in the birthwort (*Aristolochia clematidis*)-reed grass (*Calamagrostis epigejos*) community on the left bank of the Ural River (Table 1). The study area is dominated by *Populus nigra* L., and *Populus alba* L., *Acer negundo* L., *Salix alba* L., and *Ulmus laevis* Pall. are the main forest-forming species of the second layer. *Prunus spinosa* L., *Rhamnus cathartica* L., *Rosa canina* L., and *Lonicera tatarica* L. form a shrub layer of forest trees. *Arctium lappa* L., *Calamagrostis epigeios* (L.) Roth., *Cynoglossum officinale* L., *Dracocephalum ruyschiana* L., *Glycyrrhiza glabra* L., *Leonurus cardiaca* L., etc. grow in the grass cover. The central floodplain is occupied by black poplar (*Populus nigra* L.), white poplar (*Populus alba* L.), elm (*Ulmus laevis* Pall.) forest, and meadow

communities consisting of bonfire (*Bromopsis inermis* (Leyss.) Holub), couch grass (*Elytrigia repens* (L.) Nevski), licorice (*Glycyrrhiza glabra* L.), and sedge (*Carex acutiformis* Ehrh.).

Discussion

Volvariella is readily recognized by its pink lamellae and spores. The stipe of fruit body does not have an annulus. It has a volva at the base of the stipe. The lamellae of *Volvariella* species are initially whitish before turning pink. The German naturalist Jacob Christian Schäffer initially described *V. bombycina* in 1774 as *Agaricus bombycinus*. Throughout its taxonomic history, it has been classified into various genera, including *Pluteus* (Fries, 1836), *Volvaria* (Kummer, 1871), and *Volvariopsis* (Murrill, 1911). In 1951, it was classified as *Volvariella* (Singer, 1951). *Volvariella bombycina* has been reported from Australia, Asia, the Caribbean, Europe, and North America (Justo et al., 2011; Karnan et al., 2016; Chaudhary et al., 2017). In the present study, *Volvariella bombycina* specimens collected from forest communities of the Ural River valley within the West Kazakhstan region are identified by using macromorphological and micromorphological data. The macro- and microscopic

properties of the Kazakhstan collection are mostly consistent with prior descriptions (Seok et al., 2002; Adhikari, 2017; Ajana et al., 2017; Lotfi et al., 2019)

Author contributions

All authors have equal contribution.

Conflicts of interest

The authors declare no competing interests.

Ethical Statement: It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited (Assemgul SARSENOVA, Sardarbek ABIYEV, Talshen DARBAYEVA, Cafer EKEN).

Table 1. Details of *Volvariella bombycina* collected from forest communities of the Ural River valley within the West Kazakhstan region.

Host	Place name (district/village)	Location and altitude	Collected date
<i>Populus nigra</i>	Baiterek/ Rubezhka	N51° 26.091' E52° 00.120' 34 m	08.08.2020
<i>Alnus glutinosa</i> , <i>Populus alba</i> , <i>P. nigra</i>	Baiterek/ Petrov	N51° 30.468' E52° 15.270' 46 m	16.08.2020; 14.08.2021
<i>Populus alba</i> , <i>P. nigra</i> , <i>P. tremula</i>	Uralsk/Krugloozernoe	N51° 04.606' E51° 20.405' 28 m; N51° 04.964' E51° 21.428' 29 m	26.06.2021; 03.07.2021
<i>Populus nigra</i>	Baiterek/Spartak	N51° 25.849' E52° 04.839' 41 m N51° 25.869' E52° 04.897' 41 m	21.08.2021
<i>Populus nigra</i> , <i>P. tremula</i> , <i>Ulmus laevis</i>	Terekty/ Kogalytubek	N50° 26.043' E51° 08.494' 16 m	25.07.2021
<i>Populus nigra</i>	Terekty/ Kabyltobe	N51° 19.109' E51° 52.796' 39 m	31.08.2024
<i>Populus nigra</i>	Baiterek/ Ozyornoe	N51° 21.503' E51° 50.340' 28 m N51° 21.501' E51° 50.336' 28 m N51° 21.502' E51° 50.339' 28 m	11.10.2024

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