= Volvariella bombycina =

Volvariella bombycina , commonly known as the silky sheath , silky rosegill , silver @-@ silk straw mushroom , or tree mushroom , is a species of edible mushroom in the family Pluteaceae . It is an uncommon but widespread species , having been reported from Asia , Australia , the Caribbean , Europe , and North America . The fruit body (mushroom) begins developing in a thin , egg @-@ like sac . This ruptures and the stem expands quickly , leaving the sac at the base of the stem as a volva . The cap , which can attain a diameter of up to 20 cm (8 in) , is white to slightly yellowish and covered with silky hairs . On the underside of the cap are closely spaced gills , free from attachment to the stem , and initially white before turning pink as the spores mature . The mushroom grows singly or in clusters , often appearing in old knotholes and wounds in elms and maples . V. bombycina contains compounds with antibacterial properties .

= = Taxonomy = =

The species was first described in 1774 by German naturalist Jacob Christian Schäffer as Agaricus bombycinus . Throughout its taxonomical history , it has been shuffled to several genera , including Pluteus (by Elias Fries in 1836) , Volvaria (Paul Kummer , 1871) , and Volvariopsis (William Alphonso Murrill , 1911) . Rolf Singer placed it in its current genus , Volvariella , in 1951 . Other names that have been applied to the species include Jean @-@ Baptiste Lamarck 's Amanita calyptrata and August Johann Georg Karl Batsch 's Agaricus denudatus (both published in 1783) , but these are illegitimate names as Schäffer 's earlier 1774 name has priority .

In 1949 , Murrill described the variety flaviceps from collections made growing on magnolia wood in Gainesville , Florida . Although he originally described it as a new species , Volvaria flaviceps , Robert Shaffer considered it a variety of V. bombycina . Variety microspora was first described in 1953 , was later (1961) named by R.W.G. Dennis ; variety palmicola was originally described as a distinct species Volvaria palmicola by Belgian mycologist Maurice Beely in 1928 , and later as a variety of V. bombycina by the same author in 1937 .

The root for the generic name Volvariella (as well as Volvaria and Volvariopsis , genera in which the species had been formerly placed) derives from the Latin volva , meaning " wrapper " or " a covering " . The specific epithet bombycina derives from the Latin root bombyc , or " silky " . Common names for the mushroom include the " silky sheath " , the " silky rosegill " , the " silver @-@ silk straw mushroom " , or the " tree mushroom " .

= = Description = =

The fruit bodies of Volvariella bombycina are initially egg @-@ shaped when still enclosed in the universal veil . As they expand , the caps later becoming bell @-@ shaped or convex , and finally nearly flattened in age , attaining a diameter of 5 ? 20 cm (2 @.@ 0 ? 7 @.@ 9 in) . The dry cap surface is covered with silky threads . Its color is white to yellowish , becoming more pale approaching the margin . The flesh is thin , soft , and white , and has an odor , resembling raw potatoes . Gills are crowded close together , free from attachment to the stem , and initially white before turning pinkish as the spores mature . The stem measures 6 ? 20 cm (2 @.@ 4 ? 7 @.@ 9 in) long by 1 ? 3 cm (0 @.@ 4 ? 1 @.@ 2 in) thick , and is typically tapered upward or thickened below . It is white , with a smooth surface , and is often slightly curved . The universal veil is membranous , often areolate (cracked into irregularly shaped blocks) or scaly , and forms a long , saclike volva that wraps around the base of the stem . It is white to yellowish or dingy brown , and often divided into lobes .

The variety V. bombycina var. flaviceps is distinguished from the main form by its smaller , bright yellow caps , up to 3 @.@ 5 cm (1 @.@ 4 in) in diameter , and its dirty @-@ white , scaly volva . Murrill also noted that it developed a " peculiar sickening odor during drying " . V. bombycina var. microspora has smaller spores (6 ? 7 @.@ 5 by 4 ? 5 ?m) , a yellow cap , and a blotched brown volva . V. bombycina var. palmicola also has a yellow cap and small spores (5 @.@ 9 ? 7 @.@ 5

by 4 @.@ 3 ? 5 @.@ 4 ?m) , but can be distinguished from the previous varieties by its distantly spaced gills .

Mushrooms produce a spore print with a color ranging from pinkish to salmon . Spores are elliptical , smooth , and measure 6 @.@ 5 ? 10 by 4 @.@ 5 ? 6 @.@ 5 ?m . The basidia (spore @-@ bearing cells) are club @-@ shaped , four @-@ spored , and measure 19 ? 43 by 6 ? 11 ?m . Pleurocystidia (cystidia that occur on the gill face) are usually spindle shaped , but have a widely variable morphology ; they are abundant in the hymenium , and have dimensions of 26 ? 122 by 8 ? 57 ?m . The cheilocystidia (on the gill edge) are similar in morphology and abundance , some may feature knobs held at the end of slender projections up to 20 ?m long ; dimensions are in the range of 26 and 144 ?m long by 8 ? 46 ?m wide . Clamp connections are absent from the hyphae of V. bombycina .

The fruit bodies can be readily grown in laboratory culture .

= = = Similar species = = =

The combination of a silky white cap , white stem , pink gills , pink spore print , and growth on wood is characteristic of this species and make identification of Volvariella bombycina in the field relatively easy . Some Pluteus species have a general similar appearance , and also produce pinkish to pinkish @-@ brown spore prints , but they lack a volva . Amanita species grow on the ground and make white spore prints . V. pusilla has a small cap measuring 0 @.@ 5 ? 3 cm (0 @.@ 2 ? 1 @.@ 2 in) in diameter with silky fibers and short lines visible at the cap edge when moist ; it grows in soil in gardens and greenhouses and on lawns . V. hypopithys has a medium @-@ size white cap that is 2 ? 5 cm (0 @.@ 8 ? 2 @.@ 0 in) in diameter with silky to scaly fibers and lacks the short lines at the cap edge when moist ; it grows on the ground in woods . V. caesiotincta has a bluish @-@ gray cap , while V. gloiocephala can be distinguished from V. bombycina by its smooth cap that is sticky when damp , and a white volva .

= = = Edibility = = =

The fruit bodies are edible , and usually considered of good quality . They have been called " excellent " , " tasty " with a " modest and pleasant flavor " , and " worth eating if found in large enough quantities " .

Alexander H. Smith related a story of how unique circumstances led to the development of a local superstition about the species :

... the members of a family here in Ann Arbor were poisoned , some fatally , as the result of eating caps of a species of Amanita . The next year Volvaria bombycina fruited on a maple tree at the home of these people , and the story was circulated that some of the spores of the poisonous fungus , which caused the deaths the year before , had escaped from the house , lodged in the tree , germinated , grew and were now producing fruiting bodies . Consequently the carpophores of the Volvaria were held in great awe by the neighbors , and soon came to be referred to as the " ghost mushroom " . No one , of course , would consider eating them .

= = Habitat and distribution = =

Volvariella bombycina is a saprobic species . Fruit bodies grow singly or in small groups on trunks and decayed stumps of dead hardwoods . Favored species include sugar maple , red maple , silver maple , magnolia , mango , beech , oak , and elm . It is often found in clefts and knotholes of dead or living tree trunks . It has been noted to fruit in the same location for several years . Despite its preference for hardwoods , it has been reported growing on rare instances on coniferous wood . An uncommon species with a wide distribution , it has been reported from Asia (China , India , Korea , Pakistan) , the Caribbean (Cuba) , Australia , Europe , North America , and South America . It acquired protected status in Hungary in 2005 , making it a legal offense to pick it . Variety microspora is known from Venezuela , while V. bombycina var. palmicola occurs in the DR Congo .

= = Bioactive compounds = =

Several bioactive secondary metabolites have been isolated and identified from Volvariella bombycina fruit bodies , mycelium , or pure culture . The compounds ergosta @-@ 4 @,@ 6 @,@ 8 (14) , 22 @-@ tetraene @-@ 3 @-@ one , ergosterol peroxide , indole @-@ 3 @-@ carboxaldehyde , and indazole were found in liquid culture . In 2009 , the novel compound isodeoxyhelicobasidin was identified from culture broth ; this compound inhibits the enzyme human elastase . The fungus also produces compounds that have antioxidative activity .