= Volvariella surrecta =

Volvariella surrecta , commonly known as the piggyback rosegill , is an agaric fungus in the family Pluteaceae . Although rare , the species is widely distributed , having been reported from Asia , North America , Northern Africa , Europe , and New Zealand . The fungus grows as a parasite on the fruit bodies of other gilled mushrooms , usually Clitocybe nebularis . V. surrecta mushrooms have white or greyish silky @-@ hairy caps up to 8 cm ( 3 @.@ 1 in ) in diameter , and white gills that turns pink in maturity . The stipe , also white , is up to 9 cm ( 3 @.@ 5 in ) long , and has a sack @-@ like volva at its base .

= = Taxonomy = =

The species was first mentioned in scientific literature as Agaricus surrectus by English botanist John Leonard Knapp in his 1829 Journal of a Naturalist . Knapp described the species and illustrated it in a woodcut . He wrote :

We have even an agaric , with a bulbous root and downy pileus , that will spring from the smooth summit of another ( agaricus caseus ) , which has a uniform footstalk , though not of common occurrence . Thus a plant , that itself arises from decay , is found to constitute a soil for another ; and the termination of this chain of efficiency is hidden from us .

Seven years later , Miles Berkeley described the fungus as Agaricus loveianus , not aware of Knapp 's previous publication , and wrote that it was " a most elegant and curious species which ... appears not to have been hitherto noticed . " Berkeley 's name was frequently used in literature to refer to the fungus for over a century rather than Knapp . In his 1917 North American Flora , William Alphonso Murrill proposed a new name combination for the species based on Berkeley 's name , Volvariopsis loweiana . In 1942 , John Ramsbottom discovered Knapp 's image and description of the fungus , and realizing it referred to the same species as Berkeley 's Agaricus loveianus , made the new combination Volvaria surrecta . Rolf Singer transferred it to the genus Volvariella in 1951 , giving it the name by which it is known presently .

Molecular analysis of DNA sequences suggests that V. surrecta belongs to the Volvariella pusilla group ? a grouping of related Volvariella species that produce small , white fruit bodies . In this analysis , V. surrecta formed a subclade with V. hypopithys . Almost 90 years earlier , Paul Konrad and André Maublanc recognized the relatedness of these species , and proposed that V. surrecta should be considered a subspecies of V. hypopithys .

The specific epithet surrecta is Latin for " to arise " . Berkeley 's epithet loveianus honors British naturalist and Reverend Richard Thomas Lowe . The mushroom is commonly known as the piggyback rosegill .

= = Description = =

The fruit bodies of V. surrecta have caps that are initially ovoid ( egg @-@ shaped . Later they become bell @-@ shaped or convex before flattening ; reaching diameters of 2 @.@ 5 ? 8 cm ( 1 @.@ 0 ? 3 @.@ 1 in ) . The cap sometimes has a shallow umbo , although the presence of this character is not consistent . The cap surface is dry and covered with long , silky hairs ; the color is white to light gray , with a yellowish or brownish center . The gills are free from attachment to the stipe and are packed close together . They are initially white , later becoming pink . There are many lamellulae ( short gills that do not extend fully from cap margin to the stipe ) interspersed between the gills . The stipe is 4 ? 9 cm ( 1 @.@ 6 ? 3 @.@ 5 in ) long by 4 ? 12 mm ( 0 @.@ 16 ? 0 @.@ 47 in ) thick , and roughly equal in width throughout the length or somewhat thicker at the base . Its color is white to light gray , and the stipe surface is appressed @-@ fibrillose , with a pruinose coating near the apex . The white volva measures 1 @.@ 3 ? 2 @.@ 5 cm ( 0 @.@ 5 ? 1 @.@ 0 in ) high and 0 @.@ 6 ? 1 @.@ 3 cm ( 0 @.@ 2 ? 0 @.@ 5 in ) broad , and has a lobed margin . The mushroom is not edible .

The color of the spore print is brownish @-@ pink . The spores are egg @-@ shaped to oval ,

measuring 5 @.@ 4 ? 7 @.@ 6 by 3 @.@ 4 ? 4 @.@ 9 ?m . The basidia ( spore @-@ bearing cells ) are club @-@ shaped , four @-@ spored , and measure 20 ? 31 by 5 ? 10 ?m . The pleurocystidia ( cystidia on the gill face ) are fusoid @-@ ventricose ( distinctly enlarged in the middle and tapered toward both ends ) , sometimes with an elongated neck . The cheilocystidia ( cystidia on the gill edge ) are also fusoid @-@ ventricose with a neck that is sometimes short and bulbous ; they measure 25 ? 50 by 6 ? 20 ?m . The hyphae do not have clamp connections .

= = = Similar species = = =

Because of its occurrence on the fruit bodies of other agarics , V. surrecta is unlikely to be confused with other mushrooms . Other parasitic mushrooms include Asterophora species , but these have thick gills compared to the thin gills of V. surrecta . Collybia species , including C. cookei , C. cirrhata and C. tuberosa are saprobic , and grow on the blackened , decayed remains of other agarics . Their fruit bodies are much smaller than V. surrecta , with cap diameters up to 2 cm ( 0 @.@ 8 in ) . Although some other Volvariella species have an appearance similar to V. surrecta , they grow in grass or in leaf litter .

= = Habitat and distribution = =

Volvariella surrecta grows parasitically on the fruit bodies of Clitocybe species , usually C. nebularis , although it has been reported growing on Tricholoma species , as well as Melanoleuca brevipes . The mushrooms grow in clusters , and fruit in the summer and autumn . The host mushroom is sometimes malformed and assumes an irregular appearance . In an early publication , Charles Bagge Plowright commented " Berkeley 's figure ... is rather misleading . So is that given by Knapp under the name Agaricus surrectus ... , inasmuchas they show the Agaric ( A. nebularis ) , upon which it is parasitic , in a very robust condition . In my specimen the host ( A. nebularis ) was quite sodden and collapsed so as to be practically unrecognisable unless one had known what species to expect . "

Volvariella surrecta is a rare species , even though its major host is quite common ; the conditions required for the parasite to produce fruit bodies are not well known . Some authors have suggested that it may grow equally well as a parasite or a saprobe . V. surrecta has been found on its host in several different habitat types , including birch woodlands , pine plantations , scrub , thickets of small trees or shrubs beside roads , and under brambles . No definite preference for soil type has been determined , having been found in sands , clay , gravels , and peat . In 1867 , Worthington George Smith reported that he had successfully cultivated the species by partially burying fruit bodies under water @-@ soaked rotting fir leaves that were placed in a bell @-@ glass in a warm room . According to his account , a white mycelium grew over the leaves and eventually formed small white pins ( immature , undifferentiated fruit bodies ) that grew into fully formed mushrooms about two weeks after starting .

The geographical distribution of the fungus includes North America north of Mexico , Northern Africa , Europe , New Zealand , and Asia ( Amur region of Russia , India , and Korea ) .