= Mycena chlorophos =

Mycena chlorophos is a species of agaric fungus in the family Mycenaceae . First described in 1860 , the fungus is found in subtropical Asia , including Japan , Taiwan , Polynesia , Indonesia , and Sri Lanka , in Australia , and Brazil . Fruit bodies (mushrooms) have pale brownish @-@ grey sticky caps up to 30 mm (1 @.@ 2 in) in diameter atop stems 6 ? 30 mm (0 @.@ 2 ? 1 @.@ 2 in) long and up to a millimeter thick . The mushrooms are bioluminescent and emit a pale green light . Fruiting occurs in forests on fallen woody debris such as dead twigs , branches , and logs . The fungus can be made to grow and fruit in laboratory conditions , and the growth conditions affecting bioluminescence have been investigated .

= = Taxonomy = =

The species was first described scientifically by Miles Berkeley and Moses Ashley Curtis in 1860 as Agaricus chlorophos . The original specimens were collected from the Bonin Islands by American botanist Charles Wright in October 1854 as part of the North Pacific Exploring and Surveying Expedition of 1853 ? 56 . Pier Andrea Saccardo transferred the species to the genus Mycena in an 1887 publication . Daniel Desjardin and colleagues redescribed the species and set a lectotype specimen in 2010 .

In 1860 Berkeley and Curtis described the species Agaricus cyanophos from material also collected from the Bonin Islands . This material was found near the location that the original specimens of M. chlorophos were found , but a couple of weeks later . Japanese mycologists Seiya Ito and Sanshi Imai studied these collections in the late 1930s , and concluded that Agaricus cyanophos was the same species as M. chlorophos , despite differences in cap shape , gill attachment , and the color of emitted light . Desjardin and colleagues agreed with this determination after examining the type material of both taxa . M. chlorophos is classified in the section Exornatae of the genus Mycena . Other luminescent species in this section are M. discobasis and M. marginata . Some authors have considered M. illuminans to be synonymous with M. chlorophos due to their morphological similarity , but molecular analysis has shown that they are distinct species .

In Japan , the mushroom is known as yakoh @-@ take , or " night @-@ light mushroom " . In the Bonin Islands it is called " Green Pepe " .

= = Description = =

The cap is initially convex before flattening out (sometimes forming a central depression) , and measures up to 30 mm (1 @.@ 2 in) in diameter . The cap has radial grooves extending to nearly the center , and sometimes develops cracks in the margin , which has small rounded teeth . Its color is pale brownish gray that fades after expansion , and it is somewhat sticky . The white stem is 6 ? 30 mm (0 @.@ 24 ? 1 @.@ 18 in) long by 0 @.@ 3 ? 1 mm thick , hollow , and translucent . It has tiny hairs on the surface . The base of the stem is disc @-@ shaped or somewhat bulbous , measuring 1 ? 2 @.@ 5 mm wide . The thin gills are free from attachment to the stem , or are adnexed (narrowly attached) to a slight collar encircling the stem . Initially white then grayish in color , they are somewhat crowded , with 17 ? 32 full @-@ length gills and 1 to 3 tiers of lamellulae (shorter gills that do not extend fully from the cap margin to the stem) . The gills are 0 @.@ 3 ? 1 mm wide with micaceous edges . The flesh is very thin , and has a strong odor of ammonia . Both the caps and the gills are bioluminescent , while the mycelia and stems have little to no luminescence .

The spores are white , smooth , roughly elliptical , and have dimensions of 7 ? 8 @.@ 5 by 5 ? 6 ?m . The basidia (spore @-@ bearing cells) are 17 ? 23 by 7 @.@ 5 ? 10 ?m , and four @-@ spored with sterigmata around 3 ?m long . The paraphyses are 5 ? 8 ?m wide , shorter than the basidia , more abundant and form a somewhat gelatinous layer . The cheilocystidia (cystidia on the cap edge) are 60 by 7 ? 21 ?m , hyaline , conical or ventricose (inflated) . The tips of the cheilocystidia are drawn out to a point , or have a short appendage measuring 15 by 2 ? 3 ?m ,

which is sometimes branched , and is thin or slightly thick @-@ walled . There are no cystidia on the gill face (pleurocystidia) . Pileocystidia (cystidia on the surface of the cap) are club @-@ shaped , measuring 25 ? 60 by 13 ? 25 ?m . They are somewhat thick @-@ walled , and spiny on the exposed surface with short simple outgrowths extending up to 3 ?m long . The pileocystidia are joined together and form a continuous layer over the young cap , but break up as the cap expands . The caulocystidia (cystidia on the stem) are conical or lance @-@ shaped , hyaline , and smooth , with walls that are thin or slightly thickened . They measure up to 300 by 10 ? 25 ?m , but are shorter in the upper regions of the stem . Clamp connections are present in the hyphae of all tissues .

= = Similar species = =

The two other luminescent species of Mycena section Exornatae are similar in appearance to M. chlorophos . M. discobasis fruit bodies have paler caps ; microscopically , they have larger spores measuring 9 @.@ 9 by 6 @.@ 7 ?m , and lack the short apical appendage found on M. chlorophos cheilocystidia . M. margarita has smaller spores averaging 6 @.@ 9 by 4 @.@ 4 ?m , smaller cheilocystidia , and loop @-@ like clamp connections .

= = Habitat and distribution = =

Fruit bodies of Mycena chlorophos are found in forests , where they grow in groups on woody debris such as fallen twigs , branches , and bark . In the Japanese Hachijo and Bonin Islands , mushrooms occur predominantly on decaying petioles of the palm Phenix roeberenii . The fungus requires a proper range of humidity to form mushrooms ; for example , on Hachijo Island , fruiting only occurs in the rainy seasons in June / July and September / October when the relative humidity is around 88 % , usually the day after rain falls . Experimental studies have shown that mushroom primordia that are too wet become deformed , while conditions that are too dry cause the caps to warp and break because the delicate gelatinous membrane covering them is broken .

In Asia , the species has been found in Japan , Taiwan , Polynesia , Java , and Sri Lanka . In Japan , the fungus is becoming more scarce as its natural habits are decreasing . Several Australian field guides have reported the species from that country . The fungus has also been recorded several times from Brazil . Mycena chlorophos was one of several fungi featured in a set of postage stamps issued in Samoa in 1985 .

= = Bioluminescence studies = =

Since the mushroom is small , and fruits in only a limited season in a small area , researchers have investigated the conditions needed to artificially cultivate the species in laboratory conditions , in order to have more material to study the mechanism of bioluminescence , and to help preserve the species . The optimum temperature for the growth of mycelia is 27 ° C (81 ° F) , while the optimum for the growth of primordia is 21 ° C (70 ° F) . These temperatures are consistent with the subtropical climate in which the species is typically found . Maximum luminescence occurs at 27 ° C , and about 25 ? 39 hours after the primordia begin to form , when the cap has fully expanded . At 21 ° C , luminescence persists for about 3 days , and becomes undetectable to the naked eyes about 72 hours after primordium initiation .