

= *Hygrophorus agathosmus* =

Hygrophorus agathosmus , commonly known as the gray almond waxy cap or the almond woodwax , is a species of fungus in the *Hygrophoraceae* family . It was first described by Elias Magnus Fries in 1815 ; Fries gave it its current name in 1838 . A widespread species , it is distributed in the United States , Europe , Africa , and India , and can be found growing under spruce and pine in mixed forests . The fruit bodies are characterized by a light grayish cap that measures up to 8 cm (3 @. @ 1 in) in diameter , waxy gills , a dry stem , and the distinct odor of bitter almonds . An edible but bland @-@ tasting mushroom , extracts of the fruit bodies have been shown in laboratory tests to have antimicrobial activity against various bacteria that are pathogenic to humans .

= = Taxonomy , classification , and naming = =

The species was originally named *Agaricus agathosmus* by Swedish mycologist Elias Fries in 1815 ; he later moved it into the genus *Hygrophorus* in 1838 . In the interim , English naturalist Miles Joseph Berkeley named the species *Agaricus cerasinus* in 1836 , although he too would later transfer the species to *Hygrophorus* in 1860 . In 1948 , Richard Dennis examined the type material , and concluded that the two names referred to the same species . Additional historical synonyms include *Limacium pustulatum* var. *agathosmum* (Kummer , 1871) , and *Limacium agathosmum* (Wüensch , 1877) .

In their 1963 monograph of the *Hygrophorus* of North America , American mycologists Lexemuel Ray Hesler and Alexander H. Smith classified *H. agathosmus* in the subsection *Camarophylli* , a grouping of related species characterized by a dry stem , and the absence of a gelatinous outer veil .

The specific epithet *agathosmus* is derived from the Greek word *agathos* meaning ? good ? , and *osme* meaning ? scent ? . *Hygrophorus agathosmus* is commonly known as the gray almond waxy cap , or the almond woodwax .

= = Description = =

The cap is 4 ? 8 cm (1 @. @ 6 ? 3 @. @ 1 in) in diameter , and initially convex with the edges rolled inwards . As it ages and the cap expands , it becomes flat , sometimes with the center slightly depressed , or sometimes with a slight central elevation . The color is a dull ashy gray , and when moist , the cap surface is sticky or tacky to the touch . It is smooth , although the edges can have a layer of minute , soft hairs . The flesh is soft , and whitish or watery gray . *Hygrophorus agathosmus* has a pronounced fragrant odor resembling cherry pits or bitter almonds (occasionally the odor is weak) .

The gills have an adnate attachment to the stem , but in maturity the attachment becomes adnate @-@ decurrent , meaning the gills start to extend down the length of the stem . The gills are white , but become grayish in maturity , close to distant (40 ? 50 reach the stem) , moderately narrow , rather thin . The stem is 4 ? 8 cm (1 @. @ 6 ? 3 @. @ 1 in) long by 0 @. @ 6 ? 1 @. @ 4 cm (0 @. @ 2 ? 0 @. @ 6 in) thick , whitish at first , and colored pale ashy in age . It is the same thickness throughout or somewhat narrowed toward the base . It is solid , dry or moist but has no gelatinous universal veil present . When young , the stem surface is evenly covered with tiny fibrils and a fine whitish powder ; over time it loses the hairs and the powder and becomes smooth .

= = = Microscopic characteristics = = =

When viewed in mass , such as with a spore print , the spores appear to be white . Viewed with a light microscope , the basidiospores are 8 ? 10 @. @ 5 by 4 @. @ 5 ? 5 @. @ 5 µm , ellipsoid , smooth , and yellowish in Melzer 's reagent . The spore @-@ bearing cells , the basidia , are four @-@ spored and measure 48 ? 65 long by 6 ? 8 µm thick . *Pleurocystidia* and *cheilocystidia* (specialized cystidia found on the gill faces and edges , respectively) are absent in this species . The

pileipellis (cap cuticle) is made of a broad (175 ? 350 μm) gelatinous zone , composed of loosely interwoven , slender (1 @. @ 5 ? 4 μm) hyphae ; the surface hyphae are a fuscous ? a dark brownish @-@ gray color . This hyphal arrangement is called an ixocutis , in which the hyphal walls swell up and gelatinize , giving a translucence to the layer that stands out in contrast to the underlying flesh . The layer of gelatinized hyphae is tenacious , and may be peeled off the cap as a film . Although clamp connections are found on the hyphae that make up the flesh of the gill , none are found in the cap flesh nor in the pileipellis .

= = = Edibility and antimicrobial activity = = =

Hygrophorus agathosmus is edible , but considered bland . A study of the antioxidant capacity of the mushroom was composed of at least five organic acids : oxalic , citric , malic , quinic , and fumaric acids . Using a standard laboratory test to determine antimicrobial activity , *Hygrophorus agathosmus* was shown to inhibit the growth of various pathogenic bacteria , including *Escherichia coli* , *Enterobacter aerogenes* , *Salmonella typhimurium* , *Pseudomonas aeruginosa* , *Staphylococcus aureus* , *Staphylococcus epidermidis* , and *Bacillus subtilis* ; it also inhibits the growth of the yeast *Candida albicans* and *Saccharomyces cerevisiae* .

= = = Similar species = = =

Hygrophorus pustulatus resembles *H. agathosmus* and has a similar almond odor . However , the fruit bodies of *H. pustulatus* are smaller , and it produces larger spores (11 ? 14 μm long) . *Hygrophorus occidentalis* , which grows under conifers or oak , has a sticky stem and less pronounced almond odor . *Hygrophorus marzuolus* is also similar in appearance , but it lacks a distinctive odor , and has smaller spores than *H. agathosmus* .

= = Habitat and distribution = =

Hygrophorus agathosmus is an ectomycorrhizal fungus , and it has been isolated , cultivated , and maintained as pure cultures of vegetative fungal inocula for artificial mycorrhization of planting stock in forest nurseries . Fruiting bodies are found scattered under spruce and pine and in mixed woods in the United States . The fungus is also found in Europe (Czech Republic , Poland , Russia , Turkey , and the United Kingdom) , Africa , and India .