= Amanita gemmata =

Amanita gemmata , commonly known as the gemmed Amanita or the jonquil Amanita , is an agaric mushroom of the family Amanitaceae and genus Amanita . The fruit body has a cap that is a dull to golden shade of yellow , and typically 2 @.@ 5 ? 12 cm (1 @.@ 0 ? 4 @.@ 7 in) in diameter . The cap surface is sticky when moist , and characterized by white warts , which are easily detached . It is initially convex , and flattens out when mature . The flesh is white and does not change colour when cut . Gills are white and closely spaced . The stem is pale yellow , and measures 4 ? 12 cm (1 @.@ 6 ? 4 @.@ 7 in) long by 0 @.@ 5 ? 1 @.@ 9 cm (0 @.@ 2 ? 0 @.@ 7 in) thick . The partial veil that covers the young fruit body turns into the ring on the stem at maturity . The spore print is white , while the spores are roughly elliptical , and measure 8 ? 10 by 6 @.@ 5 ? 7 @.@ 5 µm .

This species is a mycorrhizal fungus , widespread in the Americas and Europe . It can grow either singly , scattered , or in groups . It prefers habitats like coniferous and mixed forests and alongside paths , where it fruits in summer and fall . It is a toxic mushroom that has muscarine , the same toxin as Amanita muscaria and Amanita pantherina as well as many species in the Clitocybe and Inocybe genera . It is often confused with various other European species . A. gemmata resembles the false death cap , tawny grisette and panther cap mushrooms . Its cap is brighter in color than the former , and more yellow than the latter two .

= = Taxonomy and phylogeny = =

The species was first described scientifically by Swedish mycologist and botanist Elias Magnus Fries as Agaricus gemmatus in 1838 . It was transferred to the genus Amanita in 1866 by the French statistician Louis Bertillon . The species has been transferred to several genera in its history , resulting in a number of synonyms , including Amanita muscaria var. gemmata (1886 , Lucien Quélet) , Amanitopsis gemmata (1887 , Pier Andrea Saccardo) , Amanitaria gemmata (1940 , Jean @-@ Edouard Gilbert) , and Venenarius gemmatus (1948 , William Murrill) . Amanita authority Rodham E. Tulloss considers A. amici (published by Claude Casimir Gillet in 1891) to be synonymous with A. gemmata , as the macroscopic characteristics of the former fall within the limits of the range expected for the latter .

Within the genus Amanita , A. gemmata is classified in subgenus Amanita , section Amanita , subsection Gemmatae , and series Gemmatae . Tulloss places the species in a stirps (an informal ranking above species level) with A. russuloides and A. viscidolutea . Some mycologists believe that A. gemmata is not different from A. russuloides . Two molecular studies based on sequences of the large ribosomal subunit RNA gene (nLSU @-@ rDNA) and the mitochondrial small ribosomal subunit RNA gene (mtSSU @-@ rDNA) show that A. gemmata is part of a clade within Amanita with its close relatives A. muscaria , A. farinosa and A. roseitincta .

The mushroom is commonly known as the " gemmed Amanita " , the " jonquil Amanita " , or the " European gemmed Amanita " .

= = Description = =

The fruit bodies are colored yellow overall . The fresh cap , ranging in color from dull creamy yellow to golden yellow to buff , is sticky when moist . White warts adorn the cap surface , but they are usually flimsy and easily washed away by rain . They are placed randomly , but tend to be more concentrated in the center . The cap is typically 2 @.@ 5 ? 12 cm (1 @.@ 0 ? 4 @.@ 7 in) in diameter , and initially convex before flattening out in maturity . The flesh is white , and shows no change when sliced .

The gills are adnate to adnexed , and white ; they are close together , with little intervening space . The pale yellowish stem is 4 ? 12 cm (1 @.@ 6 ? 4 @.@ 7 in) long by 0 @.@ 5 ? 1 @.@ 9 cm (0 @.@ 2 ? 0 @.@ 7 in) thick , and either roughly equal in width throughout , or slightly thicker at the base . Young mushrooms have a membranous partial veil extending from the upper stem to the cap margin ; as the mushroom grows , the partial veil tears to leave a flimsy , skirt @-@ like , easily lost

ring on the stem . At the base of the stem is a white volva (a remnant of the universal veil that covered the immature mushroom) that usually forms a small , free rim . Spore prints are white . There is no distinctive odour .

= = = Microscopic characteristics = = =

Amanita gemmata has ellipsoid to broadly ellipsoid spores measuring 8 ? 10 by 6 @.@ 5 ? 7 @.@ 5 µm with an average Q @-@ ratio (the fraction of length / width) of 1 @.@ 35 ; they are not amyloid . The spores are smooth , thin @-@ walled , and they contain one to several small oil droplets . The basidia (spore @-@ bearing cells of the hymenium) are usually four @-@ spored , club shaped , and measure 30 ? 40 by 8 ? 11 µm .

The gill tissue is divergent , meaning that the cells are more or less parallel near the center of the gill , but bend outwards near the end of the gill . The hyphae in this tissue are cylindrical to inflated , thin walled , hyaline (translucent) to yellowish , and measure 2 @.@ 2 ? 9 µm wide ; the hyphae in the central strand are narrower and typically cylindrical . The hyphae of the subhymenium (a layer of tissue directly under the hymenium) are interwoven . These hyphae are branched , cylindrical to slightly inflated , hyaline , and 6 ? 9 µm wide . The hyphae of the cap cuticle are filamentous , interwoven , and radially arranged . They are cylindrical , 2 @.@ 7 ? 4 µm wide , thin @-@ walled , hyaline to yellowish , and gelatinize when mounted in potassium hydroxide . The cap tissue is also interwoven , with hyphae that are cylindrical to somewhat inflated , 3 @.@ 7 ? 14 @.@ 6 µm wide , thin @-@ walled , branched , and hyaline to yellowish . Caulocystidia are abundant on the apex of the stem ; they are club @-@ shaped to cylindrical , thin @-@ walled , hyaline , and measure 3 ? 9 µm wide . The annulus tissue comprises interwoven cylindrical hyphae measuring 3 ? 9 µm wide . Sphaerocysts (inflated , spherical cells) are also present in the annulus tissue ; they are club shaped to ellipsoidal , with dimensions of 29 ? 55 by 30 ? 70 µm . The warts on the cap surface (remnants of the universal veil) comprise loosely interwoven cylindrical to inflated thin @-@ walled hyphae that are 3 @.@ 5 ? 8 µm wide . Sphaerocysts in this tissue are 58 @.@ 5 ? 70 @.@ 2 by 17 @.@ 5 ? 40 µm , ellipsoidal , and hyaline . The volval tissue is interwoven , with cylindrical , hyaline hyphae that are 4 @.@ 4 ? 7 @.@ 3 µm wide . The sphaerocysts here are ellipsoidal to roughly spherical , hyaline , and measure 35 ? 70 by 20 ? 35 µm . In A. gemmata , where they are most abundant in the region just below the cap cuticle , these refractive cells are scattered , and have a width of 3 @.@ 7 ? 6 µm . Clamp connections are rare in the hyphae of A. gemmata ; they are present in the annulus , gill tissue , subhymenium , and cap tissue .

= = = Similar species = = =

There are numerous forms in North America that tend to intergrade with A. pantherina . In 2005 , mycologist Rod Tulloss described Amanita aprica , a species that has been confused with A. gemmata several times in the past . According to mycologists Pierre Neville and Serge Poumarat , the Mediterranean species A. amici (synonymous with A. gemmata f. amici) is similar in appearance to A. gemmata but is larger . According to Tulloss however , their measurements of the cap and stem dimensions of A. amici fell within the range expected for A. gemmata , and for this reason , the two taxa should be considered conspecific . Neville and Poumarat suggest that the name A. gemmata still persists for Mediterranean collections because of its frequent historical misapplication to the native Italian species A. gioiosa , which had not been described as a distinct species until 2004 . A. orientigemmata , a mushroom ranging from Japan to China , is a lookalike , but has clamps , unlike A. gemmata . Other differences between the two species include the slightly smaller spores of A. orientigemmata , and differences in the microstructure of the cap warts .

= = Toxicity = =

Toxicity is suspected to be due to the presence of muscimol and ibonetic acid .

Generally , symptoms of poisoning appear within three hours of ingestion of the mushroom as

visual hallucinations , nausea , vomiting , stomach pain , diarrhea , irregular and slow heart beat and agitation . Severe cases involving coma , convulsions , or death are extremely rare .

= = Ecology , habitat and distribution = =

Amanita gemmata is a mycorrhizal fungus , meaning it forms a mutually beneficial relationship with the roots of compatible host plants . Through the association , the plant provides the fungus with a carbon source , and the fungus provides the plant with several benefits such as nutrients and protection from pathogens . Largent and collaborators (1980) document mycorrhizal associations of A. gemmata with Manzanita (Arctostaphylos spp .) and Lodgepole Pine (Pinus contorta) , and Nieto and Carbone with Maritime Pine (Pinus pinaster) in Spain . The fungus favours sandy and slightly acidic soils , and is often found in association with Norway Spruce (Picea abies) . The mushroom grows either singly , scattered , or in groups in coniferous and mixed forests , especially along paths and roads .

The species is distributed in areas of Asia , the Americas , and Europe . It fruits in summer and fall (fall and winter in California) . It is widely distributed (as a species cluster) in North America , where it has been found as far south as Ixtlán de Juárez , Mexico . The species has been reported from the Dominican Republic . In South America , it is known from Chile . In Asia , the mushroom has been collected from Iran and China .