

***Amanita sinicoflava* Tulloss**

“Mandarin Yellow Lack-Ring”

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BRIEF DESCRIPTION: *Amanita sinicoflava* has a Chinese yellow or “curry powder colored” or yellow-olivaceous or olive-tan cap is 25 - 66 mm wide. Grooves run inward from the cap edge for about 40% of the radius. Warts or patches of pallid to grayish volva are often left on the cap, but can be washed off easily by rain. This mushroom has a whitish stem (60 - 135 × 4 - 12 mm) decorated with somewhat darker fibrils. The stem lacks both a membranous ring and a bulb. The volval remnants are saccate and submembranous and becoming progressively grayer with age beginning from the top of the sac and working downward. The gills of this species turn grayer as the mushroom ages. The very plentiful short gills appear approximately squarely cut off on the end nearest the stem. The spore print is white. The species is probably symbiotic with oak, beech, and diverse conifers and is distributed widely in the northeastern and north central United States and, probably, in southeastern Canada—fruiting from late June to October. It is expected to be found in the Park. Prior to its description, this species was often determined as “*Amanita fulva*.” —R. E. Tulloss.



Amanita sinicoflava Tulloss. 1988. *Mycotaxon* 32: 421.

Illus.: Phillips. 1991. *Mushr. N. Amer.:* 19 (bottom).

Illus.: Kibby. 1993. *Illus. Guide Mushr. Other Fung. N. Amer.:* 87 (bottom).

Illus.: Bessette *et al.* 1997. *Mushr. NE North Amer.:* 274 (upper right).

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TECHNICAL DESCRIPTION (incomplete).

Etymology: *sinicoflava*, Chinese yellow—a common color for the pileus.

PILEUS: 25 - 66 mm wide, from pale olive-tan to olive-yellow to curry to brownish olive sometimes darker in disk (4B3, browner than 4B3, 4-5C4, 4-5C8, browner than 4C4, browner than 4C8, much more olive than 5C4, 5F7-8 (over disk in one specimen), 6D4), sometimes pigmentation developing/darkening after rupture of universal veil, occasionally paler to cream at margin, at first ovoid with umbo, expanding to broadly subcampanulate to convex to plano-convex with decurved margin, always retaining small pronounced umbo, dull, subviscid to dry; *context* (1-) 2.5 - 4 mm thick at disk, white to off-white, sometimes darker or yellowish under disk, unchanging, thinning evenly for about 60 - 80 per cent of the radius, then very thin to margin; *margin* striate ((0.3R-) 0.4R (-0.5R)); *universal veil* not present or rarely as one or very few small whitish to sordid patches graying with age.

LAMELLAE: close to subcrowded, 4 - 7.5 mm broad, free to narrowly adnate, occasionally with minute decurrent tooth, white to off-white to cream occasionally with faint orangish tint in mass, white to pale cream in side view, unchanging, after drying cream to pale tan sometimes with darker margin to light brown (between 3A3 and 4A3 to 4A3 to 4-5A4 to 5B4-5 to 5C-D4), with edge minutely fimbriate (lens); *lamellulae* in many ranks most longer than half pileus radius, truncate to subtruncate to subtruncate with small to broad attenuate tooth at attachment to pileus.

STIPE: 60 - 135 × 4 - 12 mm, white to off-white to pale cream to grayish, palest toward apex, becoming yellowish to tannish to brownish from handling, narrowing upward, flaring at apex, with surface longitudinally striate or faintly so at least near base, fibrillose for most of length, fibrils concolorous with pileus or paler or slightly sordid, coloring/darkening with exposure and handling, minutely punctate/pulverulent near apex, occasionally with faint lines at apex; *context* white, unchanging to rarely becoming brownish, larvae tunnels concolorous to rarely sordid tan, hollow with occasional

white, cottony stuffing, with central cylinder 3 - 5.5 mm wide; *exannulate*; *universal veil* white to whitish at first becoming gray with exposure or handling, sometimes with small rusty or brick-red spots, interior pale orangish or pinkish becoming gray, submembranous to membranous, saccate to limbate, at first flaring above a constriction at about mid-height of sac with interior longitudinally pleated above point of constriction, collapsing on stipe with age, occasionally in large patches or smears or a ring on lower stipe and leaving only lower portion or very little of sac, highest point of limb reaching 26 - 39 mm from stipe base; *limbus internus* thin, fibrillose, cottony at about point of constriction of sac, rarely seen.

Odorless. *Taste* not recorded.

MACROCHEMICAL TESTS: Spot test for tyrosinase (L-tyrosine) - positive (only tested stipe context and stipe surface). Test voucher: Tulloss 8-16-85-C.

PILEIPELLIS: 40 - 70 μm thick, colorless for 5 - 10 μm at surface, but lacking differentiated suprapellis, with yellow-orange intracellular pigment in remainder of tissue; filamentous, undifferentiated hyphae 1.5 - 5.0 μm wide, densely interwoven, subradially arranged, often at least partially gelatinized; vascular hyphae 2.0^{\pm} μm wide, occasionally branching, sinuous, infrequent. PILEUS CONTEXT: branching, undifferentiated, filamentous to inflated hyphae, 2.1 - 16.1 μm wide, interwoven; acrophysalides to 63×26 μm ; branching, vascular hyphae 2.1 - 12.2 μm wide, plentiful. LAMELLA TRAMA: bilateral; $w_{\text{cs}} = 2$ μm ; subhymenial base containing branching hyphae and intercalary inflated cells (clavate to ellipsoid, up to 28×16.8 [$28.4 - 69 \times 17.6 - 45$ μm] μm), with elements diverging at angles up to 2° ; filamentous, undifferentiated hyphae 1.5 - 14.0 μm wide, 2° divergent, terminal, inflated cells not observed; vascular hyphae 2.8 - 6.6 μm wide, branching, common. SUBHYMENIUM: $w_{\text{st-near}} = (10-)$ 15 - 25 μm ; $w_{\text{st-far}} = (40-)$ 50 - 55 μm ; branching structure of short uninflated or partially inflated hyphal segments and occasional inflated cells, with basidia arising from elements of all types (least often from inflated cells). BASIDIA: (41-) 49 - 63 \times 12.6 - 16.8 (-21) μm , clavate to broadly clavate, 4-spored to rarely 1- or 2-spored, thin-walled; no clamps seen. UNIVERSAL VEIL: *On stipe base, exterior surface*: occasionally with somewhat scattered remnant patches of a layer (one or two hyphal diameters thick) of longitudinally arranged, undifferentiated, filamentous hyphae up to 7 μm wide. *On stipe base, interior*: tissue becoming slightly denser toward inner surface; filamentous, undifferentiated hyphae 2.1 - 5.6 (-7.0) μm wide, branching, interwoven loosely, sometimes anastomosing; inflated cells plentiful, globose to subglobose to ellipsoid, terminal singly or (occasionally) in chains of two (rarely three), often with colorless partially inflated subterminal segment (holotype), difficult to

reinflate in older specimens, 19 - 45 (-60) × 15 - 39 (-46) μm, with walls thin to slightly thickened; vascular hyphae up to 10.5 μm wide, branching, scattered, singly or in tangled clusters; no clamps seen. *On stipe base, inner surface*: occasionally having remnants such as those on exterior surface, but here gelatinizing or nearly entirely gelatinized. STIPE CONTEXT: longitudinally acrophysalidic; branching, filamentous, undifferentiated hyphae 2.8 - 5.6 μm wide; acrophysalides very long and narrow to 635 × 50 μm; vascular hyphae 5.6 - 9.1 μm wide, occasional, branching; no clamps observed. All tissues pale yellow in ammonium hydroxide.

BASIDIOSPORES: [645/33/25] (8.0-) 9.1 - 12.1 (-15.4) × (7.0-) 8.4 - 11.5 (-15.4) μm, (**L** = (9.5-) 9.8 - 11.4 (-11.7) μm; **L'** = 10.6 μm; **W** = (8.7-) 9.0 - 10.6 (-10.8) μm; **W'** = 10.0 μm; **Q** = 1.0 - 1.14 (-1.26); **Q** = 1.04 - 1.09 (-1.10); **Q'** = 1.06), inamyloid, thin-walled, hyaline, globose to subglobose to occasionally broadly ellipsoid, frequently slightly adaxially flattened; contents guttulate; apiculus sublateral to rarely lateral, truncate conic to cylindrical, can be rather large relative to spore size; white in deposit.

Habitat and distribution: Solitary to occasionally subgregarious, at 10-1,000+ m elev. Maine, U.S.A.: In mixed woods of *Abies*, *Picea*, and *Thuja* (Bigelow 3963). Massachusetts, U.S.A.: In thin layer of damp loam over rock in moss under *A. balsamea* (Tulloss 8-17-86-A) or in loam under *Acer*, *Fraxinus*, *Betula papyrifera*, and scattered *Fagus grandifolia* (Tulloss 8-15-86-C). Michigan, U.S.A.: In *Tsuga canadensis* and northern hardwoods forest (Shaffer 3783). New Jersey, U.S.A.: With *B. lutea* f., *T. canadensis*, *Tilia* sp., and *Ulmus* sp. (Tulloss 6-15-85-A, 10-6-85-A, -E) or in typical *Quercus-Pinus rigida* barrens (Tulloss 8-28-85-D) or in sandy soil of woods dominated by *Acer rubrum*, *Q. alba*, *Q. velutina*, *Rhododendron*, and *Spirea* (Tulloss 8-28-85-F). New York, U.S.A.: In duff over acid, glacial out-wash sands under *T. canadensis*, *F. grandifolia*, and *Prunus* sp. (Tulloss 8-22-87-E) or in wet loam in mixed deciduous woods composed of *Acer* sp., *Carya* sp., *Quercus coccinea* and *Q. rubra* (Tulloss 8-18-86-C). West Virginia, U.S.A.: At 990 m elev. In moist loam of mixed forest locally dominated by *F. grandifolia*, *T. canadensis*, *A. balsamea*, and *Acer* (Tulloss 8-31-96-A).

Collections examined: **U.S.A.:** MAINE—Aroostook Co. - ca. Guerrette, “state game preserve,” 13.vii.1956 H. E. Bigelow 3963 (MICH). Cumberland Co. - Wolf Neck St. Pk., 16.x.1988 Moselio Schaechter *s.n.* [Tulloss 10-16-88-MS1]. [Hancock Co. - W of Pickerel Pond, 11.viii.1991 Stachula *s.n.* [Tulloss 8-11-91-E]. Penobscot Co. - University of Maine, 12.viii.1991 NEMF participant *s.n.* [Tulloss 8-12-91-C.] MASSACHUSETTS—Berkshire Co. - Adams, M. A. King & R. E. Tulloss 8-15-86-C (paratype, L); Balance Rock St. Pk., 15.viii.1986 R. Roper *s.n.* [Tulloss 8-15-86-L] (paratype); Cheshire, Camp Mohawk, 15.viii.1986 S. Sheine *s.n.* [Tulloss 8-15-86-F] (paratype); Mt. Greylock summit, R. E. Tulloss 8-17-86-A

(paratype). Border Hampshire & Hampden Cos. - Mt. Tom St. Res., 27.ix.1986 Ellen Greer *s.n.* [Tulloss 9-27-86-EG8] (paratype). MICHIGAN—Marquette Co. - Sullivan Creek area, 12.vii.1968 N. Smith & T. Gilliam [TG 165] (MICH). Ontonagon Co. - Porcupine Mtns. St. Pk., Government Peak Trail, 24.viii.1962 R. L. Shaffer 3783 (MICH as “*A. vaginata*”). [MINNESOTA—? NEW HAMPSHIRE—Hillsborough Co. - Harris Center, 18.viii.1989 NEMF participant *s.n.* [Tulloss 8-18-89-C].] NEW JERSEY—Mercer Co. - Hopewell, R. E. Tulloss 7-6-81-B (paratype), 7-7-81-C (paratype), 7-18-84-D (paratype). Monmouth Co. - Shark River Co. Pk., 8.vii.1984 Susan Hopkins *s.n.* [Tulloss 7-8-84-F] (paratype), R. E. Tulloss 8-28-85-D (paratype), 8-28-85-F (paratype), Bruce Vansant *s.n.* [Tulloss 8-3-86-H] (paratype). Sussex Co. - Stokes St. For., M. A. King & R. E. Tulloss 6-15-85-A (paratype); Stokes St. For., Kittle Field Recreation Area, 6.x.1985 NJMA member *s.n.* [Tulloss 10-6-85-A] (holotype, NY)[, M. A. & R. E. Tulloss 9-28-97-A]; Wallpack Center, 6.x.1985 Neal Macdonald *s.n.* [Tulloss 10-6-85-E] (paratype). NEW YORK—Essex Co. - North Elba, 21.viii.1987 NEMF participant *s.n.* [Tulloss 8-21-87-L] (paratype, DTJ). Franklin Co. - Floodwood, 22.viii.1987 Joe Arnold *s.n.* [Tulloss 8-22-87-E] (paratype); Harriestown, 21.viii.1987 Smith *s.n.* [Tulloss 8-21-87-K] (paratype, DTJ). Hamilton Co. - Raquette Lake, 21.viii.1987 Bill Roody *s.n.* [Tulloss 8-21-87-N] (paratypes: RET; TBORG; XAL). Otsego Co. - Arnold St. For., 16.viii.1985 R. M. Fatto *s.n.* [Tulloss 8-16-85-C] (paratype). Schenectady Co. - Mariaville, M. A. King & R. E. Tulloss 8-18-86-C (paratype). PENNSYLVANIA—Pike Co. - Pocono Environmental Educ. Ctr., M. A. King & R. E. Tulloss 6-20-81-A (paratype), 6-20-81-H (paratype)[, 24.vi.1989 Hanna Tschekunow *s.n.* [Tulloss 6-24-89-B]]. VERMONT—Bennington? Co. - NEMF '81 site, 30.viii.1981 NEMF participant *s.n.* [Tulloss 8-30-81-A] (paratype). Pownal Co. - NEMF '81 site, 29.viii.1981 NEMF participant *s.n.* [Tulloss 8-29-81-D] (paratype). VIRGINIA—Grayson Co. - Grayson Highlands St. Pk., Cabin Crk. Tr., 9.ix.1986 Robert S. Williams 323 (paratype).] WEST VIRGINIA—Tucker Co. - Canaan Valley St. Pk., E. terminus Abe Run Tr., jct. w/ Deer Run Tr., 31.viii.1996 R. E. Tulloss 8-31-96-A.]

DISCUSSION

There are two taxa which closely resemble *A. sinicoflava* macroscopically: *A. mortenii* Knudsen & Borgen (from Greenland) and *A. submembranacea* (Bon) Gröger (subalpine, from Europe).

Amanita mortenii may be distinguished from *A. sinicoflava* by the following characters:

- The occasional presence of small, ochraceous flakes on the exterior, upper surface of the volval sac.

- Thick-walled, acrophysalides throughout the context of pileus and stipe, lamella trama, and the universal veil. These are easily seen if the tissue is stained with Congo Red and viewed with an oil immersion lens at 1000 \times . The wall thickness is 1.0-1.2 μm .
- Many thick-walled hyphae throughout the basidiocarp. Often the cell walls of such hyphae are not as thick as the walls of the inflated cells.
- A cellular subhymenium.
- Shorter acrophysalides in the stipe context.
- A thicker pileipellis.
- Generally narrower and possibly more plentiful, vascular hyphae.
- Basidia slightly longer.
- Spores slightly larger.

Amanita submembranacea may be distinguished from *A. sinicoflava* by the following characters:

- In the volva of *A. submembranacea*, a broken, thin fibrillose-felted to submembranous outer layer is visible to the naked eye in many, well-preserved exsiccata; remnants of the outer layer superimposed on the grayish unbroken inner volval layer may give the appearance of bits of flaking paint on old canvas. This character is completely absent in *A. sinicoflava*.
- The spores of *A. submembranacea* are about the same size as, or slightly larger than, those found in *A. sinicoflava*. Spores of "*A. subalpina*" may be as large as 12-17 \times 12-15 μm (Moser, 1983).
- A cellular subhymenium.
- Shorter acrophysalides in the stipe context.
- A thicker pileipellis.
- Slightly longer basidia in most specimens.

In addition to the two taxa examined in detail above, there are a number of others which require mention because of some similarity to *A. sinicoflava*. The fungus illustrated as *A. strangulata* (Fries) Quélet by Merlo & Traverso (1983) has pileus coloration which is similar to, although paler than, that of *A. sinicoflava*. This European entity is distinguishable—at least by its larger spores (12-14 μm in diameter) and its smaller ratio of striation length to pileus radius.

The literature contains five other taxa in *Amanita* section *Vaginatae* with globose cells dominant in the universal veil and globose to subglobose spores. The universal veil in *A. sinicoflava* is similar to that of *A. ceciliae* of Europe (Corner & Bas, 1962 and Bas, 1984) and “*A. inaurata*” *sensu* Peck of North America (description and discussion under *A. ceciliae* (Jenkins, 1986)). However, *A. sinicoflava* can be distinguished from either of these fungi by its pileus with olive tones, a smaller habit, and a commonly more robust universal veil frequently appearing as a constricted, saccate volva on the stipe base rather than as warts on the pileus which latter occurrence is more common in *A. ceciliae* and “*A. inaurata*” *sensu* Peck. The acrophysalides in the stipe of *A. sinicoflava* are up to twice as long as those of “*A. inaurata*” *sensu* Peck (Jenkins, 1986). *Amanita cinctipes* Corner & Bas (Corner & Bas, 1962) of southeast Asia has a universal veil similar to that of *A. ceciliae*, but sometimes appearing in small pyramidal warts on the pileus; its spores are reported to be smaller than those found in *A. sinicoflava*; *A. cinctipes* lacks an umbo; and its coloration is said to tend to grayish tones. *Amanita craseoderma* Bas (Bas, 1978) of the Amazon region has even smaller spores than *A. cinctipes*, a “very dark brownish grey” pileus, and considerably narrower basidia than *A. sinicoflava*. The pileus of *A. craseoderma* lacks an umbo. *Amanita groenlandica* Bas ex Knudsen & Borgen has a larger pileus than *A. sinicoflava* with shorter (0.1-0.2R) marginal striations, no umbo, and frequently a patch or patches of universal veil. Knudsen & Borgen (1987) also describe *A. groenlandica* as “relatively short-stemmed” and robust—another difference.

Three additional Western Hemisphere species of *Amanita* exhibit a universal veil somewhat similar to that in *A. sinicoflava*—*A. antillana* Dennis of Trinidad (Dennis, 1952 and Bas, 1978), *A. coacta* Bas of the Amazon region (Bas, 1978), and *A. constricta* Thiers & Ammirati of California (Thiers & Ammirati, 1982). However, all exhibit an average Q greater than that (1.06) seen in *A. sinicoflava*—1.2 in *A. antillana*, 1.3 in *A. coacta*, and approximately 1.2 in *A. constricta*. The closest of these to *A. sinicoflava* is the last named which can have a submembranous universal veil; however, *A. constricta* is further distinguished from *A. sinicoflava* by a gray-brown to hair brown pileus, red staining in the universal veil when moist, and striations that represent only about 0.2R (Thiers & Ammirati, 1982).

It should be noted that the collections of *A. sinicoflava* made in the Coastal Plain ecological region (those from New Jersey's Mercer and Monmouth counties) had, with but one exception, smaller spores than all other collections examined. I conjecture that this is due, at least in part, to the rapid loss of surface moisture due to the soil of the Monmouth County collection region being entirely composed of sand. Unlike many radicating species of *Amanita* section *Lepidella* which occur in the Atlantic Coastal Plain, basidiocarps of *A. sinicoflava* sit high in the soil—even to the extent of the volval sac being almost entirely above ground. This fact can be confirmed even in exsiccata because one finds fragments of leaves (and almost no sand at all) attached to the surface of the very bottom of the stipe.

In the field in eastern North America, *A. sinicoflava* is distinguished from taxa close to *A. vaginata* (Bull. per Fr.) Vittadini and *A. fulva* by pileus coloration. Moreover, these taxa do not exhibit the graying, submembranous to membranous volval sac of *A. sinicoflava*. The prominent orange-rusty stains frequently found on the volva of *A. fulva* do not occur in *A. sinicoflava*. —R. E. Tulloss

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