

***Amanita pachysperma* Atk.**

“Gray-Capped Little Caesar”

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BRIEF DESCRIPTION: This very small, gray-capped species may be easily overlooked because amanitas are not expected to be so small. The cap is 15 - 27 mm wide, darkest in the center, and has marked grooves extending from the margin 40% of the distance to the center. Its white stipe (23 - 50 × 3 - 6 mm) has a little, fragile skirt at first; but this may be lost with age. The volva is membranous and cup-like. The spore print is white. It appears to be symbiotic with oak and might also occur with pine. Its known range extends through the east coast states of the U.S. from Massachusetts to North Carolina. The species is named for its spores, which are unusually large for an *Amanita*—(9.5-) 10.5 - 16.2 (-20.0) × (6.0-) 7.5 - 10.5 (-12.5) μm.
—R. E. Tulloss



Photo: R. E. Tulloss

Amanita pachysperma Atk. 1918. *Proc. Amer. Philos. Soc.* 57: 354.

Illus.: Tulloss. 1993. *Mycotaxon* 49: Figs. 5-8.

Etymology: *pachys* (παχύς) + *spermus* (σπερμύς), stout-seeded—for the unusually large spores of this species.

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TECHNICAL DESCRIPTION.

PILEUS: 15 - 27 mm wide, light gray to gray (5B2), sometimes with dark gray disk, convex and umbonate at first, then planoconvex, finally with central depression, dull, slightly sticky or dry; *context* white, unchanging when cut or bruised, 1 - 1.5 mm thick, thinning rapidly to a point about half-way to margin, then a membrane; *margin* sulcate to tuberculate-striate (0.35 - 0.45R), nonappendiculate, sometimes slightly decurved; *universal veil* absent or as an irregular patch, membranous, white, often with its surface impregnated with sand.

LAMELLAE: narrowly adnate or adnexed to barely free, subdistant to subcrowded to crowded, pure white both in mass and in side view, 2.5 - 3 mm broad, occasionally anastomosing; *lamellulae* truncate to subtruncate to subattenuate, of variable length, unevenly distributed.

STIPE: 23 - 50 × 3 - 6 mm, pure white, not changing when cut or bruised, narrowing upward, not flaring or only slightly flaring at apex, faintly longitudinally striate (lens), somewhat floccose or fibrillose (lens), with its surface occasionally breaking up into girdle-like formations, fragile; *base* rounded or obconic; *context* white, occasionally pale reddish brown in very base, unchanging when cut or bruised, solid to stuffed to hollow, in the latter cases with a central cylinder 1 - 1.5 mm wide; *partial veil* white, superior to median, membranous, fragile, small, often lost; *universal veil* as a small cup or saccate, slightly greater than 1 mm thick at midpoint between point of attachment and topmost point of limb, pure white, somewhat leathery, not fragile, 7 - 13 mm from stipe base to highest point of limb, 5 - 8 mm across.

Odor of *Russula adusta*¹ Fr. (Singer collection) or odorless (Tulloss 8-6-88-A & Tulloss 7-17-91-C). *Taste* not recorded.

MACROCHEMICAL TESTS: Phenol - maroon (Singer collection).

1. Described by Kibby and Fatto (1990) as "often of old wine casks."

PILEIPELLIS: 20^{\pm} μm thick; filamentous, undifferentiated hyphae 1.5 - 5.5 μm wide, dominantly subradially arranged, tightly interwoven, partially to totally gelatinizing, with a slightly browner tint than adjacent pileus context; vascular hyphae not distinguishable. PILEUS CONTEXT: filamentous, undifferentiated hyphae 3.0 - 8.0 μm wide, occasionally up to 17.5 μm wide and then with walls thickened (0.5 - 0.8 μm thick); acrophysalides plentiful, thin-walled, ellipsoid to clavate to narrowly clavate, up to 68×39 μm ; vascular hyphae 1.8 - 12.0 μm wide, common, branching. LAMELLA TRAMA: bilateral, with $w_{\text{CS}} = 30 - 40$ μm , with central stratum sometimes partially obscured by inflated or partially inflated cells of the subhymenium; with divergent elements exiting central stratum at a shallow angle, sometimes at an angle of about 45° or more to central stratum when reaching bases of basidia; filamentous, undifferentiated hyphae 2.5 - 6.0 μm wide, some with rather frequent swollen intercalary segments; divergent, terminal, inflated cells not observed; vascular hyphae 1.5 - 3.8 μm wide, locally common, branching; clamps present. SUBHYMENIUM: $w_{\text{st-near}} = 30 - 55$ μm ; $w_{\text{st-far}} = 55 - 60$ μm ; filamentous, undifferentiated hyphae frequently branching and short-segmented outside the central stratum; elongate, intercalary, subinflated to inflated hyphal segments frequent, sometimes in short chains, sometimes clavate, sometimes narrowly subfusiform to bacilliform, up to 75×21 μm , thin-walled, sometimes arising in central stratum and with major axis roughly parallel to same, curving away from the central stratum smoothly until reaching an angle of $30^{\circ} - 45^{\circ}$ to it and giving rise to short elements near the bases of basidia, with end nearest basidia sometimes recurved slightly; short hyphal segments (including a variable number inflated) dominant near basidia bases with many running at shallow angle to central stratum; in some regions, small inflated cells (up to 29×18.5 μm , but mostly smaller, e.g., 9.0×8.5 μm) locally dominant in three to six layers; with basidia arising from inflated cells or from the end or the side of an uninflated to partially inflated hyphal segment; clamps observed. BASIDIA: $24 - 56$ (-67) $\times 8.0 - 14.5$ (-15.5) μm , thin-walled, at times with base curved to one side, dominantly 2-sterigmate, occasionally 4- or 1-sterigmate, with sterigmata up to 13.8×3.8 μm ; clamps and proliferated clamps prominent, frequent. UNIVERSAL VEIL: *On pileus*: absent in material studied. *At stipe base, exterior surface*: a very thin layer of tightly interwoven hyphae with a few ventricose gaps here and there; filamentous, undifferentiated hyphae 1.5 - 7.5 μm wide, sublongitudinally oriented, often collapsing and slightly gelatinized; vascular hyphae 4.8^{\pm} μm wide, scarce. *At stipe base, interior*: filamentous, undifferentiated hyphae, 2.2 - 7.2 μm wide, often in fascicles, plentiful; inflated cells dominating, terminal, single, subglobose to ovoid to elongate to ellipsoid to subpyriform up to 105×63 μm ; vascular hyphae 4.0^{\pm} μm wide. *At stipe base, inner surface*: like the interior except elements collapsed and gelatinized. STIPE CONTEXT: longitudinally acrophysal-

idic; filamentous, undifferentiated hyphae 1.5 - 10.2 μm wide, dominating, branching; acrophysalides thin-walled, up to 191 \times 47 μm ; vascular hyphae common, 3.0 - 6.5 μm wide, branching; clamps common. PARTIAL VEIL:¹ extensively gelatinized; with surface having irregularly scattered pits (evidently due to loss of inflated cells) up to 56 \times 36 μm ; filamentous, undifferentiated hyphae with co-parallel orientation; internal inflated cells not observed; vascular hyphae not distinguishable due to gelatinization.

BASIDIOSPORES: [204/10/5] (9.5-) 10.5 - 16.2 (-20.0) \times (6.0-) 7.5 - 10.5 (-12.5) μm , (**L** = (11.3-) 11.7 - 14.5 μm ; **L'** = 13.1 μm ; **W** = (8.1-) 8.6 - 9.7 μm ; **W'** = 9.0 μm ; **Q** = (1.12-) 1.26 - 1.75 (-2.10); **Q** = (1.30-) 1.31 - 1.64; **Q'** = 1.48), inamyloid, thin-walled, hyaline, smooth, ellipsoid to elongate, occasionally cylindrical, sometimes subfusiform, usually at least somewhat adaxially flattened; apiculus sublateral, cylindrical, often quite broad (e.g., 3.2 μm across); contents granular to guttulate; white in deposit.

Habitat and distribution: Occurring in July and August, western North Carolina to eastern Massachusetts and Rhode Island, solitary to subgregarious, in grass near mature *Quercus* (Singer collection) or in packed loamy soil near *Quercus sp.* and *Rhododendron maximum* (Tulloss 8-6-88-A) or in pine-oak barrens dominated by *Pinus rigida* with several species of *Quercus* as scrub (Tulloss 7-17-91-C) or in mixed deciduous woods with *Quercus* present (Tulloss 7-25-92-D). The holotype was collected in mixed deciduous and coniferous forest.

Collections examined: **U.S.A.:** CONNECTICUT—Litchfield Co. - Washington Twp., N of Washington Depot, Bee Brook Pk., 25.vii.1992 B. Eldering *s.n.* [Tulloss 7-25-92-D]. MASSACHUSETTS—Suffolk Co. - Cambridge, Observatory Park, vii.1942 M. & R. Singer *s.n.* (FH; field notes in F). NEW JERSEY—Middlesex Co. - Jamesburg Co. Pk., *ca.* Helmetta, R. E. Tulloss 7-17-91-C. NORTH CAROLINA—Watauga Co. - Blowing Rock, 19.viii-19.ix.1899 G. F. Atkinson 3711 (holotype, CUP-A). RHODE ISLAND—Washington Co. - near Kingston, 6.5 km S of University of Rhode Island campus, 6.vii.1988 Rick Van de Poll *s.n.* [Tulloss 8-6-88-A].

DISCUSSION

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1. No tissue assignable to the partial veil could be located on specimens of the holotype. In his type study, Jenkins (1982) found “exclusively filamentous hyphae 3 - 8 μm diam.” The data presented here are from a flake on the stipe of Tulloss 8-6-88-A.

The investigations reported in this paper were undertaken as a result of my finding a packet containing material of the present taxon marked "*A. biovigera* type" in FH. Dr. C. Bas, L, advised me that the name first appeared in (Singer, 1951 ["1949"]: 387). The citation is in a list of taxa assigned to *Amanita* section *Ovigerae* Sing. and consists entirely of the following: "*A. biovigera* Sing. [*A. strangulata* (Fr.) Quél. *sensu* Bres. *non al.*]." Dr. Bas pointed out to me that, because Bresadola's description was in Latin, the brief quotation just cited results in a valid publication of *A. biovigera*. Dr. Bas was very generous in sending me notes that he had prepared on the subject several years ago. He had examined potential syntypes of *A. biovigera* among Bresadola's collections at S and found this material to have 4-sterigmate basidia. The composite from his spore measurements is as follows: [25/3/3] (10.8-) 11.2 - 13.9 (-14.4) × (8.2-) 8.3 - 11.5 (-11.7) μm, (**L** = 11.7 - 12.9; **L'** = 12.4 μm; **W** = 8.6 - 10.4 μm; **W'** = 9.8 μm; **Q** = (1.07-) 1.08 - 1.45 (-1.51); **Q** = 1.18 - 1.35; **Q'** = 1.27). (It should be noted that the specimen with **Q** of 1.18 was annotated "juvenilis" by Bresadola.) The description of Bresadola (1927: 18 & Tab. XVIII) includes an umbrinous (but not dark) pileus 80 - 100 mm wide and a stipe 120 - 160 × 11 - 15 mm. [The color of the pileus in the accompanying plate is between *Light Brownish Olive* and *Buffy Olive* or a little lighter (due to uneven application of pigment in the illustration).] It became clear that *A. biovigera* cannot be the correct name of its apparently once-intended type. During a visit to F, I was shown and given permission to copy Dr. Singer's original field notes, which give a good account of the fresh material of the Observatory Park collection.

Jenkins (1982) reported a study of the holotype collection of *A. pachysperma* that matches my observations on the Singer material in every detail except for the fact that basidial clamps had not been observed. Re-examination of the holotype revealed relatively common clamps and proliferating clamps. The holotype is in poor condition—reduced to fragments that are somewhat difficult to handle. For this reason, repetition of a complete anatomical study of the type was not attempted. Spore size and shape as well as the structure of the lamella trama and subhymenium were examined in the type and, along with macroscopic characters, were emphasized in determining the recent collections.

The shortest spores of any collection examined were those from Tulloss 8-6-88-A (**L** = 11.3 - 11.7 μm). Tulloss 8-6-88-A was collected during a dry, hot period in which the daytime temperature in Rhode Island regularly rose to over 38° C. The basidiocarps of *A. pachysperma* are quite small and, as such, particularly liable to the impact of environmental stresses. Therefore, it seems reasonable that such conditions might cause production of smaller spores than usual. In the same regard, Tulloss 7-25-92-D was collected in the wet and relatively cool July of 1992, the **Q** and **L** values calculated for this specimen (1.63 and 14.4 μm respectively) were the second highest recorded for both of the variables.

As has been noted by Jenkins (1986), the anatomies of *A. virginiana* and *A. pachysperma* are very similar. I decided against using figures showing the interior structure of the universal veils of all three taxa treated in this paper because they are essentially identical. *Amanita pachysperma* differs from the *A. virginiana* and *A. subvirginiana* (Murr.) Murr. in at least six characters:

- pigmentation of the pileipellis
- closeness of lamellae (those of *A. pachysperma* being most crowded)
- size and shape of spores
- completeness of the outer layer of the universal veil (that of *A. pachysperma* nearly completely covering the interior, while the interior is commonly exposed between parallel fascicles of hyphae in the other two taxa)
- quantity of vascular hyphae in the pileus context (common in *A. pachysperma*, scarce or absent in the other two taxa)
- amount of inflation in elements of the subhymenium (frequently, more elements inflated in *A. pachysperma*) and of the lamella trama (terminal, divergent, inflated cells absent in *A. pachysperma*).

It must be noted that in the sections of *A. virginiana* lamella trama in which the greatest degree of inflation was seen, the similarity to the lamella trama of *A. pachysperma* was striking; a shallower angle of divergence and occasional, divergent, terminal, inflated cells were the differences. Based on limited observations, it appears that the partial veil of *A. pachysperma* is lost more readily than the partial veils of the other two taxa. —R. E. Tulloss

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