

Taxonomic Structure of the Genus *Oudemansiella* (Agaricales)

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Zusammenfassung. Für die Gattung *Oudemansiella* SPEG. (Agaricales) wird folgende taxonomische Struktur vorgeschlagen: Untergattung *Megacollybia* emend. mit den neuen Sektionen *Megacollybia*, *Pseudoradicatae* und *Protoxerula*. Untergattung *Xerula* mit den neuen Sektionen *Xerula* und *Albotomentosae*. Die neuen Untergattungen *Pseudomycenella* und *Dactylosporina* mit je nur einer nicht speziell benannten Sektion. Untergattung *Oudemansiella* emend. mit den neuen Sektionen *Radicatae*, *Hygrophoroides* und *Oudemansiella*. Die taxonomische Struktur der Gattung wird aufgrund einer taxometrischen Computer-Analyse in einer dreidimensionalen Zeichnung veranschaulicht und diskutiert.

Introduction

Data obtained from observations on fresh or dried material and information gained from the literature have been used in a computer aided study of the infrageneric taxonomy of the mushroom genus *Oudemansiella* SPEGAZZINI. In the final analysis 18 species have been retained for a Wisconsin comparative ordination (COTTAM et al. 1973) based on a matrix of taxonomic distances obtained by computing GOWER similarities (SNEATH & SOKAL, 1973).

The 16 characters used were cap size, pigmentation, villosity and viscosity; stipe pigmentation and villosity, rhizomorphs, pseudorhiza and annulus; spore size and form and ornamentation; size and form of basidia, pleurocystidia and cheilocystidia; ecology (habitat; growing on wood or not so). The species retained were those for which sufficient data could be obtained. They represent the vast majority of the described species.

No attempt has been made to clarify critical species or to validate invalide names, as this will be the topic of a forthcoming paper.

Taxonomy

Five major groups are recognized. Since three of them correspond to already established subgenera the remaining two groups are also given this taxonomic rank. A total of 10 sections can be distinguished.

Oudemansiella SPEG.

Subgenus I. *Megacollybia* (KOTL. et POUZ.) MOS. emend.

Pileipellis not gelatinized. Stipe surface devoid of erect hairs. Spores smooth. Annulus absent.

Type species: *Oudemansiella platyphylla* (PERS. ex FR.) MOS.

Section 1. *Megacollybia* sect. nov.

Pileipellis consisting mainly of repent hyphae many of them with clavate to pyriform, more or less erect terminal cells. Terminal cells not arranged in an hymeniderm or only poorly so in the center of the pileus. Stipe with rhizomorphs, but a true pseudorhiza is lacking. Spores relatively small with thin and simple wall.

Type and only species known: *Oudemansiella platyphylla* (PERS. ex FR.) MOS.

Section 2. *Pseudoradicatae* sect. nov.

Pileipellis a true hymeniderm, lacking erect hairs. Stipe without rhizomorphs, pseudorhiza absent or poorly developed. Spores usually big, with slightly thickened wall.

Type and only known species: *Oudemansiella pseudoradicata* MOS.

Section 3. *Protoxerula* sect. nov.

Pileipellis a hymeniderm with numerous erect, septate and hyaline hairs. Pseudorhiza present. Spores large.

Type and only known species. *Oudemansiella xeruloides* BON.

Subgenus II. *Xerula* (R. MRE) SING.

Pileipellis not gelatinized, a true hymeniderm. Unicellular hairs (usually erect, but sometimes collapsing) present on cap and stipe. Pseudorhiza present, rhizomorphs and annulus lacking. Spores smooth.

Type species: *Oudemansiella longipes* (BULL. ex St. AMANS) MOS.

Section 1. *Xerula* sect. nov.

Hairs on cap and stipe with brownish to brown walls.

Type species: *Oudemansiella longipes* (BULL. ex St. AMANS) MOS.

Additional species: *O. badia* (QUÉL.) MOS., *O. pilosa* (RICK) SING., *O. fraudulenta* MÉTOD (nom. nud.).

Section 2. *Albotomentosae* sect. nov.

Hairs on cap and stipe with hyaline walls, usually collapsing and more or less applied against the surface of the fruit body forming a white tomentum.

Type species: *Oudemansiella nigra* DÖRFELT.

Additional species: *O. renati* CLÇ., *O. caussei* (R. MRE) MOS. ap. CLÇ.

Subgenus III. *Pseudomycenella* subgen. nov.

Pileipellis a non gelatinized hymeniderm. Unicellular hairs present

on cap and stipe, with hyaline wall, usually collapsing. Rhizomorphs, pseudorhiza and annulus lacking. Spores covered with peg-like projections.

Type and only species known: *Oudemansiella kuehneri* (ROMAGN.) SING.

Subgenus IV. *Dactylosporina* subgen. nov.

Pileipellis a gelatinized layer of pedunculate globose to subglobose cells sometimes forming a hymeniderm; cap subviscid to viscid. Unicellular hairs absent. Stipe with a pseudorhiza, annulus lacking, naked or with some villosity. Spores ornamented with long finger-like projections.

Type species: *Oudemansiella steffenii* (RICK) SING.
Additional species: *O. macracantha* SING.

Subgenus V. *Oudemansiella* emend.

Pileipellis a hymeniderm covered by a gelatinous layer; cap viscid to glutinous. Unicellular hairs absent. Stipe with or without a pseudorhiza, annulus absent or present. Spores smooth, usually big.

Type species: *Oudemansiella canarii* (JUNGH.) HÖHNEL.

Section 1. *Radicatae* sect. nov.

Pseudorhiza present, annulus absent.

Type and only species known (very variable, perhaps several closely related species): *Oudemansiella radicata* (RELH. ex FR.) SING.

Section 2. *Hygrophoroides* sect. nov.

Pseudorhiza absent or poorly developed, annulus absent.

Type species: *Oudemansiella hygrophoroides* SING. et CLÇ.
Additional species: *O. ephippium* (FR.) MOS.

Section 3. *Oudemansiella* sect. nov.

Pseudorhiza absent, annulus present. Usually fruiting directly on wood.

Type species: *Oudemansiella canarii* (JUNGH.) HÖHNEL.
Additional species: *O. mucida* (SCHRAD. ex FR.) HÖHNEL, and obviously also *O. venosolamellata* (IMAZ. et TOKI) IMAZ. et HONGO. (This species has not been included in the computer analysis).

Diagnoses of new or infrageneric taxa

Subgen. *Megacollybia* (KOTL. et POUZ.) MOS. emend., generis *Oudemansiella*.
Pileus siccus. Pili unicellulares nulli. Sporae leaves. Annulus nullus.

Typus: *Oudemansiella platyphylla* (PERS. ex FR.) MOS.

Subgen. *Pseudomycenella* subgen. nov. generis *Oudemansiella*.

Pileus stipesque pilis unicellularibus hyalinis instructi.

Pseudorhiza deest, annulus nullus. Sporae appendicibus digitaliformibus praeditae. Pileus siccus.

Typus: *Oudemansiella kuehneri* (ROMAGN.) SING.

Sect. *Albotomentosae* sect. nov. subgeneris *Xerula*.
Pileus stipesque pilis unicellularibus hyalinis instructi.
Typus: *Oudemansiella nigra* DÖRFELT.

Sect. *Radicatae* sect. nov. subgeneris *Oudemansiella*.
Pseudorhiza adest. Annulus nullus.
Typus: *Oudemansiella radicata* (RELH. ex FR.) SING.

Sect. *Hygrophoroides* sect. nov. subgeneris *Oudemansiella*.
Pseudorhiza nulla vel indistincta. Annulus nullus.
Typus: *Oudemansiella hygrophoroides* SING. et CLQ.

Sect. *Oudemansiella* sect. nov. subgeneris *Oudemansiella*.
Pseudorhiza nulla. Stipes annulatus.
Typus: *Oudemansiella canarii* (JUNGH.) HÖHNEL.

Interpretation of the graphic representation (fig. 1)

The five subgenera are outlined by solid boundaries which, of course, do not depict actual limits with mathematical precision. Within the subgenera *Oudemansiella* and *Xerula* the sections with more than one species are made more evident by solid connecting lines corresponding to GOWER similarities superior to 0.850. The broken lines between the subgenera link nearest species.

Six characters play a major role in the taxonomic structure and perhaps in evolution as well. Together they form three gradients or vectors used in the graph as the three dimensions of space. The species are arranged along these gradients, minimizing distortion as far as possible. The most important gradient runs from side 2 to side 3, the second gradient goes from side 1 to side 4, and the third gradient with the lowest information content rises vertically from the ground plane.

The six characters are:

1. Intensity of pigmentation (maximum at side 2, minimum at side 3)
2. Viscosity of the cap (maximum at side 3, minimum at side 2)
3. Presence of unicellular hairs (maximum at side 2, minimum at side 3 — actually fading out already at midway, being replaced by a viscous cap).
4. Development of a pseudorhiza, best expressed by the third vector. High position above the ground plane indicates strong development of a pseudorhiza. This character is also somewhat expressed in the first gradient from 2 to 3, with some disturbance in the middle region.
5. Complexity of the spore wall (minimum at side 1, maximum at side 4)
6. Complexity of the pileipellis, from hyphal with some pyriform cells via hymeniderm to the complex structures found in the subgen. *Dactylosporina* (minimum at side 1, maximum at side 4).

The three gradients are composed of

gradient 1 (running from side 2 to side 3): degree of (brown) pigmentation, viscosity of the cap viz. presence or absence of unicellular hairs, and (to a lesser degree) the development of a pseudorhiza.

gradient 2 (running from side 1 to side 4): increasing complexity of the spore wall and of the structure of the pileipellis.

gradient 3 (rising from the ground plane): increasing development of a pseudorhiza.

In *Oudemansiella* the most primitive subgenus is *Megacollybia*, probably derived from *Tricholomopsis*. As a matter of fact, SINGER (1975) places *O. platyphylla* in the genus *Tricholomopsis*. Biochemical data (not used in the computer analysis) support the position of this species in *Oudemansiella*. There are similarities of pigments between *O. platyphylla* and *O. radicata* (KNECHT 1967) and dissimilarities of free amino acids between *O. platyphylla* and several species of *Tricholomopsis* (NIMURA et al., 1974).

At first sight it seems rather surprising to include *O. pseudoradicata* and *O. xeruloides* in subgen. *Megacollybia*. GOWER similarities between these species are greater than average similarity between subgenera, but not high enough to unite the three species in one section. The subgenus *Megacollybia* is understood as being composed of species with dry pileus lacking unicellular hairs. It is important to realize that the septate hairs of *O. xeruloides* are of a different type than the unicellular hairs observed on species belonging to the subgenera *Pseudomycenella* and *Dactylosporina*. The fact that the septate hairs occur only on the cap, the unicellular hairs, however, both on cap and stipe, confirms the difference in nature of these bodies. With respect to unicellular hairs the cap of *O. xeruloides* is as naked as the cap of *O. pseudoradicata*.

Evolution within the subgen. *Megacollybia* proceeds from a simple pileipellis with incomplete or spurious hymeniform structures to a fully developed hymeniderm, occasionally bearing septate hairs. At the same time a pseudorhiza is developed, and the spore wall becomes thicker and double, but lacks ornamentation. The most advanced species seems to be *O. xeruloides*.

From subgen. *Megacollybia* evolution took two different directions. The first direction is characterized by the development of a gelatinous layer covering the pileus leading finally to the glutinous cap of the sect. *Oudemansiella*. The line starts with *O. pseudoradicata* and goes directly to *O. hygrophoroides*, and from there probably to *O. muscida* and *O. canarii*. These species are further characterized by the absence of a pseudorhiza and increasingly larger spores without ornamentation. The well known *O. radicata* seems to be at the dead-end of an early side line producing a strong pseudorhiza which normally is confined to the

dry or only slightly viscid species. Along this line of development we also find a decreasing intensity of pigmentation. This whole line constitutes the subgen. *Oudemansiella*.

The second direction of evolution produces dry caps covered with unicellular hairs. At the same time pigmentation increases and the pseudorhiza becomes a well established feature. The spores are smooth in species united in the subgen. *Xerula*. But from that subgenus evolution proceeded by producing the spectacularly ornamented spores. Reduction of the pseudorhiza (and of over all size as well) leads directly to subgen. *Pseudomycenella*, whereas reduction of the unicellular hairs and their replacement by gelatinization of the pileipellis leads to subgen. *Dactylosporina*.

It would be possible to derive the species belonging to subgen. *Dactylosporina* directly from subgen. *Megacollybia*, more precisely from *O. pseudoradicata*, by increasing complexity of spore wall and pileipellis and by slight gelatinization of the cap surface. GOWER similarities between *O. pseudoradicata* and the two species in subgen. *Dactylosporina* are too small to put those three species closer together in the graph. In view of the primitiveness of *Megacollybia* and under the impression of the highly derived state of subgen. *Dactylosporina* the adopted situation seems justified.

O. kuehneri has first been described as a species of *Mycenella*, and there are perhaps some relationships to that genus indeed. More evident seems the connection to *Strobilurus*, which is characterized by a hymeniform pileipellis (containing protruding cells strongly reminiscent of the unicellular hairs in *Oudemansiella*), the tail-like pseudorhiza and the lignicolous habitat.

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