

## Four interesting European Russulae of subsections Sardoninae and Urentinae, sect. Russula.

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The following redescrptions of European Russulae refer to two taxa, poorly understood and variously interpreted: *Russula sardonica* Fr. and *R. adulterina* (Fr.) Britz.

For reasons we have explained in previous publications (Ann. Mycol. 23: 335, 1935) and for many additional reasons we could add here, the binomial *R. sardonica* is a nomen dubium. It was not known well to Fries himself who took it at first for a variety of *Russula depallens* with more yellowish lamellae, and later separated it mainly on the basis of literature data, particularly Schaeffer, t. 16, fig. 5, 6 and Secretan, no. 509, both hardly belonging to *R. chrysodacryon* or *R. drimeia*, although "lamellae plorantes" (Fries 1836) and his unpublished plate of 1854 (See Singer, Sydowia 5: 459, 1951) would tend to support the determination as *R. chrysodacryon*. Not even the color of the pileus of the original *R. sardonica* is known; one of the first or the first indication given by Swedish botanists is "pileus yellow"! Furthermore, not even the taste of this species is indicated. If a species so poorly described, without type or authentic material, were at least fixed by a clear tradition among European mycologists, it might still be acceptable for either *R. drimeia* Cooke or *R. chrysodacryon* Sing., but the first authors who provide additional data which make it possible to interpret their material, descriptions, or illustrations, Britzelmayr, Romell, Bresadola and Ricken arrive at very different solutions: Their interpretation of Fries's species is *R. sanguinea* (Bull. ex Fr.) Fr., *R. queletii* Fr., *R. luteotacta* Rea, and *R. chrysodacryon* Sing. respectively, not counting those authors who attributed to *R. sardonica* yellow pileus. But even if *R. sanguinea*, *luteotacta*, and *queletii* could be clearly excluded, there would still be uncertainty as to whether *R. sardonica* is *R. drimeia* or *R. chrysodacryon*. This is so because we shall demonstrate that the latter two species are not identical although very closely related.

It is hardly necessary to redescribe *R. chrysodacryon*. This species has been redescribed several times (see for example Singer, Beih. Bot. Centralbl. 49: 288, 1932). However, J. Schäffer (under *R. torulosa* Bres., Ann. Mycol. 31: 479, 1933; Pilze Mitteleuropas III, p. 234, 1952) indicates a form which he considers rather an ecological or climatological form of *R. sardonica* (i. e. *R. chrysodacryon*), perhaps the intermediate form which caused Romell to combine *R. sardonica*

and *R. queletii*. I am convinced that this form such as characterized by Schäffer is indeed a somewhat bleached form of dry weather or dry habitats, but neither of *R. queletii* nor of *R. chrysodacryon*, but of a species, intermediate between these two now well defined species. It differs from *R. chrysodacryon* in the lamellae which do not distill watery droplets and do not stain yellow in age, on drying, or on bruising, in white to yellowish-white context which remains completely unchanging and only occasionally, in worm holes of the stipe, turns brownish or yellowish brown, in not unbearably acrid (young and fresh decidedly acrid, in dry weather, especially in stipe less acrid) taste, apple odor, whitish (not yellowish) color of the interior of dried stipes, rather thick pileus with subacute, later obtuse margin, weaker and slower ammonia reaction; frequently on sandstone, apparently also on calcareous soil (whereas *R. chrysodacryon* appears to prefer more acid and sandy soils). Habit and colors remind one often of a larger *R. queletii*, and the first impression is rather of this latter species than of *R. chrysodacryon*.

In the following lines we shall give a complete description of this species based on material collected in Britain by this author:

*Russula drimeia* Cooke Grevillea 10: 46. 1881.

*Russula queletii* var. *fuscoviridis* Bres. Icon. Mycol. 9: 431. 1929.

*Russula queletii* var. *atropurpurea* Bres. in Sacc., Fl It Hym., p. 420.

Pileus light purple red to purplish flesh color, purple red to deep purple, center often blackish purple, somewhat shining and more or less viscid when wet, unpolished-opaque when dry, even slightly innately granular at times, somewhat expallent in certain (mostly marginal) regions and rarely showing olive spots, glabrous and smooth, margin at first subacute, later becoming obtuse to rounded, cuticle poorly peeling, separable to up to one third of radius, convex, then in the center appanate to depressed, often subumbonate to obtuse, rarely umbonate (but obtusely so), diameter 50—80 mm.

Lamellae at first whitish or with a slight yellowish tinge, later light ochraceous cream (Crawshay no. 6 in the light, shades: 8), not becoming darker stained or discolored in age, on decaying, bruising, or drying, or merely slightly pale buffy ochraceous along the edges when drying out, but near the margin of the pileus sometimes colored along the edges with the pigment of the cuticle of the pileus, close, more rarely crowded or subclose, but then generally only in a certain sector, anastomosing-intervenose, few or none forking or shorter ones intermixed, generally medium broad, rather narrow to rather broad (4—7 mm. broad), adnexed to attenuate-subfree, later subdecurrent. Spore print cream (Crawshay: C).

Stipe varying from entirely purple to white with purplish or pinkish purple areas, and then especially near apex and base pigment-

less, but always with some purplish tinge, occasionally with brighter red areas, in age sometimes becoming yellowish at the base, glabrous or in young specimens often innately pruinose, later not pruinose, mostly quite smooth, but sometimes somewhat subrugulose, solid, generally cylindric, rarely somewhat tapering towards the base, 45—80×10—21 mm.

Context white to yellowish white, not discoloring anywhere when bruised or cut, on pressure or handling, on drying or decaying, only the maggot holes occasionally found discolored brownish or yellowish brown, firm, usually rather thick and becoming spongy very late if at all; taste generally distinctly acrid in all parts although less so in stipe, and under certain weather conditions in age not very strongly acrid and in parts submild; odor when quite fresh often inodorous, soon developing an agreeable odor of apples.

Microscopical characters: Spores 7—9×6—8  $\mu$ , yellowish hyaline, very short ellipsoid to subglobose, rough, ornamentation projecting 0.3—0.4  $\mu$ , of type IIIa (fewer IIIb, IIIb—VIII, IIIb—II), i. e. warty with fine reticulating connecting lines. — Hymenium: Basidia 25—35×7—9  $\mu$ , 4-spored, clavate. Macrocystidia 60—120×7—11  $\mu$ , fusoid, fusoid-subclavate, cylindric, or ventricose, obtuse or more often subacute to acute, often with a short appendage at the tip, strongly banded internally, hyaline to (mostly) yellowish, crowded. Hyphae hyaline without clamp connections, inamyloid, only in hypodermium fresh purplish pink (also in the uppermost zone of the stipe), non-gelatinized except in the epicutis of the pileus which is an ixotrichodermium, consisting of hyaline filamentous hyphae intermixed with typical and rather numerous dermatopseudocystidia (blue in sulfovanillin), the latter subacute to obtuse, 3.5—6  $\mu$  thick, not or little septate, often extremely long; oleiferous hyphae with bluing contents occurring in the hypodermium which is a cutis; dermatopseudocystidia of the macrocystidial type also occurring on the surface of the stipe; hymenophoral trama consisting of large nests of spherocysts and relatively few enveloping filamentous hyphae.

Chemical characters:  $\text{NH}_4\text{OH}$  on context of stipe positive (pink) reaction, but very pale and often very slow; other reactions as in *R. chrysodacryon*.

Under *Pinus silvestris* (perhaps also other conifers?) on the ground, particularly earth and humus over sandstone ground (perhaps also on calcareous soil — according to other observers), singly and in groups. Fruiting mainly in fall, but also in summer. With certainty in England, obviously also in Italy (Bresadola, see below), Germany (J. Schäffer, see above and below), Austria, and perhaps widely distributed and confused with *R. chrysodacryon*.

Material studied: Great Britain, South England, Kent, Nat. Pine Arboretum, under (planted) *Pinus silvestris*, 30-X-1960, leg. Singer

C 3116 (BAFC, K) — aside from this fresh material also material collected by J. Schäffer as *R. torulosa* (FH) and by Bresadola as *R. queletii* var. *atropurpurea*.

A comparison with correct descriptions of *R. chrysodacryon* will show that the species differs slightly but noticeably from *R. chrysodacryon* in a number of minor characters and is intermediate between the latter and *R. queletii*. *R. queletii* occurs most frequently in mountain spruce forests and in spruce forests of Central Europe where it may be found in (obviously mycorrhizal) relation with other conifers, particularly pines if the soil is calcareous. *R. chrysodacryon*, on the other hand, seems to be commonest in sandy woods of *Pinus silvestris* while *R. drimeia* may have a preference for non-sandy soils of the warmer and oceanic climates of Europe. These data, as far as they refer to *R. drimeia* should be tested more carefully, from an ecological point of view, now that the differences of the three species are entirely clear.

As for the choice of a name, we feel certain only about the names indicated above (*R. drimeia*, *R. queletii* var. *atropurpurea*, var. *fuscobrunnea*), not about *R. torulosa* Bres. and *R. queletii* var. *torulosa* (Bres.) Sing. I am still convinced that the specimens seen and characterized by me from Central Europe (l. c. p. 287, 1932) are forms of *R. queletii* (or possibly a species close to *R. queletii* but different from *R. drimeia*) inasmuch as they show completely negative  $\text{NH}_4\text{OH}$  reaction and spores of the type of *R. queletii*. It remains necessary to study these forms more in detail, particularly at the type locality (Sopramonte) and in the Southern Wiener Wald. Some doubts are still in order as to the non-identity of *R. torulosa* (type) and *R. drimeia* (type) since the weak ammonia reaction also was indicated as negative in J. Schäffer's collections which belong to *R. drimeia*, and because of the fact that *R. drimeia* does occur in the Trentino, apparently near the type locality of *R. torulosa*.

As for illustrations, the one published by Cooke, Illustrations plate 1023, is excellent, and material from the locality where our material was collected has been determined *R. drimeia* by E. Wakefield on the basis of this illustration. We also consider as excellent both pl. 431 (as *R. queletii* var. *fuscobrunnea*, even showing the precise and typical colors and the innate granulosity, the cylindrical stipe, and the rounded margin of the mature specimen) and pl. 432 (as *R. drimeia* — an exallant or paler, perhaps somewhat retarded form of the preceding plate) of Bresadola, Iconographia.

The spore and lamellae color has been slightly exaggerated by both Cooke and Bresadola — an understandable exaggeration if one considers the fact that both thought that *R. drimeia* differs from the related species in deeper spore and lamellae color — which is actually the case (excepting *R. chrysodacryon*) — but the differences

are weak (*R. queletii* having cream — B — spores, not white spores, and *R. drimeia* cream — C — spores — not pale ochraceous spore print). The pale sulphur yellow lamellae actually are the same as the color described by us, only this color is not fully constant and exists particularly in specimens which have developed in dry conditions.

The other complex of species in *Russula* which we shall discuss here refers to those species or forms which are generally characterized as being similar to *R. integra* but acrid. Since Fries mentioned a subspecies *adulterina* of what he calls *R. integra* (Epicrisis, p. 360, 1838) which is said to have slowly acrid taste, many authors call *Russula adulterina* any species similar to *R. integra*, but acrid. However, the situation is somewhat more complicated. *R. integra* Fr. is based on Linne, Suec. no. 1230 (about this see Zeitschr. f. Pilzk. 3: 77, 1924; Ann. Myc. 23: 333, 1935) which in my (1924) interpretation is the same as *R. velenovskyi* Melzer & Zvára (1927). Fries himself has a collective species in which a large number of elements can be traced (*R. integra* sensu Sing., *R. paludosa*, *R. polychroma*, cf. particularly Sydowia 5: 457, 1951). The interpretation given by Maire in preference to that by Singer (accepted temporarily by J. Schäffer), Ulbrich in Lindau and others was, for a time, adopted by a majority of European mycologists although the case for it, as exposed by J. Schäffer (Ann. Mycol. 31: 405, 1933) — who pleads for conventional „Festlegung“, i. e. creation of a nomen conservandum specificum — is admittedly very weak. Consequently, the new name *R. polychroma* was introduced by me, and legally published by Hora in Dennis, Orton & Hora (New Check List IV, Trans. Brit. Myc. Soc. 43: 457, 1960, see also vol. I, Suppl. Trans. Brit. Myc. Soc. p. 157, 1960) which then is the legal name for *R. integra* sensu Maire et al. and for what has been compared with the acrid species similar to it. Therefore, it can hardly be assumed a priori that Fries attached his *adulterina* to *polychroma* rather than to any other species of his complex. Besides, the Friesian subspecies is characterized as being “minor, fragilior, pileo difformi sordide pallido alboque”. It is said to have white, then ochraceous lamellae and to grow in pine woods. This leaves a large number of explanations open, but a true interpretation which might be acceptable and convincing is impossible. *R. integra* ssp. *adulterina* Fr. is a nomen dubium.

Bataille has called *R. adulterina* a species whose description adapts itself to a certain degree to the short diagnostic data published by Fries but whose illustration remains rather doubtful to me. Melzer & Zvára (1927) redescribed *R. adulterina* as a clearly brown (not pallid to white) *Russula* with clearly deep ochraceous spore print (not pale cream ocher) and very large spores and extremely crowded cystidia. Singer (1932) has described a similarly brown

species with deep colored spores as *R. badia* var. *cinnamomicolo*, (l. c. p. 347) but the status as variety is untenable both for nomenclatorial and anatomical (spore ornamentation) reasons.

After having studied numerous collections of material attributed to this "species", this author has come to the conclusion that we are dealing here with two distinguishable forms which we shall redescribe under two different specific names. This solution should however not be interpreted as a strict rejection of the possibility that they represent subspecies (mycoecotypes) of each other, yet it is necessary to study the question more in detail, particularly from an ecological point of view, but also with a view at confirmation of the constance of the characters indicated.

The first of these species is characteristic for the coniferous, particularly *Picea abies* (spruce) woods of the mountains while the second is characteristic for the frondose woods (*Carpinus*, *Quercus*, *Fagus*, *Betula*, mostly mixed) of lower altitudes. Both forms have occasional purple tinges on the pileus and are therefore closely related and similar to other species of the subsection *Urentes* where they quite obviously belong. Before comparing them with the other species of *Urentes*, we shall give full descriptions of each.

***Russula picetorum* Sing. spec. nov.**

Pileus variable in color, often predominantly brownish yellow, ochraceous brown, but often with olive, purplish (6—C/D—10 to "chestnut"), or grayish ("lint" M&P) tinge, the latter often in a marginal zone, with opaque central and often slightly shining marginal zone, with subobtuse-subacute, smooth margin, with glutinous, glabrous cuticle which is separable over one third of the radius from the margin inwards, convex, soon with depressed center, fleshy, 50—90 mm. broad.

Lamellae pale whitish, at maturity becoming ochraceous yellow, between subclose and subdistant, anastomosing-intervenose, some forked in many collections, generally equal, rarely with some shorter ones intermixed, rounded-adnexed, later adnato-subdecurrent, medium broad. Spore print ochraceous (Crawshay: G).

Stipe white, glabrous, firm, solid, often at least on one side strongly rugose, often becoming slowly brownish fuscidulous where handled or on drying, equal above, but often with claviform or bulbous thickened base, 40—61 × 16—21 mm.

Context white, unchanging where bruised, but at times slightly brownish fuscidulous where the broken surfaces dry out, rather firm; taste acrid, even in the cuticle of the pileus and the stipe, but less so than in *R. badia*; odor none, or weak, fruity.

Microscopical characters: Spores 9—11 × 7.8—10.5  $\mu$ , ochraceous, echinate, subglobose, ornamentation projecting 0.4—2 $\mu$ , of type VI,

but some of type IV, IV—II, rarely V, most spores with an extremely fine network of barely noticeable connecting lines, but for all practical purposes typically echinate in the Melzer. Hymenium: Basidia 40—50 × 10—15  $\mu$ , 4-spored, clavate; macrocystidia 53—82 × 9—12.3  $\mu$ , numerous on edges and sides of lamellae, yellow, fewer hyaline, fusoid to frequently ventricose or constricted between two ventricose swellings, obtuse (and then mostly appendiculate), or subacute to acute, with generally short appendage, but the latter up to 10  $\mu$  long, contents banded but moderately dense. — Subhymenium subcellular; trama with numerous spherocysts and few filamentous hyphae; hyphae without clamp connections, inamyloid; hypodermium of repent hyphae; epicutis well developed, gelatinized, consisting of hyphae which are filamentous and form an ixotrichodermium, terminal members hyphous or transformed in ciliate dermatocystidia with mostly swollen to spherocystoid base (about 6  $\mu$  across) and septate above it, mostly with a basal swelling or with two ventricose swellings (4—11  $\mu$  across) and thin (13—3.7  $\mu$ ), acute to obtuse above, 18—36  $\mu$  long; besides numerous but not crowded dermatopseudocystidia which have scattered banded contents and a large number of cross septa (here constricted or not), mostly incrustated by a fine granular incrustation, turning blue in sulfovanillin, variable in diameter, 3—10  $\mu$  across. Surface of stipe with similar dermatopseudocystidia.

Chemical characters: Not checked.

In coniferous woods, particularly *Picea abies*, in montane forest, on the ground. Fruiting in summer and fall.

Material studied: Austria, Tirol, St. Leonhard im Pitztal, north of the village at 1350 m. alt., September 22, 1960, Singer no. C 3006 (BAFC) — Germany: earlier material from Schwarzwald, not preserved. — Italy, Trentino, det. as *R. consobrina* by Bresadola (R).

This is obviously the same as *R. consobrina* Fr. sensu Bresadola, non Fr., non al. (Icon. Mycol. 9: 424. 1929), as has been pointed out by J. Schäffer, at least pro parte. It is hardly the *R. adulterina* as characterized by Kühner & Romagnesi (Flore anal. p. 463, 1953) who observe that very strongly related forms appear to exist also under frondose trees (see description below), nor is it *R. badia* var. *cinnamomicolor* (Krombh.) Sing. 1932 (which combines both this and the form of frondose woods).

This differs from *R. badia* in the white stipe, the more isolated spore ornamentation, the slightly less intense acidity, the preference for *Picea* rather than *Pinus* (although both species seem to occur occasionally under other conifers). It differs from *R. nitida* in larger size, less rounded margin, glabrous margin, never dry-shining central portion of pileus, relatively longer spines on spores. It differs from the following species as well as from *R. urens*, *luteoviridans*, *maculata*,

*vinosopurpurea*, *pseudoemetica*, and *lundellii* in its colors, and its habitat (not in frondose woods!).

It is remarkable that *R. adulterina* as described by Romagnesi (Bull. Nat. Oyonn. 4: 57. 1950) and Kühner & Romagnesi (l. c.) are described with variable spores which are sometimes enormously large (7.5)—8—13—(15)  $\times$  7—11.5  $\mu$  which would include our spore measurements of 1932 and those given above. The larger spores may be exceptional (formed by bisporous basidia?) but it would be wise to recheck on the measurements after a careful comparison between our present descriptions of both the above and the following species. Another character we have not been able to confirm is the odor reminding one of *Russula fellea* (of compot of pears) or of *R. pseudo-integra*, as was mentioned by Romagnesi (l. c.), but in my descriptions the odor was tested on unbroken entire carpophores so that it may have escaped me. Romagnesi describes well the dermatocystidia but mentions the incrustations only in another species which he calls *R. luteoviridans* sensu Melzer and which differs in habitat (frondose woods), shining pellicle of the pileus and weak or absent bluing of dermatopseudocystidia in sulfovanillin. A species described by Blum (Bull. Soc. Mycol. Fr. 69: 70. 1953) as *R. cinnamomicolor* and which also appears to fit our *R. piceetorum* well, comes from *Abies* woods of the Pyrenees and has spores 10—12 (13)  $\mu$  large, i. e. only slightly larger than were ours. In the type of *R. piceetorum*, we have measured the spores with ornamentation, from a good print. Obviously, the species II, *R. adulterina* of Blum (l. c. p. 71) is the one described by Romagnesi. Could it be that there are two conifer-inhabiting forms, one with variable large spores and „*fellea*-odor”, the other with medium sized spores and without “*fellea*-odor”? The latter perhaps also somewhat larger and with more purple colors on the pileus. In this case, the true *R. piceetorum* is the one with smaller spores (*R. cinnamomicolor* sensu Blum) while the large-spored odoriferous species might be a conifer form of the species described below.

*Russula cinnamomicolor* Krombholz, Naturg. Abb. 9: 28. 1845.

*Russula badia* var. *cinnamomicolor* (Krombh.) Sing., Beih. Botan. Centralbl. 49: 347. 1932.

*Russula adulterina* f. *frondosa* Blum, Bull. Soc. Mycol. Fr. 69: 71. 1953, nom. subnud.

Pileus brown to purple, often beautifully purple with ochraceous-cinnamon center (frequently near Lange 8k or 1/2h) or purple red with deeper center, the latter opaque, the marginal zone mostly distinctly shining even when dry, with obtuse to rounded margin and smooth, finally slightly or irregularly sulcate, convex, sometimes umbilicate, becoming depressed in the center and at times applanate or concave, 60—110 mm. broad.



Lamellae ochraceous yellow, anastomosing-intervenose, adnexed to subfree, later often subdecurrent, broadest near margin, rather broad to broad, close or subclose; spore print deep ochraceous (Crawshay: G—H).

Stipe white, at times rather strongly rugose, somewhat dirty brownish where handled, especially on drying, solid, finally spongy-hollow, versiform but generally rather short and broad.

Context white, unchanging, distinctly acrid although less burning than *R. badia*; odor (when flesh is bruised) characteristically like *Amanita phalloides* but at the same time somewhat aromatic.

Spores  $8.8-13.2 \times 7.2-12 \mu$ , ochraceous, echinate, ellipsoid to subglobose, ornamentation projecting  $1-1.5 \mu$ , of type VI, VI—VIII (few), IV, V (very rarely), i. e. with isolated cylindric to coarse, long spines. Hymenium: Basidia  $33.5-48 \times 11-14.7 \mu$ , 4-spored, often some 2-spored basidia intermixed. Macrocystidia  $60-85 \times 7.5-16.5 \mu$ , numerous to crowded on edges, numerous on sides, with distinct, usually abundant banded contents which occasionally leaves the apex "empty", bluing in sulfovanillin, yellow or pale yellowish hyaline, with hyaline to yellowish incrustation, fusoid to ventricose, some appendiculate, acute to obtuse. Subhymenium subcellular; hymenophoral trama predominantly of spherocysts, few connective hyphae surrounding them, hyphae without clamp connections. Hypodermium — a cutis of filiform hyphae with pinkish (in  $\text{NH}_4\text{OH}$ ) pigment, intermixed with a few oleiferous hyphae with granular contents, the latter formed by terminal cells of the former; epicutis an ixotrichodermium of filamentous hyphae, intermixed with dermatopseudocystidia, the latter versiform (cylindric, subfusoid, subclavate), with comparatively little banded contents, but bluing in sulfovanillin, rather numerous but less numerous than the hymenial macrocystidia, many distinctly multi-septate and constricted at the septa, very long with broadly rounded, more rarely attenuate apex,  $3.2-8.3 \mu$  broad; on stipe many pseudocystidia, much like those of pileus, but less septate, more yellow, broader.

Chemical characters: Not studied.

Under frondose trees, e. gr. *Carpinus*, *Fagus*, *Quercus*, *Betula*, most frequently in pure or mixed stands of oak, fruiting in summer more rarely in fall.

Material studied: Sweden: Park Drottningholm, Stockholm, under oak, 21—VII—1951, Haglund no. 106a (LIL) — Kersön, 25—VIII—1950, Haglund, Jahn, and Suber (LIL) — S. Djurgården, 12—VIII—1950, Haglund (LIL).

Data encountered in modern literature indicate that this species occurs also in France (Blum). The presence of a characteristic odor as described above would indicate that the form encountered in coniferous woods (and which has been described by Melzer &

Zvára, Kühner & Romagnesi, and Blumas *Russula adulterina* II) is merely a race or subspecies of *R. cinnamomicolor*. Of this, I have studied only some Swedish material and original material sent to J. Schäffer by Zvára (as a sample of *R. adulterina* sensu Melzer & Zvára). This latter has the same spores as *R. cinnamomicolor*, the basidia are likewise both 2- and 4-spored,  $41-49 \times 13-17.5 \mu$ ; macrocystidia with a glutinous or resinous incrustation at the apex, with hyaline to pale yellow copious handed contents, extremely abundant, ventricose, often acute; dermatopseudocystidia on epicutis present, numerous, few septate (fewer than in the *R. cinnamomicolor* of frondose woods); some slightly modified molinioid hyphal ends  $4.5 \mu$  broad. The Swedish material from Södersunden, Haglund 64a is absolutely opaque and almost subvelutinous, with slightly fusciculose base of stipe, more purple than the Zvára's material on pileus, margin slightly sulcate, on calcareous ground, fruiting in October. Here the incrustations of the cystidia are less developed, the cystidia are more obtuse, the spores slightly smaller ( $9-11.3-(12.5) \times 8.5-9.2-(10.5) \mu$ , ornamentation  $0.8-1.6 \mu$ , instead of, in Zvára's material,  $9.8-14.2 \times 8.7-12.5 \mu$ , ornamentation  $1-1.7 \mu$ ), but all basidia seen were 4-spored.

Comparing our *R. cinnamomicolor* with other European species of the frondose woods, *R. cinnamomicolor* has larger spores with longer spines than most of them, including even *R. pseudoemetica* (Secr.) Sing. which I believe to be the same as *Russula roseobrunnea* Blum, l. c. p. 64. Among the species with large spores and high ornamentation, we mention only *R. schiffneri*, *R. maculata*, *R. urens*; of these *R. schiffneri* has somewhat paler spore print and different colors; *R. maculata* a different odor and likewise different colors; *R. urens* is green with softer, more fragile context, and a larger number of non-septate typical dermatopseudocystidia. In reality, *R. urens*, generally poorly known and not clearly separated from other greenish forms, is closest to *R. cinnamomicolor*, and because of this, we redescribe this species below:

*Russula urens* Romell, apud Maire, Bull. Soc. Mycol. Fr. 36: 23, 1910 nom. nud. ex Sing., Hedwigia 66: 197. 1926.

Pileus yellowish green either all over or only in center or only on margin, (mostly near "light yellowish olive" Ridgway), sometimes almost without greenish tones, and then "brussels brown", "maize yellow", "tawny olive" (Ridgway) or between "kaffa" and "trotteur tan" (Maerz & Paul), occasionally also more grass green or olive green ("yellow ochre" (Ridgway) or 14-G/J-6 (Maerz & Paul, or Ridgway 23i-29m according to J. Schäffer), with or without more lemon yellow or even purplish (the former more often in the middle, the latter more often near the margin), in dried condition often less greenish, in age often discolored and partly pallid, more or

less viscid, shining when wet but opaque when dry or dried, with a partly (one half to two thirds) separable cuticle, glabrous, smooth but eventually with striate to tuberculate or sulcate margin which is obtuse, rounded, with convex margin and convex, soon appanate or depressed center, 30—75 mm. broad.

Lamellae pallid, soon "deep chrome", "cadmium yellow" (Ridgway), close, free to rounded-adnexed or adnate, narrowed behind, broadest in marginal third, but generally not or not strongly ventricose, 4—6 mm broad, equal or exceptionally with a few lamellulae, simple, with entire edge. Spore print deep ochraceous (Crawshay: H).

Stipe entirely white, rugulose, glabrous, opaque or somewhat shining, generally slightly attenuate towards the apex and the base also often shortattenuate, and, on drying, sometimes slightly brownish, more rarely subequal, clavate or ventricose, solid, later spongy-hollow, 30—70 × 8—17 mm.

Context white everywhere, at maturity soft, loose, spongy, rather thin in the pileus and fragile in the stipe rind, unchanging; odor mostly none, twice indicated as weakly sour; taste decidedly acrid in the context of the pileus and the rind of the stipe, but most burning in the lamellae, not as strongly acrid as in *R. badia* (not intolerably burning the tongue).

Microscopical characters: Spores 8.8—12—(12.7) × 8—9.8—(10.7)  $\mu$ , mostly 9.5—10 × 8.7—9  $\mu$ , short ellipsoid to subglobose, ochraceous yellow in KOH and ammonia, ornamentation echinate, 1—1.7  $\mu$  projecting, spines cylindric, type VI, few spores with type IV, IV—VIII—, IV—II, very few IIIb in some collections, in many collections practically all mature spores of type VI. Hymenium: Basidia 33—50 × 8—15.5  $\mu$ , 4-spored, clavate. Macrocystidia (43)—60—80 × (7.7)—8.5—15  $\mu$ , with yellow amorphous to banded contents, ventricose, in the upper portion or subclavate, or ventricose-fusoid with broadest portion in the middle, often mucronate, sometimes with a short appendage, numerous to very numerous in certain regions of the hymenial surface especially on the edges, without incrustation, very rarely some with a very detersile indistinct thin incrustation, acute or obtuse, bluing in sulfovanillin. Epicutis with numerous normal filamentous hyphae and with numerous dermatopseudocystidia which turn blue in sulfovanillin, the latter mostly very long, fewer short, with banded to granular dense to moderately dense contents, rounded above, fusoid-ventricose, cylindric-worm-shaped, or clavate, mostly non-septate, few with numerous septa and very few constricted at the septa, 40—105 × 3.3—10  $\mu$ . Dermatopseudocystidia of stipe even more variable, but many typical ones present, hair-shaped dermatocystidia or primordial hairs not observed in the covering layers. No spherocysts there, but extremely numerous in the trama; all hyphae without clamp connections.

Chemical characters: Acids on cuticle: lighter or brighter green in the greenish areas. — Guaiac negative. — Phenol: "ferruginous" to "Mars brown", "taupe" (Ridgway) —  $\text{NH}_3$  and  $\text{NH}_4\text{OH}$  negative on flesh — Anilin: a weak alutaceous-orange reaction. —  $\text{FeSO}_4$  normal sordid gray, weak reaction. — Sulfovanillin rose red but soon pallescent.

In mixed and frondose woods on the ground, mostly with *Quercus*, more rarely *Corylus*, *Fagus*, *Carpinus* or *Betula*, with certainty only in Denmark and Sweden. Fruiting in summer, mostly in July, also in August, September.

Material studied: Denmark: Falster, July 1933, leg. J. Schäffer, Russula-Exsicc. no. 68a (FH) — Sweden: Stockholm, Karlbergs Parken, 30—VII—1953 leg. G. Haglund & N. Suber (S), compared with authentic, material, collected and determined by Romell (S) — Same place and date, no. 1 (S) — Same place and date (no. 2), (S) — Kasviken, 26—VIII—1951, leg. Haglund (S) — Kersön, leg. Suber (S), young specimens. — Wärmdö, 24—IX—1950, leg. Ingeltröm (S).

The species is, according to the material studied (see above) authentic in the sense of Romell and J. Schäffer. Consequently, it is very probable that the illustration in Pilze Mitteleuropas, pl. XX, fig. 68 is a good illustration of the species described above.

It is difficult to tell whether or not *R. urens* occurs in France and Central Europe. The form of *R. urens* described by Blum (Bull. Soc. Mycol. Fr. 69: 67. 1953) has a weak guaiac reaction and narrower cylindrical dermatopseudocystidia; otherwise it appears to be identical with our species. The species which Kühner & Romagnesi indicate as variety of *R. firmula* (i. e. *R. nitida*), viz. var. *ocellata* Romagnesi has a strong guaiac reaction and perhaps an other pigmentation of the pileus. *R. luteoviridans* Martin Bull. Soc. Bot. Gen. 7: 187. 1892—4, is difficult to interpret with any degree of precision as long as no type or authentic material has been studied, and no topotypes have been collected, with more detailed and modern descriptive data. The species described as *R. luteoviridans* by Melzer & Zvára is apparently not identical with the species described above. Melzer & Zvára described the epicutis as containing only scarce and narrow pseudocystidia and authentic spore prints studied by J. Schäffer contained no spores with isolated spines but a "netzig-gratige" ornamentation. The circumference of the context is said to be sulphureous-grayish, and the taste is less acrid. The *R. luteoviridans* sensu Romagnesi (Bull. Soc. Mycol. Fr. 63: 167. 1942) differs from that of Melzer & Zvára in spore ornamentation VI, in different flesh colors, more acrid taste and absence of true dermatopseudocystidia. It is very possible that this is the true *R. luteoviridans*, but neither form is identical with *R. urens* as had been taken for granted by a majority of specialists. I have myself received material of a form which seems to

coincide with the var. *ocellata* Romagnesi, but my experience with this is not sufficient to insist on my observations.

Latin description:

*Russula piceetorum* Sing. spec. nov. Pileo versicolore, brunneolo, saepe purpureo-tincto in centro nec non griseolo ad marginem, parte centrali opaco, margine levi subobtusio-subacuto, glutinoso, glabro, 50—90 mm. lato. Lamellis ochraceo-luteis; sporis in massa ochraceis (H. Crawshayi). Stipite albo, saepe rugoso, saepe exsiccano brunnescente, ad basin frequenter subbulboso, 40—61 × 16—21 mm. Carne alba, laesa immutabili, subfirma, acri, inodora vel subinodora. — Sporis 9—11 × 7.8—10.5  $\mu$ , echinatis (VI); macrocystidiis contentu vermiculari impletis, 53—82 × 9—12.3  $\mu$ ; hyphis epicuticularibus, dermatocystidiis ciliatis, dermatopseudocystidiis (in sulfovanillina caerulescentibus) ixotrichodermium efformantibus, his multiseptatis, ad septa constrictis, contentu sparso impletis, subtiliter granuloso-incrustatis. Sub Picea abiete in silvis montanis. Typus in herbario BAFC conservatur.

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Jahr/Year: 1962/1963

Band/Volume: [16](#)

Autor(en)/Author(s): Singer Rolf

Artikel/Article: [Four interesting European Russulae of subsections Sardoninae and Urentinae, sect. Russula. 289-301](#)