

Studies in *Lepiota* II. – *Lepiota rubella*

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Two European greenhouse species, *Lepiota rubella* and *L. bettinae*, are synonymized. *Lepiota rubella* is recorded for the first time with certainty from natural habitats in South America and the Caribbean Islands.

Key words. – *Lepiota rubella*, *Lepiota bettinae*, natural occurrence

The name *rubella* versus *bettinae*

Two small purple-brown to red-brown *Lepiota* species are known to occur in European greenhouses, viz. *L. rubella* Bres. and *L. bettinae* Dörfelt. According to Møller (1953), and Bon (1993b), the first one is characterized by clavate elements in the pileipellis, whereas *L. bettinae* has thick-walled cylindrical, repent to ascending hyphae on its pileus.

A comparison of the two original descriptions (Bresadola in Hennings, 1890; Dörfelt, 1982) does not yield differences in macroscopic characters. Both species have been described as having a squamulose pileus with a more hirsute centre, and white lamellae becoming yellow(ish). Since Møller's (1953) description of *L. rubella* from a greenhouse in the Botanical Garden of Copenhagen as having clavate elements in the pileipellis, the name *L. rubella* has hardly been used. His observations led people to expect a hymeniderm, and Bon (1993b) placed *L. rubella* in section *Lilaceae* (Kühner ex M. Bon) M. Bon. Some of Møller's collections were examined for this study and it appeared that he is quite right in his observations of these clavate elements, but he omitted the fact that the clavate elements are thick-walled and actually the terminal elements of adnate to ascending, cylindrical hyphae.

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Original Hennings' material from the Botanical Garden in Berlin, on which Bresadola based his description, is provided with the same kind of brown thick-walled elements on the pileus (this material has been distributed as Rabenhorst-Pazschke Fungi europaei et extraeuropaei no. 4245 and as Sydow's Mycotheca no. 2728 over several herbaria in Europe). This type of pileus covering is also present in Dörfelt's material and other collections from several Dutch greenhouses.

Dörfelt (1982) might have been one of those misled by Møller's statement, when he described his *Lepiota bettinae* as a new species. Macroscopically his taxon fits perfectly well into Bresadola's description (1890) and pictures (1927) of *L. rubella*, and there are no microscopical differences between the type collection of *L. bettinae* and the original Berlin material.

As pointed out by Migliozi & Coccia (1990) and Hardtke & Rödel (1993), the spores (also those of the type collection which both groups of authors studied) are smaller than stated by Dörfelt (1982) ($6.2\text{--}7.6 \times 3.1\text{--}3.8 \mu\text{m}$ as given by Dörfelt), and also the pileus elements are much smaller than indicated in the original description.

It is interesting to note that Bon (1993a) placed *L. bettinae* in the genus *Echinoderma* M. Bon, a genus characterized by acute squamules on the pileus, made up of globose to ellipsoid elements in agglutinated chains. In *L. bettinae* the pileus covering is not made up of such structures, but its infrageneric position within *Lepiota* has still to be established, and comparison of molecular data will be of great help.

As we were unable to find essential differences between the various collections studied, *Lepiota bettinae* and *L. rubella* are synonymized. A full description is given below. To prevent further confusion about the identity of *L. rubella*, the collection made on 31 May 1889 by P. Hennings, conserved in S, is here selected as lectotype.

Striking macroscopic characters of this taxon are the strongly overhanging pileus margin, the lamellae that become yellow with age and on drying, and the white mycelium cords.

Microscopically the presence of thick-walled, brown, repent hyphae on the pileus is a constant character. However, spore sizes and shape, and width of the terminal elements of the pileus covering show a considerable variability.

Habitat and distribution

This taxon, which hitherto has been known from hothouses in Europe, is now reported from native habitats in several South American countries and some Caribbean islands. It is interesting in

this respect that Dörfelt found his *L. bettinae* collection associated with roots of *Phlebodium aureum* (L.) J. Smith, a fern species native to tropical (Central) America.

Rick (1937) listed *L. rubella* from Brazil. Raitelhuber (1988), however, doubted whether Rick's collections really belong to that species, as one of the Rick collections has punctate spores and could belong to *Smithiomyces lanosofarinosa* (Rick) Raitelhuber. The spore sizes in the other collection are too large for *L. rubella*, as they are $6.2\text{--}7 \times 4.3\text{--}5 \mu\text{m}$ according to Raitelhuber (1988).

The type collection of *L. bettinae* and the collections of *L. rubella* comprise numerous basidiocarps. The collection from the Leiden greenhouse is likewise made up of many basidiocarps, and also in South America the species grows gregariously.

Hardtke & Rödel (1993) mention one collection from a natural habitat in Europe, the first such record in Europe.

Lepiota rubella sensu Bon

The collection described by Bon (1993b) as *L. rubella*, with clavate elements in the pileus covering, was studied as well. Here, the pileus covering consists of clavate elements only, arranged as a hymeniderm. Other characters are: spores $5.0\text{--}6.7 \times 3.3\text{--}3.5 \mu\text{m}$, mean length \times mean width = $5.9 \times 3.4 \mu\text{m}$, $Q = 1.5\text{--}2.0$, mean $Q = 1.75$, ellipsoid to oblong, some ovoid in side-view, ellipsoid to oblong in frontal view, slightly colouring in Congo Red, non-dextrinoid or slowly and slightly colouring in Melzer's Reagent, metachromatic (with pink inner wall) in Cresyl Blue, totally and immediately blue in Cotton Blue; basidia 4-spored; lamella edge sterile, made up of clavate and narrowly clavate cheilocystidia, $16\text{--}24 \times 7\text{--}12 \mu\text{m}$; pleurocystidia not observed; pileus covering made up of clavate elements, $32\text{--}45 \times 10\text{--}17 \mu\text{m}$, some with intracellular brown pigment; clamp-connections present in all tissues.

This collection belongs to a species of section *Lilaceae*. No macroscopic description accompanies the collection, and the description in Bon (1993b) contains elements of the original description by Bresadola (in Hennings, 1890). The exsiccate consists of several basidiocarps with small granulose squamules on the pileus, and without a distinct annulus. It is close to *L. lilacea*, but a squamulose ring is lacking, and the squamules on the pileus are not discrete enough. It is also close to *Lepiota hymenoderma* D. Reid, but in that species the spores are slightly smaller and relatively shorter, the squamules are more discrete, and the cheilocystidia have refractive contents.

Taxonomy

In the following description the notation [45, 4, 3] indicates that measurements were made on 45 spores from 4 basidiocarps in 3 collections. The abbreviations "avl" and "avw" indicate mean length and mean width, respectively.

Abbreviations of herbaria are according to Index herbariorum (Holmgren et al., 1990).

Lepiota rubella Bres. in P. Henn. in Verh. bot. Ver. Prov. Brandenb. 31: 149. 1890. – Fig. 1.

Lepiota bettinae Dörfelt in Z. Mykol. 48: 246. 1982; *Echinoderma bettinae* (Dörfelt) M. Bon in Doc. mycol. 22 (88): 28. 1993.

Excl. – *Lepiota rubella* sensu M. Bon in Fl. mycol. Eur. 3: 81. 1993 (= *Lepiota* spec.).

Sel. icon. – Breitenb. & Kränzl., Pilze Schweiz 4: pl. 215. 1995 (as *L. aff. bettinae*); Migl. & Coccia in Boll. Ass. micol. ecol. Romana 18: 7. 1990 (as *L. bettinae*).

Sel. descr. & figs. – Babos in Agarica 6 (12): 204–205. 1985; Contu in Micol. ital. 15 (3): 52–53. 1986; Dörfelt in Z. Mykol. 48: 245–251. 1982; Migl. & Coccia in Boll. Ass. micol. ecol. Romana 18: 5–11. 1990 (all as *L. bettinae*).

Pileus 6–10 mm, rounded conical when young, then concave, conico-convex, plano-convex and even plano-concave, often with

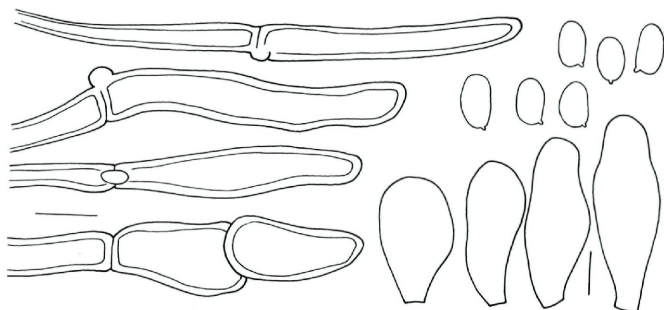


Fig. 1. – *Lepiota rubella*. Spores and terminal elements of pileus covering hyphae (from lectotype, S); cheilocystidia (from isotype of *L. bettinae*, L). – Scale bar 5 μ m (spores and cheilocystidia); 10 μ m (pileus covering).

small umbo, set with hairy squamules, which are densely set, erect and purple-brown at centre, close to margin more adnate and spreading out, and lilac-purple, on white, slightly woolly background, with strongly dentate margin with hanging acute fibrillose squamules. – Lamellae, $L = 23-27$, $l = 3(-)$, rather crowded, free, often anastomosing, ventricose, rather broad, ≤ 2 mm in older specimens, ivory white and becoming yellowish to distinctly yellow and later sordid-brown, with whitish, slightly fimbriate edge. – Stipe $5-15 \times 0.7-1$ mm, tapering towards apex, not fistulose, but with narrow whitish centre, whitish at uppermost apex, then with lilaceous tinge, pinkish lilaceous to slightly brownish at base, entirely hyaline-pubescent, rarely with floccose, dark purplish ring zone, more often with incomplete ring, below ring zone with scattered, minute, purplish brown flocculi, with strikingly white mycelium cords at base. – Context thin and whitish to pale yellowish in pileus, brownish-lilaceous in stipe. – Smell of bruised basidiocarps acid spermiac. – Spore print colour not recorded; according to Breitenbach & Kränzlin (1995) pale yellow.

Spores [245, 15, 12] $3.5-6.5 \times 2.5-4.5$ μm , $avl \times avw = 4.3-5.8 \times 2.5-3.5$ μm , $Q = 1.45-2.05$, $avQ = 1.55-1.9$, oblong, ellipsoid or ovoid in side view and ellipsoid to oblong in frontal view, slowly and not strongly colouring brown in Melzer's Reagent, not metachromatic in Cresyl Blue and pale pink in Congo Red, pale blue in Cotton Blue; slightly thick-walled and smooth as seen both with the light microscope and with the scanning electron microscope, with 2 nuclei. – Basidia $11-20 \times 4.5-7.0$ μm , 4-spored. – Lamella edge sterile; cheilocystidia $15-30 \times 5.0-8.0$ μm , narrowly clavate, a few subfusiform. – Pleurocystidia absent. – Pileus covering made up of very thick-walled, brown-walled, adnate hyphae, $4.0-7.0$ μm wide, with walls ≤ 2.0 μm thick, with terminal ascending elements hardly widened to distinctly clavate, ≤ 21 μm wide. – Stipitipellis a cutis of cylindrical hyphae, $2.0-7.0$ μm wide, with in lower part patches of repent to ascending thick-walled, brown hyphae as in pileus covering. – Clamp connections present in all tissues.

Habitat and distribution. – Gregarious in large groups, saprotrophic and terrestrial, in hothouses, and in wet places among grasses and ferns. Known from several (botanical) gardens in Europe and from South America (Bolivia, Colombia) and some Caribbean Islands (Cuba, Trinidad).

Collections examined. – BELGIUM: Meise, Botanical Garden, in subtropical greenhouse, 2. 10. 1977, L. Thumas 77.14 (BR). – BOLIVIA: Dpto de Beni, prov. José Ballivian, along Rio Beni, south of Rurrenabaque and the junction with Rio Tuichi, 4. 4. 1990, A. E. Franco-Molano 364a (LPB, NY). – COLOMBIA: Dpto Magdalena, Mpio de Guachaca, Sierra Nevada de Santa Marta, alto Buritica, 16. 6.

1992, A. E. Franco-Molano 977 (COL, NY). – CUBA: without date, without locality, without collector (NY). – DENMARK: Copenhagen, Botanical Garden, 26. 7. 1941, F. H. Møller (two collections) (C). – GERMANY: Halle-Wittenberg, Botanischer Garten, 17. 3. 1981, B. Kieler & H. Dörfelt (isotype *L. bettinae*, K, L, NY); Berlin, Botanischer Garten, in Palmhouse, 31. 5. 1889, P. Hennings (lectotype, Bresadola herbarium, S); Exsiccata Series: Rabenhorst-Pazschke, Fungi europaei et extra-europaei 4245, Marchia: Hortus berolinensis, without date, P. Hennings (L, S); Sydow, Mycotheca Marchia 2728, Berlin, Botanischer Garten, 8.1889, P. Hennings (S). – GREAT BRITAIN: Surrey, Richmond, Kew, Royal Botanic Gardens, Palm house, 18. 9. 1990, A. E. Franco-Molano 546 (HUA, L). – THE NETHERLANDS: prov. Utrecht, Baarn, Cantonspark, in greenhouse, 28. 8. 1943, G. A. de Vries (L); prov. Zuid-Holland, Leiden, Hortus Botanicus, in *Cycas*-greenhouse, 10. 7. 1957, C. Bas 1214 (L). – TRINIDAD: Belmont, Lunatic Asylum, 30. 12. 1907, W. E. Broadway (NY).

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