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The systematics of *Callistosporium luteo-olivaceum*

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Abstract. — Species epithets associated with the name *Callistosporium lut o-olivaceum* (Berk. & Curt.) Singer are critically examined. The names "*Tricholoma elaeodes*", "*Collybia xanthophylla*" and "*Callistosporium majus*" are invalid. Valid names for the first two of these taxa are *Callistosporium elaeodes* Bon and *C. xanthophyllum* Bon. A macroscopic description is supplied for the type of *C. favrei* Singer. These three names and *C. graminicolor* Lennox, *C. luteofuscum* Singer and *C. luteofuscum* var. *major* Singer are all reduced to synonymy under *C. luteo-olivaceum* because the critical diagnostic features intergrade to an extent not anticipated by the original authors.

Clitocybe marginata Peck is a synonym of *Tricholoma fulvum* (Bull.) Sacc.

Introduction

Eight species of *Callistosporium* Singer have been reported from regions north of 40° N. A single species, *C. luteo-olivaceum* (Berk. & Curt.) Singer, is known to occur in Canada (Bisby et al., 1938; Groves & Macrae, 1963; Mains et al., 1939). *Callistosporium luteo-olivaceum* and two other species have been reported from temperate areas of the U.S.A. *Callistosporium graminicolor* Lennox (1979) was described from the state of Washington, and *C. marginatum* (Peck) Bigelow (1976) was reported from Maine. In Europe, both Bon (1976a, b) and Moser (1978) have recognized three species, *C. olivascens* (Boud.) Bon, "*C. elaeodes*", and "*C. xanthophyllum*". Singer (1978) treated a number of species in his world key among which there were three western European species recognized, i. e. *C. favrei* Singer, "*C. majus*", and "*Tricholoma elaeodes*", along with a fourth, *C. heimii* (Singer) Singer, from the Black Sea region of the U.S.S.R.

A discussion about the taxonomic relationship of *C. luteo-olivaceum* to the other north temperate species of *Callistosporium* initially appeared simple. However, a detailed investigation of specimens representing various "species" and literature on the subject revealed that all of the major distinguishing characters have been inconsistently recorded or compared and that many names now in use are invalid. Thus the systematics was chaotic. An analysis of the problems is offered here.

Agaricus luteo-olivaceus was described from North Carolina (Berkeley & Curtis, 1859). Peck (1873, 1886) described it twice

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more as *A. coloreus* and *A. rubescentifolius*, both based on New York collections. PECK (1896) later recognized his two taxa as conspecific and reduced *A. rubescentifolius* to varietal rank under *Collybia colorea*. PECK (1888, 1896) suggested a relationship to *A. luteo-olivaceus*. LLOYD (1900) considered *Collybia colorea* and *C. luteo-olivacea* to be conspecific but preferred to adopt PECK's name. MURRILL (1916) recognized the conspecificity of *A. luteo-olivaceus* and *A. coloreus* but treated the fungus under the European epithet "*exsculpta*". This latter epithet will be discussed later.

SINGER (1944) unwittingly proposed a new name, *Callistosporium psilocybe*, for *A. luteo-olivaceus* in his new genus, but soon (SINGER 1946) recognized the former name as superfluous and transferred *Agaricus luteo-olivaceus* to *Callistosporium*. *Agaricus coloreus* PECK, *A. rubescentifolius* PECK, and *Callistosporium psilocybe* MURRILL & SINGER in SINGER, are considered to be synonyms of *C. luteo-olivaceum* by contemporary authors (BIGELOW & BARR, 1966; LENNOX, 1979; SINGER, 1970).

ROMAGNESI in KÜHNER & ROMAGNESI (1953) invalidly introduced the name "*Tricholoma elaeodes* ROMAGN." without a Latin diagnosis or reference to a previously published one (STAFLEU et al. 1978: Art. 36). Later a Latin diagnosis was published for the name "*Tricholoma elaeodes* ROMAGN." (KÜHNER & ROMAGNESI, 1954: 76, 122—124) but this name remained invalid as did its alternative name, "*Collybia elaeodes* ROMAGN." published simultaneously on page 74, in violation of Art. 34.4. BON (1976a) inadvertently validated the new name *Callistosporium elaeodes* BON when he proposed the combination "*Callistosporium elaeodes* (ROMAGNESI) nov. comb.", and cited the basionym fully, thus referring to a Latin diagnosis indirectly, and by citing a type collection in the Romagnesi herbarium. This validation is not as clearly made as in the example for Art. 34.4 regarding the validation of the name *Euphorbia yaroslavii* by POLJAKOV (STAFLEU et al., 1978; GREUTER, 1981). However, it seems best to interpret BON's "comb. nov." status as a formal error much as is done in the emended Art. 59, and correct the authority to read "BON" which dates the name from 1976.

The same combination, "*Callistosporium elaeodes*", was proposed by BRESINSKY & SCHWÖBEL (BRESINSKY & HAAS, 1976) the same, month. Even if their combination were proposed on an earlier day the name would be invalid as no type was cited, as was required by 1976 (Art. 37), and the basionym was invalid. Their authority is best treated as a bibliographic error to be corrected to *Callistosporium elaeodes* BON.

SINGER (1975) introduced another invalid name, "*Callistosporium majus*" for "*Collybia exsculpta* (FR.) GILLET sensu BRES. non FR." SINGER did not designate a type (see Art. 37) or supply a Latin diagnosis (Art. 36). Coincidentally, MALENÇON & BERTAULT (1975) invalidly

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proposed the name, "*Collybia xanthophylla*", for a taxon with a circumscription overlapping "*C. majus*" as was evident from the citation of "*Collybia exsculpta* sensu BRESADOLA Icon. Myc., tab. 214, fig. 1, 1928 non *Agaricus* (*Collybia*) *exsculptus* FRIES, COOKE, RICKEN", in synonymy. Although they supplied a Latin diagnosis and designated one of their collections as type they violated Art. 34.4 by supplying an alternative name, "*Callistosporium xanthophyllum*", in a footnote on page 406, thus invalidating both names.

BON (1976a) mistakenly treated the name "*Callistosporium majus* SINGER" as valid and dated from "1944". "*Collybia xanthophylla*" was considered to be a synonym by BON. When BON (1976b) realized that SINGER's name, "*C. majus*" dated from 1975 and was a *nomen nudum* he proposed the "new" combination "*Callistosporium xanthophyllum* (MAL.-BERT., 1975) BON", fully citing as basionym, "*Collybia xanthophylla*". BON recognized a single name, *Callistosporium xanthophyllum*, and cited the place of publication where both the Latin diagnosis and the type designation were supplied, thereby inadvertently publishing a new name as he had done for *C. elaeodes* (see above). BON, MALENÇON & ROMAGNESI and KONRAD & MAUBLANC have all considered R. MAIRE's (1937) *Tricholoma chrysenteron* var. *olivascens* to be conspecific with this taxon.

MOSER (1978) too proposed the combination, *Callistosporium xanthophyllum*, as new, but this is best considered a bibliographic and formal citation error to be corrected to read *C. xanthophyllum* BON, 1976. SINGER (1978) again introduced the name "*Callistosporium majus*" for "*Collybia exsculpta* sensu BRESADOLA", this time citing "Icon. Mycol. 5: 214. 1928". Although BRESADOLA's (1928) Latin description suffices for the Latin diagnosis required by Art. 37, no type was designated by SINGER. SINGER stated that, "BRESADOLA's type was collected on conifer wood", but there is no way of deducing what SINGER meant because BRESADOLA did not publish a new name. Clearly SINGER did not meet the requirements for designating a type and as a result "*Callistosporium majus*" remains invalid (Art. 37) as a new species name. It cannot serve as a valid *nomen novum* either because *nomina nova* may be proposed only for previously and validly published names (Art. 33.2). The only validly published name SINGER mentioned was *Collybia exsculpta* (FR.) GILLET, but unlike BRESADOLA (1928), who accepted FRIES's *Agaricus exsculptus* in the species concept of *Collybia exsculpta* (Art. 47), SINGER explicitly excluded FRIES's concept thus rejecting the sole valid basionym for a *nomen novum*. Possibly SINGER's proposals were based on a misinterpretation of Art. 48 which states, "When a later author refers to and adopts an existing name but explicitly excludes the original type of the name, he is considered to have published a later homonym that must solely be ascribed to him." Many mycologists fall into this trap when circumscriptions of

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a taxon by two or more authors do not coincide. However, unless the type collection or the basionym is explicitly excluded there is no basis for claiming that a homonym is created. Article 47 is very explicit, "An alteration of the diagnostic characters or of the circumscription of a taxon without the exclusion of the type does not warrant citation of an author other than the one who first published its name." BRESADOLA may be considered to have either enlarged the species concept or misapplied the epithet but he did not explicitly exclude the Friesian type.

SINGER (1975) recognized an unnamed species by reference to a FAVRE collection deposited at Geneva (G) originally collected on a spruce stump near Nyon, Switzerland. Apparently this collection was the same one later designated as type for the name *Callistosporium favrei* SINGER (1978) although reference to his earlier citation was not made directly. The validity of the name *C. favrei* is questionable but for convenience it is accepted as valid. The type was said to be in FAVRE's herbarium (SINGER, 1978) but as most of FAVRE's collections are housed in two herbaria (G, CHUR) SINGER's (1975) earlier reference must be consulted to determine which is correct. There were no collections labelled *C. favrei* at Geneva but the presumed type was eventually located by the curator, labelled by FAVRE as "*Tricholoma* gr. *olivascens* BOUD." There was no indication with the specimen that Singer had examined it but surely it is what he intended to be type. The collection data reads, "18 Oct. 1942, Bois de Chêne, sous Genolier pr. de Nyon. Forêt humide d'épicéas et de boleaux, sur souche pourrie d'épicéa."

When SINGER proposed *C. favrei* he did not describe characters of the fresh collection, although he did indicate that a water-colour painting with additional data existed. Copies of this painting and of FAVRE's detailed notes were made available to me by the curator. To aid in the circumscription of *C. favrei* portions of FAVRE's notes are quoted:

"Chapeau sec, mat densément feutré sous la loupe, d'un beau vert olivâtre canescent pelucheux dû au feutrage, puis vert olivâtre brunâtre foncé au centre quand le tomentum feutré est froissé ou disparu, obscurément zoné plus par des zones concentriques légèrement en relief qui par des alternances de trous sombres et plus clairs. Marge engonflée et feutrée puis à la fin parfois retroussée. Les jeunes ne montrent point de voile.

Lamelles d'un beau vert olive, un peu épaisses, à arête légèrement sinuée à faces légèrement ridulées parfois fourchues tant près du pied que près de la marge du chapeau.

Pied de couleur olive un peu ténu et plus foncé que le chapeau quand il est pelucheux, ainsi que les lamelles, tardivement fistuleux, un peu tenace coriace, glabre sauf en haut ou il est très finement pruineux immediatement sous les lamelles et en bas ou il est aranieux — cotonieux blanchâtre. Les très jeunes exemplaires ont un pied encore vert d'un très fin, fibrilleux, aranieux blanchâtre verdâtre très fugace.

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Chair olive insipide, inodore. Sur exsiccatas les hyphes paraissent lisses ou peut-être à peine zébrées par un pigment incrustant. Regonflées dans l'eau les hyphes sont d'un brun jaune un peu verdâtre. Avec NH_3 elles passent au brun rose".

FAVRE described and illustrated by line drawings clampless hyphae, tetra-, bi- and mono-spored basidia bearing spores in the ranges of $7-8(8.5)\times 3.5$ µm, $9-11\times 3.8$ µm, and $12-15\times 4.5-4.8$ µm respectively. SINGER reported only 4-spored basidia with spores $5.8-9.7\times 2.8-4.5$ µm. FAVRE's microscopic observations of the morphology were confirmed by me.

Taxonomy

The publications by SINGER (1970) and by BIGELOW & BARR (1966) contain detailed accounts of the eastern North American form of *Callistosporium luteo-olivaceum* which includes the type collection from North Carolina. As described by LENNOX (1979), her western collections of *C. luteo-olivaceum* were generally darker than the eastern form but not sufficiently distinctive to recognize as a different species. Her new species, *C. graminicolor*, actually bears a closer resemblance than her *C. luteo-olivaceum* collections to the eastern form of *C. luteo-olivaceum* macroscopically. She distinguished *Callistosporium graminicolor* from *C. luteo-olivaceum* by larger spores, reported to be $6-8\times 4-5.5$ µm. An examination of the type of *C. graminicolor* (fig. 2) confirmed this range, $6.2-7.0\times 4-4.5$ µm, but the paratype (fig. 4) had spores $5.3-6.4\times 3.8-4.5$ µm more like eastern collections of *C. luteo-olivaceum*. Additional west coast collections (see collections examined, figs. 3, 7, 17) revealed a range of spore sizes with intergradation between the two extremes. I therefore concur with MURRILL (1916) who treated west coast materials (NY) as conspecific with the eastern materials even though the eastern collections were more consistently small-spored (figs. 5, 8—13, 15).

As mentioned earlier, MURRILL applied the European epithet "*exsculptus*" to *C. luteo-olivaceum* based on his recognition that the taxon occurred both in Europe and North America. MURRILL had available a BRESADOLA collection from Italy (fig. 6) labelled *Collybia exsculpta* (see specimens examined). Also it was probably MURRILL's North American collections sent to BRESADOLA which led BRESADOLA (1928) to state of *C. exsculpta*, "*Specimina americana, mecum communicata, prorsus identica*". BRESADOLA (1920) had considered *Collybia exsculpta* synonymous with *C. colorea* and *C. luteo-olivacea*. BRESADOLA's concept of *Collybia exsculpta* has been used as a standard for various applications of the species epithet "*exsculptus*" (BON, 1966; JOSSERAND, 1959; ROMAGNESI, 1967; KÜHNER & ROMAGNESI, 1954) despite considerable controversy concerning FRIES's original application (see excluded species).

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It was for the species as BRESADOLA understood it that MALENÇON & BERTAULT (1975) proposed their name "*Collybia xanthophylla*" and it was also the basis for SINGER's proposed name "*Callistosporium majus*". A BRESADOLA specimen at the New York Botanical Gardens (NY), which could well serve as type if "*majus*" were to be validated, bears collecting data matching that given by BRESADOLA for his icones 214, "*Collybia exsculpta* FR. *mox decoloratus*! *Ad truncos Pini silvestris*. S. Antonio pr. Trento. Dat. Aug. 6, 1900. Coll. et det. G. BRESADOLA." Spores from this collection were found by me (fig. 6) to be 5—6.5×3.2—4.0 µm, in fairly close agreement with the size reported by BRESADOLA (1928), 6—7×3—4 µm, and overlapping those for "*Collybia xanthophylla*", 5—5.6×4—4.2 µm by MALENÇON & BERTAULT (1975). Even without reporting such intermediate spore sizes the latter authors felt their collections to be conspecific with BRESADOLA's collection(s). The larger spore sizes of BRESADOLA's collection are comparable to the larger spore sizes of some west coast North American collections such as the type of *C. graminicolor*, and the darker colours are comparable to some of the other darker west coast collections described by LENNOX.

Comparisons between the European populations and the North American populations have given inconsistent results. SINGER (1978) distinguished a new world taxon, *C. luteo-olivaceum*, from on old world taxon, "*C. majus*", mainly by taste. The former was styptic to bitterish and the latter almost or quite mild. MALENÇON & BERTAULT (1975) have noted there is considerable variation in European authors' records of the tastes and odors of the European taxon. Some authors recorded mild taste and no odors but others recorded slightly bitter or styptic tastes, as is often recorded for North American collections, and also a variety of odours.

While not considering taste critical, MALENÇON & BERTAULT (1975) like SINGER (1978) maintained a distinction between the European and North American taxa. They believed the European fungus was usually darker, with more green pigments, and generally formed larger basidiomes than the North American fungus. Their comparisons were made with the eastern North American populations alone. They failed to take into account the fact that basidiomes from other collections of the European fungus reported by different authors were smaller than theirs from Morocco (see JOSSERAND, 1966; MAIRE, 1937; BON, 1976) and some were paler, exhibiting more yellow pigments (see JOSSERAND, 1966; BON, 1976) as in the North American forms. They also were not aware of the larger or darker western North American forms subsequently recorded by LENNOX (1979). With no further characteristics with which to constantly separate North American collections from European collections, there is no reason to recognize two taxa.

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Since the taste is not as critical as SINGER (1978) emphasized and the size and colouration of the basidiome is more variable than MALENÇON & BERTAULT (1975) have allowed, it becomes more realistic to include as synonyms the South American taxa *Callistosporium luteofuscum* var. *major* and var. *luteofuscum*. SINGER (1978) actually suggested that *C. lutefuscum* var. *major* was conspecific with the European taxon he labelled "*C. majus*", and he scarcely distinguishes the two varieties of *C. luteofuscum* in an earlier paper (SINGER, 1970). The basidiome sizes, colours, spore sizes, and tastes of the two varieties can all be found on some form or another in the Northern Hemisphere populations. There are no critical characters left to distinguish the populations at a species level. Thus *C. luteofuscum*, which was based on a form which RICK (1938) considered to be *Collybia luteo-olivacea*, is returned to synonymy.

Another variation of *C. luteo-olivaceum* is represented by *C. favrei* (fig. 1). Macroscopically it is difficult to distinguish from other European forms mentioned above but microscopically its 1-, 2- and 4-spored basidia are distinctive. However, the spore sizes from the four-spored basidia overlap that of normal European forms. The longer spores emphasized by SINGER (1978) can be explained by the variation of spores per basidium and the subsequent increased sizes on 1 and 2 spored basidia.

The name *Callistosporium elaeodes* apparently has been applied to a single collection. Based on KÜHNER & ROMAGNESI's (1954) description and BON's (1976a) study of the type I see little to help distinguish *C. elaeodes* from the concept of *C. luteo-olivaceum* developed above. The bright olive green colours described for the species were evident in the type of *C. favrei* although the latter also produced fuscous pigments as found in other European collections. The spore sizes are similar to that for other collections of *C. luteo-oïivaceum* as discussed above. The spacing of the lamellae is similar to that described for the type of *C. graminicolor* but the latter also intergrades well with other collections of *C. luteo-olivaceum*.

In spite of all of the intergradations of critical characters discussed above, it is apparent that there is a great diversity of forms within the broad species concept which when viewed individually appear quite distinct from one another. Some of these forms occur more frequently in certain geographical locations. This diversity takes on some semblance of order only when viewed on a global basis. The type form occurs in eastern North America from southern Ontario west to Michigan and south to Venezuela. This population is fairly homogeneous, specimens usually have relatively small spores, small basidiomes, and lighter pigments. Towards the extreme latitudes of its range and apparently disjunct in our present state of knowledge are more variable forms usually in the geographically vicinity of mountains systems

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although not restricted to a montane habitat. In montane western North America a greater percentage of the basidiomes are larger, have darker pigments and produce larger spores. The same is true in northern Africa and western Europe. FAVRE's collection with 1-, 2-, and 4-spored basidia occurred in the Alps, in a valley bottom. In South America the type of *C. luteofuscum* was made in a subtropical forest south of the Sierra do Mar mountain system and the even more aberrant collections named *C. luteofuscum* var. *major* came from southern Chile just west of the Andes.

Excluded names

The name *Agaricus exsculptus* FRIES has often been applied to collections of *C. luteo-olivaceum* but it has been used for a variety of *Collybia dryophila* also which has an alternative name, *C. dryophila* var. *funnicularis* BULL.: FR. There are problems associated with the application of the name *A. exsculptus* to both varieties but more so for the former. FRIES (1836) emphasized, by italics, that the pileus of his *A. exsculptus* did not pale (i. e. presumably not hygrophanous) and that the stipe did not change colour. *Callistosporium luteo-olivaceum* is often notably hygrophanous and usually not only the stipe but the entire basidiome will darken with age. FRIES also described the colours as yellow ("sulphureis" or "sulphureum") giving no hint of any olivaceous pigments which are common in the European forms. His illustration (FRIES, 1867) depicts a fungus similar in habit to *C. luteo-olivaceum* but lacking the olivaceous tints and the colour changes that usually occur in European collections. It is possible but improbable that FRIES described a collection of *C. luteo-olivaceum*. It is more probable that FRIES had a form of *Collybia dryophila* as some authors, notably KONRAD (1927) and MALENÇON & BERTAULT (1975), have indicated.

Callistosporium marginatum is not a true *Callistosporium* as indicated by BIGELOW (1976) but is a synonym of *Tricholoma fulvum* (BULL.) SACC. All of the microscopic features of the type of the basionym, *Clitocybe marginata* PECK, (NYS) are identical to those in collections of *T. fulvum* (cf. MALLOCH, 1974). A gelatinous pellis with embedded incrusted hyphae is present on the type but is in much poorer condition than in well preserved specimens of *T. fulvum* in DAOM. BIGELOW (1976) did not mention this feature. The pigments in the basidia and spores reported as necropigments by BIGELOW are normally present in collections of *T. fulvum*. A painting (NYS) of the type collection of *C. marginata* has come to light since BIGELOW's examination of the type collection, and it depicts a tricholomoid fungus. Notes by the collector, WHITE, with the painting state that the taste was, "like that of *Clitopilus prunulus* or very nearly so," which I interpret to be farinaceous and characteristic of *T. fulvum*.

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Related nor hern species

Both *Callistosporium heimii* and *C. olivascens* are easily distinguished from *C. luteo-olivaceum*. *Callistosporium heimii* has dark violet-lilac necropigments (SINGER, 1937) and its lamellae are whitish when fresh. *Callistosporium olivascens* has clavate pileocystidia and broad amygdaliform spores (BON, 1976a; VERDE & CALONGE, 1979).

Summary

Callistosporium luteo-olivaceum is a widespread species restricted to temperate or tropical forests mostly outside of boreal and subalpine regions. Populations along the Pacific coast of North America, Europe, and in southern South America digress nearly enough from the northeastern North America — northeastern South American population to be recognized as subspecies but a considerable overlap of characters prevented recognition even at that reduced taxonomic level. Cultural studies may help to delimit those taxa here reduced to synonymy with *C. luteo-olivaceum*.

Callistosporium luteo-olivaceum (BERK. & CURT). SINGER (1946: 117) Figs. 1—17.

≡ *Agaricus luteo-olivasceus* BERKELEY & CURTIS (1859: 286)

≡ *Collybia luteo-olivacea* (BERK. & CURT.) SACCARDO (1887: 215)

= *Agaricus coloreus* PECK (1873: 46)

≡ *Collybia colorea* (PECK) SACCARDO (1887: 230)

= *Agaricus rubescentifolius* PECK (1886: 38)

≡ *Collybia rubescentifolia* (PECK) PECK (1888: 83)

≡ *Tricholoma rubescentifolium* (PECK) SACCARDO (1891: 15)

≡ *Collybia colorea* var. *rubescentifolia* (PECK) PECK (1896: 51)

= *Tricholoma chrysenteron* var. *olivascens* R. MAIRE (1937: 87—88)

= *Callistosporium psilocybe* MURRILL & SINGER in SINGER (1944: 363)

= *Callistosporium luteofuscum* SINGER (1953: 115)

= *Callistosporium luteofuscum* var. *major* SINGER (1969: 53)

= *Callistosporium elaeodes* BON (1976a: 282), see also BRESINSKY & HAAS (1976)

≡ *Tricholoma elaeodes* ROMAGNESI in KÜHNER & ROMAGNESI (1953: 157; 1954: 76), nom. invalid.

≡ *Collybia elaeodes* ROMAGNESI in KÜHNER & ROMAGNESI (1954: 74), nom. invalid.

= *Callistosporium xanthophyllum* BON (1976b: 52) see also MOSER (1978)

≡ *Collybia xanthophylla* MALENÇON & BERTAULT (1975: 406), nom. invalid.

≡ *Callistosporium xanthophyllum* MALENÇON & BERTAULT (1975: 406), nom. invalid.

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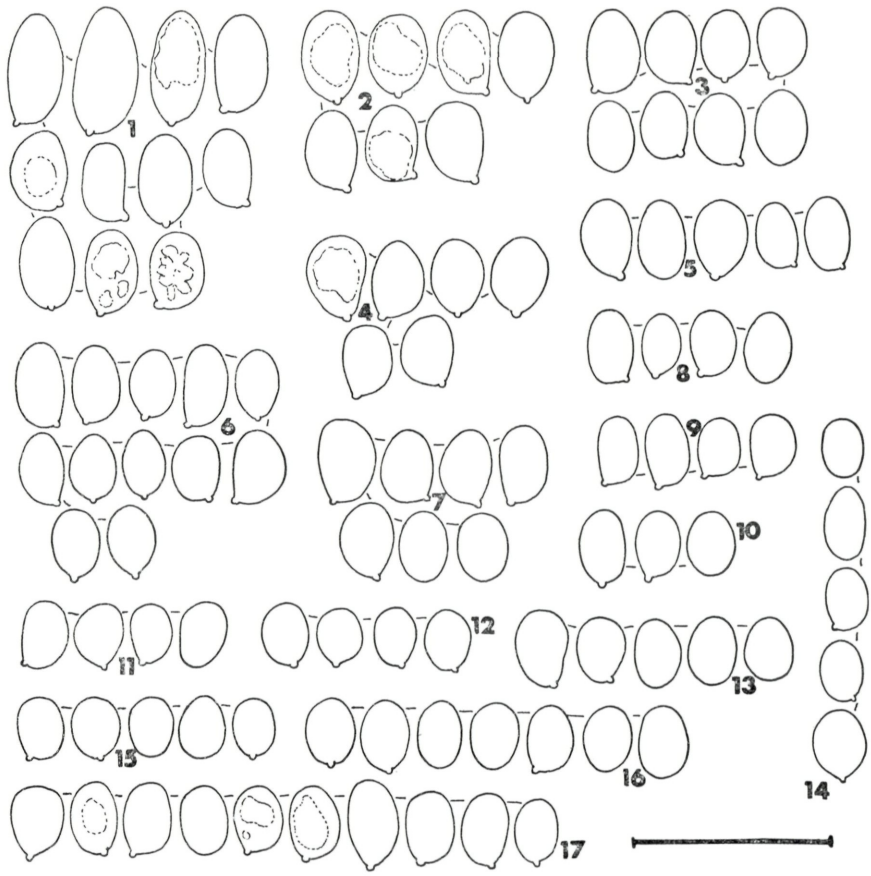
≡ *Callistosporium majus* Singer (1975: 271; 1978: 263), nom. invalid.

= *Callistosporium favrei* Singer (1978: 262)

= *Callistosporium graminicolor* Lennox (1979: 152)

Illustrations: Water colour: Bon, 1966; Bresadola, 1928; Konrad & Maublanc, 1953; Malençon & Bertault, 1975; Romagnesi, 1967. — Black & white photographs: Bigelow & Barr,



Figs. 1—17. Basidiospores of *Callistosporium luteo-olivaceum*: Fig. 1. Type of *Callistosporium favrei*. — Fig. 2. Type of *Callistosporium graminicolor*. — Fig. 3. Murrill, 483. — Fig. 4. Paratype of *C. graminicolor*, W 1713. — Fig. 5. 1908 N. C. collection. — Fig. 6. Bresadola, 1908 collection. — Fig. 7. Murrill, 632. — Fig. 8. 1901, Maine collection. — Fig. 9. Murrill, 883. — Fig. 10. Murrill, 672. — Fig. 11. 1920, Virginia collection. — Fig. 12. North Greenbush collection. — Fig. 13. July 19, 1938 Florida collection. — Fig. 14. VE-4353. — Fig. 15. July 2, 1938 Florida collection. — Fig. 16. VE-6351. — Fig. 17. DAOM 176485. — Scale = 15 μm

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1966; LLOYD, 1900. — Sketches: JOSSERAND, 1959; LENNOX; 1979. — Detailed descriptions (various forms): BIGELOW & BARR, 1966; BON, 1976a; JOSSERAND, 1959; LENNOX, 1979; MALENÇON & BERTAULT, 1975; SINGER, 1953, 1969; 1970. — Shorter descriptions: BERKELEY & CURTIS, 1857; BON, 1966; BRESADOLA, 1928; KONRAD & MAUBLANC, 1927; KÜHNER & ROMAGNESI, 1954; LLOYD, 1900; MAIRE, 1937; MURRILL, 1916; PECK, 1873, 1886, 1896; RICK, 1938; ROMAGNESI, 1967; SINGER, 1944, 1946, 1978.

Specimens examined: *Callistosporium luteo-olivaceum*: CANADA: British Columbia: Vancouver Island, Cowichan L., Oct. 2, 1979, REDHEAD 3290 (DAOM 176485); Ontario: Petawawa, Aug. 31, 1947, GROVES (DAOM 17425), Sept. 1, 1947, GROVES (DAOM 17490); Québec: Gatineau Park, July 12, 1956, GROVES (DAOM 51902). — ITALY: S. Antonio pr. Trento, Aug. 6, 1900, Bresadola (NY). — SWITZERLAND: Genolier pr. de Nyon, Oct. 18, 1942, Favre (type of *Callistosporium favrei*, G). — UNITED STATES OF AMERICA: Florida: Gainesville, July 2, 1938, MURRILL (NY), July 15, 1938, WEST (NY); Maine: Bar Harbor, 1901, WHITE (NY); New York: North Greenbush, no date or collector (NY); Albany Co., Vorheesville, Aug., PECK (NYS); North Carolina: Transylvania Co., Pink Bed Valley and surrounding mountains, July 13—24, 1908, MURRILL & HOUSE (NY); Tennessee: Unka Springs, Aug. 18—24, 1904, MURRILL 672, 883 (NY); Virginia: Blacksburg, July 27, 1920, MURRILL (NY); Washington: King Co., Lee Forest, July 4, 1970, LENNOX, W[-illiams] 626 type of *Callistosporium graminicolor*, WTU); Seattle, Oct. 20-Nov. 1, 1911, MURRILL 483, 632 (NY), Totem L., Nov. 1, 1973, BAINES, W[-illiams] 1713 (paratype *C. graminicolor*, WTU). — VENEZUELA: Edo. Miranda, vicinity of El Arado, ca. 12 km S. W. of Macarao, July 28, 1972, DUMONT, CAIN, SAMUELS & MORILLO, DUMONT-VE-6351 (NY); Edo. Sucre, along Rio Aguas Calientes, N. of Maraval, N. W. of Irapa, July 8, 1972, DUMONT, CAIN, SAMUELS, MORILLO & VILLEGAS, DUMONT-VE-4353 (NY).

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Note added in proof: HORAK (1979) has reported *Callistosporium luteo-olivaceum* from Tierra del Fuego Argentina, however the presence of clamp connections on its hyphae indicates that another taxon is involved.

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