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Type Studies on Basidiomycetes IX

By Rolf Singer (Tucuman, Argentina) Maccagnia carnica Mattirolo

The type of this remarkable species was collected at Gemona, Udine, Italy. Its author sent part of the type collection to P atouill ard whose herbarium is now at Harvard. This portion was kindly lent to the author by Dr. I. M. L am b.

M. carnica is up till now the only species of the genus and obviously the generic type.

This genus has been mentioned by Zeller & Dodge (1936) and Heim (1937) as belonging in the neighborhood of *Hydnangium*, *Elasmomyces*, *Arcangeliella*, and the whole asterogastraceous series, called *Hydnangiaceae* by Dodge (in Gäumann-Dodge 1928 and Zeller & Dodge 1936), or *Asterogastraceae* by Malençon (1931), or what Singer & Smith (1958 and following years) and Singer (1958) refer to as the *Secotiaceae* (in an emended sense), asterogastraceous series, a group of closely related genera, ancestral to the *Russulaceae*, and which should at least be given subfamily rank.

However, we must remember that the asterogastraceous series is based on the affinity of a number of secotiaceous genera which gradually acquire the characters, step by step, which characterize the *Russulaceae* in the *Agaricales* (or, according to Malençon's opinion, gradually lose, step by step, the main diagnostic characters of the *Russulaceae*). The point of origin (or the end of the degradation process, according to Malençon) must necessarily be expected to be so far from the *Russulaceae* that its classification within the series, subfamily, or family which contains the genus *Macowanites* as well as its relatives down to *Hydnangium* can be substantiated only by demonstrating a close affinity between it and the genus *Hydnangium*.

The demonstration of a close affinity with *Hydnangium* is already difficult to demonstrate as far as *Octaviania* is concerned. Nevertheless in that case we still have much similarity in habit, laticiferous ducts, and general size and ornamentation of the spores.

In order to demonstrate affinity of *Maccagnia* with *Hydnangium* it is necessary, first, to clear up a number of questions which cannot be decided by merely reading the original diagnosis. The purpose of the present type studies is to provide these data and thus facilitate a conclusion.

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We shall not need a new macroscopial description since the study of the specimen does not help materially in the interpretation of Mattirolo's diagnosis, and we merely refer to his original work (Mem. R. Accad. Naz. Licei, ser. 5, 13 (12): 17. 1922). The microscopical analysis yielded the following data:

S p or e s 5.2—5.9—(7) \times 4.8—5.6 μ , often vaguely angular in polar view, subglobose to short ellipsoid in profile, some few ellipsoid, or ellipsoid-oblong, with a hilar appendage attached symmetrically at the geometrical base of the spore, or somewhat off the base and then oblique, hyaline to pale melleous, finely spinulose-verruculose from small spinules with obtuse tips, or low small warts and appearing rough in oil immersion mounts, ornamentation neither amyloid or amylaceous and not strongly projecting but rather of the type known in *Lepista*, entire spore wall inamyloid.

Basidia 18–19 \times 4.5–5 μ , clavate, hyaline, with four apical spinose narrow straight sterigmata. Cystidia and pseudocystidia none.

Hyphae: Subhymenium not cellular and generally not strongly differentiated, Hymenophoral trama (sterile tissue of tramal plates) simply regular, consisting of filamentous hyphae which are 2.5-3 µ thick and interwoven, occasional swollen elements subisodiametric or isodiametric, constantly showing in the hymenophoral trama measuring 9-16 \times 8.5-14.5 u, elements not or only very slightly gelatinized (perhaps like in most boletes), most of the filamentous hyphae hyaline, others with a mellous incrusting or membrana pigment, apparently "oleiferous" certainly without any oleiferous or laticiferous hyphae of the type observed in Russulaceae, Arcangeliella, or Macowanites, the oleiferous hyphae here often turning greenish in iodine. Peridium consisting of tangentially (perclinal) arranged filamentous hyphae, both of the "oleiferous" and the hyaline (normal) type, and of swollen, spherocyst-like elements, all these elements subirregularly interwoven but not of the heteromerous type known in Russula and Macowanites, generally appearing pale melleous. Columella consisting of irregulary interwoven filamentous hyphae and some swollen and spherocyst-like elements, here also hyaline and "oleiferous" hyphae distinguishable, not any more distinctly gelatinous (rather dense, not wavy or spiralling) than the hymenophoral trama, only more intermixed and interwoven than the latter. All hyphae with clamp connections and neither pseudoamyloid nor amylaceous.

The conclusion from these data must be based on the following observations:

(1) The intermixed (although not heteromerous) character of the tissues in *Maccagnia* is analogous but not homologous with the similar structures in the asterogastraceous series. The spherocyst-like elements seem to be of an entirely different origin. While we (1958)

have shown that the spherocyst nests of the *Russulaceae* originate from the imperfect loculi and correspond (are homologous with) to the subhymenial cells, the swollen elements in *Maccagnia* appear to originate in the oleiferous hyphae and have nothing whatsoever to do with the subhymenial cells inasmuch as the subhymenium is not cellular.

(2) The oleiferous hyphae are not comparable with the oleiferous hyphae of the genus Russula, or of Macowanites, and even less with the broad elements, full of contents, which carry the latex, and which should exclusively be known under the term laticiferous ducts.

(3) The spores are of a type completely different from that of the asterogastraceous series, and do not correspond in size and ornamentation to either the typical spores of *Hydnangium*, or the *Martellia*-type nor the *Macowanites-Russula*-type, nor even to the type known to occur in *Octaviania*. They seem, however, to be rather close to the type described in *Sclerogaster*, a genus which we have not studied critically, and which likewise seems to be rather remote from the asterogastraceous series proper.

(4) The inamyloidity and the presence of clamp connections remain as the only tangible similarities between *Maccagnia* and *Hydnangium*.

(5) The gelatinous columella, emphasized by Fischer in Engler & Prantl (1933), could not be demonstrated anatomically. It does not mean, however, that it does not exist and that its description by Mattirolo is based on an erroneous observation. It may well be that there is a gelatinous mass produced between strands of hyphal elements which, themselves, remain non-gelatinized. In other words, the gelatinization within the hyphal strands is not — if that much! — more developed than in the genera of *Boletaceae*, but it is not comparable to the gelatinization found in the *Aphyllophorales* or *Tremellales*, or even to the gelatinization of columella and tramal plates as found in the type species of *Hysterangium*, *H. clathroides* Vitt.

The affinities of *Maccagnia* are thus not quite clear. Apart from an obvious similarity with *Sclerogaster*, we find no convincing evidence of affinity with the genera of the astrogastraceous series with inamyloid spores, and even less with the amyloid-spored representatives of that series. There might be just enough congruence as to provide a hint as to the common gastroid origin of all secotiaceous series from *Gastromycetes* atypical in but related with the *Hysterangiaceae*, *Hymenogastraceae*, and *Rhizopogonaceae*, but, as for *Maccagnia carnica*, we would rather emphasize its relation with a thus far incompletely known series leading from such atypical forms directly to — or, with Malençon — coming directly from — such agaric forms as *Ripartites*, *Ripartitella* or *Lepista*. It is true that connecting genera — as we know them to exist in the asterogastraceous series — are absent in this case: we have no genus intermediate between *Maccagnia* and *Ripartites*, or any white-spored agaric, but if it is permitted to link *Richoniella* with the *Rhodophyllaceae* it is equally permissible to link *Maccagnia* with the genera named above.

Indeed, the spores are quite similar to the spores of *Ripartites* and clamp connections, oleiferous hyphae, a membrana pigment, regular gill trama, and repent epicuticular hyphae are characteristic for that genus. In *Ripartitella*, there is a remnant of the spherocystlike cells in the cuticular layer, and in *Smithiomyces*, likewise, spherocysts exist in the cuticule of the pileus. Spores similar to those of *Maccagnia* can also be found in *Lepista* and one section of *Clitocybe*.

If we take these facts together with the contention that at the *Hydnangium* and *Octaviania* level we are already in a position to make the same comparison with *Laccaria*, *Hygroaster* and, perhaps, *Oudemansiella*, it may not be too farfetched to suggest the theory that "at the bottom" of the asterogastraceous series, and at the level of *Maccagnia*, *Sclerogaster* we are dealing with modern gastroid sidebranches of the group, that, by branching out and developing a number of spore types, produced the evolutionary lines that lead to the various *Agaricales* families.

If such an interpretation of *Maccagnia* and analogous genera is acceptable, it is logical to conclude that the fashionable trend of considering the *Gastromycetes* as an assembly of unrelated gastroid groups with very heterogenous affinities, is irreconcilable with the intermediate position of these genera, and, furthermore, unnecessary in order to explain the affinities of certain *Gastromycetes* with the *Agaricales*. The tendency to split the *Gastromycetes* into supposedly unrelated (among each other) orders has its origin in the discovery of genera of *Gastromycetes* closely related to certain families of the *Agaricales* whereby some mycologists projected the principles of agaric taxonomy into the taxonomy of the *Gastromycetes* far beyond the level where such principles had any meaning.

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Zeller, see Dodge & Zeller.

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