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AGLAOTHECIUM GROENH., A NEW LICHEN GENUS FROM MALAYSIA

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(With seven Text-figures)

The new genus *Aglaothecium* Groenh. is proposed to accomodate the new species *A. saxicola* Groenh. The development of bitunicate asci as occurring in cryptothecioid genera is compared with that of the supposedly unitunicate but thick-walled asci which are common in Lecideaceae and Lecanoraceae. The question is discussed whether bitunicate asci are always indifferent to iodine.

Aglaothecium Groenh., *gen. nov.*

Thallus crustaceus, uniformis; apothecia sessilia, orbicularia, lecideinea; asci 8-spori, unitunicati, membrana tenui cincti, iodo indifferentes; sporae obovoideae, decolores, primum transversaliter septatae demum submuriformes, cellulis rectangularibus, membrana septisque tenuibus; paraphyses simplices in apice non incrassatae; excipulum gonidiis destitutum, e hyphis pachydermaticis, septatis, ramosis, e media excipuli basi radiatim divergentibus conglutinatisque compositum. — Species generis typica: *Aglaothecium saxicola* Groenh., gonidiis protococcoideis.

Aglaothecium saxicola Groenh., *spec. nov.* — Figs. 1–3

Thallus epilithicus, crustaceus, uniformis, irregulariter areolato-diffractus vel subcontinuus, mediocris, laete isabellinus, sat laevigatus, subnitidus vel opacus, soraliis isidiisque destitutus, K–, Ca–, KCa–; margo ignotus; cortex imperfecte evolutus; gonidia viridia, globosa, protococcoidea, zonam continuam formantia; medulla alba, tenuis.

Apothecia sessilia, dispersa, orbicularia, ad basin plus minusve constricta, 0.3–0.5 mm lata; discus primum laete fulvus demum atro-purpureus, planus, nudus, opacus; margo sat tenuis, obscure atro-purpureus vel subniger, integer, persistens, discum bene superans; hymenium 90–105 μ altum, laete fulvum vel subdecolor, hyalinum, purum, J–, vel laete rubro-brunneum; asci 8-spori, clavati, membrana tenui in apice non incrassata cincti, unitunicati, J–; sporae 1–2-seriatae, obovoideae, decolores, primum transversaliter septatae demum submuriformes, septis transversis 4–6, septis longitudinalibus 1–2, loculis rectangularibus, septis et membrana tenuibus, 6–7 × 16–20 μ; paraphyses simplices, in apice non incrassatae, sat laxe cohaerentes; excipulum in regione hypotheciali decolor aut laete ochraceum, in parte exteriore atropurpureum, K–, ex hyphis pachydermaticis, septatis ramosisque, bene conglutinatis, e media excipuli basi radiatim divergentibus formatum, extus glabrum. — Holotypus: *Groenhart 1742*.

Thallus thin to thickish, irregularly cracked to almost continuous, pale isabelline, rather smooth, slightly shining to dull, without reactions with K, Ca, and KCa, cortical layer poorly developed or almost absent; apothecia sessile, scattered, orbicular, somewhat constricted at the base, 0.3–0.5 mm across; disk pale to blackish purple, plane, naked, dull; margin rather thin, entire, persistent, dark purplish to blackish; hymenium (including the 10–15 μ thick ascogenous layer) 90–105 μ thick, almost colourless to pale fulvous, hyaline, pure (i.e. not insperse), J+ reddish brown; the narrow ascogenous layer composed of densely interwoven ascogenous hyphae; asci 8-spored, clavate, with short, rounded base, unitunicate, J–; spores 1–2-seriate, obovoid, colourless, with 4–6 transversal septa and usually with 1–2 longitudinal septa, the cells rectangular, with thin septa and wall, 6–7 × 16–20 μ; paraphyses unbranched, not thickened at the tips; excipulum in the hypothecial region colourless to pale ochre, otherwise with a blackish-purplish pigment, K–, composed of thick-walled, septate, branched hyphae running radiately from the centre of the base of the excipulum to its circumference, there to form a more or less well delimited cortical layer of parallel, strongly conglutinated hyphae with somewhat elongate lumina; close to the cortical layer, especially in the lower part of the excipulum, irregular spaces occur between the hyphae, up to 3 μ wide; in the centre of the excipulum and in the hypothecial part the hyphae are densely conglutinated, with rather short and narrow lumina.

EAST JAVA: Pass of Ngantgang, 14 July 1937, *P. Groenhart 1742* (type), on rock, ± 1000 m alt. (L).

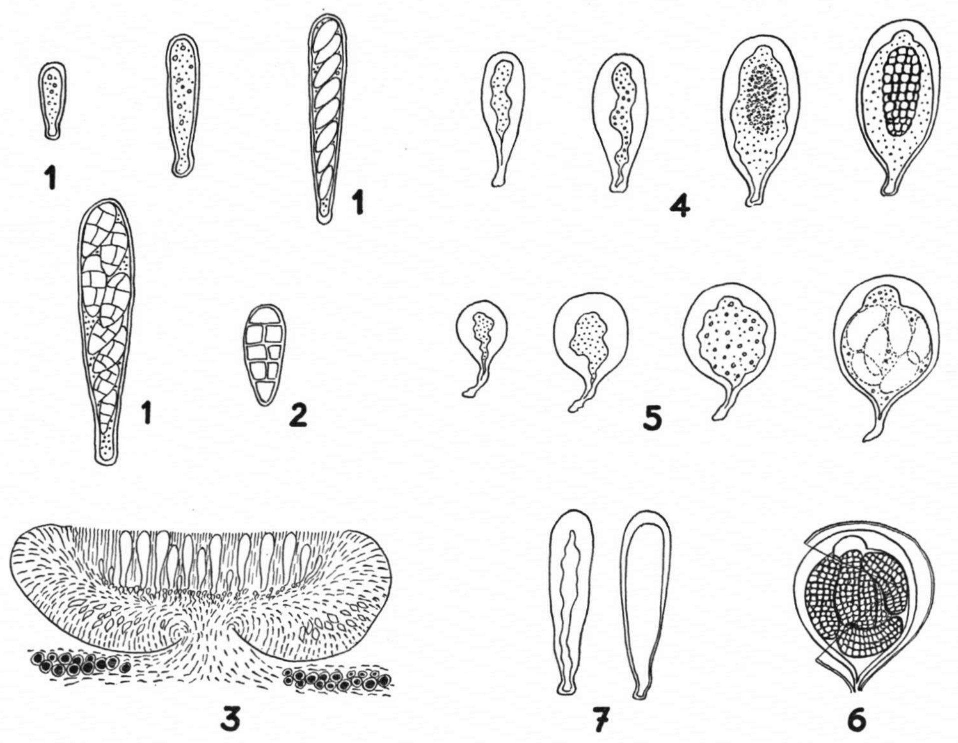
The new genus differs from all genera of the Lecideaceae by its thin-walled, unitunicate asci which are indifferent to iodine. In these genera, of which at least several may prove to be heterogeneous, species prevail with thick-walled asci, usually becoming blue with iodine, and which very probably must be considered to be bitunicate. This difference in ascus type gives rise to the question whether or not *Aglaothecium* should be placed in the Lecideaceae. The answer to this question depends on the taxonomic evaluation of the characters of the asci and the excipular structures.

The ascogonal apparatus[1] can be regarded as the true ascocarp of the fungus, and as such is of much more importance to the (sexual) reproduction of the plant than are the parascogonal tissues.[2] It is evident, therefore, that taxonomically the characters of the ascogonal apparatus are to be valued higher than those of the additional tissues. As a consequence the genus *Aglaothecium* is not to be ranged in the Lecideaceae, although the structure of the exciple of the new genus shows a strong similarity to the excipular structures in some of the genera of that family. It is not known at present which are the nearest relatives of *Aglaothecium* that possess unitunicate asci only.

[1] That is, the ascogon (or its substitute), the ascogenous hyphae, the asci and the spores.

[2] These are all additional tissues composed of differentiated hyphae, produced under the influence of the sexual stimulus which leads to the initiation of the ascogon. A tissue is called protascogonal if produced before the ascogon is initiated, as for instance the stromal tissue in the Ascoloculares; synascogonal if produced simultaneously, or almost so, with the initiation of the ascogon, as for instance the excipulum and paraphyses in Ascohymeniales.

In lichens a second category of additional tissue occurs which is more or less actively or passively added to the true ascocarp and its parascogonal tissues by the thallus, as for instance the carbonaceous excipuli and the thalline walls in Graphidaceae, and the thalline warts of the Pertusariaceae.



Figs. 1–3. *Aglaothecium saxicola* Groenh. — 1. Developmental stages of the ascus. — 2. Spore. — 3. Apothecium (diagrammatic).

Fig. 4. *Cryptothecia* sp. — Developmental stages of the ascus.

Fig. 5–6. *Myriostigma* sp. — 5. Developmental stages of the ascus. — 6. Ascus with ruptured exoascus.

Fig. 7. Developmental stages of the ascus common in Lecideaceae and Lecanoraceae.

THE NATURE OF THE THICK-WALLED ASCI IN LECIDEACEAE AND OTHER LICHEN TAXA

The problem whether the thick-walled asci in Lecideaceae and other lichen taxa are to be considered bitunicate or merely unitunicate with a thick wall, has not yet been satisfactorily solved. Luttrell (1951) thought that the occurrence of bitunicate asci was correlated with the ascolocular (loculoascolocular) nature of the ascocarps. As a consequence he referred the Lecanorales (including the Lecideaceae) to the Unitunicatae, because the Lecanorales are ascohymenial fungi. Korf (1958) considered the Lecideales to be unitunicate and the Lecanorales bitunicate. He did not indicate on which characters his view was based, simply stating that "All members of the Lecanorales which I have studied have bitunicate asci." It should be pointed out, however, that both groups have thick-walled asci which usually stain blue with iodine.

In fact, one can only be sure of the bitunicate nature of the asci, if both endoascus and exoascus can be shown separately. This, however, is but rarely possible, at least in lichens. In *Cryptothecia* Stirt. em. Groenh. and *Myriostigma* Krempelh. the asci are not enclosed in ascocarps, but are found rather evenly distributed within the thallus, or more or less concentrated in fertile portions of it. In *Myriostigma* (Figs. 5–6) the asci are large, globose, and 8-spored. A scraping made from a fertile portion of the thallus, and mounted in a solution of iodine (or eosine to which KOH is added), needs only a moderate pressure on the cover glass to liberate a number of thick-walled endoasci from the very thin-walled exoasci. This method, however, fails completely in the case of *Cryptothecia*, although both genera are very closely related. In the last named genus (Fig. 4) the more or less ellipsoid, monosporous asci remain intact, giving no evidence of being composed of an endoascus and exoascus. Yet, there is no doubt about the bitunicate nature of the asci, if carefully compared with those in *Myriostigma*.

In both genera, the lumen of the mature asci is filled with an ascoplasma which stains purple if mounted in a iodine solution and sharply contrasts with the ascus wall. In both genera, too, there is a dome-shaped extension of the lumen protruding into the thick top of the ascus wall, while the side walls gradually taper toward the base. There is, apart from the number and shape of the spores, no difference between the asci of both genera other than in size and shape.

A similar diversity of the asci is found in *Stirtonia*, the true members of *Helminthocarpon*, in the Arthoniaceae, and in the species of several other genera. Pressure on the cover glass may cause the endoasci to become liberated, or they remain half enclosed in the exoasci, or again, as in most of the cases, the asci remain intact. The dome-shaped extension of the lumen may be of a different shape from that in cryptothecioid genera, or indistinct, or completely lacking. The asci themselves vary considerably as to shape and size, but the feature they all have in common is the wall which is thick at the top and the sides of the ascus, but tapering toward the base.

However, the way the asci develop is probably of even greater importance. In the young stage, the asci are invariably thick-walled, but the wall is of unequal thickness, being irregularly wavy on the inner side. As a consequence the enclosed ascoplast is very variable and irregular in outline, but has its conical to rounded expansion toward the top of the ascus as a rule well indicated. In the course of development, however, the wall becomes gradually thinner and its inner side smoothed out until the final shape is reached as described above.

The thick-walled asci in Lecideaceae (Fig. 7) and other ascohymenial groups all develop in exactly the same manner, frequently showing the dome-shaped extension of the lumen at the top in the immature asci.

The present author, therefore, is strongly inclined to consider the thick-walled asci mentioned above to be principally bitunicate, even if it is true that in a later stage there is no trace left of the dome-shaped extension of the lumen, and apparently no easy way can be found to demonstrate the endo- and exoascus separately.

On the other hand, in view of the tendency to gelatinization in lichens, the possiblity of the ascus being unitunicate with a gelatinized wall should not be precluded. Gelatinization, in the first instance, is a means which enables the lichen fungus to live under such environmental conditions as would otherwise prevent its existence. Therefore, gelatinization is in the first place of importance for the vegetative activities of the lichen. As far as gelatinization occurs in ascocarps it is considered to be of importance for the dispersal of the spores, at the same time preventing the asci from drying up. The fact, however, that species with thick-walled asci are found to grow under the same conditions as species with thin-walled asci,would point in favour of the assumption that asci do not need thick or gelatinized walls as protection against exsiccation. Moreover, in cryptothecioid lichens the asci are not even enclosed by a differentiated gelatinized tissue; they lie more or less scattered inside the thallus (which is usually thin) and with their apical portion often projecting beyond the surface. Finally, it would be difficult to explain why asci, developing along exactly the same lines, should have a double ascus wall in one case and a single one in another.

According to Luttrell (1951) bitunicate asci are indifferent to iodine. This may hold true for the species studied by him, but it does not necessarily mean that asci, at least those in lichens, are of the non-bitunicate type if they do turn blue in iodine. Nor has it been proved, or is there any reason to assume, that bitunicate asci are all insensitive to iodine. The production in lichens of pigments, lichen acids, and amyloid matter is often restricted to limited areas, but there is as yet no evidence of a correlation between the occurrence of such substances and the anatomical structure of the areas producing them. Why then should one assume such a correlation in the case of unitunicate and bitunicate asci?

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