Studies in the Gasteromycetes — IV.
The morphology of Lanopila Wahlbergii Fr.

By Sultan Ahmad,
Botany Department, Government College, Lahore, Pakistan.

With 3 textfigures.

The genus *Lanopila* was proposed by Fries (1848) for a plant collected by Wahlberg from Natal, South Africa. The genus resembles *Bovista* in habit and the nature of the peridium but differs in the capillitium and the manner of dehiscence. The capillitium is free from the peridium and according to several authors (cfr. Lloyd, 1903; Fischer, 1933; Coker, 1934) forms a dense, homogeneous, elastic mass formed of long intertwined and branched threads. The earlier investigators believed that the peridium was separable from the spore mass as in *Lasiosphaera* but as Lloyd (1903) has stated "it may be due to hard usuage in the mails". Coker (1934) also states that the "capillitium is densely packed and easily separable from the peridium, but not becoming a free ball as in *Lasiosphaera*". According to Coker (l. c.) and Long (1941) the long, sparingly branched, *Calvatia*-like threads easily break up into short segments at maturity. This fragmentation of the capillitium is a feature not noted by earlier investigators but is now recognised as universally true for all species of the genus.

Of the five species included under this genus the two most closely allied are *L. bicolor* and *L. Wahlbergii*. In addition to other characters they are distinguished from other species in having rough spores. Lloyd (1923) asserts that they are one and the same species. Swoboda (1937) on the other hand states that the synonymy of the two species is still an open question. According to the latter the difference in the two species lies in the colour of the gleba — reddish brown in *L. bicolor* and fuliginose in *L. Wahlbergii*. On the basis of this he refers the specimens from Texas to *L. bicolor*. Coker (l. c.) applies the name *bicolor* to the Venezuelean plant but on different grounds. He writes as follows: "we are using the name *bicolor* rather than *Wahlbergii* as the former is according to Lloyd well represented in the Museum at Paris, where as no authentic specimen of the latter is known to exist".

The writer's plant was identified as *L. bicolor* by Dr. W. C. Coker and following Lloyd it was reported as *L. Wahlbergii* (Ahmad, 1940). It is difficult at present to state with certainly whether the Panjab plant should be referred to *bicolor* or *Wahlbergii*. The question regarding the synonymy of the two species has become still more complicated due the recent morphological investigation of Swoboda. In the colour of the gleba our plant is certainly *bicolor* of Léveille but in its internal structure it is entirely different from the plant referred to *bicolor* by Swoboda. If the colour of the gleba is a constant feature and if Swoboda's observations are correct then our plant deserves some other name. It is, however, tentatively referred to *Wahlbergii* in the present investigation.

The plant is hypogeous and its presence is noticed only when the superficial layers of the soil become cracked by the growing sporophores. It occurs in sandy soil covered with grass and generally sheltered by bushes. The description of the fungus has already been published by the writer (Ahmad, 1940). The exoperidium consists of a thin white adnate layer which peels off gradually after the plant has become exposed. The endoperidium is papery-cartilaginous, of reddish brown colour. The gleba is also of reddish brown colour. The dehiscence is effected by the weathering of the top portion of the peridium. The spores are coarsely verrucose and the capillitium threads break up into segments which have a pitted surface. The pits are somewhat different from those represented by Swoboda in Fig. 7.

The morphology of *Lanopila bicolor* has been described in some detail by F. Swoboda (1937). According to him the plant is remarkable in the total absence of hymenial cavities, the arrangement of spores on the basidia and the absence of the pseudoparenchymatous layer of the peridium. On this account he proposes to include the genus in a new family *Lanopilaceae* of the order *Plectobasidiales (Sclerodermatales* of Fischer).

Material

Several young plants were collected in August 1948 growing in sandy soil close to bushes of *Zizyphus jujuba.* They were fixed in Formalin-Acetic-Alcohol, the sections were cut 5—10 μ thick and stained with Iron Alum Haematoxylin.

Anatomy

Peridium: The peridium is differentiated into an outer exoperidium and an inner endoperidium (Fig. 1). The exoperidium is pseudoparenchymatous and develops by the interweaving of the peripheral hyphae as has been described in *Bovista plumbea* by

Swartz (1933). It is continuous round the entire fructification and does not show any fissures as have been described for several species of *Lycoperdon*. In this respect it resembles the pseudoparenchymatous layer of the exoperidium of *Disciseda cervina*. When fully formed this layer is 450—500 μ thick and consists of several layers of more or less irregular cells. The outer ends of the hyphae forming this layer enclose a few sand particles. At maturity the cells of the exoperidium collapse but persist as a thin white layer on the surface of the fruit body.

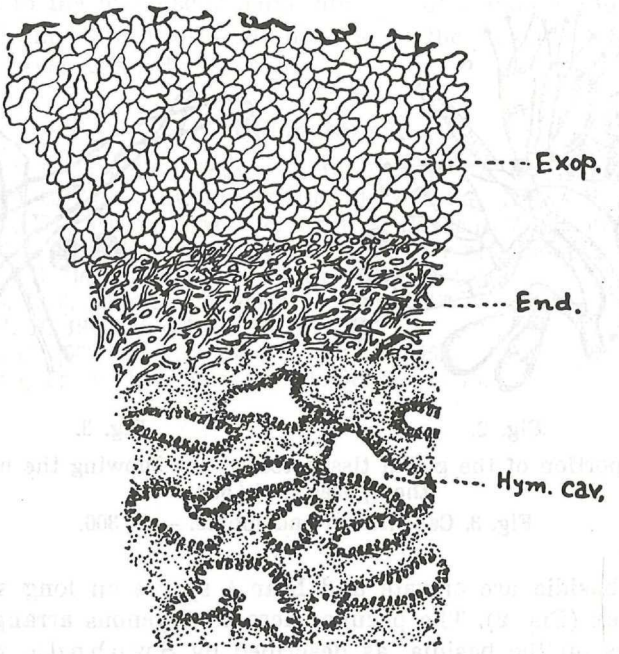

Fig. 1. A portion of L. S. of a young fructification showing the two layers of the peridium, and well developed hymenial cavities. — × 70.

The endoperidium is differentiated immediately below the exoperidium. In the early stages the hyphae of the endoperidial zone do not differ markedly from those of the tramal plates. They differ only in their tangential arrangement and somewhat deeply staining reaction. The component hyphae which form the endoperidium of the mature fructification arise rather late. They are compact and closely interwoven, running tangentially round the entire fructification. In the early stages the endoperidial layer is continuous with the exoperidium on the outside and with the gleba on the inside. In the ripe specimens the endoperidium is 250—300 μ thick.

Gleba: The hymenial cavities appear long before the formation of the exoperidium and in all probability originate in the centre and progress towards the periphery. The cavities are well developed and lined by a compact layer of basidia (Fig. 1). The tramal plates are 35—45 μ thick and formed of loosely arranged hyphae. The increase in the size of the cavities takes place by the union of the adjacent cavities. Very often stout hyphae are seen running across the hymenial cavities. The gleba is fertile through out, there being no trace of a sterile base at any stage of development.

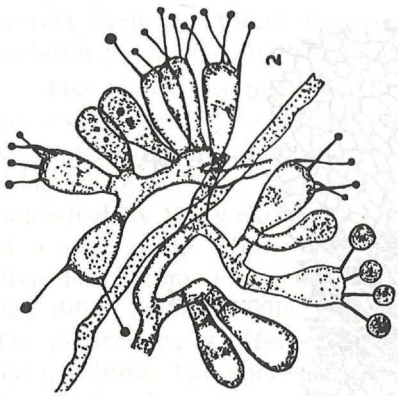

Fig. 2.

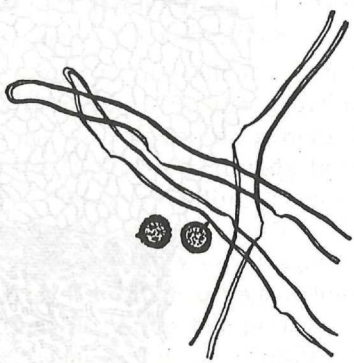

Fig. 3.

Fig. 2. A portion of the glebal tissue teased out showing the basidia and the spores. — × 500.

Fig. 3. Capillitium and spores. — × 300.

The basidia are clavate and bear 4 spores on long sterigmata at the apex (Fig. 2). The peculiar acropleurogenous arrangement of the spores on the basidia, as described by Swoboda, was never observed. The capillitium threads arise from the tramal hyphae as described in several other members of the family. At maturity the capillitium threads break up into short segments which have very prominent pits in their walls (Fig. 3).

Conclusion

As Swoboda had only two dried specimens at his disposal so not much reliance can be placed on his observations. In the ripe specimen the absence of the pseudoparenchymatous layer and the hymenial cavities can be understood as both these structures collapse or disintegrate on drying. But it is doubtful if the younger specimen also belonged to the same species. The form and arrangement of the basidia and the position of the spores suggest a young sporophore

of *Schizostoma* or some other similar genus. The whole matter needs re-investigation based on authentic material.

It is quite evident from the present investigation that in *Lanopila* the structure however of the exoperidium and gleba, form of the basidia and the arrangement of spores is typical of the family *Lycoperdaceae* and there is no occasion for creating a new family for this genus.

In the family *Lycoperdaceae* the genus occupies a position at the base of the *Abstoma-Disciseda* series. It resembles the genus *Abstoma* in the hypogeous habit, absence of a mouth and fragmentation of the capillitium but differs in the absence of an outer mycelial layer (s a n d y c a s e).

Bibliography.

Ahmad, Sultan. 1940. Jour. Ind. Bot. Soc. 18: p. 169—177.
Coker, W. C. 1934. Univ. Puerto Rico Monogr. Ser. B., No. 2: p. 321.
Fischer, Ed. 1933. in Engler & Prantl, Pflanzenf. 7a, p. 64.
Fries, E. M. 1848. K. vetensk. Akad. Handlingar Stockholm, p. 31.
Lloyd, C. G. 1904. Mycological Notes no. 18, p. 190.
————. 1923. Mycological Notes no. 68, p. 1177.
Long, W. H. 1941. Mycologia 33: p. 272.
Swartz, D. 1933. Amer. Jour. Bot. 20: 440—465.
Swoboda, Fr. 1937. Annales Mycologici 25: 1—13.