PERIDIA OF CRUCIBULUM VULGARE.

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This fungus was first studied by Tulasne, and after the studies of Sachs, published in 1855, no important work was done with reference to it until 1920, when Leva Walker[1] in Nebraska showed that the peridia of *Crucibulum vulgare* grow from mycelial hyphae, from a dense mat of surface hyphae, or not infrequently from the interior of a peridium from which the sporodioles have disappeared.

Early in May, 1928, there was an extremely vigorous growth of peridia from mycelial hyphae about one hundred yards west of Kirkwood Hall, Indiana University. The formation of new peridia within old ones was not observed until the following month, then only in one case. This phenomenon did not occur again until the next August. At that time they were quite common. In September and October it was found in 51 per cent of the emptied peridia collected. Specimens were gathered without reference to this. The growth of young peridia arising from a subicle was not noticed until October 18, 1928. The color of these peridia was that of raw sienna and the color of the subicle was mustard yellow. The mycelium collected at the same place and time was hyaline.

Sections were made to study the development of this plant and to determine the connection between the peridia which grow inside the emptied ones and the mycelium (fig. 1). The sections showed the things which Walker had observed in the development. There was a process of gelatinization, which begins just above the base and beneath the yellow covering and forms a covered dome-shaped crown when the peridium is only about one millimeter high. Before this crown is completely formed the sporodioles begin to differentiate. They first appear as spots of slightly denser hyphae which take the analine safranin stain better than does the ground tissues. After the gelatinization of the dome is complete the ground tissue begins to gelatinize, leaving the sporodioles as round masses attached by their ventral surfaces to remaining masses of ground tissue. The sporodioles become lenticular in shape and the ground tissue to which they are attached forms the funiculus, a wavy mass of hyphae connecting the sporodiole with the inner wall of the peridium, and also a sheath around the funiculus which promptly gelatinizes.

The region of growth was shown by Walker to be at the top. The top surface is flattened when the peridium is about three millimeters high and about the same in diameter at the top. When it is this size the

[1] Walker, Leva B. Development of Cyathus Fascicularis, Cyathus Striatus, and Crucibulum Vulgare. Bot. Gaz. 70:1-24. 1920. Further bibliography listed here.

yellow epiphragm appears. There is a groove around the epiphragm in which the lateral wall of the peridium and the epiphragm are connected.

As the sporodioles assume their mature shape, a central cavity appears in them into which the basidia project. The basidiospores first appear when the peridium is about four millimeters high, but they are not plentiful until it is time for the epiphragm to disappear.

The mycelium which lines the peridial cavity at its base was alive when the peridia were fixed for study. The dead mycelium took the orange G stain, but was only slightly affected by analine safranin and gentian violet, while the living mycelium was stained by these, and only slightly colored with the orange G.

Fig. 1—Longitudinal section through part of an emptied peridium showing the base of the peridial cavity with the young peridium developing from the lining of the old one. x32.

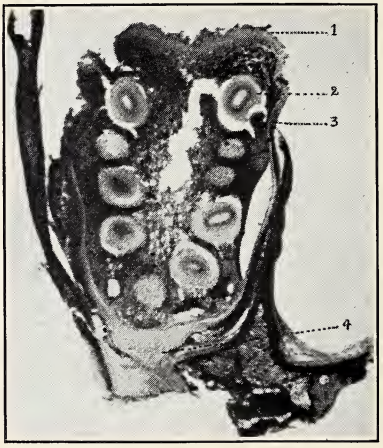

Fig. 2—Longitudinal section through an emptied peridium showing another peridium, nearly mature, which has developed inside it. The inner peridium shows (1) epiphragm, (2) sporodiole, (3) funiculus, and (4), the connection of the second peridium with the lining of the peridial cavity of the first. x20. (Photo-micrograph by Weatherwax).

There was a mass of undifferentiated hyphae which issued from the living lining and extended to the subicle (fig. 2). These hyphae passed into the base of the new peridium which grew out of the lining of the old one. In several cases studied there were two and in one case three peridia growing out of the lining of a single peridial cavity. In these cases the new peridia were confluent, but separated by a layer of yellow-brown very loose hyphae similar to those which cover the young peridia after their earliest stage. These peridia do not always develop equally, one becoming much larger than the other. This causes variation in shape, making some appear to be lanceolate in section rather than wedge-truncate as is normal. They appear to grow out of

the lining of the old peridium at the same place, which may be the bottom of the peridial cavity or may be some point on its side near the bottom.

It is a phenomenon of common occurrence among the mushrooms for one fructification to grow from the sporophore of an older one. *Clytocybe*, *Collybia*, and *Hypholoma*, along with most other genera of caespitose mushrooms, display this characteristic. In these cases the later fructifications grow on the outside of the earlier ones, often before the latter are mature. All the mycelium of the sporophore does not die at the same time, and more sporophores may be produced from part of it. Ordinarily new sporophores are not produced by the mycelium of an older one, but appear only from new hyphae.

Crucibulum vulgare constitutes another exception to the usual order. The mycelium which lines the peridial cavity has living connection with the subiculum and the mycelium in the substratum. This must either contain an excess of food, more than is needed for the maturation of the first peridium, or the absorption of food may continue after the first fruit bodies have been produced. Growth is natural when an excess of food is present, unless other factors intervene, so new peridia are formed from the old peridial mycelium. These correspond to the mushroom sporophores which develop on the sporophore of an older one. In either case the fructification grows from the mycelium of an older sporophore. Usually the young sporophores appear on the outside of the stipe of the mushroom, but in *Crucibulum vulgare* these appear inside the old peridium. The dead wall of the emptied peridium probably protects the mycelium at the bottom of the peridial cavity, and the new peridium, as the subiculum could not protect it.

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