

SAPROLEGNIA.

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In the Saprolegnieae the sporangium is a somewhat club-shaped cylinder which sooner or later is cut off from the rest of the filamentous structure of the plant by a transverse wall. This sporangium is of varying length, but ordinarily its length exceeds its greatest diameter from four to ten times. Aside from the presence of a transverse wall, one thing that attracts the attention of the observer is the much more grumous or densely granular nature of the protoplasm. This latter condition is generally quite conspicuous in parts or organs that are or are becoming reproductive centers of various kinds.

This dense protoplasm of the future zoösporangium finally divides into more or less polygonal areas. Sometimes these areas show a somewhat rounded appearance and the transverse wall which confines them to the end of the filament is slightly rounded or arched toward the apex. The zoösporangium opens at the end and preparatory changes in the contents lead to the final expulsion of the zoöspores. There are questions, however, concerning this process which are still unanswered and which deserve attention.

The transverse wall above referred to is not always straight at first but may become curved at a later period, in some members of the group Saprolegnieae, as in some cases in Saprolegnia and Achlya. In the latter, especially, it is often straight at first or slightly curved from the tip, whereas later it is curved apically, particularly when the zoöspores are escaping. At this time, and even before at times, the thin transverse wall is sometimes curved apically due to greater hydrostatic pressure back of the zoösporangium, notwithstanding the considerable swelling of the contents of the zoösporangium. This curving outward of the transverse wall frequently occurs at first whether a new zoösporangium is to be produced or not in the hull of the old zoösporangium.

"The distinguishing mark of Saprolegnia," says de Bary,¹ "is that the spores are in the motile state as they issue from the sporangium, and that the branch of the thallus which bears the sporangium grows through it when it has discharged its spores." In Achlya a branch is formed laterally and beneath the transverse wall. This new branch becomes the zoösporangium after development.

An illustration of the apically directed or curved transverse wall is also to be seen in Saprolegnia Thuretis at times, as illustrated by Nathansohn,² which is due to greater hydrostatic pressure probably from the first in the main filament than in the zoösporangium, notwithstanding the swelling process in the latter. This wall is not form-

¹ de Bary, A., Comparative Morphology and Biology of the Fungi, Mycetozoa and Bacteria, 1887, p. 143.

² Nathansohn, A., Allgemeines Botanik, 1912, p. 303.

ing a new zoösporangium in the old one, although the old zoösporangium is probably due to external conditions, as stated by Pfeffer,* in various plants, and these may even prevent at times the formation of sporangia. A deficiency of food, says Pfeffer,† may cause the formation of zoospores or oöspores in Saprolegnia, whereas with some substances no reproductive organs are formed and again with other food substances the formation of oögonia are favored.¹ The various conditions also account for the difference in the latent period of the spores of this plant, which, as stated by Pfeffer² and observed by different investigators, ranges from 8 to 10 days as observed by Klebs³ and 45 to 145 days according to de Bary.⁴ Also the zoöspores are especially influenced by various conditions, among these being the attraction by certain substances of which the phosphates are very active.⁵

Inasmuch as the representatives of this division of the fungi are, like some other plants, rather susceptible to some or all of the above mentioned conditions, they tend toward some variation from the forms ordinarily observed. In many cases fish of various kinds are attacked by this fungus and extensive epidemics, as stated by de Bary,⁶ of fish in the English and Scottish rivers and elsewhere have occurred. The writer has observed, however, and can confirm de Bary's⁷ statement, namely, "that healthy gold fish may continue lively and free from the Fungus for months in water in which Saprolegnieae kept purposely in large quantities were forming an abundance of spores."

The writer has observed insects of various kinds on which, on one occasion, a heavy growth of Saprolegnia was present. The zoösporangia of all of these were formed in the usual manner at first, but when new sporangia were being produced in the first ones some departures from the usual order were noticed. This will be made clear by an observation of Figure 1. Usually, as is well known, but one new zoösporangium is formed by growing up through the hull of the old one in the ordinary way. In this case, however, four new zoösporangia had formed within the hull of the original one. The hulls of these sporangia were still held together and attached to the main branch or filament of the fungus but were empty. A small part of the contents was left in the third one that was newly formed. The old zoösporangial cavity contained the upper parts of the new sporangia that had grown through it.

In another instance a single tube had grown up through the old sporangial cavity in the usual fashion. On the end of the tube which projected through the original apical opening of the old zoösporangium, a large, round swelling was present which resembled as to form and size the ordinary oögonia. This departure from the usual behavior of the formation of zoösporangia is shown in Figure 2. The further de-

* Pfeffer, W., *Physiology of Plants*, 1903, p. 39.

† Pfeffer, W., l. c., p. 116.

¹ Pfeffer, W., l. c., p. 117.

² Pfeffer, W., l. c., p. 208.

³ Klebs, *Jahrb., f. Wiss. Bot.*, 1899, Bd. 38, p. 571.

⁴ De Bary, *Vervil, Morph. u. Biol. des Pilze*, 1884, pp. 356-370.

⁵ Pfeffer, W., l. c., Vol. 3, 1906, p. 348.

⁶ De Bary, *Comp. Morph. and Biol. of the Fungi*, 1887, p. 375.

⁷ De Bary, l. c., p. 375.

velopment of this structure was not followed out owing to the breaking down of the material under observation.

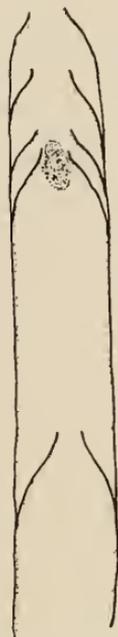


Fig. 1. *Saprolegnia* showing four sporangia that have grown up in the old zoosporangium x 520.

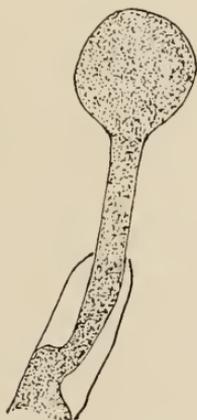


Fig. 2. Hull of the old zoosporangium occupied by a tube having a large terminal swelling x 520.

