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THE PRODUCTION OF SEXUAL ORGANS IN PURE CULTURES OF PHYTOPHTHORA CINNAMOMI RANDS AND BLEPHAROSPORA CAMBIVORA PETRI.

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(With two Text-figures.)

IN the preceding paper* on the production of sexual organs in paired cultures of strains and species of *Phytophthora* the statement was made that they had not been detected in pure cultures of *P. Cinnamomi* and *B. cambivora*. They have now been found in a pure culture of *P. Cinnamomi* (American Type Culture Collection, No. 1407) in two tubes of sloped maize-meal agar after six months at the temperature of the laboratory; and also in the "Cinnamomi" zone of a paired culture of that species with *B. cambivora* on the same medium and of the same age.

In one of the tubes of *P. Cinnamomi* alone, a yellowish brown patch, present on the glass at the base of the **V**, was found to be due to many mature sexual organs with large amphigynous antheridia which were mostly longer than they were broad. The oogonia, which showed more or less thickened yellow walls, although in some instances the coloured walls were quite thin, were for the most part broadly clavate with the wide funnel-shaped base within the antheridium. The oospores with hyaline thickened walls usually filled the upper main part of the oogonial cavity. The sexual organs appeared to be borne on separate hyphae. The measurements which follow, record in microns the

* See p. 252.

mean size and range of sixty-five oospores and thirty-two oogonia and antheridia.

Organs	Mean size	Range
Oospores	27·2	19–36
Oogonia	32·0	21–42
Antheridia	19 × 17	15–25 × 13–19

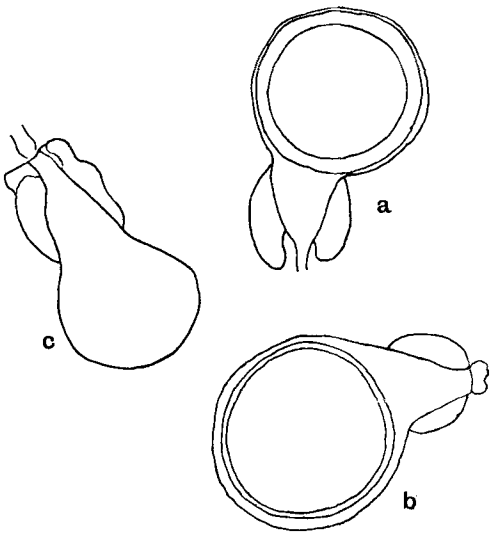

Fig. 1, *a* and *b*. Mature sexual organs of *P. Cinnamomi* showing oospores and amphigynous antheridia. × 700. *c*. Immature sexual organ of the same species. × 700.

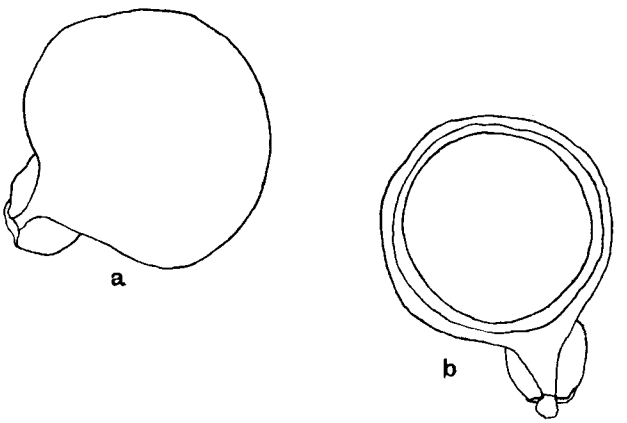

Fig. 2, *a* and *b*. Mature sexual organs of *B. cambivora* showing amphigynous antheridia. × 720. (The oospore of *a* collapsed and was omitted from the drawing.)

The oospores and oogonia show a considerably greater range of variation in size than those of *P. cryptogea* Pethyb. and Lafferty and *P. Richardiae* Buis. (*l.c.*) almost as great, in fact, as those two forms together, while the mean sizes are intermediate. The size and form of the mature sexual organs in the pure cultures of *P. Cinnamomi* confirm my inference that those found in paired cultures of the same isolation with a strain of *P. parasitica* of the section "microspora" ([1], fig. 6) were actually those of *P. Cinnamomi*. This finding induced me to re-examine a pure culture of *B. cambivora** nine months old on slanted maize-meal agar in which sexual organs had not been detected previously. Three mature sexual organs with yellow oogonial walls were found at the base of the **V** and were mounted in dilute potash solution. The antheridia appeared to be amphigynous, but their relations to the oogonia were not very distinct. They were transferred to concentrated lactic acid, one being lost during the manipulation. In that medium the remaining two showed the relations of the antheridia and oogonia (see figure) to be distinctly of the amphigynous type. (In one the oospore collapsed and is not shown in the figure.) The dimensions in microns of the oogonia and oospores measured in dilute potash solution were:

	Oospore	Oogonium
1	40·8	49·0
2	35·7	43·3
3	40·0	49·0

The first two are shown in the figure, that with the mature oospore being the second; in potash the oospore did not quite fill the oogonial cavity, but in lactic acid it filled the cavity, increasing in diameter to 38 μ, while the oogonium showed no perceptible increase in size.

Petri [2] has recorded oogonia 22–26 μ and oospores 20–27 μ in diameter in the tissues of chestnut seedlings (the oogonium in his Pl. IV, fig. 14 is about 36 μ in diameter). In a later paper [3] he stated that the antheridia were paragynous in the tissues of seedlings and figured an oogonium about 42 μ in diameter. It is possible, therefore, that the one type of sexual apparatus might be dominant in the tissues of the host and the other type in pure culture on artificial media such as maize-meal agar. The production of similar sexual organs in pure culture strengthens the view of the close relation between *B. cambivora* and *P. Cinnamomi*.

* The original culture was kindly sent by Professor L. Petri by the hand of Miss M. L. Yeo, then on the staff of the Imperial Bureau of Mycology. It proved to be a vigorous pure culture.

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STUDIES IN THE MORPHOLOGY OF DISCOMYCETES.

I. THE MARGINAL GROWTH OF APOTHECIA.

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(With four Text-figures.)

THE early development of the apothecium has been investigated in several Discomycetes. The manner in which the mycelial hyphae grow together, branch and intertwine around the archicarp to form the primary sheath, and the origin of the hymenium, are known in some detail. In the smaller apothecia with no other complication in development, as *Pyronema* and *Ascobolus*, it may be said that the hyphal system is fully known. But in the majority there must be a continual formation of new tissue at the margin of the hymenium, which is one of the chief means of growth of the apothecium. Few investigations have included this period of marginal growth and they are unfortunately incomplete. De Bary (1) has described in general terms the marginal growth of two species of *Sclerotinia*, and Brown (4) has made a diagram of the hyphal system of *Ciliaria scutellata*, but the way in which the hyphae at the margin grow and branch, that is, the working of the growing-point, is not clearly shown. These are apparently the sole examples, yet, oddly enough, de Bary states (*loc. cit.* p. 53), without reference, that several accounts have been given of the way in which apothecia "grow for a time by the formation of new elements in their originally involute margin": these I have been unable to trace. In more recent works on the morphology of Discomycetes there is barely, if any, allusion to the process, though the evolution of the apothecium may be discussed. But to what purpose may one compare even apothecia differing only in size in this respect without a knowledge of the mode of formation of new tissue? The object of this paper is to bridge this gap in the morphology of the group.