SOME OBSERVATIONS ON THE SPORE DISCHARGE OF PLEURAGE CURVICOLLA (WINT.) KUNTZE.

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Introduction

While making some studies on the comparison of a strain of *Pleurage curvicolla* (Wint.) Kuntze with those strains previously investigated, the results of which studies are being published in a separate paper,[1] it was noticed that this organism has the power to discharge its spores with remarkable force.

So far as known, parasitic Ascomycetes are able to project their spores only to a distance of a few millimeters, while it has been shown that certain saprophytic forms such as members of the Sordariaceae, Ascobolaceae, and others are able to shoot their spores a considerably greater distance. Griffiths[2] studied the method of spore discharge in *P. curvicolla* as well as in related species, and found that the maximum height of projection in the former is 9 centimeters. A good discussion of the details of spore ejection by these fungi is given by Griffiths and need not be repeated here. Woronin[3] found that *Sordaria fimiseda* could shoot its spores to a height of 15 centimeters. This is the maximum distance found recorded for a member of the Sordariaceae.

Buller[4] states that *Ascobolus immersus* is possibly not exceeded by any other Ascomycete in the violence of its spore discharge. It was found to project its spores to a height of 35 centimeters.

Experiments

In the experiments recorded below, the fungus was grown on moistened corn meal in a two-liter Erlenmeyer flask. The cultures were allowed to grow at room temperature, about 24–28° C., and exposed to the diffused light of the laboratory until the perithecia began to discharge their spores as indicated by the presence of the spore masses upon the sides of the flask. It might be mentioned in passing that few and often no perithecia were

[1] Weimer, J. L. Variations in *Pleurage curvicolla* (Wint.) Kuntze. Amer. Journ. Bot. **6**: 406–409. 1919.

[2] Griffiths, David. The North American Sordariaceae. Mem. Torrey Club **11**: 1–134. 1901.

[3] Woronin, M. *Sphaeria Lemaneae, Sordaria fimiseda, Sordaria coprophila* und *Arthrobotrys oligospora*. Abhand. Senkenb. Naturforsch. Gesell. (Frankfurt) **7**: 325–360. pl. 1–6. 1869–1870.

[4] Buller, A. H. R. Researches on fungi. pp. 287. 1909.

found in cultures grown in an incubator in the dark or wrapped in black paper, while in duplicate cultures grown in the laboratory in the light, perithecia were formed in abundance. When the culture was ready for use the cotton stopper was removed and a large test tube, 37 mm. in inside diameter and 243 mm. in height, was inverted over the mouth of the flask. The flask and all but the bottom of the tube were covered with black paper, to keep out the light. The apparatus was placed upon a desk before a north window, where it was exposed to rather strong diffused light. The perithecia are positively heliotropic, and hence the spores were discharged towards the source of light, namely, the bottom of the test tube. Spore masses were found all along the sides of the test tube to a height of 45 cm. above the fruiting surface of the culture. None were found on the bottom of the tube 5 cm. higher. This is three times as high as previously recorded for a member of this family, and 10 cm. higher than given by Buller for *Ascobolus immersus*. So far as the writer has knowledge, this strain of *Pleurage curvicolla* can project its spores to a greater height than any other Ascomycete yet studied and three times as high as any other Pyrenomycete investigated.

Considerable attention has been paid by various workers to the study of the influence of light upon the direction in which spores are discharged. Allen and Jolivette[5] have reported in detail, observations made on the accuracy with which Pilobolus could project its sporanges toward a source of light. While endeavoring to determine the height to which *Pleurage curvicolla* could shoot its spores, the writer incidentally made a few observations on its power to aim towards the light. Spore masses have often been seen on the side of the petri dish in which this organism was growing next to the source of light. In most cases perithecia were present only at or near the center of the culture, and these had oriented their beaks in such a way as to cause the spores to be discharged in a direction parallel to the surface of the substratum on which they were growing.

In one experiment a two-liter flask containing the fungus growing on corn meal was wrapped in two thicknesses of black paper, and a hole about 2½ cm. in diameter was cut in the paper on the side of the flask nearest the source of the strongest light. After 48 hours a considerable deposit of spore masses was present on the side of the flask immediately beneath the opening in the paper. The flask was then turned about so that the hole in the paper was directly opposite where it had been. This would mean, of course, that many of the beaks of the perithecia were pointing directly away from the opening. After a period of 48 hours a considerable deposit of spores was present beneath the opening in the paper. The paper was moved in this manner time after time with the result that each time the perithecia changed their aim and discharged their spores towards the source of light.

[5] Allen, Ruth F., and Jolivette, Hally D. M. A study of the light relations of Pilobolus. Trans. Wisc. Acad. Sci., Arts, and Lett. **17**: 533–598. 1914.

In another experiment the opening in the paper was 1½ cm. in diameter and about 5 cm. from the bottom of the flask. The spore masses were found mostly within this circle, but a few were scattered in all directions about the opening; however, they were all included within a circle 4½ cm. in diameter concentric with the opening in the paper. The flask was then turned about so that the opposite side was exposed to the light through the opening in the paper. After 45 hours the paper was removed, and the same conditions as described above with regard to the arrangement of the spores about the opening were found to have been duplicated. In one experiment a grayish-black, instead of a jet-black, paper was used to exclude the light. In this case the spores, instead of being discharged towards the opening in the paper, were discharged against the side of the flask almost opposite the opening. This paper behind the glass acted as a mirror and it would seem that the reflected light exerted a stronger heliotropic influence than did the direct light. In this case the spore print covered an area on the side of the flask opposite and slightly below the source of light about six times larger than the area of the opening in the paper. The flask was then turned about, exposing the opposite side to the light, and the spores were again shot away from the direct light. However, when the paper was removed entirely the spores were discharged towards the window.

Buller shows that the great distance to which *Ascobolus immersus* spores are projected in comparison with that traveled by the spores of the Hymenomycetes is due to the large size of the spore mass. The size of this spore mass, he states, is due (1) to the unusually large size of the spores; (2) to the thick gelatinous envelope round each spore; (3) to the clinging together of the spores; and (4) to the large mass of the discharged ascus sap. In the case of *Pleurage curvicolla* there are approximately 500 spores all clinging together and discharged as one body together with a quantity of ascus sap or other gelatinous substance, making a large projectile. A number of spore prints made upon a microscopic slide placed over the mouth of the two-liter culture flask 26 cm. above the fruiting surface were measured. These were circular in outline and ranged from 168 to 266 μ in diameter. Surrounding each spore mass was a sort of halo about 25 to 30 μ wide due to the gelatinous substance in which the spores were imbedded and which was discharged along with them. No doubt the comparatively great mass of material discharged in this instance, as in the case of *Ascobolus immersus*, is a big factor in determining the distance to which the spore masses are shot.

Pleurage curvicolla probably can project its spores to a greater height than any other Ascomycete yet studied. Its spores are usually discharged in masses towards the source of light, but reflected light seems to exert a stronger heliotropic stimulus than does direct light.