

# Proceedings of the Iowa Academy of Science

---

Volume 36 | Annual Issue

Article 20

---

1929

## Reproduction in *Cyathus stercoreus* (Schw.) De Toni

Don B. Creager  
*State University of Iowa*

Copyright ©1929 Iowa Academy of Science, Inc.

Follow this and additional works at: <https://scholarworks.uni.edu/pias>

---

### Recommended Citation

Creager, Don B. (1929) "Reproduction in *Cyathus stercoreus* (Schw.) De Toni," *Proceedings of the Iowa Academy of Science*, 36(1), 121-124.

Available at: <https://scholarworks.uni.edu/pias/vol36/iss1/20>

This Research is brought to you for free and open access by the Iowa Academy of Science at UNI ScholarWorks. It has been accepted for inclusion in Proceedings of the Iowa Academy of Science by an authorized editor of UNI ScholarWorks. For more information, please contact [scholarworks@uni.edu](mailto:scholarworks@uni.edu).

REPRODUCTION IN *CYATHUS STERCOREUS* (Schw.)  
DE TONI

DON B. CREAGER

Spore germination in the Nidulariaceae and in a closely related family, Sphaerobolaceae, has been very difficult to obtain.

The most successful attempt to germinate spores of either family has been reported by Eidam (1), who germinated the spores of *Crucibulum vulgare* and *Cyathus striatus* by keeping them in a saturated atmosphere for twenty-four hours at 20° to 25°C. Various kinds of media were used but horse dung decoction proved the best.

Walker (3), working with *Cyathus fascicularis* found that in most cases spore germination did not take place. In a few cases, however, she obtained abundant germinations in water, using the hanging-drop method.

Fischer (2) obtained germination of spores of *Sphaerobolus stellatus* on dung decoction, but with much difficulty, and the number of spores germinated was very small. Walker (4), who also carried on germination experiments with *Sphaerobolus stellatus*, reports that the gemmae germinate readily, but spore germinations were rarely secured. Hanging drops were made in water and in numerous nutrient media but germinations were obtained only in water to which a trace of pepsin had been added. Even in these cases germination was very scanty and uncertain.

The writer has made many attempts to germinate the spores of *Cyathus stercoreus*, but all attempts have met with no success. Various kinds of agar media were used in the attempts to induce germination, including clear filtered II = a nutrient, horse dung decoction, barley malt, malt gelatine, and prune decoction. All experiments were carried on at room temperature (20° to 24°C.). Some of the spores became granular and brown in color, which appeared to be early stages in the germination process. Several spores out of the multitude examined developed a slight projection at one side that suggested the origin of a germ tube. After several weeks under observation no further change toward germination occurred. The greater number of spores showed no sign of germin-

ation whatsoever. There seemed to be no difference whether the spores were taken out of the peridiole and scattered over the surface of the medium, or whether the peridiole was placed on the medium allowing the spores to remain undisturbed on the inside.

It is a familiar fact that within twenty-four hours after a mature peridiole is placed in a moist chamber or on a nutrient medium, there appears all over its surface an abundance of rapidly growing hyphae. Since it was found that the spores did not germinate, and therefore, were not responsible for these growing hyphae, it became of interest to find out, if possible, from what part or parts of the peridiole they had their origin.

Peridioles were placed on agar media, and various stages of mycelial growth projecting from the walls were obtained. Microtome sections of these peridioles stained in Haidenhan's iron-alum haematoxylin showed that the new hyphae had their origin in the loosely interwoven filaments of the outer layer of the peridiole wall, while sections of some peridioles seemed to show that hyphae not only came from the outer layer of the wall, but that some came from the loosely arranged minute hyphae in the central part of the peridiole. Hyphae that appeared to have their origin in the central part came to the surface through breaks in the thick peridiole wall made either by mechanical means or by bacterial action, (figures 1 and 2).

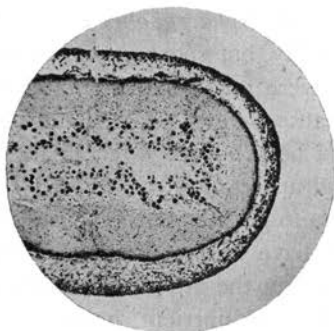


Fig. 1

Photomicrograph of part of a section through mature peridiole of *Cyathus stercoreus*, showing outer wall composed of loosely arranged hyphal filaments, pseudoparenchymatic layer and loosely interwoven portion of inner wall, and mature spores imbedded in gelatinous substance among loosely interwoven minute filaments of interior.

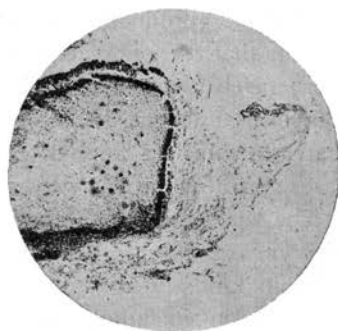


Fig. 2

Photomicrograph of part of a section through germinated peridiole of *Cyathus stercoreus* after being on dung decoction agar for 200 hours, showing hyphae which developed from the loosely arranged filaments of the outer wall.

Magnification of both X50

During spore germination experiments a small portion of a dark brown thick-walled hypha, which to all appearances came from the outer layer of the peridiole wall, was accidentally placed on dung decoction agar along with the spores. After being on agar for twenty-four hours it gave rise to a new thin-walled colorless hypha with abundant clamp connections. This very clearly demonstrated that the filaments of the outer layer of the peridiole wall can give rise to new hyphae, and that only a very small portion is required.

Based on these experimental results and observations, the following conclusions have been drawn: first, that the spores of *Cyathus stercoreus* do not germinate under ordinary conditions, thus failing to function in the role of reproduction; and second, that the function of reproduction has been taken over by certain filaments or cells of the wall and interior of the peridiole. The peridiole, therefore, serves as a vegetative reproductive body, whose morphology and methods of resuming growth closely resemble the sclerotium in some of the other groups of fungi.

These experiments, it is true, were carried on under artificial conditions, but it seems extremely doubtful whether the spores ever play a part in the life cycle of *Cyathus stercoreus* growing under natural conditions since they could not be induced to germinate under the various conditions to which they were subjected. If they ever germinate, certainly the conditions favorable for germination are very rare.

Fischer (2) found that a very similar condition exists in *Sphaerobolus stellatus* in that the spores rarely germinate, and that the peridiole functions as a reproductive body, germinating as a whole. He believed that the new hyphae coming from the germinating peridiole came from the gemmae, and not from the spores. The spores in a germinating peridiole degenerate, or decompose, and this decomposition has never been observed to be due to germination of the spores. He did not suggest that any of the hyphae had their origin in the wall of the peridiole.

These peculiar conditions may be explained by the hypothesis of functional degeneration on the one hand and specialization on the other. The spores seem to have lost their function by degeneration, and through specialization of certain hyphae in the gleba, the peridioles have been developed to such an extent of complexity that they have taken over the reproductive function formerly belonging to the spores.

This explanation seems to be the most logical, since these two

families. Nidulariaceae and Sphaerobolaceae, to which the members under discussion belong, represent two of the most highly specialized groups of the Basidiomycetes.

This investigation was made under the direction of Professor G. W. Martin in the mycological laboratories of the State University of Iowa.

LITERATURE CITED

1. Eidam, Edw. Die Keimung der Sporen und die Entstehung der Fruchtkörper bei den Nidularieen. Beiträge zur Biol. der Pflanzen, 2: 221-248. 1876.
2. Fischer, Ed. Zur Entwicklungsgeschichte der Gastromyceten. Bot. Zeitung, 42: 465-470. 1884.
3. Walker, Leva B. Development of *Cyathus fascicularis*, *C. Striatus*, and *Crucibulum vulgare*. Bot. Gaz., 70: 1-24. 1920.
4. Walker, Leva B. Development and Mechanism of Discharge in *Sphaerobolus iowensis* n. sp., and *S. stellatus* Tode. Jour. Elisha Mitch. Sci. Soc., 42: 152-178. 1927.

DEPARTMENT OF BOTANY,  
STATE UNIVERSITY OF IOWA,  
IOWA CITY, IOWA.