

OBSERVATIONS ON A DISCOMYCETE FOUND ON MEDLAR FRUITS.

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In 1920 the present writer* recorded the occurrence in this country of a fungus found associated with, and apparently the cause of, a leaf blotch of Medlar trees (*Mespilus germanica* L.). The fungus appeared on the upper surface of the diseased leaves in the form of grey tufts which were often confluent in lines along the principal veins and consisted of chains of almost spherical conidia; these conidia were connected by the slender fusoid bodies known as "disjunctors."

On comparing this fungus with the description and figures given by Schellenberg† it was evident that it was the conidial stage of *Sclerotinia Mespili*. That author found the apothecial stage of the fungus on the mummied Medlar fruits. He stated that these mummies were the result of infection brought about by the transference, by insects, of conidia from diseased leaves to the flowers.

During the latter half of April and the first fortnight of May, 1920, specimens of the leaf blotch were sent to Wye College from five localities, four in Kent, the other in Somersetshire. At two of these a search was made under affected trees for the apothecial form of the fungus. On the trees and also on the ground beneath them were found small dried up undeveloped Medlar fruits but in no case could apothecia be discovered on these. Some of these mummies were collected towards the end of April (1920) and brought to the College where they were placed on the surface of ordinary garden soil in two plant pots; in one pot were placed those collected from the ground, in the other those taken from the tree. The pots were then left exposed in the open.

A microscopic examination of a number of these mummies showed the presence of hyphae in the tissues, and almost invariably numerous, minute, spherical, spore-like bodies (microconidia or sporidia) could be obtained by placing scrapings from the surface of the fruits in water. Cultures were obtained from

* Wormald, H., On the Occurrence in Britain of the Conidial Stage of *Sclerotinia Mespili* Schell., Ann. Appl. Biol. vii, Nos. 2 and 3, pp. 173-6, Dec. 1920.

† Schellenberg, H. C., Ueber *Sclerotinia Mespili* und *Sclerotinia Ariae*, Cent. für Bakt. Abt. 2, Bd. xvii, pp. 188-202, 1907.

the internal mycelium and these resembled in their mode of growth others obtained from conidia taken from the leaves. In such cultures micro-conidia similar to those obtained from the surface of the mummies were invariably produced. No macro-conidia, i.e. similar to those which develop on the leaves, were formed in any of the cultures.

When the pots were examined about the middle of the following February (1921) it was seen that on some of the mummies in the pot containing those collected from the ground, there were present rounded villose brownish outgrowths, 1 to 1.5 mm. in diameter; by March 1 these outgrowths had become more or less conical, being broadest near the base and tapering to a bluntly pointed apex. On March 14 it was noticed that these outgrowths were being devoured by slugs so some of the mummies were brought into the laboratory and placed on moist filter paper in a large Petri dish. Under these conditions development continued and by March 21, the upper portion of each outgrowth had elongated to form a stalk with a slightly swollen terminal knob which in some cases was already provided with a central pore. The pores gradually increased in size, the fructifications becoming cup- or funnel-shaped, and by March 29 well-developed apothecia were present on two of the mummies, which bore ten and twelve sporophores respectively. Three days later the apothecia had become almost plane and were splitting at the margin. As the apothecia reached maturity it was found that, on removing the lid of the dish containing them, the spores were discharged in little visible clouds. Later several such discharges were distinctly seen on placing a mummy bearing ripe apothecia on black velvet exposed to sunlight.

The number of sporophores growing from a mummy was variable; of those left in the open very few attained to their full development owing to the depredations of the slugs, but observations showed that the early stages (the rounded villose outgrowths referred to above) of some ten or more sporophores usually appeared on each mummied fruit. On one of the specimens brought indoors fifteen sporophores were counted.

It is to be noted that the mummies were collected in the spring of 1920 before the trees came into flower; they had therefore passed the previous winter either on the tree or on the ground and, when the apothecia appeared, had been exposed in the open during two (at least) winters. That the medlar fruits do not produce apothecia until the second year after infection was observed by Schellenberg*; the same period is also required by other species of *Sclerotinia*, as shown by

* *Loc. cit.* p. 189.

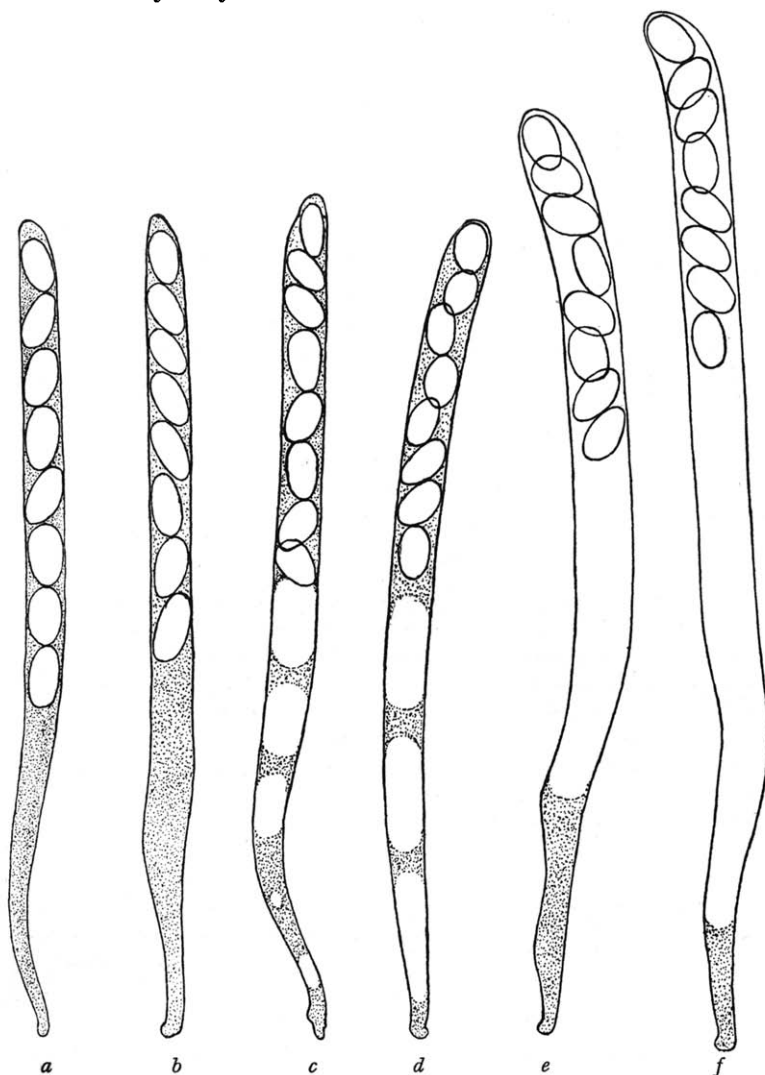


Fig. 1. Asci, showing the change which takes place preparatory to the discharge of the spores $\times 500$. *a* and *b*, not vacuolate. *c* and *d*, several vacuoles present. *e* and *f*, one large vacuole in each extending almost to the base.

Aderhold and Ruhland* for *S. fructigena* and the form they refer to *S. laxa*, and by the present author† for *S. cinerea*.

* Aderhold, R., u. Ruhland, W. Zur Kenntnis der Obstbaum-Sklerotiniën. Arb. Biol. Abt., Land-u.-Forst. Kaiserl. Gesundheitsamte, iv, pp. 427-42, 1905.

† Wormald, H. On the Occurrence in Britain of the Ascigerous Stage of a "Brown Rot" Fungus. Ann. Bot. xxxv, pp. 125-135, 1921.

From the fructifications examined the following general description was obtained:

The stipe was from 2 to 5 mm. long, pale brown in colour; the receptacle was 3 to 9 mm. in diameter when fully expanded, at length plane or even slightly convex and lobed by the splitting of the margin, pale brown at the edge but darker towards the centre.

On teasing out the hymenium the asci could be found in various stages of development. In some the ascospores were not defined while in those in which the spores were fully formed three stages could be distinguished, viz. (1) asci in which the eight spores extended from the apex to half-way or more down the ascus, the spores being surrounded by protoplasm which extended without vacuoles to the base of the ascus, (2) those in which several vacuoles were present while the spores were pushed nearer the apex so that they extended barely to the middle of the ascus, (3) asci with a single large vacuole extending from the apex almost to the base, the spores being in the upper one-third (or very little more) of the ascus (Text-fig. 1).

The more mature asci, i.e. those in which there was a single large vacuole were on the whole longer and broader than those described under (1) and (2). Thus of those asci which were not vacuolate or which contained several comparatively small vacuoles the dimensions were $144-171 \times 7.5-9\mu$, while those in which a single large vacuole extended almost the whole length of the ascus were found to measure $159-210 \times 9.5-12\mu$.

The ascospores were variable in shape and size; they were generally ovoid to ellipsoid but often rather irregular, thus they were sometimes flattened on one side, some were pyriform, others were elongate becoming more or less fusiform and sometimes almost pointed (Text-fig. 2). In size they showed a range of from 10 to 19.5μ in length and 5 to 7.5μ in width; the great majority however came within the limits $12-16 \times 6-7\mu$. The average of 100 spores was found to be $13.6 \times 6.4\mu$. As showing the variation in size and relative proportions the following may be given as examples: $19.5 \times 6.5\mu$, $10 \times 7.5\mu$, $10 \times 6\mu$, $15.5 \times 5\mu$, $13 \times 7\mu$. No definite guttules were observed.

The apical pore of the ascus stained blue with iodine. The paraphyses were about the same length as the asci, usually swollen at the apex and unbranched or occasionally with one branch.

One of the few sporophores which reached maturity in the open was found fully expanded on April 8 and was examined microscopically; the asci and ascospores resembled in shape and size those previously examined. It is to be assumed therefore that the morphology of the fungus was not appreciably modified

by bringing the mummies indoors, although the later stages of development, leading to the discharge of the spores, were accelerated.

The foregoing account of the form examined at Wye differs but slightly from that given by Schellenberg for the ascigerous stage of *Sclerotinia Mespili*, if allowance is made for a smaller range of variation in the various morphological characters as recorded by him; the chief discrepancy is in respect to the width of the ascospores. It may be of interest to summarize

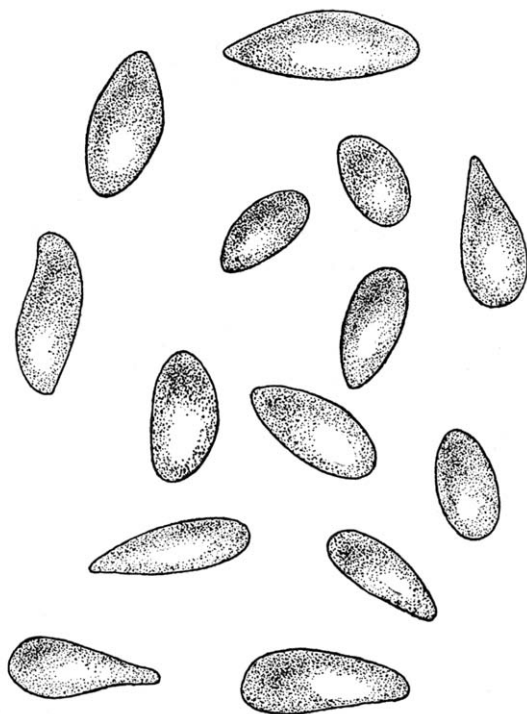


Fig. 2. Ascospore, showing range of variation in shape and size. $\times 650$.

the above description in tabular form side by side with that of *S. Mespili*.

Schellenberg's description of
S. Mespili summarized

The apothecia borne by each mummied fruit were few in number (mostly 1 or 2, but two fruits each bore 3 apothecia, and one had 4).

Stalk of apothecium 3-5 mm. in length (as shown by his figures):

The Medlar *Sclerotinia* described
in this paper

Apothecia more numerous, 8 to 15 on each fruit except in those cases where most had been eaten by slugs.

Stalks 2-5 mm.

Schellenberg's description of <i>S. Mespili</i> summarized	The Medlar Sclerotinia described in this paper
Diam. of cup 6-8 mm.	Diam. of cup 3-9 mm.
Apothecium bell-shaped to cup-shaped without recurved margin; margin becomes split irregularly.	Apothecium funnel-shaped to cup- or saucer-shaped, at length plane or even slightly convex, and lobed by the splitting of the margin.
Asci 160-180 \times 8-12 μ (3 asci are figured all with several vacuoles); apical pore stained blue with iodine.	Asci: (a) with no vacuoles or several small ones 144-171 \times 7.5-9.0 μ . (b) with one large vacuole 159-210 \times 9.5-12 μ ; apical pore stained blue with iodine.
Paraphyses as long as asci, slightly swollen at apex (figured as simple or with one branch).	Paraphyses about as long as asci, unbranched or with one branch, usually swollen at tip.
Ascospores ellipsoid to ovoid often with a point at each pole, 12-15 \times 9-11 μ	Ascospores rather irregular, usually ellipsoid to ovoid, but often pyriform or fusiform, sometimes almost pointed, 10-19.5 \times 5-7.5 μ , mostly 12-16 \times 6-7 μ . Average size 13.6 \times 6.4 μ .

The mode of development of the ascophore from the mummified fruit is described by Schellenberg as follows: "Wenn aus dem Sclerotium sich ein Apothecium bildet, so tritt die Ablage [? Anlage] als kleiner fleischiger Höcker aus der Frucht heraus. Diese wird gestielt und das knopfförmige Ende breitet sich nach und nach zur Glockenform aus*." This is not in accordance with my own observations, for when the fruits were brought indoors they were under daily observation and it was found that, instead of the primary protuberance becoming stalked and raised up to form the cup, it elongated at its apex; it was thus attenuated upwards and at that stage was more or less conical or flask-shaped so that there was some doubt as to whether it was really a Sclerotinia or whether it was a Sordaria, a genus characterized by a flask-shaped perithecium. No pore appeared however until there was further apical elongation and the development of a terminal head which finally expanded to form the cup.

Schellenberg describes and figures the infection of Medlar leaves with the ascospores. Attempts to induce germination of the ascospores of the Wye specimens failed both in water and on agar plates. Ascospores isolated on the surface of prune juice agar gradually disintegrated without even the protrusion of germ tubes. That fully matured spores behaved thus was shown by catching, on the agar, spores actually shot out from the asci; these could be seen under the microscope in groups of eight and were kept under observation for a week or more, but no germ tubes were developed. Apothecia were then attached

* *Loc. cit.* p. 190.

to twigs of a Medlar tree in the College grounds but no infection of the leaves occurred.

The direct connection between this discomycete and the *Monilia* with disjunctors found on the leaves was therefore not traced, although the fact, noted above, that a fungus, showing the same habit when grown in plate cultures as that isolated from the leaves, was isolated from the mummies, is suggestive that the two forms are stages in the life cycle of the same fungus. It appears probable therefore that the discomycete is the *Sclerotinia Mespili* of Schellenberg.

SUMMARY.

Mummied Medlar fruits collected from the ground in spring and placed on soil in a pot in the open gave rise to fructifications of a discomycete in the following spring.

The fungus differs but slightly from *Sclerotinia Mespili* as described by Schellenberg.

The differences noticed are:

- (1) the ascospores are distinctly narrower;
- (2) the stalk of the apothecium develops from the apex of the primary protuberance, not from the base as mentioned by Schellenberg.

STUDIES IN DISCOMYCETES. III.

By Jessie S. Bayliss Elliott, D.Sc. Birm., B.Sc. Lond.

Arachnopeziza aurata Fckl. This fungus has been growing on the under side of a log of wood in my garden during the last five years. In all months of the year I have been able to gather material, but growth is most flourishing during the months June to October. The specimens of the fungus I have gathered hardly justified the specific name *aurata* until this summer, for they have always been nearly colourless, as were also specimens I gathered at Porlock Easter and September 1920. Very marked characters—the fascicle of elongated ascospores, the much-branched paraphyses and the white subiculum—leave no doubt as to the identity of the species under consideration. No doubt the deeper colour of the apothecia gathered in July may be correlated with the brilliant summer weather, the log having received more light in its rather shady quarters this year (1921).

Owing to the presence of a subiculum it was possible to make out the early stages in the development of the apothecia which to some extent agree with similar stages figured for *Eremascus albus* Eidam.