

THE CATALPA LEAF SPOT.*

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On October 11, 1908, the writer collected from a catalpa tree growing upon the campus of Ohio State University, a number of leaves affected by the leaf spot fungus so prevalent upon this tree. A few of these spots bearing fruiting bodies thought at the time of collection to be those of a species of *Phyllosticta* were killed and hardened in alcohol preparatory to imbedding in paraffin. While yet in the alcohol this material was examined under the low power of the microscope which revealed upon some of these spots fruiting bodies smaller and lighter in color than those of *Phyllosticta*, which were present also upon other spots. When sectioned and stained these smaller bodies proved to be perithecia containing 8-spored asci in various stages of development. This discovery led to a more careful study of the remainder of the material collected and to a comparison of this with specimens of leaf spot fungi of the catalpa found in the herbarium of the late Dr. W. A. Kellerman. As a result of this study, the writer is of the opinion that the fungus is a new species belonging to the genus *Didymosphaeria* and herewith submits the following description:

Didymosphaeria catalpae n. sp. Perithecia very small, scattered, imbedded in the tissue of the leaf, pyriform to nearly spherical, varying in width from 48—104 mic. and in depth from 64—140 mic. Ostiolum broadly conical, erumpent. Asci 8-spored, cylindrical, usually somewhat curved, paraphyses few or wanting. Spores oblong-elliptical, hyaline or yellowish, uniseptate, constricted in the middle 9.6—13 x 3—4 mic.

Occurs in leaf spots upon *Catalpa* sp. the ostiola appearing upon either or both surfaces of the leaf.

In the herbarium were found specimens of two species of imperfect fungi upon *Catalpa* leaves, *Macrosporium catalpae* E & M on material collected by J. A. Jack, Jamaica Plain, Mass., August 20, 1890, and *Phyllosticta catalpae* E & M collected by H. W. Ravenel, Aiken, S. C., July, 1904. The comparison of this herbarium material with that secured upon the university grounds led to the discovery of conidial spores very similar to those of *Macrosporium catalpae* upon the latter and also upon that labeled *Phyllosticta catalpae* (Fig. 1, 2, 3). It revealed also pycnidia upon the specimens labeled *Macrosporium catalpae* similar to those upon specimens labeled *Phyllosticta catalpae* and to those upon the leaves obtained upon the university grounds. But upon none of the herbarium specimens did the writer find perithecia. It may be of significance to note that the material secured upon the university grounds was collected just before frost fell and that only the latest developed spots bore perithecia.

* Contribution from the Botanical Laboratory of the Ohio State University, XLV.

In an effort to secure more perithecia from this material a number of spots were cut from leaves that were dried and laid away at the time of collection. These spots were placed in water to soften and after a few hours a part of them was taken out, killed, imbedded, sectioned and stained. Upon one of these spots both perithecia and pycnidia were found (Fig. 9) similar to those before discovered upon separate spots—a fact pointing to the probability that both fruiting bodies sprang from the same mycelium. A few of the leaf spots not imbedded were left in the water for several days and when again examined showed a vigorous growth of mycelium which was producing in abundance the chain-like spores of an *Alternaria* (Fig. 4). A number of other spots similarly treated gave like results. A more thorough investigation of the specimens labeled *Macrosporium catalpae* was now made by soaking some of the spots in water and then mounting them in glycerin. This revealed conidiophores and chain-like spores (Fig. 5) similar to those mentioned above, from which it appears that the fungus known as *Macrosporium catalpae* is a species of *Alternaria*. Furthermore, one of the spots from which sprang mycelium bearing spores of *Alternaria* showed among its conidiophores a perithicium as shown in figure 7.

In July the writer received a supply of infested leaves from Mr. Erwin F. Smith, of the Bureau of Plant Industry, at Washington, D. C., collected from catalpa trees in that vicinity. Upon the spots on these leaves a species of *Alternaria* was found flourishing and when they were removed from the leaves, placed in a moist watch-glass and covered with a small bell jar a vigorous growth of mycelium sprang up producing an abundance of spores in chains. As far as it was possible to determine by comparison, these spores were in all respects similar to those developed in a similar manner from leaves collected at Columbus. From the spores developed from leaves collected at Washington an artificial culture was made from which a pure culture of the fungus was secured. In August three young catalpa trees with leaves representing all stages of development were thoroughly sprayed with sterilized water in which an abundance of the spores from this pure culture had been placed. These trees were growing in a small court with walls on four sides and were in a thrifty, vigorous condition. The spores were sprayed upon them in the evening of a day on which at about noon a heavy rain had fallen. The next day was warm and cloudy and the moisture sprayed upon the plants in the evening was still visible upon them at noon the following day. The conditions seemed to be exceptionally favorable for the development of the spores yet not a single spot appeared upon the leaves of any of the trees. Spores taken from the same source at the same time and placed upon an artificial medium grew nicely thus showing that

the spores were viable. The stress of other duties prevented a repetition of the experiment and the negative results here secured, throw but little light upon the source of infection.

In addition to the fungi already mentioned as occurring upon the leaf spots of the catalpa, the writer found a species of *Epicoccum* flourishing upon every spot in the leaves collected at Columbus as well as upon every spot examined in the material taken from the herbarium though it was not abundant upon that labelled *Phyllosticta catalpae*. There is also present on the spots in the leaves collected at Columbus and on those in herbarium specimens labeled *Macrosporium catalpae* a species of *Cladosporium*, a fungus that, so far as the writer is aware, has not been reported for the catalpa. These two fungi, however, are in all probability saprophytes that have no part in producing the spots upon the leaves. The results of this investigation tend to show that the species of *Alternaria* (= *Macrosporium*) occurring on the catalpa is likewise a saprophytic form. Therefore, in summing up the work so far as it has been carried the writer is of the opinion that the disease-producing species is *Didymosphaeria catalpae*, of which *Phyllosticta catalpae* is an imperfect form and that the other species of fungi found upon the leaf spots are saprophytic. Whether or not this is the true relationship existing among these different species of fungi remains still to be proved—a task the writer hopes to find at some future time opportunity to perform.

EXPLANATION OF PLATE XXVI.

The drawings were made with a Spencer microscope equipped with a 3 mm. objective and an 8 x ocular (4 x ocular used with No. 6). All are camera drawings made at table distance; reduced one-half in reproductions. The magnification in the microphotographs was not computed.

Fig. 1. Conidial spores of *Alternaria* sp. on leaves collected at Columbus.

Fig. 2. Conidial spores from herbarium specimen labeled *Macrosporium catalpae*.

Fig. 3. Conidial spores from herbarium specimen labeled *Phyllosticta catalpae*.

Fig. 4. Conidiophores and conidia developed by placing in water spots taken from leaves collected at Columbus. The number of spores in the chains varied from 5 to 8.

Fig. 5. Chain of spores found on herbarium specimen labeled *Macrosporium catalpae*.

Fig. 6. Ascus of *Didymosphaeria catalpae* drawn from a stained section.

Fig. 7. Ascospores of *Didymosphaeria catalpae* drawn from stained material.

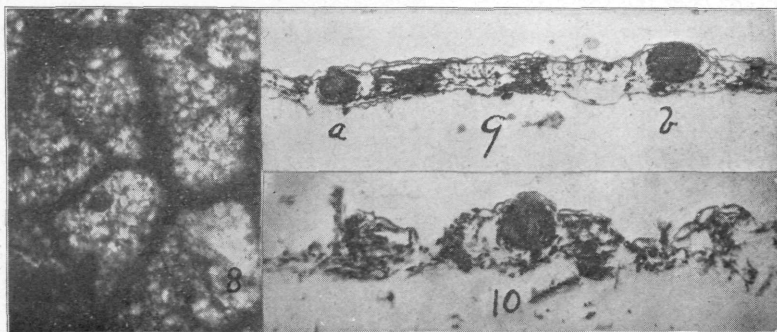
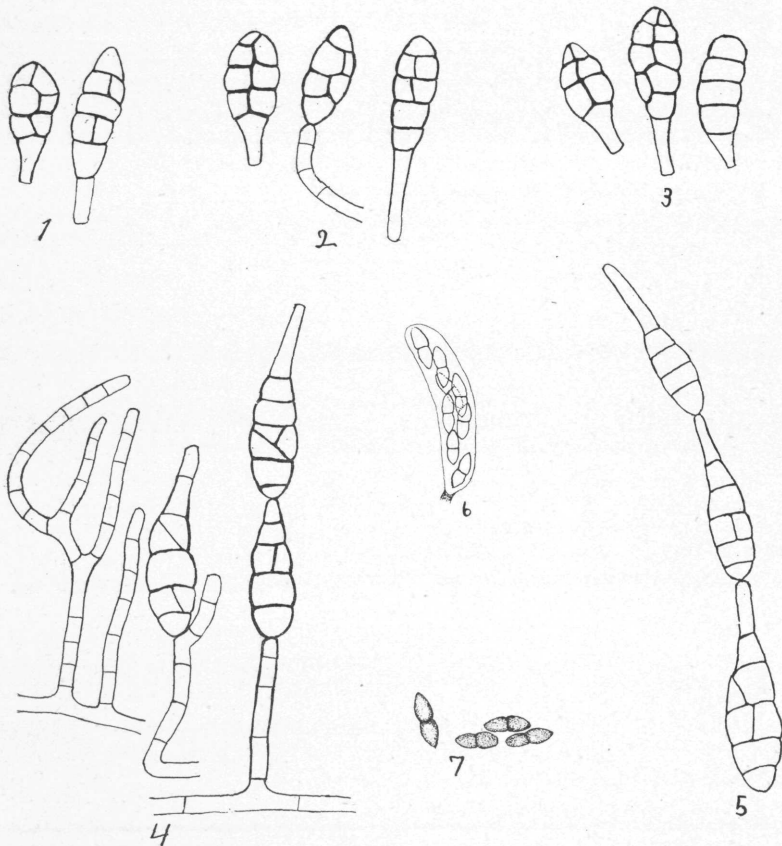
Fig. 8. Microphotograph of a perithecium in a leaf spot.

Fig. 9. Microphotograph of a section of a leaf spot showing a perithecium of *Didymosphaerium catalpae* at (a) and a pycnidium of *Phyllosticta catalpae* at (b).

Fig. 10. Microphotograph of section of perithecium from which Figure 6 was drawn.

OHIO NATURALIST.

Plate XXVI.



PARKER on "Catalpa Leaf Spot."