

## NOTES ON THE POWDERY MILDEWS OF OHIO.

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My interest in the powdery mildews dates from 1884, when I was a student of the first class-room teacher of mycology, the late Dr. T. J. Burrill, of the University of Illinois. My first publication on fungi dealt with this group, and my interest has never abated. My collecting in Ohio began shortly after entering the State in the summer of 1906, and two of my students, Mr. E. E. Duncan and Miss Esther Young, have spent a considerable amount of time in studying the group in my laboratory. Miss Freda M. Bachman and Mr. W. G. Stover have also aided considerably with the collecting and determinations.

Mr. A. D. Selby published "The Ohio Erysipheæ" in a Bulletin of the Ohio Agricultural Experimental Station for 1893, and Mr. W. C. O'Kane published "The Ohio Powdery Mildews" in THE OHIO NATURALIST for May, 1910. The last paper follows the nomenclature of E. S. Salmon and furnishes keys and short diagnoses. This publication will still be found useful in studying the powdery mildews of Ohio, and I only hope, in the present paper, to supplement it by additions of localities, hosts, and species not previously reported from Ohio.

The mycelia of powdery mildews usually occur on the leaves or the small stems or twigs of seed plants, and these fungi are easily collected by those who are accustomed to observe small fungi, provided that the mycelia are fairly conspicuous. In summer and autumn, these parasites may be observed on the leaves of goldenrods, asters, sunflowers, yard grass, ragweeds, verbenas, roses, willows, oaks, lilacs, and other herbs, shrubs, and trees. Less conspicuous mycelia occur on yellow sorrel, grapes, hackberry, tulip poplar, Ohio buckeye, maples, elms, chestnut, and other seed plants. In order to know whether the perithecia (Fig. 1) are in good condition and to see the inconspicuous forms at all, one should collect with a hand lens at hand. Previous consultation of a host index will add greatly to the success of the collecting trip.

The most common powdery mildew in Ohio is *Erysiphe cichoracearum* DC. This species grows on a large number of hosts and may be collected from mid-summer until late autumn. We get this fungus about Oxford, in June, for study in the laboratory at Miami University. From this time until the host plants are killed by frost, the number of hosts increases, and material for study may be had directly from the field.

Nearly as abundant and much better known is *Microsphaera alni* (Wallr.) Salm, which comes to maturity a little later and continues in condition for study from some of its

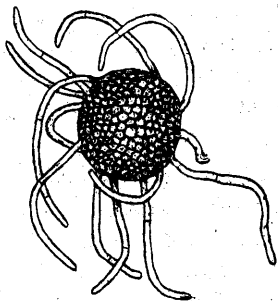


FIG. 1

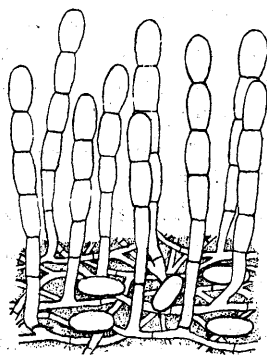


FIG. 2

Fig. 1. A perithecium of *Sphaerotheca humuli* (DC.) Burr. on leaves of *Rosa blanda*—a form with short appendages.  $\times 150$ .

Fig. 2. Mycelium, cothidiophores and conidia of *Erysiphe polygoni*, (DC.) on leaves of garden peas—largely diagrammatical.  $\times 150$ .

hosts quite as late in the season. This species is a beautiful object for microscopic study and is the form of powdery mildew most commonly used for laboratory study. However, the appendages, which are wonders of natural beauty, defy the best powers of the artist to reproduce. No drawings that I have seen do them justice, and the sketches ordinarily made by students are far from satisfactory. Some Americans who have known this species from the studies of Dr. T. J. Burrill are doubtless reluctant to follow the revision of Dr. E. S. Salmon. Yet the studies of this worker bear the stamp thoroughness, and it seems best to part company with our American pioneer at points of divergence between him and the later student of the group, with respect to this and other species of the *Erysiphaceæ*.

The powdery mildews should be collected as soon as the perithecia are mature, and if possible, while the mycellum is still fairly conspicuous. Of course the combination can not be had in species which have very evanescent mycelia. Finally, the collecting should be done before wind and rain have caused nearly all of the mature perithecia to disappear, or these fruits have become so ripe that they fall off shortly after being collected. More than once, such material collected in quantity for study in the laboratory has proved satisfactory soon after being brought in from the field, but has been found so nearly devoid of perithecia by the next year as to be practically useless for any purpose.

For successful study, the conidial stage must be taken in its prime (Fig. 2), and this is before the perithecia are mature. Young mycelia with such conidial conditions may be found at any time from the middle of June until late autumn. By seeking silvery-white, often glistening stages, devoid of perithecia, any species with a reasonably conspicuous mycelium will serve for this purpose. *Erysiphe graminis* on grasses, the species on roses, and some forms on plaitain are likely to give good conidial conditions late in the season, while quite as good material may be found on asters and other hosts.

Mr. E. E. Duncan made the collections recorded from Montgomery County. All others were made by the writer unless otherwise stated, in the additions to hosts, distribution, and species newly reported for Ohio to follow.

### **Sphærotheca humuli** (DC.) Burr.

Butler, Hamilton, and Montgomery Counties. This seems to be the species that causes injury to our roses most commonly throughout Ohio and other portions of the United States. *Sphærotheca pannosa* (Wallr.) Lev. is said by Salmon to grow commonly on the same hosts in Europe, but to be replaced largely on the roses in America by the other species. Someone might well try to ascertain the facts regarding the cause of the disease of our roses.

### **Sphærotheca humuli fuliginea** (Schlecht.) Salm.

Montgomery County. Known on three or four hosts from about as many localities in Ohio.

**Sphaerotheca phytophila** Kell. & Swingle.

Butler and Hamilton Counties. On witches brooms of *Celtis occidentalis*.

**Erysiphe cichoracearum** DC.

Butler, Montgomery, and Lake Counties. Also collected in the first county by Freda M. Bachman. Very common and found on an unusually large number of host plants.

**Erysiphe graminis** DC.

Butler County, collected and determined by Freda M. Bachman. Probably in good condition when collected, but the herbarium specimens are practically worthless now. I have seen the conidial condition late in autumn, but have not found the perithecia in Ohio.

**Erysiphe polygoni** DC.

Butler and Montgomery Counties. Also collected in the first county by W. G. Stover and E. E. Duncan. This mildew is found on several hosts in Ohio. It is very common on yard grass (*Polygonum aviculare*).

**Uncinula circinata** Cooke & Peck.

Butler, Hamilton, and Lake Counties. Also collected in the first county by Freda M. Bachman and V. E. Lantis. The mycelium usually disappears early, but it sometimes accompanies the perithecia on the maple leaves.

**Uncinula clintonii** Peck.

Butler County. Also collected here by E. E. Duncan. Seen but rarely. Previously reported from two localities in Ohio, on *Tilia americana*, to which it may be confined in America.

**Uncinula flexuosa** Peck.

Butler County. Also collected here by E. E. Duncan. Confined to species of *Aesculus*, and little known in Ohio.

**Uncinula geniculata** Gerard.

Butler County, collected and determined by Freda M. Bachman and later by E. E. Duncan. On *Morus rubra*. Not previously reported from Ohio. This species is known only in North America and on the single host. The mycelium is inconspicuous.

**Uncinula macrospora** Peck.

Butler and Hamilton Counties. Also collected in the first county by Freda M. Bachman and W. G. Stover. Usually found on elms in Ohio.

**Uncinula necator** (Schw.) Burr.

Butler and Hamilton Counties. Also collected in the first county by Freda M. Bachman and E. E. Duncan. This mildew sometimes damages grapes considerably.

**Uncinula parvula** Cooke & Peck.

Butler County. Also collected here by E. E. Duncan. On *Celtis occidentalis*. Not previously reported from Ohio. Known only in North America and on members of the genus *Celtis*.

**Uncinula salicis** (DC.) Winter.

Butler and Lake Counties. Also collected in the first county by Freda M. Bachman, W. G. Stover, and E. E. Duncan. A beautifully zonate condition, not otherwise known to me, was collected on a species of *Populus* in Lake County. Unfortunately the zonation has disappeared in the herbarium. Well known in Ohio, and confined mainly to the *Salicaceæ*.

**Podosphæra oxycanthe** (DC.) de Bary.

Butler County. Also collected here by W. G. Stover. Previously collected in Ohio from several localities and on three or four hosts.

**Microsphæra alni** (Wallr.) Salm.

Butler, Highland, Ross, and Montgomery Counties. Also collected in the first county by Freda M. Bachman, W. G. Stover, E. E. Duncan, and J. R. Wright. Probably the best known mildew in Ohio. Common on *Syringa vulgaris* and found on many other hosts. A variable and confusing species.

**Microsphæra alni vaccinii** (Schw.) Salm.

Butler County. Reported from a few other localities in Ohio, with species of *Vaccinium* and *Catalpa* as hosts.

**Microsphæra diffusa** Cooke & Peck.

Butler County. Collected here also by Freda M. Bachman and E. E. Duncan. On *Symporicarpus vulgaris*. Recorded for Ohio from several other localities and on other hosts.

***Microsphæra euphorbiæ* (Peck) Burk. & Curt.**

Butler County. Also collected here by E. E. Duncan. Known now from but three localities in Ohio and on the single host, *Euphorbia corollata*.

***Microsphæra grossulariæ* (Wallr.) Lev.**

Butler, Montgomery, and Lake Counties. Also collected in the first county by V. E. Lantis. Recorded for Ohio from only two other localities and only on *Sambucus canadensis*.

***Microsphæra russellii* Clinton.**

Butler County. Collected here also by E. E. Duncan. Common enough here, but reported from only three other localities in Ohio. Easily overlooked as the mycelium is inconspicuous and usually evanescent. Found only on species of *Oxalis*, and known to me only on *Oxalis stricta*.

***Phyllactinia corylea* (Pers.) Karst.**

Butler and Montgomery Counties. Also collected in the first county by Freda M. Bachman. On *Fraxinus americana*, *Juglans nigra*, and *Morus rubra*. Known from several localities in Ohio, but inconspicuous and usually overlooked. Formerly known under the synonym, *Phyllactinia suffulta* (Reb.) Sacc.