

THE OHIO POWDERY MILDEWS.*

W. C. O'KANE.

INTRODUCTION.

A number of years ago Professor A. D. Selby published a paper on The Ohio *Erysiphaceae*, or Powdery Mildews, so far as they had been reported in this state at that time.

Since then new species have been recorded, new host plants have been reported, and there have been changes in nomenclature as further scientific study has disclosed certain synonyms.

The present paper is an attempt to bring the record down to date.

In the generic keys as well as the specific descriptions the writer has closely followed Salmon's admirable monograph of the *Erysiphaceae*.

Acknowledgment is due the valuable assistance of Professor J. H. Schaffner, under whose direction this paper has been prepared; also the suggestions and counsel of the late Dr. W. A. Kellerman.

GENERAL CHARACTERISTICS OF THE POWDERY MILDEWS.

The Powdery Mildews are familiar to observers in two distinct stages.

In the earlier, or conidial, stage, the affected parts of the parasitized plant appear as if covered with a white, mealy powder—the summer spores given off by the rapidly growing mycelium.

Later the winter spore-cases, or perithecia, are formed. These are dark, spherical bodies, distinguishable with the unaided eye, and give the affected parts of the plant the appearance of being more or less covered with a brown or black powder.

The perithecia usually bear characteristic appendages. If the perithecium is gently crushed it is found to contain one or more spore-sacs, or asci, in which are the spores. The outer surface of the perithecium is divided into many cells.

The mycelium that bears the conidia and the perithecia grows on the surface of the leaf, or stem, drawing its nourishment by means of short branches, or haustoria. These may penetrate directly into the epidermal cells; or, as in the genus *Phyllactinia*, may enter the stomata of the leaf, and so reach the inner cells. In either case the plant is robbed of its sap, and the mildew lives at the expense of its host.

* Contribution from the Botanical Laboratory of Ohio State University, 56.

KEY TO THE GENERA (After Ellis & Everhart).

Class—ASCOMYCETAE.

Order—PERISPORIALES.

Family—ERYSIPHACEAE.

1. Appendages of perithecia simple, and similar to the mycelium 2
- Appendages different from the mycelium 3
2. Only on ascus in the perithecium *Sphaerotheca*
- Several asci in the perithecium *Erysiphe*
3. Appendages coiled at tip *Uncinula*
- Appendages branched at tip 4
- Appendages not branched, swollen at base, with tip straight
- Phyllactinia*
4. Only one ascus in perithecium *Podosphaera*
- Several asci in perithecium *Microsphaera*

Sphaerotheca, Sw.

Key to the Ohio Species.

1. Mycelium thick, forming persistent patches containing the perithecia 2
- Mycelium thin or not persistent 3
2. Mycelium brown. Outer and inner walls of perithecium not separating *mors-uvae*
3. Perithecia 60–70 μ in diameter; ascus 60 x 42 to 70 x 50 μ , inner and outer walls of perithecium readily separating . . . *phytoptophila*
- Perithecia 58–120 μ in diameter; ascus 45 x 50 to 72 x 90 μ , inner and outer walls of perithecium separating with difficulty 4
4. Cells of perithecium averaging 15 μ *humuli*
- Cells of perithecium averaging 25 μ *humuli* var. *fuliginea*

Sphaerotheca humuli (DC) Burr. Perithecia 58–120 μ in diameter; cells 10 to 20 μ ; appendages usually long, straight, septate, dark brown; ascus usually without stalk, 45 x 50 to 72 x 90 μ ; spores 8, 12 x 20 to 18 x 25 μ .

Host plants in Ohio Herbarium: *Geum canadense*, Medina Co., *Rubus odoratus*, Cuyahoga Co., E. Claassen; *Rosa* (cult), Columbus, J. G. Sanders; *Taraxacum taraxacum*, Auglaize Co., J. D. Simkins; *Agrimonia eupatoria*, Lancaster, W. A. Kellerman.

Sphaerotheca humuli fuliginea (Schl.) Salm. Perithecia averaging smaller than *humuli*; cells averaging 25 μ ; spores 12 x 20–15 x 25 μ .

Host plants in Ohio Herbarium: *Prenanthes alba*, Cuyahoga Co., E. Claassen; *Bidens frondosa*, Columbus, F. L. Stevens, Cuyahoga Co., E. Claassen; *Taraxacum taraxacum*, Cuyahoga Co., E. Claassen, Columbus, F. L. Stevens.

Sphaerotheca mors-uvae (Schw.) B. & C. Mycelium dense; perithecia abundant, 75–110 μ in diameter; cells 10–25 μ ; appendages few, pale, brown, tortuous, length 1–5 times diameter of perithecium; ascus 50 x 70–62 x 92 μ ; spores 12 x 20–15 x 25 μ .

Common on cultivated gooseberries throughout Ohio.

Sphaerotheca phytoptophila, Kell & Swingle. Mycelium thin; perithecia 60–78 μ in diameter, inner wall separating easily; cells 10 μ , obscure; appendages few, irregular, often septate, usually longer than diameter of perithecium; ascus 42 x 60 to 50 x 75 μ ; spores 8, 12 x 20–15 x 25 μ .

Host-plant, the distorted branches produced by the *Phytoptus* growing on *Celtis occidentalis*.

Specimens in the Ohio Herbarium from Preble Co., Brown Co., Mt. Gilead, W. A. Kellerman; Morgan Co., Kellerman and Jones.

Otherwise reported in Ohio from Lima, W. A. Kellerman, Columbus, A. D. Selby.

Erysiphe Hedw.

Key to the Ohio Species.

1. Perithecia not usually maturing on living host plant... *graminis*
Perithecia usually maturing on living host plant.....2
2. Asci 8-spored..... *polygoni*
Asci 2-spored.....3
3. Asci usually 10–15, haustoria lobed..... *galeopsidis*
Asci same, haustoria not lobed..... *cichoracearum*

Erysiphe graminis DC. Mycelium rather persistent; perithecia large, 135–280 μ in diameter; cells obscure; appendages short, simple, light brown; asci 9–30, 70 x 25–108 x 40 μ , long-stalked; spores 8, 20 x 10–23 x 13 μ .

Host plants in Ohio Herbarium: *Poa pratensis*, College Hill, W. H. Aiken.

Otherwise reported in Ohio; *Triticum vulgare*, Columbus, F. Detmers, Lima, W. A. Kellerman; *Poa pratensis*, Columbus, W. A. Kellerman; *Agropyrum*, Ashtabula Co., Sara F. Goodrich.

Erysiphe polygoni DC. Mycelium usually thin; perithecia 65–180 μ in diameter; cells 10–15 μ ; appendages variable, usually many, 5–15 times diameter of perithecium, simple, sometimes flexuose; asci 2–10, 46 x 30–72 x 45 μ , sometimes with short stalk; spores 3–8, 19 x 9–25 x 14 μ .

Host plants in Ohio Herbarium: *Caltha palustris*, Columbus, W. A. Kellerman; *Polygonum aviculare*, Sandusky Co., Ottawa Co., W. A. Kellerman, Toledo, F. D. Kelsey; *Polygonum* sp., Miami Co., W. A. Kellerman and W. R. Beatty, Adams Co., Athens Co., W. A. Kellerman; *Polygonum erectum*, Franklin Co., F. L. Stevens, Belmont Co., Sugar Grove, Brown Co., W. A. Kellerman; *Scutellaria laterifolia*, Cuyahoga Co., E. Claassen; *Oenothera biennis*, Lake Co., E. Claassen; *Thalictrum purpurascens*, Lake Co., E. Claassen, *Lupulinus perennis*, Erie Co., F. L. Stevens, Toledo, F. D. Kelsey; *Eupatorium* sp., Columbus, C. M. Weed; *Celmatis virginiana*, Columbus, C. M. Weed; *Aquilegia canadensis*, Champaign Co., W. C. Werner.

Otherwise reported in Ohio: *Aquilegia canadensis*, Columbus, F. Detmers; *Clematis virginiana*, Columbus, A. D. Selby, F. Detmers; *Clematis* sp. (cult), Columbus, A. D. Selby, F. Detmers, Waynesville, W. A. Kellerman; *Desmodium canescens*, Columbus, A. D. Selby; *Liriodendron tulipifera*, Columbus, Fairfield Co., A. D. Selby.

Erysiphe galeopsidis DC. Practically the same as *E. cichoracearum*, except that the haustoria are larger and are lobed.

Host plants in Ohio Herbarium: *Stachys* sp., Columbus, W. A. Kellerman.

Otherwise reported in Ohio: *Scutellaria laterifolia*, Columbus, A. D. Selby, W. C. Werner, Fairfield Co., A. D. Selby; *Stachys aspera glabra*, Columbus, W. A. Kellerman; *Stachys palustris*, Columbus, A. D. Selby; *Chelone glabra*, Ashtabula Co., Sara F. Goodrich.

Erysiphe cichoracearum DC. Perithecia 80–140 μ in diameter; cells 10–20 μ , distinct; appendages numerous, 2–4 times the diameter of the perithecium; asci 10–15, stalked, 58 x 30–90 x 50 μ ; spores 2, 20 x 12–28 x 20 μ ; haustoria not lobed.

Host plants in Ohio Herbarium: *Helianthus tuberosus*, Sandusky Co., Sugar Grove, W. A. Kellerman; *Helianthus* sp., Lancaster, W. A. Kellerman, Columbus, H. H. Richardson; *Asclepias syriaca*, Cuyahoga Co., E. Claassen; *Vernonia gigantea*, Portage Co., Cuyahoga Co., E. Claassen; *Ambrosia trifida*, Columbus, F. L. Stevens, Cuyahoga Co., E. Claassen; *Aster* sp., Columbus, F. L. Stevens, Amanda, W. A. Kellerman, Georgesville, E. V. Wilcox; *Hydrophyllum macrophyllum*, Columbus, A. Brooks, Cincinnati, W. H. Aiken; *Ambrosia artemisiaefolia*, Columbus, F. L. Stevens, Cuyahoga Co., E. Claassen; *Aster paniculata*, *Vernonia fasciculata*, *Solidago canadensis*, *Verbena alternifolia*, Cuyahoga Co., E. Claassen; *Verbena hastata*, Cuyahoga Co., E. Claassen, Lancaster, W. A. Kellerman, Columbus, C. M. Weed; *Aster laevis*, *Eupatorium perfoliatum*, *Aster novi-belgii*, Cuyahoga Co., E. Claassen; *Verbena urticaefolia*, Cuyahoga Co., E. Claassen, Amanada, W. A. Kellerman; *Phlox divaricata*, Hamilton Co., W. H. Aiken; *Phlox* (cult) Fairfield Co., W. A. Kellerman; *Actinomeris squarrosa*, Columbus, C. M. Weed, Amanda, W. A. Kellerman, Toledo, F. D. Kelsey.

Otherwise reported in Ohio: *Parietaria pennsylvanica*, Columbus, A. D. Selby; *Hydrophyllum macrophyllum*, Pickaway Co., W. A. Kellerman, Fairfield Co., A. D. Selby; *Dahlia* (cult), Fairfield Co., W. A. Kellerman, Columbus, A. D. Selby; *Helianthus* sp., London, Mrs. K. D. Sharp.

UNCINULA Lev.

Key to the Ohio species.

1. Appendages colored one-half their length or more..... *neicator*
Appendages colorless..... 2
2. Asci 2-spored..... *macrospora*
Asci 4–8-spored..... 3
3. Appendages flexuous..... *flexuosa*
Appendages straight..... 4
4. Appendages thick-walled, dark or rough at base, perithecia 64–146 μ
in diameter, asci 34–40 μ wide..... *clintoni*
Appendages thin-walled throughout..... 5
5. Asci 4–6 spored..... *salicis*
Asci 7–8 spored..... *circinata*

Uncinula neicator (Schw.) Burr. Perithecia scattered, 70–128 μ in diameter; cells distinct, 10–20 μ ; appendages 7–32 in number, 1–4 times diameter of perithecium; simple, septate, brown in lower half; asci 4–7, sometimes short-stalked, 50 x 30–60 x 40 μ ; spores, 4–7, 18 x 10–25 x 12 μ .

Host plants in Ohio Herbarium: *Vitis quinquefolia*, Cuyahoga Co., E. Claassen; *Parthenocissus quinquefolia*, Columbus, W. A. Kellerman; *Vitis* (cult), Columbus, W. A. Kellerman; *Ampelopsis quinquefolia*, Columbus, H. H. Richardson, C. M. Weed, W. A. Kellerman, Oberlin, Toledo, F. D. Kelsey.

Uncinula macrospora Peck. Mycelium thin; perithecia 95–165 μ ; cells 10 μ ; appendages 50–130 in number, $\frac{1}{3}$ –1 times diameter of perithecium, nonseptate, colorless, thicker-walled toward base; asci 8–14, often curved, 54 x 29–65 x 35 μ ; spores 2, 30 x 16 μ .

Host plants in Ohio Herbarium: *Ulmus americana*, Wyandotte Co., Thos. Bosner, Columbus, W. C. Werner, Fairfield Co., W. A. Kellerman; *Ulmus fulva*, Canal Winchester, W. C. Werner, Warren Co., W. A. Kellerman, Columbus, C. M. Weed.

Otherwise reported in Ohio: *Ulmus americana*, Fairfield Co., A. D. Selby, F. Detmers, Columbus, A. D. Selby; *Ulmus fulva*, Columbus, W. C. Werner.

Uncinula flexuosa Peck. Mycelium persistent on upper side of leaf; perithecia scattered, 85–156 μ in diameter; cells distinct, 17 μ ; appendages 14–60, length equaling diameter of perithecium, colorless, nonseptate, becoming enlarged, flexuose and thickwalled at apex; asci 4–11, short-stalked, 50 x 30–58 x 38 μ ; spores 8, 18–22 x 10 μ .

Host plants in Ohio Herbarium: *Aesculus glabra*, Columbus, C. M. Weed; *Aesculus* sp., Oberlin, F. D. Kelsey.

Otherwise reported in Ohio: *Aesculus glabra*, Columbus, F. M. Webster.

Uncinula clintoni Peck. Perithecia 80–130 μ in diameter; cells 10–20 μ ; appendages 10–35, 1–2 times diameter of perithecium, colorless or light brown at base, thick-walled, swollen at apex; asci 3–10, short-stalked, 40 x 34–62 x 40 μ ; spores 3–7, 20 x 10–25 x 13 μ .

Host-plants in Ohio Herbarium: *Tilia americana*, Cuyahoga Co., E. Claassen.

Otherwise reported in Ohio: *Tilia americana*, Oberlin, F. D. Kelsey.

Uncinula salicis (DC) Winter. Perithecia globose-depressed, 90–175 μ in diameter; cells 10–15 μ ; appendages numerous, 100–150, crowded, $\frac{3}{4}$ –1 $\frac{1}{2}$ times diameter of perithecium, nonseptate or 1-septate at base, colorless, gradually enlarging toward apex; asci 8–14, stalked, 55 x 30–80 x 40 μ ; spores 4–6, 20 x 10–26 x 15 μ .

Host plants in Ohio Herbarium: *Salix* sp., Bowling Green, Columbus, Fairfield Co., W. A. Kellerman, Toledo, F. D. Kelsey; *Salix glaucophylla*, Cedar Point, E. Claassen; *Salix cordata*, Cuyahoga Co., E. Claassen, Columbus, W. A. Kellerman; *Salix humulis*, Amanda, W. A. Kellerman; *Salix nigra*, Columbus, C. M. Weed; *Salix petiolaris*, Columbus, C. M. Weed; *Scutellaria latrifolia*, Williams Co., W. A. Kellerman; *Populus monilifera*, Cedar Point, E. Claassen; *Populus tremuloides*, Cedar Point, E. Claassen.

Otherwise reported in Ohio: *Scutellaria laterifolia*, Columbus, A. D. Selby.

Uncinula cicrinata C. & P. Perithecia scattered, somewhat lenticular, 160–225 μ diameter; cells obscure, 10–14 μ ; appendages crowded, very numerous, length a little less than diameter of perithecium, nonseptate, colorless, apex not helicoid; asci 9–26, 68 x 29–86 x 40 μ ; spores 8, 18 x 20–22 x 14 μ .

Host plants in Ohio Herbarium: *Acer saccharum*, *Acer rubrum*, *Acer saccharinum*, Cuyahoga Co., E. Claassen; *Acer dasycarpum*, Columbus, C. M. Weed.

Otherwise reported in Ohio: *Acer rubrum*, Fairfield Co., A. D. Selby; *Acer saccharum*, Columbus, C. M. Weed.

PODOSPHAERA Kunze.

Key to the Ohio Species.

- 1. Appendages clear, except at base; branches of apex not swollen *biuncinata*
- Appendages dark-brown for more than half their length; branches or apex swollen *oxyacanthae*

Podosphaera biuncinata, C. & P. Perithecia subglobose, 55–72 μ in diameter; appendages equatorial, 4–15 in number, 3–5 times diameter of perithecium, straight, nonseptate, colorless, or light brown at base, apex once dichotomously branched, branches variable and often recurved; ascus short-stalked, 45 x 40–50 x 48 μ ; spores 8, 20 x 11–24 x 13 μ .

Host plants in Ohio Herbarium: *Hamamelis virginiana*, Summit Co., Cuyahoga Co., E. Claassen.

Podosphaera oxyacanthae (DC) DeB. Perithecia subglobose, 64–90 μ in diameter; cells 10–18 μ wide; appendages usually equatorial, sometimes nearer apex, 4–30 in number, $\frac{1}{2}$ –6 times diameter of perithecium, septate, brown for more than half their length, apex 2–4 times dichotomously branched, branches short, tips of ultimate branchlets swollen; ascus 58 x 45–90 x 75 μ ; spores 18 x 10–30 x 17 μ .

Host plants in Ohio Herbarium: Cherry (cult) Ottawa Co., W. A. Kellerman; *Prunus virginiana*, Cedar Point, E. Claassen; *Spiraea tomentosa*, Fairfield Co., W. A. Kellerman; *Prunus cerasus*, Columbus, H. H. Richardson.

Otherwise reported in Ohio: Cherry (cult), Columbus, C. M. Weed, F. Detmers, Dayton, Jos. Potts.

Key to the Ohio Species.

- 1. Appendages angularly bent, branches lax and irregular *euphorbiae*
- Appendages not so 2
- 2. Ultimate branchlets usually recurved 3
- Ultimate branchlets not recurved 4
- 3. Appendages long and flaccid, apex much branched, ornate and close recurved *alni*, var. *extensa*
- Appendages short, not flaccid, ultimate branchlets all distinctly recurved *alni*
- Appendages $2\frac{1}{2}$ –8 times diameter of perithecium, apex moderately branched, widely forked *alni*, var. *vaccinii*

4. Appendages 3-7 times diameter of perithecium, colored nearly to apex *russellii*
 Appendages colorless..... 5
5. Branches lax and irregular..... *diffusa*
 Branches close and regular, digitate..... *grossulariae*

Microsphaera euphorbiae (Peck) B. & C. Perithecia 85-145 μ ; in diameter; cells 10-15 μ ; appendages 7-28, $2\frac{1}{2}$ -8 times diameter of perithecium, contorted, colorless, nonseptate, 3-4 times dichotomously branched, branches lax and irregular; asci 4-13, short-stalked, 48 x 26-66 x 35 μ ; spores 4, 19 x 10-21 x 12 μ .

Host plants in Ohio Herbarium: *Euphorbia corollata*, Toledo, F. D. Kelsey.

Otherwise reported in Ohio: *Euphorbia corollata*, Columbus, E. M. Wilcox.

Microsphaeraalni (Wallr.) Salm. Mycelium thin; perithecia 66-110 μ in diameter; cells 10-15 μ ; appendages 4-26, $\frac{1}{3}$ - $2\frac{1}{2}$ times diameter of perithecium, colorless, often darker at base, apex 3-6 times dichotomously branched, ultimate branchlets recurved; asci 3-8, 42 x 32-70 x 50 μ , short-stalked; spores 4-8, 18 x 10-23 x 12 μ .

Host plants in Ohio Herbarium: *Sambucus canadensis*, Cuyahoga Co., E. Claassen; *Gleditschia triacanthus*, Columbus, W. A. Kellerman, Alton, F. L. Stevens, Brown Co., W. A. Kellerman, Hebron, Kellerman and Beatty, Warren Co., Fairfield Co., W. A. Kellerman, Columbus, Weed and Craig; *Castanea dentata*, Cuyahoga Co., E. Claassen; *Cornus candidissima*, Cuyahoga Co., E. Claassen; *Syringa vulgaris*, Cuyahoga Co., E. Claassen, Columbus, E. E. Bogue; Lilac (cult), Hamilton Co., W. H. Aiken, Sugar Grove, W. A. Kellerman; *Viburnum acerifolium*, *Platanus occidentalis*, *Lonicera ciliata*, Cuyahoga Co., E. Claassen, *Viburnum cassinoides*, Ottawa Co., W. A. Kellerman; *Castanea sativa*, var. *americana*, Sugar Grove, Wilcox, Bogue and Weed; *Lathyrus myrtifolius*, Painesville, W. C. Werner.

Otherwise reported in Ohio: *Euonymus atropurpureus*, Ross Co., W. A. Kellerman, Columbus, A. D. Selby; *Sambucus canadensis*, Columbus, A. D. Selby; *Platanus occidentalis*, Columbus, A. D. Selby; *Castanea sativa* var. *americana*, Ross Co., W. A. Kellerman; *Gleditschia triacanthos*, Ross Co., W. A. Kellerman.

Microsphaeraalniextensa (C. & P.) Salm. Mycelium persistent; perithecia gregarious, 90-140 μ in diameter; cells 10-20 μ ; appendages 8-19, $2\frac{1}{2}$ -6 times diameter of perithecium, flexuous, colorless, nonseptate, walls thickened toward base, apex 3-5 times dichotomously branched, branching close, ultimate branchlets distinctly recurved; asci 3-8, short-stalked, 58 x 34-72 x 45 μ ; spores usually 6, 22 x 12-26 x 15 μ .

Host plants in Ohio Herbarium: *Quercus* sp., Columbus, C. M. Weed; *Quercus tinctoria*, Lawrence Co., W. A. Kellerman; *Quercus macrocarpa*, Columbus, C. M. Weed; *Quercus rubra*, Columbus, E. V. Wilcox; *Quercus nigra*, Fairfield Co., W. A. Kellerman; *Quercus coccinea*, Worthington, C. M. Weed.

Microsphaeraalni vaccinii (Schw.) Salm. Perithecia scattered, 70–145 μ in diameter; cells 10–20 μ ; appendages 4–22, $2\frac{1}{2}$ –8 times diameter of perithecium, colorless, or darker at base, nonseptate, apex 2–4 times dichotomously branched, ultimate branchlets recurved; asci 2–16, 45 x 28–72 x 38 μ ; spores 4–6, 18 x 10–22 x 13 μ .

Host plants in Ohio Herbarium: *Vaccinium vacillans*, Portage Co., Lake Co., E. Claassen, *Vaccinium corymbosum*, Portage Co., E. Claassen; *Catalpa bignonioides*, Columbus, C. M. Weed, Oberlin, F. D. Kelsey, Toledo, F. D. Kelsey.

Microsphaera russellii Clinton. Perithecia scattered, 70–118 μ in diameter; cells 6–14 μ ; appendages 5–14, 3–7 times diameter of perithecium, septate, colored nearly to apex, 2–4 times dichotomously branched, branches irregular and lax, tips not recurved, primary branches long; asci 4–9, short-stalked, 42 x 24–56 x 32 μ ; spores 4, 18 x 10–22 x 12 μ . Appendages not branched until fully mature.

Host plants in Ohio Herbarium: *Oxalis stricta*, Hamilton Co., W. H. Aiken, Columbus, W. A. Kellerman.

Otherwise reported in Ohio: *Oxalis recurva*, E. M. Wilcox.

Microsphaera diffusa C. & P. Perithecia 55–126 μ in diameter; cells 10–20 μ ; appendages 4–30, 1–1 2-7 times diameter of perithecium, sometimes septate in lower half, colorless, thicker walled toward base, apex 3–5 times irregularly dichotomously branched, tips swollen and not recurved; asci 4–9, 48 x 28–60 x 30 μ , with very short stalk; spores 4, 18 x 9–22 x 11 μ .

Host plants in Ohio Herbarium: *Meibomia canescens*, *Meibomia dillenii*, Cuyahoga Co., E. Claassen; *Desmodium* sp., Franklin Co., F. L. Stevens; *Desmodium nudiflorum*, Columbus, C. M. Weed.

Otherwise reported in Ohio: *Desmodium canescens*, Columbus, C. M. Weed, F. Detmers, A. D. Selby.

Microsphaera grossulariae (Wallr.) Lev. Perithecia 65–130 μ in diameter; cells 14–20 μ ; appendages 5–22, 1–1 $\frac{3}{4}$ times diameter of perithecium, colorless, nonseptate, thicker walled toward base, apex 4–5 times dichotomously branched, branches close and regular, and ultimate branches long, giving a digitate appearance; asci 4–10, short stalked, 40 x 28–62 x 38 μ ; spores 4–6, 20 x 12–28 x 16 μ .

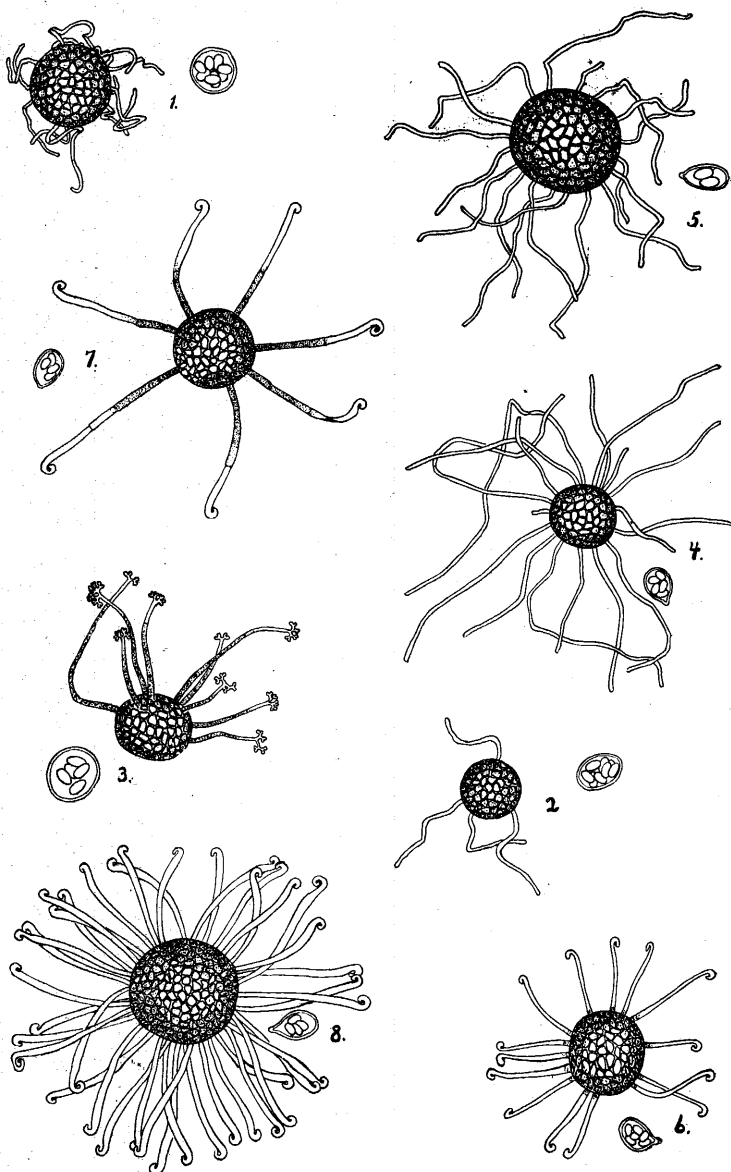
Host plants in Ohio Herbarium: *Sambucus canadensis*, Columbus, W. A. Kellerman, Sugar Grove, W. A. Kellerman.

PHYLLACTINIA Lev.

Phyllactinia corylea (Pers.) Karst. Perithecia 150–275 μ in diameter; cells 10 to 15 μ ; appendages 8–12, equatorial, length $\frac{3}{4}$ to 4 times diameter of perithecium, sharp-pointed, with bulbous base; asci 5–20, stalked, 30 x 90 μ ; spores 2, 14 x 18 μ .

OHIO NATURALIST.

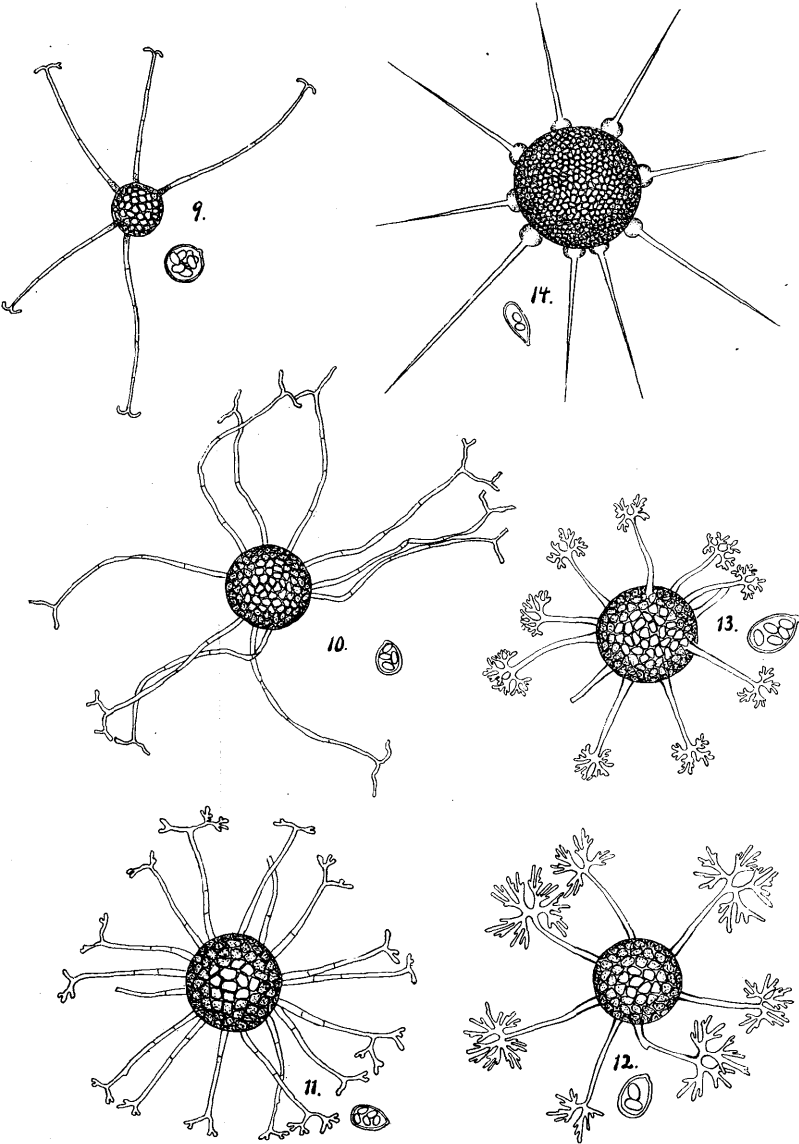
Plate IX.



O'KANE on "Powdery Mildews."

OHIO NATURALIST.

Plate X.



O'KANE on "Powdery Mildews."

Host plants in Ohio Herbarium: *Carpinus caroliniana*, Fairfield Co., W. A. Kellerman; *Catalpa* (cult), Warren Co., *Catalpa bignonioides*, Fairfield Co., W. A. Kellerman; *Alnus rugosa*, Licking Co., J. G. Sanders; *Magnolia acuminata*, Franklin Co., J. H. Schaffner; *Quercus rubra*, Toledo, F. D. Kelsey; *Fagus americana*, Worthington, C. M. Weed; *Castanea sativa*, var. *americana*, Knox Co., H. J. Detmers; *Quercus* sp., Fairfield Co., W. A. Kellerman.

Otherwise reported in Ohio: *Phlox paniculata*, Columbus, A. D. Selby.

EXPLANATION OF PLATES IX AND X.

Figures 1 to 13, inclusive, were drawn at a magnification of 315 diameters, and cuts made at two-thirds reduction. These figures, therefore, are shown at a magnification of 105 diameters.

Figure 14 was drawn at a magnification of 210 diameters, and cut made at two-thirds reduction. This figure, therefore, is shown at a magnification of 70 diameters.

- Fig. 1. *Sphaerotheca humuli* (DC.) Burr.
- Fig. 2. *Sphaerotheca phytophila* Kell & Swingle.
- Fig. 3. *Podosphaera oxyacanthae* DeB.
- Fig. 4. *Erysiphe polygona* DC.
- Fig. 5. *Erysiphe cichoracearum* DC.
- Fig. 6. *Uncinula clintoni* Pk.
- Fig. 7. *Uncinula necator* (Schw.) Burr.
- Fig. 8. *Uncinula salicis* (DC.) Winter.
- Fig. 9. *Podosphaera biuncinata* C. & P.
- Fig. 10. *Microsphaera russellii* Clint.
- Fig. 11. *Microsphaera diffusa* C. & P.
- Fig. 12. *Microsphaera grossulariae* (Wallr.) Lev.
- Fig. 13. *Microsphaera alni* (Wallr.) Salmon.
- Fig. 14. *Phyllactinia corylea* (Pers.) Karst.

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