

A LIST OF PLANT DISEASES OF ECONOMIC IMPORTANCE IN INDIANA WITH BIBLIOGRAPHY.

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INTRODUCTION.

Plant diseases cost Indiana considerably more every year than the maintenance of all public schools in the State. In other words, they exact an annual tax of over \$15,000,000. The loss on the grain crops alone amounts to about \$11,000,000. The above estimates are based upon the results of the experimental and demonstrational work conducted for a number of years with grain smuts over a large section of the state, upon special reports from coöperators in plant disease survey, general correspondence, and personal investigations and observations by the members of the Botanical and other departments of the Agricultural Experiment Station.

A considerable proportion of this damage to growing crops can be readily and cheaply prevented by employing certain well-established, precautionary measures. This has been clearly demonstrated in the disinfection of seed grain by the formaldehyde treatment and in the spraying of fruit trees. Other effective sanitary measures and methods of control are available, which, if put into practice, will save yearly a neat sum of money.

It is highly desirable, therefore, that Indiana farmers realize these facts and avail themselves of the knowledge regarding plant diseases and their control. A greater interest of the farmer in this phase of work will also add stimulus to further and more extensive investigations of plant diseases so that new and more practical measures of prevention and control can be evolved and made available for general practice.

In order to bring together the accumulated information regarding the plant diseases that occur within the State the writer has made an attempt in this paper to present a list and a bibliography of plant diseases in Indiana. It is far from complete, however, and when a thorough survey is completed many additions will be made to it. This list is merely intended to serve as a foundation for plant disease surveys to be made in the future.

With a few exceptions the list includes all plant diseases that have been reported heretofore in various publications, and other diseases of which

specimens have been collected or received from correspondents by former and present members of the Department of Botany, Indiana Agricultural Experimental Station, or by Professor G. N. Hoffer, of the School of Science, Purdue University. Unless otherwise stated in the list the specimens are in the phytopathological collection of the Station Department of Botany, or in the collection of Professor Hoffer. The distribution of the diseases is given either by counties, together with the dates of collections when known; or by sections of the State in which they are prevalent. If they occur generally over the State they are mentioned as common.

The bibliography includes articles written by Indiana workers and pertaining to Indiana plant diseases, published mostly in the bulletins and reports of the Indiana Agricultural Experiment Station, Proceedings of the Indiana Academy of Science, Transactions of the Indiana Horticultural Society, and the Annual Reports of the State Entomologist. It also includes several papers presented at meetings by out-of-state scientists, but pertaining to diseases common to Indiana and printed in the State publications. References to the articles dealing with the diseases mentioned in the following list are given by number, in the chronological order in which they were published.

In order to make the plant disease survey as complete as possible, cooperation is solicited, and the Department of Botany, Agricultural Experiment Station, Lafayette, will be pleased to receive specimens, especially of the less common or unreported diseases. Any valuable information as to the prevalence of such diseases, the extent of damage caused, relation to weather conditions, etc., will also be appreciated.

The writer wishes to express his gratitude to Prof. H. S. Jackson, Chief of the Department of Botany, Indiana Agricultural Experiment Station, for valuable advice and assistance in the preparation of this list.

LIST OF DISEASES.

Alfalfa (*Medicago sativa* L.)

Downey Mildew, *Peronospora Trifoliorum* DeB. Tippecanoe, 1915.

Leaf Spot, *Pseudopeziza Medicaginis* (Lib.) Sacc. Common. 78.

Rust, *Uromyces Medicaginis* Pass. Putnam, 1907.

Violet Root Rot, *Rhizoetonia Crocorum* (Pers.) DC. Referred to formerly as *R. Medicaginis* D.C. St. Joseph, 1915. County agent, J. S. Bordner, reported a number of affected spots in one field, each spot being as much as 10 feet across and enlarging at the rate of 1 foot every 30 days during the growing season. So far as known to the writer this disease has been reported on alfalfa only from Nebraska, Kansas and Virginia.

Wilt, *Sclerotinia Trifoliorum* Eriks. Clark, Fulton and Henry, 1914. Especially prevalent in Clark county.

Apple (*Pyrus Malus* L.)

Bitter Pit (cause physiological). Common on Baldwin variety. Baldwin Fruit Spot, caused by *Cylindrosporium Pomi*, has been reported but no definite determination of it has yet been made. References to Baldwin Fruit Spot: 58, 59, 84, 36.

Bitter Rot, *Glomerella rufo-maculans* (Berk.) Spaul. and von Sehr. Prevalent in the southern half of the State. 46, 76, 78, 57, 58, 84, 100, 36, 40.

Black Rot, *Sphaeropsis Malorum* Peck. Shear's studies indicate genetic connection with Melanops. Prevalent in the southern half of the State. 78, 58, 59, 84, 100, 67, 36, 40, 117.

Blister Canker, *Nummularia discreta* (Schw.) Tul. Becoming serious in the southern part of the State. 36, 40, 39, 117, 86.

Blotch, *Phyllosticta solitaria* E. & E. Common. 78, 58, 59, 84, 37, 40.

Brown Rot, *Sclerotinia cinerea* (Bon.) Wor. Common. 58, 59, 84.

Crown Gall, *Pseudomonas tumefaciens* E. F. Smith & Towns. Reported serious occasionally on nursery stock. 57, 59, 84, 36.

European Canker, *Nectria ditissima* Tul. Found injurious to nursery stock. 57, 58, 59.

Fire Blight, *Bacillus amylovorus* (Burr.) DeToni. Common. 76, 78, 57, 58, 59, 34, 36, 38, 117, 62. See also under Pear.

Fly Speck, *Leptothyrium Pomi*. (Mont. & Fr.) Sacc. Usually found together with sooty blotch. 73, 53, 34, 36, 40.

Jonathan Fruit Spot (cause unknown). Serious on Jonathan apples in storage.

Leaf Spot, *Phyllosticta limitata* Pk. Tippecanoe, 1915.

Pestalozzia concentrica B. & Br. Monroe, Franklin and Martin, 1912.

Mildew, *Podosphaera oxycanthae* (D.C.) DeB. Floyd, 1906, and *Podosphaera leucotrichia* (E. & E.) Salm. Sullivan, 1915. 34.

Pink Rot, *Cephalothecium roscum* Cda. Common. 53, 34.

Root Rot, *Clitrybe parasitica* Wilcox and *Armillaria mellea* (Vahl.) Qual. Serious in some orchards in the southern counties.

Rust, *Gymnosporangium Juniperi-virginianae* Schw. Common. 133, 94, 73, 57, 53, 34, 100, 36, 40, 39, 117.

Scab, *Venturia inaequalis* (Fr.) Wint. Common. 76, 73, 57, 53, 34, 59, 100, 36, 40, 39.

Soft Rot, *Penicillium* spp. Common. 53, 59, 34.

Sooty Blotch, *Phyllachora pomigena* (Schw.) Sacc. Most abundant in unusually moist seasons and in damp situations. 73, 53, 34, 36, 40.

Trunk Rot, *Fomes applanatus* (Pers.) Wallr. Kosciusko, 1914.

Ash (*Fraxinus* spp.)

Mildew, *Phyllactinia corylea* (Pers.) Karst. Johnson, 1890. Montgomery and Putnam, 1893. 132.

White Heart Rot, *Fomes fraxinophilus* Peck. 132, 74.

Asparagus (*Asparagus* sp.)

Rust, *Puccinia Asparagi* D.C. Rather common. 110, 21, 142, 76, 77, 136, 25.

Aster, Chinese (*Callistephus hortensis* Cass.)

Fusarium Wilt, *Fusarium* sp. Tippecanoe, 1912; Clinton, 1914; Allen and Marion, 1915.

Rust, *Coleosporium Solidaginis* (Schw.) Thum. Jefferson, 1914.

Barley (*Hordeum* sp.)

Black Stem Rust, *Puccinia poeciliformis* (Pers.) Wettst. Common.

Covered Smut, *Ustilago Hordei* (Pers.) Kell. & Sw. Rather common.
132, 42.

Loose Smut, *Ustilago nuda* (Jens.) Kell. & Sw. Rather common.

Stripe Disease, *Helminthosporium graminum* (Rag.) Erik. Tippecanoe,
1910.

Bean (*Phaseolus vulgaris* L.)

Anthraxnose, *Colletotrichum Lindemuthianum* (Sacc. & Magn.) Bri. &
Cav. Common. 78, 128.

Rust, *Uromyces appendiculatus* (Pers.) Lev. Common. 132, 142, 78.

Stem Rot, *Corticium vagum* B. & C. var. *Solani* Burt. Laporte, 1911.

Beech (*Fagus* sp.)

Heart Rot, *Steccherinum septentrionale* (Fr.) Banker. Rather common.
132, 71.

Leaf Spot, *Phyllosticta faginea* Pk. Monroe, 1909. 137.

Mildew, *Microsphaera Alni* (D.C.) Wint. Johnson, 1890. 132.

Beet (*Beta vulgaris* L.)

Bacterial Disease. While the cause of this disease has been ascribed to a bacterial origin, the matter has not been definitely settled. The general characteristics of the diseased plants are similar to those caused by the curly top disease described by Townsend (U. S. Dept. of Agr. B. P. I. Bul. 122). The curly top disease, however, appears to be caused, as indicated by Shaw (U. S. Dept. of Agr. B. P. I. Bul. 181) and Ball (U. S. Dept. of Agr. Bur. Ent. Bul. 66), by the beet leafhopper (*Eutettix tenella*). As this insect is claimed to be confined to the southern states and therefore is not likely to be found in Indiana, it is doubtful if the Indiana disease is the same as the curly top. 65, 31, 55.

Leaf Blight, *Cercospora beticola* Sacc. Probably common. 128, 78.

Leaf Spot, *Septoria Betae* West. Tippecanoe, 1896.

Scab, *Oospora scabies* Thaxter. Common. 65, 31.

Birch, Yellow (*Betula lutea* Michx. f.)

Rust, *Melampsoridium betulinum* (Pers.) Kleb. Steuben, 1913. 25.

Blackberry (*Rubus* spp.)

Anthraxnose, *Glocosporium vinctum* Speg. Burkholder reported genetic connection with *Plectodiscella*. Common. 123, 73, 57, 36, 40.

Crown Gall, *Pseudomonas tumefaciens* E. F. Smith and Townsend.

Rather serious in some localities. 76, 57, 40.

Leaf Spot, *Septoria Rubi* West. Common. 73, 40.

Rust, *Gymnoconia interstitialis* (Schlecht.) Lagh. Common. 64, 123,

142, 73, 57, 36. *Puccinia Peckiana* Howe. Tippecanoe, 1895.

Kuchneola Uredinis (Link) Arthur. Common.

Blue-grass (*Poa pratensis* L.)

Anthraxnose, *Colletotrichum cereale* Manns. Tippecanoe, 1914.

Leaf Spot, *Scoletotrichum graminis* Fekl. Johnson, 1890. 132.

Mildew, *Erysiphe graminis* D.C. Common in wet seasons. 132.

Rust, *Puccinia epiphylla* (L.) Wettst. Common. 132.

Slime Mold, *Physarum cinereum* (Batsch) Pers. Tippecanoe, 1913.

Marion, 1915.

Cabbage (*Brassica oleracea* L.)

Black Leg, *Phoma oleracea* Sacc. Elkhart, 1915. Large percentage of the crop in two fields was severely affected.

Black Rot, *Pseudomonas campestris* (Pammel) E. F. Smith. Common.

103, 76, 73, 42.

Club-root, *Plasmodiophora Brassicae* Wor. Rather common. 77.

Drop, *Sclerotinia libertiana* Fekl. Tippecanoe, 1915. No specimen preserved.

Leaf Blight, *Alternaria Brassicae* (Berk.) Sacc. Clark, 1908. One field almost ruined. No specimen preserved.

Wilt or Yellows, *Fusarium conglutinans* Wr. Pike and Decatur, 1914.

Canteloupe (*Cucumis Melo* L.)

Anthraxnose, *Colletotrichum Lagenaarum* (Pass.) Ell. & Halls. Becoming common. 73.

Leaf Blight, *Alternaria Brassicae* (Berk.) Sacc. Common. 123, 73, 144.
 Wilt, *Bacillus tracheiphilus* E. F. Smith. Very serious in many localities.
 76, 73, 144.

Carnation (*Dianthus Caryophyllus* L.)

Bacteriosis, *Bacterium Dianthi* Arth. & Boll. Serious in greenhouses.
 30.
 Bud Rot, *Sporotrichum anthophilum* Peck. Marion, 1909. 58.
 Leaf Spot, *Alternaria Dianthi* S. & H. Monroe, 1912. 133.
 Rust, *Uromyces caryophyllinus* (Schrank) Wint. Common. 132, 133.

Catalpa (*Catalpa* spp.)

Heart Rot, *Collybia velutipes* Fr. and *Polyporus versicolor* Fr. Tippecanoe,
 1913. 71.
 Leaf Spot, *Cladosporium* sp. Common. 58. *Macrosporium Catalpae*
 Ell. & Mart., Koseiusko, 1914, and *Phyllosticta Catalpac* Ell. & Mart.,
 Koseiusko, 1914. 71.
 Mildew, *Microsphaera vaccinii* (Schw.) Salm. Reported as *Microsphaera*
elevata Burrill. Putnam, 1891. Owen, 1893. Tippecanoe, 1890.
Phyllactinia suffulata (Reb.) Sacc. Montgomery, 1893. 132.

Cauliflower (*Brassica oleracea* L. var. *botrytis* D. C.)

Black Rot, *Pseudomonas campestris* (Pammel) E. F. Smith. No locality
 mentioned. 77.

Celery (*Apium graveolens* L.)

Leaf Spot, *Sclerotia Petroselinii* Desm. var. *Apii*. Br. & Cav. Tippecanoe,
 1915. *Cercospora Apii* Fr. Marshall and St. Joseph, 1915.

Cherry (*Prunus* spp.)

Black Knot, *Plowrightia morbosa* (Schw.) Sacc. Common. 127, 10, 130,
 57, 36, 40, 117.
 Brown Rot, *Sclerotinia cinerea* (Bon.) Wor. Common. 57, 58, 36, 40.
 Leaf Spot, *Cylindrosporium Padi* Karst. Higgins has reported genetic
 relation with *Coccomyces hiemalis* Higgins. Common. 78, 57, 36,
 38, 40.
 Powdery Mildew, *Podosphaera oxycanthae* (D.C.) DeB. Common.
 Seab. *Venturia cerasi* Aderh. Koscinsko, 1913.

Chestnut (*Castanea* spp.)

Blight, *Endothia parasitica* (Murrill) Anders. Marion and Benton, 1915.
 Leaf Spot, *Mycosphaerella maculiformis* (Pers.) Schw. Martin, 1915.

Chrysanthemum (*Chrysanthemum* spp.)

Rust, *Puccinia Chrysanthemi* Roze. Tippecanoe, 1900. 24.

Clover (*Trifolium* spp.)

Anthraxnose, *Colletotrichum Trifolii* Bain. Monroe, 1908, on red clover.

137. *Glocosporium caulivorum* Kirchner. Tippecanoe, 1915, on red clover.

Black Mold, *Phyllachora Trifolii* (Pers.) Fekl. Johnson, 1890, on red clover. 132.

Rust, *Uromyces fallens* (Desm.) Kern and *Uromyces Trifolii* (Hedw.) Lev. Common. 132, 25, 142, 98.

Sooty Spot, *Polythrincium Trifolii* Kze. Franklin, 1912, on red and white clover.

Wilt, *Sclerotinia Trifoliorum* Eriks. Gibson, 1915, on red and crimson clover.

Corn (*Zea Mays* L.)

Dry Rot, *Fusarium* sp. Common. 77, 78.

Rust, *Puccinia Sorghi* Schw. Common. 132, 112.

Smut, *Ustilago Zeae* (Beckm.) Ung. Common. 49, 12, 56, 107, 33, 111, 113, 45, 76, 78.

Cucumber (*Cucumis sativus* L.)

Angular Leaf Spot, *Bacterium lachrymans*. E. F. Smith & Bryan. Pulaski, Marshall and Fulton, 1915.

Anthraxnose, *Colletotrichum Lagenerium* (Pass.) Ell. & Hals. Marshall, Laporte, St. Joseph, Starke, Pulaski and Fulton, 1915.

Bacterial Wilt, *Bacillus tracheiphilus* E. F. Smith. Marshall, Tippecanoe, Laporte, Fulton, Starke, Pulaski and St. Joseph, 1915.

Downy Mildew, *Peronoplasmopara eubensis* (B. & C.) Clinton. Marshall, 1915.

Powdery Mildew, *Erysiphe Cichoracearum* D.C. Marshall, 1915.

White Pickle or Mosaic Disease (cause not known). Marshall, Laporte, Tippecanoe, Fulton, Pulaski, St. Joseph and Starke. 1915.

Currant (*Ribes* spp.)

Anthracnose, *Pseudopeziza Ribis* Kleb. Rather common. 138, 40.

Leaf Spot, *Septoria Ribis* Desm. Common. 78, 40.

Powdery Mildew, *Sphaerotheca Mors-uvae* (Schwein.) Berk. & Curt. Common. 40.

Eggplant (*Solanum Melongena* L.)

Leaf Spot, *Ascochyta Lycopersici* Brun. Tippecanoe, 1915.

Elm (*Ulmus* spp.)

Leaf Spot, *Mycosphaerella Ulmi* Kleb. Johnson, 1890. *Dothidella ulmca* (Schw.) E. & E. Montgomery, 1893. Koscusko, 1912. 132, 135, 71.

Mildew, *Uncinula macrospora* Pk. Rather common. 132.

Rot, *Pleurotus ulmarius* Bull. Common. 71.

Ginseng (*Panax quinquefolium* L.)

Wilt, *Acrostalagmus albus* Preuss. Brown, 1909. 58.

Gooseberry (*Ribes grossularia* L.)

Anthracnose, *Pseudopeziza Ribis* Kleb. Becoming common. 40.

Leaf Spot, *Septoria Ribis* Desm. Common. 78, 138, 40.

Mildew, *Sphaerotheca Mors-uvae* (Schw.) Berk. & Curt. Common. 128, 78, 40.

Grape (*Vitis* spp.)

Anthracnose, *Glocosporium ampelophagum* Sacc. Rather common. 58, 60, 36, 40.

Black Rot, *Guignardia Bidwellii* (Ell.) Viala & Ravaz. Common. 8, 128, 78, 60, 36, 40.

Crown Gall, *Pseudomonas tumefaciens* E. F. Smith & Towns. No locality mentioned. 38.

- Downy Mildew, *Plasmopara viticola* (B. & C.) Berl. & DeToni. Common.
132, 58, 60, 36, 40.
- Powdery Mildew, *Uncinula necator* (Schw.) Bull. Common. 8, 127,
36, 40.
- Necrosis, *Fusicoccum viticolum* Red. Tipton, 1907. 60.

Hickory (*Hicoria* spp.)

- Leaf Spot, *Bacterium* sp. Common. 71.
Marsonia sp. Kosciusko, 1913.
- Mildew, *Microsphaera Alni* (D.C.) Wint. Johnson, 1890; Marshall,
1893. 132.
- Root Rot, *Armillaria mellea* Vahl. Tippecanoe, 1915. 71.

Hollyhoek (*Althaea rosea* Cav.)

- Rust, *Puccinia malvacearum* Mont. St. Joseph, Montgomery, Marshall,
Huntington, Marion, and Tippecanoe, 1915.

Horse Chesnut (*Aesculus Hippocastanum* L.)

- Mildew, *Uncinula flexuosa* Pk. Johnson, 1890; Montgomery. 132.

Japanese Ivy (*Ampelopsis tricuspidata* Sieb. & Zucc.)

- Cladosporium Wilt, *Cladosporium herbarum* Link. Tippecanoe, 1914.

Lettuce (*Lactuca sativa* L.)

- Downy Mildew, *Bremia Lactucae* Regel. Found frequently in green-
houses. 143.
- Drop, *Sclerotinia libertiana* Fekl. Common in greenhouses.
- Leaf Spot, *Septoria Lactucae* Pass. Johnson, 1890. Kosciusko, 1913.
132.

Lilac (*Syringa vulgaris* L.)

- Mildew, *Microsphaera Alni* (Wollr.) Wint. Common. 102.

Linden (*Tilia americana* L.)

- Mildew, *Uncinula Clintonii* Peck. Montgomery, 1890; Putnam, 1893.
132.

Locust, Black (*Robinia Pseudacacia* L.)

Yellow Heart Rot, *Fomes rimosus* Berk. Rather common. 71.

Locust, Honey (*Gleditsia triacanthos* L.)

Leaf Spot, *Melasmnia hypophylla* Sacc. Marion, 1890; Tippecanoe, 1892; Putnam, 1893. 132.

Mildew, *Microspheera Alni* (Wallr.) Wint. Common. 71.

Maple (*Acer* spp.)

Anthraxnose, *Glocosporium apocryptum* E. & E. Marion, Floyd, Vanderburg and Boone, 1914. 39.

Bark Canker, *Schizophyllum commune* Fr. Rather common. 71.

Canker, *Nectria cinnabarina* (Tode) Fr. Carroll, 1913. 71.

Leaf Spot, *Phleospora Aceris* Lib. Johnson, 1890, on red maple. *Stagonospora collapsa* (C. & E.) Sacc. Putnam, 1893, on soft maple. 132.

Leaf Tar Spot, *Rhytisma acerina* (Pers.) Fr. Common in some localities. 132, 137, 39, 71.

Mildew, *Uncinula circinata* C. & P. Montgomery, 1885; Johnson, 1890; Marshall, 1893, on red and soft maple. 132, 102.

Sun Scald. This trouble, thought to be due to drouth and storm injury has been quite prevalent over the State during the past few seasons. 38, 39.

White Heart Rot, *Fomes igniarius* (L.) Gillet. Common. 71.

White Rot, *Polyporus squamosus* (Huds.) Fr. Tippecanoe. 71.

Millet (*Chaetochloa italica* (L.) Scribn.)

Smut, *Ustilago Crameri* Koern. Rather common but not serious. 112.

Oak (*Quercus* spp.)

Leaf Spot, *Ceratophorum uncinatum* (Cl. & Pk.) Sacc. Johnson, 1890, on bur-oak. *Didymella lephosphora* Sacc. & Speg. Monroe, 1911, on red oak. *Gloeosporium septorioides* Sacc. Montgomery, 1890; Monroe, 1909, on red oak. *Marsonia Martini* Sacc. & Ell. Common on several species. *Phyllosticta Quercus* Sacc. & Speg. Montgomery, 1893, on bur-oak. 132, 137, 71.

Brown Heart Rot, *Fomes Everhartii* Ell. & Gall. = (*Pyropolyporus Everhartii* (Ell. & Gall.) Murrill). Common in the northern counties. 71.

Mildew, *Microsphaera Alni* (Wallr.) Wint. Frequently on leaves of coppice growth of red and white oaks. *Phyllactinia suffulta* (Reb.) Sacc. Shelby, 1890; Vigo, 1893, on swamp and red oaks. 132, 71.

Piped Rot, *Polyporus pilotae* Schw. = (*Aurantiporus pilotae* (Schw.) Murrill). In the southern part of the State. 71.

Red Heart, *Polyporus sulphureus* (Bull.) Fr. = (*Laetiporus speciosus* (Batt.) Murrill). Common. 71.

Root Rot, *Armillaria mellea* Vahl. Common. *Polyporus Berkeleyi* Fr. = (*Grifolia Berkeleyi* (Fr.) Murrill). Tippecanoe and Monroe. *Polyporus dryadeus* Fr. Tippecanoe and Monroe. 71.

Speckled Rot. *Stercum frustulosum* Pers. Putnam, 1891. 132.

Straw-colored Rot, *Polyporus frondosus* Fr. = (*Grifolia frondosa* (Fr.) Murrill.) Common, although it does not frequently attack living trees. 71.

White Rot or Coral Fungus, *Hydnum erinaceus* Bull. Common. 71.

Oats (*Avena sativa* L.)

Covered Smut, *Ustilago levis* (Kell. & Sw.) Magn. Common.

Loose Smut, *Ustilago Avenae* (Pers.) Jens. Common. 3, 6, 9, 132, 56, 122, 109, 20, 123, 115, 26, 27, 76, 78, 42, 32, 75, 91.

Rust, *Puccinia Rhamni* (Pers.) Wettst. Common. 132, 25, 142, 76, 78.

Ohio Buckeye (*Aesculus glabra* Willd.)

Mildew, *Uncinula flexuosa* Pk. Johnson, 1890; Montgomery. 132.

Leaf Spot, *Phyllosticta Pariae* Desm. Montgomery and Johnson, 1890; Brown, 1893. 132.

Onion (*Allium Cepa* L.)

Black Mold, *Macrosporium parasiticum* Thuem. Starke, 1912.

Smut, *Urocystis cepulae* Frost. Becoming serious locally in the north central counties. 135.

Soft Rot, *Bacillus* sp. Occasionally causes considerable loss in storage.

Pea (*Pisum* sp.)

Blight, *Ascochyta Pisi* Lib. Common. 42, 136.

Peach (*Amygdalus persica* L.)

- Bacterial Leaf Spot, *Bacterium Pruni* E. F. Smith. Vanderburg, 1915.
- Blight, *Coryneum Beyerinkii* Oud. Reported in several localities in the peach-growing districts. 61, 40.
- Brown Rot, *Sclerotinia cinerea* (Bon.) Wor. Common. 76, 57, 58, 61.
- Crown Gall, *Pseudomonas tumefaciens* E. F. Smith & Towns. Probably not common. 57, 61.
- Leaf Curl, *Eoascus deformans* (Berk.) Fekl. Common. 132, 128, 17, 76, 78, 57, 61, 40.
- Powdery Mildew, *Sphaerotheca pannosa* (Wallr.) Lev. Common. 58, 61.
- Scab, *Cladosporium carpophilum* Thuem. Common. 2, 98, 58, 61, 40.
- Yellows. Common. 76, 78, 57, 58, 61, 40, 117.

Pear (*Pyrus communis* L.)

- Black Rot, *Sphaeropsis Malorum* Pk. Shear's studies indicate genetic connection with Melanops. Tippecanoe, 1915.
- Blight, *Bacillus amylovorus* (Burr.) DeToni. Common. 43, 57, 81, 92, 93, 97, 121, 52, 53, 51, 105, 128, 99, 63, 95, 76, 78, 59, 84, 36, 38, 40, 117, 62. See also under Apple.
- Leaf Blight, *Entomosporium maculatum* Lev. Perfect stage = *Fabrea maculata* (Lev.) Atk. Rather common. 36, 40.
- Leaf Spot, *Septoria pyricola* Desm. Rather common. 135. *Mycosphaerella sentina* (Fr.) Schw. Koseiusko, 1914.
- Scab, *Venturia pyrina* Aderh. Rather common. 123, 78.

Pepper (*Capsicum annum* L.)

- Black Rot, *Macrosporium Solani* Ell. & Mart. Tippecanoe, 1912.

Plum (*Prunus* spp.)

- Black Knot, *Plowrightia morbosa* (Schw.) Sacc. Common. 127, 10, 128, 130, 76, 78, 57, 58, 36, 40, 117.
- Brown Rot, *Sclerotinia cinerea* (Bon.) Wor. Common. 128, 76, 78, 57, 58, 36, 40.
- Leaf Spot, *Cylindrosporium Padi* Karst. Common. 128, 78, 57, 36, 40.
- Plum Pocket, *Eoascus Pruni* Fekl. Common. 17, 38, 117.

Poplar (*Populus* spp.)

Leaf Spot, *Marsonia Populi* (Lib.) Sacc. Tippecanoe, 1910.

Mildew, *Uncinula Salicis* (D.C.) Wint. Common. 132.

Rust, *Melampsora Medusae* Thuem. Common. 142, 71. *Melampsora Abietis-canadensis* (Farl.) Ludwig. Tippecanoe, Jasper, Steuben, Putman.

Potato (*Solanum tuberosum* L.)

Bacterial Wilt, *Bacillus solanacearum* E. F. Smith. Serious locally. 78.

Early Blight, *Macrosporium Solani* Ell. & Mart. Common. 128, 119, 78.

Fusarium Rot, *Fusarium* sp. Common.

Late Blight, *Phytophthora infestans* (Mont.) DeB. Common. 128, 119, 78.

Scab, *Oospora scabies* Thaxter. Common. 11, 13, 14, 15, 20, 76, 78, 54. Tipburn. Probably sunscald injury. Tippecanoe, 1907.

Privet (*Ligustrum vulgare* L.)

Anthraxnose, *Glocosporium cingulatum* Atk. Marion, 1908. 58.

Quince (*Cydonia vulgaris* Pers.)

Black Rot, *Sphacropsis malorum* Pk. Shear indicates genetic connection with Melanops. Common. 76, 78.

Blight, *Bacillus amylovorus* (Burr.) DeToni. Common. 76, 78, 36, 40. See also under Apple and Pear.

Leaf blight, *Entomosporium maculatum* Lev. Common. 128, 58, 36, 40. Perfect stage = *Fabrea maculata* (Lev.) Atk.

Mildew, *Podosphaera oxyacanthae* (D.C.) DeB. Montgomery, 1885. 102.

Rust, *Gymnosporangium germinale* (Schw.) Kern. Perry, 1914. 77.

Radish (*Raphanus sativus* L.)

Downy Mildew, *Peronospora parasitica* (Pers.) DeB. 143.

White Rust, *Albugo candida* (Pers.) Roussel. Common. 132, 143.

Raspberry (*Rubus* spp.)

- Anthraxnose, *Gloeosporium venetum* Speg. Burkholder reported genetic connection with *Plectodiscella*. Common. 123, 76, 73, 53, 36, 40.
 Cane Blight, *Coniothyrium Fuckelii* Sacc. No locality mentioned. 40.
 Crown Gall, *Pseudomonas tumefaciens* E. F. Smith & Towns. Common. 40.
 Leaf Spot, *Septoria Rubi* West. Common. 73, 40.
 Rust, *Gymnoconia interstitialis* (Schlecht.) Lagh. Common. 73, 36.

Rhubarb (*Rheum Rhaponticum* L.)

- Leaf Spot, *Ascochyta Rhei* E. & E. Tippecanoe, 1912 and 1915.

Rose (*Rosa* spp.)

- Black Spot, *Actinonema Rosae* (Lib.) Fr. Wolf reported perfect stage, *Diplocarpon Rosae* Wolf.
 Leaf Spot, *Dicoccum Rosae* Bon. Howard, 1911.
 Mildew, *Sphaerotheca pannosa* Wallr. Common. 132.
 Rust, *Phragmidium americanum* Dietel. Probably common. 132.
Phragmidium discolorum (Tod) J. F. James. St. Joseph, 1915.
Phragmidium subcorticium (Schrank) Wint. Tippecanoe, 1915.

Rubber Plant (*Ficus elastica* Roxb.)

- Leaf Spot. *Macrosporium* sp. Tippecanoe, 1910.

Rye (*Secale cereale* L.)

- Ergot, *Claviceps purpurea* (Fr.) Tul. Common. 132.
 Leaf Rust, *Puccinia asperifolia* (L.) Wettst. Common.
 Stem Rust, *Puccinia poculiformis* (Jasq.) Wettst. 25.

Sorghum (*Sorghum* spp.)

- Kernel Smut, *Sphacelotheca Sorghi* (Lk.) Clinton. Common. Collected on several members of the sorghum group.

Snapdragon (*Antirrhinum majus* L.)

- Anthraxnose, *Colletotrichum Antirrhini* Stew. Tippecanoe, 1915.
 Rust, *Puccinia Antirrhini* Diet. & Holw. Montgomery, Lagrange, Hendricks and Wabash, 1915.

Strawberry (*Fragaria* spp.)

Leaf Spot, *Mycosphaerella Fragariae* (Tul.) Linden. Common. 128, 58, 40, 90, 39.

Mildew, *Sphaerotheca Humuli* (D.C.) Burr. Common. 38, 40.

Sweet Pea (*Lathyrus* spp.)

Root Rot, *Fusarium Lathyræ* Taubenhaus. Tippecanoe, 1912.

Sweet Potato (*Ipomoea Batatas* Lam.)

Black Rot, *Sphaeronema fimbriatum* (Ell. & Hals.) Sacc. Rather common. 77, 83.

Dry Rot, *Diaporthe batatatis* Harter & Field. Tippecanoe, 1912. 83.

Fusarium Rot, *Fusarium* sp. Tippecanoe, 1912. 83.

Stem Rot, *Nectria Ipomoeae* Hals. Tippecanoe, 1912. Monroe. 83.

Swiss Chard (*Beta* sp.)

Leaf Spot, *Cercospora beticola* Sacc. Tippecanoe, 1910.

Sycamore (*Platanus occidentalis* L.)

Leaf Spot, *Stigmina Platani* Fekl. Tippecanoe, 1914. 71.

Mildew, *Microsphaera Alni* (DC.) Wint. Johnson, 1890; Putnam, 1891; Montgomery, 1893. 132.

Phyllactinia Corylea (Pers.) Karst. Common. 71.

Timothy (*Phleum pratense* L.)

Anthracnose, *Colletotrichum cereale* Manns. Hamilton and Bartholomew, 1909.

Leaf Spot, *Scoletotrichum graminis* Fekl. Johnson, 1890. 132.

Rust, *Puccinia poeuliformis* (Jacq.) Wettst. Common. 79, 80, 74.

Silver Top, *Sporotrichum Poae* Pk. Kosiński, 1914.

Smut, *Ustilago striaeformis* (West.) Niess. Common. 132.

Tomato (*Lycopersicon esculentum* Mill.)

Anthracnose, *Colletotrichum phomoides* (Sacc.) Chest. Common.

Bacterial Blight, *Bacillus solanacearum* E. F. Smith. Serious locally. 78, 39.

Black Rot, *Alternaria* sp. Tippecanoe, 1912.

Blossom End Rot (cause not known). Common, especially during dry weather. 76, 78, 131.

Fusarium Wilt, *Fusarium Lycopersici* Sacc. Knox, 1913; Tippecanoe, 1914 and 1915.

Leaf Mold, *Cladosporium fulvum* Cke. Wabash, 1915, in greenhouse.

Leaf Spot, *Septoria Lycopersici* Speg. Common. 128, 78, 131.

Mosaic Disease (cause not definitely known). Common in greenhouses.

Oedema. Cause physiological. Tippecanoe, 1912, in greenhouse.

Walnut, Black (*Juglans nigra* L.)

Leaf Spot, *Marsonia Juglandis* (Lib.) Sacc. Perfect stage = *Gnomonia leptostyla* (Fr.) Ces. & d. Not. Tippecanoe, 1914.

Mildew, *Microsphaera Alni* (D.C.) Wint. Johnson, 1890. Putnam, 1893. 132.

Walnut, White (*Juglans cinerea* L.)

Mildew, *Phyllactinia Corylea* (Pers.) Karst. Carroll, 1913. 71.

Watermelon (*Citrullus vulgaris* Schrad.)

Anthracnose, *Colletotrichum Lagenerium* (Pass.) Ell. & Hals. Common. 128, 78.

Fusarium Wilt, *Fusarium vasinfectum* Atk. var. *niveum* Sm. Common. 78, 144.

Leaf Blight, *Alternaria Brassicae* (Berk.) Sacc. var. *nigrescens* Pegl. Common.

Wheat (*Triticum vulgare* L.)

Anthracnose, *Colletotrichum cereale* Manns. Posey, 1912.

Ebony Point, *Alternaria* sp. Common.

Fusarium Blight, *Fusarium* sp. Unusual outbreak of Fusarium trouble occurred during the past season (1915) in Orange, Washington, Jefferson and Green counties. The maturing heads had a dull grayish-brown color instead of the normal golden brown. The kernels were small, shrunken, and in many cases covered with mycelial growth. Prof. G. N. Hoffer, who co-operated in the investigation of this disease, found many kernels internally infected with Fusarium.

Leaf Rust, *Puccinia triticina* Eriks & Henn. Common. See under Stem Rust.

Loose Smut, *Ustilago Tritici* (Pers.) Jens. Common. 82, 35. 91a, 132, 19, 109, 23, 116, 76, 78, 42, 32.

Scab, *Fusarium* sp. Common, 7, 18, 76, 78.

Septoria Spot, *Septoria graminum* Desm. Common. Another species of Septoria which agrees closely with *S. glumarum* Sacc. was found associated with the Fusarium blight disease. Pyrenidia were found in abundance not only on glumes but on sheaths and nodes as well. In one of the fields examined by the writer every wheat plant was severely affected.

Stinking Smut, *Tilletia foetans* (B. & C.) Trel. Common. 82, 3, 5, 91a, 9, 56, 20, 76, 78, 42, 57, 32, 88. *Tilletia Tritici* (Beij.) Wint. Franklin, 1912.

Stem Rust, *Puccinia poeciliformis* (Jacq.) Wettst. Common. 82, 50, 4, 47, 48, 142, 76, 78, 57.

Willow (*Salix* spp.)

Mildew, *Ucinula Salicis* (D.C.) Karst. Common. 132, 71.

Rust, *Melampsora Bigelovii* Thuem. Common. 71.

Wood Rot, *Daedalea confragosa* (Balt.) Pers. Tippecanoe, 1912.

Yellow Poplar (*Liriodendron tulipifera* L.)

Mildew, *Erysiphe Liriodendri* Schw. Putnam, 1891 and 1893; Montgomery 1893. *Phyllactinia suffulta* (Reb.) Sacc. Johnson, 1890; Montgomery, 1893. 132.

BIBLIOGRAPHY.

1. Anderson, H. W.

- 1914 A new leaf spot of *Viola cucullata*. Proc. Ind. Acad. Sci.
1914:187-190. Description of leaf spot diseases caused by
Colletotrichum.

2. Arthur, J. C.

- 1889 Spotting of peaches and cucumbers. Ind. Agr. Exp. Sta.
Bul. 19:5-10, figs. 1-6. Description and brief discussion
of *Cladosporium carpophilum* Thuem. and *Cladosporium*
cucumerinum E. & A.

3. _____

- 1889 Smut of wheat and oats. Ind. Agr. Exp. Sta. Bul. 28:3-23,
figs. 1-7. Detailed discussion of the stinking smut of wheat
and briefer reference to the loose smuts of wheat, oats,
barley and rye.

4. _____

- 1889 What is common wheat rust? Proc. Soc. Prom. Agric. Sci.
7:11-12.

5. _____

- 1890 Treatment of smut in wheat. Ind. Agri. Exp. Sta. Bul. 32:3-9.
Discusses copper sulfate and hot water treatments for pre-
venting stinking smut.

6. _____

- 1891 The loose smut of oats. Ind. Agr. Exp. Sta. Bul. 35:81-97,
figs. 1-4. Discussion of the occurrence of oat smut in the
State and its prevention by the hot water treatment.

7. _____

- 1891 Wheat scab. Ind. Agr. Exp. Sta. Bul. 36:129-132. Observa-
tions on the occurrence of scab, caused by *Fusarium* sp.,
in the vicinity of Lafayette.

8. _____

1892 Treatment of powdery mildew and black rot on grapes. Ind. Agr. Exp. Sta. Bul. 38:17-18, pl. 1. Results on spraying with a solution of potassium sulphide and dusting with sulphur for mildew and spraying with bordeaux for black rot.

9. _____

1892 Grain smut and the use of hot water to prevent it. Agric. Sci. 6:393-397. Abstract in Proc. Soc. Prom. Agr. Sci. 9:135. Experiments with the stinking smut of wheat.

10. _____

1894 Black knot and other excrescences. Trans. Ind. Hort. Soc. 1894:76-80. Discussion of the nature and control of *Plowrightia morbosa* on plums and cherry and of similar excrescences on other trees, as poplar, oaks, peach, apricot, etc.

11. _____

1895 Potato scab and its prevention. Ind. Agr. Exp. Sta. Bul. 56:69-80. Same in Ind. Agr. Rep. 1895:537-545. Corrosive sublimate treatment recommended.

12. _____

1895 Treatment of corn smut. Ind. Agr. Exp. Sta. Newsp. Bul. 16. Gathering and destroying of smut recommended.

13. _____

1896 Prevention of potato scab. Ind. Agr. Exp. Sta. Newsp. Bul. 21. Discussion of the corrosive sublimate treatment.

14. _____

1897 A new remedy for potato scab. Ind. Agr. Exp. Sta. Newsp. Bul. 43. First announcement of the formaldehyde treatment.

15. _____

1897 Formalin for prevention of potato scab. Ind. Agr. Exp. Sta. Bul. 65:19-32, pls. 2.

16. _____
1897 Distinction between health and disease in plants. Trans. Ind. Hort. Soc. 1897:26-30.
17. _____
1898 Peach leaf curl and plum pockets. Ind. Agr. Exp. Sta. Newsp. Bul. 60. General description and suggestions on preventive measures.
18. _____
1898 Scab in heads of wheat. Ind. Agr. Exp. Sta. Newsp. Bul. 62. General discussion and suggestion on measures of control.
- 19.* _____
1898 Loose smut of wheat. Ind. Agr. Exp. Sta. Newsp. Bul. 65. General discussion and recommendation of the hot water treatment.
20. _____
1899 Formalin for grain and potatoes. Ind. Agr. Exp. Sta. Bul. 77:38-44. Discussion of smut of corn, wheat, oats and of potato scab. Preventive measures recommended.
21. _____
1900 Asparagus rust. Ind. Agr. Exp. Sta. An. Rep. 1900:10-14. Same in Ind. Agr. Rep. 1900:520-524. General discussion of the nature of this disease with suggestions on methods of control.
22. _____
1900 Damping off of beets in the field. Ind. Agr. Exp. Sta. An. Rep. 1900:15-16. Same in Ind. Agr. Rep. 1900:524-526. Beet seedlings were observed killed in the field by some parasitic organism whose identity had not been established.
23. _____
1900 Formalin and hot water as preventive of loose smut of wheat. Ind. Agr. Exp. Sta. An. Rep. 1900:17-24. Same in Ind. Agr. Rep. 1900-526-532.

*Article 19 should be credited to Wm. Stuart.

24. —————
1900 Chrysanthemum rust. Ind. Agr. Exp. Sta. Bul. 85:143-150.
Same in Ind. Agr. Rep. 1900:637-643. Reports detailed
study of the rust. Preventive measures suggested.
25. —————
1903 Revised list of Indiana plant rusts. Proc. Ind. Acad. Sci.
1903:141-152.
26. —————
1905 Rapid method of removing smut from seed oats. Ind. Agr.
Exp. Sta. Bul. 103:257-264. Description of method of
treating oats with formaldehyde solution on a large scale.
27. —————
1906 Treatment for oat smut. Ind. Agr. Exp. Sta. Newsp. Bul.
125. Brief discussion of the formaldehyde treatment.
28. —————
1909 Right and wrong conception of plant rusts. Proc. Ind. Acad.
Sci. 1909: 383-390.
29. —————
1914 Some large botanical problems. Proc. Ind. Acad. Sci. 1914:
267-271. Reference to a number of serious diseases affecting
cereal, vegetable and forage crops.
30. **Arthur, J. C., and Bolley, H. L.**
1896 Bacteriosis of carnations. Ind. Agr. Exp. Sta. Bul. 59:17-39
pls. 1-8. Detailed description and discussion of carnation
disease caused by *Bacterium Dianthi* Arth. and Bol. n.sp.
31. **Arthur, J. C., and Golden, Katherine.**
1892 Diseases of the sugar beet root. Ind. Agr. Exp. Sta. Bul. 39:
54-62, pl. 1. Description of beet scab, bacterial disease,
and water-core spots.
32. **Arthur, J. C., and Johnson, A. G.**
1910 Loose smut of oats and stinking smut of wheat and their
prevention. Ind. Agr. Exp. Sta. Cir. 22:1-15, figs. 1-9.
Formaldehyde treatment recommended.

33. **Arthur, J. C., and Stuart, Wm.**

1899 Corn smut. Ind. Exp. Sta. An. Rep. 1899:84-135, pls. 10-13, fig. 1. Detailed account of corn smut, including its early records, life history, modes of dissemination, methods of control and chemical properties.

34. **Baldwin, C. H.**

1912 Fungicides and spray calendars. Rep. Ind. State Entomol. 1911-1912:26-36. Spray calendar includes treatments for diseases of apple, pear, quince, cherry, plum and grape.

35. _____

1912 Some points on the control of plant diseases. Rep. Ind. State Entomol. 1911-1912:237-238.

36. _____

1912 Some important diseases of apple, pear, quince, stone fruits, grapes, raspberry and blackberry. Rep. Ind. State Entomol. 1911-1912:239-281, figs. 27.

37. _____

1912 Shade tree troubles. Rep. Ind. State Entomol. 1911-1912:282-284, fig. 8. Discussion of root suffocation, malnutrition, and other causes as gas, drouth, smoke and fungi. Also gives an account of tree surgery methods.

38. _____

1913 Plant diseases. Rep. Ind. State Entomol. 1912-1913:61-73, fig. 5. Discussion and partial list of diseases of the maple, apple, pear, cherry, peach, plum, currant, gooseberry, grape, blackberry, raspberry and strawberry.

39. _____

1914 Diseases of the year. Rep. Ind. State Entomol. 1913-1914:59-67, fig. 5. Account of some diseases of the maple, apple, tomato and strawberry.

40. **Baldwin, C. H. and Dietz, H. T.**

1913 A program for the treatment of orchard insect pests and plant diseases. Office Ind. State Entomol. Bul. 3:119-123 and 145-200, fig. 33. Discussion of fungicides and diseases

of and spray calendars for apple, pear, quince, stone fruits, grape, currant, gooseberry, raspberry, blackberry, strawberry, potatoes and cucurbits.

41. **Banker, H. J.**

1910 *Steccherinum septentrionale* (Fr.) Banker, in Indiana. Proc. Ind. Acad. Sci. 1910:213-218, fig. 1. Detailed description and discussion as to its occurrence on hosts and in the State.

42. **Barrus, M. F.**

1908 The dissemination of disease by means of the seed of the plant host. Proc. Ind. Acad. Sci. 1908:113-126, figs. 1-7. The host list includes bean, pea, wheat, barley, oats, flax, cabbage and sweet corn.

43. **Beecher, H. W.**

1844. Fire blight. Trans. Ind. Hort. Soc. 1902:263-275. An interesting paper on fire blight read before the Society in 1844, by Henry Ward Beecher, the famous preacher.

44. **Bitting, A. W.**

1899 The effects of eating moldy corn. Ind. Agr. Exp. Sta. An. Rep. 1899:44-45. Tests conducted with two horses.

45. _____

1901 Corn smut and disease. Ind. Agr. Exp. Sta. Newsp. Bul. 98. Brief account of the tests in feeding corn smut to live-stock.

46. **Blair, J. C., and Burrill, J. T.**

1902 Prevention of bitter rot. Trans. Ind. Hort. Soc. 1902:290-292. Same in Ind. Agr. Rep. 1902:437-439. Bordeaux mixture recommended.

47. **Bolley, H. L.**

1889. Sub-epidermal rusts. Bot. Gaz. 14:139-145, pl. 1. Notes on various species of *Puccinia* in Indiana.

48. —————
 1889 Wheat rust. Ind. Agr. Exp. Sta. Bul. 26:5-19, figs. 1-9. Detailed description and discussion of the nature of wheat rust.
49. **Brown, Ignatius.**
 1856 Enemies and diseases (of corn). Ind. Agr. Rep. 1856:354-355. Brief description of corn smut with suggestion on control.
50. **Brown, R. T.**
 1868 Rust (on wheat). Ind. Agr. Rep. 1868:364-365. Brief account of wheat rust with suggestions on measures of preventing damage.
51. **Budd, J. K.**
 1885 Blight. Trans. Ind. Hort. Soc. 1885:31. Brief discussion of blight of apple and pear.
52. **Burrill, J. T.**
 1880 Blight, or bacteria ferments in fruit trees. Trans. Ind. Hort. Soc. 1880:84-92. Discussion of bacteria causing fire blight.
53. —————
 1881 Bacteria and pear blight. Trans. Ind. Hort. Soc. 1881:20-24. Report on inoculation experiments.
54. **Conner, S. D.**
 1913 Irish potato scab (*Oospora scabies*) as affected by fertilizers containing sulfates and chlorides. Proc. Ind. Acad. Sci. 1913:131-137, figs. 1-5.
55. **Cunningham, C. A.**
 1899 A bacterial disease of the sugar beet. Bot. Gaz. 28:177-192, pls. 16-20. Review and further investigation of the disease reported on by Arthur and Golden.
56. **Davis, E. W.**
 1895 Rust and fungus diseases of plants. Ind. Agr. Rep. 1895:450-455. General discussion of the nature of fungi, especially of grain smuts and potato diseases. Preventive measures suggested.

57. **Douglas, B. W.**

1908 The diseases of plants. Rep. Ind. State Entomol. 1907-1908: 170-189, fig. 12. Discussion of the diseases of apple, pear, blackberry, cherry, cucumber, grape, maple, peach, raspberry and wheat.

58. _____

1909 Plant diseases. Rep. Ind. State Entomol. 1908-1909:129-168, fig. 36. Discussion of the diseases of apple, catalpa, cherry, chesnut, carnation, ginseng, grape, peach, plum, privet, pear, quince, raspberry and strawberry.

59. _____

1909 Some diseases of the apple. Trans. Ind. Hort. Soc. 1909: 92-101. Description and recommendation of methods of control.

60. _____

1910 Grape diseases. Report Ind. State Entomol. 1909-1910: 205-210, fig. 3. Description and recommendation of methods of control.

61. _____

1911 Diseases of the peach. Rep. Ind. State Entomol. 1910-1911: 53-66, fig. 10. Description and recommendation of methods of control.

62. **Durham, C. B.**

1915 Fire blight of apples and pears. Purd. Univ. Dept. Agr. Ext. Leaflet 63:1-4, fig. 1. Suggests methods of control.

63. **Flick, W. B.**

1903 Shall the fire blight remain unconquered? Trans. Ind. Hort. Soc. 1903:96-101. Same in Ind. Agr. Rep. 1903:360-361. General discussion of the fire blight problem.

64. **Furnas, A.**

1874 Rust in blackberries. Trans. Ind. Hort. Soc. 1874:74. Fourteenth report. Account of personal experience with the disease.

65. **Golden, Katherine.**

1891 Diseases of the sugar beet. Proc. Ind. Acad. Sci. 1891:92-97. Discussion of scab and a new disease thought to be caused by bacteria.

66. **Goodrich, C. E.**

1856 Potato disease. Ind. Agr. Rep. 1856:49-59. Account of mildew rot (blight?). Conducted experiments to prevent it.

67. **Hesler, L. R.**

1911 The New York apple tree canker. Proc. Ind. Acad. Sci. 1911:325-339, figs. 1-7. Detailed description and discussion of *Sphaecopsis Malorum* and its economic importance.

68. **Hobbs, C. M., Reed, W. C., and Flick, W. B.**

1906 Spray calendar of the Indiana Horticultural Society. Trans. Ind. Hort. Soc. 1906:284-285.

69. **Hoffer, G. N.**

1913 A test of Indiana varieties of wheat seed for fungous infection. Proc. Ind. Acad. Sci. 1913:97-98. Reports isolation of a number of imperfect fungi.

70. _____

1913 *Polyporus Everhartii* (Ellis & Gall.) Murrill as a wound parasite. Proc. Ind. Acad. Sci. 1913:99-101, pls. 1-4.

71. _____

1914 The more important fungi attacking forest trees in Indiana. Rep. State Board Forest. 1914:84-97. Figs. 5. Description and discussion of parasitic fungi attacking the wood, leaves and roots of forest trees.

72. **Huston, H. A.**

1895 Sugar beet. Bacterial disease: Effect on sugar content. Ind. Agr. Rep. 1895:523-524.

73. **Johnson, A. G.**

1908 On the heteroecious plant rusts of Indiana. Proc. Ind. Acad. Sci. 1908:87-94. Account of what has been done and what remains to be done in connecting the various forms.

74. _____
 1910 Further notes on timothy rust. Proc. Ind. Acad. Sci. 1910: 203-204. Notes on distribution of the rust in the State.
75. _____
 1911 What about oat smut this year? Ind. Agr. Exp. Sta. Newsp. Bul. 173. Brief account of the formaldehyde treatment.
76. **Kern, F. D.**
 1906 Indiana plant diseases in 1905. Ind. Agr. Exp. Sta. Bul. 111: 121-134. Brief description and discussion of diseases reported by correspondents.
77. _____
 1906 Parasitic plant diseases reported for Indiana. Proc. Ind. Acad. Sci. 1906:129-133, fig. 1. List of diseases reported by correspondents.
78. _____
 1907 Indiana plant diseases in 1906. Ind. Agr. Exp. Sta. Bul. 119: 424-436. Brief description and discussion of diseases reported by correspondents.
79. _____
 1908 The rust of timothy. Proc. Ind. Acad. Sci. 1908:85. Brief note on the occurrence of timothy rust in the State.
80. _____
 1909 Further notes on timothy rust. Proc. Ind. Acad. Sci. 1909: 417-418. Additional notes on distribution.
81. **Kirtland, J. P.**
 1866 Pear tree blight—concerning its cause and cure. Trans. Ind. Hort. Soc. 1866:62-65.
82. **Lemmon, A. W.**
 1856 (Brief reference to wheat diseases.) Ind. Agr. Rep. 1856: 398. Apparently refers to the stinking smut of wheat. Blue vitriol treatment is recommended.
83. **Ludwig, C. A.**
 1912 Fungous enemies of the sweet potato in Indiana. Proc. Ind. Acad. Sci. 1912:103-104. Notes on several fungi causing rots.

84. **M'Cormack, Edna F.**

- 1910 Fungous diseases of the apple. Rep. State Entomol. 1909-1910:128-165. fig. 29. Description and recommendation of methods of control.

85. **Newby, T. T.**

- 1888 Spraying fruit trees. Trans. Ind. Hort. Soc. 1888:18-19. Discussion of spraying apple trees in particular.

86. **O'Neal, Claude E.**

- 1914 Some species of *Nummularia* common in Indiana. Proc. Ind. Acad. Sci. 1914:235-241. Description and key to five species of *Nummularia*, including *N. discreta*, a serious parasite.

87. **Orton, C. R.**

- 1910 Disease resistance in varieties of potatoes. Proc. Ind. Acad. Sci. 1910:219-221.

88. _____

- 1911 The prevalence and prevention of stinking smut in Indiana. Proc. Ind. Acad. Sci. 1911:343-346.

89. **Osner, G. A.**

- 1911 Diseases of ginseng caused by *Sclerotinias*. Proc. Ind. Acad. Sci. 1911:355-364, figs. 1-6. Description of black and crown rots.

90. **Oskamp, J.**

- 1913 Strawberries. Ind. Agr. Exp. Sta. Bul. 164:764. **Brief** reference to leaf spot and mildew of strawberry.

91. **Pipal, F. J.**

- 1914 Oat smut in Indiana. Proc. Ind. Acad. Sci. 1914:191-196. Reference to oat smut demonstrations conducted in cooperation with county agents and data on prevalence of the smut in the State.

91a. **Plumb, C. S.**

- 1891 How to prevent smut in wheat. Hot water treatment **recom-** mended.

92. **Ragan, W. H.**
 1874 Pear blight, its prevention and cure. Trans. Ind. Hort. Soc. 1874:55-57 and 102-109. Thirteenth report.
93. _____
 1874 The pear blight. Trans. Ind. Hort. Soc. 1874:37-38. Fourteenth report. General discussion of the blight problem.
94. _____
 1896 The relations of the red cedar to our orchards. Trans. Ind. Hort. Soc. 1896:85-88.
95. _____
 1906 Pear blight—frozen sap blight. Trans. Ind. Hort. Soc. 1906:150-151. Mentions the origin of the theory that frozen sap is responsible for pear blight.
96. **Ramsey, Glen B.**
 1914 The genus *Rosellinia* in Indiana. Proc. Ind. Acad. Sci. 1914:251-265, pls. 1-3. Description of a number of saprophytic and parasitic species. Key to species.
97. **Ratcliff, J. C.**
 1874 (Remarks on pear blight.) Trans. Ind. Hort. Soc. 1874:20.
98. **Richards, M. W.**
 1912 Orchard spray calendar. Ind. Agr. Exp. Sta. Cir. 34:1-12, figs. 1-8.
99. **R. J. B.**
 1902 Pear blight. Trans. Ind. Hort. Soc. 1902:294-295. Same in Ind. Agr. Rep. 1902:441-442. General discussion of the blight problem.
100. **Roberts, J. W.**
 1910 Some apple diseases common to the middle west. Trans. Ind. Hort. Soc. 1910:48-51. Discussion of scab, bitter and black rots, and rust.
101. _____
 1910 The dilute lime-sulphur sprays versus bordeaux mixture for apple diseases—is bordeaux to be abandoned? Trans. Ind. Hort. Soc. 1910:82:90.

102. **Rose, J. N.**
 1886 The mildews of Indiana. Bot. Gaz. 11:60-63. Enumerates twelve species of Erysiphaceae.
103. **Selby, A. D. and Manns, T. F.**
 1908 A new anthracnose attacking certain cereals and grasses. Proc. Ind. Acad. Sci. 1908:111. *Colletotrichum cereale* n. sp. is reported as being found throughout the State of Ohio.
104. **Simpson, R. A.**
 1902 Spraying. Trans. Ind. Hort. Soc. 1902:237-240. Same in Ind. Agr. Rep. 1902:385-389. Discussion of orchard spraying.
105. **Snyder, Lillian.**
 1897 The germ of pear blight. Proc. Ind. Acad. Sci. 1897:150-156, fig. 1. Account of cultural studies of the bacterial organism causing pear blight.
106. **Stahl, Wm.**
 1891 Spraying: Why, how, when. Trans. Ind. Hort. Soc. 1891:101-103. Discussion of orchard spraying.
107. **Stuart, Wm.***
 1895 Fungicides for the prevention of corn smut. Proc. Ind. Acad. Sci. 1895:96-99. Spraying tests with bordeaux mixture and a solution of ammoniacal copper carbonate.
108. _____
 1898 Bacterial rot of cabbage. Ind. Agr. Exp. Sta. Newsp. Bul. 69. Preventive measures recommended.
109. _____
 1898 The resistance of cereal smuts to formalin and hot water. Proc. Ind. Acad. Sci. 1898:64-70. Tests with spores of *Ustilago Triticæ* and *Ustilago Avenae*.
110. _____
 1899 Asparagus rust, a serious menace to asparagus culture. Ind. Agr. Exp. Sta. Newsp. Bul. 80. Discussion of the nature of the disease and recommendation of preventive measures.

*See, also, No. 19.

111. _____
1900 Corn smut, its cause, remedy, effect upon cattle. Ind. Agr. Rep. 1900:315-318.
112. _____
1900 Formalin as a preventive of millet smut. Ind. Agr. Rep. 1900:532-533.
113. _____
1900 A study of the constituents of corn smut. Proc. Ind. Acad. Sci. 1900:148-152. Same in Ind. Agr. Rep. 1900:533-538.
114. _____
1900 A bacterial disease of tomatoes. Proc. Ind. Acad. Sci. 1900:153-157, figs. 1-3. Same in Ind. Agr. Rep. 1900:539-543. Notes on greenhouse inoculation studies of rot supposed to be caused by bacteria.
115. _____
1901 Formalin as a preventive of oat smut. Ind. Agr. Exp. Sta. Bul. 87:1-26.
116. _____
1901 Spore resistance of loose smut of wheat to formalin and hot water. Proc. Ind. Acad. Sci. 1901:275-282.
117. **Swallow, A. P.**
1911 Pruning and the care of trees in relation of disease and insect control. Rep. State Entomol. 1913-1914:71-101, figs. 23.
118. **Taft, L. R.**
1900 The philosophy of spraying. Trans. Ind. Hort. Soc. 1900:153-160. Discussion of orchard spraying.
119. _____
1905 The potato and potato blight. Trans. Ind. Hort. Soc. 1905:143-148. Same in Ind. Agr. Rep. 1905:523-528. Discussion of the early and late blights.
120. **Templin, L. J.**
1873 Diseases of potato. Trans. Ind. Hort. Soc. 1873:59-60. Brief account of "rot," suggesting probable causes and remedies.

121. _____
 1874 Pear blight. *Trans. Ind. Hort. Soc.* 1875:89-91. General discussion of the fire blight problem.
122. **Thomas, M. B.**
 1897 The effect of formalin on germinating seeds. *Proc. Ind. Acad. Sci.* 1897:144-148. Tests with seeds of oats, rye, corn, buckwheat, millet, beans and others.
123. _____
 1900 Experiments with smut. *Proc. Ind. Acad. Sci.* 1900:123-124. Field tests in the formaldehyde treatment for preventing oat smut.
124. **Trans. Ind. Hort. Soc.**
 1888 (Discussion on black rot of grapes.) 1888:102-104.
125. _____
 1903 (Discussion on root rot of apple.) 1903:121-125.
126. _____
 1903 (Discussion on anthracnose of raspberry.) 1903:217-219.
127. **Troop, J.**
 1893 Spraying as a means of protecting our fruits from insects and fungi. *Trans. Ind. Hort. Soc.* 1893:46-52.
128. _____
 1897 Formulas for making insecticides and fungicides and directions for spraying. *Trans. Ind. Hort. Soc.* 1897:272-277.
129. _____
 1898 Insecticides, fungicides and spraying. *Ind. Agr. Exp. Sta. Bul.* 69:33-40. Same in *Ind. Agr. Rep.* 1898:530-535.
130. _____
 1901 Black knot of the plum and cherry. *Ind. Agr. Exp. Sta. Newsp. Bul.* 90. Same in *Trans. Ind. Hort. Soc.* 1901:245-246, and in *Ind. Agr. Rep.* 1901:425-426. Account of the nature and control of this disease.
131. **Troop, J., Woodbury, C. G., and Boyle, J. G.**
 1910 Growing tomatoes for the canning factory. *Ind. Agr. Exp. Sta. Bul.* 144:509-528, figs. 1-8. Reference to point rot, anthracnose and leaf spot of tomato.

132. **Underwood, Lucien M.**
1893 Report of the Botanical Division of the Indiana State Biological Survey. Proc. Ind. Acad. Sci. 1893:13-67. Includes list of fungi collected in the State.
133. _____
1894 The relations of the red cedar to our orchards. Trans. Ind. Hort. Soc. 1894:81-84.
134. _____
1894 An increasing pear disease of Indiana. Proc. Ind. Acad. Sci. 1894:67. Abstract on the occurrence and description of *Septoria pyricola*.
135. _____
1894 Report of the Botanical Division of the Indiana State Biological Survey for 1894. Proc. Ind. Acad. Sci. 1894:144-156. Includes additions to the list of Indiana fungi.
136. **Van Hook, J. M.**
1910 Indiana fungi. Proc. Ind. Acad. Sci. 1910:205-212. List of species in the collection at Indiana University.
137. _____
1911 Indiana fungi—II. Proc. Ind. Acad. Sci. 1911:347-354, fig 2. Additional list of species collected.
138. _____
1912 Indiana fungi—III. Proc. Ind. Acad. Sci. 1912:99-101. Further report on additional collections.
139. **Webster, F. M.**
1901 Spraying and spraying mixtures. Trans. Ind. Hort. Soc. 1901:115-124. Directions for spraying orchards.
140. **Whetzel, H. H.**
1901 Notes on apple rusts. Proc. Ind. Acad. Sci. 1901:255-260.
141. **White, F. D.**
1893 Spraying fruit for the control of fungi and insects. Trans. Ind. Hort. Soc. 1893:116-118.
142. **Wilson, G. W.**
1905 Rusts of Hamilton and Marion counties, Indiana. Proc. Ind. Acad. Sci. 1905:177-182.

143. _____
1907 The Peronosporales of Indiana. Proc. Ind. Acad. Sci. 1907:
80-84. List of species collected to date.
144. **Woodbury, C. G.**
1907 (Discussion of rust (*Alternaria* leaf spot) and wilt of melons.)
Trans. Ind. Hort. Soc. 1907:190-192.
145. _____
1910 Spraying the orchard. Ind. Agr. Exp. Sta. Cir. 21:1-20,
figs. 1-17. Directions for spraying apple, pear, peach,
plum and cherry trees.

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