

**A Compilation of Plant Diseases and
Disorders in Indiana—1987**

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Introduction

The Plant Diagnostic Clinic in the Department of Botany and Plant Pathology at Purdue University is a service of the Cooperative Extension Service, Purdue Agricultural Experiment Station. Plant disease diagnosis and weed identification are gratuitous services offered by the clinic. Approximately 70% of the samples submitted annually come from county extension agents. The remainder come directly from commercial growers, homeowners, private consultants and other interested persons. This paper is a summary of the major plant diseases and disorders which were diagnosed in the clinic and throughout the state in 1987.

Methods

Plant specimens are submitted to the Plant Diagnostic Clinic from county extension agents, homeowners, growers, nursery operators, consultants, and others. Specimens are diagnosed visually or by culturing the pathogen on selected media. Some virus diseases are diagnosed serologically and others by the leaf dip (negative stain) technique utilizing the electron microscope. Once a disease or disorder is diagnosed, appropriate control measures are suggested. A summary of the samples diagnosed from January 1 through November 25, 1987 is given in Table 1.

Results

As of November 25, 1987 the clinic had received 1105 samples, including ornamentals, fruits, vegetables, turf and agronomic crops. Of these samples approximately 50% were diagnosed as infectious disease problems, 23% were diagnosed as environmental disorders, 6% were diagnosed as chemical injury, and 4% exhibited a nutritional problem. The remaining samples were either damaged by insects, were poor samples or lacked adequate information for a proper diagnosis.

In general, temperatures were above normal and precipitation was below normal for most areas of the state during the entire growing season. Warm dry weather in May and June prevented serious disease epidemics from occurring on spring crops. However, localized areas of the state received sporadic thunderstorms in July, with some of these storms producing up to 8 inches of rainfall in a 24 hour period. Disease conditions were directly related to these weather patterns. The wet weather in the latter part of the growing season did promote severe disease outbreaks on several main season and late season crops.

Shade and Ornamental Trees

Diseases: Apple scab (*Venturia inaequalis*) of crabapples was very light in early spring due to dry weather, however, symptoms were evident by late spring and continued to increase in severity throughout the growing season. Anthracnose (*Gloeosporium* sp.) of sycamore and ash was light to moderate in most areas of the state, resulting in some minor defoliation during late May and early June. Anthracnose of white oak and hard maple was negligible. Rust (*Gymnosporangium* sp.) on hawthorn and crabapples was

Table 1. Plant samples received in the Purdue Plan Diagnostic Clinic
Jan 1 through Nov 25, 1987.

Plant Samples	Number of Samples	Diseases ²	Disorders ³	Chem. ⁴	Nutr. ⁵	Insect ⁶	Other ⁷
AGRONOMIC							
Corn	91	55	24	17	5	8	22
Soybeans	179	130	13	7	15	4	22
Small Grain	35	25	7	0	0	0	12
Forage Grasses and Legumes	24	15	2	4	1	8	4
ORNAMENTAL							
Trees-Shade and Ornamental	329	89	123	16	7	73	89
Shrubs and Groundcover	86	33	31	7	1	15	21
Flowers	73	42	5	5	4	5	16
House plants	11	2	4	0	0	1	3
FRUIT							
Tree Fruit	84	49	13	2	1	17	23
Small Fruit	45	29	7	1	1	4	10
VEGETABLE	90	44	18	6	5	4	24
TURFGRASS	58	45	9	2	0	7	11
WEED IDENTI- FICATION	163	—	—	—	—	—	—
TOTAL	1268	558	256	67	40	146	248

¹ The number of diagnosed problems add up to more than the number of samples received since many samples may have more than one problem.

² Problems caused by an infectious disease causing agent, e.g. fungus, bacterium, virus, mycoplasma, nematode.

³ Problem caused by noninfectious environmental stress, e.g. wind, drought, heat, soil compaction.

⁴ Problem caused by herbicide/pesticide misuse.

⁵ Problem caused by a nutrient imbalance.

⁶ Problem caused by an insect. Does not include samples submitted to Entomology Diagnostic Clinic.

⁷ "Other" includes the causal agent categories: No disease, and inadequate sample for diagnosis.

almost nonexistent due to the early dry conditions. *Diplodia* tip blight (*Sphaeropsis* sp.)¹ continued to be of common occurrence in Austrian, red and scotch pine plantings. *Verticillium* on maple and redbud, Dutch Elm Disease (*Cerotocystis ulmi*), *Rhizosphaera* on spruce, and tatters on oak, a still undiagnosed malady, were prevalent. Ash yellows, a disease caused by a mycoplasma, was recognized in northern Indiana and 2 southern counties in Indiana (9) and confirmed by Dr. Sinclair of Cornell University. The extent and importance of ash yellows in Indiana is not yet known. White pine root decline (*Verticicladiella* sp.) was also diagnosed.

Disorders: Decline of maples continues to be the most common shade tree disorder. Decline was again most prevalent on older street trees planted in restricted sites and subjected to a variety of urban stress factors, eg. road salts, soil compaction, air pollutants, etc. Tree decline was also common on hickory, oak and ash. Late season leaf scorch due to extended drought periods was common. Iron chlorosis of pin oak remains the most frequently recorded nutritional disorder. Exposed buttress roots on deciduous trees, particularly silver maple, as well as loss of normal needle color on spruce were common environmental-site related problems.

Ornamentals

Disease: There were no widespread diseases of major occurrence on ornamentals. As in previous years, powdery mildew (*Erysiphe* sp.) was severe during late summer on lilac,

zinnia, dahlia and numerous other susceptible hosts. Kabatina twig blight was again diagnosed throughout Indiana (7,8). *Alternaria* and *Botrytis* blights on zinnia and marigold were frequently diagnosed. *Sclerotinia* damping off on ajuga, a ground cover, was a severe problem in several nurseries. *Phoma* tip dieback on vinca and *Volutella* leaf and stem blight on pachysandra were prevalent.

Disorders: Cold injury was prevalent on cotoneaster throughout middle and northern Indiana. Winter desiccation (browning) of junipers and other evergreens was common as in previous years, but not severe (1,2,3,4,5,6,7,8). A wilting and stunting of commercially field-grown statice was diagnosed as root girdling and compaction.

Tree Fruits

Disease: Early season apple scab (*V. inaequalis*) and cedar apple rust (*Gymnosporangium juniperi-virginianae*) were of minor occurrence due to early dry spring weather. Fire blight (*Erwinia amylovora*) of pear and apple was severe in localized areas of southern Indiana but was not widespread, as experienced the previous year (1986) (8). Fire blight was confined to the extreme southern portion of the state. Very little blight was reported in middle and northern Indiana. Above normal wet periods during summer resulted in sooty blotch (*Gloeodes pomigena*) and fly speck (*Microthyriella rubi*) diseases of apple fruit being extremely common throughout the state. Brown rot of cherry (*Monilinia fructicola*) was prevalent at harvest, especially in northern areas of the state.

Disorders: Hail damage was the most noticeable disorder. The extent of hail damage was widely variable depending on orchard location. Extended summer drought periods resulted in scattered reports of death of newly planted trees and older stressed trees. Bitter pit on apples, a calcium deficiency/site stress/weather related problem was again diagnosed on red delicious and jonathans (6,7,8).

Small Fruits

Disease: Severe outbreaks of orange rust (*Gymnoconia peckiana*) of blackberries and raspberries were reported for individual plantings in both southern and northern Indiana. Strawberry leaf diseases (*Dendrophoma* sp.; *Diplocarpon* sp.) were prevalent during late summer and early fall. Black rot (*Guignardia bidwellii*) on grape was frequently diagnosed on samples from homeowners.

Disorders: There were no prominent disorders recorded for small fruits.

Vegetables

Crucifers: Black rot (*Xanthomonas campestris*) continues to concern growers. Not many fields of cabbage, cauliflower or broccoli were affected by this disease, but the few that were affected suffered severe losses. Brown bud, a physiological disorder that causes decay of broccoli heads was particularly prevalent among fall crops in the northern part of the state. For the first time in 6 years, brown bud also was observed on cauliflower. Black leaf spot (*Alternaria brassicae*) remains a serious problem to cauliflower growers. Most growers avoided economic loss by following a diligent (and expensive) fungicide spray program. Incidence of leaf spot on cabbage and broccoli was very low. White rust (*Albugo candidans*) was identified on spinach and mustard greens in the northern part of the state.

Cucurbits: The usual contingent of diseases on muskmelon and watermelon prevailed in 1987 (1,2,3,4,5,6,7,8). *Fusarium* wilt (*Fusarium oxysporum*) gummy stem blight (*Didymella bryoniae*), and anthracnose (*Colletotrichum orbiculare*) occurred with moderate frequency. *Alternaria* leaf blight (*Alternaria cucumerina*) remains the greatest threat to muskmelon production. Successful growers managed the disease through a combination of cultural practices and a diligent fungicide spray program. Bacterial wilt (*Erwinia*

tracheiphila) occurred on muskmelons in low frequency because of sound insect management tactics used by Indiana farmers. Powdery mildew (*Sphaerotheca fuliginea*) was identified on June 19 in a commercial muskmelon field in southwestern Indiana. Throughout the summer, specimens of mildew infected leaves were examined microscopically to determine whether the mildew species was *S. fuliginea* or *Erysiphe chicoracearum*. For all 31 samples from various cucurbits in different parts of the state, the pathogen species was identified as *S. fuliginea*. (With the aid of KOH, fibrosin bodies (small crystals) are visible in the *S. fuliginea* conidia while conspicuously absent in the *E. chicoracearum* conidia, thus allowing for positive diagnosis of the powdery mildew genus.) Downy mildew (*Pseudoperonospora cubensis*) was not observed on cucurbits in 1987. Root knot nematode (*Meloidogyne incognita*) was diagnosed in 4 muskmelon and 3 watermelon fields in Knox and Gibson counties. Zucchini yellow mosaic virus was identified in several muskmelon, squash, and pumpkin fields. The disease appeared to spread quickly and caused economic yield loss in an early muskmelon field and a late pumpkin field. Pumpkins were also infected with powdery mildew, black rot, and anthracnose diseases. Pickling and slicing cucumbers remained almost disease-free, except for bacterial wilt and an unusual amount of anthracnose in varieties previously considered resistant. Non-infectious disorders of cucurbits such as injury from triazine herbicide carry over, magnesium deficiency, manganese toxicity, and molybdenum deficiency also were identified.

Tomatoes: Southern bacterial wilt (*Pseudomonas solanacearum*) was a major concern among processing tomato growers. Bacterial canker (*Clavibacter michiganense* var. *michiganense*) was particularly severe among several varieties of commercially grown fresh market tomatoes. Bacterial speck (*Pseudomonas syringae* var. *tomato*) occurred with greater than usual frequency on irrigated tomatoes in the southern third of the state. Wet weather in the middle-eastern portion of the state promoted severe outbreaks of anthracnose (*Colletotrichum coccodes*) on tomato fruit, especially in fields harvested in mid-September. Tomato early blight (*Alternaria solani*) caused no severe problems, and late blight (*Phytophthora infestans*) was not diagnosed in Indiana for the fifth consecutive year. Septoria leaf spot (*Septoria lycopersici*) was the foliar disease of major concern in commercial and home garden tomatoes.

Beans: White mold (*Sclerotinia sclerotiorum*) caused a few problems on green beans grown for processing. Bean rust (*Uromyces phaseoli*), common blight of beans (*X. campestris* var. *phaseoli*), and halo blight (*P. syringae* var. *phaseolicola*) were diagnosed on late season, fresh market beans. Rust and white mold problems are expected to continue as bean acreage increases in our state.

Peppers: Bacterial spot (*Xanthomonas campestris* pv. *vesicatoria*) was presumed to be introduced into bell pepper fields in Indiana by infected transplants shipped from the southern states. The cultivar Jupiter was severely affected; many Jupiter crops were total losses this year due to bacterial spot alone. Other varieties in adjacent fields were affected later in the season, but losses were not as severe. Phytophthora blight (*Phytophthora capsici*) continued to plague northern pepper fields. Sunscald and blossom end rot were prevalent in many non-irrigated pepper fields.

Other Vegetables: Scab (*Streptomyces scabies*) was diagnosed on potatoes. Hollow heart, a noninfectious, high temperature related malady was diagnosed frequently on potatoes from homeowners' gardens. Rust (*Puccinia sorghi*) reduced the value of Indian corn. This disease causes premature death and blemishes on wrapper leaves. Common smut (*Ustilago maydis*) also was identified on sweet corn with the usual frequency. Rust (*Puccinia asparagi*) was identified on asparagus ferns from northern Indiana. Botrytis blast (*Botrytis cinerea*) and Alternaria purple blotch (*Alternaria porri*) were diagnosed on onions.

Agronomic Crops

Diseases—Corn: Seedling blight due to *Fusarium spp.*, primarily *Fusarium moniliforme*, was widespread. It was most pronounced and severe on young seedlings in fields where soil compaction, herbicide injury or other stress factors compounded the stresses of above normal temperatures and dry soil conditions. Most infection appeared to occur in the mesocotyl tissues. When infection occurred early in seedling development, many seedlings were killed. When infection occurred later as the nodal root systems were developing, seedlings were sometimes killed, but, more frequently, they were temporarily stunted and weakened. Consequently, many fields exhibited uneven plant development early in the season. In some fields increased Fusarium stalk rot at harvest time appeared to be related to the degree of seedling blight. Some genotypes were more affected than others.

Gray leaf spot (*Cercospora Zea-maydis*) was much more widespread in the southern half of Indiana in 1987 than it was in 1986, but individual fields appeared to be less severely affected (8). The disease was observed or reported from many of the counties south of Indianapolis. Races 1 and 2 of the Northern Corn Leaf Blight fungus (*Exserohilum turcicum*) were again identified from individual fields in 1987, but the disease was less damaging than in 1986. As in 1986, most of the Northern Corn Leaf Blight occurred in the east central and southern parts of the state. Southern Corn Leaf Blight (*Bipolaris maydis* race O), Northern Corn Leaf Spot (*Cochliobolus carbonum*) and Anthracnose leaf blight and top kill (*Colletotrichum graminicola*) were commonly found diseases, but caused little or no yield losses, except in some seed production fields. The leaf blight phase of Stewart's Disease (*Erwinia stewartii*) was widespread but damaging only in fields planted to highly susceptible inbreds and hybrids. The vector of this bacterial pathogen, the corn flea beetle, overwintered quite well due to the mild winter conditions, and high populations of the vector were present throughout the growing season.

Stalk rots were the most prevalent and damaging diseases to corn in 1987. Early maturity and good weather conditions at harvest time greatly reduced stalk rot losses in many fields. Premature killing of plants due to stalk rots was limited to individual fields, and reduced yield through light weight, chaffy kernels in addition to stalk lodging. Fusarium Stalk Rot (*Fusarium moniliforme*) and Anthracnose Stalk Rot (*Colletotrichum graminicola*) were the most prevalent stalk rots encountered. Gibberella Stalk Rot (*Gibberella zeae*) Diplodia Stalk Rot (*Stenocarpella maydis*) (*Diplodia maydis*), and Charcoal Stalk Rot (*Macrophomina phaseolina*) were other stalk rot diseases that were observed or reported, but occurred with less frequency than Fusarium and Anthracnose stalk rots.

Diplodia Ear Rot (*S. maydis*) was very severe in limited areas of southern Indiana. Some fields had 30% of the ears entirely rotted. While the disease was primarily limited to southern Indiana, light infections were found as far north as Tippecanoe County. Overall, Diplodia Ear Rot was more severe and widespread in Indiana in 1987 than it has been in more than 25 years (1,2,3,4,5,6,7,8).

Sorghum Downy Mildew (*Peronosclerospora sorghi*) was found for the second year in succession in Tippecanoe County. In 1987, the disease was identified from dent and pop corn as well as sorghum and Sudax.

Diseases—Soybeans: Most soybeans were planted in relatively dry, warm soils and there was a minimal amount of seedling blight problems observed or reported. Unlike corn, these soil conditions did not appear to stress the young soybean seedlings. Rhizoctonia Root Rot (*Rhizoctonia solani*) was a commonly reported early season problem, but in most cases this disease was found in association with suspected herbicide injury. The Phytophthora Root Rot organism (*Phytophthora megasperma* var *sojae*) was isolated from many specimens from areas that received heavy rainfall from sporadic thunderstorms

in July. In many cases, the organism was isolated from plants that did not exhibit typical Phytophthora Root Rot symptoms. *Verticillium* sp. was also isolated from several wilting soybean plants.

Foliar diseases such as Brown Spot (*Septoria glycines*) and Bacterial Blight (*Pseudomonas syringae* pv *glycinea*) were commonly found, but infection was light. Downy Mildew (*Peronospora manschurica*) was prevalent in east central Indiana, and especially in Henry and Randolph Counties. Yield losses from Downy Mildew were estimated to be minimal even in areas where the disease was widespread. Minor instances of Stem Canker (*Diaporthe phaseolorum*) were reported from individual fields, primarily from the southern part of the state.

Sudden Death Syndrome, a disorder of unknown etiology, was more severe in southwestern Indiana in 1987 than it was in 1985 or 1986. Yield losses in individual fields were as much as 40 to 60%. The problem was identified for the first time in Putnam and Benton Counties, but yield losses were minor. Brown Stem Rot (*Phialophora gregata*) was observed or reported from several fields in the northwestern part of the state. Yield reductions in some fields affected with Brown Stem Rot were reported to be 10 to 20%. Charcoal Root Rot (*Macrophomina phaseolina*) was observed or reported from numerous fields in the state. The disease appeared to be most prevalent in the southern half of Indiana, although it was identified in several northern Indiana locations. Yield reductions of 20% or more were reported from severely infected fields.

Diseases—Wheat: Infectious disease were of minor importance in wheat production during 1987. Early in the spring, Septoria Leaf Blotch (*Mycosphaerella graminicola*; (*Lep-tosphaeria nodorum*), Powdery Mildew (*Erysipha gamminis* f. sp. *tritici*) and Tan Spot (*Pyrenophora trichostoma*) were present in many fields in the state. Dry weather, however, prevented these diseases from developing to damaging proportions. Barley Yellow Dwarf Virus was probably the most widespread, but most infections occurred in the spring and yield losses were not sizeable. Barley Yellow Dwarf Disease was very extensive and damaging to susceptible oat varieties.

Pythium Root Rot (*Pythium* spp.) was identified from two different fields. This is a rarely identified disease in this state, possibly due to confusion with other root pathogens. While the disease was identified from only two fields, the disease may have been more widespread.

Take-all (*Gaeumannomyces, graminia* var. *tritici*), Fusarium Root Rot (*Fusarium* spp.) and Rhizoctonia Root Rot and Sharp Eyespot (*Rhizoctonia solani*) were root rots also identified, but these disease were of minor importance, except in a few fields.

Diseases—Forages: Sclerotinia Crown and Stem Rot of alfalfa (*Sclerotinia trifoliorum*; *S. sclerotiorum*) caused severe damage to young plants in some fields that were seeded in the fall 1986. The disease was identified from fields scattered over the entire state.

Foliar and stem diseases of alfalfa were common throughout the state. The severity of these diseases was dependent upon the amount of rainfall received in a particular location. Lepto Leaf Spot (*Leptosphaerulina medicaginis*) and Spring Blackstem (*Phoma medicaginis*) were the most commonly observed. Both quality and yield were reduced in some fields. Anthracnose (*Colletotrichum trifoli*) occurred in some fields, but the disease appeared to be relatively light. However, anthracnose crown rot was suspected in some fields that suffered stand reductions during the summer.

Phytophthora Root Rot (*Phytophthora megasperma*) was identified in a few fields, but was not severe in 1987. The Crown Root Rot Complex, a disease of the crowns that can be induced by numerous fungi, appeared to cause stand reductions in many fields scattered over the state. Violet root rot (*Rhizoctonia crocorum*) was diagnosed on alfalfa from Knox County.

A leafspot on Fescue from northern Indiana was identified as *Stagnospora* sp.

Turfgrasses

Snow Molds (*Typhula* spp.; *Fusarium* spp.) were observed in many areas in the late winter. Helminthosporium leafspot diseases (*Dreschlera* spp.; *Bipolaris* spp.) were common throughout the state in the early spring on bluegrasses, fescues and ryegrasses. Leaf Rust (*Puccinia* spp.) occurred in many northern Indiana lawns late in the fall.

Patch diseases (*Leptosphaeria korrae*; *Phialophora graminicola*; *Rhizoctonia solani*) were common summer diseases identified on *Poa pratensis* and *Poa annua*. Due to the extreme environmental stresses placed on turfgrasses during the summer, it was difficult to ascertain whether turfgrass death was the result of disease or environmental conditions without laboratory studies.

Discussion

A compilation of plant disease information, such as this, could be an invaluable tool in determining the problems that require attention by extension personnel. Through proper diagnosis of plant problems and the subsequent rendering of proper methods of control it is hoped that both the economic and aesthetic losses caused by plant diseases can be reduced in future years.

Literature Cited

1. Evans, G.E., D.H. Scott and P.C. Pecknold. 1980. A Compilation of Plant Diseases and Disorders in Indiana—1980. Proc. Indiana Acad. Sci. 90:91-104.
2. Evans-Ruhl, G.E., R.X. Latin, P.C. Pecknold, and D.H. Scott. 1981. A Compilation of Plant Diseases and Disorders in Indiana—1981. Proc. Indiana Acad. Sci. 91:20-139.
3. Pecknold, P.C., W.R. Stevenson, and D.H. Scott. 1974. A Compilation of Plant Disease and Disorders in Indiana—1974. Proc. Indiana Acad. Sci. 84:71-84.
4. Ruhl, G.E., R.X. Latin, P.C. Pecknold, and D.H. Scott. 1982. A Compilation of Plant Diseases and Disorders in Indiana—1982. Proc. Indiana Acad. Sci. 92:97-177.
5. Ruhl, E.G., R.X. Latin, P.C. Pecknold, and D.H. Scott. 1983. A Compliation of Plant Diseases and Disorders in Indiana—1983. Proc. Indiana Acad. Sci. 93:103-120.
6. Ruhl, G.E., R.X. Latin, P.C. Pecknold, and D.H. Scott. 1984. A Compilation of Plant Diseases and Disorders in Indiana—1984. Proc. Indiana Acad. Sci. 94:145-150.
7. Ruhl, G.E., R.X. Latin, P.C. Pecknold, and D.H. Scott. 1985. A Compilation of Plant Diseases and Disorders in Indiana—1985. Proc. Indiana Acad. Sci. 95:115-119.
8. Ruhl, G.E., R.X. Latin, P.C. Pecknold, and D.H. Scott. 1986. A Compilation of Plant Diseases and Disorders in Indiana—1986. Proc. Indiana Acad. Sci. 96:
9. Personal correspondence with Phil Marshall—State Forester—Vallonia, IN.

