

**2016 Delaware Plant Diagnostic Clinic Report**  
**UD Cooperative Extension, Department of Plant and Soil Sciences**  
**University of Delaware**

**Nancy F. Gregory, Plant Diagnostician**  
**Brian A. Kunkel, Ornamentals IPM Specialist**  
**Nathan Kleczewski, Extension Plant Pathologist**

The Plant Diagnostic Clinic at the University of Delaware is housed in the Department of Plant and Soil Sciences, and is located in Townsend Hall, Room 151. The clinic serves the public through Delaware Cooperative Extension, directly serving commercial growers, crop consultants, nurserymen, landscapers, public gardens, and private homeowners. Samples are also received through county offices, from Extension professionals and the Master Gardener Program. The clinic is the National Plant Diagnostic Network (NPDN) laboratory for Delaware, and the plant pathology diagnostic laboratory for Delaware Department of Agriculture and USDA/APHIS CAPS. The clinic operates with one full-time staff, the Plant Diagnostician, cooperating with the Extension Plant Pathologist and the Ornamentals IPM Specialist in Entomology, numerous Extension Agents, and one part time employee.

During 2016, the Plant Diagnostic Clinic processed approximately 656 non-survey routine clinic samples. Nursery surveys for Delaware Department of Agriculture resulted in a few samples of boxwood and gardenia. Other samples were diagnosed in field situations, and not brought in for analysis. Phone inquiries and e-mail requests for information accounted for undocumented samples in addition to physical specimens submitted to the lab. In Cooperative Extension's online Ask an Expert service through eXtension.org, 143 questions were answered by Nancy via e-mail in 2016. Over 50 % of the total questions answered via Ask an Expert for Delaware involved trouble-shooting of suspected disease or cultural issues with plants. Some trouble-shooting plant samples for plant parasitic nematodes were processed in the lab.

Weather conditions in 2016 contributed to plant stress, favored pathogens on many hosts, and affected establishment of new plantings. There was a hard freeze in late April and again in May, as some plants were leafing out. Conditions during 2016 included fluctuating rainfall, which resulted in periodically saturated soils and sometimes droughty soils. Adding to root stress was a dry period for approximately five weeks during August and September. Adequate moisture early benefited many agronomic crops such as corn,

soybeans, and vegetables, and the late season dry spell resulted in lower foliar disease incidence later in the season. Moisture stress and compromised root systems were an issue and will lead to problems in the spring of 2017. Rainfall totals were compiled from the Delaware Environmental Observation System (DEOS), as follows:

**DEOS Summary 2016 – Rainfall in inches**

<b><u>2016</u></b>	<b><u>Newark</u></b>	<b><u>Dover</u></b>	<b><u>Georgetown</u></b>
<b><u>April</u></b>	<b><u>3.33</u></b>	<b><u>2.84</u></b>	<b><u>3.49</u></b>
<b><u>June</u></b>	<b><u>12.64</u></b>	<b><u>10.30</u></b>	<b><u>5.90</u></b>
<b><u>August</u></b>	<b><u>2.61</u></b>	<b><u>2.79</u></b>	<b><u>3.25</u></b>
<b><u>September</u></b>	<b><u>4.69</u></b>	<b><u>4.07</u></b>	<b><u>3.37</u></b>
<b><u>December</u></b>	<b><u>2.01</u></b>	<b><u>2.63</u></b>	<b><u>3.27</u></b>
<b><u>Yearly total</u></b>	<b><u>41</u></b>	<b><u>46</u></b>	<b><u>55</u></b>

\* Normal is 40 in/yr

Of the 656 routine samples received, the majority (491) were from Delaware (75 %). Others were received from Maryland, Pennsylvania, and Virginia, totaling 164 samples, or 25 % from out of state. Almost all were physical samples (99 %), although several were digital images only. A few samples were processed for Delaware clients through Bartlett Tree Labs in North Carolina. Commercial samples (growers, crop consultants, landscapers, etc.) received through Cooperative Extension accounted for 55 % of samples.

There were many different diagnoses, from different crop areas, with over 90 % of samples submitted for Disease ID, or unthrifty plants. The crop sources for those were, in order of predominance: Ornamentals (55 %), Vegetables (22%), Field Crops (10%), Fruit, Turf, Insect ID, Fungal ID, and Christmas trees. The diagnosis categories ranked in incidence as follows:

- Environmental/Physiological
- Fungal Diseases
- Bacterial Diseases
- Viral Diseases
- Nematodes
- Insect (Damage and ID's)
- Plant/Weed ID
- Fungal ID

Percentages were not determined for diagnoses, due to multiple diagnoses for many samples. For example, insect damage and fungal dieback were common on physiologically stressed trees. Numbers show that physiological and environmental stresses are primary or play a role in over 40% of samples received, and was the primary diagnosis in over 30% of samples. The diagnosis of environmental stress, when communicated, can save growers and landscapers money and time when they avoid unnecessary spray treatments if there is no specific pest present. Accurate diagnosis is central to maintaining good plant health.

No USDA quarantine pests were detected, which is beneficial for trade implications. Bacterial black leg caused by *Dickeya* species was found on potato, as a part of a larger problem with potato seed piece infection in several states. *Dickeya dianthicola* was identified as a first state report from Delaware by USDA APHIS PPQ, CPHST. Ongoing research is being done to determine the exact pathogens involved, the source, and the extent of the problem. Boxwood was monitored in retail sites, and several samples tested for boxwood blight. No boxwood blight detections were made, but various boxwood pathogens were found. One sample of downy mildew on sweet basil was confirmed late in the season.

New reports for the year 2016 included (may not be first occurrence):

- 1) Fig buttercup (*Ranunculus ficaria*)
- 2) Puncturevine (*Tribulus terrestris*)
- 3) Sweetroot (*Osmorhiza* spp.)
- 4) White Avens (*Geum canadense*)
- 5) *Dickeya dianthicola* on potato (confirmed by USDA/APHIS, first state record)
- 6) Bishops goutweed (*Aegopodium podagraria*)
- 7) Fusarium stem rot on pumpkin (*Fusarium equiseti*)
- 8) Armored Scales on bamboo (Family Diaspididae)
- 9) Black leaf spot on broccoli (*Alternaria brassicicola*)
- 10) Skin blotch on garlic (*Alternaria embellisia*)
- 11) Leaf spot on hops (*Cercospora beticola*)
- 12) Bamboo spider mite on *Sasa veitchii*
- 13) Black rot (*Xanthomonas campestris*) on kale
- 14) Powdery mildew (*Erysiphe betae*) on kale
- 15) Russian thistle (*Salsola iberica*) from Blair Co., PA
- 16) Blue mold on tobacco (*Peronospora hyoscyami* f.sp. *tabacina*)

**First State Report Data for Delaware 2016 (first time entered in database, may not be first occurrence)**

Sample Date	State	Diagnostic Lab	Pest	Host
2016-12-14	DE	0830 (DE)	Earthstars [ Family Geastraceae ]	Arborvitae
2016-11-20	DE	0830 (DE)	Wood rot fungus; Sheep's head [ Grifola frondosa ]	Oak
2016-11-09	DE	0830 (DE)	Fusarium crown and stalk rot [ Fusarium sp./spp. ]	Sorghum
2016-11-09	DE	0830 (DE)	Guttation [ Abiotic disorder ]	Malabar Chestnut
2016-10-22	DE	0830 (DE)	Sedges [ Family Cyperaceae ]	Grasses
2016-09-27	DE	0830 (DE)	Unidentified insect egg [ Unidentified Insect Egg ]	Azalea; Rhododendron
2016-09-27	DE	0830 (DE)	Unspecified pathology [ Fusarium equiseti ]	Pumpkin
2016-09-14	DE	0830 (DE)	Earth ball [ Scleroderma sp./spp. ]	Mulch
2016-09-14	DE	0830 (DE)	Katydid [ Microcentrum sp./spp. ]	Home and Garden
2016-08-20	DE	4304 (NC)	Woolly apple aphid [ Eriosoma lanigerum ]	Firethorn
2016-08-09	DE	4304 (NC)	Needle blight [ Phyllosticta sp./spp. ]	Juniper
2016-08-08	DE	0830 (DE)	Bitter rot [ Colletotrichum sp./spp. ]	Common Apple
2016-07-26	DE	4304 (NC)	Armillaria root rot; Butt rot [ Armillaria sp./spp. ]	Copper Beech
2016-07-25	DE	0830 (DE)	Bishops goutweed [ Aegopodium podagraria ]	Plant Id Request
2016-07-10	DE	0830 (DE)	Fishing spider [ Dolomedes sp./spp. ]	Home and Garden
2016-07-08	DE	0830 (DE)	Oriental beetle [ Anomala orientalis ]	Lettuce
2016-06-30	DE	0830 (DE)	Gall [ Unidentified Agent ]	Hickory
2016-06-05	DE	0830 (DE)	Potato black leg; Stem rot [ Dickeya dianthicola ]	Potato
2016-06-13	DE	0830 (DE)	Bacterial soft spot [ Pectobacterium sp./spp. ]	Lettuce
2016-06-10	DE	0830 (DE)	Unidentified spider [ Unidentified Spider ]	Home and Garden
2016-06-06	DE	4304 (NC)	Honeylocust plant bug [ Blepharopterus (Diaphnocoris) chlorionis ]	Thornless Honeylocust
2016-05-23	DE	4304 (NC)	Azalea bark scale [ Eriococcus azaleae ]	Azalea; Rhododendron
2016-05-10	DE	0830 (DE)	Constriction canker [ Diaporthe amygdali ]	Peach
2016-05-05	DE	0830 (DE)	Sweetroot [ Osmorhiza sp./spp. ]	Plant Id Request
2016-05-05	DE	0830 (DE)	Anthraxnose; Twig dieback [ Colletotrichum sp./spp. ]	English Ivy
2016-05-05	DE	0830 (DE)	White avens [ Geum canadense ]	Plant Id Request
2016-04-28	DE	0830 (DE)	Curculionid bark beetles [ Family Curculionidae ]	Home and Garden
2016-04-28	DE	0830 (DE)	Stinkhorn mushrooms [ Family Phallaceae ]	Home and Garden
2016-04-21	DE	0830 (DE)	Puncturevine [ Tribulus terrestris ]	Plant Id Request
2016-04-21	DE	0830 (DE)	Common sawflies [ Family Tenthredinidae ]	Home and Garden
2016-04-15	DE	0830 (DE)	Japanese honeysuckle [ Lonicera japonica ]	Plant Id Request
2016-04-05	DE	0830 (DE)	Fig buttercup [ Ranunculus ficaria ]	Plant Id Request

Agronomic Crops – Fewer samples were received in 2016 due to field visits and determinations made by field pathologists. Soybean vein necrosis (SVNV) was scattered throughout the state in 2016. Soybean sudden death syndrome caused by *Fusarium virguliforme* was diagnosed in one sample. Foliage diseases of soybean, such as downy mildew, Septoria brown spot, bacterial blight, Phyllosticta leaf spot, frog-eye leaf spot and Cercospora blight were noted at low levels during the season. Brown stem rot caused by *Cadophora (Phialophora) gregata* was confirmed in one field of soybean (D. Malvick, Minnesota), and was suspected in another.

Weather conditions in the spring of 2016 were favorable for seedling diseases such as damping off and Pythium root rot in early planted agronomic crops. Mesocotyl rot of corn seedlings caused by a complex of *Fusarium*, *Pythium*, and bacteria was diagnosed in several fields. Barley yellow dwarf virus was observed at low incidence in wheat and barley, along with a few samples of head scab. Foliar diseases on corn included anthracnose, northern corn leaf blight (NCLB), and gray leaf spot. Thrips damage showed up severely on one specimen of sweet corn. Charcoal rot, Diplodia, Pythium and Fusarium stalk rots were diagnosed, and late season lodging was observed in some corn stalks, from poor root systems that did not establish well in saturated soils in the spring.

Vegetables – *Pythium*, *Fusarium*, and *Phytophthora* were recovered from crown, root and stem rots on pepper, tomato, snap bean, spinach, squash, and also on annual bedding plants such as begonia, phlox, pansy, petunia, and periwinkle. *Sclerotinia sclerotiorum* was found on snap bean and garden peas. Watermelon samples were confirmed for bacterial fruit blotch, gummy stem blight, anthracnose, Alternaria leaf spot, and other foliar spotting, as well as crown rots and fruit rots. Cucurbit downy mildew appeared on cucumber in June, and was later reported on other cucurbits, including watermelon. *Phytophthora capsici* was confirmed on pepper stems and cucurbit fruit in Sussex County, but not with severe incidence reported in 2016. Fusarium stem rot (*F. equiseti*) was found on the cut stems of pumpkin, causing “handles” to rot and fall off. Bacterial angular leaf spot due to *Pseudomonas* was identified on cantaloupe. Due to dry weather in August, few foliar and stem diseases were diagnosed on lima beans and pole limas, but some bacterial brown spot (*Pseudomonas syringae*) was found early. A Cercospora leaf spot was identified on hops.

Fruit – Notable diseases on fruit included downy mildew, anthracnose, Botrytis blight, and Phomopsis twig and cane dieback on grape, and Phomopsis canker/blight due to *P. amygdali* on peach twigs. Orange rust and raspberry gall wasp were found on blackberry and raspberry. Strawberry plants were diagnosed with Botrytis crown rot, Mucor fruit rot, Pseudomonas angular leaf spot, Phomopsis blight, low pH injury, and grub damage.

Ornamentals – Numerous boxwood samples were received, but boxwood blight was not detected in 2016. There are many factors in boxwood decline in the region. Thousand cankers disease of walnut has not been detected in Delaware to date. Emerald ash borer was detected in one trap in Hockessin, DE, prompting educational efforts and spray programs.

Winter injury and uneven soil moisture led to root death and root rot on many ornamental plants, resulting in dieback on evergreens, and leaf scorch symptom on hardwoods such as maples. Late frost injury was severe on hydrangea, boxwood, forsythia, and lily. Evergreen ornamentals suffered tip and twig dieback, and *Diplodia*, *Phomopsis* and *Pestalotiopsis* were among the pathogens found. Seiridium canker and abiotic stress continues to affect Leyland cypress, as over-crowded trees mature. A *Phomopsis* was cultured from an American elm in decline, which also had Botryosphaeria canker, and in which compaction was thought to play a role. Phytophthora root rot was diagnosed on juniper, Pieris japonica and white pine, mostly in areas with poor drainage. Gymnosporangium rusts appear to be on the increase, in pear, hawthorn, serviceberry, and other Rosaceae hosts. The leaf rust on callery pear is presumed to be pear trellis rust caused by *G. sabinae*, as that rust has been detected in other states in the region. Monilinia blight was observed on flowering (Kwanzan) cherry for the fifth year in a row, but not as severe as in the past few years.

Other interesting pathogens on ornamental plants included downy mildew of impatiens and balsam, although the decreased planting of impatiens appears to have slowed the recent epidemic. Downy mildew was confirmed on *Rudbeckia* and *Coleus*. Viruses detected included CMV on Lobelia, and an unknown ringspot virus on Gardenia jasminoides. Southern blight caused by *Sclerotium rolfsii* was diagnosed on numerous plantings at one public garden, most notably on *Pachysandra procumbens*, *Penstemon*, and Zinnia. White mold (*Sclerotinia sclerotiorum*) was detected on European ginger, *Asarum europaeum*. Botrytis blight was found on rosemary, *Aconitum*, and *Asclepias*, Phyllosticta leaf blight on *Trillium*, along with Alternaria leaf spot on turtlehead (*Chelone* sp.). Bacterial leaf scorch is widespread in the landscape on northern red oak and pin

oak. Rose rosette virus continues to spread in cultivated rose plantings. Several weedy plants were submitted for identification, including Bishop's goutweed (*Aegopodium podagraria*), *Osmorhiza* species, white avens (*Geum canadense*), and puncture vine.

*The UD Plant Diagnostic Clinic gratefully acknowledges the following colleagues who assisted with diagnoses and identifications as Advisory Consultants for samples in 2016: Entomology and Applied Ecology Dept., Charles Bartlett, Bill Cissel, and Joanne Whalen; Plant and Soil Science Dept., Tom Pizzolato, Robert Lyons, and Richard Taylor; USDA APHIS PPQ CPHST: and DNREC, William McAvoy.*