

2021 Summary Report

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2021 Plant & Pest Diagnostic Lab Annual Summary Report

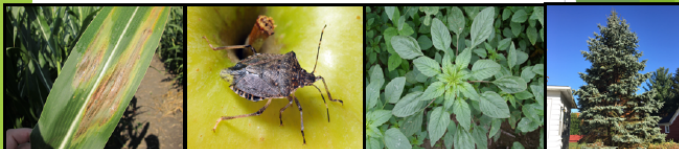




Purdue Landscape Report wins Purdue Agriculture 2021 TEAM Award.
Together Everyone Achieves More

Pictured left to right:
 Aaron Patton, Elizabeth Barnes,
 Tom Creswell, Janna Beckerman,
 John Bonkowski, Cliff Sadof, Kyle
 Daniel, Todd Abrahamson, Kirby
 Kalbaugh, and Dean Karen Plaut.
 Not shown:
 Lindsey Purcell, Rosie Lerner, and
 Gail Ruhl

TEST, DON'T GUESS



WE IDENTIFY:

- Plant Diseases
- Insects and pests
- Plants and weeds
- Damage caused by weather, chemicals, growing conditions

VISIT: www.ppd1.purdue.edu
 To submit photos, download forms and more.



The PPDL proudly partners with
 The National Plant Diagnostic Network

Purdue University, LSPS Room 116
 765-494-7071

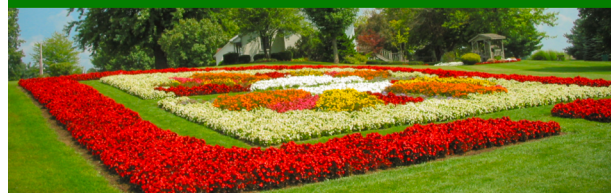
Tom Creswell, Lab Director



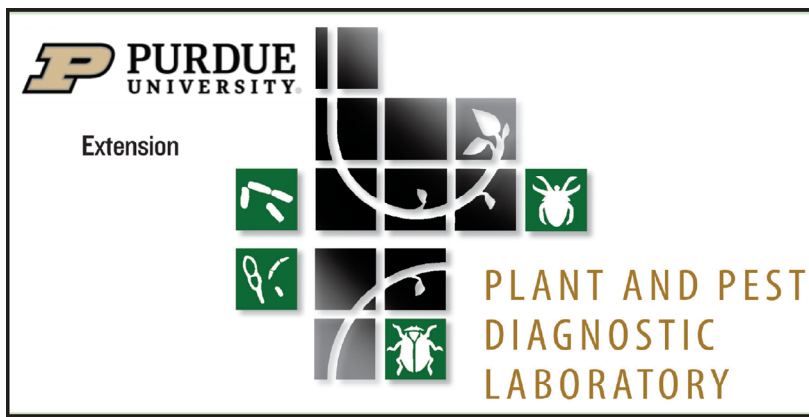
Extension
 Plant and Pest Diagnostic Lab

PURDUE UNIVERSITY
LANDSCAPE REPORT

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THE PURDUE LANDSCAPE REPORT



2021 Summary Report

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Introduction

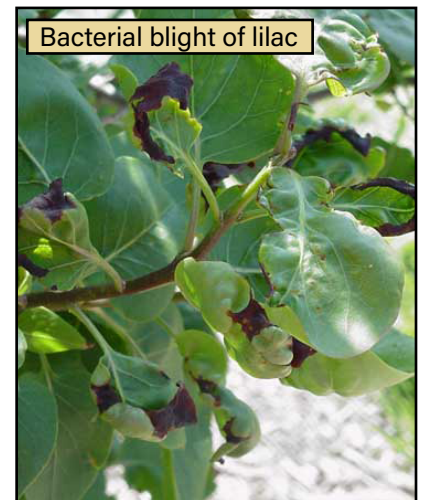
The Plant and Pest Diagnostic Laboratory (PPDL) remains dedicated to helping protect Indiana's agriculture, the green industry and individual landscapes, by providing rapid and reliable diagnostic services for plant disease and pest problems. We also provide appropriate pest management strategies and diagnostics training. We are a participating member lab in the National Plant Diagnostic Network (NPDN), a consortium of Land Grant University diagnostic laboratories established to help protect our nation's plant biosecurity infrastructure.

Regulatory/State Collaboration

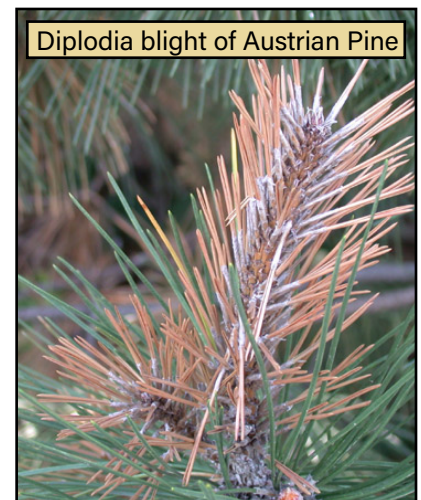
The PPDL serves as the state laboratory charged with assuring accuracy in disease diagnosis for phytosanitary certification for exports, administered by the Indiana Dept. of Natural Resources (IDNR). The PPDL supports the work of the IDNR by providing insect identification and disease diagnosis for nursery inspection samples and official state survey samples (see below under diagnostic highlights and surveys). The PPDL serves as the lab of record for the Indiana Crop Improvement Association (ICIA) and provides hands-on disease identification phytosanitary training to field inspectors annually. We also partner with the Office of the Indiana State Chemist (OISC) to evaluate potential damage from herbicides, disease and insects on samples collected as part of official investigations of pesticide misapplication cases.

Extension Specialist Collaboration

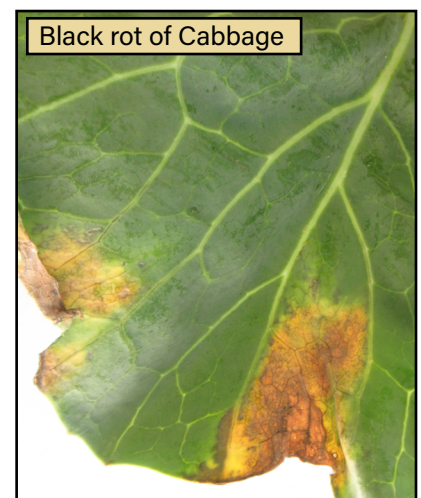
The PPDL could not provide the range of services we offer without the diagnostic expertise provided by specialists in other departments (Table 1). As in past years, faculty and staff from the Departments of Botany & Plant Pathology, Agronomy, Entomology, Horticulture & Landscape Architecture, and Forestry & Natural Resources very generously assisted with providing problem diagnoses involving their specialties. The PPDL team provides an ongoing point of connection between county-based Extension educators, the public and Extension specialists on campus; facilitating knowledge exchange and information about trends in lab samples to promote more informed recommendations for disease and pest management.



Bacterial blight of lilac



Diplodia blight of Austrian Pine



Black rot of Cabbage

Diagnostic Highlights and Surveys

COVID-19 Impacts:

Along with the rest of the world, the Covid-19 pandemic continued to impact our operations in 2021. We received samples both by mail and through in-person deliveries while adhering to the Protect Purdue guidelines regarding masks and social distancing. As was the case with so many other services, our clients increasingly took advantage of our on-line presence and uploaded photos for diagnosis. In prior years samples submitted as photos averaged 235 per year but that nearly doubled to 440 (18.8%) samples in 2021.

Ramorum Blight/Sudden Oak Death survey:

Since 2004 the PPDL has partnered with the IDNR in annual Cooperative Agriculture Pest Survey (CAPS) efforts to assure Indiana nurseries are free from *Phytophthora ramorum*, the causal agent of Ramorum Blight and Sudden Oak Death. If this pathogen became established in the state it would threaten a wide range of ornamental woody plants and forest trees, including rhododendron, azalea, viburnum and oaks. This nursery survey assists in protecting Indiana landscapes, forests and the timber industry from a potentially destructive pathogen while preventing impacts to trade that might occur if *P. ramorum* became established in our nurseries and forests. Fortunately there were no *P. ramorum* detections in the 204 survey samples.

Table 1. Departmental faculty and staff that assisted with sample diagnoses - 2021 [1]

Faculty/Staff	Number of Diagnoses	Faculty/Staff	Number of Diagnoses
Agronomy	16	Entomology	222
Keith Johnson	15	Cliff Sadof	74
Other	1	Tim Gibb	60
		Larry Bledsoe	39 [5]
		Elizabeth Long	15
Botany & Plant Pathology	2840	Laura Ingwell	14
Tom Creswell	956	Other	20
John Bonkowski	1516 [2,3]		
Marcelo Zimmer	227	Horticulture & Landscape Architecture	91
Janna Beckerman	103	Kyle Daniel	32
Darcy Telenko	8	Aaron Patton	38
Dan Egel	7	Ross Braun	8
Other	23	Other	13
Forestry & Natural Resources	22	Non-Purdue Specialist	38
Lindsey Purcell	22	Jan Bryne, MSU	31 [4]
		Other	7

[1] Names in **BOLD** are Department Diagnostic Liaisons.

[2] 204 diagnoses were provided for *Phytophthora ramorum* nursery survey samples

[3] 91 diagnoses were provided for Phytosanitary field survey samples.

[4] 31 PCR negative diagnoses provided by MSU diagnostician certified for *p. ramorum* testing.

[5] 30 diagnoses were provided for the American Public Gardens Invasive Insect survey.

Table 2. Affiliation of persons submitting samples to the PPDL - 2021

Affiliation	Number of samples	% of Total
Non-regulatory Samples	1728	73.85%
Commercial	1034	44.19%
Garden Center/Greenhouse/Nursery	283	12.09%
Crop Consultant	190	8.12%
Landscaper/Groundskeeper/Lawn & Tree Care	172	7.35%
Agribusiness	115	4.91%
Grower/Farmer	111	4.74%
Arborist	79	3.38%
Extension Educator	44	1.88%
Pest Control	28	1.20%
Other	10	0.43%
Golf Course	2	0.09%
Non-Commercial	694	29.66%
Homeowner	355	15.17%
Researcher/Specialist	289	12.35%
Extension Educator	50	2.14%
Regulatory Samples	612	26.15%
IDNR (SOD <i>P. ramorum</i> Nursery Survey)	204	8.72%
Office of the Indiana State Chemist	147	6.28%
IDNR (Nursery inspection)	140	5.98%
IDNR/ICIA (Phytosanitary certification field inspection)	91	3.89%
APGA Invasive Insect Survey	30	1.28%
Totals:	2340	100.00%

Boxwood Blight survey:

Boxwood blight was first detected in a landscape in Indiana in 2018 and was detected again in 2019 in a nearby location. The disease was confirmed in a third Indiana landscape in 2021, but in that case plants were in containers in the landscape so all plant material and soil was removed and the containers were decontaminated, hopefully eradicating the pathogen from that site. IDNR inspectors collected and submitted symptomatic boxwood samples for both a boxwood blight survey and in response to a boxwood blight trace-forward event in which suspect infected plants were identified in shipments to retail locations in the state. Three out of sixteen boxwood trace forward samples were positive for boxwood blight. All diseased plants were put on stop sale and destroyed.



Fig. 1: The most prominent symptoms of boxwood blight are rapid defoliation of the lower branches, dieback and black streaks on the green stem tissue (red arrows, right).



ICIA Collaboration:

In Indiana, ICIA field inspectors assist the IDNR by providing field inspections of crops grown for international export so that IDNR may issue appropriate Phytosanitary export certificates. The PPDL provides phytosanitary corn and soybean disease diagnostics workshops to train Indiana Crop Improvement Association (ICIA) field inspectors annually to promote high standards of plant inspection work.

Corn Tar Spot Update:

Since our lab first detected this disease in the United States in 2015, Tar spot of corn, caused by *Phyllachora maydis* (Fig. 2.1), has become an important disease in Indiana, primarily in the northern counties of the state.



Fig. 2.1: Tar spot symptoms on corn.

southern rust samples submitted to the PPDL for diagnosis. We diagnosed southern rust on 110 samples submitted from 75 Indiana counties (Fig. 3.2).



Fig. 3.1: Orange pustules of Southern rust shown on corn leaf. Photo by D. Telenko.

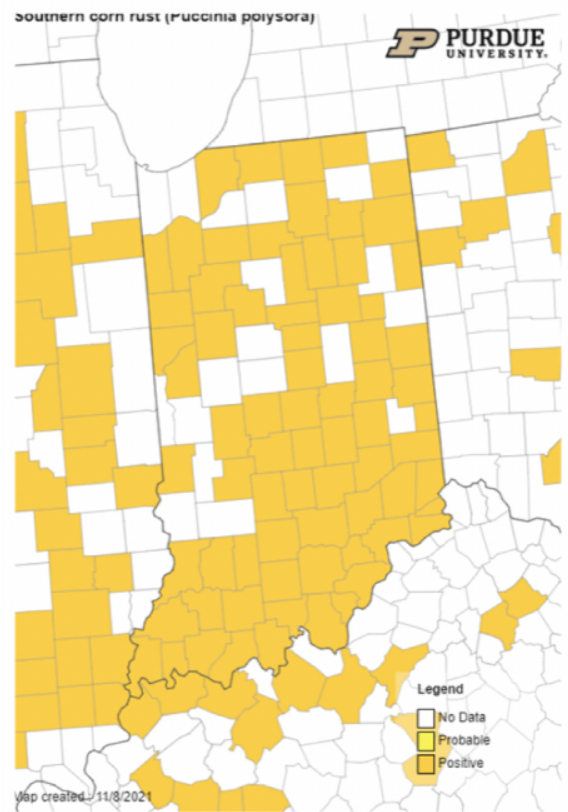
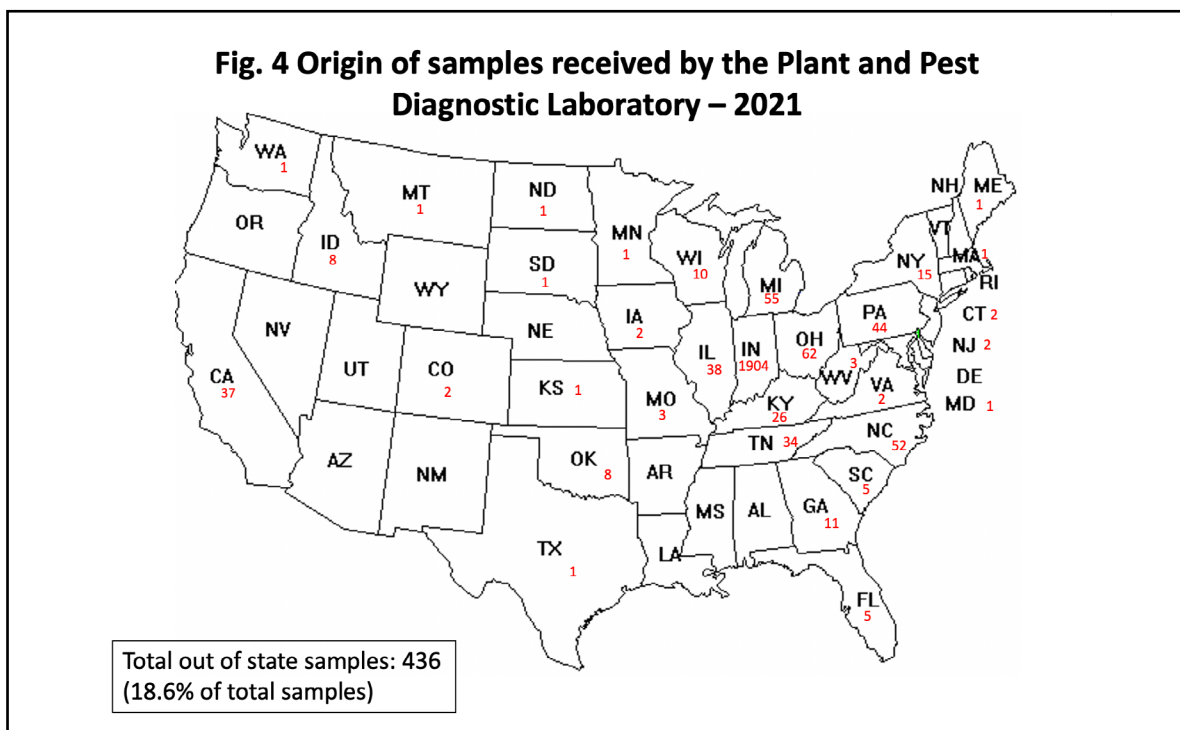


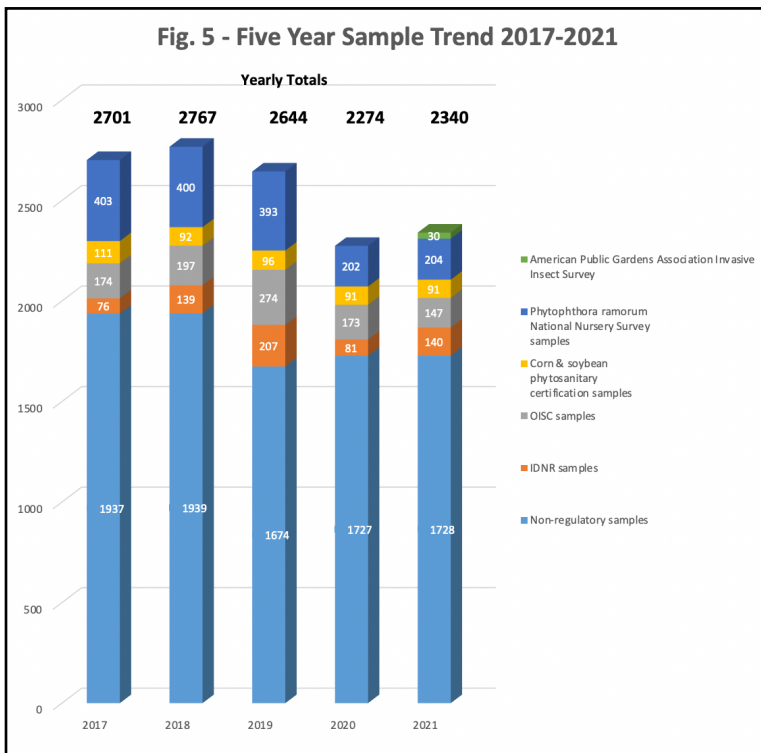
Fig. 3.2: Southern corn rust map of confirmed (yellow) counties that had southern corn rust in Indiana in 2021. Photos credit: (BP-217-W Diseases of Corn: Common and Southern Rust), Map source: <https://corn.ipmPIPE.org/southerncomrust/>

Sample Overview

In 2021, we diagnosed 3829 problems on a total of 2340 samples submitted (Tables 2 and 4), both of which represent an increase over 2020 totals. Samples originating from outside Indiana increased by 28% over 2020 to a total of 436 (Fig. 4).



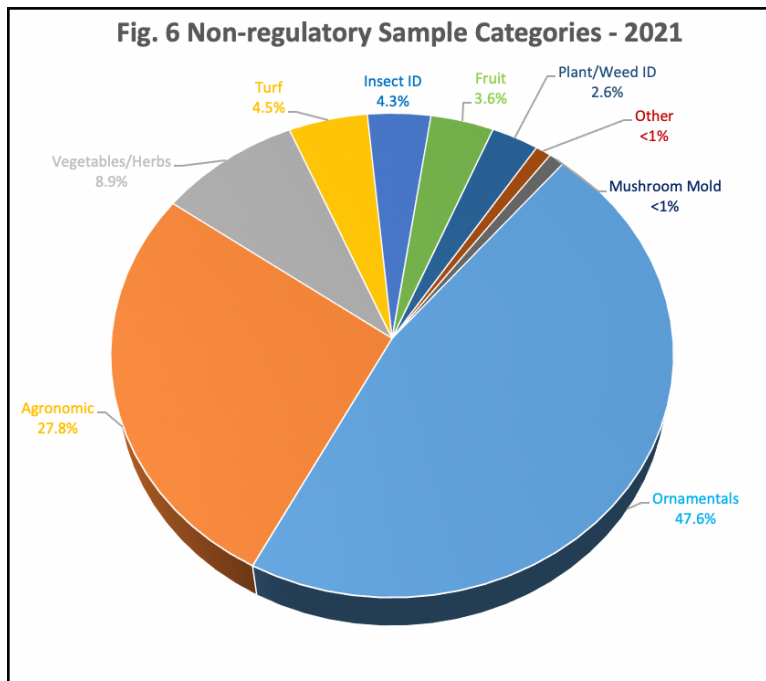
The 5 - Year Sample Trend is shown in Figure 5.



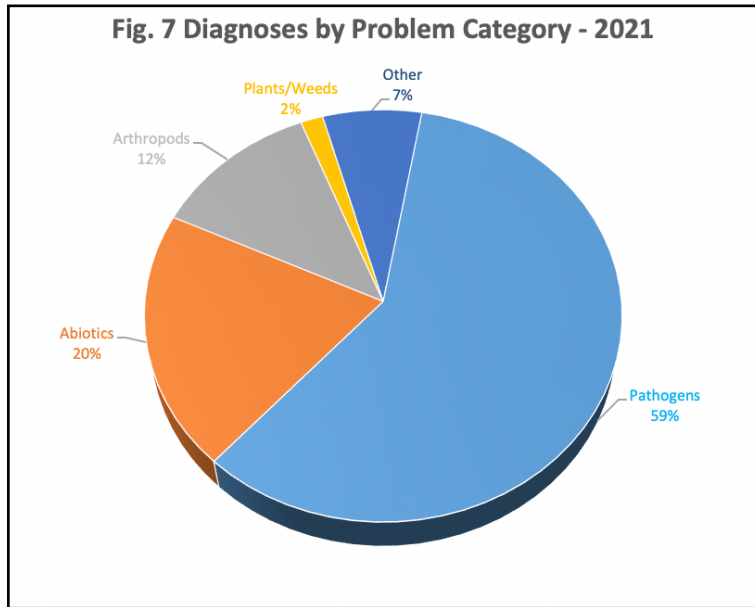
Ornamental plants are consistently the largest category of non-regulatory samples (47.6%) highlighting the reliance of Indiana's green industry on the expertise provided by the PDDL (Fig. 6). A more detailed list of sample types is given in Table 3.

Table 3. Non-regulatory Samples by Category - 2021

Category	# of Samples	% of Samples
Agronomic	480	27.8%
Corn	251	14.5%
Soybean	134	7.8%
Hemp	41	2.4%
Small Grains	28	1.6%
Alfalfa	18	1.0%
Other	8	0.5%
Fruit	62	3.6%
Fruit	38	2.2%
Small Fruit	15	0.9%
Citrus	9	0.5%
Ornamentals	822	47.6%
Woody Ornamental - Deciduous	400	23.1%
Woody Ornamental - Evergreen	219	12.7%
Perennials	156	9.0%
Annuals	37	2.1%
Other	10	0.6%
Turf	77	4.5%
Vegetables/Herbs	153	8.9%
Lettuce	59	3.4%
Tomato	30	1.7%
Other	18	1.0%
Herbs	17	1.0%
Spinach	15	0.9%
Cucumber	14	0.8%
Miscellaneous	134	7.8%
Insect ID	75	4.3%
Plant/Weed ID	45	2.6%
Other (Multiple Host, Aquatics)	12	0.7%
Mushroom/Mold	2	0.1%
Total Samples:	1728	100.0%



While diseases comprised 59% of our diagnoses last year, arthropod problems and damage due to non-living (abiotic) factors such as herbicide injury and weather extremes continue to be a significant segment of the problems diagnosed (Fig. 7 and Table 4).



Category	Number of Diagnoses	% of Total
Pathogens	2258	59.0%
Fungi	2001	52.3%
Viruses	153	4.0%
Bacteria	104	2.7%
Abiotics	773	20.2%
Cultural/Environmental	377	9.8%
Chemical/Herbicide Injury	263	6.9%
Nutritional	86	2.2%
Other	47	1.2%
Arthropods	462	12.1%
Insects	343	9.0%
Mites	74	1.9%
Nematodes	35	0.9%
Other	10	0.3%
Plants/Weeds	62	1.6%
Other	274	7.2%
Totals:	3829	100%

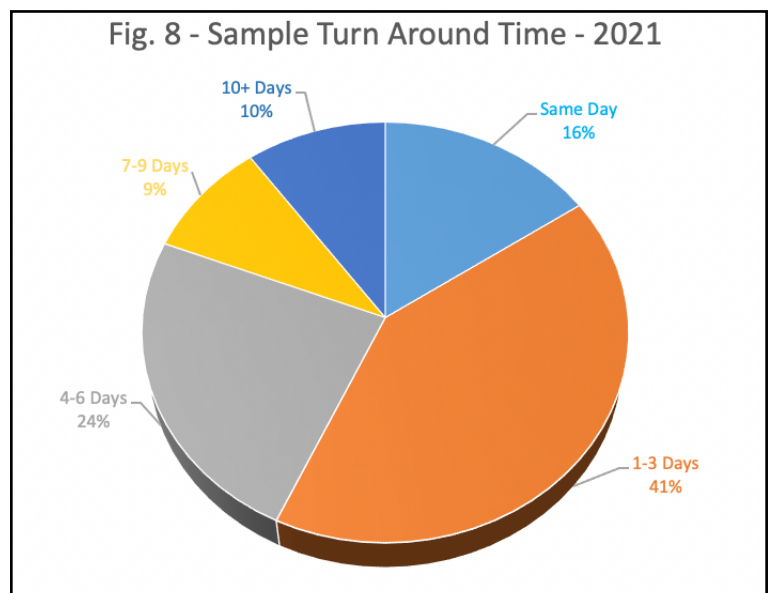
Despite the pandemic restrictions we were able to process 56.9% of all samples in 3 days or less. Samples requiring in-depth laboratory analysis naturally take longer to complete and thus preliminary reports are provided to update clients on sample progress (Fig. 8).

Extension and Teaching Activities

The PPDL staff typically participates in multiple in-person training events throughout the state each year. Presentations, workshops, and speaking engagements were conducted in face-to-face, recorded presentations, and online webinars in accordance with Protect Purdue guidelines.

In 2021 our educational efforts included participation in Indiana Green Expo, Turf and Landscape Field Day, Indiana Arborists Association meeting, Indiana Professional Lawn and Landscape Association, Category 1A Pesticide Certification Training, Master Gardener events and classroom training;

all being delivered by a combination of recorded video, in-person events, or live webinars. We also provided classroom lectures and/or lab experiences related to diagnostics work for students in six courses: BTNY 605, BTNY 208, BTNY 301, HORT 318 and FNR 444.



Journal Publication:

Everything is Faster: How Do Land-Grant University-Based Plant Diagnostic Laboratories Keep Up with a Rapidly Changing World? Iles, L., A. Fulladolsa, A. Smart, J. Bonkowski, T. Creswell, C. Harmon, R. Hammerschmidt, R. R. Hirsch, and L. Rodriguez Salamanca. 2021. Annual Review of Phytopathology. Vol 59:333-349.

Extension Bulletins written or revised in 2021:

Midwest Vegetable Production Guide for Commercial Growers 2021, ID-56 (revised)
mwvegguide.org.

Midwest Fruit Pest Management Guide 2021-2022, ID-465 (revised)
<https://ag.purdue.edu/hla/Hort/Documents/ID-465.pdf>

2021 Corn & Soybean Field Guide, ID-179 (revised)
https://edustore.purdue.edu/item.asp?Item_Number=ID-179

Symptoms and Signs for Plant Problem Diagnosis - An Illustrated Glossary, BP-164-W (new)
[Symptoms and Signs for Plant Problem Diagnosis - An Illustrated Glossary \(purdue.edu\)](https://www.purdue.edu/hla/Hort/Documents/ID-465.pdf)

Root Rot in Landscape Plants, BP-206-W (new)
https://edustore.purdue.edu/item.asp?Item_Number=BP-206-W

Purdue Landscape Report articles written in 2021:

Phomopsis Dieback of Spruce	https://www.purduelandscape.com/article/phomopsis-dieback-of-spruce/
Peony leaf blotch	https://www.purduelandscape.com/article/peony-leaf-blotch/
Dianthus Anthracnose	https://www.purduelandscape.com/article/dianthus-anthracnose/
Tobacco Rattle Virus (TRV)	https://www.purduelandscape.com/article/tobacco-rattle-virus-trv/
Iris Leaf Spot	https://www.purduelandscape.com/article/iris-leaf-spot/
Arborvitae Needle Blight	https://www.purduelandscape.com/article/arborvitae-needle-blight/
Rhizoctonia Web Blight	https://www.purduelandscape.com/article/rhizoctonia-web-blight/
Coleus Downy Mildew	https://www.purduelandscape.com/article/coleus-downy-mildew/
Half The Battle	https://www.purduelandscape.com/article/half-the-battle/
Contorted Filbert: A Gnarly Problem Plant	https://www.purduelandscape.com/article/contorted-filbert-a-gnarly-problem-plant/
Tip blights of Juniper	https://www.purduelandscape.com/article/tip-blights-of-juniper/
Oak Kermes Scale and Fungal Dieback: A One-Two punch for Northern Red Oak	https://www.purduelandscape.com/article/oak-kermes-scale-and-fungal-dieback-a-one-two-punch-for-northern-red-oak/



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