Annual Report
2005

Purdue University Cooperative Extension Service

PURDUE
UNIVERSITY

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TABLES AND FIGURES

ACKNOWLEDGMENTS

Purdue's Plant and Pest Diagnostic Lab (P&PDL) is recognized as a source of unbiased, quality, diagnostic information. This recognition is a result of the hard work and dedication of P&PDL diagnosticians and volunteer faculty and staff. A special thanks to all of you.

We are also indebted to our computer support specialist for his database expertise, to our departmental extension secretary for her webmaster assistance and to our P&PDL secretary whose patience and friendly phone etiquette provides a welcome introduction to our clientele.

To the administration at Purdue University, we thank you for recognizing the vital role of the P&PDL in addressing Indiana's plant and pest diagnostic needs, especially during this time of heightened agro-biosecurity concerns.

Gail E. Ruhl and Karen K. Rane
P&PDL Co-Directors

"…to enable people to improve their lives and communities through learning partnerships that put knowledge to work" (Extension mission as per the National Association of State Universities and Land Grant Colleges, 2001)

MISSION

The Plant and Pest Diagnostic Laboratory (P&PDL) at Purdue University is an interdisciplinary laboratory that was established in 1990 with funding from the Crossroads initiative to integrate the existing plant disease and weed diagnostic lab (est. 1979) in the Department of Botany & Plant Pathology with the identification services provided by the Departments of Entomology, Horticulture and Landscape Architecture, Agronomy and Forestry. The mission of the P&PDL is to provide accurate and rapid identification of plants, pests, and plant problems; suggest management strategies, when requested; and serve as a source of unbiased information for plant and pest related problems.

The Laboratory provides technical expertise to specialists and county extension educators of the Purdue University Cooperative Extension Service (CES); to University research faculty and staff; to the Director of the Entomology and Plant Pathology Division of the Indiana Department of Natural Resources (IDNR) and associated inspectors. The laboratory also provides routine pest and plant problem diagnoses for private businesses and citizens of Indiana.

HOMELAND SECURITY AND THE NATIONAL PLANT DIAGNOSTIC NETWORK

As a result of the 9-11-01 terrorist attacks on the World Trade Centers and the Pentagon, Congress created a new U.S. Department of Homeland Security. With heightened awareness and concern for potential acts of bioterrorism directed at U.S. food and agricultural systems, the Department of Homeland Security provided funds for USDA/CSREES to develop the National Plant Diagnostic Network (NPDN). Land grant university plant diagnostic laboratories comprise the backbone of the system. The nation is divided into five regions, with a regional center designated for each region. The P&PDL, as part of the North Central Plant Diagnostic Network (NCPDN) region has been working with counterparts at other land grant institutions to prepare for plant disease and pest introductions that might pose a threat to American agriculture. Part of this response includes training of First Detectors in recognizing threat pathogens. First detectors typically include individuals such as county extension educators, growers, crop consultants and regulatory field inspectors. Once trained, first detectors will be on the look-out for unusual or new diseases to submit to the diagnostic laboratories. This will greatly reduce the time between introduction of plant pests and diseases and their detection.

As part of this national initiative, the P&PDL conducts IP video training sessions for ANR educators with the intent of improving their surveillance capabilities for invasive plant diseases and pests in Indiana. The training in 2005 included updated information on Soybean Rust and Ramorum blight.

P&PDL AND THE INDIANA DEPARTMENT OF NATURAL RESOURCES

The Plant and Pest Diagnostic Laboratory serves as the plant disease diagnostic facility for the Indiana Department of Natural Resources (IDNR). The IDNR and the Purdue Plant and Pest Diagnostic Laboratory work together during outbreaks of diseases of regulatory concern. In 2005, P&PDL and IDNR staff worked together to survey Indiana nurseries for the presence of *P. ramorum*, a disease of regulatory concern.

The P&PDL also provided disease diagnosis on corn and soybean samples for the IDNR Phytosanitary Certification Program, as well as confirmation of *Peronospora tabacina* on tobacco samples as a part of the 2005 Tobacco Blue Mold Field Survey, and disease diagnosis of foliar pathogens on corn for entry into the National Agricultural Plant Information System (NAPIS) database.

STAFF

Purdue faculty and staff from the departments of Agronomy, Botany and Plant Pathology, Entomology, Forestry and Natural Resources, and Horticulture and Landscape Architecture serve as diagnosticians for the P&PDL on a part time basis as a portion of their total commitment to their respective departments. Staffing responsibilities in the P&PDL and the department to which they belong, are listed below.

Botany and Plant Pathology	
Co-Directors	Gail Ruhl, Karen Rane
Secretary and Receptionist	Janet Whaley
Webmaster and Extension Assistance	Amy Deitrich
Disease diagnosis and control	Gail Ruhl, Karen Rane
Weed identification, control, and diagnosis of herbicide injury on field crops	Glenn Nice
Computer support	Robert Mitchell
Entomology	
Invertebrate and other pest identification and control	Timothy Gibb, Clifford Sadof
Horticulture & Landscape Architecture	
Identification of horticultural plants and plant problems	B. Rosie Lerner
Agronomy	
Fertility, soil and environmentally related problems of corn	Robert Nielsen
Turfgrass management	Zac Reicher, Glenn Hardebeck
Forestry & Natural Resources	
Tree identification	Rita McKenzie

The P&PDL is fortunate to have the support and assistance of numerous faculty and staff in the School of Agriculture. During 2005, more than 25 additional faculty and staff members assisted with sample diagnoses **(Table 1)**. The P&PDL also employs a student hourly worker throughout the year to help with logging in samples, sample distribution, filing and other general laboratory duties.

Table 1. Departmental faculty and staff that assisted with diagnoses of samples submitted to the Plant and Pest Diagnostic Laboratory during 2005.[1]

Faculty/Staff	Number of Diagnoses	Faculty/Staff	Number of Diagnoses
Agronomy	**120 (5%)**	**Entomology**	**244 (9%)**
S. Conley	39	L. Bledsoe	6
G. Hardebeck[2]	33	R. Foster	3
K. Johnson	7	**T. Gibb**	158
E. Kladivco	1	J. Loven	1
R. Nielsen	36	J. Obermeyer	2
Z. Reicher	4	**C. Sadof**	74
Botany & Plant Pathology	**2077 (81%)**	**Horticulture & Landscape Architecture**	**139 (5%)**
J. Beckerman	8	B. Bordelon	11
D. Egel	1	M. Dana	46
R. Green	2	P.A. Hammer	23
D. Huber	7	**R. Lerner**	33
R. Latin	12	E. Maynard	1
C. Lembi	7	M. Mickelbart	5
R. Martyn	1	S. Weller	20
G. Nice	82		
P. Pecknold	4	**Other**	**8 (*)**
K. Rane	865	J. Ellis, Entomology	1
G. Ruhl	1063[3]	C. Gunter, Horticulture-SWPAC	1
G. Shaner	14	S. Jeffers, Clemson University	1
I. Thompson	10	J. McKemy, USDA	1
C. Woloshuk	1	D. Miller, USDA-ARS-SEL	1
		L. Nees, State Chemist Office	3
		Total Diagnoses	**2590**

[1] The total number of diagnoses exceeds the total number of samples due to multiple problems/diagnoses per sample. More than one person may assist with a diagnosis.
[2] Names in bold type were designated by departments as 2005 P&PDL diagnosticians.
[3] 801 additional sample diagnoses were provided for *P. ramorum* nursery survey samples
* Less than 1%

ADVISORY COMMITTEES

The inter-departmental nature of the P&PDL demands frequent and free-flowing exchange of information among the participating departments. This communication takes place on at least three different levels.

The Steering Committee

The Steering Committee provides a forum to discuss matters that relate to the daily operation of the P&PDL. Input from the diagnosticians is considered essential for smooth functioning of the Lab. The Committee meets as needed and reports periodically to the Operations Committee. The Committee is chaired by the Co-Directors of the P&PDL and is composed of diagnosticians, and the secretary.

The Operations Committee

The Operations Committee provides a forum for discussion of operational matters and facilitates communication among diagnosticians and other specialists. The Committee meets as needed and reports periodically to the Management and Policy Committee. The Committee is chaired by the Co-Directors of the P&PDL and is composed of the Steering Committee, one Extension specialist from each participating department and the Department Head charged with administrative overview of the laboratory. Departmental Extension Specialists are appointed on a three-year rotating basis.

The Management and Policy Committee

The Management and Policy Committee provides administrative overview for the P&PDL. The Committee is composed of the Heads of the participating Departments and administrators from the Cooperative Extension Service and the Agricultural Experiment Station. The Committee is chaired by the Director of the Cooperative Extension Service. The Committee meets as needed.

2005 COMMITTEE STRUCTURE

The Steering Committee: Gail Ruhl (Co-Chair, Co-Director of P&PDL; plant disease diagnosis and control), Karen Rane (Co-Chair, Co-Director of P&PDL; plant disease diagnosis and control), Glenn Nice (Weed identification and control, and diagnosis of herbicide injury on field crops), Tim Gibb and Cliff Sadof (Arthropod identification and control), B. Rosie Lerner (Identification of horticultural plants), Bob Nielsen (Fertility and soil-related problems of corn), Zac Reicher and Glenn Hardebeck (Turfgrass management), Rita McKenzie (Forestry), Bob Mitchell (Database programming, web page management and computer support), Janet Whaley (Receptionist and accounts), Amy Deitrich (Webmaster and Extension secretary)

The Operations Committee: Gail Ruhl and Karen Rane (Chairs, Co-Directors of P&PDL), Steering Committee members, Ray Martyn (Head, Department of Botany and Plant Pathology) (administrative overview), Keith Johnson (Agronomy), Greg Shaner (Botany and Plant Pathology), Rick Foster (Entomology), Rita McKenzie (Forestry and Natural Resources), Allen Hammer (Horticulture and Landscape Architecture)

The Management and Policy Committee: Dave Petritz (Chair, Director of CES), Tom Jordan (Assistant Director of CES & Agriculture and Natural Resources), Marshal Martin (Associate Director of Agriculture Research Programs), Craig Beyrouty (Head, Department of Agronomy), Ray Martyn (Head, Department of Botany and Plant Pathology), Steve Yaninek (Head,

Department of Entomology), Ed Ashworth (Head, Department of Horticulture and Landscape Architecture), Dennis LeMaster (Head, Department of Forestry and Natural Resources), and Gail Ruhl and Karen Rane (Co-Directors of P&PDL)

LABORATORY OPERATIONS

County offices of the Cooperative Extension Service (CES) are provided with a supply of sample submission forms, alcohol vials and mailing boxes to facilitate the submission of plant specimens and insects to the P&PDL. Submission forms are available online and may be downloaded from the P&PDL web page. Completed submission forms are to accompany all sample submissions. Digital images may be submitted, from the P&PDL web page (http://www.ppdl.purdue.edu).

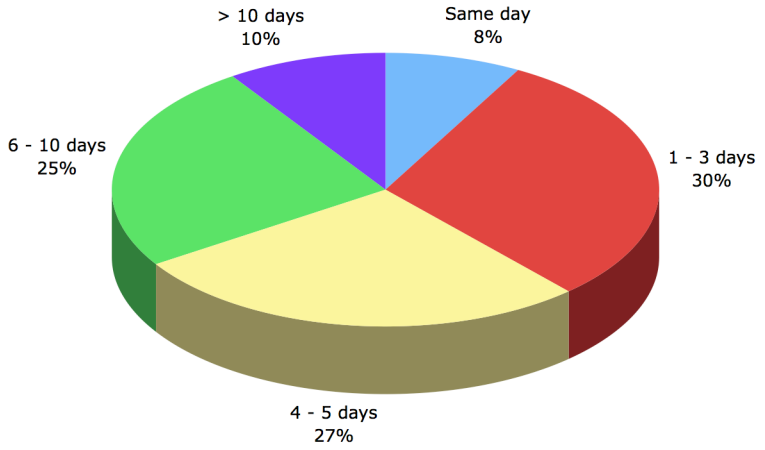
Diagnosis Process

Information from the sample submission form is logged into the P&PDL computer database as well as the NPDN Plant Diagnostic Information System (PDIS), and the sample is assigned a unique number in both databases. Samples are then distributed to the appropriate diagnostician. If the diagnosis requires pathogen isolation or some other lengthy procedure (determined by the diagnostician), a preliminary reply, including a tentative diagnosis and projected final completion date, is returned to the client. When the diagnosis has been completed the identification and management recommendations (when requested) are entered into the database, printed, and the final response along with any supporting information is returned to the client and/or submitter via electronic mail and/or FAX, and US mail (as requested by the submitter on the submission form).

Turn-around time

Turn-around time is the length of time between when a sample is received and when the final diagnosis is returned. Same day service was provided for 8% of the samples received during 2005 and 38% of the samples were completed in three days or less. A total of 65% of the samples received during 2005 were diagnosed within five working days and 90% of all samples received were answered within 10 working days. An extended turn-around time of greater than 10 days (10% of samples) was documented for those samples requiring more extensive culture work and laboratory testing **(Figure 1)**. Preliminary reports were sent for samples requiring additional time for pathogen confirmation.

Figure 1. Turn around time for routine samples received in 2005*



*Excludes *P. ramorum* National Nursery Survey, NAPIS survey, and Phytosanitary inspection samples

Sample Breakdown

As per Table 2, approximately six percent (94) of the total number of routine samples diagnosed by P&PDL diagnosticians in 2005 were submitted electronically, as digital samples. In addition to the 1567 routine samples diagnosed, 801 nursery samples were tested for the presence of *Phytophthora ramorum* as part of the Sudden Oak Death (Ramorum blight) National Survey. A total of 95 corn and soybean samples were submitted for disease diagnosis for phytosanitary certification (ICIA and IDNR) and 64 additional corn samples were submitted for disease diagnosis to contribute to the collection of Indiana data for the NAPIS database.

Table 2. Breakdown of total samples for 2005

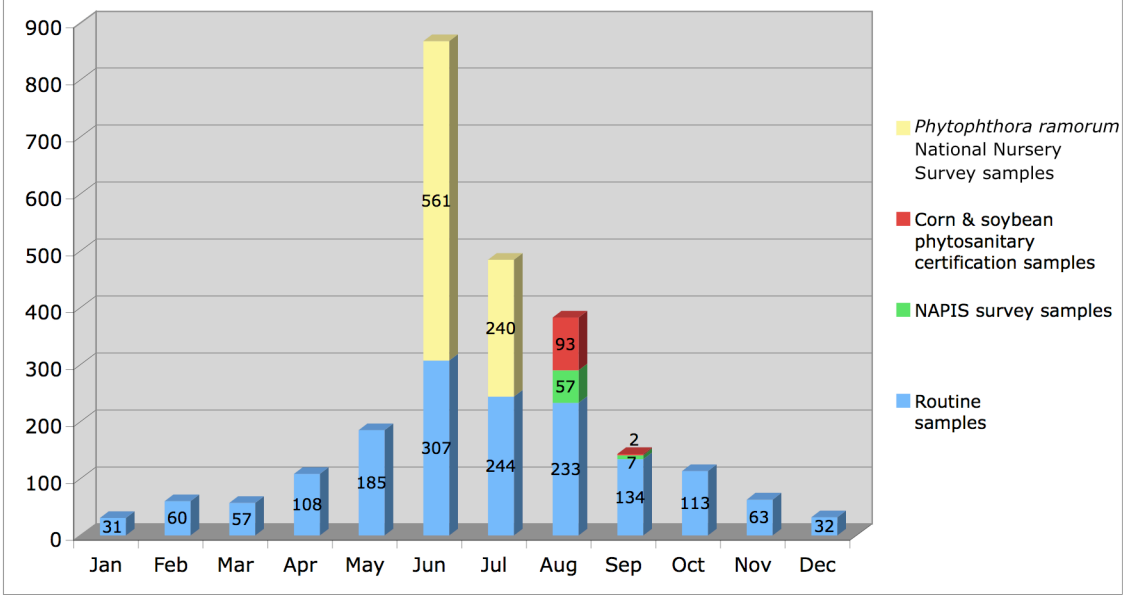
Routine samples	**1567**
Physical samples	*1473*
Digital samples	*74*
Digital samples with physical follow-up	*20*
Regulatory/survey samples	**960**
P. ramorum national survey samples	*801*
Phytosanitary certification samples (IDNR/ICIA)	*95*
NAPIS corn survey (IDNR)	*64*
Total number of samples	**2527**

DIAGNOSES AND SAMPLES

Monthly Activity

During 2005, the Laboratory diagnosed a total of 1567 routine samples. As illustrated in Figure 2, more than half of the year's routine samples were processed in the lab during the three months of June, July and August. The majority of the 2005 *Phytophthora ramorum* National Nursery Survey samples were submitted during June for diagnosis of the presence or absence of *P. ramorum*, the causal agent of SOD. During the month of August, ICIA and IDNR field inspectors submitted corn and soybean foliar samples to the P&PDL for disease diagnosis required for phytosanitary certification of seed. Corn samples were submitted in August for collection of NAPIS information.

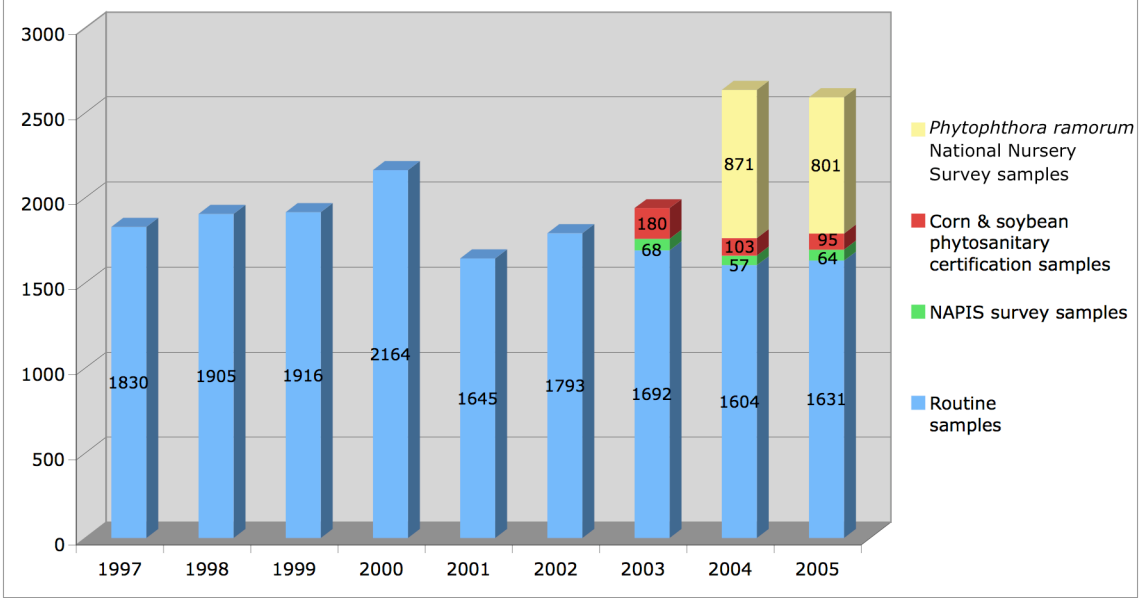
Figure 2. Number of samples received per month in 2005



Long-Term Trends

Sample submissions have remained relatively stable for the past nine years. Participation of the P&PDL in the 2005 National Nursery Survey for *P. ramorum* resulted in an increase in the total number of samples diagnosed **(Figure 3)**.

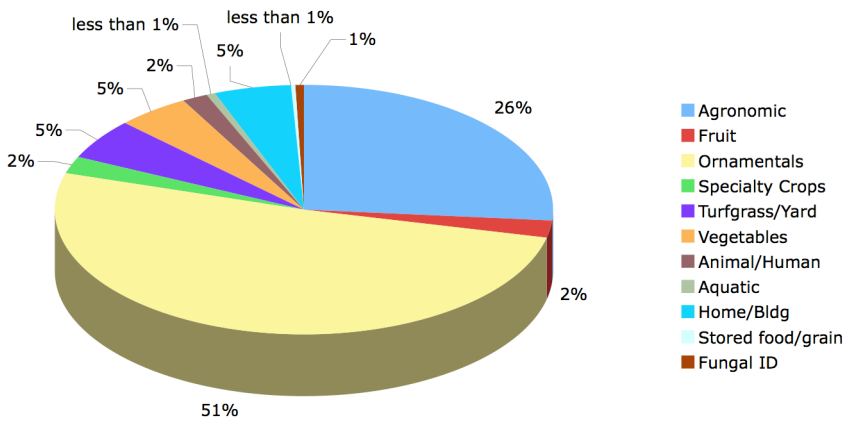
Figure 3. Long-term trends in clinic activity



Commodities Diagnosed

Figure 4 and **Table 3** show the number of specimens submitted in each commodity group, for 2005. The majority of samples submitted for diagnosis (51%) were from the ornamental commodity group. In descending order, agronomic crops (26%), turfgrass/yard (5%), vegetables (5%), and insects infesting homes and other buildings (5%) comprised the other major commodities submitted for routine diagnosis. Several other minor commodity groups comprised the remaining 8% of the submitted samples **(Figure 4** and **Table 3)**.

Figure 4. Samples sorted by commodity group in 2005*



*Excludes 801 ornamental samples submitted for 2005 *P. ramorum* National Nursery Survey

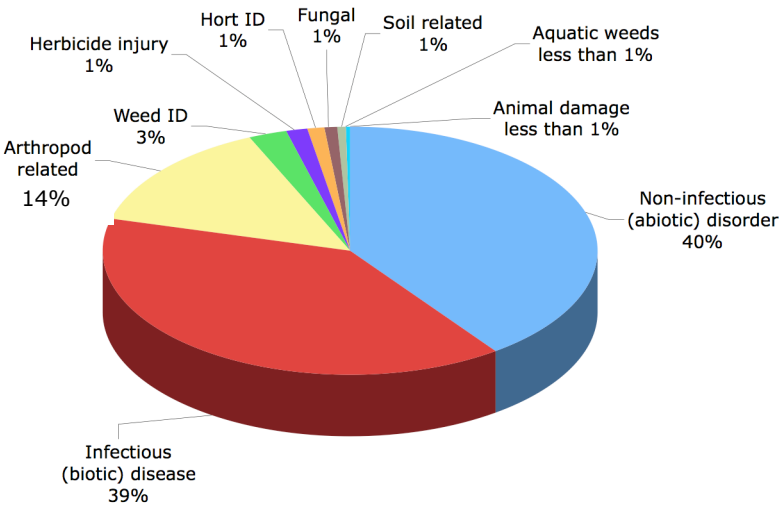
Table 3. Samples sorted by commodity group[1]		
	2005	
Commodity	**Number of Specimens**	**%[2]**
Agronomic	**457**	**26**
Alfalfa	1	*
Barley	4	*
Clover	1	*
Corn	232	13
Wheat	39	2
Soybeans	161	9
Pasture	5	*
Popcorn	1	*
Plant ID	11	1
Fruit	**39**	**2**
Small Fruit	20	1
Tree Fruit	19	1
Ornamentals	**879**	**51**
Flowers	249	14
Interior Plants	26	2
Grnd Cvrs/Vines	45	3
Shrubs	194	11
Trees	365	21
Specialty Crops	**40**	**2**
Field	10	1
Hort	30	2
Turfgrass/Yard	**91**	**5**
Vegetables	**83**	**5**
Miscellaneous	**137**	**8**
Animal/Human	28	2
Aquatic	7	*
Home/Bldg	87	5
Stored Foods/Grains	6	*
Fungal ID	9	1
Total Specimens	**1726**	**100%**

[1] Excludes 801 ornamental samples submitted for 2005 *P. ramorum* National Nursery Survey
[2] Percent of total samples submitted during the year
* Less than 1%

Type of Diagnosis

Many of the samples received multiple diagnoses due to more than one causal agent. The most frequently diagnosed causal agents, determined by the type of diagnosis made, were noninfectious (abiotic) disorders (40%), followed by infectious diseases (39%), arthropods (14%), and weed identification (3%). Herbicide injury, horticultural and fungal ID, and soil related problem diagnoses each comprised 1% of the primary diagnoses of samples submitted in 2005 **(Figure 5)**.

Figure 5. Proportion of primary diagnoses of samples submitted in 2005*

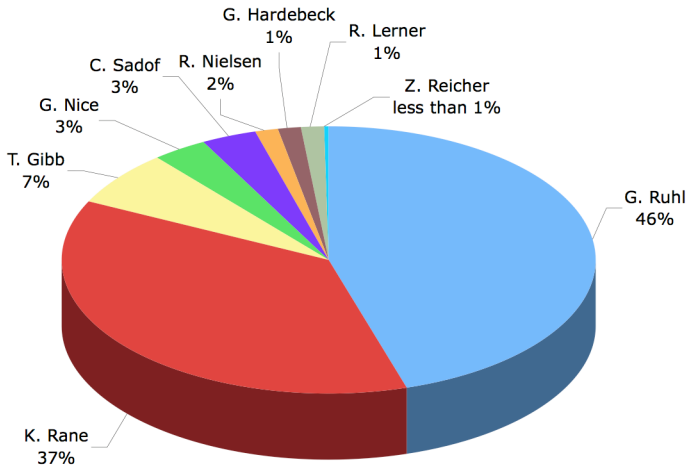


*Excludes 801 ornamental samples submitted for 2005 *P. ramorum* National Nursery Survey

Diagnoses per Diagnostician

A comparison of the proportion of total diagnoses of routine (non-survey) samples made according to diagnostician is given in **Figure 6**.

Figure 6. Percentage of diagnoses made by each P&PDL diagnostician in 2005*

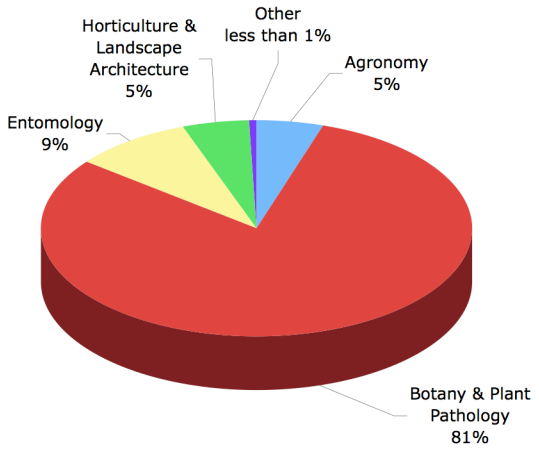


*Excludes 801 ornamental samples submitted for 2005 *P. ramorum* National Nursery Survey

Diagnoses per Department

A comparison of the proportion of total diagnoses made according to participating departments is shown in **Figure 7**. The majority (81%) of sample diagnoses were provided by the Department of Botany & Plant Pathology.

Figure 7. Proportion of total diagnoses made by faculty and staff in participating departments in 2005*



*Excludes 801 ornamental samples submitted for 2005 *P. ramorum* National Nursery Survey

SAMPLE ORIGIN

Clientele Groups

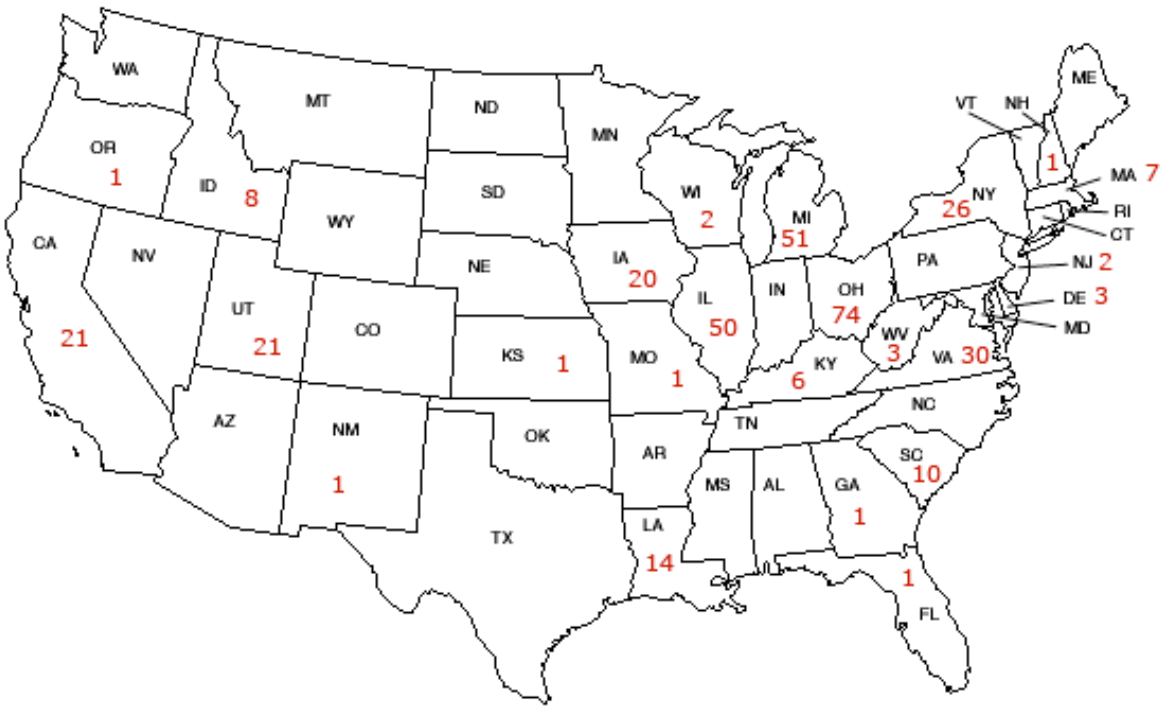
Samples are submitted to the P&PDL by commercial and non-commercial clientele and by IDNR/USDA/APHIS personnel for regulatory and survey work. **(Table 5).**

Table 4. Affiliation of persons submitting samples to the P&PDL in 2005

Affiliation	Number of samples	%
Commercial	**935**	**37**
Consultant	91	4
Dealer/Industry Rep	210	8
Garden Center	10	*
Golf Course	7	*
Greenhouse	248	10
Growers – Agronomic	14	*
Growers – Fruit/Vegetables	20	1
Growers – Ornamentals	4	*
Landscaper	71	3
Lawn/Tree Care	142	6
Nursery	71	3
Pest Control	47	2
Non-Commercial	**524**	**21**
Extension Educator	255	10
Homeowner	200	8
Purdue – not Educator	69	3
Regulatory/Survey	**1068**	**42**
ICIA	137	5
IDNR	854	34
IDNR – Forestry	7	*
State Chemist	24	1
USDA	46	2
Totals	**2527**	**100**

Out of State Submissions
The Laboratory was established to serve residents of Indiana, however, due to the P&PDL's national reputation, diagnostic services were also provided for 355 samples submitted from 21 other states during 2005. The P&PDL obtained a USDA/APHIS/PPQ permit to receive out-of-state samples for diagnosis from the lower 48 states. No out-of-country samples are accepted. **(Figure 8)**

Figure 8. Distribution of samples received from outside Indiana by the Plant and Pest Diagnostic Laboratory in 2005.



AN INFORMATION SOURCE

The P&PDL staff not only provide accurate and timely diagnosis of samples, but also serve as a resource of information for plant and pest-related problems. The team cooperates with university personnel to provide accurate and up-to-date information to clientele.

Webpage

The Virtual Plant and Pest Diagnostic Laboratory, the P&PDL World Wide Web Home Page, (URL: http://www.ppdl.purdue.edu) was put "on-line" in June of 1995. The web server, now maintained by Bob Mitchell, IT manager for the Dept. of Botany and Plant Pathology and Amy Deitrich as webmaster, serves as an invaluable educational tool accessible not only to the citizens of Indiana, but people throughout the United States and the world. The P&PDL web site provides up to date soybean rust information as well as a "Picture of the Week", "What's Hot" in the P&PDL, and featured links. There is a keyword searchable database, a digital library and a link for submitting digital samples to the P&PDL. Web server statistics for the Plant and Pest Diagnostic Laboratory reported an average of 6,252 requests per day for P&PDL web pages from January 1 through December 31, 2005, an increase from 2004 of almost 1,300 'hits' per day.

Extension Activities

P&PDL staff members participate in a variety of Purdue University sponsored events and educational programs. Some of these programs in 2005 included Turf Field Day, Master Gardener Training, Turf and Ornamentals Workshops, Pesticide Applicator Training, and Certified Crop Advisor Training.

APPENDIX A: COMMODITY RELATED SUMMARIES

Small Fruits, *Bruce Bordelon, Department of Horticulture & Landscape Architecture*

Brambles: We've seen a considerable amount of raspberry leaf spot in our plantings, and it has caused defoliation of some varieties. Growers may want to consider fungicide applications if they have a problem. Potato leaf hopper damage was prevalent this year. Anthracnose was as common as usual, especially on black raspberries.

Marvin Pritts, Cornell Dept. of Horticulture, reports the following on a new rust disease of Blackberries that may spread across the United States: "Himalaya blackberry (*R. armeniacus*/*R. procerus*) is considered a noxious weed in Australia, New Zealand, and Chile. A rust fungus was introduced in these countries to help control its spread. Now this fungus has shown up in Oregon and Washington and has begun to infect commercial plantings of certain blackberry cultivars, causing significant losses. Most of the varieties grown in California, Washington, and Oregon are not closely related to the susceptible varieties; however, many eastern varieties have susceptible species in their parental background. It is possible that this rust disease could spread to eastern plantings in the next couple of years. We do not yet know which varieties are susceptible, so screening will be underway shortly.

"The rust disease does not kill the plant completely, but can weaken it over time and significantly reduce fruit production. Wine-colored spots appear on the top of infected leaves. Directly under these spots, on the bottom of these leaves there will be circular patches of cream to yellow spore masses surrounded by a violet tinge. Advanced stages of the disease will also have black spores mixed in with the yellow spores. Older leaves close to the canes are the first infected and can eventually die. Defoliation of entire canes has been seen in severe cases.

"Spores can also often be found on the blossoms and unripened fruit. All green portions of both primocanes and floricanes can be infected. Information and images of this rust can be found online at http://www.nwipm.info/blkrust-05.asp. If the rust appears, we should be able to control it with fungicides…" Note: We have seen no evidence of this rust disease in Indiana. However, we did have considerable late leaf rust on red raspberries. This is the first time we have seen this disease in our plots. Orange rust is quite common in Indiana, especially on wild blackberries.

Strawberries: We saw considerable strawberry leaf spot (probably *Mycosphaerella fragariae*) in our trials this year. Black root rot complex seems to be the major disease problem in strawberries, but Botrytis (Gray Mold) is also quite common.

Blueberries: Indiana had a bumper crop this year. Excessive heat during the ripening period caused some softening of fruit.

Phomopsis twig blight seems to be more prevalent than in the past. Many growers are now spraying to control this disease that, in the past, was only an occasional problem.

Mummyberry occurs in some locations in northern Indiana and growers with the disease must maintain good control to prevent crop losses.

Grapes: Disease incidence was relatively low in 2005 due to hot, dry conditions. Still, major outbreaks of black rot and powdery mildew were noted. Phomopsis cane and leaf spot is a very common problem and can cause considerable fruit rot losses if not controlled early in the season.

The Multicolored Asian lady beetle was abundant on late ripening grapes this year, especially in the northern part of the state.

Vegetable Diseases, *Dan Egel, Region Pest Management Specialist, SWPAC*

Hurricanes affect Indiana weather in 2005

Many years from now, old timers may refer to '05 as the year when 4 hurricanes struck Indiana. Meteorologists may object: by the time the storms actually struck Indiana they were no longer hurricanes and Arlene never made it beyond a tropical storm. Nevertheless, it has been a weather year to be remembered. It is not clear that four such storms have ever struck Indiana (In 1979 two former hurricanes wandered Indiana). Folks whose business had anything to do with agriculture know that Arlene, Dennis, Katrina and Rita affected more than just the Gulf States. After crashing ashore, eventually all four storms tracked across the Hoosier State.

The four-month period of June to September 2005 was hot and wet. But that isn't the whole story. June was actually, hot and dry, ranking only 31 out of 111 Junes for amount of precipitation. Arlene brought needed moisture, albeit too much at one time. July 2005 might have been close to normal except for the rains associated with Dennis. August and September were particularly hot and wet.

Crop development and weather

Muskmelon/watermelon-Hurricane Arlene provided 3.81 inches of rainfall during flowering and early fruit set of these crops. The precipitation was not completely unwelcome since the spring had been on the dry side. Furthermore, large precipitation events are not uncommon in the spring. However, Arlene's rainfall did increase the incidence of foliar diseases such as gummy stem blight and Alternaria leaf blight.

Unfortunately, the rainfall events from Arlene were the last southern Indiana were to see for 14 days, depending on the area. The growing conditions during the last week of June were very dry with above normal temperatures. Vines were observed wilting and some fruit were aborted during this time. Watermelon vines were particularly hard hit since many commercial fields are not irrigated.

The weather system that had been Dennis hovered about the Midwest for a few days, adding much needed rainfall. Vines began to grow again and fruit set continued. The added rainfall did bring higher foliar disease pressure. A few growers reported vine death of watermelons in water logged areas of their fields. However, there were no widespread reports of mature watermelon vine decline.

After Dennis, rainfall levels were fairly low until the end of the season, Hurricane Katrina dumped huge amounts of rainfall across the southern portion of Indiana. At SWPAC, 3.3 inches were recorded in a 24-hour period. Since the season was almost over for muskmelons and watermelons, the rainfall had little effect.

Pumpkin-The rainfall from the remnants of Arlene came during planting and vegetative growth of pumpkins. Although some areas of pumpkins had to be replanted (pumpkins are primarily direct seeded), the rainfall was not detrimental.

The hot, dry weather between Arlene and Dennis inhibited early fruit set of pumpkins. Late planted pumpkins suffered from poor stand establishment. Dennis brought needed rainfall, even if many farmers would have preferred a more even distribution of rainfall. The predominate disease in pumpkins in early July is powdery mildew which does not require rainfall for establishment or spread.

The rains which accompanied Katrina and Rita came to southern Indiana when fruit were maturing. The result has been that pumpkins, which are planted in heavier ground than muskmelons or watermelons, suffered from a variety of fruit rots including Fusarium fruit rot and Phytophthora fruit rot. Downy mildew of cucurbits was reported in southern Indiana on 11 August. The rains of Katrina and Rita contributed to the onset and spread of downy mildew.

Field crops-The dry weather in June caused much concern among corn and soybean farmers. However, for much of the state, Arlene and Dennis provided needed relief. The excess moisture provided by Katrina and Rita came after silking and blooming; thus, flowering and fruit set were not severely affected. However, the heavy rains and wind did cause some lodging of corn and soybean.

Turfgrass, *Rick Latin, Department of Botany & Plant Pathology*

The 2005 growing season was marked by long periods of heat and humidity that favored diseases such as brown patch, Pythium blight, and summer patch. Root zone temperatures remained elevated from late May through mid-September, resulting in severe and widespread outbreaks of summer patch on Kentucky bluegrass and annual bluegrass. Hot days and warm nights prevailed through July and August, promoting the establishment and spread of brown patch and Pythium blight. Perennial ryegrass and certain types of bentgrass suffered serious Pythium-related damage across the Midwest. Brown patch symptoms were evident on almost all cool season turf species throughout the summer. The gray leaf spot pathogen was re-introduced into Indiana with rains from the remnants of hurricane Dennis. Perennial ryegrass and tall fescue stands suffered severe damage from gray leaf spot at several locations as far north as Lafayette. Diseases that were generally less severe in 2005 than in recent years included dollar spot and basal anthracnose.

Weed Science, *Bill Johnson, Assistant Professor, Botany & Plant Pathology, Purdue University and Glenn Nice, Weed Diagnostician, Botany & Plant Pathology, Purdue University*

We received a number of corn and soybean herbicide injury reports during 2005. In some cases, the cause of the injury was related to stressful weather conditions which reduced the plant's ability to metabolize or degrade the herbicide.

Herbicide Injury Issues

Growth Regulator: Several cases of soybean growth regulator injury were sent into the P&PDL in 2005. This is a common situation in Indiana and the surrounding states or for that matter anywhere where corn and soybean are grown in close proximity. Soybean leaf puckering, cupping, and strapping are a common symptom when exposed to low doses of a growth regulator such as 2,4-D, Banvel, Clarity, Crossbow, Distinct, etc. In many cases if the injury occurs early in the season there is not a yield response. However, if the growing season leads to delayed corn applications and injury occurs later in the soybean development yield effects may be seen. For more information on growth regulator injury on soybean, see the following publication (http://ipcm.wisc.edu/pubs/pdf/dicamba2004.pdf).

ALS Injury on Corn: We noticed several cases of ALS herbicide injury to corn from applications made during the extremely hot weather we experience in early July. The injury symptoms consisted of leaf yellowing, particularly in the whorl area of the plant, crinkling of the leaf edges near the chlorotic tissue and stunting. In most cases we are aware of the corn grew out of the injury and did not suffer yield loss. During stressful weather conditions, corn plants are not able to metabolize herbicides as efficiently and crop injury is more likely. Some postemergence ALS herbicides also contain statements on the label that warn users that crop injury is more likely when applications are made in daytime air temperatures of 90 degrees F or higher.

Giant Ragweed and Common Lambsquarter: We received several reports of poor giant ragweed and lambsquarter control with glyphosate in 2005. In many cases, glyphosate applications were made in early June during a hot dry spell and herbicide activity was compromised. Although resprays were effective in many cases, we have received a number of reports of fields with giant ragweed that were sprayed three times with glyphosate and giant ragweed was still not controlled. We are currently investigating about 20 different sites to determine the sensitivity of giant ragweed and common lambsquarter to glyphosate.

Common Pokeweed: Common pokeweed continues to be problematic to manage in no-till soybean and corn production. We believe that infestation levels are increasing due to lack of management in the fall when control is best with herbicides. Although herbicides applied during the growing season can reduce competition by controlling the above ground growth, we believe it is not controlling the underground tap root of this perennial.

Giant Hogweed: A new invasive plant by the name of giant hogweed (Heracleum mantegazzianum) was identified in Indiana by an employee of JFNew (a Natural Resource Consulting agency, www.jfnew.com). Giant hogweed is a problem invasive in Australia, Europe, and Canada. In the US it has been found in Maine, Michigan, New York, Pennsylvania, and Washington. It is a large plant in stature resembling a large cow parsnip (Heracleum maximum). For more information about giant hogweed see the following article "The Infamous Giant Hogweed" (http://www.btny.purdue.edu/weedscience/2004/articles/gianthogweed04.pdf)

Greenbrier: Several homeowners that have woods on their property have sent in vines with or without spines that belong to the Smilax genus. Plants from this genus are fairly common in Indiana's wooded areas and have been also known as "Jacob's Ladder", "Bristly Sarsaparilla".

Horseweed/marestail: In 2004, 19 counties that had been screened had glyphosate resistant horseweed/marestail. In 2005, we identified glyphosate-resistant marestail in 9 additional counties. For more information about our marestail work, see this website http://www.btny.purdue.edu/weedscience/marestail/index.htm.