Welcome to

PLANT PEST DIAGNOSTICS CENTER

INTRODUCTION

Primary Mission

- The primary mission of the Plant Pest Diagnostics Center is to serve as a scientific and professional resource, providing timely and accurate plant pest diagnostics to our clients, with the aim of protecting California's agriculture and environment.

The Plant Pest Diagnostics Center (PPDC) provides timely and accurate diagnostics of plant pests and diseases in support of the pest prevention programs of the Department. PPDC has five laboratories: Botany, Entomology, Nematology, Plant Pathology and Seed, with about 50 permanent and 30 seasonal employees. The Branch also serves as a scientific resource and provides professional expertise to a number of clients, including the United States Department of Agriculture (USDA), other federal and state agencies, county agricultural commissioners, the University of California Cooperative Extension, the agriculture industry and the public. The PPDC is also a collaborator with the National Plant Diagnostic Network (NPDN), is recognized as the expert lab for the western region, and provides diagnostic service and support to the NPDN. The PPDC scientists, technicians and support staff strive to provide excellence in service and leadership in plant pest diagnostics and biosystematics. More information about PPDC is available at: http://www.cdfa.ca.gov/phpps/PPD/.

The staff of the PPDC continues to provide leadership in plant pest diagnostics and excellence in scientific service and research.

Following is a table representing the number of samples and specimens submitted to the laboratory in 2009, compared with previous years. Most programs include special surveys or projects that generate additional samples that cannot be easily tracked by Pest and Damage Report numbers. Note that sample numbers are not comparable among the different disciplines (labs/programs) as an accurate comparison of workload since the time and work required to diagnose or identify different types of samples varies widely from lab to lab and even sample to sample.

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2009 ACCOMPLISHMENTS

Labs/Programs	2003	2004	2005	2006	2007	2008	2009
Botany[1]	3,284	1,008	1,000	1,474	1,029	1,682	1,167
Entomology[2]	36,146	45,000+	50,000+	50,000+	65,000+	70,000+	80,000+
Nematology[3]	4,782	3,874	4,923	7,912	8,648	5,870	7,864
Plant Pathology [4]	88,233	109,398	103,451	87,434	78,872	90,531	92,218
Seed [5]	3,067	6,923	3,166	5,791	2,427	1,843	3835
Total	**135,512**	**166,203**	**162,540**	**152,611**	**155,976**	**169,926**	**185,084**

[1] An additional 3000 botany specimens were examined & identified for herbarium curation in 2009.

[2] Estimate of specimens examined.

[3] Figure includes quarantine samples, nursery registration & certification samples, USDA Survey Project samples, as well as diagnostic samples.

[4] 2009 figure includes 50,363 samples tested for several target viruses as part of the California Deciduous Fruit Tree, Nut Tree, and Grapevine Improvement Advisory Board (IAB); 26,577 Sudden Oak Death (SOD) samples, 10,000 Asian citrus psyllids tested for Huanglongbing (HLB) causal agent, and 2,169 plant samples tested for HLB causal agent.

[5] Quarantine, phytosanitary and noxious weed seed examinations require identification of 25,000 seeds per sample. Purity analyses require identification of 2,500 seeds per sample. In 2009, the total number of seeds or other propagules actually examined for identification exceeded 18,600,000. Germination tests require the evaluation of 400 seedlings per sample; thus the total number of individual seedlings evaluated for germination tests was in excess of 440,000.

2009 ACCOMPLISHMENTS

Following is a sampling of some of the various accomplishments of the Plant Pest Diagnostics Center from 2009. It is intended to reflect a few of the highlights of the year but is not an exhaustive list.

- The PPDC acquired a USDA permit to receive samples for diagnosis from our Western Plant Diagnostic Network (WPDN) partners in the Pacific—Hawaii, Guam and American Samoa.
- Plant Pathology staff provided special training to a UCD environmental horticulture class in diagnostics, including a lecture by Dr. Cheryl Blomquist on the benefits and limitations of molecular diagnostics.
- In May, the PPDC hosted a group of agricultural extension scientists from Iraq as part of a training program through the College of Agricultural and Environmental Sciences at the University of California, Davis. The Iraqi scientists were then given a tour of the Plant Pest Diagnostics Center and also interacted with our scientific staff on various pest diagnostic topics. Senior Seed Botanist Dr. Riad Baalbaki, who speaks Arabic, was able to explain the complicated concepts of PCR testing as well as phytosanitary seed health testing to the group in their native language. Dr. Dean Kelch, Dr. Andy Cline, Dr. Riad Baalbaki and Mr. Jim Effenberger also evoked much discussion and interest on the part of the group for seed testing and label compliance, weed identification and arthropod pest identification. The group got a real sense of the value and need for such diagnostic tools as seed, botany and arthropod collections in their own country.
- In June, Drs. Suzanne Latham and Cheryl Blomquist detected a rare leaf spot pathogen *Embellisia hyacinthi* on *Scilla* sp. from Monterey County. This is a disease normally found in Europe. This was only the second detection of this pathogen in the United States.
- The first report of downy mildew of Hellebore or Lenten rose caused by *Peronospora pulveracea* in the United States was reported by Drs. Colleen Warfield (UC Cooperative Extension) and Cheryl Blomquist, CDFA Plant Pathologist, in the March 2009 issue of *Plant Disease* (journal).
- In May, scientists presented displays and interacted with school children from all over California at the annual "California State Scientist's Day" at the State Capitol.
- Gladiolus rust was diagnosed from multiple samples collected throughout the San Francisco Bay Area and, for the first time, from a sample collected in Santa Cruz County.
- A species of the needle nematode, *Longidorus* sp., was detected in rhizosphere soils of walnut trees in Glenn County as part of the ongoing USDA Cooperative Agricultural Pest Survey (CAPS) in California. Dr. Sergei Subbotin made the identification of this pest which is subject to mandatory control in Europe.
- The National Karnal Bunt Survey was completed in December by PPDC staff. Fifty-six samples representing 24 counties were tested with no positives detected; in addition, fifty samples from the quarantine area in Riverside County were also tested by Plant Pathology staff and no positives were detected.
- Three posters were presented by PPDC scientists at the National Plant Diagnostic Network (NPDN) national meeting in Miami, FL. The posters featured content on palm wilt disease in California, a summary of the exotic fruit fly detections in the State over the last five years, and the diagnostics class taught by our staff at UCD last fall.
- Branched Broomrape, *Orobanche ramosa*, was identified from a tomato field in San Benito County. This was the first report of branched broomrape in more than twenty five years.
- Plant Pathology staff collaborated with Dr. Francisco Assis of the diagnostic testing company, Agdia, to help with the development of an improved lettuce mosaic virus (LMV) seed health test.
- Plant Pathology and Entomology staff combined efforts to publish the first report of bamboo rust caused by *Kweilingia divina* on *Bambusa domestica* in Los Angeles County.

2009 ACCOMPLISHMENTS

- One intercepted Asian citrus psyllid (ACP) was diagnosed positive by the Plant Pathology staff and confirmed by the USDA for the HLB pathogen. It was found on luggage at the Fresno airport.

- A fungus associated with twig blights and cankers of conifers but unknown in California was indentified from intercepted firewood at a northern border station as *Therrya fuckelii*.

- The botany laboratory received and identified a specimen of squarrose knapweed (*Centaurea squarrosa*) from Shasta-Trinity National Forest. This is only the third report of this A-rated pest from Trinity County and the first report in 15 years. Squarrose knapweed is quite similar to diffuse knapweed (*Centaurea diffusa)*, another A-rated pest, but has slimmer heads and smaller flowers. This similarity may be a reason why it has been so rarely reported from this area.

- Senior Plant Taxonomist Dr. Dean Kelch collected specimens near Lemoore to check for the continued existence of a B-rated pest, Russian knapweed (*Acroptilon repens*), at a historic reported locality. This species was last reported here in the 1970s and no voucher specimen exists. Dr. Kelch confirmed the continued existence of the noxious weed here and collected specimens to permanently document its occurrence.

- A leaf spot disease caused by the fungus *Mycosphaerella handelii* (*Cercospora handelii*) was recently detected on three different native Manzanita species. The fungus was found on *Arctostaphylos pallida* and *A. montarensis* from Contra Costa County and *A. imbricata* from Alameda County. The pathogen, *M. handelii* occurs worldwide as a foliar pathogen of *Rhododendron* spp. Both *Rhododendron* and *Arctostaphylos* are in the same plant family (Ericaceae).

- The tipu psyllid, *Platycorypha nigrivirga* Burckhardt (Hemiptera: Sternorrhyncha Psylloidea), is reported for the first time in North America (USA: California). PPDC scientists Alessandra Rung and Raymond Gill (retd.) published a paper on the insect. Diagnostic characters for identification of adults, nymphs, hosts, damage data and known distribution are given. Originally described in 1987 from Argentina (type-locality), Bolivia, and Uruguay, the tipu psyllid was subsequently recorded in southern Brazil, and Europe. This insect has recently emerged as a serious pest of tipu trees in Curitiba (Brazil), where pest populations are high, trees are being defoliated, and excessive honeydew excretion is fouling concrete sidewalks and vehicles parked under the host trees. Relatively similar levels of damage to tipu trees are observed in West Hollywood, California. In the absence of natural enemies (e.g., predators, parasites or pathogens) or insecticidal controls, the establishment of tipu psyllid in California represents a significant threat to the health and value of tipu tree plantings in California landscapes. The citation for this publication can be found at the end of the report.

- Pachysandra blight caused by *Volutella pachysandricola* = *Pseudonectria pachysandricola* (pest rating=Z) was confirmed in a large garden planting of Japanese spurge (*Pachysandra terminalis)* in Sacramento County. Japanese spurge is an evergreen shrub grown as a groundcover in the shade with attractive dark green leaves and spikes of fragrant white flowers. Although this is the first official confirmation of *Volutella pachysandricola*, this fungus is thought to be present in nearly all pachysandra plantings, but it only becomes a problem when plants are stressed. In the Sacramento Valley, these stressors would include heat, drought and mites. This fungus uses wounds to enter the plant so insect damage can be a way the fungus gains entry. Senior Plant Pathologist Dr. Cheryl Blomquist made the determination.

- The reniform nematode, *Rotylenchulus renifomis*, was recently detected in a shipment of fifty-one *Dracaena deremensis* plants imported from Hakalau, Hawaii. The shipment destined for Costa Mesa was intercepted and inspected by Orange County. The reniform nematode is not present in California and is a quarantine agricultural pest. It can infect a large range of plant hosts. If allowed to enter and establish in California, the reniform nematode can cause significant economic damage mainly to the State's cotton, grape and citrus production.

- Drs. Cheryl Blomquist and Susanne Rooney-Latham in collaboration with Pat Nolan of San Diego County published a "First Report of Downy Mildew on Field-Grown Sweet Basil Caused by a *Peronospora* sp. in San Diego County, California" in the September 2009 issue of the journal *Plant Disease*. The pictures of the disease symptoms were featured on the journal cover. The citation for this publication can be found at the end of the report.

- Staff Botanists curated several dozen plant specimens collected in Louisiana. As California continues to import millions of nursery plants from the southeastern United States, it is crucial to have a good collection of common southeastern plants for diagnosis of received samples. Although many southeastern weeds require too much water to thrive in much of California, several species from this region have become wetland or nursery weeds in California and there is potential for more weed pests to enter and establish here in California.

- Senior Plant Taxonomist Dr. Fred Hrusa continued annotation of Russian thistle (*Salsola* spp.) from other collaborating institutions. Over 200 specimens from Riverside were annotated and over 50 specimens from Rancho Santa Ana Botanic garden were annotated. The species of *Salsola* are important imported weeds in the western United States. Taxonomic confusion has added to the problems in controlling these species.

- In August, the fungal pathogen that causes thousand cankers disease of walnut species (*Juglans*) was confirmed in California by PPDC Pathologists. The disease is associated with widespread dieback of black walnut trees in Colorado and other parts of the western U.S. Branches of southern California black walnut (*Juglans californica*) showing typical canker symptoms of the disease were collected by CDFA officials in Yolo County. The fungal pathogen, *Geosmithia* sp., was readily cultured in the lab from the cankers.

2009 ACCOMPLISHMENTS

- The fungal pathogen *Botryosphaeria corticola* (*Diplodia corticola*) was diagnosed from a residential oak tree in Plumas County— a new record for this fungus in California and the western U.S. The fungus is typically associated with stressed oak trees in Europe but has also been found on a redbud and an oak tree in the eastern U.S. According to the county biologist that collected the California sample, the oak tree appeared to be severely overwatered.

- The spotted winged drosophila, *Drosophila suzukii*, was identified by Associate Insect Biosystematist Dr. Martin Hauser in California— a new record for North America. This insect is part of a group that usually feed on decaying vegetation, but this species attacks healthy fruit and causes significant damage. In California they have been feeding primarily on cherries, but have a wider host range on soft-skinned fruits and have since been found to be widespread in the state as well as in Oregon, Washington and British Columbia.

- Senior Plant Nematologist Dr. John Chitambar was invited to serve as a member of the American Phytopathological Society (APS) Widely Prevalent Phytopathogenic Nematodes Sub-Committee (APS-WPPNL). The Sub-Committee (of APS' Nematology Committee) in response to the United States Department of Agriculture, Animal and Plant Health Inspection Service (USDA-APHIS) is charged with development of a list of about 100 widely prevalent phyto-pathogenic nematodes. USDA's goal, with concurrence from individual state plant regulatory departments, is ultimately to improve and streamline the PPQ 526 permit granting process. The opportunity for CDFA Nematologist to have direct input in this project should prove very valuable to both state and federal agencies.

- The Burrowing Nematode, *Radopholus similis*, was detected in shipments of Pothos, *Epipremnum aureum* plants. Sixty plants in 6-inch pots, originating in Mount Dora, Florida, had been inspected and sampled at their destination at Half Moon Bay, California, by the San Mateo County Commissioner's Office. CDFA Nematologists identified the nematode species. The Burrowing Nematode, an A-rated pest not present within the State, is of quarantine significance to California. Its introduction and spread has been prevented through CDFA's effective External Quarantine program for Burrowing and Reniform Nematodes established in 1953. If left undetected and allowed to establish, the nematode species would be a serious problem to California's citrus, strawberry, carrot and ornamental industries.

- An introduced leaf-footed bug, *Centrocoris variegatus* from the Mediterranean was identified from Yolo County (new county record) on June 10 by Senior Insect Biosystematist Dr. Andrew Cline. The species was only recently identified by PPDC in May 2009, which was then the first report of this true bug in North America. Thus far, the species has been reported from three counties: Alameda - 1st record, Sacramento, and Yolo

RESEARCH / SEMINAR SERIES

- The PPDC tested citrus samples from nursery propagative sources. The sampling and testing was for compliance with citrus tristeza virus (CTV) state quarantine. All samples were tested by Enzyme Linked Immunosorbent assay (ELISA) and positive detections were confirmed by reverse transcriptase polymerase chain reaction (RT-PCR). Four samples out of the 10,168 citrus samples that were tested and were identified as CTV-positive.

- Plant Pathology staff diagnosed a powdery mildew of Mahonia that is new to California. The Mahonia sample was from a nursery in Riverside County. *Microsphaera berberidis* [=*Erisyphe berberidis*] was causing leaf spotting and producing spores directly on the leaf in the irregularly shaped spots. The Mahonia plants came to the Riverside County nursery via a nursery in Jacksonville, Oregon. This discovery is consistent with the first reporting of the pathogen in the U.S. in the state of Washington in 2003 and then in British Columbia in 2005. This powdery mildew is well known in Europe and Asia. Since it has never before been reported in California, it is currently assigned a Q-rating.

- Numerous workshops were held to train County Agriculture Department staff in recognition of various important and high profile insects. These workshops were given throughout the year and included training in the identification of various moths, scales, and flies.

RESEARCH

The scientists at the PPDC continue to research and publish scientific papers as part of the mission of the branch. In the past year, members of the PPDC published 51 scientific papers, books, manuals or other publications. In addition, 38 oral presentations and/or posters were given at various professional meetings, seminars and training workshops. A list of scientific publications and presentations for 2009 are included at the end of this report.

SEMINAR SERIES

The Plant Pest Diagnostics Center seminar series began in 2004 to enable scientists to present research data and discuss ongoing research and pest issues of general importance and has continued throughout 2009 with enthusiasm and participation by many from within and outside of our branch. The speakers have included scientists from the PPDC and other branches of CDFA, USDA, University of California, Davis, and University of California Cooperative Extension. The focus of the seminar series has been to share information on any aspect of basic or applied research or diagnostics and includes invited speakers from other institutions.

CALIFORNIA STATE COLLECTION OF ARTHROPODS

2009 REPORT

The California State Collection of Arthropods (CSCA) is a scientific resource for the local, federal and international community for research and identification of various groups of arthropods, especially insects. The collection is maintained by the Entomology Lab of the Plant Pest Diagnostics Center. Two curators, a collection manager, and the entire scientific staff directly supervise the care, use, growth and development of CSCA by encouraging the use of this collection for research on the taxonomy and systematics of arthropod taxa. The web page for the collection is located at the following website: http://www.cdfa.ca.gov/phpps/ppd/csca.html. As far as specimen usage, the California State Collection of Arthropods issued 24 loans in 2009 representing nearly 3,000 specimens, and hosted more than 20 visitors from the local, national and international communities to study the collections on site. Visitors came from several North American institutions, including the Smithsonian Institution, the Canadian National Collection of Insects, the California Academy of Sciences, the Field Museum, and the Royal Alberta Museum.

The total number of prepared specimens is over 2 million, with approximately 100,000 prepared specimens accessioned in 2009. With the CSCA's blanket permit to collect arthropods in California's State Park system, several seasonal survey efforts were undertaken in 2009, including Indian Grinding Rock Historical, Calaveras Big Trees and Prairie Creek State Parks, as well as Redwoods National Park. In addition, the CSCA organized the 2009 North American Dipterists Society field meeting, based in Crescent City. CSCA's frozen tissue collection continues to grow. At least 12 holotypes and numerous paratypes were deposited in CSCA in 2009, and the collection has been recognized as an important repository for certain groups of arthropods. While personal examination of types may always be necessary, there are plans to add multiple-view close-up digital images to the CSCA Web page for each species held. The inventory of the entire collection is nearly complete with more than 40,000 species so far.

To accommodate interested vocational and avocational entomologists locally, regionally, and worldwide the CSCA has a Research Associate program. Through the associate program, PPDC encourages the use of the collection, the growth of the collection through their respective donations and allows associates to cite their status, if necessary, to provide an institutional address for publications or grants. Several additional scientists have applied to our program in 2009 and have been awarded this courtesy appointment. The Research Associates can be found on the branch website at: http://www.cdfa.ca.gov/phpps/ppd/csca.html#associates.

2009 PUBLICATIONS AND PRESENTATIONS

PUBLICATIONS

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Epstein, M. "False Codling Moth, European Grape Vine Moth and a previously unknown caterpillar of a native California slug moth". Meeting of the Lorquin Entomology Club, Rancho Dominguez, California.

Epstein, M. Workshop on identification of invasive species of leafrollers. For CDFA staff in the Los Angeles area. Oct. 23, 2009. Los Angeles, CA.

Epstein, M. Evening lecture on little known Lepidoptera caterpillars in California. Oct. 23. 2009. Corporate headquarters of Bioquip for the Lorquin Entomology Club.

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Gaimari, S.D. Taxonomic identification and its relationship to systematic research: A few comments on the applied side of things. Bay Area Biosystematists Society, Berkeley, CA.

Garrison, R.W. G2009. Diversity of Neotropical Zygoptera. Invited Plenary talk: 6th WDA International Congress of Odonatology. 7-12 June 2009, Xalapa, Mexico. Organized by Worldwide Dragonfly Association and Instituto de Ecología, UNAM

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Hauser, M. "The Spotted Winged *Drosophila* in California." Spotted Wing *Drosophila* Meeting, November 2, 2009. University of California, Davis.

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Hauser, M. "*Drosophila suzukii* - Identification, History and International Perspective." Invited talk, Spotted Wing Drosophila Meeting, Davis, Ca, 02.November.2009

Hauser, M. "When vinegar flies go bad – the case of the spotted winged *Drosophila*." Invited talk, CDFA seminar series, 17.September.2009. .Sacramento, CA.

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Stouthamer, R., J. G. Morse, P. F. Rugman-Jones, L. J. Robinson, A. Urena, and **G.W. Watson**. "Armored scale Blythe Border Station sampling / dispersal studies." Presentation made by Professor Joseph Morse (UC Riverside) at the California Avocado Grower Seminar Series, March 14 at San Luis Obispo, CA, March 15, 2009 at Ventura, CA and March 16, at Temecula, CA.

Subbotin S.A. DNA barcoding, the way ahead: examples for tylenchs. (Oral presentation). The Second International Congress of Tropical Nematology, 4-9 October, 2009, Maceio, Brazil

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Tidwell, T.E.. "Diagnosing Horticultural Problems." Presentation to UC Davis Environmental Horticulture class, Department of Plant Sciences, April 6, 2009. Sacramento, CA

Tidwell, T.E. "Tree Disease Diagnosis" Presentation to Sacramento Tree Foundation, January 21, 2009. Sacramento, CA.

Watson, G.W.. "Scales and whiteflies: the challenges of a sessile lifestyle." CDFA-PPDC seminar, March 19, 2009. Sacramento, CA.

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