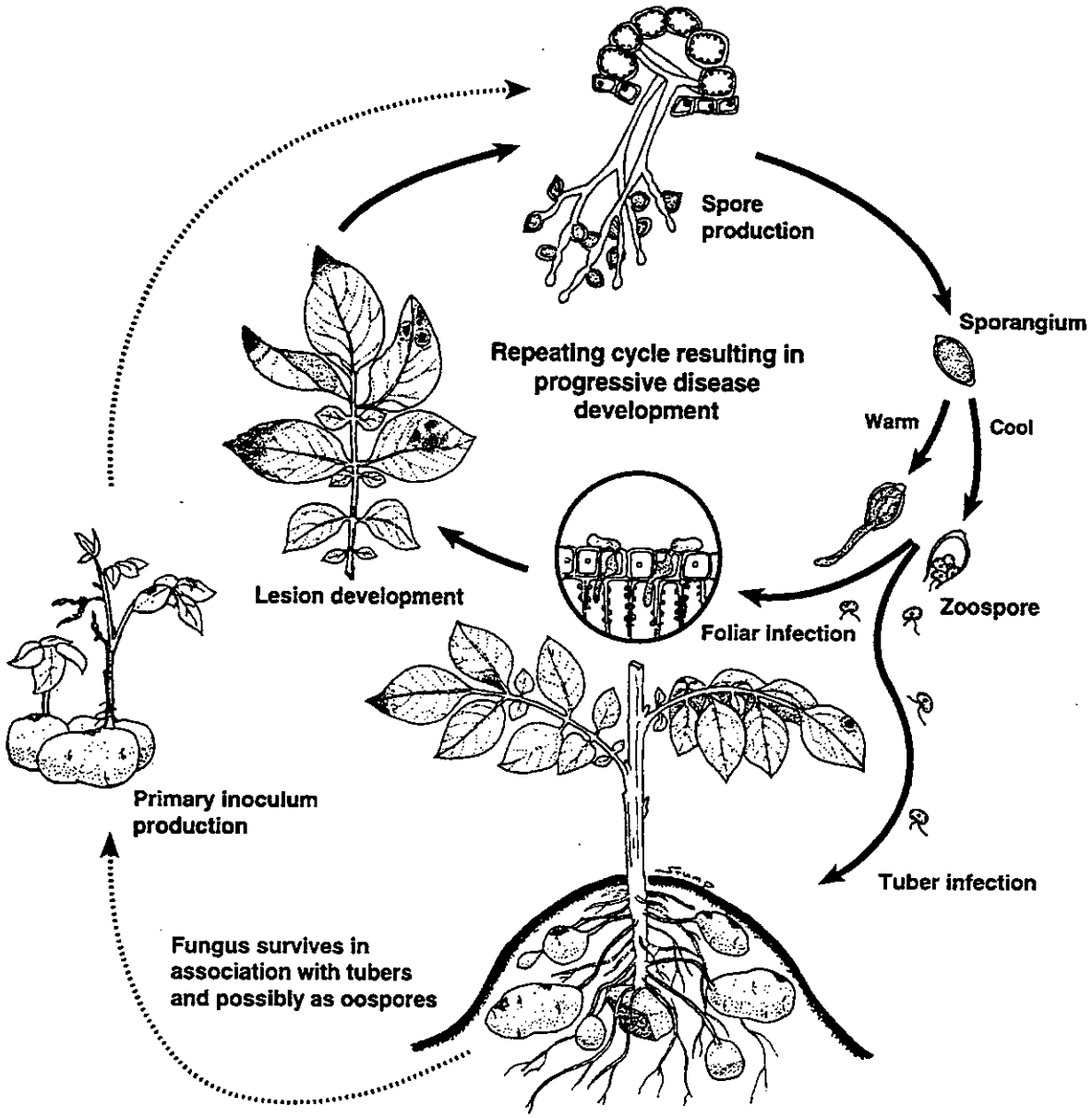
June 2000
Volume 21, Number 2

Plant Diagnostics Quarterly

Feature: Excerpt from APS Emerging and Reemerging Plant Diseases



On the Cover:

This issue of PDQ features the Potato Late Blight Disease cycle, which is a disease caused by the fungus *Phytophthora infestans*. "The fungus survives in infected tubers and volunteer plants. Spores are only produced on the surface of living host plant tissue. Disease progression is influenced by many factors including host susceptibility, fungicide use and environmental conditions. Cool wet conditions favor disease progression (prepared by W. L. Stump and G. D. Franc)". Reproduced with permission from the University of Wyoming's factsheet #B-1032, May 1996, Potato Late Blight.

Cover Art was graciously supplied by Dr. William Stump from the University of Wyoming. He has been doing scientific illustration since the early eighties with subjects that encompass plant pathology, botany, and entomology. Though a full-time research scientist in plant pathology, he is willing to undertake projects for a reasonable fee. He can be contacted by email: wstump@uwyo.edu

Plant Diagnostics Quarterly (PDQ) is a nonprofit publication which serves plant pathologists in extension, regulatory and industrial clinical laboratories, private consultants, and other interested persons. PDQ is published four times a year.

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Send manuscripts, announcements, and letters to the Editor: Stephan Briere, University of Wyoming, P.O. Box 3354, Laramie, WY 82071-3354.

FROM THE EDITOR

Dear PDQ Readers:

The summer is upon us and I hope that most of you will be able to lift your heads long enough from under the deluge of samples to enjoy this issue of PDQ. Spring came early for most areas and this summer is shaping up to be a hot one across the whole county. There have been some important disease problems this year including citrus canker in Florida, fire blight epidemic in Michigan and Begomovirus epidemics in solanaceous crops.

The feature article for this issue of PDQ is actually an excerpt from the syllabus of the recently published APS Emerging and Reemerging Plant Disease slide set. The slide set was compiled by Gail Schumann and Edward Braun and includes 13 important emerging and reemerging plant disease of importance in the United States.

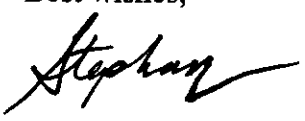
In the rush to get the last issue of PDQ together I neglected to thank outgoing Pacific Northwest/Rocky Mountain Regional editor Ellen Bentley for her many years of service. She has done a fine job coaxing everyone in her region to submit their reports and getting them edited for PDQ. I would also like to welcome Cheryl Ruby from North Dakota State University who has gladly accepted to take over as editor for the region.

I would also like to acknowledge and thank Anita Sanders (formerly Anita Eberle) for her many years of service to PDQ. Anita worked behind the scenes with Gail and myself to help coordinate enclosures, maintain the subscriber list and get PDQ duplicated and mailed.

I am looking for more feature articles for the September and December issues of PDQ. If you have an article (3 to 5+ pages) to include that would be of interest to our readership please contact me soon. This is a good way to get some of your work published and help provide the diagnostic community with informative articles.

We are still looking for a new editor for PDQ to start work on the March 2001 issue. If you or someone you know is interested please contact Gail Ruhl or myself to volunteer for this prestigious honor.

Best wishes,



Stephan Briere, Editor
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Features:

Enclosures:

- Haugen, Linda *et al.* **Pest Alert: Oak Tatters.** U.S. Department of Agriculture Forest Service. Forest Insect & Disease Leaflet NA-PR-02-00.
- **Do You Know The Powdery Mildews.** Chase Research Gardens, Inc. 8031 Mt. Aukum Rd., P.O. Box 529, Mt. Aukum, CA 95656

PDQ – Plant Diagnostics Quarterly

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Guidelines to Contributors

Submission of articles:

Articles may be submitted in any of the following manners:

1) As a "document" or "note" attached to an email message. Send these articles to Stephan Briere at **briere@uwyo.edu**. I use Microsoft Word 97 but can accept documents from earlier versions of Microsoft Word or WordPerfect versions 5.1 or higher.

2) As a diskette (3.5") with PC formatting if possible.

   Mail to:
   Stephan Briere
   University of Wyoming
   P.O. Box 3354
   Laramie, WY 82071-3354

   Please include a hardcopy of the article with the disk. Disks will be returned.

3) As a camera-ready hardcopy. Follow the manuscript guidelines shown below. Mail to Stephan Briere at the above address.

Information for the classified section (including job announcements and workshops) can be submitted in any of the above manners or as a email message.

Manuscript Format:

Titles: Center in Boldface; Author(s) and institution(s) should be centered below the title.
Margins: 1 inch (Top, Bottom, Left, Right)
Page Numbers: Do not include (although you may lightly pencil page numbers on any hardcopies that are sent)
Font: Something easy to read, such as Times New Roman, 12 point
Spacing: Single-spaced
Latin binomials: Italicized
References: Cite at the end of the article using a consistent format, such as that used in Plant Disease.
Printing: If sending a hardcopy, laser printed articles are preferred; type needs to be clear and dark enough to be reproduced well.

Enclosures:

Send 200 copies of fact sheets to be used as enclosures in the PDQ to:

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West Lafayette, IN 47907-1155

If you are unable to supply 200 copies, send a few to Gail Ruhl (at the above address) and request that they be duplicated. Fact sheets with pictures that are to be copied **must** be of adequate quality to enable good reproduction of the photographs.

PDQ Deadline Dates For 1999

ISSUE:	**MARCH**	**JUNE**	**SEPTEMBER**	**DECEMBER**
Copy Due*:	2/19/2000	5/21/2000	8/20/2000	11/19/2000
Printing Date:	3/12/2000	6/11/2000	9/10/2000	12/10/2000

* - Date by which all information **must be received.**

NEWS & VIEWS

[This is a new section devoted to readership comments about recent news, events, moves, job opportunities or just to get a topic out in the open for discussion. Please e-mail me (briere@uwyo.edu) any items you would like posted to this section, thanks.]

Additional: Regarding the request for isolates of *Phomopsis* from known hosts made in the March 2000 issue of PDQ;

In reading my message to the recipients of PDQ, I should have made clear that we can easily isolate pure cultures from specimens of Diaporthe and Phomopsis. If diagnosticians find Phomopsis on a known host, they can simply air-dry the specimen and mail it to us with information about the host identity, locality, collector, and information on pathogenicity, if known. And, thank you!

Amy

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REGIONAL REPORTS

NORTHEAST
Cheryl Smith

Well, looks like this season may provide a bit more variety than 1999 (drought, drought and drought). Our weather here in the Northeast (particularly New England) has bounced all over the place, from 70 degrees in March to snow in early May followed by record-breaking temperatures in mid-May, then several damaging frosts in late-May! Many of the labs in New England have seen a lot of drought-predisposed winter injury on woody plants, particularly winter burn on hemlocks (which most homeowners fear is Hemlock Wooly Adelgid).

Woody Ornamentals

Delaware - Bob Mulrooney

Bob reported seeing lots of anthracnose on sycamore and white ash. Scab is rampant on crabapple in areas with abundant rainfall. He saw Monilinia twig blight on Chaenomoles again on campus. The disease produces very distinct twig cankers, and causes dieback. At first it can look like fireblight until the flowers are examined closely and the tan fungal growth is visible. Powdery mildew on *Cornus florida* was seen on May 15, which is very early. Many of the routine wet weather diseases have also been seen so far this spring. They generally don't see much Rhabdocline needlecast on Douglas fir, but several Christmas tree growers had minor outbreaks this spring.

Maryland - Ethel Dutky

Ethel mentioned "This spring was especially nice for frost injury with bacterial augmentation". She saw many cases on nursery lilac, forsythia, euonymus and magnolia. In the landscape, *Acer palmatum* was diagnosed with severe dieback or many did not leaf out at all. She is diagnosing it as drought injury. Many landscape and nursery 'Foster' and 'Nellie Stevens' hollies suffered severe winter damage, "perhaps drought injury played a role as well", but they are seeing this both in landscapes and nurseries.

Forsythia were diagnosed with shoot blight caused by *Sclerotinia sclerotiorum* and the *Pseudomonas syringae* plus spring frost complex. Many trees and shrubs were diagnosed with Botryosphaeria cankers. Other diseases reported were Sphaeropsis canker and dieback *on Calocedrus decurrens*, spot anthracnose (Elsinoe corni) on Cornus florida and bacterial leaf spot and shoot blight on star Magnolias.

New York - Karen L. Snover

Karen reported drought stress on Norway spruce and several other woody ornamentals. Several root rots were diagnosed, including Armillaria root rot on magnolia and. rhododendron; *Phytophthora* on rhododendron and dogwood; and Procera root rot on white pine. Other diseases reported were Canavirgella needlecast on white pine, Rhabdocline on Douglas fir, Volutella leaf blight on Pachysandra, anthracnose on sycamore and Common canker on rose.

Massachusetts - Dan Gillman & Susan Lerner

Environmental problems seemed to dominate the samples received by the UMass Urban Forestry Diagnostic Lab. Dan and Susan reported drought/winter drying (wind and sun) injury on Cupressus and Hemlock. Volutella blight on Boxwood was determined to be secondary to winter injury, drought and heat stress. Other environmentally-related problems included marginal scorch due to drought/heat stress on Cherry laurel; high-soluble salts, over-fertilization and drought stress on container-grown blueberry; branch dieback due to Nectria canker following drought, freeze and wind damage on Holly; and interveinal yellowing and brown blotches on the leaves of Rhododendron

caused by intense sunlight plus heat and drought.

Diseases reported were *Pestalotia* on Arborvitae and Rhododendron; Botryosphaeria canker on Crabapple; Colletotrichum leaf spot/anthracnose on Carolina rhododendron; Botryosphaeria and Phomopsis cankers on Rhododendron; and Fusarium root rot and damping off of Spice bush (*Lindera benzoin*) seedlings.

New Hampshire - Cheryl Smith

Winter burn predisposed by drought stress was the major problem reported by Cheryl on evergreens. Samples included rhododendron, white pine, holly, balsam and Fraser fir, hemlock (lots), and mountain laurel. The injury to the mountain laurel was followed by *Phomopsis*, which caused extensive blighting of the leaves and twigs. Bacterial blight following frost injury was diagnosed on lilac, forsythia and viburnum (the viburnum was also colonized by Botrytis). Two lilac samples were also diagnosed with Botrytis blight (culturing on King's B was negative for *Pseudomonas*). *Botrytis* was also diagnosed as causing seedling blight on fir seedlings in close-packed nursery beds. One nursery had significant losses in overwintered rooted cuttings and potted plants of several species. The material looked fine before going into winter storage in a poly-tunnel. Most of the plants broke bud, but then died in the tunnel or soon after they were moved outdoors (frost was not an issue). Turned out the grower 'stacked' the pots several high when they were stored in the tunnel. They were watered once or twice in the winter, but regularly in the spring. The pots on the bottom of the stack were the ones with root rot. Other diseases diagnosed were herbicide injury on Euonymus, common canker on tea rose, Phomopsis twig blight on pyracantha, Cercospora leaf spot on rhododendron and mountain laurel, Rhizosphaera on spruce, and Botryosphaeria canker on red maple & thundercloud. The lab and county offices also received samples and numerous calls about 'an abundance of twigs falling from spruce trees'. Seems that squirrels had it out for spruces this spring, and were chewing the ends of the spruce branches, causing the ground to be littered with branch tips.

New Jersey - Rich Buckley

Rich's first sentence was "Cankerland, presumably a response of the last couple of droughts". He reported finding *Cytospora* on almost every maple sample. Other cankers reported were *Botryosphaeria* on Rhododendron, Apple, Holly, Dogwood; *Diaporthe* (*Phomopsis*) on ornamental pear; and Nectria on beech.

There also seemed to an abundance of insect problems, borers, mites and scales. They found oriental beetle in nursery stock "these things are destructive - we usually see them in container stock, but this spring we are getting (them in) plants from the field". Rich said the injury looks like vole/mouse feeding, but it is below ground (and they usually find a grub nearby). One grower lost approximately 30% of 1600 Euonymus seedlings to the beetles. Another says that because of label particulars, treatment would run him $140,000. The grower also commented that that the oriental beetle problem is worse than Japanese beetle ever was.

Virginia - May Ann Hansen

Mary Ann said Virginia experienced a cool, wet spring until the first 3 weeks of May (which were dry in many areas). The early cool, wet weather favored spring diseases, such as bacterial blight of lilac, spot anthracnose of dogwood, oak leaf blister, and anthracnose of sycamore. Botryosphaeria dieback of rhododendron was also been prevalent this spring. Its appearance is undoubtedly related to stress from severe droughts of the previous two summers. They also reported seeing winter damage on many woody ornamentals in the eastern part of the state. A sudden temperature drop and a severe winter storm followed warm winter temperatures in late January in eastern Virginia. They believe most of the winter injury they've seen on camellia, Euonymus, photinia, and various hollies is related to the January temperature drop.

She also reported bacterial leaf spot, caused by *Pseudomonas syringae* pv. *syringae*, on ornamental cherry. They frequently see leaf spots on ornamental cherries, but are usually unable to isolate a pathogen from them. This was the first time they saw definite bacterial streaming associated with leaf spots on cherry and were able to culture and identify the pathogen. In addition, they had several cases of Cercospora leaf spot on hollies. This fungus causes circular, black leaf spots that resemble those described in the literature as anthracnose of holly.

Herbaceous Ornamentals & Greenhouse

Delaware - Bob Mulrooney

Bob reported that powdery mildew on Gerbera daisy has been a problem for some growers. *Botrytis* was everywhere when they had lots of cloudy, rainy weather before Easter. The cloudy weather also favored the development of edema on ivy geraniums, which they saw in the clinic before Mothers Day. He also diagnosed Heterosporium (*Didymellina*) leaf spot on iris from a wholesale nursery this spring.

Maryland - Ethel Dutky

Ethel reported that she had several Maryland growers that had propane gas leaks that caused damage on a variety of vegetable transplants (tomato, pepper, eggplant, chard, etc) and bedding plants. The gas leaks were confirmed with gas chromatography analysis of the greenhouse atmosphere. The damage looked very chemical, similar to herbicide with affected leaves thickened, twisted, and crisp. As soon as the plants were moved to a gas-free location they rapidly grew out of the damage.

She also mentioned that "This was also an excellent spring with lots of cold wet weather, so I saw perhaps more white mold on more different greenhouse crops than usual". A few crops she noted were *Pelargonium* x *hortorum*, *Helleborus foetidus* and 'Wave' Petunia, all with *Sclerotinia sclerotiorum* blight. Rust was diagnosed on Malva (*Puccinia malvacearum*) and Lantana (*Puccinia lantanae*). *Rhizoctonia* was reported causing web blight on non-stop begonia and melting out on garden impatiens.

Other diseases reported were Septocylindrium leaf spot on Sweet Flag (*Acorus*), daylily leaf *streak (Aureobasidium microstictum*) on Hemerocallis, stem and bulb nematode, (*Ditylenchus dipsaci*) on mossy phlox, fire (*Botrytis tulipae*) on tulips, powdery mildew on Gerbera daisy and yucca leaf spot caused by *Coniothyrium concentricum*. Ethel also had a sample of Spiderwort (*Tradescantia*) with leaf spot symptoms. If she incubates the samples for days, she can get *Colletotrichum* to sporulate (sometimes). If anyone has a better explanation for this "nasty looking leaf spotting on production spiderwort" please let Ethel know.

New Jersey - Rich Buckley

Rich reported lots of samples of Geraniums with iron and manganese toxicity caused by low pH. He also received several geranium samples with soluble salts problems. He had one confirmed case of bacterial blight on geraniums and several *Pythium*/fungus gnat problems.

New York - Karen L. Snover

Karen reported seeing lots of bacterial blight on geraniums. She also reported Phytophthora root rot on gardenia, powdery mildew and Phytophthora root rot on Verbena, Septoria leaf spot on phlox and Potyvirus on Alstromeria.

New Hampshire - Cheryl Smith

Geraniums seemed to be plagued with problems. The most common problem was Iron/manganese toxicity caused by low pH. Pythium root rot and Botrytis blight were also common on geraniums. Bacterial blight (Xcp) was confirmed on samples from three growers (Agdia Imunostrip®, vascular streaming and testing by Agdia). Rust (*Puccinia pelargonii-zonalis*) was diagnosed on one sample. Phytophthora root rot caused significant problems on million bells (Calibrachoa), and was also diagnosed on Heliotrope and verbenas. One grower had significant losses on overwintered containerized perennials due to *Pythium*. When he applied Bandit in the fall, he applied it at the bedding plant rate (which was approximately half that for perennials). Pythium root rot was also a problem on million bells, New Guinea impatiens and pansy. The variations in winter

temperatures caused significant losses in daylilies for one producer. Many of the crowns were killed. Viruses included INSV on impatiens and lily symptomless virus on Easter lily. Other diseases diagnosed were leaf spot on hosta and stem rot and leaf spot on cranesbill caused by *Botrytis*; tulip fire, Thielaviopsis root rot on petunias, and leaf streak on daylily.

Virginia - May Ann Hansen
Mary Ann reported seeing one case of a mixed infection of Tobacco Mosaic Virus and Tomato Mosaic Virus in greenhouse-grown petunias. Symptoms on leaves resembled a fungal leaf spot disease, but no fungal pathogens were found. From the same greenhouse, they received a verbena with tiny purplish leaf spots centered around trichomes, and purpling of older leaves. They found no pathogens associated with the leaf spots and concluded that the symptoms were due to a combination of cold injury and phosphorus deficiency. One other unusual disease they saw in ornamentals was Macrophoma cladode rot on prickly pear cactus. Symptoms were circular, black, sunken lesions, mostly centered on thorns. Pycnidia were present in many of the spots. Another unusual problem was a stem rot on bearded iris. Symptoms were watersoaking and progressive soft rot of only the flower stalks. Initially, the main stem was healthy and the flower stalks hung limply from the main stem, but eventually the rot moved down into the main stalk and caused wilting of the entire plant. A white, fluffy fungus, thought to be *Sclerotinia*, was present on the rotted areas; however, no sclerotia have formed in culture. If anyone has information on this disease, please contact Mary Ann (maryannh@vt.edu).

Turf

Massachusetts - Gail Schumann
Gail reported the following: "In general, we had a cool, wet spring. Samples and disease reports have included a lot of yellow patch (cool season brown patch/ *Rhizoctonia cerealis*) and Fusarium patch (pink snow mold) as well as some take-all patch on bentgrass in wetter areas with high pH. Red thread was very active in lawns. When the weather became very hot for a few days, turf in many areas suffered from the heat stress. Fairy ring became widespread in thatchy turfgrass areas in mid-May.

New Jersey - Rich Buckley
Rich reported seeing the usual winter, early-spring disease problems. He has seen a fair amount of *Microdochium* (pink snow mold), but a lot of *Rhizoctonia cerealis*. The rain in late-April certainly lead to peaks in disease frequency. Take-all was diagnosed on newer bentgrass turf, but from further south (VA, DE, and Philly area). They received some take-all on the winter wheat form New Jersey, but none had been confirmed in golf turf. Rich mentioned that anthracnose basal crown rot was active. He thinks the brief heat spell they had in early May caused some stress on the *Poa annua* ("certainly stimulated seed head production") on golf greens, thus overwintering anthracnose infections started to cause some turf decline. (Rich pointed out that both Jackson and Landscoot suggest that anthracnose infection periods appear to begin in the cooler weather of late spring.) They had text book symptoms on one sample (perfect black stromata on the crown!!). Leaf spots on Kentucky bluegrass (*Drechslera poae*) and fine fescues (*Drechslera dictyoides*) were starting to come into the lab from homeowners. He has not seen any red thread yet.

New York - Karen L. Snover
Karen reported A number of turf samples with pink snow mold, Pythium root rot and Dreschlera leaf spot. She also saw a surprising case of early summer patch from a course in the Adirondacks.

New Hampshire - Cheryl Smith
Cheryl reported an interesting case. A homeowner brought in a lawn sample and described the symptoms as "two round spots, two feet in diameter, that appeared almost overnight." There were no dogs on the property (nor did the neighbors have dogs that access to the yard). The woman mentioned that one of the circles, when it first appeared, had what looked like a depression from a hose on one side of it and a 'finger-like appearance' on the other side.

After several more questions it was determined that the hot water heater had been replaced earlier in the day that the symptoms first appeared. The hot water from the tank had been drained onto the lawn! (more than '20 questions' this time). Other turf problems included melting out and anthracnose on a home lawn, and pink snow mold (*Microdochium nivale*) and Pythium blight samples from golf courses.

Vegetables

Delaware - Bob Mulrooney

Bob reported they experienced a serious outbreak of white rust (*Albugo occidentalis*) on overwintered spinach. The symptoms made for excellent pictures but the outbreak was hard on the grower's wallet. They also saw an interesting case of herbicide damage on English peas caused by Dual (metolachlor). The Dual was pre-plant incorporated. The symptoms included lots of curling and stunting resembling viral symptoms or phenoxy herbicide damage.

Maryland - Ethel Dutky

The only disease Ethel had to report was white rot of garlic, caused by *Sclerotium cepivorum.*

New Hampshire - Cheryl Smith

The only sample reported was a case of phytotoxicity from twine used on tomatoes grown for sale a potted plants. The symptoms (distorted leaves and stems) were caused by the chemical used to treat the baling twine (samples were run through a virus screen by Agdia).

New Jersey - Rich Buckley

Rich reported a case of bacterial spot on pepper transplants. An organic grower was producing his own transplants and ran into problems. Another grower had problems with Pythium root rot in field tomatoes. "The grower bought the cheapest transplants and got really cruddy, diseased material that he put into his field to die". Rich mentioned that they assumed the Pythium came in with the transplants.

Virginia - May Ann Hansen

Mary Ann reported seeing a very unusual case of what they determined to be some type of chemical injury in greenhouse tomatoes. They were never able to pinpoint the chemical that might have caused the damage. Symptoms, which were restricted to the leaf veins and stems, included swelling and whitening of the tissue, followed by browning and drying of the veinal and stem tissues. The distortion of the veins caused a general upward curvature and distortion of the leaves. Interveinal tissue appeared puckered along the veins but was otherwise not distorted. Symptoms and the pattern of distribution in the greenhouses were not typical of 2,4-D injury. No heat had been used in the affected greenhouses, so they could not attribute the symptoms to ethylene injury. Symptoms were present on all tomato plants in two greenhouses, but not on tomato or other plants in other greenhouses or on plants growing outside the greenhouses. According to the grower, all greenhouses had been sprayed using the same sprayer and no herbicides had been used in the sprayer. Plants eventually grew out of the damage. If anyone has information or ideas on this problem, please contact Mary Ann (maryannh@vt.edu).

Fruit

Maryland - Ethel Dutky

Ethel reported a case of bacterial canker (*Pseudomonas syringae* plus cold) on 'Patriot' highbush blueberry. The symptoms included red blotches on year old shoots, red spotting of foliage, and blighting of the new shoots.

Virginia - May Ann Hansen

Mary Ann mentioned that few diseases have shown up in fruits yet this spring. They have seen several cases of mechanical injury to strawberry, most likely due to wind-swept sand. Symptoms of the injury included blackened areas on petioles, which alarmed growers who were concerned about anthracnose.

Field Crops

Delaware - Bob Mulrooney

Bob reported that powdery mildew was again the most predominant disease of wheat this spring. Increased levels of wheat spindle streak mosaic virus were seen this spring on susceptible wheat cultivars. He also reported

seeing wheat soilborne mosaic. They have seen relatively little barley yellow dwarf, but they did have had a few positive ELISA tests (all sent to Agdia). The first *Septoria* disease seen was speckled leaf spot caused by *Septoria tritici*. They usually see predominately *S. nodorum*, which causes glume blotch. Leaf rust was just beginning to appear at low levels. It has been so dry in the southern part of DE on some very sandy soils that wheat (post- flowering) is just "firing up" from the ground.

Maryland - Ethel Dutky
Ethel reported seeing tobacco seedlings in greenhouse float beds killed by collar rot caused by *Sclerotinia sclerotiorum*. Some growers had as high as 80% losses. She also reported take all (*Gaeumannomyces graminis*) on wheat.

Virginia - May Ann Hansen
Mary Ann mentioned that "the early cool, wet weather favored spring diseases, such as Sclerotinia crown and stem rot of alfalfa and clover". Virus diseases were prevalent in small grains this spring. In addition to many cases of barley yellow dwarf virus in oats and wheat and wheat spindle streak mosaic virus in wheat, they saw many cases of wheat streak mosaic virus in wheat. Symptoms of the latter virus were indistinguishable from those caused by wheat spindle streak mosaic. Wheat streak mosaic is transmitted by the wheat curl mite, whereas wheat spindle streak mosaic is transmitted by the soil-borne fungus, *Polymyxa graminis*. She also reported one case of wheat soil-borne mosaic this spring. Presence of all viruses was confirmed by Agdia's Testing Services. Take-all was also prevalent in wheat this spring.

SOUTHEAST
Jackie Mullen

Spring has been abnormally dry in the southern half of the Southeast. And consequently, many plants are suffering from drought stress. Some plantings in the southern portions of the Gulf Coast states and Florida have been totally destroyed by the severe drought.

Field Crops/Forages
Arkansas-Steve Vann. The major disease in wheat this year was stripe rust (*Puccinia striiformis*). Losses were significant in many wheat growing areas. Take-all (*Gaeumannomyces* sp.) was also quite common, followed by soil-borne viruses.

Kentucky-Julie Beale. By late March/early April we had begun to see wheat streak mosaic virus and were then taken by surprise by the number of reports of this disease occurring throughout western and into south-central Kentucky. We also saw wheat spindle streak mosaic virus, barley yellow dwarf and powdery mildew on wheat at more normal levels, and more take-all than usual.

For tobacco transplant production, the spring was much quieter than usual (as much for political reasons as any other) with only Pythium root rot being seen on a regular basis on float plants; cases of target spot, Rhizoctonia damping off and Sclerotinia crown rot were occasional.

Tennessee-Tom Stebbins. Reniform nematodes in cotton; wheat leaf streak mosaic virus on wheat.

Alabama-Jackie Mullen. Wheat spindle streak mosaic virus on wheat was observed and confirmed by Agdia's ELISA testing. Symptoms typical of barley yellow dwarf virus were also noted in many areas on oats and wheat. A previous study completed last year confirmed the presence of BYDV (ELISA confirmed) in many areas of Alabama (H. Van Riessen, P. Mask, J. Murphy). Cotton and peanuts are suffering under severe drought in many parts of the state, especially the southern sections.

Vegetables
Arkansas-Stephen Vann. There was an unusually large number of tomato samples with bacterial speck (*Pseudomonas*). Most samples were from a commercial transplant operation. Sales were suspended as a result of this disease. The clinic also received many tomatoes from homeowners. Tomato spotted wilt virus

(TSWV) has also been quite common from several homeowner samples and from a commercial operation in the southeastern part of the state. The disease reached epidemic proportions in 1997.

Kentucky-Julie Beale. Greenhouse tomatoes were diagnosed with INSV. See details under Ornamentals section.

Alabama-Jackie Mullen at the Auburn Lab. Tomato spotted wilt virus (TSWV) was confirmed on tomatoes early in the season (April). We did receive a few more tomato samples with TSWV in May, but the epidemic we expected has not materialized.....as yet. Bacterial spot and speck have been identified tomatoes. Bacterial spot was also noted on pepper.

Alabama. Jim Jacobe at the Birmingham Lab. Tomato plants were diagnosed with bacterial spot, bacterial wilt, and tomato spotted wilt virus.

Florida. R. T. McMillan and W. R. Graves of the Homestead Tropical Research and Education Center Plant Disease Clinic (REC-PDC) reported virus diseases of corn. Rhizoctonia caused root rots of squash and beans. BGMV and Tomato Yellow Leaf Curl continues at a very low level on the bean and tomato crops because of the low populations of silverleaf whitefly vector *Bemisia argentifolii.* Hurricane Irene devastated the whitefly populations and they are now beginning to increase but very slowly. The spring windstorms brought extensive physical damage to the bean and tomato crops.

Florida. Pam Roberts of the Immokalee S. W. Florida REC-PDC reported that they are at their season's end from most vegetable crops. Downy mildew was widespread and severe on susceptible cucurbits if not properly controlled. Powdery mildew was also a widespread problem this spring on squash. Early blight (*Alternaria solani)* was present on tomatoes. Tomato yellow leaf curl virus incidence was detected but low (<1-3%) all season. Fusarium crown rot (*Fusarium oxysporum* f. sp. radicis-lycopersici) was a problem in fields with a history of the disease as usual. Bacterial spot (*Xanthomonas campestris* pv. Vesicatoria) was not as severe under the drought conditions. Gummy stem blight (*Didymella bryoniae)* and Fusarium wilt (*Fusarium oxysporum* f. sp. *niveum*) was present on watermelon in low incidence generally although some individual fields were severely affected.

Florida. Ken Pernezny of the Everglades REC reported powdery mildew of field-grown bell pepper and some real hot spots of blossom-end rot of field tomatoes.

Florida. Richard Cullen of the PDC at the U.F. Gainesville Campus. Richard reported seeing many and unusual diseases for such a drought stricken spring. Probably one of the most unusual diseases diagnosed this spring was powdery mildew of bell pepper. A crop consultant wanted to know if their peppers had downy mildew. As it turned out, it was *Leveillula taurica,* powdery mildew, which according to the big red book, has only been reported on pepper in the U.S. from Utah. This southwestern U.S. powdery mildew is rarely seen in Florida on tomato.

Some other vegetable diseases of interest this spring were potato scab (*Streptomyces scabies),* zucchini yellow mosaic virus of watermelon, tomato yellow leaf curl of tomato, cauliflower mosaic virus of watercress, and bacterial spot of tomato. We had a squash sample that had papaya ringspot virus, watermelon mosaic virus II, and zucchini yellow mosaic virus. And, in contrast to this, we had a watermelon sample that did not react to the former three cucurbit virus antisera, but did react to the general poty virus antiserum and had poty virus inclusion bodies.

Florida. Tim Momol and Hank Dankers of the Quincy North Florida REC-PDC reported tomato yellow leaf curl virus of tomato.

Fruits and Nuts

Arkansas-Stephen Vann. There was a larger than normal number of cedar-apple rust samples through the clinic. Homeowners were quite concerned about the leafspot symptoms on apple. Peach leaf curl (*Taphrina*) was also quite common during this reporting period.

Kentucky-Julie Beale. Peach leaf curl and plum pockets were noted.

Tennessee-Tom Stebbins. Crown gall on grape was reported.

Alabama-Jackie Mullen. Bacterial leaf spot of strawberry (*Xanthomonas*),
powdery mildew on blueberry were noted this spring.

Florida. Pam Roberts of the S.W. Florida REC-PDC reported postbloom fruit drop (*Colletotrichum acutatum)* on citrus was not a problem during the spring bloom. Citrus canker (*Xanthomonas axonopodis* pv. *citri*) continues to be detected in commercial and backyard citrus in SW Florida and the eradication efforts continue.

Florida. Tim Momol and Hank Dankers of the Quincy North Florida REC-PDC reported powdery mildew of grape and strawberry leak (*Rhizopus* sp.).

Ornamentals

Arkansas-Stephen Vann. As a result of frequent rainfall and cool temperatures during the early spring months, powdery mildew was quite common on dogwood, euonymous, and rose. The number of blackspot and rose mosaic samples is also up compared to last year. Fire blight samples from ornamental pear were unusually high this year from the southern areas of the state.

Kentucky-Julie Beale. March remained fairly quiet in our Diagnostic Labs with mostly landscape samples showing damage from last year's drought. We saw much more pine wilt (pinewood nematode) than usual and suspect drought stress favored beetle activity and spread of the nematode.

Early this spring, we had an interesting case in a commercial greenhouse with INSV on impatiens (New Guinea and regular), tomatoes, and petunia. The spots on the petunia were quite non-descript (not ringspots) and without the lead from the other plants, this might have been a tough one to figure out.

In the landscape, spring rains promoted heavy infection of apple scab (often forming "sheet scab" where entire leaf surfaces were covered with the fungus). By about the second week in May, anthracnose on maples was rampant (only occasional ash and sycamore anthracnose samples, surprisingly enough). The number of calls about the anthracnose of maple within a two week period got to be pretty comical!

Tennessee-Tom Stebbins. The following diseases were reported: Hypoxylon canker of blackjack oak; Ascochyta leaf sot on viburnum; cherry leaf curl (*Taphrina* sp.); rose rosette disease on roses; Kabatina blight on juniper; downy mildew on roses; bud proliferation (cause unknown) on redbud.

Alabama-Jackie Mullen at the Auburn University campus; Jim Jacobi at the Birmingham Botanic Gardens Plant Diagnostic Lab.

Jackie Mullen at the AU campus PDL. Fire blight was extremely common this spring, especially on Bradford pears. Powdery mildew was also common and especially on dogwood. A cold snap in early April caused some cold damage on selected turf and landscape areas in some northern sections of the state.

Jim Jacobi at the Birmingham PDL. Fire blight has been very common in the Birmingham area this spring. Moderate to severe fire blight has been observed on pears and apples both in the landscape and home orchard. Frost injury was seen on both ornamentals and turfgrass following freezing temperatures on April 9. Damage was observed on warm season turf,

especially centipedegrass and St. Augustine grass, and on ornamental plants and trees including boxwood, various hollies, chestnut, and sycamore. We have continued to get in dieback samples on a wide range of evergreen ornamentals. In some cases, stress diseases including Macrophoma blight and Botryosphaeria canker, were found associated with the diseased plants. In other cases, no disease organisms were found, and the dieback was believed to have been caused by drought last summer and fall. Hollies and junipers were the most common plants with dieback symptoms.

Florida. R.T. McMillan and W.R. Graves at the Homestead location. They reported viruses on orchids and bacterial disease such as bacterial leaf spot of Syngonium and crown gall of Ficus. Rhizoctonia occurred as foliar blight (web blight) of the East India Holly Fern. Spring wind storms were at times strong enough to damage the leaves of an old banyan tree on Florida West Coast. As the season warmed, physiological edema has become a problem with hibiscus, Ficus, Ixora, croton, orchids, and bromeliads. Last October's hurricane Irene continues to cause plant problems in both Miami-Dade and Monroe counties. Many of the plants, especially palms, that appeared to survive the wind and flooding from both fresh and salt water, are now, seven months later showing latent damage which may prove fatal to the damaged plant.

Florida. Richard Cullen at the Gainesville location reported many interesting and unusual diseases for such a drought stricken spring. Fusarium wilt of palm continues to be a common concern of our clientele. We have processed many samples this spring and have confirmed *Fusarium oxysporum* f. sp. *canariensis* on *Phoenix canariensis, P. dactylifera; and P. sylvestris*. Other palm diseases of interest include bud rots, heart rots, and root rots caused by *Thielaviopsis paradoxa*.

Other interesting ornamental diseases include a heuchera, black geranium, sample with three interesting diseases: *Cylindrocladiella* sp., *Acidovorax* sp., and *Botrytis cinerea*. More diseases of interest were tobacco ringspot of verbena, downy mildew of salvia (*Peronospora lamii)* (reported only in Kansas according to the big red book), thread blight of ligustrum (*Pellicularia koleroga),* stem galls of cupha (*Kutilakesa pironii),* and stem galls of oleander (*Sphaeropsis tumefaciens).*

Florida. Tim Momol and Hank Dankers at Quincy reported fire blight of Bradford pear, cotoneaster, and India hawthorn. Other diseases of interest included leaf streak of daylily, soilborne wheat mosaic virus of rye, rust on juniper (*Gymnosporangium clavipes),* rust on oak (*Cronartium quercuum),* rose mosaic virus of rose, Thielaviopsis root rot of holly, bot canker of crape myrtle, downy mildew of rose and red blotch of amaryllis (*Stagnospora curtisii).*

Turf

Tennessee-Tom Stebbins. Take-all patch on zoysia and bermuda decline (*Gaeumannomyces* sp.) was noted.

Florida. Richard Cullen at Gainesville. In the late spring, a turf grass consultant called with a problem on bermudagrass overseeded with ryegrass. He reported that the newly laid sod at this golf course was dying at an alarming rate. The dead areas were covered with five to fifteen inch circular pink patches. The disease turned out to be red thread (*Laetisaria fuciformis)* and even though this was not a new report to Florida, it was a first at this lab. The sod was imported from one of our neighboring states. Besides the red thread, another interesting disease of turf grass was Cercospora leaf spot of St. Augustine grass.

Alabama. Jackie Mullen at the Auburn Lab. Brown patch was noted on bermuda, centipede and zoysia grasses. Take-all patch has been diagnosed on St. Augustine grass.

Alabama. Jim Jacobe at the Birmingham Lab. Bipolaris leaf spot on bermudagrass , brown patch on St. Augustine grass, and take-all patch on St. Augustine grass were reported.

CENTRAL
Brian Hudelson

Once again the growing season has arrived in the central region and sample numbers have begun to increase. In this quarter's summary, Nancy Pataky (IL), Karen Rane and Gail Ruhl (IN), Sandee Gould (MN), Judy O'Mara (KS), Julie Thompson (MO), Nancy Taylor (OH) and Brian Hudelson (WI) report.

A common theme among diagnosticians was the prevalence of conifer diseases and disorders. In particular, drought stress symptoms were report from several states (IL, IN, OH, WI). Common conifer diseases included Sphaeropsis tip blight of Austrian (and other) pine (IL, KS, OH, WI), Dothistroma needle blight (IL, WI) and Cytospora canker of spruce (IL, WI). Other reported diseases included pine wilt and cedar-apple rust (KS), and Rhizosphaera needle blight of spruce and Phomopsis tip blight of juniper (WI).

Traditional springtime diseases/disorders on deciduous woody trees and shrubs were also common. These diseases/disorders included anthracnose on maple (IL, IN), apple scab on crabapple (IL), powdery mildew, downy mildew and black spot of rose (KS), bacterial blight of lilac (WI), peach leaf curl (WI), and herbicide exposure on a variety of woody ornamentals (IN, WI). More unusual diseases of woody ornamentals that were reported included Exobasidium gall on azalea (IN), prunus necrotic ringspot virus on rose and downy mildew of *Potentilla* (MO), and golden canker (*Cryptodiaporthe corni*) on pagoda dogwood (WI). Vascular wilts are once again a problem with reports of Dutch elm disease (IL), Verticillium wilt of magnolia (IL) and oak wilt (WI).

In the world of herbaceous perennials, Volutella leaf blight of *Pachysandra* was reported at several locations (IN, OH, WI). Other reports included *Ditylenchus* on creeping phlox foliage (MO), bacterial soft rot of iris (KS, WI), Rhizoctonia stem canker (IL) and black root rot caused by *Thielaviopsis basicola* (IN) on vinca, leaf streak caused by *Collecephalus hemerocalli* on daylily (WI), Colletotrichum stem rot of lupine and dianthus (MN), and rusts on hollyhock and Jack-in-the-pulpit (WI). Several turf diseases/disorders were mentioned this quarter. These included dollar spot, anthracnose, Drechslera leaf spot and brown patch reported from Kansas, and yellow patch (*Rhizoctonia cerealis*) and take-all patch reported from Ohio.

Among diseases of greenhouse-grown ornamentals and vegetables, viral problems seemed most common. INSV was reported on coleus, *Aegopodium*, artemesia, fuchsia, and salvia in Minnesota, lemon basil (a new report), phlox (a new report) and impatiens in Ohio, and impatiens and begonia in Wisconsin. TSWV was reported on tomato in Indiana. Tospovirus was detected in begonia, impatiens, scabiola and pepper in Kansas. Pythium and Rhizoctonia root rots were mentioned on a variety of plants from several states (IN, KS, MN, WI). Other root/crown rots of note included black root rot of viola (MN) and hibiscus (OH), Phytophthora root rot of gardenia (MN), and Fusarium and Erwinia stem rots of *Dracena* (IL). Bacterial blight of geranium was also reported (MN, OH, WI) as were edema of tomato and sweet potato (OH, WI). Among vegetable diseases, bacterial spot of tomato and wirestem of cabbage were reported in Indiana, as was downy mildew of broccoli in Ohio.

In the field and forage crop arenas, viral diseases of wheat were a common theme. Wheat streak mosaic virus (IL, IN, OH), wheat spindle streak mosaic virus (IN, KS, OH, WI), soil-borne wheat mosaic virus (KS, OH, WI), barley yellow dwarf virus (IN, KS) were reported. Other reported wheat diseases included leaf rust, stripe rust, and tan spot reported in Kansas, Septoria leaf spot reported in Illinois and take-all reported in both of these states. Several diagnosticians also reported working with soybean cyst nematode samples (IL, KS, OH). Finally there was one report of stem nematode in soybean (KS) and several severe cases of Stewart's wilt of corn (IL).

SOUTHWEST
Tom Isakeit

Sclerotinia minor and *S. sclerotiorum* have been active in several southwestern Arizona crops. Seed crops of Chinese cabbage, radish, and broccoli have been invaded by *S. sclerotiorum*, causing significant losses. Some lettuce plantings were infected by *S. minor* or *S. sclerotiorum*. A stem and crown rot in two garbanzo fields was found to be caused by *S. minor* and *S. sclerotiorum*. In both cases, lettuce was grown in each field and Sclerotinia leaf drop occurred in each lettuce field before the garbanzo plantings were established. Powdery mildew, caused by *Erysiphe cichoracearum*, was present in many lettuce fields during February and March. The lettuce season is finished in southwestern Arizona, and melon harvesting is beginning. Powdery mildew, caused by *Sphaerotheca fuliginea*, has been detected in a couple of melon fields. Powdery mildew on melons will continue to develop until the spring melon plantings mature and are terminated in early July.

California, Imperial Valley - Tom Turini
Spring has been busy this year. We had a very mild winter and early spring. Some of the problems associated with rapid growth that plagued lettuce and cole crops in winter continued to be a problem for broccoli growers in early February when hollow stem and brown bud showed up in two fields in the valley. Downy mildew, which is caused by *Peronospora destructor*, was widespread on dehydrator onions in commercial fields, but not in an experiment I was hoping it would be in. Near the Salton Sea, downy mildew (*Peronospora parasitica*) was also a problem on stocks for a cut flower grower. Some of the late season lettuce had powdery mildew, which included my lettuce powdery mildew fungicide experiment. There were three garbanzo bean fields that suffered from root rot. Both Miguel Vilchez (SRA for Dr. Paulus) and I recovered *Fusarium* spp. from the affected roots.

In early April, the aphid-vectored viruses made an appearance. I have found Alfalfa mosaic in a pepper field where the Ancore cultivar had more pronounced symptoms than the Endra variety. Zucchini Yellow Mosaic was confirmed in three fields in the county: In two fields, it caused substantial crop loss due to flower abortion and fruit distortions. In a field where both ZYMV and watermelon mosaic virus II were present, the crop was nearly mature when the symptoms were noticed and only a very small portion of the field was affected, so there was an excellent yield (about 900 cartons/acre) in spite of the virus. WMVII is more widespread than ZYMV. Ninety percent of the fields that I have been in have some mosaic symptoms. In a few fields, the symptoms are associated with flower abortion, but most fields have produced a good crop.

Bacterial rot has been a problem on carrots this season. On some carrot shipments, the problem has not been noticed until the crop gets to Bakersfield. In one field the problem was obvious three weeks before harvest. They were irrigating for 24 hours per run in every row and daily high air temps ranged from 93 to 99°F and high soil temps were between 80 and 90°F at a depth of four inches. They changed their irrigation practices to 8 hours per run in alternate rows. I went back to the field just before harvest and I could not find any new infections.

I received a call on Botrytis fruit rot on tomatoes, which has caused substantial loss in the packinghouse. Approximately 20 % of the fruit that was harvested 11 days previously were affected and it was also present on fruit harvested 9 days previously. The post-harvest treatment at the packing shed includes a rinse in 200 ppm of Cl at a pH of 7 and a wax containing imazalil. Shady Lady is the variety that has been affected most severely. The plants have a heavy canopy and even at 10:00 am, the fruit are damp. I found an article by Chastagner and Ogawa that stated that DCNA (Botran) substantially reduced disease incidence when applied in the wax, but Botran is no longer registered for that use. We are currently looking

into the feasibility of a hot water treatment in this packer's situation, as well as investigating a pre-harvest fungicide application.

California, South Central Coast (Santa Maria) - Franklin Laemmlen
February has been notable by rain, rain, rain. We started the month at 38% of normal for the precipitation year and ended the month at 106% of normal. The rain has been both a blessing and a curse. The cattle growers are very happy, as they were starting to supplemental feed because there was no grass growing on the hills. That problem has now been eliminated. The row crop farmers have been pretty much shut out of their fields. However, no tillage is occurring and where beds were made before the rain only the occasional field on very light ground is being transplanted or seeded. Some planted fields are flooded and harvesting has become a nightmare. Even so, they put 2 or three tractors in front of the harvest engine and drag it through the field, taking what they can get and leaving ruts as deep as the Grand Canyon in their wake. The strawberry growers were off to a great start with good fruit size and quality. The rain has pretty much shut them down. Botrytis fruit rot is the primary problem. Most of the ripening fruit was being stripped and dropped in the furrows. A small amount was salvaged and sent to the processor to make juice. A few other problems that popped up with the rain are: downy mildew on young lettuce and on stocks (cut flowers), rust on turf grass, dollar spot on turf, Alternaria leafspot on mizuna and lots of bead rot in broccoli. Edible pod peas are also showing Ascochyta leafspot and downy mildew.

Fast-forwarding to the month of May, the disease situation was pretty normal. We saw *Bremia* on lettuce (head, romaine, butter and leaf). Romaine seems to carry a little resistance, as the lesions do not get as big as the ones on iceberg. There was also *Sclerotinia* and *Botrytis* in lettuce, and a very little bit of Cucumber Mosaic Virus (CMV). I found some CMV in snow peas brought in by a seed company rep. In strawberries, I saw powdery mildew (not much) and *Botrytis*. The end of the rains and the hot weather lately have really slowed the gray mold down. However, as of mid-May, the strawberry supply was large and the price, at least to the grower, was in the can. Things do not look good for berry grower profits this year! Artichoke leaves are showing the first Ramularia spots and as the summer fog rolls in, that will get worse. Broccoli and cauliflower seedlings (transplants) are having their normal problems with downy mildew. A good preventive treatment program by the grower usually gets them through this susceptible stage and into the field, but if the grower misses a spray, the transplants are often not saleable. I am also seeing *Sclerotinia* and *Septoria* in celery (very low incidence). Our growers seem to be getting better at growing transplants from clean seed and rotating crops to keep disease incidence low. Clubroot in crucifers is present in many fields in Santa Maria and Lompoc and you can quickly identify the grower that has not been paying attention to his soil pH levels.

California, San Diego County - Pat Nolan
The Mexican fruit fly quarantine is expected to end in early June. This will complete 3 life cycles since the last fly was found in October, 1999.

Despite a very dry year, I'm getting quite a few of the usual spring diseases: anthracnoses on sycamore, elm and ash, rust on carnation, snapdragon and poplar, Entomosporium leaf spot on flowering pear, and tomato spotted wilt/impatiens necrotic spot viruses in ornamentals, including ranunculus and Agapanthus.

Texas - Tom Isakeit
Mark Black reported late blight of potato was present in the Winter Garden area, south of San Antonio, during March and April, but there was no noticeable yield loss. He also reported that there was a 100% incidence of aster yellows in some carrot fields and the disease could also be seen in cabbage, dill, parsnip and weeds. A warm, dry winter contributed to the build-up of leafhoppers that vectored this pathogen.

Andreas Westphal reported a tuber discoloration problem affecting potatoes grown in the Lower

Rio Grande Valley. The incidence in early-harvested potatoes was 2-5%, but this increased as the harvest progressed. Two thousand acres were involved. The tubers had a vascular ring necrosis that blackened when the potatoes were fried. The cause has not yet been determined.

Kevin Crosby, a melon breeder in Weslaco, reported in April that cucurbit yellow stunt disorder virus was prevalent on Lower Rio Grande Valley cantaloupes. He thought that the yield loss in some fields could be between 10-15%.

Billy Crow in Dallas reported a fire blight epidemic on Bradford pear. This fire blight epidemic was also observed by George Philley in east Texas. The epidemic was driven by warm weather prior to bloom, followed by humid, mild weather during bloom. George reports that Entomosporium leafspot on photinia is also a problem. Additionally, the powdery mildew fungi were prevalent on roses, crape myrtles and euonymous. He received an oak sample from Texarkana showing severe oak leaf blister, as well as anthracnose. Anthracnose was also seen on elm. Two rust diseases have been observed on blackberry: leaf and cane rust, which causes little damage and orange rust, which causes sterility. Tomato spotted wilt was confirmed on early planted tomatoes in late April. The incidence of this virus is related to warm winters that allow buildup of the thrips that vector it.

In April, I saw one vegetable farm near Wharton (south of Houston) that had several disease problems. First, there was a high incidence of downy mildew of onion. Then, late blight of potatoes appeared, but did not cause much economic loss. Finally, the grower was vexed with an Erwinia soft rot problem on his Chinese cabbage that worsened as the weather became warmer. This was especially painful, since, prior to the onset of the disease, he was receiving $4.50 per box - the break-even point for him. Then, the problem hit him during a market window when California was briefly out of the market and the price went to $26 per box. More recently, gummy stem blight and downy mildew appeared in watermelon fields near College Station.

PACIFIC NORTHWEST AND ROCKY MOUNTAINS

Cheryl Ruby

Washington

Ellen Bentley - Diagnostic Plant Pathologist, WSU-Prosser

A warm, dry spring has made for a boring diagnostic quarter in Eastern Washington (WSU-Prosser). Late frosts nipped back ornamentals and early garden plantings. Some orchards experienced fire blight and apple scab infection periods but only two samples to date (guess everyone finally knows what fire blight of apples looks like). Aphids are on everything, perhaps spreading viruses. Cherry Leaf Roll Virus was confirmed in several more orchards.

Lindsey du Toit - Plant Pathologist/Diagnostician, WSU-Puyallup Plant Clinic

Some of the plant diseases/problems received through late winter and early spring include:

Trees & shrubs:

Phomopsis tip blight on spruce; Lophodermium and Lophodermella needle casts on pines (especially Scotch pines); Nectria canker on elms and maples; Rhizoctonia and Cylindrocarpon root rots on serviceberry (probably secondary to poor soils); witches' broom (*Exobasidium vaccinii*), powdery mildew (*Microsphaera azaleae*), bud and twig blight (*Briosia azaleae*), and mosaic virus (possibly – no verification) on rhododendron; Phyllosticta leaf spot on *Photinia*, salal, and rhododendron; bacterial blight (*Pseudomonas syringae* pv. *syringae*) on magnolia and lilac; cankers (*Leptothyrium* and *Hendersonia*) on rose; Phytophthora root rot on *Chamaecyparis* and Daphne; Phytophthora leaf and twig blight (*Phytophthora ilicis*) on holly; laminated root rot (*Phellinus weirii*) and red heart rot (*Phellinus pini*) on Douglas fir; western gall rust (*Peridermium harknesii*) on Scotch pine; the

ever-present Verticillium wilt on maples; physiological shothole on English laurel.

Lots of problems coming in from Christmas tree farms, including: current season needle necrosis on noble fir; Swiss needle cast (*Phaeocryptopus gaeumannii*) on Douglas fir; Phytophthora root rot on Noble firs; and lots of Armillaria root rot and Annosus heart rot (*Heterobasidion annosum*) on Noble firs where growers are getting into 2nd and 3rd rotations of Noble firs and planting next to old fir stumps.

Groundcovers:
Phomopsis stem canker on *Vinca minor*.

Greenhouse ornamentals, flowers & bulbs, houseplants:
Pythium and *Thielaviopsis basicola* on fuchsia and geranium; Fusarium basal rot and Penicillium blue mold on tulips; oedema on seed geranium; dramatic and varied symptoms on Helleborus (Christmas rose) that turned out to be cucumber mosaic virus and a Carlavirus (verified by Agdia Inc.and with inclusion body staining); and very distinct stem lesions on peony caused by *Cercospora*;

Turfgrass:
Downy mildew (*Sclerophthora macrospora*), anthracnose basal rot (*Colletotrichum graminicola*), Drechslera leaf spot and crown rot, and Typhula snow mold.

Tree fruits:
Lots of anthracnose (*Cryptosporiopsis curvispora*) and European canker (*Nectria galligena*) on apple, as well as Coryneum blight or shothole (*Wilsonomyces carpophilus*) on peach and brown rot (*Monilinia*) on various *Prunus* spp.; Phomopsis canker on persimmon; an interesting case of a bark disorder on a cider apple variety from a nursery, which Ken Eastwell (WSU-Prosser) is investigating with grafting and herbaceous indexing; first report of eastern filbert blight (*Anisogramma anomala*) in northwestern WA (Whatcom Co.);

Small fruits:
Phomopsis and Botrytis tip dieback on blueberry; lots of Phytophthora root rot and Botrytis cane blight on raspberry; spur blight (*Didymella applanata*) on raspberry;

Herbs & vegetables:
Black root rot (*Thielaviopsis basicola*) on greenhouse basil; damping-off (*Pythium*) and Fusarium root rot of pea seedlings; lots of gray mold (*Botrytis*) and some oedema on greenhouse tomatoes and tomatillos; the ever-present late blight on tomatoes (greenhouse); cauliflower mosaic virus on seed cabbage;

Field crops:
Most field crop samples go to the WSU-Prosser Plant Clinic in eastern WA, but occasionally we get the odd field crop sample – like downy mildew (*Peronospora trifoliorum*) on alfalfa.

Montana

Martha Mikkelson - Plant Disease Diagnostician, Montana Diagnostic Lab

Montana's winter was practically the warmest that anyone can remember and there was very little snow this year. So far this spring, most samples have been abiotic in nature. However, we did receive an apple branch that was wilting and silvery from the tremendous powdery mildew infection. The warm winter temperatures may have allowed more over-wintering than normal.

During the winter, we tested pulse crop seeds (chickpeas, lentils, and field peas) mainly for Ascochyta blight. Surprisingly, one sample from Livingston, MT contained 7% *Sclerotinia* even after surface sterilization. Grow out tests resulted in about 5% of the plants developing *Sclerotinia* symptoms and numerous apothecia growing on the soil surface. Dry conditions in many parts of the state resulted in some dry seed decay (*Penicillium* spp.) in winter wheat. Some wheat streak mosaic virus has been detected in winter wheat, but at present the insect problems outweigh diseases in small grains. For the second year, I am manning a toll-free Horticulture Hotline for 2 hours each day. While this makes my work day longer, it has been absolutely refreshing to be asked how to grow

asparagus or seed a lawn rather than just why the old spruce tree is dying.

North Dakota

Cheryl Ruby - Plant Diagnostician, NDSU Plant Diagnostic Lab

North Dakota's winter was also mild, compared to other years. We also had a bonafide spring, a season that often misses us as the winds of winter subside and the summer sun arrive within a week of each other. Some of the problems recorded in the lab include:

Trees and Shrubs:
Rhizosphaera needlecast, Cytospora canker, and spider mites are prevalent on spruce; Sphaeropsis tip blight and herbicide injury on pine, herbicide and salts damage to spruce, herbicide damage to cotoneaster. We have seen frost injury in an ash tree nursery that was fairly dramatic, and we have just started getting calls on ash anthracnose again this year as well.

Turfgrass:
Pythium blight and salts accumulation injury on bentgrass; Patch Disease Complex on Kentucky blue grass.

Greenhouse ornamentals:
Tomato Spotted Wilt Virus (TSWV), spider mite injury, high salts on geranium; spider mite injury on Vinca; salts injury on pansy.

Field Crops:
Seed planted too deep on barley; Wheat Streak Mosaic Virus (WSMV) on winter wheat; Pythium root rot on sugar beet; Pythium root rot on wheat. Heat canker and frost injury have been reported on wheat, canola, and sugar beets. We also anticipate increased Barley Yellow Dwarf Virus (BYDV) this year.

Oregon

Joy Jaeger - Lab Manager, Ext. Plant Pathology Lab, Hermiston Ag. Res./Ext. Center

The usual spring problems appeared again this year. The mild fall and winter contributed to substantial Barley Yellow Dwarf virus in wheat. Physiologic leaf spot has also been found in wheat. Potato samples out of storage came in with dry rot (*Fusarium* spp.) and powdery scab (*Spongospora subterranea*). Recently planted onion plants came in with *Pythium*. Peach and nectarine submissions had peach leaf curl (*Taphrina deformans*) and, more importantly, Coryneum blight (*Wilsonomyces carpophilus*). Poplar canker on poplar and alfalfa stem nematode on alfalfa were also confirmed. Several powdery mildews were identified including: apple (*Podosphaera leucotricha*), henbit, rose, and bluegrass (*Erysiphe graminis*).

Many of the problems were insect caused. These included: armyworms and army cutworms in wheat, lettuce root aphid in poplar, pear leaf blister mite in pear, wireworm in onion, leaf miner in spinach, and pine shoot moth and pine bark adelgid in pine. Houseplants had spider mites on Norfolk Island pine and scale on umbrella plant. It was a great winter for aphids and samples have come in from mulberry, daisy, henbit, ash, and fir.

Oregon

Melodie Putnam – Oregon Plant Diagnostic Lab

This was a good spring for downy mildews in Western Oregon. *Peronospora* came in on seed onions (early and severe), cabbage, alfalfa, white vetch , foxglove, *Buddleia*, veronica, alyssum, and stock. We continue to see stem cankers in *Malus* and flowering pear caused by *Phytophthora syringae*. We've also found *Phytophthora* associated with a foliar dieback of kinnikinnick (not a root problem) and root rot of *Myrica californica*; it is too early yet to tell what the species of *Phytophthora* are. We've found *Thielaviopsis basicola* in blackened rotted

roots of *Prunus lusitanica*, snapdragons, and petunia (yawn), and *Colletotrichum* apparently causing a rot of pseudobulbs of the orchid, Pleione. In other orchid news, we've isolated a species of *Xanthomonas* from Colmanara. The bacterium remains unidentified beyond genus, in spite of FAME analysis by two different labs; it may be a new species. White rust, probably *Albugo tragopogonis*, was found in Dusty miller - a first for Oregon. In the vegetable world, *Pseudomonas syringae* was found causing peppery leaf spot in cauliflower, something we don't usually see.

Colorado

Laura Pottoroff – Plant Diagnostician, Jefferson County Plant Diagnostic Clinic

The Rocky Mountain Region has experienced a very mild, dry winter. No freezes during crabapple and apple flowering; however temperatures warmed to the high 80's to 90 F in late April, followed by a drop in temperatures to 23F on May 11. Rarely do we have roses blooming on Mother's day, as we have had this year. As weather conditions and adverse climate are typically the major source of plant problems in this area, our disease occurrence this past season has been somewhat mundane. Tospovirus has been confirmed on Coleus, Ivy geranium, and Lisianthus. Many herbaceous ornamentals have been planted too deeply, predisposing them to the usual Rhizoctonia root and crown rot. Earlier this spring, downey mildew caused a problem on snapdragons and other cut flowers. The emerging issue with tree diseases in Colorado is white pine blister rust. A conscientious effort is being made to keep this disease from coming into the state via nursery stock by training nursery workers and landscape managers how to recognize the disease.

Wyoming

Stephan Briere – Associate Research Scientist/Plant Diagnostician, University of Wyoming Extension Plant Pathology Lab

The winter was a mild one by most accounts here in Wyoming ....and windy! Many areas received smaller than usual snowfall accumulations and the snowpacks in the mountains are below average in most areas. This has predisposed many trees and turfgrasses to winter injury/desiccation and the ailments associated with this. We also had some late hard frosts in mid-May and a huge wet snow storm here in Laramie that broke and bent many branches and deformed lilacs and other flowering bushes.

Trees

Some diseases seen on trees have been frost damage on spruce and lilac (remember this is Wyoming!). Kabatina blight and Cedar apple rust in Juniper; Cottonwood Poplar vagabond aphid; Dothistroma needle blight and mites in pines; Venturia shoot blight; Cytospora in Aspen; fire blight crabapple. Winter injury, hail, iron chlorosis, zinc deficiency and over/under watering in many tree species.

Turf and Ornamental

We also noted Botritis blight on Shasta daisy; Powdery mildew (*Erisiphe cichoracearum*) on verbena;
Phythium dampening off in flats of mixed ornamentals; Phytophthora root rot on Calibrachoa (cv Terra Cotta), will ID the species when time permits; Early blight in tomato, hollyhock leaf rust and nutrient deficiencies. Turf diseases included Anthracnose *(Colletotrichum graminicola)* and a whole heap of Ascochyta leaf blight.

Field Crops

Storage potatoes we received had late blight, soft rot, Fusarium dry rot, black heart (physiological).
Winter Wheat had wheat streak mosaic virus and Cephalosporium strip. We also noted Spring black stem and leaf spot (*Phoma medicaginis*) and Brown root rot (*Phoma sclerotioides*) in alfalfa. Brown root rot is slowly spreading in Wyoming and several counties have confirmed reports. Brown root rot had only been reported previously in Alaska and Canada. The latest is

from a ranch that straddles Idaho and Wyoming and the infected field was on the Wyoming side. This disease has yet to be reported in Idaho, so it's just a matter of time before it is!

DIFFUSION

Melodie Putnam
Oregon State University

***Acidovorax anthurii* sp. nov., a new phytopathogenic bacterium which causes bacterial leaf-spot of anthurium.** Bacterial leaf spot of anthurium is a problem that causes necrotic lesions that occur close to leaf veins and margins; affected areas then blacken and turn gray. From these lesions bacteria enter leaf parenchyma and become systemic, resulting in tissue discoloration and plant death. Initially limited to Guadeloupe, the disease is becoming more widespread. Researchers in France, Belgium, and the UK (L. Gardan, *et al.*) have characterized 29 strains of bacteria isolated from leaf spots of naturally infected anthurium. Biochemical and physiological tests, fatty acid analysis, DNA-DNA hybridization, 16S rRNA gene sequence analysis, and DNA-16S RNA hybridization were performed. The 25 pathogenic strains on anthurium were clustered in one phenon closely related to phytopathogenic strains of the genus *Acidovorax*. Anthurium strains constituted a discrete DNA homology group indicating that they belong to the same species. DNA-rRNA hybridization, 16S rRNA sequence and fatty acid analysis confirmed that this new species belongs to the beta-subclass of Proteobacteria and to rRNA superfamily III, to the family of Comamonadaceae and to the genus *Acidovorax*. The name *Acidovorax anthurii* is proposed. *International Journal of Systematic and Evolutionary Microbiology* 2000, **50**:235-246.

***Cylindrocladium perseae* sp. nov.** T.S. Schubert, R.M. Leahy, and N.E. El-Gholl of the Florida Department of Agriculture and Consumer Services, Gainesville, have described the cause of a leaf spot of *Persea borbonia* (red bay), an evergreen tree native to the south eastern seaboard of the US. Affected leaves had irregularly shaped leaf spots and blotches on both the abaxial and adaxial surfaces, and affected plants were dropping leaves. Colony morphology, growth characteristics, and morphological features of the causal fungus are described. The fungus was considered distinct from all other species of *Cylindrocladium* based on differences in vesicle morphology, branching, size and septation of conidia. *Mycotaxon* 1999, **LXXIII**:465-475.

Septoria leaf spot of *Stevia rebaudiana* in Canada and methods for screening for resistance. R. Reeleder (Agriculture and Agri-Food Canada, Delhi, Ontario) has characterized the pathogen that causes leaf spot and defoliation of *Stevia*, a plant from which a low calorie sweetener is derived. Diseased leaves were collected from Delhi, ON and Agassiz, BC. Symptoms included depressed, angular, shiny olive-gray foliar lesions that rapidly coalesced and were often surrounded by a chlorotic halo. Leaves quickly became necrotic and were often cast. The disease progressed upwards from the bottom of the plant and in severe cases over 50% of the foliage became necrotic. The causal fungus

was isolated and identified as *Septoria steviae*, previously only reported from Japan. The fungus can apparently overwinter in temperate climates. Germplasm with resistance was identified. *Journal of Phytopathology* 1999, **147**:605-613.

DNA relatedness among strains of Streptomyces pathogenic to potato in France: description of three new species, *S. europaeiscabiei* sp. nov. and *S. stelliscabiei* sp. nov. associated with common scab, and *S. reticuliscabiei* sp. nov. associated with netted scab. K. Bouchek-Mechiche, (INRA, Le Rheu, France) and colleagues have evaluated the genomic relatedness of 23 strains of bacteria isolated from lesions of common and netted scab in France and 19 strains from other countries, including type strains of *Streptomyces* species. Common, netted and russet scabs are complex bacterial diseases, because of the diversity of their symptoms and causal agents. Common scab is caused by *S. scabies* (the most prevalent bacterium), *S. acidiscabies*, *S. caviscabies*, and other as yet unnamed species of *Streptomyces*. There are phenotypic differences between strains identified as *S. scabies* however, and they may not all belong to the same genomic group. The taxonomic position of strains causing netted scab, which occurs only in European countries, is unknown. Russet scab, reported from North America and Japan, is caused by strains related to *Streptomyces aureofaciens*. This study was initiated to confirm by DNA-DNA hybridization that the new phenotypic groups of *S. scabies* correspond to new genomic species; and to determine, based on complete 16S rRNA gene sequences, the phylogenetic relationships between the defined species and other species of *Streptomyces*. Three genomospecies were defined within the conventional species of *Streptomyces scabies*. Two of these correspond to new species, for which the names *Streptomyces europaeiscabiei and Streptomyces stelliscabiei* are proposed. The pathogenic strains associated with netted scab lesions constituted a new species that was named *Streptomyces reticuliscabiei. International Journal of Systematic and Evolutionary Microbiology* 2000, **50**:91-99.

OFF THE SHELF

Gary Simone
University of Florida

Agrqwal, Anurag A., Sadik Tuzun, and Elizabeth Bent
Induced Plant Defenses Against Pathogens and Herbivores: Biochemistry, Ecology and Agriculture.
1999. APS Press. 390pp. $55.00
ISBN 0-89054-242-2

The editors present an overview of induced plant defense against both pathogens and herbivores that includes such topics as immunization, induced resistance, induced systemic resistance and systemic acquired resistance. The book is divided into three sections that present invited chapters on "Biochemistry and Mechanisms", "Ecology and Evolution", and lastly "Agriculture and Application". Select chapters deal with the roles of salicylic acid, hydrolytic enzymes, and jasmonic acid-signaled responses in plants. Several chapters focus in upon herbivore saliva and effects on plant defenses and the diversity of herbivore-induced defensive proteins and phytochemicals in plants.

The section on "Ecology and Evolution" includes chapters dealing with the specificity of induced responses to both pathogens and herbivores, the influence of induced plant resistance on herbivore populations, and the influence of induced plant volatiles on the behavior of predaceous and herbivorous insects. The evolution of the induced plant defense and the diversity of locally induced responses in plants are also reviewed in two chapters.

The last third of the book deals with the application of this innovative research to today's agriculture. This section begins with an overview of the potential utility of elicitor mediated induced resistance in crop production. Several more focused chapters follow that deal with experimental results of the jasmonic acid mediated induced resistance and microbe-induced resistance against both plant pathogens and herbivores. The commercial side of elicitor development is presented by the research team from Novartis Crop Protection using the development of CGA-245704 as an example. Finally the potential role of induced resistance to pathogens and herbivores for biological weed control is overviewed.

All chapters have ample literature citations. The entire book is well indexed by subject and taxon for easier access to chapter information. This book presents a broader coverage of this area than the normal review article because the entire scope of induced

plant defense is overviewed across the 19 chapters. This provides a great update on this rapidly exploding area of science.

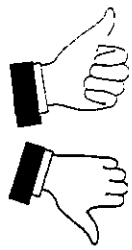
Hartman, G.L., J.B. Sinclair and J.C. Rupe (eds.)
Compendium of Soybean Diseases. 4th ed. 1999
APS Press. 100pp. $37.00. ISBN 0-89054-238-4

It is hard to believe that this title has been in print for 25 years and is now in its fourth edition. You wouldn't think the pathology of soybeans would change so much as to justify this many revisions! The basic format of this compendium is unchanged—pathogens grouped by relatedness. Diseases of prokaryotes, mollicutes, fungi, nematodes and viruses represent Part I, while stress disorders are presented in Part II and overall disease management strategies fill Part III. Coverage on the prokaryotes and mollicutes has changed little since the last revision. Text dealing with Agrobacterium crown gall has decreased, the bacterial taxa have been made current, and a new section dealing with "Ineffective Nitrogen Fixation" discusses the possible causes of decreased nodulation.

The two areas of greatest revision in the fourth edition take place with the foliar fungal diseases and with the virus diseases. The following new diseases have been added: Aristastoma leaf spot, Black leaf blight (*Arkoola nigra*), Drechslera blight, Leptosphaerulina leaf spot, and Stemphylium leaf blight. Sudden death syndrome has been upgraded as a disease of defined etiology and placed in the section dealing with the diseases of lower stems and roots. The viral diseases have been totally rearranged, now being presented by viral family. New viruses presented include the following: alfalfa mosaic (alfamovirus), soybean stunt and peanut stunt comoviruses, soybean dwarf luteovirus, soybean severe stunt nepovirus, African soybean dwarf begomovirus, and soybean mild mottle virus (unassigned). Coverage of a variety of comoviruses beyond bean pod mottle and cowpea severe mosaic are also added as potential threats to soybean production.

Other changes in this edition involve the reorganization of the section on seedborne field fungi and the placement of many of these pathogens with either foliar of stem and root disease sections. Chloride toxicity has been added to Part III dealing with stress disorders. The final section on disease management strategies now includes text dealing with beneficial bacteria and arbuscular mycorrhizal fungi. The index has been reduced in size but without appreciable loss in function as three appendices have been established: one dealing with "Microbes Associated with Soybean", another titled "Insects Associated with Soybeans", and the third appendix entitled "Hosts of Soybean Pathogens". The weed/host plant list of soybean pathogens was disappointing after closer examination, as each weed/plant host presented was unlinked to any soybean disease. If you wanted to learn how many soybean pathogens were also hosted by pigweed, you would have to read the entire compendium to find out! One more column in that appendix would have really benefited functionality.

Of course no one buys a compendium for revised text, but rather for revised images! Edition four is no exception. In the previous edition (3rd), there were 136 black and white images, 66 color plates and 3 life cycles. This revision presents 53 black and white images, 139 color plates and 2 life cycles. Only about 16 color plates have been recycled from the last edition and these have had their color digitally enhanced. The images keep improving! If you are in the soybean production zone or deal with other major leguminous crops, this revision is a necessary purchase to keep the library current.



Podila, Gopi K. and David D. Douds, Jr. (eds.)
Current Advances in Mycorrhizae Research: Symposium Series
2000. APS Press. 193pp. $38.00
ISBN 0-89054-245-7

This newest release in the symposium series deals specifically with only two phases of mycorrhizal research—the ectomycorhizas and the arbuscular mycorrhizas (AM). This title represents a series of invited chapters dealing with the application of biotechnology methods for genetic, biochemical and physiological research with these symbiotic microbes.

Those researching the mycorrhizas have always been hampered experimentally by the obligate nature of the arbuscular types. Recent advances in *in vitro* culture techniques have allowed production of aseptic spores and mycelium in sizeable quantities. Other limitations to general mycorrhizal research regarding work with small amounts of fungal tissue and actual manipulation of fungal/plant gene interaction products have similarly been surmounted through application of such methods as polymerase chain reaction and subtractive hybridization and differential screening of cDNA libraries.

Specific chapters deal with signaling mechanisms in the mycorhizal symbiosis, the plant defense responses to AM fungi, and defense gene regulation. Genetic research is reviewed in the areas of ectomycorrhizal symbiotic development, gene induction in the AM association, and finally the biochemical and molecular characterization of the truffle life cycle. The application of such new methods as NMR spectroscopy in the definition of the carbon metabolism cycle of the AM. Recent research in the area of cellular ultrastructure changes with associations among AM, bacteria and the host plant is also presented. The last chapter deals with the potential use of genetically engineered mycorrhizal fungi as biological controls. Each chapter is supplemented with recent literature citations and a volume-wide index is provided. This title provides an excellent overview of recent mycorrhizal research. Although this is not a necessary title for the Clinic library, it is a valuable addition to departmental library.

Plant-Microbe Interactions. Vol.4.
1999. APS Press. 283pp. $59.00.
ISBN 0-89054-228-7.

The key areas of active molecular biology research are reviewed in this volume through the use of key microbe examples and their effects on the plant hosts. Chapters by Hanin et al. and Gresshoff explore the effects of the Rhizobium-plant relationships. Fulbright reviews the chestnut blight system and the role of hypovirulent fungal strains as biological control agents is explored. Similarly, Gabriel reviews the Xanthomonas avr/pth gene family, focusing upon the bacterial proteins that serve as both virulence factors and active plant defense triggers. The literature on active oxygen species and their role in initiation of plant defense mechanisms, particularly during the hypersensitivity reaction is reviewed. Weisbeek and Gerrit review the role of iron and the use of biocontrol agents. Two final chapters deal with suppressor substances produced by pathogens that block active plant defense systems and the current understanding of how pathogen elicitors activate plant gene expression in the host.

All chapters are accompanied by appropriate literature citations and collectively indexed at the end of the volume. Chapters represent concise overviews of topics and collectively represent a title of use for departmental libraries. This title represents less utility for the diagnostic library.

FEATURE ARTICLE

Emerging and Reemerging Plant Diseases

APS Press Slide Collections ISBN 0-89054-237-6
(Excerpts of the original syllabus were reprinted with permission from the American Phytopathological Society)

Compiled by:
Gail L. Schumann, Department of Microbiology, University of Massachusetts, Amherst
Edward J. Braun, Department of Plant Pathology, Iowa State University, Ames

This slide set includes information on the biological and economic impact of 13 emerging and reemerging plant diseases. Each section includes a summary of the current status of the disease, images illustrating the disease and the agent or agents causing it, and several key references.

Contents

* Denotes diseases reprinted from the original syllabus

Chrysanthemum White Rust

M. R. Bonde. U.S, Department of Agriculture, Agricultural Research Service Frederick, Maryland

Host: *Chrysanthemum* spp,
Pathogen: *Puccinia horiana*

Puccinia horiana, the causal agent of chrysanthemum white rust, is a serious fungal pathogen of chrysanthemum. It is indigenous to eastern Asia and was discovered in Japan in 1895. Since 1963, chrysanthemum white rust has been reported to be present in several European countries, the United Kingdom, New Zealand, South Africa, Australia, and South America, Isolated introductions of the pathogen and the disease were reported to have occurred in the United States in 1977 and 1990,

In 1991, chrysanthemum white rust was found for the first time in California, This was of major concern to the US. Department of Agriculture and the California Department of Food and Agriculture, because the disease occurred in commercial nurseries and therefore posed a significant threat of extensive spread and economic losses. In 1993, the disease was detected in the state of Mexico, The pathogen remains in the western United States and Mexico and is the subject of internal and international quarantines.

P. horiana spreads only under humid conditions. Sporidia (basidiospores), arising from germinating teliospores, are not discharged if the relative humidity is less than 96%. Urediniospores are not produced. The sporidia are very susceptible to desiccation, and therefore they are generally not responsible for spreading the disease more than a few meters (yards). Long-distance spread occurs as a result of the movement of infected plants or cuttings containing mycelia. Treatment of symptomless cuttings with systemic fungicides, such as myclobutanil, is very effective in preventing the establishment of *P. horiana* in greenhouses.

Losses due to chrysanthemum white rust in the United States have been greatest in California and were estimated to have been about U.S. $ 1 million in 1995 and the spring of 1996. Losses have been greatly minimized by vigilant quarantine efforts by the U.S. Animal and Plant Health Inspection Service and the California Department of Food and Agriculture.

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Citrus Canker

T. R. Gottwald. U.S. Department of Agriculture, Agricultural Research Service U.S. Horticultural Research Laboratory Orlando, Florida

Hosts: *Citrus* spp., hybrids, and relatives
Pathogen: *Xanthomonas axonopodis* pv. *citri*

For the third time this century, Asiatic citrus canker, caused by *Xanthomonas axonopodis* pv, *citri*, has become established In Florida, The current outbreak is in two distinct geographic areas. One area is in Manatee County, in the west central part of the state, and the other is in urban Miami, in Dade County, Molecular analyses of bacterial isolates suggest that the strains of *X. axonopodis* pv. *citri* In the two areas are different and the result of two independent introductions.

The disease was discovered in June 1997 in Manatee County, where infections occurred predominantly in commercial citrus plantations. The age of the oldest lesions found indicated that the disease had been in the area for about 1 to 1.5 years. This outbreak has largely been suppressed by the, destruction of several hundred acres of infected commercial citrus plantations, a few abandoned grapefruit groves, and trees at several residential sites.

In contrast, the citrus canker outbreak in the Miami area is restricted to residential properties. The infested area encompassed approximately 36 km^2 (14 square miles) in September 1995, when the disease was first detected there, and had expanded to over 379 km2 (146 square miles) by May 1998.

X. axonopodis pv. *citri* spreads when bacteria ooze from lesions on infected leaves, stems, or fruits wetted by dew, rain, or irrigation water. The bacteria are frequently splash-dispersed within the tree canopy and to adjacent trees. They are also spread over longer distances in droplets of water carried by winds, Severe tropical weather patterns affecting Miami In the past several years have created hurricanes, tropical storms, tornadoes, and rainstorms with high winds, which have spread the infestation and greatly exacerbated the epidemic,

Another introduced pest of citrus, the Asian citrus leaf miner, *Phyllocnistis citrella*, is a contributing factor in canker inoculum production. Many citrus species and cultivars, have some field resistance to *X. axonopodis* pv. *citri*, but when the leaf miner forms feeding galleries within a leaf just below the epidermis, it exposes mesophyll tissues, which are highly susceptible to infection. When feeding galleries become contaminated with *X. axonopodis* pv. *citri*, numerous infections can occur, resulting in tremendous inoculum production.

The Animal and Plant Health Inspection Service of the U.S. Department of Agriculture and the Division of Plant Industry of the Florida Department of Agriculture and Consumer Services have formed a joint state-federal Citrus Canker Eradication Program to eliminate the disease. Over $12 million per year and over 500 personnel are presently dedicated to this program. This effort has involved extensive surveys to locate and identify canker-infected trees followed by the removal of infected trees and exposed trees within a 38-m (125-ft) radius.

Should citrus canker become firmly established in Florida, canker-infected and canker-free zones would probably be established, and eventually the disease would be declared endemic. If this occurred, the citrus industry would be forced to deal with quarantines,

embargoes, and other costly commercial restrictions, besides bearing the costs of disease control. Citrus canker has been used as a focal point by countries attempting to develop marketing advantages over other citrus-producing countries. The Agricultural Research Service of the US. Department of Agriculture continues to conduct epidemiological research in support of efforts to eradicate citrus canker.

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Karnal Bunt of Wheat

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Host: *Triticum aestivum* (wheat)
Pathogen: *Tilletia indica*

Karnal bunt of wheat (*Triticum aestivum*), caused by the smut fungus *Tilletia indica*, was first found near the town of Karnal, in northwest India, in 1930. Since then, it has been reported in most wheat-growing areas of India and in Pakistan, Iraq, and Nepal. Teliospores of the pathogen have been observed in wheat from Afghanistan. In 1972, the disease was reported in northwest Mexico, and in 1996 it was discovered in Arizona and a small portion of southern California.

T. indica is a basidiomycetous pathogen belonging to the order Ustilaginales. Black, dusty-appearing teliospores give this group of organisms the name *smut fungi*. The pathogen is seedborne but is not transmitted from the seed to the plant. Germinating seedlings tire infected by spores in the soil or on the seed cost. Teliospores of the fungus can persist in contaminated soil up to about 4 years.

Karnal bunt is difficult to detect under field conditions, and generally only very careful examination will reveal evidence of the disease during a field survey. Only a few kernels of some wheat heads are infected, and usually only a portion of an infected kernel is replaced with a fungal sorus.

The main effects of extensive Karnal bunt infection are reduced yield and a fishy odor and taste imparted to flour processed from infected wheat, lowering its quality. Yield and quality losses are considered by many smut pathologists to be generally minor, even in areas of the world where the disease has become established. For example, it has been reported that in the state of Uttar Pradesh, India, overall disease losses are never more than 1%, even during the most severe, epidemics. Disease losses in Mexico averaged 0.12% from 1982 to 1989. However, since Karnal bunt is the subject of strict quarantines imposed by several wheat-importing countries, *T. indica* can have a profound effect on international trade in commercial grain and the movement of wheat germ plasm.

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Pine Wilt

L. D. Dwinell. U.S. Department of Agriculture, Forest Service Athens, Georgia

Hosts: *Pinus* spp. (pines)
Pathogen: *Bursaphelenchus xylophilus*, the pinewood nematode

In North America, the native pinewood nematode, *Bursaphelenchus xylophilus*, kills exotic pines. When inadvertently introduced into Japan and other Asian countries, the pinewood nematode became a destructive post of pines. It has been intercepted in pine shipments from North America to Europe, where there is concern that it may also kill pines and other conifers. To protect their forests from the pinewood nematode and other pests, the European Union and other countries now regulate the import of all coniferous chips, sawn wood, and logs. The embargoes have had an economic impact on the North American softwood export trade, It has been estimated that the forest industry in the United States could lose more then $ 100 million annually in green lumber exports to Europe.

Several species of Bursaphelenchus are vectored by cerambycid longhorn beetles (sawyers) in the genus *Monechamus*. Primary transmission occurs when nematode dauerlarvae (the transmission stage) emigrate from the spiracles of a beetle and enter the host through wounds caused by the feeding of the beetle. Primary infection of a susceptible host may result in pine wilt. Secondary transmission occurs when *Monochamus* vectors carry nematodes to recently felled logs and dead or dying conifers, particularly pines. The

nematodes enter logs or trees through oviposition wounds caused by the beetle vectors. This mode of transmission is now considered the most common means of transgenerational transfer of *Bursaphelenchus* species. As a result of secondary transmission, *Bursaphelenchus* species may be found in logs, unseasoned lumber, and chips.

Numerous procedures to disinfest unprocessed wood have been investigated. Procedures designed to decontaminate transported coniferous wood include irradiation; fumigation with phosphine, metam sodium, or methyl bromide; chemical dips; and heat treatment (pasteurization). Heat treatment shows the most promise in eradicating the pinewood nematode and its *Monochamus* vectors in coniferous wood. The European Union now requires heat treatment of coniferous wood, in which the care temperature is raised to 56°C (133°F) for 30 minutes, before importation.

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Pitch Canker of Pines

L. D. Dwinell. U.S. Department of Agriculture. Forest Service Athens, Georgia

Hosts: *Pinus* spp. (pines)
Pathogen: *Fusarium subglutinans* f. sp. *pini*
"Pitch canker" incompletely describes the variety of damage caused by *Fusarium subglutinans* f. sp. *pini* in pines. The pathogen infects vegetative and reproductive structures at different stages of maturity and produces a diversity of symptoms. In infections of woody vegetative structures of pine, the host pathogen interaction causes the formation of resinous cankers, and the resultant disease is referred to as pitch canker. The pitch canker fungus also causes mortality in female flowers and mature cones, deteriorates seeds of several pine species, and can cause mortality in pine seedlings in nurseries. The involvement of insects, interaction with other pine diseases, and the marked influence of biotic and abiotic factors greatly affect the incidence and severity of infection by *F. subglutinans* f. sp. *pini*.

Since pitch canker was first described (in 1946, on Virginia pine in North Carolina), the parameters of the disease have been constantly changing. Its potential impact on pine forests was fully recognized by plant pathologists in 1974, when the disease became epidemic in planted slash and loblolly pines in the southeastern United States. In the 1980s and 1990s, pitch canker evolved from a regional disease to one of national and international importance. Since 1986, It has seriously damaged Monterey pine (*Pinus*

radiata) in coastal central California, where It has all the characteristics of a disease caused by an introduced pathogen. Pitch canker is an important disease of pines in the southeastern United States and Monterey pine in California, but no accurate dollar estimates of losses are available. It has also been reported in pines in Haiti (1953), Japan (1988), and Mexico (1989). More recently, questions have arisen regarding possible damage to *P. radiata* seedlings in nurseries in the Basque region of northern Spain. In South Africa, the pathogen induces a root rot of container-grown *P. patula* seedlings.

Pitch canker is a severe threat to the Monterey pine genetic resource worldwide. The accidental introduction of the pitch canker fungus into countries with extensive plantations of *P. radiata* or other highly susceptible hosts could be disastrous if insects or other wounding agents are available to drive the disease. In the future, pitch canker and other diseases caused by *F. subglutinans* f. sp. *pini* may have in adverse impact on pine resources worldwide.

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Soybean Rust

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Hosts: *Glycine max* (soybean) and other legumes
Pathogens: *Phakopsora meibomiae* and *P. pachyrhizi*

Soybean rust occurs extensively in areas of the Eastern and Western Hemispheres: from Japan to Australia and westward to India and China; in Hawaii; generally in Latin America and the Caribbean region; and in central and southern Africa. Significant losses have been reported in Asia: 10 to 40% in Thailand,10 to 90% in India, 10 to 50% in southern China, 23 to 90% in Taiwan, and 40% in Japan. Nearly complete losses can occur in limited areas in most of these countries. There is not much documentation of losses in other regions, although there are indications that rust can be at least locally important in Brazil and, most recently, Zimbabwe. Heavily infected plants have reduced seed weight and form fewer pods and seeds.

In Hawaii, soybean rust was first found in 1994. The disease does not occur in the continental United States, and it is not known when or how it was introduced into Hawaii. The introduction of soybean rust fungi into the continental United States (on contaminated clothing; in imported infected vegetable soybeans, sold frozen in green pods; or by other means) could cause widespread damage. If an epidemic were to occur in the United States, it is estimated that generalized yield losses would be 10%, with localized losses exceeding 50%. It is not known whether the soybean rust fungi would overseason in the continental United States, but there is a chance that alternate hosts would allow at least some overseasoning.

The most common symptom of soybean rust is tan to dark brown or reddish brown lesions (the coloration is dependent on the age of the lesion, the soybean genotype, and the race of the pathogen), with one to many erumpent globose uredinia, particularly on the underside of leaflets. The lesions tend to be angular, restricted by leaf veins, and reach a size of 2 to 5 mm. They are frequently associated with leaf chlorosis, and high lesion density results in premature defoliation and early maturation. Lesions may also appear on petioles, pods, and stems. Urediniospores of the pathogens are reddish brown and form primarily in infected leaves but also in infected petioles, pods, and stems. Telia form subepidermally among the uredia and are dark brown to black at maturity. Alternate hosts of the soybean rust fungi are unknown.

Soybean rust is caused by two described species: *Phakopsora meibomiae* (anamorph *Malupa vignae*), which infects 41 natural hosts and 25 inoculated hosts in the New World, and *P. pachyrhizi* (anamorph *M. sojae*), which infects 34 natural hosts and 61 inoculated hosts in Australia, Asia, and Hawaii. *P. pachyrhizi* is more aggressive than *P. meibomiae*. In a recent epidemic in Zimbabwe, the pathogen appears to be *P. pachyrhizi*, but it is possible that both species occur there and elsewhere.

Rust epidemics are most severe when the mean daily temperature is less than 28°C (82°F) and there are long periods of leaf wetness throughout the growing season. Free water and temperatures of 8 to 28°C (46 to 82°F) are necessary for urediniospore germination and penetration. Uredinia appear about 9 to 10 days after infection, and urediniospores are produced 3 weeks after infection. Urediniospores are transported by windblown rain and are the primary means of disease spread. The role of individual hosts in the overseasoning of the soybean rust fungi is not known. Soybean is susceptible at any stage of development, but symptoms usually appear in midseason or later, because of the prolonged wet, cool period required for infection and sporulation. The pathogens are not seedborne in soybean.

Four dominant, independently inherited genes for resistance to *P. pachyrhizi* have been identified. Genes for resistance also occur in wild *Glycine* spp. from Australasia. Efforts are being made to transfer this resistance to soybean (*G. max*). By means of a set of differentials, nine races of *P. pachyrhizi* were identified by workers at the Asian Vegetable Research and Development Center, in Taiwan. However, the predominant race was compatible with 10 of the 11 differentials, and all races were compatible with three or more

differentials. Apparently, some races of *P. pachyrhizi* in the field possess multiple virulence factors to known and suspected genes for resistance.

Rate-reducing resistance has been demonstrated; however, it is difficult to evaluate, because the rate of rust development is also dependent on the development and maturity of the soybean plant. Evaluating soybean lines on the basis of their ability to sustain lower yield losses, a characteristic referred to as tolerance, is a promising method for developing improved cultivars that produce more stable yields in different environments.

Certain fungicides can reduce rust damage, but fungicide treatment may not be cost-effective, as frequent applications are required before severe symptoms occur, There are a number of other potentially effective management practices, including crop rotation and biological control, but most of them are experimental and have not been widely used.

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Hardcopy Publications

1. Florida Plant Disease Management Guide. 1999-2000. SP 52-2. Ornamentals and Turf. 267pp, $12.00
2. Florida Plant Disease Management Guide. 1999-2000. SP 52-3. Fruits and Vegetables. 365pp, $12.00
3. Florida Nematode Management Guide. SP 54. $7.00.
4. Florida Citrus Management Guide. SP 43. $3.00
5. Best Management Practices for Florida Golf Courses.(Rev. 1998) SP 141. $20.00
6. Florida Insect Management Guide. SP 51. 2 vols. $20.00
7. Insects and Related Pests of Turf Grass in Florida. SP 140. (Rev. 1999, color). $5.00
8. Aquatic Weed Management Guide. SP 55. $10.00.
9. Florida Lawn Handbook. SP 45. (224pp with color). 19.95.
10. Florida Tomato Scouting Guide. SP 22. (2^{nd}.ed., 45pp with color). $30.00
11. Florida Wildlife Resources Handbook. SP 172. (1,000 pp). $28.00
12. Florida Forage Handbook. SP 253. $10.00.
13. Florida Wetland Plants. SP 244. (608pp, 800 color photos), $35.006.
14. Plant Fun: Crafts and Games for all Ages. SP 207. (52pp, with color). $6.00.
15. Ornamental and Turf Pests. SP Set 8. Color Sheets—pictures on one side, text on the other. This set includes: Beneficial Insects (4 sheets), Sweetpotato whitefly, Scale insects, Grasshoppers, Stinging Ornamental arthropods, Butterflies (2 sheets), Insect galls, Ornamental insects (2 sheets), Turf insects (2 sheets), Caterpillars of Ornamental plants, **Foliar nematodes, Root Knot nematodes, Abiotic Problems in the Nursery (4 sheets), and Mistaken Identities in the Nursery (2 sheets.** 24 plate pages for $10.00.
16. Fusarium Crown and Root Rot of Tomato in Florida. SP 184. 4pg color fact sheet. $2.00
17. Vegetable Diseases Caused by Phytophthora capsici in Florida. SP 159. 6pg color fact sheet. $2.50.
18. Signs of Plant Pathogens. SP 258 and SP 259. Color fact sheets. 2 pgs each.
    Symptoms of Plant Diseases. SP 260-264. Color fact sheets. 2 pgs each.
    Fact sheets are available at $0.50 each. **These are NEW and not listed in catalog.**

Laminated Card Sets

1. Aquatic Plant Identification Deck. SM 50. (72 cards). $10.00
2. Grasses, Sedges, and Rushes of Wetlands: Identification Card Deck. SP 255. (84 species). $12.00

3. Identification of Mites, Insects, Diseases, Nutrition, Symptoms, and Disorders of Citrus. SP 176. (65 cards). $10.00
4. Helpful or Harmful? (Beneficial Insects) SP 130. (50 cards). $10.00
5. Household and Structural Pests. SP 181. (46 cards). $10.00
6. Troubleshooting Lawn Pests. SP 180. (46 cards of insects and diseases). $10.00.
7. Troubleshooting Diseases of Flowering Plants. SP 162. (50 cards). $10.00.
8. Troubleshooting Diseases of Foliage Plants. SP 180. (46 cards). $10.00.

CD-ROMs

1. Woodybug. SW 128. Computerized knowledgebase of pest and beneficial arthropods of Florida woody ornamentals providing information on identification, life cycle, biology, damage, hosts, scouting, and biological and chemical control. IPM emphasis. (Available for Windows 3.1, Windows 95, and Windows NT). $30.00.

Orders for above or other listed publications from the online catalog can be made by calling toll free: (800) 226-1764. VISA/MASTER CHARGE card orders accepted as well as check or money order.

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Dr. Ann R. Chase and husband Mike Zemke have two in a series of color, laminated flash card sets available for sale. These are rapid identification aids for professionals involved with the interior landscape, grounds maintenance, pest control, Master Gardening programs, or county extension.

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