January, 2009
R.P. Mulrooney,
Extension Plant Pathologist
Plant and Soil Sciences Dept
University of Delaware
Bulletin #138

Plant Pathology Field Trial Results 2008
Plant Diagnostic Clinic Report
Nematode Assay Service Report

Robert P. Mulrooney, Extension Plant Pathologist
Nancy F. Gregory, Plant Diagnostician

Department of Plant and Soil Sciences
University of Delaware
Newark, DE 19716-2170

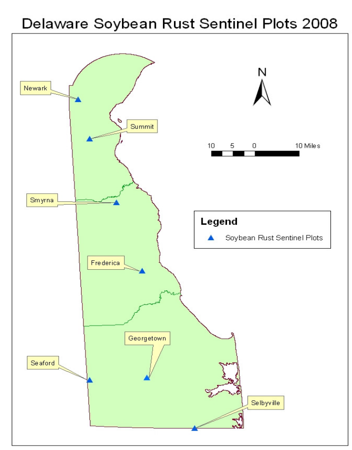

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Table of Contents

Cooperators

University of Delaware:

Dr. Tom Evans, Professor, Plant and Soil Sciences Dept.
Robert Uniatowski, Research Scientist, Plant and Soil Sciences Dept.
Scott Hopkins, Farm Superintendant, Newark Farm
Brian Hearn, Farm Manager, REC, Georgetown

Delaware Dept of Agriculture

Faith Kuehn, Randy Ciurlino, Jimmy Kroon, Stephen Hauss

Contributors of funding(**) or materials (*):

Bayer Crop Sciences *	DuPont Ag Sciences **
BASF, Corp. **	ISK Biosciences **
DowAgroSciences, Inc. *	NuFarm America *
Biagro Western Sales, Inc. **	Syngenta Crop Protection **
Conard-Pyle Company *	USDA/ APHIS / RMA **

Acknowledgements

- Many thanks to the Farm Superintendant, Scott Hopkins (Newark Experiment Station) and Brian Hearn (Georgetown, Carvel REC) and their crews that maintained the plot areas for us, including soil preparation, spraying, irrigation, harvesting, etc.
- Ms.Teresa Holton for lab assistance and data entry.
- Ms. Debbie Parrish for lab assistance during the soybean rust effort.
- Mr. Stephen Hauss who spent hours collecting soybean leaves and taking them to Dover for examination
- Mr. Sridhara Kunjeti and Chatchai Deleon for their efforts at raising and maintaining downy mildew inoculum for the lima bean trial.
- Thanks to Emmalea Ernest for input on lima bean production and harvesting.
- Mr. Dwight Myer and Delaware State University for a sentinel plot at the Smyrna Outreach and Research Center.

The enclosed reports are a compilation of the plant pathology experiments conducted in Delaware during the 2008 growing season. The data presented in these reports are not to be used as disease control recommendations. Some of the fungicides or varieties tested are not currently labeled or available commercially. Contact your local Extension office for current information on disease control recommendations.

Bob Mulrooney
Extension Plant Pathologist
148 Townsend Hall
Newark, DE 19716-2170
Phone: 302-831-4865
email : bobmul@udel.edu

Nancy Gregory
Extension Plant Diagnostician
151 Townsend Hall
Newark, DE 19716-2170
Phone: 302-831-1390
email : ngregory@udel.edu

ROSE (*Rosa* sp. 'Tropicana')
Black spot; *Diplocarpon rosae*
Powdery mildew; *Sphaerotheca pannosa*

R.P. Mulrooney
Dept. of Plant and Soil Sciences
University of Delaware
Newark, DE 19716-2170

Evaluation of fungicides and adjuvants for the control of black spot and powdery mildew of rose, 2008.

This field trial was conducted at the University of Delaware Botanic Garden in Newark, DE. Bare root hybrid tea roses were planted in the spring of 2001 in a Matapeake silt loam soil, 4 ft apart on center. Each plot consisted of two plants; pairs were 8 ft apart on center and rows were spaced 10 ft apart. Experimental design was a randomized complete block with three replications per treatment. Weeds were controlled with glyphosate and Surflan as needed, and the beds were mulched with composted woodchips for additional weed control and water conservation. No supplemental irrigation was supplied. Each rose plant was fertilized twice during the season, spring and mid-summer with 6 oz 10-20-20. Japanese beetles were controlled by two applications of carbaryl (Sevin SC) as needed. Fungicides were applied to run-off with a CO_2-powered backpack sprayer equipped with a single-hollow cone nozzle (D4 and D-45 core) at 50 psi. Fungicide applications were initiated on 8 May and repeated every 13-15 days ending 26 Aug for a total of 9 sprays. There were no symptoms of black spot or powdery mildew at the time of the first application. The plots were rated on 20 Jun, 15 and 31 Jul, 18 Aug, and 2 Sep.

The growing season began normally for May which as wet. Rainfall was sporadic and in general low for most of the rest of the season. Powdery mildew developed early and incidence fluctuated the rest of the season depending on the weather conditions. Pageant 38WP 18.0 oz was very effective for control of black spot throughout the season. By mid Aug control began to break for the 12.5 oz rate of Pageant plus the adjuvant Capsule. Trinity plus both adjuvant treatments controlled black spot early in the season but by the 18 Aug rating black spot control had reached an unacceptable level. All the treatments for black spot were significantly better than the unsprayed control. Trinity without adjuvant provided the least amount of powdery mildew control on 20 Jun. No phytotoxicity was observed for any treatment in this test, but the 18 oz rate of Pageant did leave a noticeable white residue on the treated leaves.

Treatment and rate/ 100 gallons	No. Powdery mildew infected terminals		% Defoliation and black spot infected foliage			
	20 Jun	2 Sep	15 Jul	31 Jul	18 Aug	2 Sep
Pageant 38WP 18 oz . . .	2.8 a*	18.3 NS**	0.0 a	0.2 a	1.0 a	3.2 ab
Pageant 38WP 12.5 oz + 8 fl oz Capsule	3.7 ab	21.0	0.2 a	0.8 a	11.3 bc	19.7 bc
Pageant 38 WP 12.5 oz +4 fl oz Latron B-1956. .	2.5 a	19.2	0.3 a	1.0 a	3.3 ab	4.5 ab
Trinity 1.69 EC 12.0 fl oz	11.7 b	11.0	1.7 a	9.0 a	24.2 d	34.2 c
Trinity 1.69 EC 8 fl oz + 8 fl oz Capsule	4.2 ab	13.0	0.3 a	2.0 a	16.7 cd	25.0 c
Trinity 1.69 EC 8 fl oz + 4 fl oz Latron B-1956 . .	5.5 ab	10.0	1.0 a	3.8 a	20.8 d	34.2 c
Eagle 40WP 6 oz + 4 fl oz Latron B-1956	1.3 a	1.3	0.0 a	0.0 a	0.0 a	0.5 a
Untreated control	28.2 c	13.8	26.7 b	55.8 b	85.0 e	85.0 d

* Means within a column followed by the same letter are not significantly different, Fischer Protected LSD (P=.05)
** NS= Not significant

BEAN (BABY LIMA) (*Phaseolus lunatus* 'Eastland')
Downy Mildew; *Phytophthora phaseoli* race E

R.P. Mulrooney, N.F. Gregory, T.A. Evans
Department of Plant and Soil Sciences
University of Delaware
Newark, DE 19716-2170

Evaluation of fungicides for the control of downy mildew of baby lima bean, 2008.

Fungicides were tested for control of downy mildew of baby lima bean at the University of Delaware's Experiment Station Farm in Newark, DE. The baby lima bean cultivar Eastland was planted on 9 Jul with a commercial four-row Monosem planter. Dual Magnum 7.62E (1.75 pt/A) and Pursuit 2SC (1.0 oz/A) were applied pre-emergence for weed control. The soil type was a Matapeake silt loam soil and nitrogen (30 lb/A) was side-dressed three weeks after seedling emergence. Seeding rate was 4-5 seeds/ft but the final stand was 18.2 plants/ 10 ft. This stand was half of the recommendation for commercial fields, but like soybeans, lima beans will compensate for reduced plant numbers without yield loss. Treatments were arranged in a randomized complete block design with four replications. Each plot consisted of three sprayed rows, 20 ft long and spaced 30 in. apart. A single border row separated each plot. On 5 Sep each 20 ft border row was inoculated and on 15 Sep each center treatment row was inoculated with 100 ml of a sporangial suspension (10^3/ml) of *Phytophthora phaseoli*, race E, in the evening using a Solo backpack sprayer. After the first inoculation the plots were misted daily with a low pressure misting system equipped with low volume misting nozzles. The system was operated intermittently from 4 PM until midnight daily to increase leaf wetness duration and favor infection. Once the epidemic was established misting was applied during periods of low rainfall and low humidity only. Supplemental drip irrigation was provided when needed throughout the growing season. Fungicides were applied three times on 3, 11, and 20 Sep using a backpack CO_2 pressurized sprayer that delivered 30 gal/A at 52 psi. Applications were made with a broadcast boom equipped with four hollow cone nozzles (ConeJet TXVS-18) spaced 18 in. apart. On 7 and 8 Oct, the middle 10 ft of the center row of each plot was hand pulled and evaluated for percentage of infected plants (presence of infection on the raceme, petiole or pod). Pods were removed from those plants and the percentage of infected pods, total number of pods/10 ft, and yield were determined. Yield was determined by measuring the fresh weight of harvested pods that had harvestable seed or would have had harvestable seed. On 9 Oct the pods were shelled and the fresh weight of the lima beans was recorded.

The disease severity in the field was high and uniform this season due to ideal temperatures after inoculation plus added misting and irrigation. All the treatments provided very good control of downy mildew. Although there were some significant differences between some treatments, a range of 0.1 to 5.7 % of infected pods would be very acceptable in commercial fields. The phosphorus acid salts fungicides Fungi-Phite and Phostrol provided excellent control as well. Nutri-Phite Magnum (2-40-16) is a foliar fertilizer that contains phosphite. Calci-Phite (0-15-5 +8%Ca) is a foliar fertilizer as well with added calcium and the phosphate is derived from phosphorus acid. This was first time Omega and Ranman were tested for control of downy mildew and both provided very good control compared to the industry standard of 2.0 lb Ridomil Gold/Copper. No phytotoxicity was observed for any of the fungicide tested.

Treatment and rate/A	Incidence (%) of downy mildew*		No. pods/10 ft	Fresh weight of pods/10ft (lbs)	Shelled Weight Lbs/A
	Plants	Pods			
Fungi-Phite 1.0 qt + Nutri-Phite Magnum 1.0 qt	8.5 ab**	0.9 abc	1206 a	11.0 a	4517.2 a
Fungi-Phite 1.5 qt	31.8 cd	2.3 cd	976 c	8.8 bc	3156.7 b
Fungi-Phite 1.0 qt	41.8 de	5.7 d	968 c	8.7 c	3899.2 ab
Fungi-Phite 1.0 qt + Calci-Phite 1.0 qt	51.9 e	4.3 d	1014 bc	9.1 bc	3488.6 ab
Omega 500F 5.5 fl oz	6.7 ab	0.1 a	1176 ab	11.1 a	4150.7 ab
Omega 500F 8.0 fl oz	3.2 a	0.2 a	1080 abc	10.2 ab	3920.4 ab
Ranman 400SC 2.75 fl oz + Silwet 2.0 fl oz	10.7 ab	0.3 ab	1126 abc	10.8 a	4586.2 a
Ridomil Gold/Copper 65WP 2.0 lb . . .	24.7 cd	1.0 abc	1063 abc	10.1 abc	4432.7 a
Phostrol 6.69L 1 qt	18.6 bc	2.1 bcd	1084 abc	9.8 abc	3542.3 ab
Control	100.0 f	75.6 e	524 d	1.8 d	337.7 c

* Data were transformed from percentages by arcsin√, analysis of variance was performed and means were converted back to the percentages which are represented in the table.

** Means followed by the same letter are not statistically different from each other (Fisher's Protected LSD, P=0.05).

2008 Delaware Legume ipmPIPE Sentinel Plot Survey for Diseases and Insects

Bob Mulrooney, Extension Plant Pathologist, University of Delaware
Nancy Gregory, Plant Diagnostician, University of Delaware
Joanne Whalen, Extension IPM Specialist

Five legume (non-soybean) sentinel plots were identified for disease and insect monitoring during the growing season. One of the objectives was to survey these five legume plots for the occurrence of virus diseases. Five total plots were established statewide: two each in Kent and Sussex County, of snapbean and lima bean. One lima bean plot was planted in New Castle County on the Newark Experimental Station Farm in Newark. The methodology was a new variation of the ELISA tests that have been commonly used for virus detection. The Tissue Blot Immunosassay (TBIA) for viruses on legumes was a modified method piloted (Va Tech & Agdia) to test samples directly from the field. It used a test card containing a nitrocellulose membrane and data recording fields. Solutions of antibody, enzyme conjugates, substrate, and buffer solutions were supplied, along with trays for processing. Each card was used to test for two viruses on snapbean and lima bean: bean yellows mosaic (BYMV) and cucumber mosaic (CMV). At each location sampled, leaves were taken at random from 45 plants at early flowering and again at mid-pod. Leaves were blotted onto the membranes after returning to the lab. Each membrane was processed through all solutions and incubation times, then dried and evaluated visually using magnification. Additional testing kits were available for bean pod mottle, therefore several soybean samples with possible symptoms were also included in this project.

Snapbeans and lima beans sampled in the statewide survey did not test positive for either bean yellows mosaic virus (BYMV) or cucumber mosaic virus (CMV) at either sample time in August or September. The Newark (New Castle County) lima bean plot (baby lima bean cultivar ‘Eastland’) had a very low incidence of plants with virus symptoms which were negative when tested by TBIA. Leaf samples from these same plants were sent to Agdia, Inc. for ELISA testing using their bean screen. Two viruses, alfalfa mosaic virus (AMV) and peanut stunt virus (PSV) were identified singly from different plants in the Newark plot sampled on September 7. An October 20th sampling of several more plants, as well as the one testing positive for AMV, were submitted to Agdia and AMV was confirmed and was also co-infected with soybean mosaic virus (SMV). Another sample tested positive for three viruses, AMV, SMV and cowpea mosaic virus (CPMV). A symptomatic lima bean plant was observed at the Georgetown REC and was sampled as well on October 20. It tested positive for CPMV and SMV.

Diseases that were observed were noted and recorded in the data base. There were no diseases of note on snapbeans. Lima beans were infected with low levels of anthracnose, and Cercospora leafspot that was rather extensive in some plots at Georgetown. An interesting aside was the discovery of powdery mildew on cowpea, *Vigna unguiculata,* which was a new record for the Delaware Plant Diagnostic Clinic.

Insect Survey

Five legume (non-soybean) sentinel plots and four commercial fields in Kent County, DE (two snap bean and two lima bean fields) were sampled for soybean aphids for a 4 week period from mid-July through mid-August . Data collected included plant growth stage and number of aphids per plant. Data was also collected on commonly occurring bean insect pests twice per season (late vegetative and early/mid pod-fill stages). Insects detected including thrips, lygus bugs and potato leafhopper. Data collected included plant growth stage and presence/absence of insect pests. Standard sampling protocols were used including observation of leaf samples and sweep samples. Low levels of soybean aphids were detected in the snap bean sentinel plot in Sussex County. Insect levels were very low in all of the sentinel plots and commercial fields.

CUCUMBER (*Cucumis sativus* 'Vlaspik')
Downy mildew; *Pseudoperonspora cubensis*

R. P. Mulrooney, and E. G. Ernest
Plant and Soil Science Dept, University of Delaware, Newark, DE 19716-2170

Evaluation of fungicides for control of downy mildew on pickling cucumbers, 2008.

The experiment was conducted on a Pepperbox loamy-sand soil at the Carvel Research and Education Center near Georgetown, DE. The experiment was arranged as a randomized complete block design with four replications. Plots were 7.5 ft wide and 20 ft long. Cucumbers were direct seeded in rows spaced 30 in. apart with 3 in. between plants within the row on 14 Jul. Fungicide applications were initiated on 1 Aug (three true leaves present) when a few lesions with no sporulation were seen in the plot. Downy mildew was observed at low incidence on 8 Aug. Subsequent applications were made on 8, 15, 22 Aug using a backpack CO_2 pressurized sprayer that delivered 30 gal/A at 52 psi. Applications were made with a broadcast boom equipped with 4 hollow cone nozzles (ConeJet TXVS-18) spaced 18 in. apart. Each plot was bordered by an untreated row. Disease severity was measured on 15 Aug and at harvest on 26 Aug by estimating the percent of infected leaf area per plot by two observers and the scores averaged. A 15 ft-long section of the middle row of each plot was hand harvested once on 27 Aug to simulate mechanical harvest which is the standard harvest method in the region. Cucumbers were graded according to size and quality. The weight of crooks and nubs (small and misshapen fruit) was subtracted from the total yield weight to obtain marketable yield. The weather became dry with low humidity soon after the first rating which slowed the epidemic and permitted some re-growth of healthy foliage. The plot was irrigated as necessary to maintain growth, but not excessively, to avoid promoting fruit rot and foliar infection.

The percent foliage infected data for 15 Aug, after two applications were made, indicate that better control was observed when Presidio, Previcur Flex or Ranman were applied in the first application; however this trend did not persist until harvest. Gavel was the least effective fungicide in this test and the poor performance of Ranman alternated with Tanos compared to the good performance of Tanos alternated with Ranman is not understood. All the treatments were significantly better than the control. There were no symptoms of phytotoxicity for any treatment.

Treatment and rate/A	Marketable Yield (bu/A)	Total Yield (bu/A)	Percent Crooks & Nubs	% Foliage Infected. 32 DAP	% Foliage Infected 44 DAP
Presidio 4SC 4 fl oz + Bravo Weather Stik 6SC 2 pt (A,C*) Tanos 50DF 8 oz + Manzate Prostick 75DG 1.5 lb (B, D) . .	421 a **	453 a	7.2 b	5 a	9 abc
Presidio 4SC 4 fl oz + Bravo Weather Stik 6SC 2 pts (A, B), Tanos 50DF 8 oz + Manzate Prostick 75DG 1.5 lb (C), Previcur Flex 6F 1.2 pt + Bravo Weather Stik 2 pt (D)	421 a	444 ab	5.6 b	3 a	4 a
Tanos 50DF 8 oz + Manzate Prostick 75DG 1.5 lb (A,C), Ranman 3.33SC 2.75 fl oz + Bravo Weather Stik 2 pt (B,D)	415 a	450 a	8.3 b	15 cd	11 bcd
Tanos 50DF 8 oz + Manzate Prostick 75DF 1.5 lb (A,C) Previcur Flex 6F 1.2 pt + Bravo Weahter Stik 2 pt (B,D) . . .	384 ab	413 abc	7.2 b	9 abc	8 ab
Previcur Flex 6F 1.2 pt + Bravo Weather Stick 6SC 2 pt (A,C) Tanos 50DF 8 oz + Manzate Prostick 75DF 1.5 lb (B,D)	357 ab	388 abc	8.2 b	5 a	16 d
Tanos 50DF 8 oz + Manzate Prostick 75DF 1.5 lb (A,C) Curzate 70DF 5 oz + Bravo Weather Stik 6SC 2 pt (B,D) . .	345 abc	384 abc	9.5 b	14 bc	10 bc
Previcur Flex 6F 1.2 pt + Bravo Weather Stik 6SC 2 pt (A,C) Ranman 3.33 SC 2.75 fl oz + Bravo Weather Stik 6SC 2 pt (B,D)	319 bc	349 bcd	9.5 b	8 ab	14 cd
Previcur Flex 6F 1.2 pt + Gavel 2 lb + Dithane Prostick 75DF 1.225 lb (A), Gavel 75DF 2 lb + Dithane Prostick 75DF 1.225 lb (B,C,D)	302 bcd	342 cd	11.5 b	7 a	21 e
Ranman 6F 2.75 fl oz + Bravo Weather Stik 6SC 2 pt (A,C) Tanos 50DF 8 oz + Manzate Prostick 75DF 1.5 lb (B,D) . . .	251 cd	284 d	11.7 b	5 a	24 e
Gavel 75DF 2 lb + Dithane Prostick 75DF 1.225 lb (A,B,C,D)	219 d	262 d	15.9 b	21 d	26 e
Untreated control	54 e	126 e	60.9 a	44 e	68 f
LSD	95.8	96.2	14.8	6.4	6.2
p-value	*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*

*Treatment applications: A= 1 Aug, B= 8 Aug, C= 15 Aug, D= 22 Aug.
**Mean values within a column followed by the same letter are not significantly different according to Fisher's protected least significant difference (LSD) test.

2008 ipmPIPE Downy Mildew on Cucurbits Project

Delaware component: Bob Mulrooney, Extension Plant Pathologist
Emmalea Ernest, Extension Associate, Vegetables
Cooperative Extension
Dept of Plant and Soil Sciences

OTHER COOPERATORS (alphabetically by state/province):

Alabama: Ed Sikora	New Jersey: Andy Wyendant
Delaware: Bob Mulrooney	New York: Meg McGrath
Florida: Amanda Gevens	North Carolina: Gerald Holmes
Georgia: David Langston	Ohio: Sally Miller
Illinois: Mohammed Babadoost	Oklahoma: John Damicone
Indiana: Dan Egel	Ontario: Elaine Roddy
Kentucky: Kenny Seebold	Pennsylvania: Beth Gugino
Louisiana: Don Ferrin	South Carolina: Anthony Keinath
Maryland: Kate Everts	Tennessee: Steve Bost
Massachusetts: Rob Wick	Texas: Tom Isakeit
Michigan: Mary Hausbeck	Virginia: Steve Rideout
Mississippi: David Ingram	Wisconsin: Alyson Thornton

Project Objective
Our primary objective is to document when and where cucurbit downy mildew occurs. Our secondary objective is to determine which hosts get downy mildew and at what level of severity.

Pathotype Determination
Objective: To determine which cucurbit hosts are infected and to pinpoint the time of infection on these hosts.

Methods:
Seed of seven cucurbit differentials was sown (Table 1) into peat pots with soil-less potting mix in early June to produce 15 good transplants per differential. Transplants were set in the field in late June when plants had 2 true leaves. Plants were spaced 2 ft apart within rows and rows were spaced 20 ft apart with 20 ft alleys between plots. The plots were established on black plastic mulch with drip irrigation at the Experimental Station Farm in Newark (June 16), and at the Carvel REC in Georgetown (June 3).

Results:
Newark

Infection on cucumber 'Straight Eight' (Aug 19) and 'Poinsett 76' (Aug 26)

Georgetown

Infection on both cucumber varieties , 'Straight Eight'(July 9) and 'Poinsett 76' (July 14), cantaloupe (Aug 8), butternut squash (Sep 7), and pumpkin (Sep 12)

Table 1. Cucurbits for ipmPIPE sentinel plots 2008.

No.	Species	Cultivar name	Common name	Description
1	*Cucumis sativus*	Straight Eight	Slicing cucumber	DM senstivie
2	*Cucumis sativus*	Poinsett 76	Slicing cucumber	DM resistant
3	*Cucumis melo*	Hales Best Jumbo	Cantaloupe	
4	*Cucurbita pepo*	Table Queen	Acorn squash	
5	*Cucurbita maxima*	Big Max	Giant pumpkin	
6	*Cucurbita moschata*	Waltham butternut	Butternut squash	
7	*Citrullus lanatus*	Micky Lee	Watermelon	Round, seeded

SOYBEAN (*Glycine max*, Shillinger 447RR)
Soybean rust (*Phakospora pachyrizi)*

R. P. Mulrooney
Dept. of Plant and Soil Sciences
University of Delaware
Newark, DE 19716-2170

Fungicide Trial for Control of Asian Soybean Rust, 2008.

This test was conducted at the University of Delaware Research and Education Center near Georgetown, DE. The test was conventionally planted Jun 10 at a rate of 150,000 seeds/A in an Ingleside sandy loam soil. Each plot consisted of eight 15 in. rows, 30 ft long. Plots were arranged in a randomized complete block design with six replications. Fungicide applications were made on 5 Aug at late R3 growth stage with a CO_2 back pack sprayer, 9 ft boom equipped with Tee-Jet DG 8002-VS nozzles applying 20 gal/A at 52 psi. A foliar health rating was made at late R6 and no differences could be detected visually between treatments. No more data could be taken from this plot because charcoal rot infected two tiers of plots almost uniformly and was scattered randomly throughout the remaining plots. This infection stunted growth and affected maturation once symptoms were observed. Soybean rust did not occur in DE in 2008.

There were no observable effects from the fungicide applications on charcoal rot. No phytotoxicity was observed for any of the treatments.

Treatment and rate/A
1. Punch 400 EC 4 fl oz
2. Punch 400EC 4 fl oz + Headline EC 4.5 fl oz
3. Headline EC 6 fl oz + 0.25% NIS
4. Quadris SC 6.2 fl oz + 1% COC
5. Quilt SC 14.0 fl oz + 0.25% NIS
6. Control

PERFORMANCE EVALUATION OF SOYBEAN CYST NEMATODE RESISTANT ROUND-UP READY SOYBEAN - 2008

R. Uniatowski, Associate Scientist
R.P. Mulrooney, Extension Plant Pathologist
Dept. of Plant and Soil Science
University of Delaware

Eleven cultivars were evaluated in 2008 for adaptation to Delaware growing conditions and resistance to race 1 (HG type 2.5.7) of the soybean cyst nematode (SCN). Variety evaluations were conducted at the Research and Education Center near Georgetown in Sussex County. Both trials were planted June 5 and followed a previous soybean crop. Plots consisted of five rows, 23 feet long, spaced 15 inches apart. The plots were arranged in a randomized, complete block design with four replications. Nineteen feet of all five rows of each plot were combine-harvested October 17.

The season was dry with normal temperatures for most of the season. The site was irrigated periodically during the season.

Table 1. Irrigated Race1. Soybean Cyst Nematode (SCN) RoundUp Ready Soybean Variety Performance Summary. Dill 12. Research and Education Center, Sussex County, Georgetown, DE,.2008.

Brand	**Variety**	**Yield (bu/A)**	**Plant height (in.)**	**Lodging***	**Maturity Date**	**SCN Reaction**
Trisoy	4475RR (CN)	53	34.5	1.0	10/12	R 3, MR14
Southern States	RT 4777N	51	37.8	1.0	10/14	R 3,14
Unisouth	USG 74A76	51	33.8	1.0	10/12	MR 3, 14
TA Seeds	TS 4499RS	50	32.3	1.0	10/12	R3, MR14
NK	S 46-U6	48	36.0	1.0	10/15	R 3,14
Asgrow	AG 4404	46	32.5	1.0	10/15	MR 3,14
Asgrow	AG 4703	46	30.0	1.0	10/13	MR/MS 3
Hisoy	HS 476NRR	39	29.3	1.0	10/12	R3, MR14
Clark's	CL 442NSR	36	28.5	1.0	10/08	R3, MR14
NK	S 36-B6	27	24.8	1.0	10/08	SUS
Vigoro	V 45NRR	26	24.5	1.0	10/12	R3, MR14
Statistics	**Average**	43.0	31.3	1.0		
	LSD (.05)	8.0	3.2			
	%CV	13.0	7.1			

* Lodging score: 1= all plants erect, 9= all plants lodged

Table 2. Irrigated. Race1. Soybean Cyst Nematode (SCN) RoundUp Ready Soybean Variety Performance Summary. Field 25. Research and Education Center, Sussex County, Georgetown, DE,.2008.

Brand	**Variety**	**Yield (bu/A)**	**Plant height (in.)**	**Lodging***	**Maturity Date**	**SCN Reaction**
Trisoy	4475RR (CN)	65	38.8	1.3	10/12	R 3, MR14
Unisouth	USG 74A76	59	40.5	1.5	10/08	MR 3, 14
Southern States	RT 4777N	58	38.5	1.5	10/12	R 3,14
Asgrow	AG 4404	56	35.0	1.0	10/13	MR 3,14
Asgrow	AG 4703	55	32.0	1.0	10/08	MR/MS 3
TA Seeds	TS 4499RS	55	35.3	1.0	10/03	R3, MR14
Hisoy	HS 476NRR	54	33.0	1.0	10/12	R3, MR14
NK	S 46-U6	53	42.3	1.0	10/13	R 3,14
Clark's	CL 442NSR	52	31.0	1.0	10/04	R3, MR14
NK	S 36-B6	44	31.8	1.0	10/02	SUS
Vigoro	V 45NRR	33	29.3	1.0	10/08	R3, MR14
Statistics	**Average**	53.1	35.2	1.1		
	LSD (.05)	9.3	3.5			
	%CV	12.0	6.8			

* Lodging score: 1= all plants erect, 9= all plants lodged

SOYBEAN (*Glycine max*)
Soybean cyst nematode:
Heterodera glycines, race 1
HG 2.5.7

B. Uniatowski, R. P. Mulrooney
Dept. of Plant and Soil Science
University of Delaware
Newark, DE 19716-2170

UNIFORM ROUND-UP READY SOYBEAN CYST NEMATODE VARIETY EVALUATIONS, GROUP IV, 2008: Eleven numbered lines and two named cultivars were evaluated for adaptation to Delaware growing conditions and resistance to race 1. Variety evaluations were conducted at the Research and Education Center near Georgetown in Sussex County on land known to be infested with race 1 (HG 2.5.7) of the soybean cyst nematode (SCN). Plots were planted in a loamy sand soil (sand 82 percent, silt 9 percent, and clay 9 percent) on June 6 following a previous soybean crop. Plots consisted of five rows, 18 feet long, spaced 15 inches apart. The plots were arranged in a randomized, complete block design with four replications. Plots were harvested on Oct 17.

The season was very dry, and supplemental irrigation was provided. No lodging occurred for any cultivar.

Cultivar	Yield		Maturity	Height
	bu/a	rank	date	inches
AG4103	40.1	3	11-Oct	28.2
DKB 38-52 (SCN)	32.4	9	0	26.7
AG4403 (SCN)	42.4	2	1	30.2
K05-2270 RR	24.1	11	1	26.5
S04- 3924	35.2	8	0	27.2
S04-20912	44.8	1	0	28.5
SS02-6857	36.7	6	3	31.7
SS03-6997	37.4	5	0	29.7
SS03-9235	32.1	10	3	27
SS03-9639	37.6	4	0	29.7
SS04- 4866	35.9	7	-5	28.2
Average	36.2			28.5
LSD (.05)	10.3			2.3
CV %	19.7			5.6

2008 Delaware ipmPIPE Sentinel Plot Survey for Soybean Rust and Soybean Aphid

Bob Mulrooney, Extension Plant Pathologist, University of Delaware
Nancy Gregory, Plant Diagnostician, University of Delaware
Joanne Whalen, Extension IPM Specialist

Sentinel Sites

Seven soybean sentinel plots were established through out the state during early June (see attached map). These sentinel plots were part of the ipmPIPE and funded through USDA/APHIS/ RMA. The seven sites were the University of Delaware Experiment Station Farm in Newark, a soybean variety testing plot near Summit, DE; the Delaware State University Smyrna Outreach and Research Center; a soybean variety testing plot near Frederica; a grower field near Seaford; the University Carvel REC near Georgetown, and a soybean variety testing plot near Selbyville, DE.

Survey Activities

All sentinel plots were surveyed once per week or every two weeks as soon as the plants had produced leaves. In addition, 100 leaflets were taken from each sentinel site each week once flowering began. These leaflets (700 total/week) were brought to the Delaware Dept. of Agriculture (DDA) near Camden, DE where they were incubated for 3 days and examined under a dissecting microscope for soybean rust pustules. Surveying of all sentinel plots continued until the soybeans had matured and dropped their leaves. At that time, several full season commercial fields were replaced with late season, double-cropped soybeans to extend the survey season. The Newark site had only one variety a Group IV (SS RT-4440N) the remaining sites were planted with both a group IV (SS RT4440N) as well as a very late maturing Group VII variety (USG7732NRR). Shillinger 447RR (Group IV maturity) soybean was planted at the Georgetown REC site. Additional leaf samples were taken from several kudzu patches in early November by personnel from the DDA after the soybean rust find in nearby Maryland and this contribution is gratefully acknowledged.

Delaware Lab Detection Efforts for Soybean Rust

Soybean rust was discovered in the Selbyville sentinel plot on the Group VII variety USG7732NRR. The location upon review was determined to be just over the border and thus technically in Maryland in Worcester County, between Bishop, MD and Selbyville, DE. This is the first report of soybean rust in Maryland. A sample was collected on October 23 and incubated until October 28. Debbie Parrish examined the sample at the Delaware Dept. of Agriculture and determined there was a suspect soybean rust infection. Nancy Gregory, University of Delaware Plant Diagnostician and Bob Mulrooney, University of Delaware Plant Pathologist then examined the sample. They determined that there was one soybean rust pustule on one leaf out of the 100 leaf sample. Dr. Mary Palm, USDA/APHIS PPQ NIS, confirmed the identification on October 29, 2008.

The primary significance of this find is to illustrate that soybeans in the Mid-Atlantic region can become infected with soybean rust given the right combination of events. However, this particular discovery has no direct implications for soybeans in our region. It happened at the very end of the growing season, and in fact frost (approx. Oct 20) had already damaged the upper most foliage of this extremely late soybean sentinel plot. There was no remaining green foliage in this sentinel plot and all commercial fields were in various stages of harvest. This detection also illustrates that under the present set of standards, soybean rust can be detected at very low incidence. This ability gives us the information to provide growers an early warning in time to take protective measures in case it should appear earlier in the season when the crop could be at risk. The ipmPIPE program has been a very effective tool for monitoring the presence of soybean rust in the US and preventing this disease from causing needless losses from rust or unnecessary spraying when the threat of rust is not present.

Asian soybean rust was not detected on soybean or any other host in Delaware in 2008. Leaf samples from sentinel plots in each county were collected over 17 weeks from July 10, 2008 to October 29, 2008. Five to seven sentinel plots were visited each week. Samples consisted of 100 leaves taken from each plot in the lower canopy of plants. Leaves were incubated in plastic bags at room temperature for a minimum of three days, and then the underside of each leaf was examined under low power of a dissecting microscope. Growth stage was recorded as well as well as foliar diseases and insects present. Data was entered weekly into the ipmPIPE database and the NPDN database.

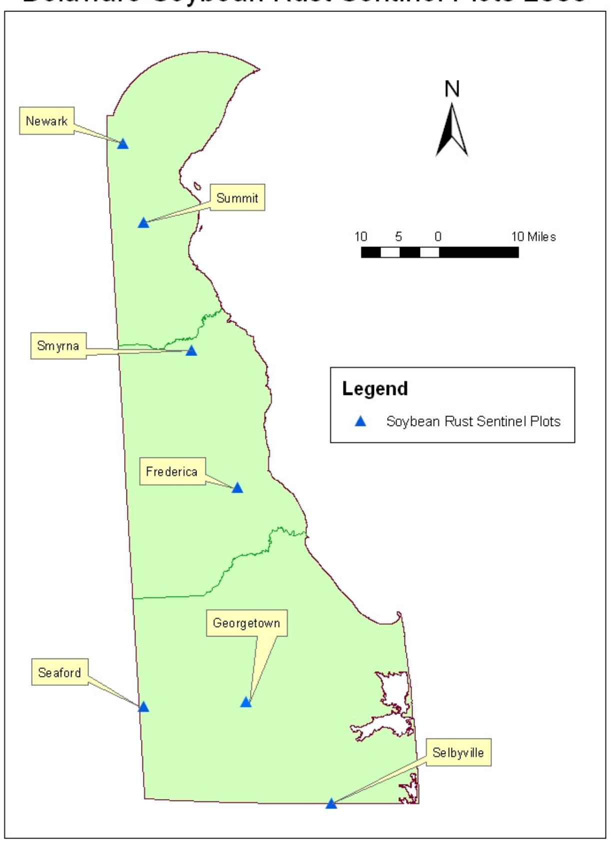
The season was very dry and few diseases were seen until Septoria brown spot and downy mildew were observed in late June. Aphids were first noted in the second week in August.

Data observations were entered for 92 samples from sentinel plots, consisting of nearly 9200 leaves. Thirteen samples were received in the UD Plant Diagnostic Clinic with various symptoms and diagnoses, and soybean rust was not detected in any of those samples. The total number of soybean samples processed was 105 for 2008.

Soybean Aphid

The 2008 Soybean Aphid survey included both sentinel plots and commercial fields. Fields were visited on a weekly basis from mid June through mid-August. Seven sentinel plots and twenty-five commercial fields were visited each week. Data collected included plant growth stage and the number of aphids per plant. Data was entered weekly into the ipmPIPE database on a weekly basis. Soybean aphids were detected the first week in August in the New Castle County sentinel plot in Newark. Populations were again very low due to the extremely dry weather. Economic levels were not detected in any of the sentinel plots or commercial survey sites.

Delaware Soybean Rust Sentinel Plots 2008



Extension Outreach

A soybean rust update was included in our weekly crop newsletter (24 issues) aptly named "Weekly Crop Update". This is emailed and posted to the web as well as mailed to subscribers. Information from the ipmPIPE website along with our local sentinel plot information was included in the update.

At a Sussex county field meeting in mid-August participants (30) were informed of the ipmPIPE activities and the latest information and literature on SBR were provided to all.

WHEAT (*Triticum aestivum* 'Seedway SW8309')
Tan spot; *Pyrenophora tritici-repentis*

R.P. Mulrooney
Plant and Soil Sciences Dept.
University of Delaware
Newark, DE 19716-2170

Evaluation of fungicides for control of wheat diseases on soft red winter wheat, 2008.

The experiment was conducted on a Matapeake silt loam soil in southern New Castle County near Middletown, DE. The experiment was arranged as a randomized complete block design with four replications. Plots were 10 ft wide and 50 ft long. The wheat cultivar, Seedway SW8309, was seeded the previous fall with a grain drill on 7.5 in. spacing following soybeans. The Kocide 3000 application was made at Feekes growth stage (GS) 6 (jointing) on 17 Apr and Quilt was applied at Feekes GS 10.51 (early flowering) on 15 May. The remaining treatments were made at Feekes GS 10 (heads in the boot). Fungicide applications were made before any disease symptoms were seen on the plants. Treatments were made using a backpack CO_2 pressurized sprayer that delivered 20 gal/A at 52 psi with a 9 ft boom equipped with Tee-Jet DG 8002-VS nozzles. Disease severity was measured on 15 Jun (soft dough stage) by assessing the percent of infected leaf area on the flag leaf and the leaf below the flag leaf (F-1). The only disease present at the time of rating was tan spot caused by *Pyrenophora tritici-repentis.* The plots were trimmed to 45 ft and the center six rows were harvested on 10 Jul. Data were adjusted to reflect 13.5% grain moisture. Temperatures were normal, but humidity levels were lower than normal. Rainfall was adequate during the early part of the season, Apr 3.9 in., May 7.0 in., Jun 2.7 in., and 0.18 in. in Jul before harvest. There were several periods of wet weather in June that were favorable for tan spot infection.

All of the treatments except Kocide 3000 applied at jointing provided significant control of tan spot. The most effective fungicides for control of tan spot were Headline 6.0 fl oz, Quilt 14.0 fl oz, BAS 556 7.0 and 9.0 fl oz, and Punch 4.0 fl oz. Both BAS 556 (pyraclostrobin + metconazole) treatments significantly increased yield compared to the check. There were no symptoms of phytotoxicity for any treatment.

Treatment, rate/A, and timing	% Flag leaf infected[z]	% F-1 infected[zy]	Yield bu/A
Unsprayed control	0.52 bc[x]	38.7 d	89.6 bc
Kocide 3000 46.1DF 0.75 lb GS 6	1.10 c	42.5 d	85.1 c
Headline 2.09EC 6.0 fl oz GS10	0.00 a	3.8 ab	93.9 ab
BAS 556 1.75EC 7.0 fl oz GS 10	0.00 a	1.7 a	96.3 a
BAS 556 1.75EC 9.0 fl oz GS 10	0.00 a	2.4 ab	96.7 a
Quilt 1.66SC 10.5 fl oz GS 10	0.20 ab	19.1 c	89.7 bc
Quilt 1.66SC 14.0 fl oz GS 10	0.00 a	4.6 ab	94.1 ab
Stratego 2.1EC 7.0 fl oz GS 10	0.07 a	12.3 bc	92.3 ab
Stratego 2.1EC 10.0 fl oz GS 10	0.15 ab	16.4 c	92.8 ab
Punch 3.3EC 4.0 fl oz GS 10	0.00 a	4.9 ab	93.7 ab
Quilt 1.66SC 14.0 fl oz GS 10.51	0.32 ab	5.1 ab	93.7 ab

[x] Means followed by the same letter are not significantly different (Fisher's protected LSD, P=0.05).
[y] F-1 = leaf below the flag leaf
[z] Data were transformed from percentages by arcsin√, analysis of variance was performed and means were converted back to the percentages which are represented in the table.

WHEAT (*Triticum aestivum* 'Seedway SW8309') R.P. Mulrooney
Tan spot; *Pyrenophora tritici-repentis* Plant and Soil Sciences Dept.
University of Delaware
Newark, DE 19716-2170

Evaluation of fungicides for tan spot control that were applied for head blight control on soft red winter wheat, 2008.

The experiment was conducted on a Matapeake silt loam soil in southern New Castle county near Middletown, DE. The experiment was arranged as a randomized complete block design with four replications. Plots were 10 ft wide and 50 ft long. The wheat cultivar, Seedway SW8309, was seeded the previous fall with a grain drill on 7.5 in. spacing following soybeans. All treatments were applied at Feekes growth stage (GS) 10.51 (early flowering) on 15 May. Fungicide applications were made using a backpack CO_2 pressurized sprayer that delivered 20 gal/A at 52 psi with a 9 ft boom equipped with Spraying Systems Twin-Jet TJ-60 8002-VS nozzles. Disease severity was measured on 15 Jun (soft dough stage) by assessing the percent of infected leaf area on the flag leaf and the leaf below the flag leaf (F-1). The only disease present at the time of rating was tan spot caused by *Pyrenophora tritici-repentis.* The plots were trimmed to 45 ft and the center six rows were harvested on 10 Jul. Data were adjusted to reflect 13.5% grain moisture. Temperatures were normal, but humidity levels were lower than normal. Rainfall was adequate during the early part of the season, Apr 3.9 in., May 7.0 in., Jun 2.7 in., and 0.18 in. in Jul before harvest. There were several periods of wet weather in June that were favorable for tan spot infection, while the weather prior to flowering and through the flowering period was dry and humidity was low.

No Fusarium head blight symptoms were present in the trial. All three fungicides provided excellent control of tan spot and significantly increased yield compared to the untreated control. There were no symptoms of phytotoxicity for any treatment.

Treatment and rate/A	% Flag leaf infected[z]	% F-1 infected[zy]	Yield bu/A
Unsprayed control	3.0 b[x]	29.5 b	81.0 c
Caramba 0.75SL 14.0 fl oz	0.0 a	1.0 a	91.1 a
Proline 4SC 5.7 fl oz	0.0 a	4.2 a	84.9 b
Prosaro 421S 6.5 fl oz	0.0 a	1.3 a	86.5 b

[x] Means followed by the same letter are not significantly different (Fisher's protected LSD, P=0.05).
[y] F-1 = leaf below the flag leaf
[z] Data were transformed from percentages by arcsin√, analysis of variance was performed and means were converted back to the percentages which are represented in the table.

2008 Delaware Plant Diagnostic Clinic Report
Department of Plant and Soil Sciences
University of Delaware

Nancy F. Gregory, Plant Diagnostician
Bob Mulrooney, Extension Plant Pathologist

The Plant Diagnostic Clinic at the University of Delaware is housed in the Department of Plant and Soil Sciences, and is located in Townsend Hall, Room 151. The clinic serves the public through Delaware Cooperative Extension and the Master Gardener program, including commercial growers, nurserymen, gardens, and private homeowners. The clinic is the National Plant Diagnostic Network (NPDN) laboratory for Delaware. The lab is also the plant pathology laboratory for USDA/APHIS CAPS diagnostics and the ipmPIPE lab for Delaware. The clinic operates with two staff, the Plant Diagnostician, the Extension Plant Pathologist, and some part-time employees.

During 2008, the Plant Diagnostic Clinic processed over 700 samples. Those sample numbers include 94 survey samples for Asian soybean rust. There were 608 routine clinic samples processed. Other samples were diagnosed in field situations, and not brought in for analysis. Phone inquiries and email requests for information concerning plant problems numbered around 30, in addition to physical specimens submitted to the lab. Soil samples for nematode assays were also processed in the lab, but are not included in this report. Drought in 2006 and 2007 along with wet weather in May of 2008 stressed some plants and opened avenues for pathogens early in the season. Dry weather late in the season exacerbated plant stress, and favored pathogens on many hosts.

Of the 608 routine samples received, the sources were as follows:

Extension Non-commercial	272	44.6%
Extension Commercial	238	39.2%
Non-extension	95	15.7%
Regulatory	3	0.5%

There were many different diagnoses, from different crop areas. The crop sources for those were:

Field crops	61	10%
Fruit	49	8%
Ornamentals	382	63%
Turf	36	6%
Vegetables	65	11%
Other*	15	2%

*Other includes home/office, insect, fungus, plant/weed ID

Of the varied diagnoses, pest and pathogen incidence was approximately* as follows:

Environmental/Physiological	250
Fungal Diseases	247
Bacterial Diseases	18
Viral Diseases	24
Nematodes	7
Insect (Damage and ID's)	76
Plant/Weed ID	19
Fungal ID	6

*Percentages were not determined due to many specimens having more than one diagnosis. For example, insect damage and fungal dieback were common on physiologically stressed trees.

New reports for the year 2008 included cereal yellow dwarf virus (CYDV-pav) on wheat from Sussex County received 4/30/08, weedy sedge *Kyllinga gracillima* received from Sussex County on 9/29/08, butternut squash with an unknown potyvirus from New Castle County on 9/29/08, and peanut stunt virus on lima bean from New Castle County on 9/29/08. Powdery mildew (*Erysiphe polygoni*?) was noted on cowpea on 10/20/08. Other new detections included the thrips *Gynaikothrips uzeli*, which were found on *Ficus benjamina* in a Sussex County greenhouse in August, on plants which had come in from a southern supplier. One quarantine pest was detected. Chrysanthemum white rust (*Puccinia horiana*), was identified on 9/16/2008, from retailer in Kent County. Plants originated from a southern supplier, and to date this pest is not established in the United States.

Asian soybean rust was not found in Delaware on any host, but was confirmed in a University of Delaware sentinel plot near Selbyville in Worchester County, Maryland on October 29, 2008. The infection was detected on one leaf from a 100 leaf sample. No further detections were made, and soybean rust was of no consequence at that late date in the season. Bean pod mottle virus (BPMV) was confirmed on soybean for the second year as a part of the national ipmPIPE legume virus survey, following a new report for this virus in Delaware in 2007, however this sample was in Maryland near the Delaware border. Foliage diseases on soybean such as brown spot (*Septoria*) and downy mildew were common, but severity was low. Mite damage was common in mid-season as weather became hot and dry. In August, Alternaria leaf spot, *Phyllosticta* (*phaseolina*?) leaf spot and other fungal leaf spots were seen on soybean in conjunction with drought stress and nutritional problems. Charcoal rot was found on soybean late in the season.

Weather conditions in the spring of 2008 were favorable for seedling diseases in row crops and vegetables. Cold weather in April followed by wet conditions in May resulted in slow seedling growth, bacterial infections and Pythium root rot on corn. Wheat and barley viruses (wheat spindle streak, wheat soil-borne mosaic and barley yellow dwarf), eyespot and *Septoria tritici* were seen in April, May, and June. Also in May, take-all was diagnosed as well as spot blotch on barley, and eyespot on timothy. In June, *Pythium*, *Fusarium*, and Phytophthora root and stem rots were found on peas, tomatoes, peppers and squash. Fungal leaf spots on corn were at a low level, but gray leaf spot and Northern corn leaf blight samples were received. There were several samples of head scab on wheat, as well as one report of scab on barley. Stalk rots and red root rot (*Phoma terrestris*) were common on corn late in the season. One sample of late blight on tomato was received in August and tomato spotted wilt was confirmed on tomato. Downy mildew on cucurbits appeared in early August, but was not as severe as in past seasons. Fusarium crown rot on pumpkins appeared in several locations in August and September. Downy mildew was noted on lima beans and pole limas late in the season, as well as peanut stunt virus and alfalfa mosaic virus. Tomato spotted wilt virus was confirmed on lettuce from New Jersey, and leaf spotting was noted on collards and turnip greens, but a cause could not be determined.

Notable diseases on fruit included a Septoria leaf spot on sweet cherry, powdery mildew along with the more common black rot on grape, and scab on peaches. Fire blight was severe on pear. Septoria leaf spot, anthracnose, and virus samples were received on brambles.

Evergreen ornamentals comprised over half of the ornamental samples received, with tip and twig dieback prevalent following two seasons of fluctuating temperatures and drought. This was often difficult to accurately diagnose, but *Phomopsis, Pestalotiopsis*, *Kabatina* and *Seiridium* were among the pathogens found. *Rhabdocline* was seen on Douglas fir in May, when bacterial blight was diagnosed on lilac, and fire blight became prevalent on flowering pear. As the weather became dry, establishment issues with new plantings became common. In irrigated landscapes, Phytophthora root rot was diagnosed on juniper, arborvitae, yew, cypress, holly and cherry laurel that had not developed good root systems. Rhizosphaera needle cast was diagnosed on several blue and Norway spruce, along with pine bark adelgid on white pine and *Diplodia* on Japanese black pine.

Elms on the University of Delaware campus in Newark were heavily affected by Dutch elm disease, with six confirmed infections. Most of those trees were removed, including several stately old established trees. Young terminals on river birch were found distorted with infestations of psyllids and spiny witch hazel aphids. Harry Lauder walking stick (*Corylus avellana*) was received with a blight and twig dieback suspected to be Eastern filbert blight caused by *Anisogramma*. Obedient plant (*Physostegia*) was confirmed with alfalfa mosaic virus (AMV). In July, *Rhizoctonia* was found causing a stem and root rot on threadleaf *Coreopsis*, along with Phoma blight on periwinkle. Also in July, *Calycanthus* was confirmed with Verticllium wilt and *Strobilanthes* with Phytophthora root rot, both from Chester County, PA.

In August and September, environmental stress led to numerous Botryosphaeria canker and similar stress related diebacks. *Sclerotium rolfsii* was found on hosta, and brown patch and summer patch became prevalent on turfgrass. Annuals diagnosed with black root rot included petunia, vinca and pansy. Late season *Septoria* and Cercospora leaf spots were common. Foliar nematode was confirmed on Japanese anemone in the UDBG. By October, twig blights, needlecasts, and cankers were even more noticeable in the landscape.

The survey for bacterial leaf scorch (BLS) continued in 2008 in cooperation with the Delaware Forest Service, with urban and forest samples. Approximately 20 samples were tested in the lab by ELISA and all symptomatic samples were positive, indicating that *Xylella fastidiosa* is widespread throughout Delaware. Urban species most commonly affected were northern red oak and pin oak. Rural and forest species most commonly affected include northern red oak, black oak, and scarlet oak.

The UD Plant Diagnostic Clinic gratefully acknowledges the following University of Delaware colleagues who assisted with diagnoses and identifications as Advisory Consultants for samples in 2008: Brian Kunkel, Tom Pizzolato, Joanne Whalen, John Frett, Richard Taylor and Wallace Pill.

Nematode Assay Service 2008 Report
Cooperative Extension Service
Department of Plant and Soil Science
University of Delaware

Bob Mulrooney, Extension Plant Pathologist
Nancy Gregory, Extension Plant Diagnostician

The Nematode Assay Service (NAS) at the University is housed in the Department of Plant and Soil Sciences, and is located in Room 151 Townsend Hall. The NAS provides nematode identification and enumeration for soil and plant samples submitted by consultants, growers, researchers, and the gardening public. The NAS provides this service to residents of Delaware and the surrounding states. The clinic operates with two staff, the Extension Plant Pathologist and the Plant Diagnostician, Nancy Gregory, who prepares samples for reading and does soybean cyst egg counts. Currently our fee structure is $10.00 for either a full larvae screen or soybean cyst nematode (SCN) egg count for both in-state and out-of-state clients.

In addition to our regular soil and root extractions of nematodes, we provide race testing of the soybean cyst nematode, as well as foliar nematode, and pinewood nematode extractions from suspect plant parts.

In 2008, the NAS processed 63 samples, of which 61 were fee samples submitted for analysis. The remainder included two research samples. Four soil or plant samples came in through the Diagnostic Clinic routine sample queue and all four had damaging levels of plant parasitic nematodes, including root knot and soybean cyst nematode.

Of these 61 for fee samples submitted for analysis, the crop sources for these were:

Field crops	31	50 %
Fruit	8	13 %
Ornamentals	6	10 %
Vegetables	16	26 %

Nineteen (19) or 31% of the samples submitted had nematode levels that were determined to require some control measure.

Nematode species detected in numbers that required control were the soybean cyst nematode, *Hederodera glycines*; southern root knot nematode, *Meloidogyne incognita*; lesion nematode, *Pratylenchus penetrans*; spiral, *Helicotylenchus*; and stubby root nematode, *Trichodorus* sp. Foliar nematode was identified on Japanese anemone, *Anemone* x *hybrida*. Final reports were saved in a new fill-in pdf form that could be saved on the computer, and printed or e-mailed to the submitter. Control recommendations and fact sheets when appropriate, were included with the report to the submitter.

Delaware and the National Plant Diagnostic Network Report 2007-08

Nancy F Gregory, Plant Diagnostician
Robert P Mulrooney, Extension Plant Pathologist
University of Delaware Cooperative Extension

Impact Nugget:

The establishment of the National Plant Diagnostic Network (NPDN) and the associated regional centers has greatly enhanced national agricultural security by linking diagnostic programs. Delaware has become better prepared for detecting new pests and pathogens, and providing a rapid response.

Background, Mission, and Delaware's Role:

In 2002, the Animal and Plant Disease and Pest Surveillance and Detection Network was established within the Cooperative States Research, Education, and Extension Service (CSREES) and the Department of Homeland Security. Worldwide, damage from invasive pests and pathogens exceeds $100 billion annually, and intentional introduction could have significant impacts. The mission of the NPDN is to enhance national agricultural security by quickly and accurately detecting outbreaks of pests and pathogens. To achieve the mission, specific objectives included i)establishing a national communications system, ii)upgrading diagnostic infrastructure, iii)training in standard protocols for diagnosticians, iv) training of a network of "First Detectors", and v)database analysis to detect unusual outbreaks. The Network is composed of diagnostic facilities at Land Grant Universities in 50 states, some territories and state labs. There are five regions in the U.S., each with a regional center and director. Delaware is a member of the Northeast Plant Diagnostic Network, with a regional center at Cornell University.

Accomplishments and Impact 2007-08:

1. Over 600 samples processed, with 92 additional soybean rust survey samples. All data was uploaded to the National Repository. Delaware cooperated with the national ipmPIPE to enter data for soybean rust and legume viruses. Bob continued to update extension personnel and growers on the Asian soybean rust threat and fungicide availability.
2. Ongoing training in diagnostic techniques for detection of pests of regional and national concern (Nancy – *Ralstonia*, Bob – Potato Cyst Nematode). Information sharing and networking through meetings and conference calls. Nancy attended annual Diagnostician/IT meetings representing the northeast region, and serves as secretary of the National Database subcommittee, editing NPDN pest codes. New national efforts include establishment of a lab accreditation system.
3. Over 47 First Detectors have been trained for the state of Delaware, with 26 in 2008 as a part of Advanced Master Gardener Training.
4. Cooperation between Delaware Department of Agriculture, USDA/APHIS PPQ and University of Delaware pathologists has increased.
5. Communication Efforts include web site development and updates, presentations, posters, and public education efforts such as news articles and a brochure.