(Cover)
68th Annual Meeting of the Northeastern Division
American Phytopathology Society
Program and Abstracts
October 8 - 10, 2008
Newport Rhode Island

(Inside cover)
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WEDNESDAY, OCTOBER 8, 2008

Morning	**EXPLORE NEWPORT'S MANSIONS AND ATTRACTIONS:** on your own
12:00 – 5:00	**REGISTRATION - (PREFUNCTION)**
1:30 – 5:00	**INDUSTRY - EXTENSION MEETING –** Ballroom C Presiding: Bangya Ma
5:00 – 6:00	**NEDAPS GRADUATE STUDENT AWARDS COMMITTEE** – Jamestown
5:00 – 7:00	Dinner on your own
7:00 – 10:00	**DIVISION SOCIAL** – Rose Island 2 light snacks/drinks/Jeopardy Game/music

THURSDAY, OCTOBER 9, 2008

7:30 – 11:00	**REGISTRATION (PREFUNCTION)**
8:00 – 9:50	**SYMPOSIUM: MINERAL NUTRITION AND PLANT DISEASE** Ballroom CD
8:00 – 8:10	**WELCOME AND OPENING REMARKS** DAN COOLEY, NED-APS President
8:10 – 9:00	**The Influence of Nitrogen-form, Chloride, and Manganese in Plant Disease Suppression.** *Wade Elmer, Connecticut AES, New Haven*
9:00 – 9:50	**Silicon in the life, performance and health of plants** *Lawrence Datnoff, Univ. of Florida, IFAS, Gainesville*
9:50 – 10:15	**BREAK** for refreshments
10:15 – 12:00	**CONTRIBUTED PAPER SESSION I** Ballroom C Presiding: Bryan Hed
10:30	**What have we learned from studying Grapevine fanleaf virus from its hypothesized origin?** N. S. BASHIR. Plant Protection Department, The University of Tabriz, 29 Bahman Blvd., Tabriz 51664 IRAN
10:45	**Applications of gibberellic acid for control of *Botrytis* and other bunch rots in wine grapes.** B. E. HED (2), and J. W. Travis (1). (1) Pennsylvania State University, Biglerville, PA (2) Pennsylvania State University, North East, PA
11:00	**Virginia creeper as a reservoir for inoculum of grape powdery mildew.** F. J. FERRANDINO, The CT Agr. Exp. Sta., New Haven, CT
11:15	**Prospects for precision agriculture to manage aerially dispersed**

pathogens in a patchy landscape. D. E. Aylor and F. J. FERRANDINO, The Connecticut Agricultural Experiment Station

11:30 **Sensitivity to fungicides of the cucurbit powdery mildew fungus in NY and PA in 2007 and 2008.** M. T. MCGRATH, Cornell University

11:45 **Evidence of reduced suppression of powdery mildew (*Podosphaera xanthii*) provided by resistant squash (*Cucurbita pepo*) cultivars in NY.** M. T. MCGRATH, Cornell University

12:00 – 1:00 **LUNCH** on your own

1:00 – 3:00 **GRADUATE STUDENT AWARD COMPETITION** Ballroom C
Presiding: Dave Rosenberger

1:00 **Mixing biorationals to optimize grape powdery mildew control.** K. D. FIEDLER (1) and D. R. Cooley (1) (1) University of Massachusetts, Amherst.

1:15 **Characterization of silicon absorption by *Equisetum arvense.*** C. GRÉGOIRE (1), W. Rémus-borel (1), G. Arsenault-labrecque (1), and R. R. Bélanger (1). (1) Département de phytologie-Centre de recherche en horticulture, Université Laval, Quebec, Qc, G1V 0A6

1:30 **The proteomic analysis of flocculosin production by *Pseudozyma flocculosa*.** W. HAMMAMI, F. Chain, and R. Bélanger. Centre de recherche en horticulture, Université Laval, Québec, QC, Canada G1V 0A6

1:45 **In vitro inoculations with *Phytophthora ramorum*: foliage susceptibility of six eastern Canadian forest species.** A. JINEK (4), M. Simard (4), S. Brière (1), A. Watson (3), R. J. Tweddell (2) and D. Rioux. (1) Canadian Food Inspection Agency, Ottawa, ON, Canada, K2H 8P9, (2) Centre de recherche en horticulture, Université Laval, Québec, QC, Canada, G1V 0A6, (3) Dept. Plant Science, McGill University, Ste-Anne-de-Bellevue, QC, Canada, H9X 3V9, and (4) Natural Resources Canada, Laurentian Forestry Centre, Québec, QC, Canada, G1V 4C7

2:00 **A new tobamovirus isolated from waters draining forest stands in New Zealand.** S. S. MUKHERJEE (2), T. J. Lough (3), D. H. Hopcroft (4), J. W. Zachritz (1), and J. D. Castello (2). (1) Department of Environmental Science, Policy, and Management, University of California, Berkeley, CA, (2) Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY, (3) Genesis Research and Development Corportion, Auckland, New Zealand, (4) Massey University, Palmerston North, New Zealand

2:15 **The effect of rate and spray interval of demethylation inhibitor fungicides on an insensitive population of *Sclerotinia homoeocarpa* on a golf course fairway.** J. T. POPKO, J. Ban, and G. Jung. Department of Plant, Soil and Insect Sciences, University of Massachusetts-Amherst, Amherst, MA 01003

2:30 **Influence of irrigation quantity on anthracnose severity of annual bluegrass putting greens.** J. A. ROBERTS, J. C. Inguagiato B. B. Clarke, and J. A. Murphy. Rutgers University, New Brunswick, NJ, USA

2:45 **New Developments in Epidemiology of *Ailanthus* Wilt.** M. J. SCHALL, D. D. Davis, Pennsylvania State University.

3:00 – 3:30 **BREAK** for refreshments –

3:30 – 4:45 **CONTRIBUTED PAPER SESSION II** – Ballroom C
Presiding: James LaMondia

3:30 **Discovery of a new species of *Fusarium* from *Spartina alterniflora* and the influence of drought on its ability to cause plant mortality.** W. H. ELMER and R. E. Marra The CT Agr. Exp. Sta., New Haven, CT US

3:45 **Species of *Pythium* present in Long Island greenhouses.** G. GIROUX (1), J. Komorowska-jedrys (2), M. Daughtrey (2), and G. Moorman (3). (1) Cornell University, Riverhead, NY 11901 USA, (2) Cornell University, Riverhead, NY 11901, USA, (3) Penn State University, University Part, PA USA

4:00 **Measurement of *Bacillus subtilis* antibiotics in the rhizosphere.** K. KINSELLA (2), C. P. Schulthess (2), G. C. Elliott (2), T. F. Morris (2), and J. D. Stuart (1). (1) Department of Chemistry, University of Connecticut, Storrs CT 06269-3060, (2) Department of Plant Science, University of Connecticut, Storrs CT 06269-4067.

4:15 **Challenges in managing diseases caused by *Rhizoctonia solani* and *Rhizoctonia*-like fungi on vegetables in New York.** M. Ohkura (3), J. W. Ludwig (3), B. K. Gugino (2), and G. S. Abawi (3). (2) Dept. of Plant Pathology, The Penn. State University, University Park, PA 16802, (3) dept. of Plant Pathology, Cornell University, Geneva, NY 14456

4:30 **Resistance to blue mold in Connecticut shade tobacco.** J. A. LaMONDIA, The Connecticut Agricultural Experiment Station Valley Laboratory, Windsor, CT 06095.

5:00 **BUSINESS MEETING NED-APS –** Ballroom D
Presiding: Dan Cooley, President

5:30 **NED-APS COMMITTEE CHAIRS** (If needed) - Jamestown

5:30 **GRADUATE STUDENT AWARD COMMITTEE –** Narragansett

6:30 **SOCIAL –** Rose Island Foyer

7:00 **BANQUET AND AWARDS – ROSE ISLAND**

FRIDAY, OCTOBER 10, 2008

8:30 – 2:00 **Workshop – Diagnosis, Visual Assessment and Management of Plant-Parasitic Nematodes of Vegetables and Small Fruit in the Northeast - Vanderbilt**
Facilitators:
Dr. George Abawi, *Cornell, Geneva*
Dr. Beth Gugino, *PSU*
Dr. Jim LaMondia, *CAES*
Dr. Deb Neher, *UVM*

Funding for the nematode workshop is being provided through a grant (ENE07-102) from the Northeast Sustainable Agriculture Research and Education (NESARE) Professional Development Program.

9:00 – 1:00 **Seminar - Turfgrass Diseases in the Northeast –** Ballroom CD
Presiding: Wade Elmer

9:00 Introduction, Dr. Nathaniel Mitkowski, *URI*
9:05 New and Emerging Turfgrass Diseases, Dr. John Kaminski, *UCONN*
9:30 Anthracnose, Dr. Jim Murphy, *Rutgers*
10:00 Dollar Spot Resistance, Dr. Geunhwa Jung, *UMASS*
10:30 Take-All Patch, Dr. Katerina Jordan, *Guelph*
11:00 Break
11:15 Nematode Control Products, Dr. Rob Wick, *UMASS*
11:45 Cool Season Root Pythium, Dr. Nathaniel Mitkowski, *URI*
12:15 Organic Golf Course Management, Jeff Carlson *CGCS, Vineyard GC*
12:45-1:00pm Questions

8:30 – 10:00 **CONTRIBUTED PAPER SESSION III -** Ballroom B
Presiding: Norm LaLancette

8:30 **Transformation of Apple for Disease Resistance: Evolving Strategies.** H. ALDWINCKLE, Cornell University

8:45 **Efficient generation of RNAi mutants of apple using multi-vector transformation.** E. BOREJSZA-WYSOCKA, Cornell University

9:00 **Development of an eco-label program in support of IPM for apples in the Northeast.** D. R. COOLEY (1), A. Tuttle (1), W. H. Reissig (3), A. Agnello (3), J. Carroll (4), M. Rozyne (5), and T. Green (2). (1) Dept. of Plant, Soil & Insect Sci., University of Massachusetts, Amherst MA 01003, (2) IPM Inst. of North Amer., Madison, WI 53705, (3) NYS Agric. Expt. Sta., Cornell University, Geneva, NY 14456, (4) NYS IPM Prog., Cornell University, Geneva, NY 14456, (5) Red Tomato, Inc., Canton, MA 02021

9:15 **Using phosphite fungicides to control sooty blotch and flyspeck on apples.** D. A. ROSENBERGER, F. W. Meyer, and A. L. Rugh. Cornell University's Hudson Valley Lab, Highland, NY 12528

9:30 **Inhibition of Monilinia fructicola sporulation on peach blossom blight cankers by Qol fungicides.** N. LALANCETTE (1), K. Mcfarland (2), and A. Burnett (1). (1) Rutgers University, Agricultural Research and Extension Center, Bridgeton, NJ and (2) Rutgers University, Agricultural Research and Extension Center, Bridgeton, NJ

9:45 **Oil sprays control Fabraea leaf spot on pears.** D. A. ROSENBERGER, Cornell University

10:00 – 10:30 **BREAK** for refreshments

PROGRAM ABSTRACTS

Transformation of Apple for Disease Resistance: Evolving Strategies. H. ALDWINCKLE, Cornell University

Apple is highly heterozygous and self-incompatible, has a long generation time and a large plant form. Therefore, development of disease-resistant cultivars with competitive quality by conventional breeding is excessively long-term and costly. rDNA technology was recognized as an attractive alternative approach. For resistance to the two most important diseases of apple in humid climates, fire blight (caused by the endobacterium *Erwinia amylovora*, Ea) and apple scab (caused by the ascomycete *Venturia inaequalis*, Vi), rDNA strategies initially used heterologous genes with direct effects on the pathogens, lytic proteins vs. Ea, and chitinases vs. Vi. Ea-resistant lines with normal quality were obtained with each type of gene. Transgenes from Ea (hrpN, and dspF) and phages (lysozyme, epolymerase) also effectively increased resistance to Ea. However apples with genes from other organisms were judged to be less acceptable to consumers than apples with added or silenced *Malus* genes. An additional copy of the apple transcription facilitator gene, MpNPR1, significantly increased Ea resistance in susceptible apple cultivars, and also moderately increased resistance to Vi and cedar apple rust. Silencing of the DIPM pathogen-protein receptor genes, and of the HrpN-interacting protein (HIPM), resulted in increased Ea resistance in some apple lines. The cloned R genes, Vfa1 and Vfa2, from the wild *Malus floribunda* have increased Vi resistance when transferred into susceptible apple cultivars. The preferred strategy now is to alter expression of native apple genes, using plant promoters, without using antibiotic or herbicide resistance selectable marker genes, in order to facilitate approval by regulatory agencies, and acceptance by consumers and apple growers.

Prospects for precision agriculture to manage aerially dispersed pathogens in a patchy landscape. D. E. Aylor and F. J. FERRANDINO, The Connecticut Agricultural Experiment Station

Precision application of disease control measures for an aerially dispersed pathogen depends on the spatial scale and temporal dynamics of pathogen spread and host development. These dynamics can be expressed in terms of basic biological and physical properties, viz., latent period, infectious period, basic infection rate, dispersal distance and survival time scales, host phenology, and the level of acceptable risk. A mean waiting time for new infections to appear on discrete patches of host plants a certain distance from a focus of disease is defined in terms of these basic parameters. We illustrate how this waiting time can be used to help establish guidelines for minimizing application of fungicides, while maintaining acceptable yield. We examine the following questions: 1) Once disease or the pathogen is detected locally, can a safety zone around a focus be protected without spraying the whole field? 2) When can small fields separated by a given distance be treated as separate management units? 3) For hosts distributed on the regional or landscape scale, can we define waiting times that allow us to forgo or delay control measures in a neighboring region?

What have we learned from studying Grapevine fanleaf virus from its hypothesized origin? N. S. BASHIR. Plant Protection Department, The University of Tabriz, 29 Bahman Blvd., Tabriz 51664 IRAN

Grapevine fanleaf virus (GFLV), the causal agent of grapevine degeneration, is one of the most important diseases of grapevine. GFLV is a *Nepovirus* belonging to the family *Comoviridae*. Its particles are isometric and its genome is composed of two +ssRNAs each coding for a polyprotein. Because it is hypothesized that GFLV has originated in Iran we attempted to examine this hypothesis by molecular characterization of the virus isolates from this country. Accordingly, total RNA extractions from leaves of diseased vines from vineyards in northwest Iran were subjected to RT-PCR assay with primers which were designed according to sequences of GFLV-F13 and -NW. As a result, segments of the virus RNA2 corresponding to the movement and coat proteins were amplified. Cloning and sequencing of the PCR product isolates facilitated designing new primers according to genotypes of local isolates. Subsequently, many GFLV isolates were detected and segments of their genomes were sequenced. Phylogenetic analysis based on the sequence data showed that the local isolates were distinct from previously reported strains and supported the hypothesis.

Efficient generation of RNAi mutants of apple using multi-vector transformation.

E. BOREJSZA-WYSOCKA, Cornell University

Apple RNAi mutants for determination of function of candidate genes in resistance of apple to *Erwinia amylovora* (fire blight) were produced using an efficient transformation system. M.26 apple was transformed with a mixture of five RNAi EST-silencing vectors in each transformation experiment to allow selection of up to five types of mutants from a single experiment. RNAi-silencing constructs were created using ESTs associated with response to *E. amylovora* which were identified by bioinformatics analysis. These constructs were transferred to *Agrobacterium tumefaciens* strain EHA 105pCH32. The five silencing constructs were mixed, and the mixture used to transform leaf-slice explants. Regenerants were selected on M.26 regeneration medium with 100 mg/L kanamycin and screened by PCR using universal primers for the presence of a silencing construct. In almost all lines PCR showed only single genes had been inserted. Because amplicons from some transgenics co migrated, to better determine the identity of the ESTs contained in the silencing-insertion, the PCR fragments were cut with 4-cutter restriction enzymes. Thus far ESTs from genes in six functional categories, general metabolism (1), photosynthesis (2), nucleic acid metabolism (1), protein metabolism (3), signaling (1), and defense/stress(4), have been subjected to this protocol. To assay their resistance phenotype, young plantlets were inoculated with *E. amylovora*, and bacterial populations and reaction symptoms determined. This project is supported by a National Research Initiative Competitive Grant 2005-35300-15462 from the USDA Cooperative State Research, Education, and Extension Service.

Development of an eco-label program in support of IPM for apples in the Northeast.

D. R. COOLEY (1), A. Tuttle (1), W. H. Reissig (3), A. Agnello (3), J. Carroll (4), M. Rozyne (5), and T. Green (2). (1) Dept. of Plant, Soil & Insect Sci., University of Massachusetts, Amherst MA, (2) IPM Inst. of North Amer., Madison, WI, (3) NYS Agric. Expt. Sta., Cornell University, Geneva, NY, (4) NYS IPM Prog., Cornell University, Geneva, NY, (5) Red Tomato, Inc., Canton, MA

Since 2005, the University of Massachusetts, Cornell University, Red Tomato (a nonprofit produce marketing corporation) and the IPM Institute of North America have been developing a protocol for producing and marketing “Eco Apples”, an eco-label for apples in the Northeast. The goal has been to create a market niche for apples grown using a well-defined integrated pest management program that will result in premium prices and access to high quality markets;

in return for using relatively more expensive and less toxic management methods, growers should receive higher returns. There has been a significant increase in both participating growers and sales, starting with six growers and approximately $130,000 in sales in 2004 and increasing to 13 growers and approximately $1,470,000 in sales in 2007. In the Eco Apple protocol, pesticides are classified into three categories: green, use with justification; yellow, use when green materials are not available or effective; and red, do not use, based on potential toxicity. To date, disease and other pest control in Eco Apple orchards was generally as effective as that in orchards using standard production methods. Fungicides are the most commonly used type of pesticide in Eco Apple orchards, and of these, almost all (96%) are classified "yellow", primarily captan and ethylenebis(dithiocarbamates).

Discovery of a new species of *Fusarium* from *Spartina alterniflora* and the influence of drought on its ability to cause plant mortality. W. H. ELMER and R. E. Marra
The Connecticut Agricultural Experiment Station, New Haven, CT

The rapid loss of the salt marsh plant, *Spartina alterniflora* (SA), has been termed Sudden Vegetation Dieback (SVD). SVD has occurred along the Atlantic and Gulf Coasts since 1999. Isolations from SA from SVD sites along the Atlantic Coast yielded over 200 isolates of *Fusarium* spp. Eighty-eight percent fell into two morphospecies (MS1 & MS2) that could not be readily identified. Inoculation into stems of healthy SA plants showed that isolates from MS 1 were virulent whereas isolates from MS2 were slightly virulent to avirulent. Growth rates on PDA also distinguished the two MS. Partial DNA sequences from the TEF1-alpha, β-tubulin, and calmodulin genes revealed that the MS1 isolates were distinct, closely related, and clustered in the trichothecene-producing clade of the *Fusarium* section *Sporotrichiella*. Isolates in MS2 had more variation and belonged to the *F. incarnatum-equiseti* species complex. When isolates of MS1 were mixed into soil, planted with seedlings of SA, and subjected to drought, normal watering, or flooded conditions, the presence of drought and *Fusarium* resulted in more plant mortality than drought without *Fusarium* ($P = 0.02$). Compared to controls, *Fusarium* infection of SA in normal or flooded conditions reduced plant weights, and increased root disease, but did not cause mortality. Increasing salinity did not increase disease. These findings suggest that drought and this undescribed *Fusarium* species could cause significant mortality of SA.

Virginia creeper as a reservoir for inoculum of grape powdery mildew. F. J. FERRANDINO, The Connecticut Agricultural Experiment Station, CT

Virginia creeper (*Parthenocissus quinquefolia*) is a native perennial woody vine which can grow up to 60 feet in length. Since the plant needs some sunlight, it usually grows along the edge of a woodlot either as a ground cover or climbing into trees along the edge of the forest. This is exactly the ecological niche occupied by wild grape vines and these two plants often grow side by side. Vineyards in the northeastern United States are most often flanked by wooded areas, so that the ubiquitous virginia creeper is often in close proximity to commercial vineyards. This plant is in the grape (*Vitaceae*) family and is susceptible to grape powdery mildew (*Erisyphe necator* syn. *Uncinula necator*). Sampling of virginia creeper adjacent to infected vineyards have indicated high levels of disease incidence (25% - 50 %) by mid-summer (July) which produce cleistothecia prolifically until frost. For this reason, the removal of this vine around vineyards may lower the springtime flush of primary inoculum of this damaging disease.

Mixing biorationals to optimize grape powdery mildew control. K. D. FIEDLER and D. R.

Cooley, University of Massachusetts, Amherst.

The objective of the study was to investigate the potential of mixing biorational compounds in order to obtain greater control of powdery mildew (*Unicinula necator*) on 'Riesling' vines. The research combines a topical and a systemic acquired resistance (SAR) inducing fungicide to investigate whether greater control of powdery mildew can be obtained than with either material used separately. Monopotassium phosphate and potassium bicarbonate were applied individually, as well as in combination, then given 24 hours to stimulate resistance mechanisms, or 'prime' the plants. These treatments were compared with the conventional fungicide combination of boscalid and pyraclostrobin. On days 1, 3, 5, and 7 the percent of conidial germination and percent conidia killed were evaluated, as well as lignin and callose formation as indicators of the SAR response. Potassium bicarbonate induced unexpectedly strong SAR responses, generating the highest amount of lignin and callose formation, and also displayed above average topical fungicide properties with statistically no difference compared to the commercial control. Monopotassium phosphate did little to prevent powdery mildew infection, allowing the highest conidial germination and leading to no significant formation of lignin or callose in the tissue. The combination of the two compounds caused unexpected conidial germination, higher than the other treatments on the last day, but also encouraged a strong SAR response. Though potassium bicarbonate controlled infection to the same degree as the commercial standard, the combination of biorationals performed significantly worse than the standard and would not be recommended for field use.

Species of *Pythium* present in Long Island greenhouses. G. GIROUX (1), J. Komorowska-jedrys (2), M. Daughtrey (2), and G. Moorman (3). (1) Cornell University, Riverhead, NY, (2) Cornell University, Riverhead, NY, (3) Penn State University, University Park, PA

Long Island flower crop greenhouses were sampled for *Pythium*> spp. repeatedly from spring 2007 to spring 2008. Samples (5 ml) of container mix from pots and debris from floor surfaces were collected and placed in plastic bags; floor areas with no debris were wiped with wet filter paper. Filter paper was plated on PARP-CMA, a medium selective for *Pythium* spp., for 24 h at 26 C. Samples of debris and mix were baited by adding 50 ml of tap water and two 1-cm long strips of peeled potato to bags containing 5 compiled samples. Potato pieces were rinsed after 24 h and placed on PARP-CMA; single hyphae from resulting colonies were transferred to CMA. Isolates were identified based on morphology on ryegrass in water and ITS-DNA sequence analysis. *P. irregulare* was found in container mix from healthy plants and on floors. The cryptic species *P. cryptoirregulare* was found in all greenhouses sampled and often was insensitive to 100 ppm of mefenoxam. Other species detected were *P. aphanidermatum*, *P. orthogonon*, *P. rostratum*, *P. rostratifingens*, *P. segnitium*, and *P. ultimum*.

Characterization of silicon absorption by *Equisetum arvense.* C. GRÉGOIRE, W. Rémus-borel, G. Arsenault-labrecque, and R. R. Bélanger. Département de phytologie-Centre de recherche en horticulture, Université Laval, Quebec, Qc, G1V 0A6

Silicon (Si) is the second most abundant element in the Earth's crust and soil, and is accumulated by plants in similar amounts to several macronutrients, yet its role in plant development remains obscure. In general, it is reported for its beneficial effects against biotic and abiotic stresses, such as fungal diseases, mineral toxicities or excess salinity. Plants vary greatly in their ability to absorb Si, ranging from 0.1 to 10% in top dry weight. However, absorption of Si in non-enriched soil is seldom sufficient to optimally protect plants from

diseases. In this report, our objectives were to characterize the mechanisms of Si absorption in horsetail (*Equisetum arvense*) in an effort to transfer the acquired information to agricultural plants and thus optimize the prophylactic role of Si. Horsetail was selected because it is known to accumulate a very high concentration of Si and it has no known diseases or insect pests. Si absorption in horsetail was studied in plants grown in pots supplied with a solution of 1.7 mM silicate potassium. Si deposition in aerial parts was dosed using Inductively Coupled Plasma (ICP) and X-rays. Si deposition was characterized by a specific pattern of dense accumulation in silicaphile cells. Horsetail plants were also grown in hydroponic solution with or without added Si. Plants without added Si showed necrosis of aerial parts and ultimately died, confirming the essentiality of this element for horsetail. These results will shed light on the differential affinity of plants for Si, and should thus help optimize the use of this element in agriculture.

The proteomic analysis of flocculosin production by *Pseudozyma flocculosa*. W. HAMMAMI, F. Chain, and R. Bélanger. Centre de recherche en horticulture, Université Laval, Québec, QC, Canada G1V 0A6

The fungus *Pseudozyma flocculosa* is known for its biocontrol activity against many powdery mildew species. This activity is conferred, at least in part, by the release of an antifungal glycolipid, flocculosin. While the factors and conditions that affect production of flocculosin have been studied, the molecular basis of the synthesis and production of flocculosin is not well understood. In this work, we conducted a proteomic analysis of flocculosin production by *P. flocculosa* by comparing the proteome map of P. flocculosa grown under conditions conducive or repressive for flocculosin synthesis. In total, more than 830 proteins were revealed. Spots of interest were excised from polyacrylamide gels after 2-D electrophoresis for peptide fingerprint analysis by serial mass spectrometry (LC-MS/MS). An LC-MS/MS ion search was performed using the Mascot search engine and a database containing all available nucleotide sequences order to find protein homologues. We identified several activities with increasing expression level in the inductive medium, which correlated to the carbon and fatty acid metabolism such as the thiamine biosynthesis protein, the transaldolase and the electron transfer flavoprotein.

Applications of gibberellic acid for control of *Botrytis* and other bunch rots in wine grapes. B. E. HED (2), and J. W. Travis (1). (1) Pennsylvania State University, Biglerville, PA (2) Pennsylvania State University, North East, PA

Gibberellic acid was applied to *Vitis* interspecific hybrid 'Vignoles' and *Vitis vinifera* 'Chardonnay' at 5, 10, and 25 parts per million, either two weeks pre bloom or at full bloom. Applications were aimed at reducing cluster compactness, a precondition for the development of *Botrytis* (*cinerea*) and other bunch rots (*Rhizopus* spp, *Penicillium* spp, *Aspergillus* spp), either by increasing cluster length (pre bloom application) or reducing fruit set (bloom application). On Chardonnay, *Botrytis* was responsible for nearly all harvest rot, and was significantly reduced in 2006 by bloom applications at 5 and 25 parts per million. In 2007, a pre bloom application at 25 parts per million and all bloom applications, significantly reduced *Botrytis* on Chardonnay. On Vignoles, other bunch rot organisms accounted for 8 to 58 % of the total rot, being lowest in treatments receiving bloom applications of gibberellic acid and highest in treatments relying solely on fungicides. This is significant because these organisms are not generally controlled by grape fungicides and their presence in fruit can have devastating effects on juice and wine quality. On Vignoles, total rot was significantly reduced in 2006 by pre bloom applications at 5 and 25 parts per million and by all bloom applications. In 2007, total rot was significantly

reduced on Vignoles by pre bloom or bloom applications at 25 parts per million. There were no negative 'year after' effects of gibberellic acid on return clusters per shoot in Chardonnay or Vignoles.

In vitro inoculations with *Phytophthora ramorum*: foliage susceptibility of six eastern Canadian forest species. A. JINEK (4), M. Simard (4), S. Brière (1), A. Watson (3), R. J. Tweddell (2) and D. Rioux. (1) Canadian Food Inspection Agency, Ottawa, ON, Canada, K2H 8P9, (2) Centre de recherche en horticulture, Université Laval, Québec, QC, Canada, G1V 0A6, (3) Dept. Plant Science, McGill University, Ste-Anne-de-Bellevue, QC, Canada, H9X 3V9, and (4) Natural Resources Canada, Laurentian Forestry Centre, Québec, QC, Canada, G1V 4C7

In North America and Europe, *Phytophthora ramorum* (Pr) causes a complex disease named sudden oak death, ramorum leaf blight or ramorum shoot dieback. The pathogen infects more than 120 hosts, several of which are present in Canadian forested and urban areas. Although Pr is absent in the wild in eastern North America, there is concern regarding its possible introduction and spread into this area. In order to assess this risk, detached leaves/needles of six eastern Canadian forest species were inoculated with Pr and the amount of necrosis and sporulation was evaluated. Inoculation was also performed by plant dipping. *Abies balsamea (Ab), Acer saccharum (As), Betula alleghaniensis (Ba), Fraxinus americana (Fa), Larix laricina (Ll),* and *Quercus rubra* (Qr) were the species tested whereas *Rhododendron* 'Nova Zembla' (Rh) served as a positive control. On detached leaves, the amount of necrosis on Ba and Fa was higher compared with that on As and Qr, whereas preliminary results of the plant dip experiment showed that Fa was the most susceptible. On detached leaves, reisolation assays and real-time PCR analyses revealed that there were no differences between Ba, Fa and Rh as well as between As and Qr. For the coniferous species, the necrosis on needles of Ab was higher than that on Ll but the real-time PCR analyses were very similar for both species. While sporulation was negligible on detached leaves/needles, it was noticeable for the plant dip assays. Preliminary results revealed that sporulation was much higher on leaves of Ba, Fa and Rh than on those of As and Qr, while for the conifers it was higher on needles of Ab than on those of Ll. Overall, among the susceptible species, Fa appears to be particularly susceptible to Pr and it could also serve as a source of inoculum.

Measurement of *Bacillus subtilis* antibiotics in the rhizosphere. K. KINSELLA (2), C. P. Schulthess (2), G. C. Elliott (2), T. F. Morris (2), and J. D. Stuart (1). (1) Department of Chemistry, University of Connecticut, Storrs CT, (2) Department of Plant Science, University of Connecticut, Storrs CT

Biological control agents like *Bacillus subtilis* offer an alternative and supplement to synthetic pesticides. Unfortunately, this alternative is not consistently effective, as biocontrol agents vary greatly in pathogen suppressiveness. Antibiotic production by biocontrol strains of *Bacillus subtilis* can play a major role in plant disease suppression. Our current understanding of *Bacillus subtilis* antibiosis comes from culture media measurements of antibiotic production and in vitro suppression of pathogens. An analytical method based on high-performance liquid chromatography (HPLC) and mass spectroscopy (MS) has been developed to quantify antibiotics produced by *Bacillus subtilis* growing on plant roots. Cucumber (*Cucumis sativus*) was grown in composted soil and potting media inoculated with *Bacillus subtilis* strain QST 713 (AgraQuest, USA). Two important *Bacillus* antibiotics, surfactin and iturin A, were extracted from root and rhizosphere soil using acidified organic solvents followed by cleaning and concentration using solid-phase extraction (SPE). HPLC and HPLC-MS were used to measure

surfactin and iturin A. Rhizosphere concentrations of both antibiotics increased with plant age. For plants grown in peat-based potting media, surfactin concentrations increased from 9 µg g^{-1} fresh root (FR) at 15 days to 30 µg g^{-1} FR at 43 days. Iturin concentrations were 7 µg g^{-1} FR at 15 days and 180 µg g^{-1} FR at 43 days. In an initial field trial in a composted fine sandy loam, we have demonstrated rhizosphere production of surfactin and iturin under competition and predation by the myriad macro- and microfauna existing in a fertile organic soil, with mature *Bacillus subtilis*-inoculated cucumber roots yielding 33 µg g^{-1} FR surfactin and 630 µg g^{-1} FR iturin at 78 days. Quantifying the antibiotic metabolite chemistry of *Bacillus subtilis* biofilms growing on root surfaces will ultimately lead to more consistent efficacy of this versatile biocontrol agent.

Inhibition of *Monilinia fructicola* sporulation on peach blossom blight cankers by QoI fungicides. N. LALANCETTE (1), K. Mcfarland (2), and A. Burnett (1). (1) Rutgers University, Agricultural Research and Extension Center, Bridgeton, NJ and (2) Rutgers University, Agricultural Research and Extension Center, Bridgeton, NJ

The QoI fungicides azoxystrobin (Abound), trifloxystrobin (Flint), and pyraclostrobin + boscalid (Pristine) were examined for their anti-sporulant activity on established peach blossom blight cankers. During summer 2008, shoots having one or more cankers were selected and tagged on trees in an experimental 'Autumnglo' peach orchard. Cankers were then washed with water using a pressurized hand sprayer to remove any conidia already formed. Immediately after drying, azoxystrobin at 0.150 g/L, trifloxystrobin at 0.074 g/L, and pyraclostrobin + boscalid at 0.069 g/L + 0.136 g/L were applied until run-off to the shoots using hand atomizers; control shoots received no treatment. After 7-days of field exposure, tagged cankers were cut from the trees and incubated at 22C and RH >95% in cover trays. After 24 h, tray covers were removed and incubation continued for another 24 h at 22C and ambient RH (67-95%). The incidence of canker sporulation was assessed via stereoscopic examination; conidia production was assessed by using a hemacytometer to count spores harvested from the twigs with an atomizer. The experiment was repeated once. Analysis of incidence data revealed that Flint and Pristine significantly reduced the percentage of sporulating cankers from 54.5% (control) to 37.6% and 41.2%, respectively. Furthermore, all three fungicides significantly inhibited conidia formation. Flint, Abound, and Pristine reduced the number of spores/canker by 73.3%, 60.7%, and 54.7%, respectively. These results demonstrated that application of QoI fungicides to established blossom blight cankers can help reduce the availability of inoculum for subsequent brown rot epidemics on ripening fruit.

Resistance to blue mold in Connecticut shade tobacco. J. A. LaMONDIA, The Connecticut Agricultural Experiment Station Valley Laboratory, Windsor, CT

A pedigree breeding program for resistance to blue mold, caused by *Peronospora tabacina*, was established for shade-grown wrapper tobacco in Windsor, CT. Sources of resistance were two non-adapted breeding lines with high (#292-343) and moderate (#509) levels of resistance to the disease. Crosses were made between the two resistant lines and two commercially grown Connecticut shade lines (8212 and male-sterile #37). Selection for blue mold resistance was made in the F2 and a cross between the two selections was used to create a male sterile resistant line. Recurrent selection in the greenhouse and field was used to select for resistance to blue mold, tobacco cyst nematode and *Tobacco mosaic virus*. Resistant lines were evaluated in 2006 and 2007 for blue mold development under field conditions and compared to a standard susceptible line (8212) that were either sprayed with a best management practices

blue mold fungicide program or not sprayed. Resistant lines had greater numbers of healthy leaves harvested after the appearance of blue mold than 8212 with fungicide (nearly 2 ×) or without fungicide (nearly 200 ×). Blue mold lesion area on resistant leaves averaged 45% of susceptible 8212 and the number of sporangia per cm^3 of leaf was less than 10% of unsprayed 8212. Resistance to blue mold in adapted lines can increase marketable yields under field conditions and impact the rate of epidemic development.

Evidence of reduced suppression of powdery mildew (*Podosphaera xanthii*) provided by resistant squash (*Cucurbita pepo*) cultivars in NY. M. T. MCGRATH, Cornell University

Squash cultivars were evaluated in replicated experiments conducted under field conditions in 2006 to 2008. The main goal was to obtain information for growers on disease suppression and yield of powdery mildew resistant (PMR) cultivars, especially new ones, relative to standard cultivars lacking resistance. Fungicides were not applied for powdery mildew. Average suppression on both leaf surfaces for the cultivars tested in 2006 and 2007 based on severity on 9 Aug in both years was 88% (67% to 100%) in 2006 and 62% (47% to 91%) in 2007 for yellow squash cultivars while it was 86% (68% to 100%) in 2006 and 35% (0% to 95%) in 2007 for green zucchini cultivars. For acorn squash cultivars tested both years control was 57% to 92% in 2006 and 11% to 72% in 2007. There is one common major PMR gene in commercial cultivars of squash (*Cucurbita pepo*). Most cultivars are heterozygous. The zucchini, acorn, and yellow squash cultivars tested with resistance from both parents exhibited excellent suppression in both years. Based on preliminary results from 2008, PMR cultivars are continuing to suppress powdery mildew on leaf blades as well as on petioles and stems, although not at the high level observed in 2006. Butternut squash also was tested in 2008. There is concern *Podosphaera xanthii* could evolve to overcome the major PMR gene; therefore, chemical and genetic control should be used together for managing powdery mildew.

Sensitivity to fungicides of the cucurbit powdery mildew fungus in NY and PA in 2007 and 2008. M.T. MCGRATH, Cornell University

A seedling fungicide sensitivity bioassay was used to assess fungicide sensitivity of *Podosphaera xanthii* in commercial plantings of squash and pumpkin (*Cucurbita pepo*). Seedlings were sprayed with various fungicides and concentrations, placed for at least 4 hours in fields where powdery mildew was developing, then kept in a greenhouse until symptoms developed. Severity on treated seedlings was compared to non-treated ones to estimate frequency of the pathogen population able to tolerate each fungicide concentration tested. In spring squash assayed early in disease development during July 2007, pathogen strains resistant to QoI fungicides (FRAC Group 11) were detected in 4 of 5 NY fields (estimated frequency 1% to 100%) and both fields in eastern PA (16% to 30%), strains tolerating 120 ppm myclobutanil (Group 3) were found in 3 NY fields (2% to 91%) and the PA fields (7% to 32%), strains tolerating 175 ppm boscalid (Group 7) were in all fields (1% to 22% and 1% to 2%, respectively), and strains tolerating 5 ppm of quinoxyfen (Group 13) were at a very low level (0% to 2%). Strains tolerating these concentrations were detected in bioassays done in NY pumpkin fields during Aug to Oct. There appeared to be an increase in sensitivity to Group 3 fungicides. Strains tolerating the same fungicide concentrations were found in 2008. Resistance to thiophanate-methyl (Group 1) also was checked and found.

A new tobamovirus isolated from waters draining forest stands in New Zealand.

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Asymptomatic and endophytic plant viruses have been previously proposed as ideal gene vector candidates for genetic improvement of forest trees. Water samples were collected from Pohangina River near Palmerston North, New Zealand to assay for infectious plant viruses that may be systemic, but asymptomatic in eucalyptus and radiata pine predominant in adjoining forest stands. Twenty liter water samples were prefiltered and virions adsorbed to electropositive Zeta Plus 50S membranes. The eluates were examined for virions by transmission electron microscopy. Rod shaped particles with a modal length of 300nm and width of 18nm with characteristic axial canal were observed. Three distinct viruses were isolated based on local lesions in *Chenopodium quinoa* and *Phaseolus vulgaris*. An $A_{260/280}$ ratio of 1.33 and a buoyant density of 1.32 in CsCl supported the conclusion that all three isolates were tobamoviruses. Maximum Parsimony trees generated from a partial replicase, and complete capsid protein gene sequence showed maximum similarity of the Pohangina River Virus (PRV) with TMV variant 1 (V01408), and TMV crucifer isolate (Z29370) respectively. On the basis of a less than 90% sequence similarity established as the species demarcation criterion by ICTV, PRV was determined to be a new species of the tobamovirus genus. The remaining two isolates were determined to be new strains of TMV and ToMV respectively on the basis of phylogenetic reconstruction based on nucleotide sequences obtained from RT-PCR amplification of the replicase, movement protein and capsid protein regions. The isolates were designated TMV-NZ and ToMV-NZ respectively. Distinctive host range and symptomatology, especially in hosts in the family Fabaceae, Solanaceae, Chenopodiaceae, Cruciferae, and Cucurbitaceae, combined with sequence differences with well-described tobamoviruses, and serological differentiation based on Ouchterlony tests, suggests that one new tobamvirus species and two new isolates of TMV and ToMV are present in water sampled from the Pohangina River. The presence of these infectious tobamoviruses in waters draining forest stands in New Zealand creates a possibility of employing them as gene vectors in future tree improvement programs, as well as in studies involving host gene and protein expression, induction of pathogen resistance, novel protein production and gene silencing.

Challenges in managing diseases caused by *Rhizoctonia solani* and *Rhizoctonia*-like fungi on vegetables in New York. M. Ohkura (3), J. W. Ludwig (3), B. K. Gugino (2), and G. S. Abawi (3). (2) Dept. of Plant Pathology, The Penn. State University, University Park, PA, (3) Dept. of Plant Pathology, Cornell University, Geneva, NY

Root and foliar diseases caused by *Rhizoctonia solani* (telemorph: *Thanatephorus cucumeris*) and *Rhizoctonia*-like fungi on vegetables including table beets, carrots, beans and cabbage have become more prevalent and damaging. Difficulty in managing these fungi is in part due to their soilborne habitat, wide host range, genetic complexity and the difficulty in the timing and application of effective fungicides. In New York, the inclusion of grain crops like corn in vegetable rotations has been an effective management strategy. However several isolates collected from naturally infected vegetables were recently characterized as being able to infect corn. A greenhouse trial was conducted to further characterize the pathogenicity of three isolates (R39, AG2-2; R43, AG4; and R62, CAG2) with variable virulence on corn on several grain crops (corn, oats, rye, sudangrass, wheat, and buckwheat). After six weeks all isolates caused light to moderately severe symptoms on the rye and sudangrass roots. Additionally,

isolate R39 was able to infect corn, wheat and buckwheat; R43 infected oats and buckwheat and R63 was able to infect wheat. Infectivity of the isolates 30 days after incorporating the grain crops as green manures was bioassayed with snap beans. Isolate R39 caused the most severe symptoms on snap bean roots while isolate R62 was least virulent regardless of the grain crop treatment. The potential role of these grain crops as hosts to these fungi warrants further study.

The effect of rate and spray interval of demethylation inhibitor fungicides on an insensitive population of *Sclerotinia homoeocarpa* on a golf course fairway.
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Dollar spot, caused by *Sclerotinia homoeocarpa*, is the most rampant and economically important turfgrass disease in the North America. The disease is primarily controlled by preventive or curative fungicide applications. Sterol demethylation inhibitor (DMI) fungicides are among the most effective and widely used in the United States. Fungicide resistance to the demethylation inhibitor chemical class has been confirmed in dollar spot and exhibits a gradual population shift towards insensitivity to DMI fungicides. Previous research has yet to pinpoint the duration of DMI field efficacy on insensitive dollar spot populations. This project aims to correlate DMI field efficacy to *in-vitro* fungicide sensitivity values, while examining the effect of fungicide rate and spray interval. Treatments were arranged in a randomized complete block design with three replications on an *Agrostis stoloniferous* and *Poa annua* fairway maintained at 0.50 inch mowing height. Treatments of two DMIs, propiconazole and triticonazole were applied every 14, 21 and 28 days at rates of 1.0/2.0 oz/1000 ft^2 and 0.5/1.0 oz/1000 ft^2, respectively. Chlorothalonil was applied every 14 days at a 5.5 oz/1000 ft^2 rate in order to exemplify acceptable control. 396 samples were taken prior to DMI application this summer and revealed an average of 52.25% $\pm$ 14.29 relative mycelial growth on potato dextrose agar amended with a single discriminatory concentration (0.1 ug a.i./ml) of propiconazole. All DMI treatments showed a reduction in number of dollar spot infection centers 7 days after application, but infection center totals increased 14 days after application. A dose-rate effect was also observed in all DMI treatments, increased active ingredient did show a reduction in dollar spot infection centers for both DMIs. The AUDPC of infection centers over 8 ratings from plots treated with 2.0 oz/1000 ft^2 of propiconazole on 14 and 21 day intervals were statistically similar to plots treated with chlorothalonil.

Influence of irrigation quantity on anthracnose severity of annual bluegrass putting greens. J. A. ROBERTS, J. C. Inguagiato, B. B. Clarke, and J. A. Murphy. Rutgers University, New Brunswick, NJ

Irrigation can influence both vigor and playability of golf course putting greens. Anthracnose (*Colletotrichum cereale* Manns) disease is more severe on stressed turf. The objective of this field trial was to evaluate the effects of irrigation quantity on anthracnose severity of annual bluegrass [*Poa annua* L. f. *reptans* (Hausskn) T. Koyama]. This 3-yr study was initiated in 2006 on a 5-yr old annual bluegrass turf mowed daily at 3.2-mm and used a randomized complete block design with four replications. Irrigation was applied daily to 2.4 by 2.4-m plots at 100, 80, 60 and 40% of reference evapotranspiration (ET_o), based on the Penman-Monteith equation. Individual plots were syringed with no more than 2.5-mm of water when wilt stress was visible. Anthracnose severity was assessed from mid-June through mid-August. Drought stress (40% ET_o) increased anthracnose in all three years; anthracnose was less severe under 60% ET_o irrigation, and irrigating at 80% ET_o reduced severity compared to 60% ET_o. Anthracnose

severity was initially lower under irrigation at 100% ET_o than 40% ET_o; however, 100% ET_o resulted in similar disease severity by the end of 2006 and 2008. While not due to anthracnose, 100% ET_o irrigation also reduced turf quality late in 2007. Thus, deficit irrigation that induced wilt stress intensified anthracnose severity and irrigation at 80% ET_o often resulted in the least disease and best turf quality.

Oil sprays control Fabraea leaf spot on pears. D. A. ROSENBERGER, Cornell University

In southeastern New York and Connecticut, *Fabraea maculate* causes fruit blemishes and premature defoliation of pears. Field trials were conducted to determine if petroleum-based horticultural oils would control Fabraea. In 2007, a highly refined petroleum oil (1% solution) was applied to Bosc pear trees on 22 May, 6, 26 June, and 13 July. Compared to trees sprayed with mancozeb on 1 May, 6, 26 June, the oil-treated trees had more infected leaves on 16 August (34% vs. 16%), similar levels of defoliation in mid-September, but fewer infected fruit (22% vs. 52%). In 2008, trees receiving oil sprays (1% solution) applied seven times between petal fall and 8 August were compared with trees receiving four applications of mancozeb followed by two applications of kresoxim-methyl during that same period. On 22 August, trees treated only with oil had a higher incidence of leaf infection (88% vs. 53%) but similar levels of defoliation (ca. 9%). Leaf disks (4-mm diam.) containing Fabraea lesions were removed from oil-sprayed and from unsprayed leaves on 7 August, 14 days after the preceding oil spray, were suspended in distilled water, and were vortexed for 30 sec to remove mature spores from lesion surfaces. Hemacytometer counts of the resulting spore suspensions showed that spore release from oil-treated leaves was reduced by 94% compared to control leaves. Spore germination as assessed 24 hr after spores were streaked on potato dextrose agar was also 63% lower for spores from oil-treated leaves. This is the first report that oil alone can provide commercial control of Fabraea leaf spot.

Using phosphite fungicides to control sooty blotch and flyspeck on apples. D. A. ROSENBERGER, F. W. Meyer, and A. L. Rugh. Cornell University's Hudson Valley Lab, Highland, NY

Phosphite fungicides were applied to control sooty blotch and flyspeck (SBFS) in four field trials during the 2006-07 growing seasons. In one trial, ProPhyt (54.5% potassium phosphite), LI-700 (a surfactant and acidifier), and Tactic (a synthetic latex and organosilicone sticker, surfactant, and deposition agent) were applied alone, with captan, or in three-way combinations with thiophanate-methyl (TM) plus captan. Treatments were applied to 'Golden Delicious' trees on 1 Sept. using a handgun sprayer. Fruit were evaluated 33 days later and 96% of unsprayed fruit had flyspeck. ProPhyt applied alone suppressed flyspeck by 50% whereas LI-700 and Tactic did not. Fruit sprayed with TM+captan+Tactic had the least flyspeck (14%), but ProPhyt+captan provided statistically equivalent control with 31% of fruit affected. Captan with LI-700 or Tactic was less effective. Thus, ProPhyt activity against SBFS involves more than spray acidification or surfactant activity. In another trial with 'Honeycrisp', 'Royal Court' and 'Cameo' apples, ProPhyt was applied at two rates either alone or in mixtures with captan, TM, or Pristine (pyraclostrobin plus boscalid). In 10 disease-control data sets from this trial, ProPhyt consistently boosted activity of captan but only occasionally improved activity of TM or Pristine. However, ProPhyt+captan had less residual activity than TM and Pristine and was less effective than TM and Pristine for controlling summer fruit rots. Thus, ProPhyt+captan can be used to control SBFS, but other fungicides may be needed to control fruit rots caused by *Botryosphaeria* species.

New Developments in Epidemiology of *Ailanthus* Wilt. M. J. SCHALL, D. D. Davis, Pennsylvania State University

Verticillium albo-atrum and *V. dahliae* have both been identified as causing wilt and mortality of the invasive tree species *Ailanthus altissima*. *Verticillium albo-atrum* is more virulent and aggressive to *A. altissima* than *V. dahliae*, under both greenhouse and field conditions. Overwintering (survival) occurs within infected *A. altissima* trees, on fallen *A. altissima* leaves, and in soil. Overwintering may also occur within striped maple trees. Inoculation likely takes place in the spring at time of leaf emergence. Wounding of *A. altissima* seedling roots increased the rate of symptom development by 4 weeks following inoculation of *V. albo-atrum*, as compared to non-wounded *A. altissima* seedling inoculations. Examination of infected plant tissues by means of histology revealed that phenols were deposited in most outer xylem parenchyma within at the last 1 week following inoculation, indicating that the fungus had began to invade the circumference of seedling initially, and then spread both upward and downward until plant mortality occurred. Extensive fungal colonization was not observed until 4 weeks after inoculation, and the seedling had completely wilted. Dissemination potentially involve wind disseminated leaflets, seeds transmission, or ambrosial beetle transmission. Within 1 year of inoculation *V. albo-atrum* had spread from five initially inoculated trees in two stands of 39 and 95 trees, to 94.9% to 86.3%, respectively, of the *A. altissima* trees within the two stands. Rate of spread is fairly rapid. Between 200 and 2006, the average spread of mortality caused by *V. albo-atrum* downwind is approximately 116.2 m/yr and upwind is 64.6 m/yr.