COOPERATIVE EXTENSION • UNIVERSITY OF CALIFORNIA
SACRAMENTO COUNTY

Tree and Vine Newsletter

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January 2007

2007 SACRAMENTO RIVER DISTRICT PEAR RESEARCH MEETING

Monday, February 5, 2007

Courtland Auditorium, corner of Primasing Ave. (off Hwy 160) and Washington Ave., Courtland
CEUs Approved: 2.0 hours PCA / Private Applicator, 3.0 hours Certified Crop Advisor

Sponsored by:
UC Cooperative Extension, Calif. Pear Advisory Board, and the Pear Pest Management Research Fund

Agenda

8:00 Refreshments
8:25 Welcome and announcements

Plant Pathology

8:30 Evaluation of new bactericides for control of fire blight
Doug Gubler, UC Davis (for Jim Adaskaveg, UC Riverside)
8:50 Detection of resistance in populations of pear scab and fire blight
Doug Gubler, UC Davis

Entomology

9:10 Evaluation of alternative pheromone dispensing technologies
Steve Welter, UC Berkeley
9:30 Monitoring and control of katydids
Lucia Varela, UCCE North Coast
9:50 Monitoring and the use of mass trapping outside the orchard to control consperse stink bug
Rachel Elkins, UCCE Lake/Mendocino counties
10:10 Break
10:30 **Guest Speaker**: Increasing employee productivity and designing a piece rate system during periods of labor shortage
Gregory Billikopf, Area Labor Management Farm Advisor, UCCE Stanislaus county

Horticulture

11:10 Evaluation of alternative varieties for California pear orchards
Rachel Elkins, UCCE Lake/Mendocino counties
11:30 Rest-breaking agents: applications and timing in the dormant period
Kitren Glozer, UC Davis
11:50 Orchard modernization: Platform research and new cost studies
Rachel Elkins, UCCE Lake/Mendocino counties
12:10 Adjourn

Using Fall Orchard Monitoring and Weather Data to Manage Pear Scab

by Jenny Broome

Introduction

Pear scab is caused by the fungus *Venturia pirina*. The pathogen develops in infected leaves on the ground during the winter and produces ascospores the following spring. Spores are mature at bud swell and are discharged when leaves become wet from rain or dew. Ascospores are present for 3 to 4 months and are carried to young, susceptible leaves and fruit by air currents. Plant tissue must remain wet for specific lengths of time at different temperatures for infection to occur. Symptoms appear about 9 days to 3 weeks after infection, depending on weather conditions. A second spore type (conidia) is produced on current-season's infected tissue and also can infect young leaves and fruit. Fully expanded leaves are resistant to infection, but fruit remain susceptible throughout the season. Fruit that become infected a few weeks before harvest show symptoms after 2 to 6 months in storage.

Pear scab control may require 2 to 11 fungicide applications per season. Several fungicides from different chemical classes are available. Protective sprays are initiated at pink bud and applied every 10 to 14 days until ascospores are exhausted in late May to early June. DMI (Procure) and strobilurin (Flint, Sovran) fungicides can be applied up to about 4 days after infection.

In addition to fungicides, several non-chemical methods can be used to lower inoculum in the orchard. These methods include application of dolomite lime to fallen leaves, flail-mowing fallen leaves, and application of urea (42 lbs urea in 100 gallons/acre) to leaves either on the tree post harvest or onto fallen leaves. One organic grower in the Delta incorporates compost just after leaf fall with a very shallow (2 in.) disking which might be enough to increase microbial decomposition of pear leaves and fungal overwintering structures. More experimental approaches include applications of beet pulp or other high nitrogen and carbon agricultural waste products to fallen leaves to increase decomposition, as well as monitoring and encouraging indigenous earthworm activity as they can significantly reduce leaf litter in orchards.

The occurrence of pear scab is closely related to climatic conditions and the application of fungicides can be fine tuned based on detailed knowledge of how weather and local microclimate affects the pathogen disease cycle. In a pear orchard, knowing if appropriate weather conditions are occurring and the presence, or absence of the pathogen's infectious spores, chemical control measures can be timed to be more effective and used only when warranted. In some years and orchards, this can result in savings in the fungicides applied and/or improved disease control.

Researchers in Oregon at OSU Mid-Columbia Agricultural Research and Extension Center (MCAREC) in Hood River have developed a 3-stage pear scab risk forecasting model that has enabled growers to obtain effective, economical control through monitoring pear trees and weather data and using these decision tools. I will outline the approach below and include parts 1 and 2 in this newsletter, and part 3 in our next one. We are hoping to evaluate this approach here in California starting in the fall of 2007.

Model Part I – Delayed first spray

An orchard sampling technique is used in the fall to determine leaf infection levels. Lesions on leaves and petioles begin as round, brownish spots that eventually become velvety in appearance. Spores of the fungus are produced within these lesions. Later in the season, small spots can be observed on the lower surface of the leaves. These are usually the result of late-spring or early summer infections. Leaf infection of pear is not as common as apple scab on apple leaves. For pears in Oregon, the researchers determined that they could count the number of infected leaves on 10 shoots per tree on 10 trees per hectare (2.5 acres) of orchard. If the number of infected leaves is 5 or less, no fungicide spray is necessary at the first infection period the following spring, and the application can be delayed until the second infection period.

Model Part II - Pear scab infection periods

Combinations of temperature and wetness duration necessary for infection of young leaves and fruit have been determined by Spotts and Cervantes (1991). The model predicts leaf infection by conidia of *V. pirina* based on the hours of wetness duration and temperature during those wet hours. This model can be presented in a tabular format (see Table 1)

which lists some key temperatures and wetness duration combinations.

Table 1. Model for estimating pear scab infection periods.

Avg. temp. during leaf wetness (F)	Min. hours of leaf wetness required for infection
44.6	25.1
46.4	21.8
48.2	19.1
50.0	16.8
51.8	14.9
53.6	13.5
55.4	12.4
57.2	11.6
59.0	11.0
60.8	10.6
62.6	10.4
64.4	10.4
66.2	10.4
68.0	10.4
69.8	10.4
71.6	10.3
73.4	10.1
75.2	9.7

This model is similar to the Mills and La Plante model originally developed for apple scab but the hours of wetness required for infection during specific temperatures is slightly more than the apple scab "low" risk category, and slightly less than the "medium" risk from the Mills Tables (Mills and La Plante, 1944), and it was developed specifically for pear scab in Oregon.

Currently in Oregon this model is operated as a degree hour model. This means that during periods of leaf wetness, temperatures above 32°F contribute to the accumulation of degree-hours. Temperatures above 66° are kept at 66° because studies indicate the development rate of pear scab ascospores does not increase above this temperature. Scab infection is predicted to occur when **320 degree hours** have accumulated. This number of degree hours can be achieved when any of the combinations of wetness hours and average temperatures during those hours occurs and this predicts an infection period (see Table 1).

In California, many pear growers may have access to this part of the model through on-site or regional weather stations and the use of either the Mills tables or the Spotts & Cervantes model in computer software. However, linking this model with the first and third stages could greatly improve scab control and potentially reduce the use of fungicides that are no longer needed if the pathogen is not present in the orchards based on additional orchard and weather monitoring in the other two stages of the model.

Model Part III - End of ascospore season

Maturity of ascospores of *V. pirina* is closely related to temperature and in particular accumulated degree-days calculated using the single sine method with a base temperature of 32° F and starting with a biofix of when bud scales separate (stage 1, delayed dormant). The Oregon researchers have determined that the primary spore season ends when 1620 degree days have accumulated, followed by at least 0.01 inch of rain or dew for spore discharge. If the orchard is free of scab up to this date, no additional fungicide applications are necessary for the season, regardless of subsequent infection periods.

Spotts and Cervantes 1994 linear regression model predicts maturation of ascospores of *V. pirina* based on accumulated degree-days over a 0°C (32°F) threshold. Originally degree day accumulation began when the first mature ascospore was observed. Model parameters are:

$$ln(1/1-Y)=-0.00797 + 0.00415X$$

Where:

Y = proportion of mature asci

X = accumulated degree-days, base 0°C

Previously UC Davis plant pathologist Doug Gubler and UCCE cooperators Rachel Elkins and Chuck Ingels tested this original pear scab ascospore maturity model developed by Spotts (part 3 in this 3 part model) here in California (Gubler et al. Pear Pest Management Research Fund, 1999). At that time they found that it did predict the date of complete maturation to a useful accuracy, however it was not as successful at accurately predicting early stages of maturation for California conditions. The date the model predicted for complete maturation of ascospores was 1-2 weeks later than what they found to be true with ascospores collected from infected leaf samples, and therefore the use of this model can be considered a conservative approach as it predicts complete maturity to be slightly later than what was seen here in California. This means growers would continue to protect their trees for a week or more than might be actually necessary.

The newer manner of employing this ascopsore maturation model that we hope to test starts with a pear based phenological biofix, when bud scales separate, so it is easier to use than the earlier version which started with a fungal spore maturity assessment. The accumulation of degree days continues to a threshold of 1620, which is when the model predicts most of the ascopores have been released, thereby ending the primary infection season. Gubler and cooperators evaluation of the earlier model showed that indeed almost all ascopores were mature by 1620 degree days, although they had started their degree day accumulation based on evaluating actual asci maturity. This newer approach is worth evaluating for California conditions due to its ease of use, having a biofix for the start and predicting the end date of ascospore maturity, and the potential linkage with the other earlier stages of the pear scab model in an integrated approach.

In conclusion:

When the researchers in Oregon used all three parts of the model they obtained excellent control of pear scab in 2001-2004 with 1 to 2 fungicide sprays per year. They had almost no scab in the fall evaluations and were able to omit the first spray of the season each year. The ascospore season ended between May 26 and June 9, and no sprays were applied after these dates, even when infection periods occurred based on temperature/leaf wetness duration.

Miguel Ahumada, Manager of Horticulture and Technology Transfer for Harry and David's located outside Ashland, OR, says that using this model saved the company $60,000 on 1,800 acres in their pear production operation as they were able to eliminate their first spray based on the fall sampling using Spotts' model.

New Publications

Weeds of California and Other Western States
This encyclopedic yet easy-to-use 2-volume set covers 262 individual entries, including a full description of 451 species and another 361 plants compared as similar species, representing 63 plant families. Pub. no. 3488. Price: $100.00. 136 pp. Available in our office (call to be sure) or order online at http://anrcatalog.ucdavis.edu or call (800) 994-8849.

Fertigation with Microirrigation
This manual helps guide users through strategies and decision making for fertigation with nitrogen, phosphorus and potassium, and gypsum. It discusses the environmental effects of chemical applications, and focuses on nitrogen management to reduce groundwater pollution. Pub. no. 21620. Price: $25.00. Available in our office (call to be sure) or order online at http://anrcatalog.ucdavis.edu or call (800) 994-8849.

Orchard Floor Management Practices to Reduce Erosion and Protect Water Quality
Water-induced erosion carries valuable soil out of orchards and into downstream waterways, where it can cause serious problems. Learn how to keep your soil where it will do you the most good. Pub. no. 8202. Free download from UC ANR: http://anrcatalog.ucdavis.edu. Search word: 8202.

Planning and Managing Agritourism and Nature Tourism Enterprises – A Handbook
This is an updated how-to manual for farmers, ranchers, and the professionals who work with them. Price: $25. Contact the UC Small Farm Center, (530) 752-8136.

New Online Registry for Grape Varieties

A listing of grape varieties and where they can be obtained throughout the United States is now available at a new Web site designed to help grape growers and researchers find appropriate grape plants.

This new National Grape Registry, developed and maintained at UC Davis, is intended to be a user-friendly source for all grape plant material available in the United States, including wine, table, juice and raisin grapes, as well as grape rootstock. It can be found online at http://ngr.ucdavis.edu/.

"The main emphasis of the site is to help growers, nurseries, winemakers and researchers find the plant material they need," said Deborah Golino, director of Foundation Plant Services at UC Davis. "We hope the site will make it easier to find domestic sources for diverse grape varieties and clones, and to identify plant material that has been tested and certified as free of certain grapevine diseases."

Each of the 650 varieties listed in the registry is profiled, with information provided about its pedigree, origin and use. Registry visitors are also provided with reference material that they can consult for further information, as well as listings of commercial grapevine nurseries and public grapevine collections.

The first phase of the registry is now complete. In addition to the lists of varieties and contact information for nurseries and public collections, the site has a database that allows users to enter any number of synonyms for grape names and search for the name most commonly used in the United States.

"The synonym search feature is the one that first-time users are the most excited about," said Ed Stover, curator of the National Clonal Germplasm Repository and author of the proposal that initiated the project. "Many important grape varieties from the Old World have as many as 20 or 30 different synonyms. With the creation of the National Grape Registry Web site, we have a new, simple tool for checking synonyms from many different countries and in many different languages. This is an extraordinary solution to a problem that has vexed grape growers and winemakers for years."

During the second phase, information will be added about individual grape clones and the level of disease-testing standards required for each clone.

UC Integrated Viticulture Online

The UC Integrated Grape Production Workgroup has created UC Integrated Viticulture Online with generous support from industry donations. This web site has information on nearly all aspects of grape production in separate links under 'Viticultural Information', such as breeding, cultural practices, IPM, varieties, rootstocks, irrigation, nutrition, and economics, and portions of several UC publications can be downloaded. The web site also links to UC researchers, publications, and grower meetings throughout the state. Web site: http://groups.ucanr.org/iv/.

Upcoming Meetings

12th Annual PlacerGROWN Farm Conference
Feb. 3, 2007
8:00 a.m. – 4:00 p.m.
Lincoln High School, Lincoln, CA
Cost: $55 ($65 late)
Call (530) 889-7398 or (530) 889-7385

2007 California Plant and Soil Conference: Opportunities for California Agriculture
Feb. 6-7, 2007
Radisson Hotel, Sacramento
Cost: $135
Register online at: http:/calasa.ucdavis.edu