Cooperative Extension • Monterey County

Crop Notes

November/December, 2008

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SPINACH DOWNY MILDEW: NEW RACE FOUND IN 2008

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Based on preliminary research findings, it appears that yet another new race of downy mildew has occurred on spinach grown in coastal California. In July 2008, outbreaks of downy mildew appeared on several cultivars that previously had been resistant to races 1 through 10. Throughout the late summer period, downy mildew disease was frequently found on these cultivars, and in some cases significant losses were experienced. The disease continues to be a concern as late season (September and October) downy mildew flare-ups are presently taking place.

Downy mildew, caused by the pathogen Peronospora farinosa f. sp. spinaciae, continues to be the most important disease of spinach in California. This fungus-like organism causes the familiar light green to yellow spots and patches on leaves, rendering the spinach leaf unmarketable. The characteristic purple sporulation occurs mostly on the undersides of leaves. The pathogen needs cool, humid conditions to grow and develop. Managing downy mildew relies on the use of resistant spinach cultivars and application of fungicides.

To distinguish downy mildew races, a set of 10 international differential spinach cultivars are grown and inoculated with the sample mildew. The race is identified based on which cultivars are susceptible and develop disease. Inoculations with multiple field isolates collected in the summer of 2008 indicated that the current outbreak of downy mildew was caused by strains infecting 4 of the 10 international differential cultivars: Viroflay, Resistoflay, Bolero, and Lazio (Table 1). This disease "fingerprint" is unique from all ten previously characterized races. Strains with this reaction profile have been found in multiple locations in California and Yuma, Arizona.

To more effectively communicate worldwide information about downy mildew on spinach and facilitate screening and characterizing of resistance, the International Working Group Peronospora committee (IWGP) was formed several years ago to establish criteria for naming new races. Jim Correll (University of Arkansas) has been in communication with the IWGP to discuss the current California situation. Presently, the general consensus of the committee is that the new race should not yet be officially named until further information is available regarding disease development and stability of the race.

The spinach industry should continue to be vigilant and aware of any unusual downy mildew developments. The UC Cooperative Extension diagnostic lab continues to analyze spinach downy mildew isolates submitted from growers, PCAs, and others. This service acts as a gauge of the downy mildew situation and an early warning system should new races occur. Research on spinach downy mildew in California is a joint project between the University of California Cooperative Extension and the University of Arkansas.

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Table 1. Disease reactions of a 2008 downy mildew isolate inoculated onto spinach differentials

	Cotyledons		True leaves		Percent plants
Cultivar	Percent infected	Severity	Percent infected	Severity	infected
Viroflay	100	3	81.2	2	100
Resistoflay	100	3	100	2.6	100
Califlay	0	0	0	0	0
Polka	0	0	0	0	0
Bolero	100	3	100	2.4	100
Lion	0	0	0	0	0
Lazio	100	2.7	100	1.4	100
Campania	0	0	0	0	0
Dolphin	0	0	0	0	0
Avenger	0	0	0	0	0

Mean disease severity on cotyledons is on a scale of 0 to 3, based on the cotyledon area infected and the degree of sporulation.

Mean disease severity of true leaves is on a scale of 0 to 4, where 0 = no disease, 1 = 1-25% leaf area infected, 2 =26-50%, 3 = 51-75%, and 4 = >76-100%.

Adapted from: Correll and Koike. 2008. California Spinach Growers Research Fund. Sept. 24.

1. Spinach leaf infected with downy mildew.

An apparently new race of mildew occurred in summer 2008.

Disease management will continue to rely on resistant cultivars.

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2. Tray of spinach differentials showing two resistant cultivars.

PHOSPHORUS FERTILIZER MANAGEMENT FOR LETTUCE PRODUCTION AND WATER QUALITY PROTECTION

University of California Cooperative Extension, Monterey County
Richard Smith and Tim Hartz, Farm Advisor for Monterey, Santa Cruz and San Benito Counties, and Extension Vegetable Specialist, UC, Davis

Phosphorus fertilization of crops in the Salinas Valley has unwittingly built up soil phosphorus levels in the valley

Background: Phosphorus (P) fertilization practices in vegetable production have changed recently due to the dramatic rise in the price of P fertilizer. In addition, regulatory pressure from the Regional Water Quality Control Boards to reduce nutrient concentration in surface water is also building. In the Salinas Valley, phosphorus is commonly applied in excess of vegetable crop needs and has increased soil P levels. Table 1 compares adjacent sites (within ¼ mile of each other) in the Salinas Valley with different management histories and illustrates the impact of management practices on soil P levels. The pasture area has the lowest P inputs and the lowest soil P value; the research station has had moderate amounts of P fertilization over the years and has an intermediate soil P level; and the soil in the production field has had fertilization practices typical for cool season vegetable production in the area and has high soil P. Phosphorus fertilization of crops in the Salinas Valley has unwittingly built up soil phosphorus levels in the valley (Table 2). The common P levels found in Salinas Valley soils can lead to elevated levels of phosphorus in drainage waters, creeks and rivers and seriously reduce water quality. Parts of the Salinas and Pajaro River watersheds have been placed on the Environmental Protection Agency 303(d) list due to excessive nutrient concentration.

Phosphorus is a critical element for plant growth. Its availability is related to soil temperature, soil pH, sorption on clay and iron oxides, and interactions with secondary soil minerals such as calcium and iron phosphates. These factors generally keep phosphate in the soil solution at low levels. However, in heavily fertilized fields P absorption sites can become overloaded, and environmentally problematic amounts of P can leave such fields in runoff; in extreme cases even drain tile effluent can have high P concentrations. When field runoff has high sediment content, large amounts of sediment-bound P can also enter the river systems.

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The Olsen (bicarbonate extractable) P soil test provides the best measure of available P for crop growth in soils above pH 6.2; most vegetable production soils in the coastal production zone are above this pH due to liming to control Club Root of brassica crops. We conducted trials in 2002-2003 to evaluate the need for P fertilization. In 12 field trials only one site showed an increase in yield from P fertilization; this responsive site was the only field with Olsen P < 55 PPM, and it was planted in the spring, in cool soil. Phosphorus fertilization of soils above this level, especially in the warm part of the season, is not likely to improve lettuce yields.

The majority of vegetable production fields in the Salinas Valley have P levels that are above the 55 ppm threshold; however, there are fields below this threshold and fields with marginal P levels that may need P fertilization during the cold times of the year. We conducted several trials examining banded application of various P fertilizers at planting. One trial was conducted at a site with a soil P level of 30 ppm. Results indicated that low rates of P (20 lb P2O5) banded over the seedline at planting gave higher yields than a higher application rate of P (60 lbs P2O5) applied at listing (Table 3). This may have occurred because the P banded over the seedline was more readily available for crop growth than the P fertilizer shanked into the beds which was farther from the roots of small lettuce seedlings. This shows that we can optimize yields, where P fertilization is justified, by applying rates of P at-planting that are similar to rates of P that are removed by the crop. For instance, an application of 20 lbs of P2O5 is equivalent to 9 lbs of P. By applying rates of P that are close to what is being removed in the harvested portion of the crop (i.e. 10-12 lbs P/A), we can help to reduce further loading and loss of P in Salinas Valley soils. In many cases growers are already applying moderate rates of P in at-planting anticrustant applications which provide sufficient P to maximize the yield of lettuce. The good news is that growers can take advantage of the high residual levels of P in their soils and economize on the use of P fertilizers.

Recommendations:

- Fertilization of head or romaine lettuce with P can be justified on sites with less than 55 ppm soil P in the winter/spring plantings.
- Once soils warm in the late spring, soils with levels above 55 ppm soil P do not respond to P fertilization.
- In situations where P fertilization is justified, low at-planting treatments applied in a band over the seedlines provides a useful technique to maximize yields. The low P fertilization rates will help reduce further loading of P in Salinas Valley soils.

Table 1. Comparison of soil P levels in adjacent fields on Chualar loam soil

Site Background	Soil P ppm
Pasture (low intensity agriculture)	37.3
Low intensity vegetable production site (Research station)	53.9
High intensity vegetable production site (Typical of the Salinas Valley)	92.6

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The good news is that growers can take advantage of the high residual levels of P in their soils and economize on the use of P fertilizers.

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Table 2. Phosphorus levels in Salinas Valley soils

Soil Type	Number of Sites	Range of soil P values	Mean Soil P Ppm
Sandy Loam	6	62-139	93
Loam	6	36-133	90
Clay Loam	5	78-134	97

Table 3. Tissue and soil P analyses, nutrient uptake at harvest and yield data.

Treatment	P/acre lbs	P_2O_5/acre lbs	Application	Mid Growth		At Harvest			
				Tissue Total P (%)	Soil P (ppm)	Soil P (ppm)	Crop P Uptake (Lbs/Acre)	Mean Head Wt. (Lbs)	Mean Wt./Acre (Tons)
Untreated	----	----	----	0.313	35.5	34.17	11.3	1.09	29.57
Actagro 7-21-0	9	20	at planting[1]	0.300	35.9	39.57	12.1	1.18	32.93
Ortho Phos 12-58-0	9	20	at planting[1]	0.277	35.0	36.73	11.8	1.10	30.33
10-34-0 + 1% Avail	9	20	at planting[1]	0.287	37.6	36.93	11.9	1.20	32.77
7-7-0-7	9	20	at planting[1]	0.297	35.5	34.37	11.9	1.17	32.20
15-15-15	27	60	Preplant[2]	0.277	36.1	34.03	10.7	1.04	28.90
LSD, α=0.10				*0.021*	*NS*	*2.68*	*NS*	*0.09*	*2.86*

1 – Applied in two 5-inch wide bands over the seedline; 2 – Shanked into the beds at listing with a commercial applicator

FUSARIUM WILT OF CILANTRO

Steven Koike
Plant Pathology Farm Advisor

Cilantro, or coriander, (Coriandrum sativum) is a leafy vegetable in the Apiaceae and is grown commercially in California for use as a fresh or dried herb. Beginning in 2002 and continuing to the present, cilantro plantings in the central coast region have been damaged at times by a Fusarium wilt disease. Affected plants grow poorly and are stunted. Lower foliage turns yellow and sometimes has a reddish tinge. Plants wilt during warmer times of the day. The main stem, crown, and taproot show internal discoloration that is reddish to light brown. Infected cilantro roots become discolored and later rot. As disease progresses, plants eventually collapse, turn brown, and die.

Fusarium wilt disease has been found on cilantro in California.

The pathogen in California was confirmed to be Fusarium oxysporum. A Fusarium wilt disease has been reported on cilantro in Argentina and India, where the pathogen was named F. oxysporum f. sp. coriandrii. Therefore, the cause of our California problem may be the same or similar pathogen that is described elsewhere in the world. This Fusarium pathogen was consistently associated with all problematic cilantro fields that we investigated in California; we did not find or recover Pythium, Rhizoctonia, or other soilborne fungi in diseased cilantro.

Thorough research has not been completed on this disease. However, we can make some sound generalizations about cilantro Fusarium wilt based on our knowledge of the Fusarium oxysporum pathogen group:

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1. Limited host range. It is likely that the cilantro pathogen would be able to infect only cilantro, or perhaps at most only a few closely related plants in the Apiaceae plant family. These F. oxysporum pathogens tend to be host specific and only infect the one plant host. For example, in one of our experiments we were unable to infect celery with the F. oxysporum isolated from cilantro. It is likely, therefore, that in a field infested with the cilantro pathogen, no damaging effects would be seen on spinach, lettuce, crucifers, and many other crops.

This pathogen likely infects only cilantro.

2. Survives in soil. Fusarium oxysporum fungi live and survive in the soil. It is therefore quite likely that the cilantro pathogen could persist in the soil for several to many years, even in the absence of cilantro crops. Because the fungus is in the soil, the movement of mud and dirt between fields could also transport the pathogen to clean, uninfested locations.

3. Fungicides ineffective. In general, Fusarium wilt diseases are not controlled effectively by the application of fungicides. While the application of some pre-plant soil fumigants could reduce soil populations of this pathogen, the use of fungicides as seed treatments or post-plant treatments would generally not be effective.

4. Resistant cultivars needed. Management of most Fusarium wilt diseases relies on planting cultivars with genetic resistance. If Fusarium wilt of cilantro ever became a widespread, persistent issue, then industry would need to develop resistant cilantro cultivars.

Compared to a healthy plant (left), cilantro plants infected with Fusarium grow poorly and are stunted.

UC Organic Soil Fertility Management Symposium 2009
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Organic Soil Fertility Management Symposium

Thursday, January 15, 2009
Activities & Recreation Center, UC Davis

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Thursday, January 15, 2009 ▪ Activities & Recreation Center, UC Davis

UC Organic Soil Fertility Management Symposium

The UC Organic Soil Fertility Management Symposium 2009 combines the latest technical information on nutrient dynamics in organically-managed soils with practical results of on-farm nutrient management research. The program is intended for growers, consultants, students, and government agency personnel who work with people in this fast-growing segment of agriculture. Speakers will be drawn from throughout California, and the information discussed will be relevant to a wide range of production environments.

Dates and times

Thursday, **January 15, 2009** from **8:30 AM-4:00 PM**
Check in will begin at 8:00 AM.

Location

The event will held in the **Activities & Recreation Center** (ARC), **UC Davis**. Parking permits cost $6.00 per day. Parking permit dispensers accept quarters, one-dollar bills, five-dollar bills, or VISA and MasterCard.

Registration fee

$ 80 (received by 12/15/08)
$100 (received after 12/15/08)
$50 (student-must show valid student ID)

The registration fee includes and lunch, light refreshments and handout material.

To register

Visit http://vric.ucdavis.edu to register **online** (credit card or UC recharge number only) OR fax/mail a completed **registration form** along with the payment to the address/fax number on the registration form.

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The course has been approved for CCA credit. The course is pending approval for PCA, QAC, QAL, and Private Applicator credit.

WE RESERVE THE RIGHT TO CANCEL THE COURSE IF THE MINIMUM NUMBER OF PARTICIPANTS IS NOT MET. WE ALSO RESERVE THE RIGHT TO REPLACE AN INSTRUCTOR. EVERY EFFORT WILL BE MADE TO NOTIFY PARTICIPANTS OF ANY CHANGES OR CANCELLATIONS.

FOR MORE INFORMATION, CONTACT THE UC VEGETABLE RESEARCH & INFORMATION CENTER:
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8:00 AM	Registration
8:30-8:40	Welcome and introduction
8:40-9:10	**Soil fertility in organic systems: lessons from long-term studies** Will Horwath, Dept. of Land, Air & Water Resources, UC Davis
9:10-9:45	**Cover crop contributions to N fertility** Richard Smith, UCCE Monterey-San Benito-Santa Cruz Counties
9:45-10:15	**Managing P and K fertility in organic systems** Rob Mikkelsen, Dept. of Plant Sciences, UC Davis
10:15-10:30	*Break*
10:30-11:00	**Certification issues in organic soil fertility management** Chip Sundstrom, FJS Consulting, Davis, CA
11:00-11:40	**Compost use: opportunities and limitations** Jean Vandergheynst, Dept. of Biological and Agricultural & Engineering, UC Davis and Tim Hartz, Dept. of Plant Sciences, UC Davis
11:40-12:10	**Organic management effects on the soil microbial community and nutrient cycling** Louise Jackson, Dept. of Land, Air & Water Resources, UC Davis
12:10-1:00 PM	*Lunch*
1:00-1:30	**Soil and plant testing for organics–what works and what doesn't** Tim Hartz, Dept. of Plant Sciences, UC Davis
1:30-2:00	**In-season fertilization in organic systems** Mark Gaskell, UCCE Santa Barbara-San Luis Obispo Counties
2:00-2:30	**Maintaining microbial food safety in organic systems** Trevor Suslow, Dept. of Plant Sciences, UC Davis
2:30-2:45	*Break*
2:45-3:15	**Irrigation management effects on organic soil fertility and environmental impact** Mike Cahn, UCCE Monterey-San Benito-Santa Cruz Counties
3:15-3:40	**Economics of organic soil fertility management** Karen Klonsky, Dept. of Agricultural & Resource Economics, UC Davis
3:40-4:00	**Discussion**
4:00	**Adjourn**

NEW ADDISTIONS TO THE ANR CATALOG

http://anrcatalog.ucdavis.edu/

Agritourism Enterprises on Your Farm or Ranch: Where to Start
Publication Number: 8334
Author: HOLLY GEORGE
Inventory Type: PDF File
Language: English
ISBN-13: 978-1-60107-581-9
Copyright Date: 2008
Length: 6 pp.
This is a free downloadable publication

This publication gives you a game plan for navigating the maze of permits, plans, and approvals you will need to get in order before you launch a potentially profitable agritourism enterprise on your California farm or ranch.

Agritourism Enterprises on Your Farm or Ranch: Understanding Regulations
Publication Number: 8333
Author: HOLLY GEORGE
Inventory Type: PDF File
Language: English
ISBN-13: 978-1-60107-580-2
Copyright Date: 2008
Length: 8 pp.
This is a free downloadable publication

Agritourism can be a great boon to the California grower, but you have to be aware of your legal responsibilities, get your permits, and follow the rules regarding land use, zoning, public health, and other areas. This gives you a brief overview.

Grape: UC IPM Pest Management Guidelines
Publication Number: 3448
Author: BARBARA OHLENDORF
Inventory Type: Print AND Electronic
Language: English
Copyright Date: Rev. 2008
Length: 126 pp.
$5.00 / EACH

These official UC-approved guidelines for pest monitoring techniques, pesticide use, and nonpesticide alternatives for agricultural crops are essential tools for anyone making pest management decisions in the field. This guideline covers grapes