Cooperative Extension • Monterey County

Crop Notes

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In This Issue:

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BACTERIAL LEAF SPOT OF PARSLEY: POSSIBLE NEW DISEASE

Steven Koike, UC Cooperative Extension
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For several years, a possible new foliar disease of parsley has been observed in California. Symptoms consist of small (less than 1/4 inch in diameter), angular shaped, dark brown leaf spots that are visible from both top and bottom sides of leaves. As disease progresses, the spots usually do not expand significantly and do not coalesce or merge together. A key diagnostic feature is that these spots do not contain any signs of fungal fruiting bodies or structures. This absence of fungal structures differentiates this apparently new disease from the commonly encountered Septoria blight caused by *Septoria petroselini*. Septoria blight of parsley causes a similarly shaped angular leaf spot; however, such spots always contain profuse numbers of tiny, black, spherical fruiting bodies called pycnidia.

This new problem is tentatively named bacterial leaf spot. A *Pseudomonas* bacterium has been consistently isolated from symptomatic flat leaf and curly parsley cultivars. Preliminary tests indicate that this *Pseudomonas* may be responsible for the disease. Bacterial leaf spot has been found in both conventional and organic parsley. Research by the University of California Cooperative Extension (Monterey County) and the USDA-ARS in Salinas is in progress. The exact identification of the pathogen, disease epidemiology, and possible control measures will be examined.

Additional samples of this disease would assist in the research effort. If possible bacterial leaf spot is observed on parsley, please contact Steve Koike (831-759-7350; 1432 Abbott Street, Salinas CA, 93901).

LEAF SPOTS OF MUSTARDS AND LEAFY CRUCIFERS

Steven T. Koike, Plant Pathology Farm Advisor

Mustards and other leafy crucifer plants (family Brassicaceae) are grown in coastal California for use as fresh leafy commodities. Japanese or mizuna mustard (*Brassica campestris* ssp. *nipposinica*) is a dark green leafy mustard that usually has finely dissected, feathery leaves. Red Asian mustard (*Brassica juncea* ssp. *rugosa*), known also as purple or giant-leafed mustard, is a dark red to red green leafy mustard that has spoon-shaped leaves. Tat soi or tah tsai (*Brassica campestris* ssp. *narinosa*) is a leafy mustard that has oval, dark green leaves and whitish petioles. These three mustards are usually sown in high plant densities, grown for short periods of time, then are harvested as young leaves for use in pre-washed bagged salad products.

Three fungal leaf spot diseases can occasionally affect these mustard crops and cause them to be unharvestable due to leaf spots and other symptoms. Controlling these diseases is difficult. No resistant cultivars are yet available, and fungicides are often not registered for these crops. The following are brief descriptions of these diseases. All three pathogens can also infect other crucifers such as broccoli, cauliflower, bok choy, and Chinese cabbage.

Alternaria leaf spot: Alternaria leaf spot symptoms consist of small (1/8 to 1/4 inch in diameter), circular to oblong, brown spots that contain concentric rings. On tah tsai, yellow borders may develop around the spots. Elongated, brown spots also develop on leaf petioles. Diseased tissues often support the dark brown to brown green growth of fungus spores and mycelium. The pathogen is *Alternaria brassicae*.

White leaf spot: The symptoms are leaf spots that first are small (1/8 to 1/4 inch in diameter), gray to gray green, and circular. Later in disease development, lesions remain circular, become light tan to white, and can grow up to 1/2 inch in diameter. Small dark streaks and specks are sometimes apparent within these leaf spots. White conidial growth may be observed on the leaf spots, often on the leaf undersides. The pathogen is *Pseudocercosporella capsellae*.

White rust: On Japanese mustard and tah tsai, white rust causes white raised pustules to develop profusely on the lower sides of leaves. On the top sides of leaves, a diffuse yellow spot will develop over the corresponding lower leaf pustule. Leaf twisting and other deformities are so far observed only on infected Japanese mustard. Red mustard is apparently not a host. The pathogen is *Albugo candida*.

UC COOPERATIVE EXTENSION HELPS FARM EMPLOYERS AND WORKERS MEET CHALLENGES OF HEAT STRESS

Even though the Central Coast does not have Central Valley temperatures, heat stress is still of concern in the here. As a new law hits the books this summer to prevent heat-related illnesses in California workplaces, UC Cooperative Extension agricultural personnel management specialist Howard Rosenberg of UC Berkeley is ready with resources and information to support farmers in complying with the new standards.

Heat stress often affects people before they notice it.

Early symptoms of heat illness – fatigue, irritability, loss of concentration or coordination – might result in a miscalibrated chemical mix, an injury due to mishandling a tool, bruised fruit, butchered vines, or conflicts between co-workers or in families, Rosenberg said. Other symptoms, like fainting or blurred vision from sweat in the eyes, could have tragic effects.

"A momentary loss of consciousness itself is not a lasting problem," Rosenberg said, "unless the person is driving a tractor or standing on top of a ladder."

A key to coping with heat stress is drinking enough water to replenish fluid the body loses in cooling itself, he said. When the body is working hard, its internal furnace is raging, raising core temperature from the inside. "Our own metabolism is the prime source of the heat that stresses us," Rosenberg said.

"Drinking to replace the water lost as sweat is crucial. Waiting for a sensation of thirst is a notoriously lousy way of deciding when to drink," Rosenberg said. "People are better off when they drink on the basis of what they know about the body, rather than simply how they feel."

Drinking to replace the water lost as sweat is crucial. Waiting for a sensation of thirst is a notoriously lousy way of deciding when to drink Rosenberg said. "People are better off when they drink on the basis of what they know about the body, rather than simply how they feel."

Getting used to the heat is also an important factor in preventing heat illnesses, Rosenberg said. In 25 serious cases of heat illness investigated by the California Occupational Safety and Health Administration last year, water was available, but most victims were dehydrated. Four out of five sufferers were in their first week on the job; nearly half fell ill the first day on the job. None had been trained about acclimatization. Most of the illnesses were not recognized until they were in an advanced state. Victims' mean body temperature was 104 degrees, 76 percent fainted, 38 percent were hospitalized beyond the emergency room and 54 percent died.

"It's a good idea to start by working only a part of the day and gradually increasing both work time and effort over the first week," Rosenberg said. "And it always helps to schedule the most strenuous jobs for cooler times of day. If the work must go on full bore, be especially alert for early signs of heat illness when the weather is very hot or humid."

"Many workers are inundated with signs, slogans and exhortations. I came to the conclusion early on that most pitches about drinking water were falling on deaf ears, because they were short on 'the why.'" Rosenberg said. "Some employers might say, 'Do it or you're fired,' others might implore, 'Do it because I'm asking you to.' I say, do it because it makes sense. I encourage growers and supervisors to tell workers, 'Here's what happens, here's how your body works, you decide.'"

In partnership with the California Farm Bureau Federation and with support from the USDA Western Center for Risk Management Education, he has compiled key points concisely in Spanish and English on a pocket-sized fold-out card and printed 200,000 copies for distribution to California's outdoor agricultural labor force. Farm Bureau is coordinating distribution by offering free supplies of cards to agricultural employers statewide. Call or come by our office at 1432 Abbott Street, Salinas, CA 831.759.7350 for copies.

Rosenberg has also put a vast collection of practical material on heat stress online at his Agricultural Personnel Management Program Web site, http://apmp.berkeley.edu. Included are links to the new regulation, information on complying with the new laws, training aids, a pdf version of the field education card, articles and heat stress references. All the materials are offered free to help employers protect their workers and businesses from the damaging effects of heat stress.

PREVAM FOR CONTROL OF LYGUS BUGS, *lygus hesperus*, IN STRAWBERRIES

Mark Bolda, UCCE Santa Cruz County
Mike Nelson, Plant Sciences, Inc.; Luis Rodriguez, Plant Sciences, Inc.

There are several new pesticides registered for use in strawberries, including Actara and the agricultural oil Prevam.

Introduction: Lygus bugs, *Lygus hesperus*, have been a serious pest of strawberries for many years in the Monterey Bay strawberry growing region. Feeding of lygus bugs on strawberry fruit early in its development can cause the misshapen fruit known as cat-facing, resulting in unmarketable fruit.

There are several new pesticides registered for use in strawberries, including Actara and the agricultural oil Prevam. The following trial tested the efficacy of these products, alone and in combination with other materials, in comparison with grower standards and an untreated control.

Materials and Methods: The trial was done as a randomized complete block design of four replicates of three 42 foot long by 4 foot wide beds per treatment on PS592 variety strawberries.

Application: An application of all materials and mixes was made on June 13, 2005. Further applications of Malathion and Prevam (see table below) were made June 20, and Prevam only on June 27 and July 5.
Applications were made at the rate of water carrier of 100 gallons per acre at approximately 50 psi pressure, with 10 nozzles per bed. Applications were made with a tractor mounted sprayer.
Refer to the table below for the list of treatments:

Number	Treatment	Rate per acre (Applications 1,2,3,4)
1.	Actara	1.3 oz
2.	Actara	4 oz
3.	Actara + Danitol	4 oz + 10.67 oz
4.	Actara + Prevam	4 fl oz + 0.4% v/v
5.	Actara + Danitol + Prevam	4 oz + 10.67oz + 0.4% v/v
6.	Danitol	10.67 oz
7.	Malathion	2 pt, 2 pt
8.	Malathion + Prevam	2 pt + 0.4% v/v, 2 pt + 0.4% v/v
9.	Prevam	0.4% v/v
10.	Untreated Control	-

Evaluation: Counts of adult and immature (nymph) lygus bugs were made with the sweep net technique, using one sample of 25 randomly selected plants per replicate plot. The pest incidence was quantified at the following intervals: -1 day (one day prior to the first application), 6 days after application and 6, 13, 21, 27, 34, and 41 days following the first application. Counts were taken at random from plants in the center bed and the interior plant rows of the neighboring beds, adjacent to the center bed of each of the replicate plots (to minimize any side-to-side drift effects on treatment performance assessments, and to minimize the effects from migration of insects from one replicate plot to another).

An evaluation for phytotoxicity, meaning burning and spotting of plant tissue, was made on July 1, 2005. A scale of 0 to 100, 0 being no visible damage, and 100 being all leaves and other plant tissues burned and spotted, was utilized in this evaluation.

Results were tested statistically using a multiple comparison procedure (Least Significant Difference at the 95 percent level of significance) to determine whether the means of counts and percentages per treatment were significantly higher or lower from the other treatments.

Results:

Refer to Tables 1 and 2 below for numerical presentation of all results obtained in this trial.
All treatments tested in this trial had significantly less numbers of nymphs than the untreated control by 13 days after the first application, and treatments consisting of Actara tank mixed with either Danitol or Prevam or both still had significantly lower numbers of lygus nymphs 21 days after the first application. Control of lygus bug adults was more equivocal, with no consistent trends of control over the untreated check.

(Cont'd to page 4)

(Cont'd from page 3)

Table 1. Statistical Evaluation of Lygus Bug Nymph Control[1]

Treatment	Pre app	6 day	13 day	21 day	27 day	34 day	41 day
Actara (1.3 oz/A)	5.25 a	1.5 a	5.25 b	9.25 abc	17.25 ab	15.25 abc	20.5 bc
Actara (4 oz/A)	4 a	0 c	2.75 c	8.75 abc	9.75 cde	18.75 ab	27.25 ab
Actara + Danitol (4 oz + 10.67 oz)	6 a	0 c	0 c	0.75 e	4.5 def	13.75 abc	22.25 abc
Actara + Prevam (4 oz +0.4%)	4 a	1 bc	0.75 c	7.75 abc	6.75 def	15.5 abc	23.75 abc
Actara + Danitol + Prevam (4 oz + 10.67 oz + 0.4%)	3.5 a	0.25 c	0.5 c	1.75 de	4.5 def	13.25 abc	15 c
Danitol (10.67 oz/A)	3.5 a	1 bc	2 c	5.75 cd	8.25 def	13.75 abc	24.5 abc
Malathion (2 pt/A)	4.75 a	0.5 c	1.25 c	7 bc	10 cde	17.5 ab	19 bc
Malathion + Prevam (2 pt/A +0.4%)	3.25 a	0.25 c	2 c	10.75 ab	16.25 abc	20.5 a	32.75 a
Prevam (0.4%)	3.25 a	3.25 ab	2.5 c	6.25 bc	11.5 bcd	18 ab	25.25 abc
Untreated Control	3.5a	5.25 a	8.75 a	12.25 a	20 a	20 a	18.25 a

Table 1. Statistical Evaluation of Adult Lygus Bug Nymph Control[1]

Treatment	Pre app	6 day	13 day	21 day	27 day	34 day	41 day
Actara (1.3 oz/A)	1.25 a	1.25 a	0.5 a	1.25 a	1.25 abc	6.75 a	7.5 abc
Actara (4 oz/A)	1 a	1.25 a	0.75 a	1 a	0.5 bc	2.5 bc	4.75 abc
Actara + Danitol (4 oz + 10.67 oz)	0.75 a	0 a	0.25 a	0.25 a	1.5 abc	2 bc	3.25 bc
Actara + Prevam (4 oz +0.4%)	1.75 a	0.25 a	0.5 a	1.25 a	0.25 c	1 c	4.75 abc
Actara + Danitol + Prevam (4 oz + 10.67 oz + 0.4%)	1.5 a	0.25 a	0.75 a	1 a	0.75 abc	2 bc	9.25 a
Danitol (10.67 oz/A)	0.5 a	0 a	0.25 a	1.5 a	0.75 abc	2.25 bc	3 bc
Malathion (2 pt/A)	0.75 a	0.25 a	1 a	0.75 a	0.75 abc	2.5 bc	6 abc
Malathion + Prevam (2 pt/A +0.4%)	0.75 a	0.5 a	0.75 a	1 a	2.5 ab	3.25 bc	8.5 ab
Prevam (0.4%)	1.5 a	0.5 a	0.75 a	0.25 a	1.5 abc	4 b	4 abc
Untreated Control	1 a	1.25 a	1.75 a	1.5 a	2.75 a	3 bc	6.25 abc

[1] Method used to discriminate among means Fisher's least significant difference procedure. Treatments followed by the same letter have no statistically significant differences.

Phytotoxicity: Very few signs of phytotoxicity were found on the evaluation date, and there was no significant difference between the treatments.

The Bottom Line: Lengthiest control of lygus bug nymphs was achieved by one application of Actara tank mixed with Danitol. This tank mix of the two chemicals is also highly recommended as a sound strategy for management of lygus resistance. The greater efficacy of these products on nymphs rather than adults suggests that growers should apply these products on nymphal lygus bug stages.

There are several insecticides mentioned for control of lygus bugs in this article. Before using any insecticides, check with your local Agricultural Commissioner's Office and consult product labels for current status of product registration, restrictions, and use information.

University of California Cooperative Extension
Monterey County

2006 Plant Disease Seminar

Tuesday, November 14, 2006
8:00 a.m. to 12:00 p.m.

Monterey County Agricultural Center
Richard W. Nutter Conference Room
1432 Abbott Street, Salinas, CA

This seminar will cover a wide range of disease and research topics for vegetable, ornamental, and coastal fruit crops.

Speakers to be announced.

Continuing education credits will be requested. For more information, contact Steven Koike (831-759-7350; 1432 Abbott Street, Salinas, California 93901).

Afternoon session will be hosted by CAPCA, Monterey Bay Chapter.

Please call ahead for arrangements for special needs; every effort will be made to accommodate full participation.

WEB SITE FOR LEARNING SPANISH OR ENGLISH

So now, at last, an introductory set of lessons is available to assist farm workers and others who are interested in learning English.

Lessons include basic greetings, polite expressions, health and safety, tools and equipment, and many others. The approach emphasizes listening and is intended to help beginners break the ice in terms of learning English. Each word and expression is given first in Spanish and then is repeated twice in English by a native speaker. This is a complimentary effort to the audio tracks developed to help English speaking farm employers and supervisors to learn some basic Spanish, which is available at the same site.

The first English lessons are already available on the Web. All of the audio tracks are available as MP3 downloads that can be easily converted into a CD that can be copied and shared with others. There is no cost for these downloads. The project is a public service of the University of California, and is available at http://www.cnr.berkeley.edu/ucce50/ag-labor/english/ or http://tinyurl.com/p59b4.

If you would like to get involved in terms of giving suggestions as to what words or expressions you would like translated, or for more information, contact farm advisor Gregorio Billikopf at gebillikopf@ucdavis.edu (209) 525-6800.

Once you have burnt a CD, feel free to make copies and distribute them to others as long as people are not charged for the materials. Your suggestions for new vocabulary will be appreciated. *This is a public service of the University of California.*

The Western Center for Agricultural Health and Safety is a comprehensive, multidisciplinary program dedicated to the understanding and prevention of illness and injury in Western agriculture.

The Western Center for Agricultural Health and Safety has four major objectives:

Conduct research related to the prevention of occupational disease and injury of agricultural producers, farmworkers and their families.

Develop, implement and evaluate educational and outreach programs for promoting health and safety for agricultural producers, farmworkers and their families.

Develop, implement and evaluate model programs for the prevention of illness and injury among agricultural producers, farmworkers and their families.

Develop linkages, communication and collaboration with other academic, governmental and non-governmental organizations involved in research and outreach on agricultural health and safety issues with special focus on communications with the affected populations themselves.

Just Published. . .

Pesticide Safety: A Reference Manual for Private Applicators, 2nd Edition
Patrick O'Connor-Marer, Susan Cohen
This manual covers information essential for anyone using pesticides on California farms, including growers, managers and employees. The book uses a farm profile format to review environmental and human safety topics. Covers pesticide labels, worker safety (handlers and fieldworkers), how to mix and apply pesticides, calibration, the hazards of pesticide use including heat related illness, and pesticide emergencies. Appendix includes sample training forms for pesticide handlers and fieldworkers. Great resource for private applicator certification with review questions in each chapter. In an easy-to-use format, with many illustrations. Publication No. 3383 $7.00

Retail Garden Center Manual
Dennis Pittinger
This study guide was written for individuals seeking to become California Certified Nursery Professionals (CCN Pros). Developed through a partnership between the University of California Cooperative Extension (UCCE) and the California Association of Nurseries and Garden Centers (CANGC), this practical, easy-to-use manual covers important topics on basic horticulture, soil, fertilizer, and water management, plant problem diagnosis, integrated pest management, landscape design, and nursery sales. Also contains an appendix summarizing nursery laws and regulations, a glossary and an index.

From indoor plants to lawns – this is also a valuable reference for any career professional in the garden retail trade. As the primary information source for home gardeners, well-trained staff knowledgeable in basic horticulture is important to retailers wanting to better meet their customer's needs. Publication No. 3492 $25.00

Guide to Efficient Nitrogen Fertilizer Use in Walnut Orchards
Kathy Kelley Anderson, Joseph Grant, Steven A. Weinbaum, Stuart Pettygrove
This publication gives the most in-depth information available on nitrogen fertilization of walnut orchards. Discusses the variables that make nitrogen management of each orchard a unique challenge; and provides tools for efficient and economic orchard management. Chapters discuss concepts of fertilization, nitrogen budgeting, choosing and using nitrogen fertilizers, and fertilizing young trees. 21623 $10.00

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DISEASES OF SWISS CHARD

Steven T. Koike, Plant Pathology Farm Advisor

Swiss chard (*Beta vulgaris* subsp. *cicla*) is in the Chenopodiaceae (beet) family and is closely related to table beet and sugarbeet. However, Swiss chard is grown exclusively for its leaves and is used as a fresh and cooked leafy vegetable. In coastal California, Swiss chard is commonly grown for only a few weeks and then harvested for "baby leaf" fresh vegetable products. Two common chard types are the green leaf varieties that have white petioles and the red green to purple green leaf types that have red petioles. One soil borne disease and several foliar diseases affect Swiss chard in the Salinas Valley. The soilborne problem can reduce plant stands. The foliar problems can result in various leaf defects, causing such leaves to be unsuitable for harvest and packaging. Table beet is also susceptible to these Swiss chard diseases. Regarding fungicides for controlling Swiss chard diseases, many products are not registered for use on this crop. Before using any fungicides, check with your local Agricultural Commissioner's Office and consult product labels for current status of product registration, restrictions, and use information.

Damping-off. Damping-off disease can affect Swiss chard seeds prior to seedling emergence, emerged plants that have germinated out of the seed but not yet grown above the soil line, and emerged plants that have grown out of the ground. The crowns and taproots of diseased Swiss chard plants become brown and necrotic (decayed). Plants will wilt and eventual die. If Swiss chard is planted in high plant densities, disease can spread rapidly and affect large numbers of seedlings. Damping-off pathogens are *Rhizoctonia solani* and species of *Pythium*. The disease is managed by using proper crop rotation, planting in well draining and well prepared soils, delaying seeding until crop residues have dissipated, and irrigating carefully.

Bacterial leaf spot. Initial symptoms of bacterial leaf spot on Swiss chard consist of water-soaked leaf spots that measure less than 1/4 inch in diameter. As bacterial leaf spot develops, spots become circular to ellipsoid in shape, measure up to 1/4 inch in diameter, and are tan with distinct brown to black borders. Spots are visible from both top and bottom sides of leaves. The pathogen is *Pseudomonas syringae* pv. *aptata* and is seedborne in Swiss chard. The disease is managed by using seed that does not harbor the pathogen and by avoiding the use of overhead sprinkler irrigation.

Cercospora leaf spot. Initial symptoms are small, angular leaf spots that are brown or tan with purple to red borders. As spots enlarge, the tissue becomes tan to gray in color and may or may not retain the purple border. The centers of the spots sometimes become gray as the fungus produces dark mycelium and other structures within and on the leaf tissue. In severe cases the spots can coalesce and cause large sections of the leaf to die. The pathogen is the fungus *Cercospora beticola*. The fungus is seedborne. The disease is managed by using seed that does not harbor the pathogen and by avoiding the use of overhead sprinkler irrigation. There are some fungicides that are active against *Cercospora* pathogens but are not registered for use on Swiss chard.

Downy mildew. On Swiss chard, downy mildew causes leaves to twist, curl, and grow in abnormal ways. The newest leaves and growing point can be extremely deformed. If conditions are favorable, affected tissue can be covered with the purple gray growth of the pathogen, *Peronospora farinosa* f. sp. *betae*. This downy mildew does not infect spinach; spinach downy mildew is caused by the closely related *Peronospora farinosa* f. sp. *spinaciae*. Downy mildew spores are spread via winds, and the pathogen requires cool, moist conditions for infection and disease development. Disease management is difficult because resistant Swiss chard cultivars are not widely available. There are some fungicides that are active against downy mildew pathogens but may not be registered for use on Swiss chard.

Powdery mildew. Swiss chard is susceptible to powdery mildew caused by *Erysiphe polygoni*. The pathogen appears as typical white to gray mycelium and conidia growing on both top and bottom sides of leaves. If disease is severe, the leaves may be twisted and distorted. In coastal California, powdery mildew is generally not very severe and control measures are often not warranted.

Rust. The most obvious sign of rust on Swiss chard is the presence of discrete, brown to orange brown pustules on both sides of the infected leaf. The brown spores emerge in large numbers from these pustules and appear as a dusty material on the leaves. Rust pustules cause the tissue around them to turn necrotic. If infected severely, the leaf can turn yellow and begin to decline. Control recommendations are not available.

Beet curly top. *Beet curly top virus* (BCTV) can result in severely stunted, chlorotic Swiss chard plants. The older leaves of infected plants turn dull to bright yellow and are brittle, thickened, and rolled. BCTV is vectored by the beet leafhopper (*Circulifer tenellus*) and other leafhopper species. This disease is not commonly seen, and there are no control recommendations.

Damping-off disease can affect Swiss chard seeds prior to seedling emergence, emerged plants that have germinated out of the seed but not yet grown above the soil line, and emerged plants that have grown out of the ground.

On Swiss chard, downy mildew causes leaves to twist, curl, and grow in abnormal ways. The newest leaves and growing point can be extremely deformed.

AGROTERRORISM AWARENESS SEMINAR

September 12, 2006

On September 12th, local growers and PCAs are invited to attend a half-day, hands-on training seminar on agroterrorism awareness. The speakers will address issues on agricultural biosecurity and plant diagnostic and control systems. The meeting will present the concepts and practical principles of awareness, preparedness, diagnostics, and identification of high risk pests and diseases. Local agribusiness should benefit from the training that the National Plant Diagnostic Network and industry experts will offer. Growers, fresh processing plant managers and operators, and PCAs are encouraged to attend.

The session will be held at the Nutter Conference Room, at 1432 Abbott Street, in Salinas on Tuesday September 12th, 9 AM – 12:00 Noon. PCA credits have been requested. The meeting will be hosted by Salinas Valley CWA in conjunction with Monterey Bay CAPCA, UC Cooperative Extension, Monterey County Agricultural Commissioner's Office, and the Grower Shipper Association of Central California.

WHITE ROT OF ONION AND GARLIC: A REVIEW

Steven T. Koike, Plant Pathology Farm Advisor

White rot affects roots and crowns, and overall symptoms are usually first noticed only after the disease is well established.

White rot is a major root and crown rot disease of alliums. Onion and garlic are especially affected. In some regions white rot is an increasing problem because of repeated allium crop rotations and shortage of uninfested land.

Symptoms and diagnostic features. White rot affects roots and crowns, and overall symptoms are usually first noticed only after the disease is well established. Leaves of infected plants turn yellow, wilt, collapse, and eventually die and become brown and dry. Foliage growth is poor and stunted. Patches of plants die rapidly and can result in significant crop loss. White, persistent mycelium develops on diseased roots and the base of bulbs in contact with soil. Numerous tiny (the approximate size of poppy seeds), black, spherical survival structures (called sclerotia) form on mycelium and diseased crown, basal plate, and root tissue. In advanced stages of disease, the roots and bulbs become soft and rotted due to activity from secondary decay organisms. Symptoms on leek are usually less severe than on onion or garlic.

White rot is caused by the fungus *Sclerotium cepivorum*. This is one of the few plant pathogens that produces no spore stage.

Causal agent. White rot is caused by the fungus *Sclerotium cepivorum*. This is one of the few plant pathogens that produces no spore stage. *Sclerotium cepivorum* reproduces, survives, and infects by sclerotia only. The white rot fungus is host specific to allium crops. A second species of *Sclerotium*, *S. rolfsii*, has a very broad host range and causes southern blight disease that affects many vegetable crops, including onion and garlic. *Sclerotium rolfsii* is distinguished from *S. cepivorum* of alliums because it produces brown, spherical sclerotia that are significantly larger (roughly the size of mustard seed) than those of *S. cepivorum*.

Field personnel should also be aware that *Botrytis* and *Sclerotinia* pathogens form irregularly shaped to elongated, black sclerotia that are generally significantly larger than sclerotia of either *Sclerotium* species (see Table 1). Such sclerotia most often form on the aerial parts of plants and are not localized at the ground level, as is the case with *Sclerotium cepivorum* and *Sclerotium rolfsii*.

Disease cycle. White rot is caused by sclerotia in the soil, so disease incidence increases as alliums are cropped in infested fields. Sclerotia can persist in soil without a plant host for over 20 years. These propagules remain dormant until allium root exudates, such as propyl and alyl cysteine amino acids, are present in soil. Sclerotia then germinate and the resulting mycelium grows through soil and invades the host root and basal plate. Secondary spread can occur by mycelial growth from plant to plant if their roots are in close proximity. Soil temperature is a key factor in disease development as sclerotia show little activity below 49 ºF or above 75 ºF; the optimum range is 57-65 ºF. Sclerotia germinate under moist conditions but are inhibited in very wet soils.

Control. Select fields and plant onion and garlic where there is no history of white rot. Implement sanitation measures to prevent introduction of infested soil and contaminated equipment into clean fields. The use of crop rotations that include non-allium plants has limited value because sclerotia persist in soil for many years; however, the over-planting of onion and garlic should be avoided. Be aware that sclerotia survive passage through the digestive tracts of grazing animals and may therefore be present in manures. Truly resistant cultivars are not yet available.

Fumigating heavily infested soils can be useful treatments, though the fungus is not completely eradicated. Some fungicides can be partially effective as applications made to plants in the field. Before using any fungicides, check with your local Agricultural Commissioner's Office and consult product labels for current status of product registration, restrictions, and use information.

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Soil inoculum can be reduced if sclerotia can be stimulated to germinate in the absence of host plants. Such germination is triggered by diallyl disulphide (DADS), which mimics the chemical activity of allium roots and is now commercially available in some countries. Effectiveness of this treatment relies on thorough application to soil and appropriate temperature and moisture conditions. Note that not all sclerotia respond to this treatment. (Steve Koike thanks Bob Ehn for assisting with this article.)

Table 1. Comparison of some sclerotia-forming fungi that infect alliums

Species	Sclerotia description	Natural host range
Sclerotium cepivorum	very small (<2 mm diameter) ("poppy seed size") spherical in shape black found at base of plant	only Allium species
Sclerotium rolfsii	small (2 mm diameter) ("mustard seed size") spherical in shape tan to dark brown found at base of plant	many vegetables, including Allium species
Botrytis species	medium to larger sized (from 3 to 10 mm long) elliptical to irregular shaped black found on aerial plant parts	*B. allii*: Allium only *B. squamosa*: Allium only *B. cinerea*: Allium and many other vegetables
Sclerotinia sclerotiorum	large (up to 10-15 mm long) elongated to irregular shaped black found on aerial plant parts	many vegetables, including onion

Field personnel should also be aware that *Botrytis* and *Sclerotinia* pathogens form irregularly shaped to elongated, black sclerotia that are generally significantly larger than sclerotia of either *Sclerotium* species (see Table 1).

Implement sanitation measures to prevent introduction of infested soil and contaminated equipment into clean fields.

Advisors, 4-H, and Nutrition Education #'s

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Merrielee Merritt	831.759.7386
Kathleen Nolan	831.759.7373
Richard Smith	831.759.7357

ANNUAL ENTOMOLOGY SEMINAR

Thursday, December 7, 2006
8:30 a.m. to 12:00 p.m.
Monterey County Agricultural Center
Richard W. Nutter Conference Room
1432 Abbott Street, Salinas, California

This seminar will cover a research conducted within the past year regarding insect management for the central coast.

Speakers to be announced.
For more information, contact Bill Chaney
831-759-7359 or email at wechaney@ucdavis.edu
1432 Abbott Street, Salinas, CA 93901

ANR APPROVES 17 ADVISOR POSITIONS FOR RECRUITMENT

UC Division of Agriculture and Natural Resources (ANR) has announced it will be recruiting for 17 county-based and area-based Cooperative Extension advisors for the 2006-07 fiscal year, which began July 1.

ANR used a rigorous review process involving campus, county and stakeholder input to determine the state's highest priority needs and is using resources made available by retirements and resignations to compensate new personnel.

"We are still dramatically smaller than we were in the 1980s, and are still recovering from the budget cuts of 2003," said W.R. Gomes, UC vice president for Agriculture and Natural Resources, "but our budget has stabilized to where we can fill some of our more critical needs."

The positions approved for recruitment in 2006-07 are:

Floriculture & Nursery Crops Advisor - San Diego County and south Riverside County
Environmental Horticulture & Nursery Advisor - San Mateo County
Rice Farming Systems Advisor - Sutter/Yuba counties
Vegetable Crops Advisor - Fresno County
Pomology Advisor - Merced County
Agricultural Crops & Weed Control Advisor - Madera County
Environmental Horticulture Advisor - Marin and Sonoma counties
IPM/Vertebrate Pest Advisor - Kearney Research & Extension Center
Vegetation Management/Weed Science Advisor - Napa County/Redwood Region
4-H Youth Development Advisor - Los Angeles County
4-H Youth Development/Nutrition, Family & Consumer Sciences Advisor - Imperial County
Nutrition, Family & Consumer Sciences Advisor - Stanislaus and Merced counties
Nutrition, Family & Consumer Sciences Advisor - Mariposa and Tuolumne counties
Water Management/Resources Advisor - Orange and Riverside counties
Dairy Advisor - Stanislaus and San Joaquin counties
Natural Resources/Water/Range/Livestock Advisor - Modoc/Intermountain Region
County Director/Natural Resources Advisor - Humboldt/Del Norte counties

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University policy is intended to be consistent with the provisions of applicable State and Federal laws.

Inquiries regarding the University's nondiscrimination policies may be directed to the Affirmative Action/Staff Personnel Services Director, University of California, Agriculture and Natural Resources, 300 Lakeside Drive, 6th Floor, Oakland, CA 94612-3550, (510) 987-0096.

MONTEREY COUNTY

Crop Notes

July/Augut, 2006

To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products which are not mentioned.

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