Cooperative Extension • Monterey County

Crop Notes

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In This Issue:

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2005 DRY BULB ONION WEED CONTROL STUDIES

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Objective: To evaluate various postemergence and layby weed control materials on weed control and yield of dry bulb onions

Summary: There was substantial weed pressure in trial 1. Preemergence applications alone (Dacthal, low rates of Chateau and Goal Tender) reduced weeds by 80% while combinations of preemergence plus postemergence applications reduced weeds generally by 95%. Ultra low rates of Chateau continued to look promising in terms of safety and weed control. We did not see a yield advantage of applications of Goal Tender over Goal 2XL this year as we have seen in the previous two years. There was a trend that indicated that at equivalent rates of Goal Tender, applications made at the 1st true leaf had improved weed control over applications made at the 2nd true leaf stage as well as reductions in the time required per acre to weed. Layby applications of Dual Magnum and Outlook improved control of nutsedge. A commercial application of Chateau at the second true leaf stage appeared to reduce the yield of onions as compared to the standard application of 1 pt/A of Goal 2XL. Flumioxazin (same active ingredient as Chateau) impregnated on fertilizer and applied at the 2nd true leaf reduced the stand of onions in trial 1 but not trial 3.

Methods: ***Trial No. 1:*** The plot was conducted in collaboration with Jerry Rava and Bob Martin, Growers, and Chris Headley of Western Farm Service on the Maggio Ranch Block south of King City. Post plant preemergence applications were made on March 29, 2005. First true leaf applications were made on April 22 and second true leaf applications were made on April 29. All plots were weeded on May 3 and layby applications made (4th true leaf stage). All application were made with a CO_2 backpack sprayer using two passes of a one nozzle wand with an 8008E tip pressurized at 30 psi applying 72 gallons per acre of water. Harvest was conducted on September 29 by harvesting all bulbs in an 8 foot long strip from the middle of each plot. Each plot was one 40-inch bed wide by 20 feet long and replicated four times in a randomized complete block design. ***Trial No. 2:*** The plot was conducted in collaboration with Bob Martin, Growers, and Paul Anthony of ICMCI on the Doud Ranch off Spreckles Rd. in King City. Postemergence (2nd true leaf) applications were made with a commercial rig to eight beds on one side of the field on May 4, 2005. The rig applied one ounce of Chateau (0.063 lb a.i./A) with 0.25% X-77 spreader sticker. This treatment was compared with the grower standard of 1.0 pint/A of Goal 2XL. No weed evaluations were conducted, but harvest evaluations were conducted on September 29 by harvesting 10 foot strips (5 reps) from the Chateau and Goal 2XL treated areas. ***Trial No. 3:*** The plot was conducted in collaboration with Bob Martin, Growers, and Paul Anthony of ICMCI on the Doud Ranch off Spreckles Rd. in King City. A postemergence (2nd true leaf) application of 0.13 lb a.i./A flumioxazin impregnated on 20-20-20 fertilizer at the rate of 260 lbs/A was made to a ten beds by 200 feet area on May 4. No weed evaluations were conducted, but harvest evaluations were conducted on September 29 by harvesting 10 foot strips (5 reps) from the flumioxazin on fertilizer and adjacent Goal 2XL treated areas (1.0 pint/A) on September 29.

Results: ***Trial No. 1.*** There was substantial weed pressure at this site because it had been abandoned for a number of years. The untreated control had 81.8 weeds per 20 ft^2 at the post 2nd true leaf evaluation date (Table 1). Dacthal alone reduced the number of weeds to 19.3, Chateau at 0.004 lb a.i./A to 14.8 and Goal Tender alone (applied at the first true leaf stage) to 14.3 weeds per 20 ft^2. All combinations of Dacthal plus Goal 2XL or Goal Tender generally reduced numbers of weeds to less than 5.0 per 20 ft^2. In situations where the number of weeds was higher it was due to the spotty nature of the shepherd's purse population and the weakness of Goal on this weed. Matran was weak on other weeds as well and had 50 weeds 20 ft^2. At the post 4th true leaf evaluation, the layby applications of flumioxazin on fertilizer, Dual Magnum and Outlook gave improved weed control over most of the treatments that did not receive layby applications (Table 2). Dual Magnum and Outlook had zero nutsedge. The nutsedge population was spotty in the plots which made obtaining statistical differences among the plots difficult, but the

(Cont'd to page 3)

IDENTIFYING DISEASES OF RADICCHIO

Steven T. Koike
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Radicchio or red chicory (*Cichorium intybus*) is one of many specialty leafy vegetable crops grown in the Salinas Valley. In 2004 in Monterey County, approximately 2,100 acres were produced having a value of over $9.4 million. Radicchio is typically a dark red to red green chicory that is field grown (in contrast to witloof chicory that is forced in dark, indoor incubation conditions) and forms rosettes that later develop into enclosed heads. Some types grow more like romaine lettuce and have an open architecture. Radicchio grown on the central coast is subject to several disease and physiological problems.

Radicchio is subject to several diseases and problems.

Alternaria leaf spot: Symptoms consist of circular to oblong, tan to light brown, necrotic spots ranging in diameter from 1/4 to 1/2 inch. Such spots usually contain alternating, concentric zones of lighter and darker tissue. The pathogen is *Alternaria cichorii*. The fungus sporulates on the leaf spots, so a dark green growth may be seen in the center of spots.

Powdery mildew: Powdery mildew forms the familiar white mycelium and conidia on both sides of radicchio leaves. This disease causes slight twisting of foliage and results in quality loss of the harvested product. Diseased leaves must be trimmed off the plant at harvest. The pathogen is *Golovinomyces cichoracearum* (previously named *Erysiphe cichoracearum*).

Tipburn: Tipburn is a physiological disorder of leafy vegetables caused by an imbalance of calcium in leaf tissue. Symptoms on radicchio occur on the margins of developing leaves and consist of light to dark brown speckling, lesions, and necrosis. In severe cases, tipburn can result in extensive damage to these leaf margins. Secondary decay organisms can subsequently turn tipburn into a soft rot. Symptomatic leaves are usually found within the inner whorls of radicchio heads. Calcium deficiency occurs when conditions cause plants to grow rapidly. This radicchio problem is similar to tipburn in lettuce and spinach, and blackheart of celery.

Tomato spotted wilt: On radicchio, the *Tomato spotted wilt virus* (TSWV) causes chlorotic spots, streaks, mottles, and other symptoms on leaves. These yellow discolorations can be quite striking. If radicchio is infected when young, the plants can be stunted and leaves are deformed and twisted. TSWV is vectored by thrips. In recent years, serious outbreaks of this virus have occurred in central coast plantings. Such outbreaks have at times resulted in 50 to 75% crop loss.

White mold: In coastal California, *Sclerotinia minor* is the main *Sclerotinia* species infecting this crop. Radicchio nearing maturity will wilt and collapse. Crown tissues become necrotic and develop a soft rot. White mycelium and small black sclerotia form on infected tissues. The pathogen is *Sclerotinia minor*. Isolates of this pathogen are able to infect both lettuce and radicchio. *Sclerotinia sclerotiorum* can also infect these plants but is infrequently found in the Salinas Valley.

Sclerotinia can infect both radicchio and lettuce.

Bacterial leaf spot of Italian dandelion: "Italian dandelion" is also a chicory (*Cichorium intybus*) plant. Italian dandelion does not form a head, but rather grows long, upright, loose foliage that superficially looks similar to true dandelion (*Taraxacum officinale*). Early symptoms of bacterial leaf spot are angular, vein delimited, dark, water-soaked leaf spots that measure 1/8 to 1/4 inch in diameter. As disease develops, spots retain the angular edges but exhibit various irregular shapes. Spots commonly form along the edges of the leaves; in some cases these spots develop into long lesions that extend along the margin of much of the leaf. Spots are visible from both top and bottom leaf sides and at maturity are dull black in color. The pathogen is *Pseudomonas syringae*.

Tomato spotted wilt virus on radicchio.

***Sclerotinia minor* infecting radicchio.**

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Dual Magnum and Outlook treatments look promising for control of this weed. The yield of the onions was high this year (Table 3). There was no difference in the yield between Goal Tender and Goal 2XL when applied at the 1st true leaf stage as was seen in 2003 and 2004. The biggest impact on yield was observed in the flumioxazin on fertilizer which reduced the number of plants per acre. All other treatments had equivalent yields. ***Trial No. 2.*** Chateau reduced the tonnage and mean bulb weight in comparison with Goal 2XL (Table 4). In addition, we did not rate weeds in the plot, but observationally, there was more malva in the Chateau treatment. ***Trial No. 3.*** No observations were made on weed control. There was not reduction in bulbs per acre in the flumioxazin treatment in this trial as was observed in Trial No. 1.

Acknowledgements: We would like to thank Jerry Rava and Bob Martin (Growers), Chris Headley (Western Farm Service) and Paul Anthony (ICMCI) for their cooperation in conducting these trials.

Preemergence applications alone (Dacthal, low rates of Chateau and Goal Tender) reduced weeds by 80% while combinations of preemergence plus postemergence applications reduced weeds generally by 95%.

There was a trend that indicated that at equivalent rates of Goal Tender, applications made at the 1st true leaf had improved weed control over applications made at the 2nd true leaf stage

Table 1. Trial 1. Post 2nd true leaf application evaluation: Weed (no./20 ft^2), phytotoxicity and time of weed time evaluations on May 3, 2005

Treatment	a.i./A lbs	Application[1]	Chenopod	Nutsedge	Shepherds Purse	Night shade	Knot weed	Malva	Other weeds	Total weeds	Phyto[1]	Time to weed Hrs/A
Untreated	----	----	39.5	1.0	13.5	5.8	3.8	2.0	4.0	81.8	0.0	20.7
Dacthal W 75	8.0	Pre	0.0	3.5	10.8	0.0	0.0	2.0	3.0	19.3	0.0	5.8
Chateau 51 WD	0.004	Pre	4.0	1.5	0.3	0.5	2.8	1.3	3.0	14.8	0.0	4.3
Chateau 51 WD	0.008	Pre	0.5	4.0	0.3	0.0	1.8	0.0	0.5	7.3	0.0	3.3
Dacthal W 75 + Goal 2XL	8.0 + 0.125	Pre Post 1 t. leaf	0.0	1.3	0.0	0.0	0.0	0.0	0.5	1.8	2.8	2.4
Dacthal W 75 + Goal 2XL	8.0 + 0.125	Pre Post 2 t. leaf	0.3	2.0	3.5	0.0	0.0	0.0	0.5	6.3	1.8	3.3
Dacthal W 75 + Goal 2XL	8.0 + 0.25	Pre Post 2 t. leaf	0.0	0.0	6.0	0.0	0.0	0.0	0.0	6.0	2.0	3.0
Dacthal W 75 + Goal Tender 4F	8.0 + 0.125	Pre Post 1 t. leaf	0.0	2.8	0.8	0.0	0.0	0.0	0.0	3.5	2.5	2.4
Goal Tender 4F	0.125	Post 1 t. leaf	7.8	1.8	0.3	0.0	3.8	0.0	0.8	14.3	2.3	5.4
Dacthal W 75 + Goal Tender 4F	8.0 + 0.188	Pre Post 1 t. leaf	0.0	1.5	1.0	0.0	0.0	0.0	1.0	3.5	3.0	2.5
Dacthal W 75 + Goal Tender 4F	8.0 + 0.125	Pre Post 2 t. leaf	0.3	1.8	5.8	0.0	0.3	0.0	2.0	10.0	1.3	4.1
Dacthal W 75 + Goal Tender 4F	8.0 + 0.25	Pre Post 2 t. leaf	1.5	0.5	15.0	0.0	0.5	0.0	1.5	19.5	1.3	2.6
Matran	20%	Post 2 t. leaf	19.5	0.0	11.5	11.0	2.0	0.0	6.0	50.0	0.5	14.3
Dacthal W 75 + Goal 2XL + flumioxazin[2]	8.0 + 0.25 + 0.063	Pre Post 2 t. leaf Post 4 t. leaf	0.3	0.8	1.5	0.0	0.0	0.0	0.8	3.3	2.8	3.3
Dacthal W 75 + Goal 2XL + Dual Magnum 7.63	8.0 + 0.25 + 1.5	Pre Post 2 t. leaf Post 4 t. leaf	0.0	1.8	0.8	0.0	0.0	0.0	0.0	2.5	3.5	3.2
Dacthal W 75 + Goal 2XL + Outlook 6	8.0 + 0.25 + 0.66	Pre Post 2 t. leaf Post 4 t. leaf	0.3	1.3	1.8	0.3	0.0	0.0	0.3	3.8	2.8	2.9
LSD (0.05)	----	----	8.7	2.6	6.5	6.2	1.7	1.0	3.7	13.0	0.6	3.0

1 – Scale: 0 = no damage to 10 = crop dead; 2 - impregnated on fertilizer (0.125 lb a.i./250 lbs fertilizer)

(Cont'd to page 9)

Phosphorus Fertilizer Evaluations on Head Lettuce in the Salinas Valley

University of California Cooperative Extension, Monterey County
Richard Smith, Tiffany Bensen, Husein Ajwa and Susanne Klose

Background: Concerns about soil phosphorus (P) levels came to the attention of the agri cultural industry in the Salinas Valley about five years ago as the Regional Water Quality Control Boards began to discuss enforcement of Total Maximum Daily Load (TMDL) levels of waters coming from agricultural fields. Through careful fertilization of the crops in the Salinas Valley we have unwittingly built up phosphorus levels in valley soils (see Table 1). The common P levels found in Salinas Valley soils can lead to elevated levels of phosphorus in drainage waters, side creeks, and ultimately, the Salinas River. High P levels in these surface waters can stimulate excessive algal growth that can reduce oxygen levels in the water and impact water quality.

Background: Concerns about soil phosphorus (P) levels came to the attention of the agricultural industry in the Salinas Valley about five years ago as the Regional Water Quality Control Boards began to discuss enforcement of Total Maximum Daily Load (TMDL) levels of waters coming from agricultural fields.

Phosphorus is a critical element for plant growth. It has complex soil chemistry and its availability is related to soil temperature, 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. In general phosphorus is tightly bound in the soil, but if the secondary minerals become overloaded with phosphorus, it can leach deeper into the soil profile where it is captured by drain tiles. Phosphorus is also moved from agricultural fields on sediments in runoff.

Soil tests provide the best measure of available P for crop growth. Recommended soil levels for cool season vegetables were in the range of 35 to 40 ppm bicarbonate extractable P (Olsen test). Salinas Valley soils are often above this range (Table 2). In trials conducted in 2002-2003 on 12 Salinas Valley fields by Dr. Tim Hartz, Extension Vegetable Specialist only one site showed an increase in yield from P fertilization. Extractable P at this site was 54 ppm and the lettuce was produced in the early part of the production season when the soils were cold, a time when soil P is less available for crop growth. This study indicates that there may be a need for P fertilization on sites <55 ppm Olsen-extractable P in the winter, but that P fertilization of soils above this level, especially in the warm part of the season is not likely to improve lettuce yields.

Soil tests provide the best measure of available P for crop growth.

Over the past two years we conducted four field trials on P fertilization of head lettuce. We examined P fertilizer types and application timing. This article summarizes the results of these studies.

Summary of Results: Four phosphorus fertilizer trials were conducted in 2004 to 2005 on sites that had varied soil P levels and planting date. No yield advantage was seen at three sites with initial soil P levels of 45, 47 and 68 ppm bicarbonate P. The site with 45 ppm P in the soil was planted on June 3 and indicates that this level of P is sufficient when the soils are warm. The sites with 47 and 68 ppm P were planted on January 20 and April 18 when the soils were cool, but no improvement in yield was observed at these sites. One test was conducted at a site with soil P levels of 30 ppm. This site probably had low soil P levels because it had just been reclaimed from the Salinas river bed. This trial provided significant insights into P fertilization. We observed a (marginally significant) yield response to P applied at low amounts (20 lb P_2O_5) at planting (Table 3). Actually this yield response was better than the higher rate of P (60 lbs P_2O_5) applied preplant. This observation is useful because it shows that we can optimize yields in the situation 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 ppm of P_2O_5 is equivalent to 9 lbs of P (actual P = P_2O_5 x 0.437). By applying rates of P that are close to what is being removed in the harvested portion of the crop (see Table 3 for estimates of P removed by the harvest portion of a crop), 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 applications of phosphoric acid used as an anticrustant which these studies indicate are sufficient to maximize the yield of lettuce.

Recommendations: Fertilization of head lettuce with P can be justified on sites with less than 55 ppm soil P in the winter. Once soils warm in the late spring, however, these sites 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.

Background on the trial sites: ***Trial No. 1:*** The trial was conducted on a Chualar loamy sand with 47 ppm soil P and 7.7 pH. Dry preplant materials were applied on December 9 with a small-plot experimental applicator and liquid preplant materials were applied with a commercial rig on December 11, 2003. The head lettuce variety Sniper was planted on January

(Cont'd to page 5)

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One test was conducted at a site with soil P levels of 30 ppm.

We observed a (marginally significant) yield response to P applied at low amounts (20 lb P_2O_5) at planting

By applying rates of P that are close to what is being removed in the harvested portion of the crop.

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20, 2004. The banded P treatment was applied on January 21 and the first germination water was applied on January 23. The field was sprinkler irrigated throughout the season, and the plots were harvested on April 30, 2004. ***Trial No. 2:*** The trial was conducted on Chualar loamy sand with 68 ppm soil P and 7.3 pH. 300 lbs of 0-0-50 was applied in the fall at listing. Preplant P applications were shanked into the beds on March 21, 2005 with a small-plot experimental applicator. The variety Sniper was seeded on April 18. All at-planting treatments applied as two 5-inch wide bands over each seedline immediately after planting. The field was switched to drip irrigation on May 30, and the plots were harvested on June 28. ***Trial No. 3:*** The trial was conducted on Metz loamy sand with 30 ppm soil P and 7.3 pH. The preplant treatment P of 400 lbs of 15-15-15 was applied at listing on April 25. All at-planting treatments were sprayed onto shaped beds prior to planting on April 29 on two 5-inch wide bands over the seedlines. The head-lettuce Sniper was sprinkler irrigated until thinning and then switched to drip irrigation in early June. The plots were harvested on July 6. Table 3 gives results for tissue analyses at mid-stage and harvest. ***Trial No. 4:*** The trial was conducted on Chualar loamy sand with 45 ppm soil P. Preplant P treatments were shanked into the beds on May 31 with a small-plot experimental applicator. The variety Sniper was seeded on June 2 and at-planting treatments were applied as two 5-inch wide bands over each seedline immediately after planting. The field was sprinkler irrigated until thinning and switched to drip irrigation on July 7. The field was harvested by a commercial crew on August 5.

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

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. Trial No. 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[2]	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*

THE USE OF THE NOVEL INSECTICIDES ESTEEM, OBERON AND PREVAM FOR THE CONTROL OF GREENHOUSE WHITEFLY, *TRIALEURODES VAPORARIORUM*, IN STRAWBERRIES

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

Introduction: Greenhouse whitefly, *Trialeurodes vaporariorum*, has been a serious pest of strawberries in recent years in the Monterey Bay strawberry growing region. Feeding of whiteflies weakens plants, deposits honeydew on leaves and fruits and has additionally been implicated in the dispersal of several viruses in strawberries.

Although there are many pest control materials registered for the control of greenhouse whiteflies, a number of them have become ineffective at least in some areas of the Monterey Bay production area. Several more effective materials have long pre-harvest intervals, making their use economically difficult to justify.

This trial was designed to test the efficacy of the newer insecticides Esteem, Oberon and Prevam in controlling greenhouse whitefly in strawberries grown on the Central Coast of California.

Materials and Methods: The trial was done as a randomized complete block design of four replicates of three 30 foot long by 4 foot wide beds per treatment on PS592 variety strawberries in a field in Salinas, California.

Application: An application of all materials and mixes was made on August 11, 2005. Subsequent applications of certain materials were made on August 21, August 31 and September 9, 2005. See Table 1 below for timing of each pesticide treatment.

Experimental applications were made at the rate of water carrier of 150 gallons per acre at 150 psi pressure. Applications were made with a motorized backpack sprayer with a hand held boom consisting of 10 8001 flat fan nozzles.

Although there are many pest control materials registered for the control of greenhouse whiteflies, a number of them have become ineffective at least in some areas of the Monterey Bay production area.

Table 1. Treatments, Rates and Timing

Product [1,2]	Rate (Product / Acre)	No. of Appls.	Application Interval
1. PrevAm	0.4 % v/v (= 51.2 ozs. / 100 gals)	3	10 days
2. Esteem 0.86EC	10 fl ozs / acre	2	30 days
3. PrevAm + Esteem 0.86EC (tank-mix)	0.4 % v/v (= 51.2 ozs. / 100 gals) + 10 fl ozs / acre	2	30 days
4. Oberon	16 fl ozs / acre	2	30 days
5. PrevAm + Oberon (tank-mix)	0.4 % v/v (= 51.2 ozs. / 100 gals) + 16 fl ozs / acre	2	30 days
6. Brigade WSB	32 ozs / acre	2	10 days
7. Pyganic 1.4EC	64 fl ozs / acre	3	10 days
8. UTC (untreated control)	-----	-----	-----

This trial was designed to test the efficacy of the newer insecticides Esteem, Oberon and Prevam in controlling greenhouse whitefly in strawberries grown on the Central Coast of California.

Evaluation: Counts of adult whitefly were made by randomly sampling and turning over, without detaching from the plant, 40 medium-aged strawberry leaflets per replicate plot and counting the number of adults present. Adult whitefly counts were be made from all of the treatments at the following intervals: 0-day (just prior to first application), 1-day after each application, and 10-days and 20-days following the final application of treatments 2 and 3.

In addition to the adult counts, separate counts of whitefly eggs and whitefly nymphs were made using a random sample of at least 10 medium-aged leaflets per replicate plot, taken at each evaluation interval specified above for the adult evaluations.

Results are displayed graphically below. Additionally, 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.

Conclusion: Treatments of Prevam and Brigade limited numbers of whitefly eggs, nymphs and adults to levels significantly lower than the untreated control on many evaluation dates. Esteem and Oberon mixed with either Prevam or Kinetic gave exceptional control, with consistent and significant control over other treatments of whitefly eggs, nymphs and adults over the course of the study.

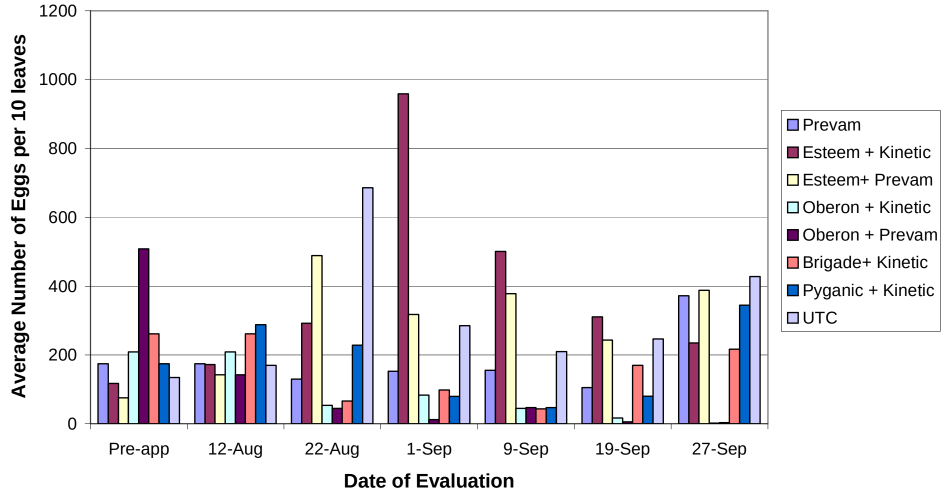
(Cont'd to page 7)

(Cont'd from page 6)

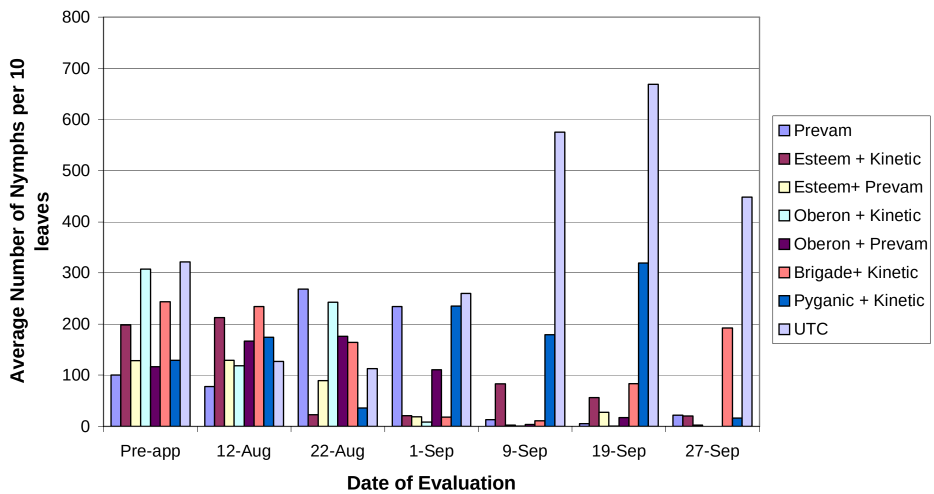
Treatments of Prevam and Brigade limited numbers of whitefly eggs, nymphs and adults to levels significantly lower than the untreated control on many evaluation dates.

For more information on this, or other, strawberry issues, contact Mark Bolda at 731.763.8040 or Steven Koike at 831.759.7350.

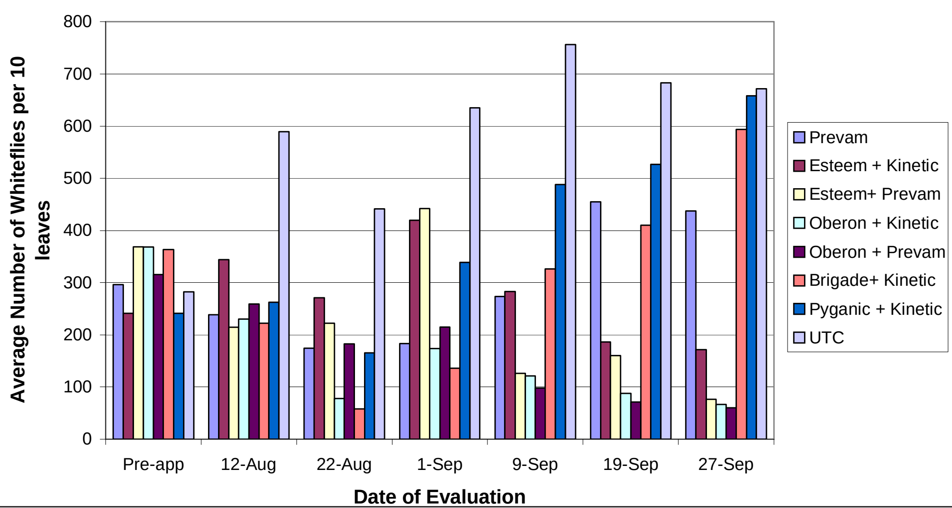
Control of Greenhouse Whitefly Eggs with Novel Compounds and Mixes



Control of Greenhouse Whitefly Nymphs with Novel Compounds and Mixes



Control of Greenhouse Whitefly Adults with Novel Compounds and Mixes



Leaf Spot Diseases on Strawberry Grown on the Central Coast of California

Mark Bolda, Farm Advisor, Strawberries and Caneberries
Steve Koike, Plant Pathology Farm Advisor

Strawberries grown on the Central Coast of California are subject to several foliar pathogens that typically cause some sort of leaf spot symptom. All of the leaf spot diseases are most commonly seen in the winter and early spring, since the establishment and spread of the pathogens are dependent on moisture and splashing water from rainfall or sprinkler irrigation. By the middle of the production season, these foliar problems are usually no longer present. While most of these leaf spot diseases are fairly minor in importance, it is useful for growers and field personnel to recognize these diseases and the associated symptoms.

Angular leaf spot: Angular leaf spot is caused by the bacterium *Xanthomonas fragariae*. This leaf spot is marked by the formation of small water soaked spots which grow and merge into larger lesions that are delimited by leaf veins, hence this name of angular leaf spot. Oftentimes observers will describe a sticky, honey colored exudate on and around the lesions; this exudate is the bacterial pathogen that has oozed out of the leaf and onto the leaf surface . *X. fragariae* is found on transplants or can survive in the soil on previously infested strawberry matter. *X. fragariae* is active when daytime weather conditions are cool and moist. The disease can be especially severe if there is rainy weather followed by cold nights near freezing. Some partial control of angular leaf spot can be achieved with copper fungicides ; however, this treatment is not recommended because many varieties of strawberry are sensitive to copper and may be damaged by the sprays. Growers should strive to obtain clean plant material from the nursery, and plant into soil that is free of *X. fragariae* infested plant residues.

Irregular Leaf Spot or Anthracnose: Perhaps best known for anthracnose crown and fruit rot, the fungal pathogen *Colletotrichum acutatum* can also cause a leaf spot disease called irregular leaf spot. These irregularly shaped spots are black to dark brown to gray, and mainly form on the margins of leaflets. The pathogen may form fruiting bodies in these spots. Infected leaflets can then serve as inoculum sources for later outbreaks of anthracnose flower blight and fruit rot, especially during rainy times of the year. Growers should try to obtain clean nursery plant stock and apply registered fungicides as needed.

Picture 1 (Column 1) - Straw Xanthomonas 5a: Angular leaf spot makes small, water soaked, angular lesions.

Common Leaf Spot: Probably the most prevalent fungal leaf spot disease is common leaf spot caused by *Ramularia tulasnei*. Frequently found early in the season, affected areas will first appear as small purple spots on the leaf, which later expand into tan to brown circular spots having purple margins . Fungal fruiting bodies are rarely seen on production strawberry foliage. *Ramularia* may come from the plant nursery or from the soil if diseased crop residues are present. Since the pathogen is spread by splashing water, we see much more of this disease in the winter and early spring. Field fumigation will destroy most of the inoculum from the soil, while the selection of clean nursery stock will limit the other inoculum source. This disease is ordinarily not damaging enough to merit fungicide applications.

Picture 2 - (Column 2 - Paragraph 1) Straw leaf spot 6: Common leaf spot causes circular spots with purple margins.

Leaf blotch: Over the past three years, leaf blotch caused by *Zythia fragariae* has been commonly identified in grower fields (see the January/February 2006 issue of <u>Crop Notes</u>). This disease has not been restricted to any one variety. Symptoms consist of tan to grey lesions expanding from the leaf margins on the first few leaves of the new plant. The presence of very small black to brown fruiting bodies inside the lesions is an important sign of this disease. As with the other pathogens described in this report, *Z. fragariae* is dependent on splashing water for spread of inoculum, and the disease is therefore much more common in the winter and early spring. This pathogen survives on strawberry residue in the soil, and most likely will not persist in the absence of this residue. Strawberry plants grow out of this disease when the winter rains stop, so fungicide applications are not recommended.

For assistance in diagnosing the various foliar problems of strawberry, contact Mark Bolda or Steve Koike with UC Cooperative Extension. 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.

Picture 3 - (Column 2 - Paragraph 2) Straw Zythia b: The leaf blotch pathogen makes very small, black fruiting bodies in the leaf blotches.

(Cont'd from page 3)

Layby applications of Dual Magnum and Outlook improved control of nutsedge.

Table 2. Trial 1. Post 4th true leaf application evaluation: Weed (no./20 ft^2) on June 17, 2005

Treatment	a.i./A lbs	Application[1]	Purselane	Chenopod	Nutsedge	Other weeds	Total weeds
Untreated	----	----	2.0	2.3	2.3	1.0	7.5
Dacthal W 75	8.0	Pre	1.5	1.8	3.8	1.3	8.3
Chateau 51 WD	0.004	Pre	0.8	1.3	2.8	3.0	7.8
Chateau 51 WD	0.008	Pre	1.5	0.5	3.5	1.8	7.3
Dacthal W 75 + Goal 2XL	8.0 + 0.125	Pre Post 1 t. leaf	0.5	1.5	2.8	0.5	5.3
Dacthal W 75 + Goal 2XL	8.0 + 0.125	Pre Post 2 t. leaf	0.0	1.3	3.3	0.5	5.0
Dacthal W 75 + Goal Tender 4F	8.0 + 0.125	Pre Post 1 t. leaf	0.3	2.3	3.8	1.5	7.8
Goal Tender 4F	0.125	Post 1 t. leaf	0.5	1.0	1.0	2.3	4.8
Dacthal W 75 + Goal Tender 4F	8.0 + 0.125	Pre Post 2 t. leaf	1.0	1.8	0.5	1.0	4.3
Dacthal W 75 + Goal 2XL + flumioxazin[1]	8.0 + 0.25 + 0.063	Pre Post 2 t. leaf Post 4 t. leaf	0.0	0.0	0.8	0.0	0.8
Dacthal W 75 + Goal 2XL + Dual Magnum 7.63	8.0 + 0.25 + 1.5	Pre Post 2 t. leaf Post 4 t. leaf	0.0	0.0	0.0	0.0	0.0
Dacthal W 75 + Goal 2XL + Outlook 6	8.0 + 0.25 + 0.66	Pre Post 2 t. leaf Post 4 t. leaf	0.0	0.0	0.0	0.0	0.0
LSD (0.05)	----	----	1.7	ns	3.4	1.5	4.7

1 – impregnated on fertilizer (0.125 lb a.i./250 lbs fertilizer)

For more information on this weed study, or other weed questions, contact Richard Smith at 831.759.7350.

Table 3. Trial 1. Yield evaluation on September 29.

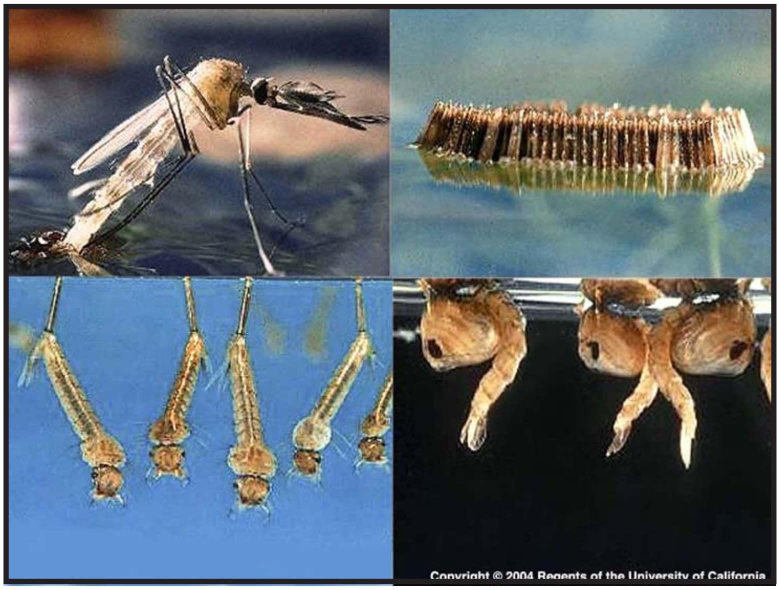
Treatment	**a.i./A lbs**	**Application[1]**	**Yield Tons/A**	**Yield Bulbs/A**	**Mean Bulb wt (lbs)**
Untreated	----	----	64.3	139,804	0.92
Dacthal W 75	8.0	Pre	64.3	139,804	0.92
Chateau 51 WD	0.004	Pre	63.9	138,169	0.92
Chateau 51 WD	0.008	Pre	63.4	134,898	0.94
Dacthal W 75 + Goal 2XL	8.0 + 0.125	Pre Post 1 t. leaf	60.6	134,081	0.90
Dacthal W 75 + Goal 2XL	8.0 + 0.125	Pre Post 2 t. leaf	62.7	131,628	0.95
Dacthal W 75 + Goal 2XL	8.0 + 0.25	Pre Post 2 t. leaf	62.5	132,445	0.95
Dacthal W 75 + Goal Tender 4F	8.0 + 0.125	Pre Post 1 t. leaf	61.3	130,810	0.95
Goal Tender 4F	0.125	Post 1 t. leaf	64.1	139,395	0.92
Dacthal W 75 + Goal Tender 4F	8.0 + 0.188	Pre Post 1 t. leaf	64.2	140,075	0.94
Dacthal W 75 + Goal Tender 4F	8.0 + 0.125	Pre Post 2 t. leaf	62.9	130,402	0.97
Dacthal W 75 + Goal Tender 4F	8.0 + 0.25	Pre Post 2 t. leaf	63.7	137,895	0.92
Matran	20%	Post 2 t. leaf	63.0	134,625	0.92
Dacthal W 75 + Goal 2XL + flumioxazin[1]	8.0 + 0.25 + 0.063	Pre Post 2 t. leaf Post 4 t. leaf	60.6	121,408	1.01
Dacthal W 75 + Goal 2XL + Dual Magnum 7.63	8.0 + 0.25 + 1.5	Pre Post 2 t. leaf Post 4 t. leaf	60.0	129,584	0.93
Dacthal W 75 + Goal 2XL + Outlook 6	8.0 + 0.25 + 0.66	Pre Post 2 t. leaf Post 4 t. leaf	59.1	132,037	0.90
LSD (0.05)	----	----	*NS*	*10,350*	*NS*

1 – Impregnated on fertilizer (0.125 lb a.i./250 lbs fertilizer)

(Cont'd to page 11)

MOSQUITOES ARRIVING EARLY THIS YEAR

Standing water from winter storms, warmer temperatures, and longer daylight hours mean that mosquito season, and with it the West Nile virus (WNV), is arriving earlier this year. Culex mosquitoes, the principal carriers or vectors of WNV, are usually the most active in California from April through October but the unseasonable springlike weather awakens them like an alarm clock from their winter semi-hibernation, according to Greg Lanzaro, director of the UC Mosquito Research Program and director of the Center for Vectorborne Diseases.



The mosquito has four life cycle stages: (top, from left) adult and eggs and (bottom, from left) larvae and pupae. Three of the stages, eggs, pupae and larvae, are aquatic. (UC Agriculture and Natural Resources Photo)

“The mosquitoes that were infected with WNV before they went into their semi-hibernation or diapause, still have the virus. They’re loaded and ready to go,” said Lanzaro. The disease, transmitted by the bite of an infected mosquito, last year killed 18 people in California and infected more than 900 others throughout the state. Health officials found WNV in all 58 counties.

The disease, transmitted by the bite of an infected mosquito, last year killed 18 people in California and infected more than 900 others throughout the state. Health officials found WNV in all 58 counties.

Last year’s WNV outbreak in California was not an isolated case, said Robert Washino, chair of the Department of Entomology and a 32-year member of the Sacramento-Yolo Mosquito Vector Control District Board. “It’s a preview of what’s to come unless we take proactive actions. This year we’re heading for a very high mosquito population.”

For a full press release with mitigation and control measures, visit the Mosquito Research Program’s Web site, http://www.ucmrp.ucdavis.edu, and look under the “News” section.

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(Cont'd from page 9)

Table 4: Yield of onions in trials 2 and 3 on September 29.

Treatments	Lbs active ingredient/A	Material/A	Mean Wt (Tons/A)	Mean # Bulbs/Acre	Mean Bulb Wt (lbs)
Trial No. 2					
Goal 2XL	0.25	1.0 pint	55.6	141,287	0.788
Chateau X-77	0.063 0.25% v/v	1.0 oz	50.2	134,484	0.748
LSD (α=0.05)			*3.2*	*NS*	*0.036*
Trial No. 3					
Goal 2XL	0.25	1.0 pint	53.7	132,914	0.81
Flumioxazin on fertilizer (0.125 lb a.i./250 lbs fertilizer)	0.13	260 lbs	51.9	139,194	0.75
LSD (α=0.05)			*NS*	*NS*	*0.04*

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Larry Strand
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MONTEREY COUNTY

Crop Notes

March/April, 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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