UNIVERSITY of CALIFORNIA
Agriculture & Natural Resources
San Joaquin County

FIELD NOTES

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Bell and Specialty Pepper Variety Trial

Benny Fouche and Debra Boelk

A bell pepper and specialty pepper variety trial was conducted in 2006. Transplants were planted on May 8th. The soil type at the trial site was a Stockton adobe clay and the trial was drip irrigated throughout the season. The field variety was Baron. The crop stand was excellent with vigorous plant growth but an extended and very cool, wet spring and subsequent heat wave in early May and again in July caused some loss of fruit set and a delay in fruit maturity. The trial contained fifteen replicated bell pepper varieties in a randomized complete block and fifteen non-replicated specialty varieties. Hand harvest of the trial was on August 15, 2006, which may have been too early for some of the specialty peppers to put on the maximum amount of colored fruit, as their maturity dates varied widely. In addition to marketable red and green yield figures for bell peppers and colored and immature yield figures for specialty peppers, data on crop maturity, fruit size and wall thickness were taken.

In the trial, highest yield of red plus green marketable fruit was achieved by Syngenta's RPP 9661, followed by Double Up, Baron and RPP 9650 (Figure 1). Unfortunately, Syngenta has decided not to pursue release of 9650 and 9661. Best quality fruit, including blocky shape, and good fruit color and size (extra-large to large) was led by RPP 9650. RPP 9661 and Sakata's SPP 1103 also showed well in both size categories. Those peppers that prolifically produced large fruits, but were lagging in extra-large fruit production were Baron, Wizard, Excel, Affinity, Harris Moran's HMX 5634 and Seminis' PX9930413. Fruit size for most of the lines evaluated was predominately extra-large and large. There was a fair amount of fruit sunburn and some blossom end rot, but very little cat-faced fruit. There was virtually no worm damage in the trial, but stink bug damage was present. Very little of the fruit from any of the cultivars had Pepper Spot (STIP).

Along with standard bell pepper varieties, we evaluated the potential yields of 15 varieties of specialty peppers for direct market sales at farms and farmers markets. Many of the specialty types performed well in San Joaquin County, as can be seen from the yield data in Table 2. Yields would have been substantially higher for the spe-

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Figure 1. 2006 Bell Pepper Yield and Maturity

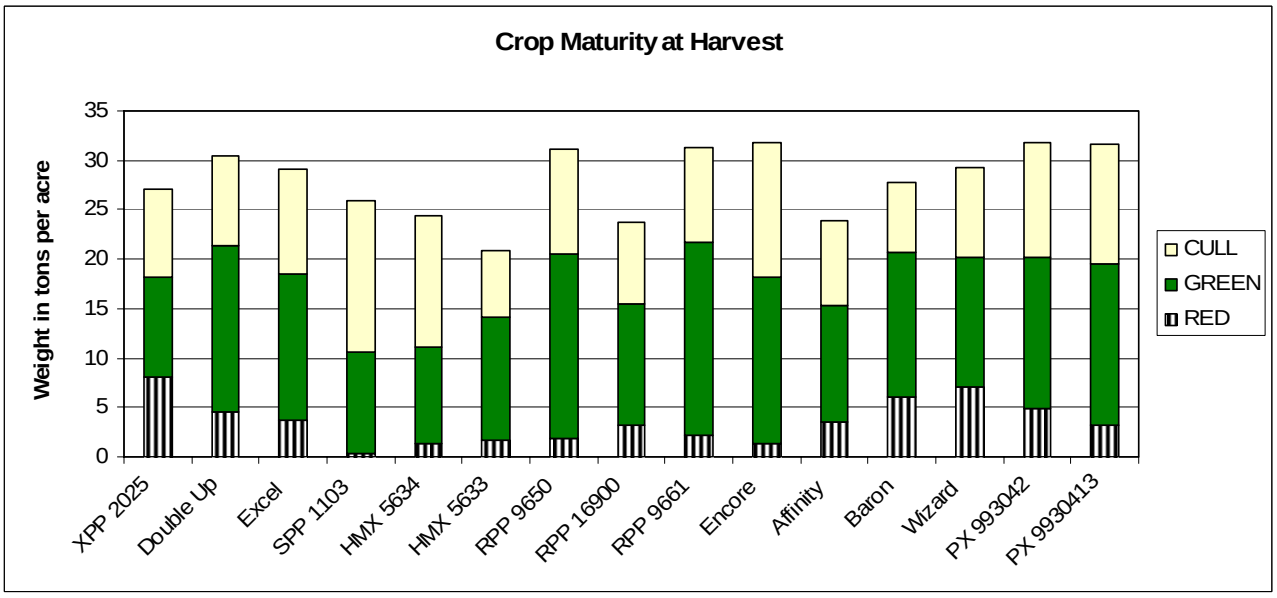
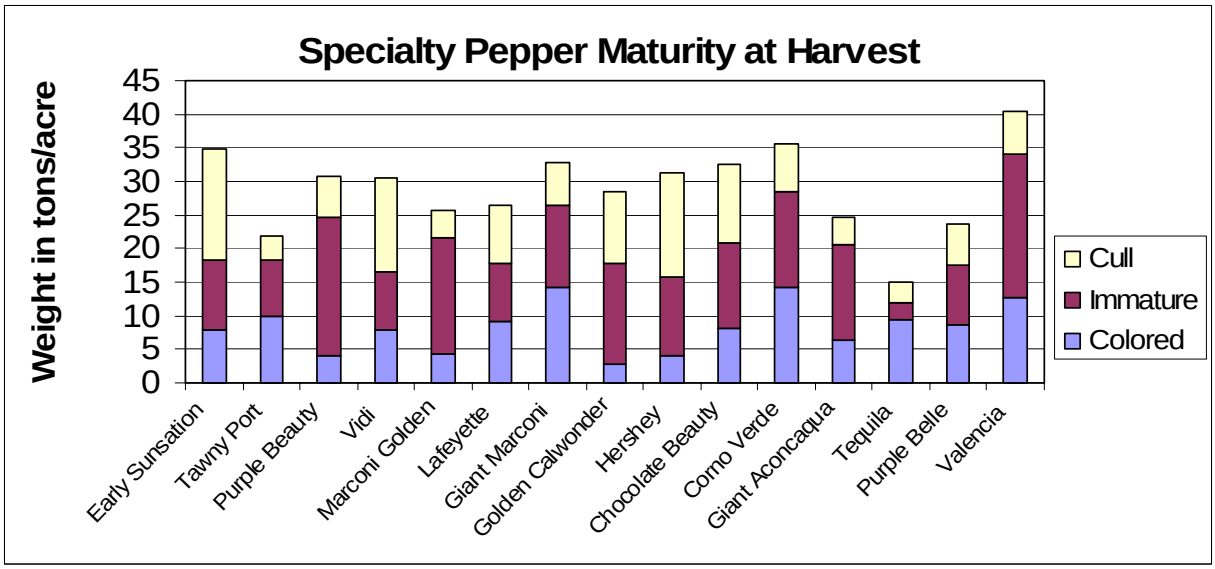


Figure 2. 2006 Specialty Pepper Yield and Maturity



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cialty types if we could have held the plants in the field longer for the multiple picking common for these types of cultivars. Due to the termination of irrigation for the bell type peppers in the growers field, we were limited to one harvest for the specialty types.

Acknowledgements: Many thanks and a great deal of appreciation are expressed to Larry Togninali (Togninali Farms) for an excellent job of crop management in a very difficult growing season. Also much appreciation is extended to Todd and Grant Craven of Craven Transplants near Crows Landing, California, for the excellent quality transplants of all varieties provided for the variety trial. Thanks also to Lockhart Seeds Inc. and Sakata Seeds for providing the raw materials and/or monetary assistance to support the bell pepper variety evaluation program in San Joaquin County. Seeds for the observational trial were obtained from Tomato Growers Supply Company at http://www.tomatogrowers.com.

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Fruit Crops: Preventing Food-Borne Illness

Joe Grant

Recent highly publicized outbreaks of food-borne illness from fresh fruits and vegetables serve to remind us that, though the vast majority of fresh produce is wholesome and free of microbial contamination that can cause illness, mistakes can occur and the consequences can be very serious. We are unlikely to have cattle or wild pigs roaming our orchards and contaminating cherries, apricots, peaches and other crops. But there are other avenues by which human pathogens can be introduced into orchards and end up on packed fruit. Chlorine and other disinfectants used to wash and cool fruit in packing sheds can help reduce this contamination and prevent fruit-to-fruit spread but can not completely eliminate it. There is really no substitute for prevention of contamination and this starts in the orchard:

- Manure used in orchards should be aged (six months or more) or composted. Apply manures in the fall to maximize the opportunity for potential human pathogens to be eliminated well before harvest the following season. Store manures as far away as practical from fields and orchards. Document your manure and compost handling practices and those of your supplier.

- Water used for spraying and irrigating can carry pathogens. Test and, if necessary, treat well and surface water used for these purposes to ensure they are free from coliform bacteria and other contaminants. Document your efforts.

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- Follow OSHA and CAL OSHA regulations for field sanitary facilities. Document your efforts to ensure field toilets are made available and are properly serviced and supplied.

- Train, supervise, and document your efforts to ensure proper personal hygiene practices and hand-washing (including soap, potable water, and single-service towels) among harvest workers.

- Pay attention to the health of pickers and fruit handlers. Workers with symptoms of nausea, diarrhea, vomiting or with open or infected wounds should not be involved in fruit harvest or handling. Insist that your labor contractor cooperate in being vigilant about the health of his workers.

- Clean and sanitize harvest tubs and bins and keep them free of dirt and debris.

- Regularly inspect trucks and trailers used to transport fruit to the packing shed for cleanliness.

- To the extent practical, take precautions to exclude wild animals, pets, and livestock from orchards, especially at harvest time.

More information on food microbial safety can be found in**:**

Food Safety Begins on the Farm (English and Spanish, (2004), Cornell Good Agricultural Practices Web site, http://www.gaps.cornell.edu

On-Farm Food Safety Self Audit and Resource CD ROM and other information, from University of California Cooperative Extension Good Agricultural Practices Web site, http://ucgaps.ucdavis.edu/.

Management Practices to Reduce Chlorpyrifos Found in Surface Waters

Terry Prichard

Chlorpyrifos (Lorsban, Lock-On) was by far the most frequently detected pesticide in excess of allowable levels in 2004 through 2006 in samples collected in the San Joaquin County and Delta Water Coalition Areas. Water samples were collected during the winter and summer in selected sub-watersheds. Among all 38 exceedances, 22 were chlorpyrifos.

These exceedances require the Coalition groups to prepare and implement management plans which will eliminate the exceedances so as to allow continued use of the pesticide. The plans include:

- Using pesticide use reports to connect the specific pesticide applications to the time and area of the exceedance.

- Using crop specific information on management practices to prevent future movement of the insecticide into waterways; this information is to be provided to growers in the area where exceedances occurred.

- Requirements that the Coalition group evaluate the effectiveness of management practices to achieve water quality objectives.

- Additional restrictions if exceedances are not controlled.

Pesticide reporting indicates near 61,000 pounds (active ingredient) of chlorpyrifos was used in 2000 in San Joaquin County. Figure 1 shows the bulk of the applications

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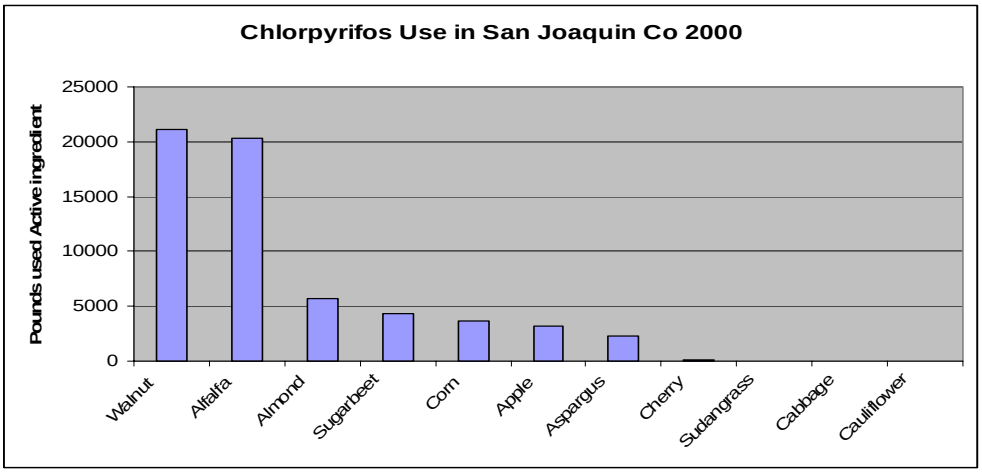

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take place in alfalfa (weevil and worms) and walnut (codling moth).

Chlorpyrifos moves easily in water; it does not have a high affinity for plant or soil particles. It also has long residual activity– good for pest control but bad for runoff potential. Irrigation runoff collected from alfalfa fields found chlorpyrifos exceeding the water quality standard up to two months after application.

Management practices to reduce the chance of chlorpyrifos runoff when used for weevil control in alfalfa were presented in the February addition of this newsletter.

Chlorpyrifos applications in walnut begin in May and can continue through August. Any irrigation runoff during this time period can cause clorpyrifos to enter surface water sources.

Management practices are divided into three categories:

Use of alternative materials (e.g. mating disruption, insect growth regulators and other non-organophosphates): Subject of future article.

Improve application methods
Use mixing & loading practices that eliminate spills.
Properly calibrate sprayer to improve application accuracy and efficiency.
Create no-spray buffer near sensitive areas (waterways).

Irrigation Management:
Irrigate to meet crop demand.
Irrigate so as not to have runoff.
If runoff occurs, such as in flood irrigation, use a return system and/or delay irrigations following pesticide applications.

University of California publications and information addressing these issues and practices include:

UC Davis Integrated Pest Management Program, http://www.ipm.ucdavis.edu

Storing Runoff from Winter Rains, UCANR Publication 8211, http://anrcatalog.ucdavis.edu/pdf/8211.pdf

Understanding Your Orchard's Water Requirements, UCANR Publication 8212, http://anrcatalog.ucdavis.edu/pdf/8212.pdf

Causes and Management of Runoff from Surface Irrigation in Orchards, UCANR Publication 8214, http://anrcatalog.ucdavis.edu/pdf/8214.pdf

Managing Existing Sprinkler Irrigation Systems, UCANR Publication 8215, http://anrcatalog.ucdavis.edu/pdf/8215.pdf

Soil Intake Rates and Application Rates in Sprinkler-Irrigated Orchards, UCANR Publication 8216, http://anrcatalog.ucdavis.edu/pdf/8216.pdf

Tailwater Return Systems, UCANR Publication 8225, http://anrcatalog.ucdavis.edu/pdf/8225.pdf

Pesticide Choice: Best Management Practice for Protecting Surface Water Quality in Agriculture, UCANR Publication 8161, http://anrcatalog.ucdavis.edu/pdf/8161.pdf

UPCOMING EVENTS

May 16

Blueberry Field Day
Kearney Ag Center 7:30 am—3:30 pm
INFO: Mary (559) 685-3303

Northern San Joaquin Valley Strip Tillage Demonstration
Lima Dairy Ranch (west of Lodi) 9 am—12 pm
INFO: David Simpson (209) 472-7127 ext. 127 or
Mick Canevari (209) 468-2085

June 10-14

Washington State High Density Cherry and Apple Orchard Tour
INFO: www.ifruittree.org

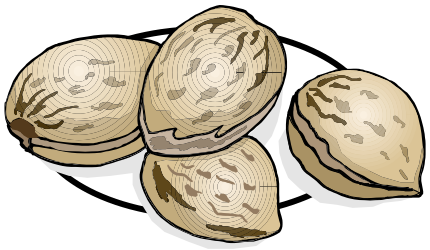
Grapes and Almonds

Paul Verdegaal

This year Spring has reversed the trend of the last two years with a below average rainfall. Compared to 24 and 25 inches of rain for 2006 and 2005, it looks like we will end up with just over 12 inches for the northern county and about slightly less than 9 inches for Stockton and the southern county area. As with most other aspects of farming, that is good and bad. The dry weather has allowed for timely completion of field operations, and disease pressure has been light. There has been concern about adequate soil moisture, but in general the below average rainfall did manage to provide surprisingly good moisture down to three or more feet.

It was good to start a little earlier with irrigation this year but, unless cover crop is present, soil texture is extremely coarse or very fine clay or there are nematode problems, lack of soil water has not been critical. That being said it was probably better to start a little early as opposed to a little late for both vineyards and orchards. The usual exceptions would include healthy Old Vine Zins, blocks for vineyard designated wines, or orchards that might have received a winter irrigation before a dormant spray.

Almonds



For almond growers, bloom was about on time, but it progressed fast to the point of being a potential problem for bees to make all the rounds. The extreme heat of last July did seem to cause an increased amount of bud failure this year. It has become a little less severe than in years past, but it's a problem that continues to plague Carmel, even with the better budwood sources now being used. If it shows up on trees younger than four years of age there may be a benefit of replacing trees. If the problem occurs after a tree is seven or more years of age, it is probably best to stay with what you have. In between is the difficult gray area where grafting over or replacing of trees is a complicated decision.

The initial weather was good for earlier blooming varieties such as Nonpareil and Sonora, while later varieties did experience some rain during bloom. Overall, conditions dried out quickly and it appears as though Buttes, Padres and Missions are not as heavily set as last year. Early varieties such as Nonpareil seem to have a better crop than last year, but the strong winds did make for an early and intensified "June Drop." Since then the weather has been a little more normal and so disease and mite pressure are relatively light.

If the nut drop is high in a particular block reducing the normal nitrogen application and putting some of that savings towards potassium might be a good idea, especially if potassium hasn't been part of a normal program in the last few years. While leaf tissue analysis is not infallible, a good representative sample from each area of an orchard or block is good for detecting problems in productivity or tree growth over time.

Now is the time to keep an eye out for the Lower Limb Dieback problem that has been popping up the last couple of years. There may be several factors involved, one of them being disease, but there is still no definitive answer as to what is going on. Symptoms including smaller twigs and branches that quit growing and die back a short distance, with no obvious cankers or disease. These symptoms are limited to the lower third of the tree canopy. *Phomopsis* and/or *Botryosphaeria* fungi are often, but not always, detected. Roger Duncan, Brent Holtz, and Dr. Themis Michalides are investigating the problem. If you have symptoms show up or intensify from last year give me a call.

If you have an interest and want to participate in a survey of nutrient strategies you can check out a web site that Dr. Patrick Brown has set up with the help of funding from the Almond Board. The aim is to help resolve some of the ongoing questions of setting critical values for nutrients, along with how best to set up an effective fertilizer program. The web site is at the following address: http://www.education.ucdavis.edu/research/nustsurvey/

Grapes

The cold January temperatures have made for some problems this year. Generally healthy vines under no stress can tolerate low temperatures down to about 15 F. Slightly drier than normal soil conditions and three weeks of very low minimums do seem to have had some negative effect as the 2007 season unfolds. Budbreak was about average, beginning just before March 15 for Chardonnay. It seemed to indicate a fairly normal start. As later varieties came out of dormancy it became more obvious that depending on variety, age, site, and soil conditions, there were some hurt vines.

Many young vineyards of Pinot gris, Pinot noir, some Chenin blanc and Sauvignon blanc, along with scattered new blocks of Petite Sirah and Zinfandel showed delayed and erratic budbreak. In a few bad cases there appears to have been cordon or spur dieback. Even older Zinfandel and Merlot seemed to show delayed and erratic bud

break, but no damage. This year's apparent winter injury closely resembles the more severe damage that occurred in December 1990 with the "Arctic Blast" that even killed Eucalyptus trees around the county. The good news is that damage was not widespread or generally severe enough to require retraining, but there was some localized damage that a few growers have to deal with.

In general cluster counts across most varieties look average to above average. This is both good and bad, but maybe more of a good thing, if the vintage is of a very good quality, as quality seems to still create demand. The strong winds did cause some shoot loss of Chardonnay and Sauvignon blanc, but as strong as the winds were, shoot strength was mostly well established.

Keeping costs down probably requires a powdery mildew program that includes sulfur. Wettable sulfur after budbreak can be a very effective and inexpensive choice for doubling up on an early start to powdery mildew control. Whatever the material of choice ends up being, a good powdery mildew program includes: some sulfur, rotation of materials between years, and complete coverage.

Soil water availability is obviously a lot less this year, but surprisingly there were some very effective rainfalls, so that vines are not too bad off in most locations. That may help encourage more manageable canopies this year. The probability is for a normal or slightly above average, but that depends on growing conditions. Soil moisture shouldn't be a big concern, but it is time for some irrigation in many varieties and sites. The hope is that more "controlled" conditions this year may provide for an excellent vintage with a little luck.

Tomato Yellow Leaf Curl Virus

Brenna Aegerter

In March 2007, the virus that causes tomato yellow leaf curl was identified in greenhouse tomatoes from Imperial County. Because this disease is potentially devastating for tomato production in California, it is critical to limit its spread. The following information is from an article written by Robert L. Gilbertson and Maria Rojas, Department of Plant Pathology, UC Davis and Eric Natwick, UC Cooperative Extension, Desert Research and Extension Center, Holtville, in collaboration with the UC IPM Program.

Symptoms

Tomato plants infected with *Tomato yellow leaf curl virus* (TYLCV) are stunted, grow abnormally upright, and take on a bushy appearance because internodes are shortened.

Flowers on infected plants commonly fall off before fruit set and fruit production is dramatically reduced. Losses can be 100% in fields with heavily infected plants.

Foliar (leaf) symptoms are the most diagnostic for this disease. Leaves of infected plants are small, strongly crumpled, curl upward, and turn yellow at the edges and between veins.

Origins and Spread

Tomato yellow leaf curl was first described in Israel around 1940 and was known only in Old World locations until the early 1990s , when it was introduced into the Dominican Republic. It has since spread to other Caribbean islands, is now established in Florida, and has been found in Georgia, Louisiana, and North Carolina.

A severe outbreak of TYLCV occurred in northern Mexico during the 2005-2006 season. In fall 2006, TYLCV was found in Texas and Arizona. The virus was first identified in California in March 2007, in diseased tomato plants from a greenhouse in Brawley, California. Researchers think that these greenhouse plants were infected by whiteflies that acquired the disease from host plants outside the green house, and that the virus most likely came from northern Mexico.

TYLCV is spread by the silverleaf whitefly, *Bemisia argentifolii* (=*B. tabaci* biotype B) and sweetpotato whitefly, *B. tabaci*, but not by other whitefly species. The virus is not transmitted in seed nor spread mechanically (e.g., by touch).

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Identification

Because the symptoms caused by TYLCV can be confused with those caused by other viruses, symptoms alone cannot be used for definitive identification. Rapid, accurate tests for identifying the virus are available at UC Davis and the California Department of Food and Agriculture (CDFA).

Management

CDFA has contained the initial outbreak of TYLCV, and is monitoring tomatoes in commercial fields, retail stores, and backyard gardens to determine the spread and establishment of the virus in southern California.

Should the virus become established, long-term approaches that may be needed are a tomato-free period in Imperial County and a restriction on the movement of transplants from locations where TYLCV is known to occur to virus-free tomato-producing areas. TYLCV-resistant tomato varieties are available and an effective IPM program has been developed for the virus in areas where it is endemic.

However, there are a number of factors that may not favor establishment of the virus in the major tomato-producing areas of California, including the Central Valley. First, *Bemisia* whiteflies are not typically found in these tomato-producing areas because the insect is intolerant of cold winter temperatures. Second, the winter season provides a "natural" tomato-free period, usually from late November through early February. This break would eliminate the primary host of the virus. Even if the virus were able to overwinter in other (weed) hosts, it would probably do so inefficiently, thereby minimizing economic damage.

Anyone finding tomatoes with TYLC-like symptoms should contact:

- their local UC Cooperative Extension office, or
- UCD pathologist Robert Gilbertson (530-752-3163, rlgilbertson@ucdavis.edu), or
- CDFA scientist Tonyan Tian (916-262-1127, TTian@cdfa.ca.gov)

For color photographs of symptomatic tomatoes, whitefly species, and for more detail on management strategies, see the *UC IPM Pest Management Guidelines: Tomato*, available on the Web at http://www.ipm.ucdavis.edu.

"There seem to be but three ways for a nation to acquire wealth… the third is by agriculture, the only honest way, wherein man receives a real increase of the seed thrown into the ground, in a kind of continual miracle, wrought by the hand of God in his favor, as a reward for his innocent life and his virtuous industry."

B. Franklin

Typical foliar symptoms of tomato yellow leaf curl. (photo by Robert L. Gilbertson)

Rodent control for alfalfa and other crops

Mick Canevari

Rodents, particularly meadow voles, pocket gophers, and ground squirrels cause significant damage in California's alfalfa fields. Left uncontrolled, these pests can be a serious threat to farming operations.

Meadow voles

Meadow voles (field mice) damage alfalfa by feeding on roots, stems and forage. They are small rodents similar to domestic mice. When full grown, they are four to five inches long (Figure 1). Meadow voles are active all year and are normally found in areas with dense ground cover. The peak breeding period is spring with a second, smaller breeding period in fall. Litters average four young. Meadow vole numbers fluctuate from year to year; under favorable conditions, their populations increase rapidly and become very dense.

Preventing meadow vole damage usually requires a management program that keeps down the population in the area. Remove or reduce the vegetative cover surrounding the alfalfa field, making the habitat less suitable to voles. When meadow voles are numerous or when damage occurs over large areas, you may need to use baits for adequate control. When using toxic

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baits, take care to ensure the safety of people, pets, and non-target animals. Do this by following product label instructions carefully. In late 2003, zinc phosphide, a very effective rodenticide, was registered for use in alfalfa crops.

Pocket gophers

Pocket gophers can be a serious problem in alfalfa, especially in non-tilled soil. They are a stout-bodied, short-legged rodent, well adapted for burrowing (Figure 2). They live in an extensive underground burrow system that can cover an area of several hundred square feet. These burrows are about two inches in diameter, usually located from six to twelve inches below ground. Mounds of fresh soil from burrow excavation indicate their presence. The mounds are crescent shaped and are located at the ends of short lateral tunnels branching from the main underground burrow system. One gopher may create several mounds in a day. Generally, a group of fresh mounds is evidence of one gopher.

Pocket gophers eat a wide variety of roots, bulbs, tubers, grasses, and seeds, and sometimes even the bark of trees. Their feeding and burrowing can damage alfalfa by severing the root. Since alfalfa plants have a single tap root system, they never recover from this damage. In addition, gophers may damage plastic irrigation lines; their tunnels can also divert irrigation water.

Usual control of gophers in alfalfa is by baiting with poison treated grain applied by hand probes or a tractor-drawn baiting device. Recently, fumigation with aluminum phosphide tablets has gained popularity and is something to consider if the gopher problem is severe. Traps can be effective in controlling pocket gophers if numbers are low and continuous effort is applied.

Strychnine treated bait is the most common type used for pocket gopher control. Zinc phosphide is also a single-feeding bait that is registered. These are Restricted Use Materials. They are usually effective with one application if placed in an active tunnel. Anticoagulants baits are also available but require multiple treatments or one larger treatment to be effective. Baits must be placed in the underground burrow made with a rod or probe. Close the probe hole with sod, rock, or some other material to prevent light and dirt from falling on the bait. Rake down existing mounds so you can distinguish new activity.

Ground squirrels

Ground squirrels are common in most alfalfa growing areas. During winter, ground squirrels hibernate but some young squirrels remain active year round. Most adults go into summer "hibernation" (aestivation) during the hottest times of the year. Ground squirrels reproduce once a year in early spring. Litter sizes vary, but seven to eight young are average. When ground squirrels cause damage, you should institute a control program suitable for the situation and time of year. The activity cycle of ground squirrels determines when various control measures are appropriate.

You can kill ground squirrels in their burrows with several types of fumigants. These are most effective in the spring when soil moisture is high. Fumigation is not effective during periods of aestivation because at those times squirrels plug their burrows with soil. Anticoagulant baits are effective when consumed in several feedings over a period of five uninterrupted days. For ground squirrels, anticoagulant baits can be applied in three ways: bait stations, spot baiting, or repeated broadcast application. Place bait stations in areas frequented by ground squirrels such as near runways or burrows. Ground squirrels are excellent foragers for seeds. Spot and broadcast baiting uses this behavior to apply bait over the area where squirrels live and feed. With spot baiting, spread the bait around the squirrel burrows or in the runways. Do not pile the bait. Apply single-feeding baits such as zinc phosphide by hand or with a mechanical broadcaster according to the label instructions.

Predators, especially hawks, coyotes and dogs eat ground squirrels. In most cases they are unable to keep the squirrel population below damaging levels in alfalfa and adjacent areas. There is considerable interest in providing artificial perches to encourage raptors to hunt near alfalfa fields. While raptors are reported using these perches, there is no evidence this resulted in less rodent damage to the alfalfa.

A new device on the market is an exploding gun that pumps propane and oxygen into the tunnel system and ignites the mixture with a spark. While some growers are using this device, its effectiveness for ground squirrel and gopher control in California has shown mixed results.

Figure 1
Meadow
Vole

Figure 2
Pocket
Gophers

Figure 3
Ground
Squirrel

Dairy cow nutrition: the corn grain dilemma

Alejandro R. Castillo and Gerald E Higginbotham

Numerous reports have examined the impact of ethanol plants on the U. S. corn market. The proliferation of ethanol plants will inevitably increase prices and cause lower availabilities of corn grain. In return, higher availability of corn byproducts such as corn distiller's grains will be made available to livestock producers. Corn grain has long been a base ingredient in dairy rations. Questions have been raised if corn grain can be replaced by other grains in dairy rations and what role do corn byproducts coming from ethanol plants have in dairy rations.

Corn grains have an average of 70% of starch, which is the main component to produce alcohol from ethanol plants. The starch is also one of the most critical nutrients for high yielding dairy cows. Dietary starch is necessary to maintain high rates of energy and protein production in the rumen as volatile fatty acids and microbial protein. It can be replaced by other sources of energy or other grains, but not by oils or fats. When corn grain starch is used for alcohol production, the other nutrients in the original grain are concentrated in a byproduct named distiller's grains. In general terms, crude protein in distillers' grains could be 30% or more compared to the 10% in the original corn grain, fat content rises to 10% and fiber as NDF (neutral detergent fiber) increases to almost 40%. Based on these components, distiller's grains are considered a good protein and energy source. Fats, fiber and starches are energy sources for livestock, but with different rumen fermentation rates, digestion sites and metabolism. For this reason, energy from distiller's grains can not replace the energy of corn grain. When using distiller's grains in dairy diets it is recommended that other sources of starch and soluble sugars should be included.

Four aspects need to be considered to make a good use of distiller's grains for lactating dairy cows. (1) Protein content. Distiller's grains are a good source of rumen undegradable protein. Degradable and undegradable protein contents should be used to avoid a shortage of nitrogen in the rumen. Lysine is the first limiting amino acid in corn byproducts and it is also most susceptible to heat damage. For that reason, lysine balances and insoluble nitrogen content should be evaluated to be sure that both (nitrogen and lysine) are available for rumen microorganism and the cows' metabolism. Positive results on milk protein content were observed when diets including distiller's grains were supplemented with lysine in lactating animals. (2) Fat content. The effects of oils and fats on rumen fermentation can vary depending on other feedstuffs used. In most situations, total dietary fat should not exceed 6-7% of dietary dry matter. (3) Mineral content and mineral balances. Particularly, sulfur should be monitored due that sulfuric acid is initially added in the dry grinding ethanol plants and to end the fermentation process. Excess of sulfur in dairy diets may affect absorption of other minerals, like selenium and copper, decreasing animal performance and in some situations affecting animal health and reproduction. Finally, (4) Distiller's grains may be offered dried or wet. Due to post fermentation problems and depending on weather conditions, wet distiller's grains should be stored for no more than 7 days. Also, a high concentration of mycotoxins could be expected if the original grain was contaminated. Propionic acid or other organic acids, or mycotoxin sequestering agents should be used to control mycotoxins as necessary. Storage in silo bags could be an option, but once these are opened, spoilage starts. It is expensive hauling wet distiller's grain long distances. Due to the high water content, rations may be too wet, affecting daily dry matter intake.

Because of the different aspects discussed in this article, no more than 15-20% of a lactating cow's total ration on a dry matter basis should be composed of distiller's grains. The recommended inclusion rate for replacements and dry cows is 10-15%. Excess protein and minerals in the diets may be related to animal health problems, and environmental concerns such as air and water quality. Make a plan with your nutritionist before including distiller's grains in your dairy rations. A complete chemical analysis of each distiller's grains lot coming to your farm is fundamental to make a good use of this corn byproduct.

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Notes from the Field

May 2007