



# FIELD NOTES

A QUARTERLY PUBLICATION OF COOPERATIVE EXTENSION

2101 East Earhart Avenue, Suite 200, Stockton CA 95206-3949 Telephone: (209) 953-6100 Fax: (209) 953-6128 Web: <http://cesanjoaquin.ucdavis.edu>

## Codling Moth Control Options Near Waterways

The San Joaquin County and Delta Water Quality Coalition—made up of irrigating landowners—is charged with monitoring sub-watershed drainage areas in San Joaquin County and parts of Calaveras and Contra Costa Counties for compliance with surface water pollution laws and regulations. Among compounds found in drainage waters from agricultural areas, chlorpyrifos (the active ingredient in Lorsban, Lock-On, and other products) has often been detected at levels above allowable limits. These “exceedances” have occurred in samples collected during winter as well as summer months. Exceedances are of concern: if they cannot be prevented by voluntary pesticide use practices undertaken by growers, then mandatory measures must be imposed to eliminate them.

About 50% of the chlorpyrifos applied in San Joaquin County is used on walnuts. Chlorpyrifos moves easily in water and has only moderate affinity for plant and soil particles. It also has long residual activity; this is good for pest control but bad for runoff potential.

Chlorpyrifos applications in walnuts begin in May and can continue through August. Any irrigation runoff during this time period can cause chlorpyrifos to enter surface waters. Significant residues have been found in irrigation runoff collected as long as two months after application. Fortunately, most walnut orchards in this area are irrigated with sprinklers, microsprinklers, or drip. Good water management, including turning the system off before any runoff occurs, can help ensure that off-site movement of pesticide residues will not occur.

Residues can also enter waterways through spray drift. Avoid spraying in conditions or locations where irrigation supply and drainage ditches pass near orchards.

Another option for reducing the potential for off-site movement of chlorpyrifos is simply not to use products that contain it. In many situations, alternative materials such as mating disruption or non-organophosphate insecticides and insect growth regulators can be substituted for chlorpyrifos. Substitute products can be used in the entire orchard or just in portions near waterways. Among several products available, Delegate (spinetoram), a relatively new product from Dow AgroSciences, offers a significant level of aquatic safety compared to organophosphate products. Other effective alternatives are available. Consult your Pest Control Advisor for materials that will work for you without running the risk of triggering further restrictions on chlorpyrifos use.

Joe Grant, Farm Advisor  
 Terry Prichard, Irrigation & Soil Specialist



First-generation codling moth larvae bore into the nut.  
 Photo by Jack Kelly Clark.

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## Root-knot Nematodes in Tomatoes and “Resistance-breaking” Strains

Tomatoes are hosts to several species of root-knot nematodes (*Meloidogyne* spp.). Most processing tomato varieties (with some notable exceptions such as AB2) and some fresh market tomato varieties possess the *Mi* gene which confers resistance to several of the species that attack tomato. Tomatoes growing in infested soil that exhibit less than five galls per plant are considered resistant. However, because such varieties have been so intensively used over the years, sometimes planted in consecutive years in the same field, there has been very strong pressure selecting for nematodes which can reproduce on these varieties. These so-called “resistance-breaking” root-knot nematodes were first found in 1995 and have recently been documented in Yolo and Merced Counties by UC Davis nematologist, Valerie Williamson. Such strains likely occur here in San Joaquin County as well, and would be one possible explanation for the recent occasional problems with nematode damage in resistant tomato varieties.

Root-knot nematodes cause distinctive galls on the roots and the damaged roots have a reduced capacity to supply the vine with water and nutrients. Above-ground, infected plants may be stunted, yellowing, prone to wilting, and respond poorly to fertilizer. Affected areas usually appear as irregular patches and are frequently associated with lighter-textured soils; however nematodes can also cause damage in heavier soils as well. The nematodes are active at temperatures above 64° F, but 90° F is optimal for their development. If soil temperatures are very high (above 82° F) when the nematode enters the root, then the resistance of the plant may break down, but soil temperatures this high are rare.

Managing fields with nematode problems can be difficult. Most other crops we grow also support reproduction of root-knot nematodes, so rotation out of tomatoes may not be effective. In fact, even nematode-tolerant alfalfa varieties can support the reproduction of the nematodes, even though they may not be damaged by them. A weed-free fallow is effective, but not likely to be implemented due to the costs of weed control and the losses of keeping land out of production. Pre-plant fumigation or other chemical controls (e.g. oxamyl [Vydate]) are expensive. In the future, we will likely be relying on the plant breeders to incorporate new sources of resistance into horticulturally acceptable varieties. In the meantime, be aware of which fields may have nematode problems. Check the roots of a few plants in midseason or at harvest, especially if you have poor growth.



**Root knot nematodes cause galling on roots.**

Photo by Jack Kelly Clark

Soil samples can be sent to a lab for analysis of nematode populations (if you need help finding a lab, contact me for assistance). Soil samples can be taken anytime prior to planting, but the table on page three references fall and spring nematode population levels. If the report from the lab gives an estimate of the total number of root-knot juveniles in your soil, you can use these figures directly in making management decisions. If the lab report gives the number of nematodes extracted from the samples, then you must also know their recovery rate. The recovery rate tells you what percentage of the nematodes in the soil is typically extracted; for root-knot juveniles, this number is usually from 10 to 30%. To get the total number of nematodes in your soil, divide the lab report number by the recovery rate and multiply by 100. The table on page three shows the impact of various levels of nematodes on processing tomato yield. Unfortunately, these standard lab tests cannot discriminate between resistance-breaking and non-resistance-breaking nematodes. If you have a history of growing nematode-resistant tomato varieties and you have a nematode-damaged tomato crop of a resistant variety, we can take plant samples and have the nematodes extracted from the roots and analyzed at UCD to determine if they are “resistance-breaking” nematodes. However, this is a lengthy process and the results may not be back in time for you to make a planting decision the following spring. Notwithstanding this limitation, such information could be valuable to you in the long run.

Brenna Aegerter  
Vegetable Crops Farm Advisor

Effect of Root Knot Nematode Populations on Processing Tomato Yield  
in San Joaquin Valley Sandy Loam Soils.

## A Thank You From Mick

Number of Root Knot Juveniles Per Kilogram in Soil Samples		Percent of Normal Yield
<i>Fall samples</i>	<i>Spring samples</i>	
0-160	0-25	100
310	50	98
620	100	95
940	150	91
1250	200	88
1560	250	85
1870	300	82
2190	350	79
2500	400	77
2810	450	74
3120	500	72
3440	550	69
3750	600	67
4060	650	65
4370	700	63
4690	750	61
5000	800	60
5310	850	58
5620	900	56
5920	950	55
6250	1000	53

Many of you already know that I will be retiring as of June 29, 2009. Having worked 38 years in the San Joaquin County Cooperative Extension office with the agriculture industry and 4-H families has been a truly rewarding experience. I can't begin to thank all the wonderful people I have met over the years who contributed to my career. Being a Farm Advisor has been an exceptional opportunity and truly a privilege to work with UC colleagues and private industry in helping to make a difference in San Joaquin County. Born and raised in Stockton, my wife Cathy and I will remain in the area and stay involved with Ag and local business but at a much slower pace.

As for the future of the CE office, UC is planning to fill the County Director position and is currently deciding how my Farm Advisor responsibilities will be handled. With the tremendous county support to this office, I am confident that University support will also continue as in the past.

Mick Canevari  
County Director and Agronomy  
Farm Advisor



From: *UC IPM Pest Management Guidelines: Tomato*  
UC ANR Publication 3470 (Nematodes section by Antoon Ploeg)

## Do you Want to Stay on our Mailing List?

This may be your last issue of the "Notes From the Field." In April 2009 the UCCE office sent out subscription request forms to all of our existing clients asking for updated mailing and e-mail information. If you did not respond to that flyer this may be the last publication sent to you from our office. If you wish to continue receiving our newsletters and meeting notices, please fill out the form shown on page 8 in this issue of the "Notes" and return it to our office.

Thank You, UCCE Staff

## Crop Digest—Grapes

A third dry winter has been a concern, but some recent rain with the end of April and into the start of May in 2009, has helped bring the north county to about 85% of average rainfall. Deep soil moisture is still lacking, but cool conditions since the three day hot spell in mid-April has also helped. Compared to 12.1 and 13.6 inches of rain for 2007 and 2008, the total is now 14.7 inches for 2009. Unfortunately the area south of Stockton continues to be very dry with about 9 inches of total rain compared to an average of 13.4 for this time of the season. As with most other aspects of farming that is good and bad. The recent storms and cloudy conditions will help delay the need for significant irrigation at least for 10 to 14 days. But watch the soil moisture either with soil moisture probes or a quick check by auger or even shovel in traditionally dry areas of your vineyard(s), especially if cover crops are present.

It still may be good to start irrigation on the early side this year, even if some water went on before the last storm. But unless cover crop is present, vines have only been using about 0.15 inches of water (or very “seat-of-the-pants”, about 3 hours worth of irrigation time) per week. During that same period orchards have been using about 0.75 inches of water. That will double soon and increase further as the shoots develop and the weather warms. That considered, it is good to stay ahead of using deep soil moisture, which is good to leave available for late summer and early fall.

Powdery mildew pressure has been very light until the last two weeks. There might be a few *Botrytis* shoot blight strikes with the warm storm and calm winds. Disease development shouldn't be too severe as it has been very dry and cool weather leading up to the recent rains, but you may see a few shoots “flagging” on scattered vines. This year looks to be another bad one for gophers and voles. They are back and active at this time and probably need some attention, even with the benefit of owls, hawks and snakes (or cats).

Keeping costs down probably requires a powdery mildew program that includes sulfur (at least when sulfur was low cost). Wetable sulfur after budbreak can also be a very effective choice for doubling up on an early start to powdery mildew control. With sulfur cost escalating, some of the newer materials are more cost competitive, although ground coverage is still much slower than with dusting sulfur. Whatever the material of choice ends up being, a good powdery mildew program includes: some sulfur, rotation of materials between years, and complete coverage.

Paul S. Verdegaal, Farm Advisor



## Ecological and Economical Impacts of Management Options for Medusahead

Medusahead (Mh) has slowly replaced our desirable forages with a monoculture that is not palatable to livestock, increases fire risk, and changes habitat for a variety of species. Fire has traditionally been the best tool to fight it, but burn permits are not easy to obtain. University of California Cooperative Extension (UCCE) has been working on many strategies that are available to ranchers that we will briefly discuss here.

First we need to cover some basics. There is a two-week window of opportunity to graze Mh which in our area occurs roughly early to mid April, depending on weather. At this time, the crude protein content dramatically drops and continues to drop as it matures. Mh also has a high silicon content. As Mh cover increases from 5 to 40%, we have seen a reduction in grazing of 50%, and as Mh cover increases over 40%, there is a 100% reduction in grazing. This means that either you have to provide supplemental feed, reduce number of livestock, or find more land to graze.

High intensity grazing. We stocked Mh infested areas with sheep to achieve utilization levels of 50, 60, 70, and 80% at short and long time periods (7 and 14 days). We had a high density of sheep in the areas, ranging from 1 to 28 sheep per acre (equivalent to 0.2 to 5.6 cows per acre). We saw no differences between the different grazing treatments, but did see great results when comparing grazing treatments to the controls (no grazing). High intensity grazing dramatically reduced seed pro-

*(Continued on page 5)*

(Continued from page 4)

duction to 187 seeds per foot squared (ft<sup>2</sup>) compared to the area not grazed producing 748 seeds per ft<sup>2</sup>. We also compared our high intensity grazing to continuous grazing, which produced roughly 654 seeds per ft<sup>2</sup>. Mh thatch decreased from 40% to 8% and other grasses and forbs increased from 18% to 50% in the treated areas, providing more desirable forages. Bare ground also increased in the treated areas.

**Supplementation.** Low moisture supplement tubs were strategically placed in areas of high Mh cover. Transects and exclosures were present to compare areas open to grazing at different distances from the tubs and non grazed areas. The supplement tubs did attract livestock, and we did see a reduction in Mh cover, however as you moved further away from the tubs, there was less impact. Tubs appear to be effective for a distance of about 40 yards.

**Mowing.** Mowing lengthens the window of opportunity by another week. Mh cover was reduced from 50% to 5% by mowing. Seed production also dramatically reduced from over 280 seeds per ft<sup>2</sup> to 13 seeds per ft<sup>2</sup>. Desirable species also increased the following year with an increase in soft chess, rose clover, and filaree.

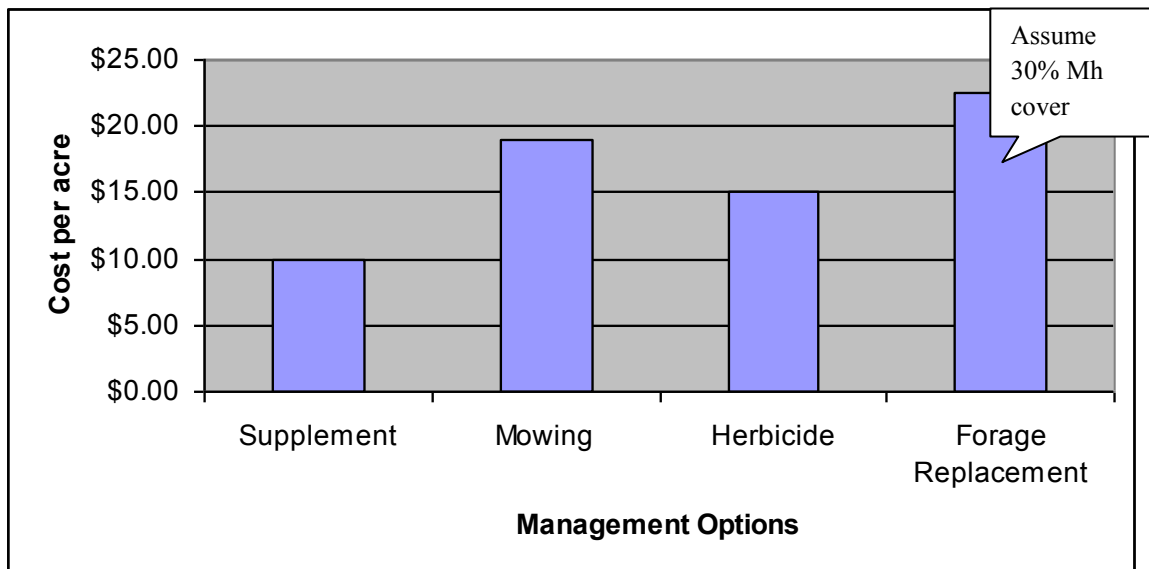
**Herbicide.** 3% active ingredient glyphosate was applied at 16 and 32 oz per acre early, mid, and late season. We did not see any difference between the rates. As expected, the early and mid applications did kill everything. Our late application may have been a little too late to be effective. From our preliminary results, it looks like a mid-season spray will allow for a longer grazing period and kill Mh. This spring we will be com-

pleting data collection and will have more information on this treatment option.

**Costs.** We have found methods that reduce Mh, however certain methods may not work for every ranch. Mowing may not be practical in rocky areas. High intensity grazing may not work if you are not able to duplicate our stock density. Each person will need to examine their own constraints and determine what works best for their situation. To help with this, UC Cost Studies were utilized to calculate costs per acre. Supplement is the cheapest option available at roughly \$10 per acre. While this is the cheapest option, it also does not provide as much control. Impact is within a small sphere, which is why moving weekly is key. It is important to note that doing nothing has a cost you may not realize. At a typical 30% cover of Mh, there is a grazing reduction of 50%. Assuming an average production of 1000 lbs of available forage per acre, a 50% reduction would mean 500 lbs per acre would need to be replaced. For our calculation, we replaced our lost forage with grass hay at a cost of \$22.50 per acre. When you start to realize how much you are losing by not controlling Mh, different control options start to look more appealing and actually can pencil out.

Many Livestock Advisors have worked on this project from Mendocino County south to San Luis Obispo County, on the coast and Shasta County south to Stanislaus County in the valley, as well as support from scientists and Specialists on the Davis Campus.

Theresa Becchetti, Livestock Advisor



Cost per Acre of different management options, and the cost of no management (forage replacement).

## Poisonous Weeds Affect Livestock

**Common groundsel** (*Senecio vulgaris*) and **fiddleneck** (*Amsinckia intermedia*) are pyrrolizidine alkaloid (toxicant) containing plants that are commonly found in spring cut alfalfa hay and winter forages. Cooperative Extension is receiving numerous phone calls due to the increased presence of these weeds this year. Early rain allowed for November germination of groundsel and fiddleneck, and the subsequent drought conditions made the plants less susceptible to herbicide treatments. Unfortunately, these fields will go to seed thereby increasing the weed seed bank for the next several years. Both plants are especially toxic to cattle and horses, while sheep and goats are less susceptible. Toxicity results in liver damage, liver failure, and possibly, death. Delayed toxicity will occur when feeding low doses of pyrrolizidine alkaloids (PA) over an extended period of time. Ensiling PA containing plants does not decrease toxicity to a safe level for feeding. It is not recommended to feed PA containing plant material to cattle or horses for an extended period of time.

If there are isolated areas of groundsel or fiddleneck in your fields, these areas should be harvested separately and marked accordingly. Since groundsel and fiddleneck are winter annuals, their reoccurrence in the later cuttings of alfalfa should be minimal.

Jennifer Heguy, Dairy Advisor  
Mick Canevari, Agronomy Advisor

## Composting 101, The Basic Course

Compost is a great elixir for soil and plants. Here are some of the things compost does for your plants. It increases tiny air pockets in soil, pores that let plants soak up water and provide air for roots. Compost holds 80 to 90 percent of its weight in water, which helps make it

available when plants get thirsty. It contains beneficial soil organisms and nutrients that feed plants, moderates the pH level by buffering the soil, and slowly releases nutrients over a long time period.

There are two kinds of composting – piles carefully built, wetted and turned - and the lazy approach, known as Let it Rot composting. In the first kind, the idea is to layer “greens” and “browns” until you have a pile a few feet high. The most common greens are fresh lawn clippings, newly pulled weeds, kitchen scraps, coffee grounds, and animal manures - but not cat or dog feces. The common browns are leaves, tea bags, straw, dried weeds and dried grass. Sawdust and wood shavings are also browns, but they take a long time to break down. It’s also important to thoroughly wet them. A compost pile should be consistently damp, like a wrung-out sponge. The other ingredient is oxygen and it’s important to “turn” the pile once a week or so. With a pitchfork or shovel, create a new pile so what was on top will be on the bottom. When done correctly, the temperature of the pile may reach 140 to 160 degrees within 24 to 36 hours, which is ideal for killing disease and weed seeds that might be in the pile. Covering the pile with a tarp is a way to keep moisture in the pile, and it’s good to keep the pile, bin, or tumbler in the shade to lessen moisture loss. In the lazy compost method, you mix the materials, wet it adequately, and keep the pile damp but turn it less. It will rot much slower, in perhaps a year or two, but you will get compost eventually.

Fancy bins are unnecessary but bins do help keep your yard tidy. A round plastic bin is easy to disassemble and set up when moving material. Having two or more bins is also a good idea so you can have batches at various stages of completion through the season. When is the compost done and useable? When it is earthy smelling and the material is broken down and unrecognizable. Now that you have the basics, start composting so you can be a happier, wiser and more productive gardener.

Lee W. Miller  
UC Cooperative Extension Master Gardener

### Are you having trouble getting in touch with us?

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Terry Prichard .....	Irrigation & Soil Specialist .....	953-6120
Paul Verdegaal .....	Viticulture/Almonds .....	953-6119

## Almond PMA

The Almond Pest Management Alliance is continuing in 2009 with several demonstration orchards established in the Central Valley, from Fresno County north to Sutter, including two sites here in San Joaquin. Insect and mite monitoring programs are in place in these cooperating growers' orchards following the UC IPM guidelines found in the Almond IPM Manual, in the pamphlet *Seasonal Guide to Environmentally Responsible Pest Management Practices in Almonds*, and online at <http://ucipm.ucdavis.edu>. These monitoring programs involve hanging traps with pheromone lures or other attractive bait in the orchards and checking them weekly or twice-weekly to determine a biofix for each significant pest (navel orangeworm, Oriental fruit moth, peach twig borer, San Jose scale). A biofix is an identifiable event, such as a sudden increase in moths caught in a sticky trap or eggs laid on an egg trap, that signals when to begin counting degree-days.

You can take much of the guesswork out of a pest management program by using the pest development models found at the UC IPM website and calculating degree-days accumulated after the biofix. By using these models, you can time your sprays so that they are most effective against the target pests. You should also now be looking for mites and mite predators. Leaf sampling to monitor mite population dynamics can help reduce grower stress when you choose to skip the preventative mite spray or when resistance issues creep up. Also, May is the month to start identifying the

different ant species and count burrows in your orchard to determine the need for a treatment, especially if you have had ant damage in previous harvests. You can start monitoring your orchard for pests today. Traps, lures, and bait can be purchased online or wherever you get your pesticides. Ask at the Cooperative Extension office for help setting up a monitoring program.

Also at the Almond PMA demonstration orchards, we will be conducting trials including some May spray treatments for worm control. Results of these and other Almond PMA activities will be reported in the newsletters and at field meetings.

At a recent field meeting at Travaille and Phippen orchards in Manteca, about 50 growers, PCAs, farm advisors, and researchers met and discussed ant, mite and mite predator monitoring, May sprays, worm control products, current season irrigation and fertilizer strategies, and some air quality issues.

Thanks to Community Alliance with Family Farmers for coordinating the meeting, Travaille and Phippen, Inc. for hosting it and Dan Dunham with Tessengerlo Kerley for helping provide the lunch. The field meetings are informal gatherings which offer timely information, hands-on IPM demonstrations and lots of discussion. Look for more seasonally timely field meetings to come. If you missed the April meeting, copies of the handouts will be available for download at the SJ County Cooperative Extension website <http://cesanjoaquin.ucdavis.edu>.

Dan Rivers, Staff Research Associate

**Table 1. Biofixes and accumulated degree days as of May 8 for Manteca, San Joaquin County.**

Pest	Biofix	Accumulated DD (°F)	Treatment timing (DD)	Estimated date
San Jose scale	3/25	405	600-700	5/22-5/28
Peach twig borer	4/16	264	400-500	5/17-5/23 <sup>a</sup>
Navel orangeworm	5/1	59	150	5/16 <sup>a</sup>



Dear Readers of UC Cooperative Extension Newsletters:

April 2009

We are required to update our mailing list for newsletters and meeting notices. Please complete the information below and **RETURN THIS FORM BY MAIL, IN PERSON OR FAX TO REMAIN ON OUR MAILING LIST.** (If you have already returned one in the last six weeks that is sufficient.) All newsletters are provided at no cost. Our mailing list is kept confidential. Our address is: UC Cooperative Extension, 2101 E. Earhart Ave. #200, Stockton CA 95205-3949. Our FAX number is: 209-953-6128.

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Keep my name on the mailing lists for information categories checked below.

Remove my name from the mailing list.

Keep my name on the mailing list; however, I prefer to be notified by e-mail so I can access the newsletters on the UCCE website. E-MAIL ADDRESS: \_\_\_\_\_@\_\_\_\_\_

**Newsletters: Please check newsletter(s) you wish to receive. This will include meeting notices.**

- Almond Digest*-A (Almonds) – Paul Verdegaal
- Along the Grapevine*-G (Wine grapes)–Paul Verdegaal
- Dairy Newsletter* -D- Jennifer Heguy
- Down the Vegetable Row* –V – Brenna Aegerter (Tomatoes, Asparagus, Melons, Peppers)
- Environmental Horticulture*-E – Ashley Basinger
- Field Notes*-N –Quarterly publication (All commodities)
- Livestock Lines*- L (Livestock) – Theresa Becchetti
- Master Gardener Newsletter*– M – Marcy Hachman
- Pomologist*– F (Tree fruits, Walnuts) – Joe Grant

**Check the commodities in which you are interested: (Meeting notices/other information)**

- Grapes-GR     Dairy-DA     Livestock-LT
- Field Crops-S
  - Alfalfa–AF     Beans-BN     Corn-CS
  - Grains-GN     Rice-RI     Winter Forage-WF
- Environmental Hort-E
  - Greenwaste-GW     Turf-TF     Nursery-NR
  - Irrigation-IR
- Fruits-F
  - Apples-AA     Cherries-CH     Tree Fruits-FT
  - Olives-OL
- Nuts-N     Almonds-AM     Walnuts-WN
- Vegetables-V
  - Asparagus-AS     Melons-ME     Tomatoes-TM
  - Peppers–PE

**Check your Occupation below:**

- Ag chemicals (San Joaquin Co.)-AL     Ag chemicals (outside county)-AO     Consultant/Advisor - CA
- Grower-GR     Lender-LN     Irrigation - IR
- Nursery/Seed Co.-NS     Pest Control Advisor-PA     Landscape - LS
- Shipper/Packer - SP     Winery-W     Parks - PK
- Government-GV     Media- M     Master Gardener - MG

Please complete the following **optional** questions. Your individual responses are **confidential**.

**Gender**     Male-M     Female-F

**Ethnicity**     White-W     Asian/Pacific Islander-A     Native American/Native Alaskan-I  
 African American-B     Hispanic-H

**Disability-D**     Yes - Y     No - N    Explain special needs for meeting attendance \_\_\_\_\_



# Weed Control Performance Reviewed

I can't remember a winter where I have seen so many weed control failures as this year. The crops having the most problems are alfalfa, orchards, vineyards, wheat, and some winter vegetable crops. Generally, we've seen poor control for many herbicides both post and premergence across several weed species. Poor weed control can reduce yield and quality or in the case of alfalfa and the weed common groundsel (*Senecio vulgaris*) can actually render the commodity unmarketable. Groundsel contains poisonous alkaloids that when fed to livestock and horses can cause serious health issues as described in another newsletter article (*Poisonous Weeds Affect Livestock*), see page 5.

Other problem weeds include horseweed (marestalk, *Conyza canadensis*), hairy fleabane (*Conyza bonariensis*), and willowweed (*Epilobium brachycarpum*). These three weeds have been on the increase and becoming a greater problem every year in grapes, orchards, and now showing for the first time in alfalfa fields. Even though we have herbicides that control these weeds, they have not always been totally effective. Some failures can be reasonably explained while others are not so clear cut. I have several experiments underway to look at some questions surrounding these control failures. Until we are able to pinpoint specific reasons for these failures, I've listed some general guidelines to keep in mind to improve your weed control program.

**Use Rates:** Shaving rates below label recommendation generally results in disappointing results. Unfortunately, the cost of developing a new herbicide with all the regulatory steps is extremely expensive. For this reason, use rates may be established on the lower end of efficacy range. They require pinpoint accuracy and allow little leeway for error.

**Conditions before and after spraying:** This is probably the biggest factor in weed control failures. Moisture stressed weeds, timely irrigation or rain after application, weed size, environmental conditions (such as hot, windy, or cold), and leaves or other residues covering the soil can contribute to poor herbicide performance.

**Herbicide choice:** Today our pest management tools are very specific to the target pest and require combinations of several materials to control multiple weed species. Identify all the weeds as well as those that you expect to emerge as your starting point.

**Mechanical issues:** Improper calibration or spray boom adjustment, worn nozzles, low pressure and overly fast ground speed can affect spray coverage and ultimately herbicide performance.

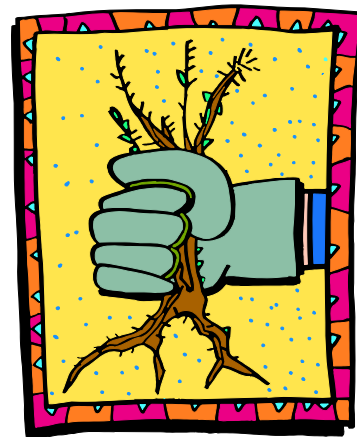
**Adjuvants:** Water quality can especially impact systemic herbicides that translocate into the plant. Stickers, spreaders, pH adjusters, buffers, and/or acidifiers are sometimes required to correct the water problems associated with post emergence herbicides. Test your water!

**Weed/Crop stage:** Timing is everything! For postemergent herbicides, treat small/young weeds. Not only is size and maturity important but weeds become tougher when exposed to environmental conditions of wind or hot and cold temperatures.

Preemergent herbicides are exactly for the purpose of controlling weeds before they emerge. Don't expect control once weeds have begun to germinate or are emerging. Once irrigation occurs, weed seeds germinate rapidly and require tillage or a postemergent herbicide to eliminate them.

**Healthy Crop:** An old adage that remains equally important today is "a healthy vigorously growing crop is the best form of weed control". Soil health, seed bed preparation, crop rotations, proper variety selection, and good irrigation management will increase herbicide efficacy and lessen the amount of overall pesticides required in your farming operations.

Mick Canevari  
County Director and Agromony Farm Advisor





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