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Field Notes
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Fertilize Alfalfa in the Fall

With the onset of fall, it is time to address alfalfa fertilization. Two nutrients that alfalfa frequently needs are phosphorus and potassium. These should be applied between October and February because it could take 60 to 90 days for the crop to fully respond to fertilizer application.

A deep-rooted crop, alfalfa can scavenge nutrients from where other crops cannot, but because it has a long growing season, alfalfa has a long season of nutrient demand. Additionally, each cutting removes large amounts of nutrients with the plant tissue. Therefore, proper nutrition is important in maintaining alfalfa yield and quality year after year.

In general, plants need three nutrients – nitrogen (N), phosphorus (P), and potassium (K) – in the largest quantities. Nitrogen fertilizer is seldom required or profitable in alfalfa because root nodules contain N-fixing *Rhizobium* bacteria. Assuming good nodulation, N fertilizer should not be applied because it can promote undesirable weed growth. Phosphorus and K fertilizers, however, are frequently needed by alfalfa plants. Phosphorus – important for seedling vigor, root development, and early season growth – is the most commonly deficient nutrient because it can get tied up by the soil. Phosphorus deficiency may be difficult to diagnose because it can be mistaken for moisture stress, but in general, plants are stunted and have smaller leaves. Potassium is often required because large amounts of it are removed with each cutting. Additionally, sandy soils and/or soils with a long history of alfalfa production can be low in K. Potassium deficiency appears as pinhead-sized white or yellow spots on new leaves and yellow to brown edges on mature leaves.

While visual deficiency symptoms are one way to assess the nutrient needs of your alfalfa, sampling soil and plant tissue are more reliable ways to assess P and K status. If you do not usually test soil or plant nutrient status, it would be a good habit to start next spring. The best time to sample soil is after an irrigation or rainfall when the soil is moist. The best time to sample tissue is at $^{1}/_{10}$ bloom. A yield response to fertilizer is very likely when soil or leaf nutrient levels are in the deficient range. Phosphorus is deficient when soil levels are <5 ppm (using bicarbonate extract in the laboratory analysis) and leaf levels are between 300-500 ppm PO_4-P (when plant samples are taken at $^{1}/_{10}$ bloom). Potassium is deficient when soil levels are <40 ppm (using ammonium acetate extract in the laboratory analysis) and leaf levels are between 0.40-0.65% (when plant samples are taken at $^{1}/_{10}$ bloom).

Use a granule (0-45-0, 11-52-0) or liquid (10-34-0) fertilizer to correct P deficiency. These sources are the most economical. If soil or plant tissue tests showed *deficient* levels, then apply P at a rate of 120-180 lbs P_2O_5/acre (if yield was around 8 tons/acre) and at a rate of 180-270 lbs P_2O_5/acre (if yield was around 12 tons/acre). Use muriate of potash (0-0-52) to correct K deficiency, or use potassium sulfate (0-0-52, 18% sulfur) if sulfur was also deficient. Correct K *deficiency* by applying it at a rate of 300-400 lbs K_2O/acre (if yield was around 8 tons/acre) and at a rate of 400-600 lbs K_2O/acre (if yield was around 12 tons/acre). Single applications of P should not exceed 100-150 lbs P_2O_5, and single applications of K should not exceed 200-300 lbs K_2O. If soil or tissue tests indicate that high rates are needed, like the aforementioned rates, then apply half of what is needed in late fall/early winter and the other half after the second or third cutting. Both P and K are effectively taken up by plants whether pre-plant incorporated or surface applied in established stands. Use these rates to guide your fertilizer applications – remembering that soil type, climate, and yield will influence fertilizer needs – and keep good records of all laboratory results, fertilizer applications, and crop observations. These records will be helpful in developing a long-term, economical fertilization program.

Michelle Leinfelder-Miles, Farm Advisor, Delta Crops

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Points to Consider in the Prevention of Crown Gall

The following article summarizes recent findings and suggestions for managing crown gall disease in walnuts. The full version was published in the Fall/Winter edition of Sacramento Valley Walnut News (http://cesutter.ucanr.edu/news_204522/Sacramento_Valley_Walnut_News_135/?newsitem=44408)

Joe Grant

Crown gall caused by the bacterium *Agrobacterium tumefaciens* can cause significant economic loss in both commercial walnut orchards and nursery operations in California. Paradox hybrid, the most popular walnut rootstock in California, is extremely susceptible to infection by the crown gall causing bacterium.

Here we discuss five areas being examined in the quest to develop a robust comprehensive approach to crown gall prevention:

Pre-plant fumigation: Methyl bromide (MeBr) has been the standard pre-plant soil fumigant for both nursery and commercial walnut production in California; however under the Montreal Protocol, MeBr is being phased out worldwide. To identify effective MeBr alternatives we investigated the direct effect of alternative soil fumigants on *A. tumefaciens* populations in native field soil brought into the laboratory. The MeBr alternatives, Vapam, Telone® C-35, and Telone® C-35 followed by an additional application of chloropicrin, all reduced soil populations of *A. tumefaciens*. Telone® II (1,3-dichloropropene) applied alone was not effective at controlling *A. tumefaciens.* The addition of chloropicrin to 1,3-dichloropropene in Telone® C-35 dramatically reduced *A. tumefaciens* populations in soil but not in buried gall tissue. The additional chloropicrin applied after Telone® C-35 in the "Telone® C-35 plus Chloropicrin" treatment was needed to reduce *A. tumefaciens* in gall material. Based on our laboratory data, Telone® C-35 is an effective pre-plant alternative to MeBr for the control of *A. tumefaciens* in soil. In sites with a history of high crown gall incidence, fumigation with Telone® C-35 plus chloropicrin combined with extensive gall removal from the soil should be considered. In conjunction with prior reports on 1,3-dichloropropene (Telone® II) efficacy on lesion nematode, and our laboratory-based data, Telone® C-35 or Telone® C-35 followed by chloropicrin are candidates for consideration in an integrated pest management program controlling the major soil-borne plant pathogens in the California walnut industry.

Long term Agrobacterium survival: Once *Agrobacterium tumefaciens* is introduced into a field site it can survive for years in the soil in the absence of any plant host. For example, we documented *A. tumefaciens* survival for at least 2 years in orchard soil and at least 1.5 years in non-irrigated fallow soil. In addition, the *A. tumefaciens* strain we introduced in the orchard soil, and reisolated 2 years later, retained the ability to induce crown gall formation. Given these data, a fallow rotation does not appear to be an effective approach to reduce *A. tumefaciens* populations and limit crown gall formation.

Importance of using "clean" black walnut seeds for Paradox hybrid rootstock production: Soil fumigation dramatically alters the composition of the microbial community in soil. The end result is a community which often is compromised in its ability to limit or inhibit soil-borne pathogenic microorganisms which enter fumigated field sites. Consequently, it is imperative that only "clean" (i.e., free of plant pathogens) planting material be used in these situations.

Recently we explored avenues for *A. tumefaciens* to enter the rootstock production system and cause crown gall. We found if black walnut seeds were shaken to the orchard floor, where they could sit for up to 48 hours, we were able to detect *A. tumefaciens* on the seeds. The longer the seeds remained on the orchard floor prior to harvest, the greater the percentage of *A. tumefaciens* contaminated seeds.

We now hypothesize the following avenue as being important in crown gall incidence. Black walnut seeds are shaken to the orchard floor where they may lay for 6 to 24 hours. During this time, the seeds become contaminated with soil which may harbor the crown gall pathogen. These *A. tumefaciens* contaminated seeds are then planted in freshly fumigated soil which contains a compromised native microbial community unable to suppress populations of *A. tumefaciens* on the seeds. This results in establishment of the crown gall pathogen in soil where it is ready to infect the walnut seedling upon emergence from the germinating seed. Given this scenario, we propose a cost effective way to reduce crown gall incidence is to limit or eliminate contact of the black walnut seed with the ground prior to planting in fumigated soil. This could be accomplished using a catching frame or even shaking the mother trees on tarps spread on the ground prior to shaking.

Contaminated grafting tools and graft wood: The importance of grafting tool sanitation has been demonstrated for numerous crops in which plant pathogens, including *Agrobacterium*, are readily transferred from plant to plant via grafting tools. When sanitation measures are not followed, Paradox seedlings can develop galls at the graft union or bleeding wounds. This implicated not only the involvement of improperly sanitized grafting and cutting tools but also potential *Agrobacterium* contamination of graft wood. Grafting tools and graft wood should never be left on soil where they can become contaminated with *A. tumefaciens.*

Bleach, a standard sanitizing agent is an effective disinfectant of water and solid surfaces. It is, however, corrosive and rapidly inactivated by dissolved or suspended solids such as organic matter, which are common in field situations. We have shown that surfactants known as quaternary ammonium compounds effectively reduced populations of *A. tumefaciens* in solutions and on solid surfaces. The detergents, benzalkonium chloride (BC), Cetyl trimethylammonium bromide, (CTAB) and Physan 20 rapidly reduced populations of *A. tumefaciens*. More importantly, BC and CTAB activity was only reduced by 16% in the presence of organic material which reduced

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bleach efficacy by 64%. In our laboratory trials these detergents dramatically reduced bacterial contamination on cutting blade surfaces which lowered gall formation in grafted test plants and were less phytotoxic than bleach. We are now exploring potential use of these materials in the field.

Crown galls can harbor large populations of the crown gall pathogen *A. tumefaciens*. Therefore, when conducting any type of gall removal operation, it is important to disinfect cutting tools after use on gall tissue and properly dispose all gall material after removal (i.e. remove from orchard and burn). Finally, before using disinfectants or other pesticides, be certain they are registered for that use in California.

Host Resistance: The best form of disease control is host resistance. Our walnut rootstock improvement team has made significant advancements in the identification of walnut genotypes which exhibit resistance/tolerance to key soil-borne pathogens including *Phytophthora*, *Armillaria* (oak root fungus), lesion nematodes and *A. tumefaciens* (crown gall). Texas black walnuts *(Juglans microcarpa*) have been found to exhibit elevated resistance to several of these key pathogens. By crossing Texas black walnuts with English walnuts (*J. regia*) we generated a hybrid that continues to exhibit tolerance to crown gall. These new hybrids will now be examined under various field conditions.

Overall Prevention Strategy: Based on our laboratory-based research and field observations, we developed a series of suggestions we feel will aid in the battle against crown gall. These include:

- Eliminate exposure of walnut seeds and graft wood to field soil prior to planting or grafting/budding.
- Surface sterilize grafting tools frequently.
- Limit time between nursery or cold storage pick up and planting and keep nursery planting stock cool prior to planting.
- Fumigate planting sites with Telone® C-35 or Telone® C-35 followed by Chloropicrin in heavily infested crown gall sites.
- Limit wounding of plant material.
- Avoid planting too deep.
- Avoid mounding soil up on newly planted trees.
- Keep crown of tree as dry as possible; *Agrobacterium* is favored by wet environments.

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Microbial Soil Inoculant Tested on Walnut Crown Gall

In early 2011, I became aware of the soil inoculant product Bio-S.I.™ (Bio-S.I. Technology, LLC, Justin, Texas) and heard accounts suggesting it was effective in controlling or eliminating crown gall from trees infected with this damaging bacterial disease. In May 2011, I initiated a small replicated trial in a Linden area orchard to test this product on crown gall. At that time, the test orchard was in its second year and had a very high incidence of severe crown gall infection.

In late May 2011, after air-excavating the soil around the crowns of 150 trees to expose the galls present, one of three experimental treatments was assigned at random to each tree with crown gall:

1. Surgery: Galls were removed surgically using a sharp tool and the healthy appearing bark ring around the excised gall area was “burned” with a propane torch to kill any remaining viable bacteria;
2. Intact/exposed galls were sprayed generously to run-off with a 1.25% water solution of Bio-S.I.;
3. Intact/exposed galls were sprayed to run-off with water (Untreated “water control”, the proper scientific comparison for Treatment #2).

Treatments #2 and #3 were repeated every 14 to 16 days for approximately 1 year - a total of 26 applications. Treatment effectiveness was evaluated in three ways:

1. By measuring tree trunk circumferences periodically to see if treatments would improve tree growth;
2. By visually inspecting trees for the presence or absence of galls at the beginning (late May 2011) and end (early August 2012) of the experiment;
3. As we had heard testimonials claiming that Bio-S.I.-treated galls could be expected to “decompose and fall away”, a soil penetrometer was used to measure the “resistance pressure” required to push the pointed metal probe of this instrument into the exterior surface of galls.

There were no statistical differences among the three treatments in their impact on trunk circumference or “resistance” of galls to puncturing pressure, so these results are not presented here. The table below shows the incidence of crown gall at the beginning and end of treatments. Bio-S.I. treatment had no measurable impact on crown gall in this trial. Galls re-developed on a large percentage of trees where galls had been surgically removed and the intact tissue around the cut area “burned”. This is a much lower success rate for this treatment than is normally seen. We do not know why it occurred but suspect that the surgery performed did not remove all infected tissue and/or that the torch heating was insuffi-

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cient to kill all bacteria and infected cells that may still have been present after the surgery.

	% of trees with crown gall	
Treatment	May 2011	August 2012
After surgery	0%	84%
Bio-S.I.	100%	100%
Water	100%	100%

Joe Grant, Farm Advisor

In the Vineyard

Weather. The 2012 season presented challenges and surprises as it wrapped up the last week of October for most growers. The season began right on schedule by long-term average, but under very dry conditions. Warm but not extremely hot days were accompanied by very cool nights most days, with minimums often 6 to 10 °F cooler than average.

After three years of very heavy and early October rains there was excellent weather during harvest until the first rain on October 22. It was significant, but considerably less than the last three harvest seasons. About 95 % of the vineyards were done and the rest quickly brought in. Seasonal growing degree days (GDD) for 2012 ended with a total right on long-term average and just below 3500, which is considered Region III. This is warmer than the last two years of GDD totals well below 3500. This year did seem warmer when compared to the last two years, which were the 9th coolest year in the last 37 years for 2011 and the 7th coolest year for 2010.

Even with most growers applying one or more mid-winter irrigations, dry soil conditions forced everyone to irrigate more than average. Canopy growth was similar to last year, but after two dry years there were more reports of what might be called “drought induced” potassium deficiency. Still early cluster counts indicated a good but average harvest.

Harvest. Grape harvest began a little on the early side of average around August 6, but at a moderate to slow pace. As harvest progressed it became evident that most varieties and most sites had a very big crop - the biggest since 2005 if not in the last 30 years. There were exceptions as always, but in general many vineyards were 20-30% above long-term averages (more so compare to the last two short crops). Syrah and Merlot were less loaded, and more variable than Zinfandel, Cabernet Sauvignon, Sauvignon blanc, and Chardonnay. May “newer” varieties were the biggest seen from experience such as Malbec, Petit Verdot, Verdelho, and Viognier, etc. Prices received by growers went up with the higher yields, which is a novel occurrence. It does look like this crop will significantly fill many wineries’ tank capacity.

This year’s warm days and very cool nights, with many mornings of very low relatively humidity (that resulted in few days with morning dew) did result in excellent colors and good flavors. Total acids were lower than recent years but still moderate and about average.

Pests. Summer bunch rot or sour rot was almost non-existent this year, especially compared to last year. Powdery mildew did cause some scattered problems in the usual suspects such as Chardonnay, but also popped up in others like Zinfandel. Overall, it was not a major concern. Spider mites did become evident, but fairly late in the season and scattered. Control was difficult in some locations, but overall not severe. Vine mealy bug (VMB) continues to spread, but growers are effectively controlling it. As VMB is effectively controlled it seems grape leafhoppers and variegated leafhoppers are much less of a problem.

VMB is still spreading throughout the county, but more slowly now that it seems there are good materials for control and most growers are adjusting spray programs to prevent problems as an ongoing cost of production. It is good to remain on the lookout and aware of any new infestations, often indicated by sooty mold or excessive honeydew in clusters, spurs, or cordons. A high degree of ant activity in and around vines can also indicate problem spots. Good places to begin looking before harvest are where birds tend to roost.

The good news this year was the official eradication of European grapevine moth (EGVM) and lifting of the quarantine. Unfortunately, invasive species continue to cause problems. The light brown apple moth (LBAM) continues to spread throughout the county and the state. Although not a concern to wine grapes (which are processed and not considered fresh fruit), the Oriental fruit fly (OFF) was discovered in Stockton last year. Although it was eradicated by an intensive urban program it is a concern to fresh fruit growers both in control and possible compliance for wine growers. Spotted wing drosophila (SWD) has increased costs for local fresh fruit growers, but fortunately it appears SWD doesn’t do well in vineyard microclimates. The marmorated stink bug is only a problem in the Northeast U.S., but is a major concern for everyone on the horizon.

Weeds. Increased reports of weed resistance, makes it more important than ever to monitor and to control some of the more noxious and troublesome weeds BEFORE THEY SEED. Besides marestail and fleabane, starthistle is also more of a problem along roadsides and it requires attention or it will dominate mowed areas, row middles, and habitats. Also, be aware there are reports currently that indicate Rely® (glufosinate) will not be available at all for 2013. This is the result of production and marketing problems.
Controlling weeds before they are large or have seeded and making repeat applications can help mitigate the problem of having one less option. Because although resistance is real and a problem, resistant doesn’t mean immune. Proper rates and calibration, good coverage,

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and appropriate timing of applications can make a big difference.

Varieties. With a big crop and a weak economy, wine sales are still increasing, if slowly, demand for many varieties such as Malbec, Pinot grigio, Petite Sirah, and Zinfandel (especially as red), whites such as Verdleho, Viognier, Vermentino and even the old standards Chardonnay, Colombard, and Sauvignon blanc are of interest. The demand for Cabernet Sauvignon is dramatically improved along with Merlot, while interest is dramatically increasing for all Muscat and Riesling types.

The county as a whole - and the American Viticultural Appellations (AVA) of Lodi, River Junction and most recently Tracy Hills within it - continue to confirm the region as a good place to grow quality fruit for quality wines that are a value for consumers. In spite of the ongoing challenges to comply with new regulations, control costs and a beaten up general economy, 2012 will be more positive than negative for local growers. The long term still looks good as 2013 approaches.

Fall Vineyard Checklist

- ☐ Little to no nitrogen should be applied now, but potassium now (or early next year) is okay. It won't "move" like nitrogen. To get full benefit of compost, it needs to be disked in.
- ☐ Make a note of any problem weed species that may be increasing.
- ☐ Mark any vines with excessive red leaves and/or leaf roll for monitoring of fruit quality next year of for possible removal before then.
- ☐ Renew your Irrigated Lands Regulatory Program (formerly Ag Waiver Discharge) permit/ membership.
- ☐ Update your air pollution mitigation plan if you have 100 acres or more in a single vineyard.
- ☐ Also, review your pesticide use reports and get everything up to date as there is continued interest to keep agriculture "accountable" for problems real and perceived.
- ☐ Check for locations near riparian areas, trees and other bird roosting sites for VMB. Focus on these areas next spring in any VMB control program. Lorsban (chlorpyrifos) is still an option for a late winter application, but be careful of sprays before any late winter/early spring storms, especially near natural drains and waterways.
- ☐ Gophers, voles, and squirrel activity are still common and may deserve attention with baits, gas cartridges, fumigant pellets (usually better in spring), trapping, shooting, or a combination of several of these methods. Remember that while ground squirrels are fair game, tree squirrels require a depredation permit. Owl boxes can help stabilize rodent populations, but do not control them.

Paul Verdegaal, Viticulture Farm Advisor

CALENDAR OF EVENTS

Delta Rice Grower Roundtable
Thursday, November 29, 2012
9 AM to12 PM
Jean Harvie Community Center, 14273 River Road in Walnut Grove. Rice growing in the Delta has a unique set of challenges and opportunities. Delta rice growers, this is your chance to hear from experts and learn from one another in roundtable discussions. For more information, or to RSVP, please contact Michelle Leinfelder-Miles at (209)953-6120 or mmleinfelder-miles@ucanr.edu.

Agri-tourism Intensive: Planning Your Agritourism Enterprise
Three-day workshops offered at two locations and dates:
Dec. 3, 2012; Jan. 7, & Feb. 12, 2013 at UC Cooperative Extension, Merced County, 2145 Wardrobe Avenue, Merced, CA
OR Nov. 15, 2012; Jan. 17, & Feb. 21, 2013 at UC Cooperative Extension, Sacramento County, 4145 Branch Center Road, Sacramento, CA 95827
Workshop fee: $50 (for 3 class sessions). **Space limited. For more information:** Penny Leff, UC ANR Small Farm Program, paleff@ucdavis.edu, (530) 752-7779

Alfalfa and Grains Symposium
Sponsored by UC Cooperative Extension, UC Davis Plant Sciences, the California Wheat Commission, and the California Alfalfa and Forage Association
Monday, December 10, 2012 through Wednesday, December 12, 2012.
Monday is a full day field tour of the Delta, with the conference taking place on Tuesday and Wednesday at the Double Tree Hotel, 2001 Point West Way, Sacramento.
Listen to over 30 expert speakers, visit with colleagues from all over the state, and see the latest on alfalfa and grain products and services at the exhibitor hall.
Early bird registration ends on November 20th. Register online at http://ucanr.edu/sites/Alfalfa/Registration/.

California Dairy Management Seminar
Tuesday, December 11, 2012; 10 AM to1 PM (registration starts at 9:30)
Stanislaus County Agricultural Center, Harvest Hall
3800 Cornucopia Way, Modesto, CA
Lunch provided. Seminars will be delivered concurrently in English and Spanish. Seminars are offered free of charge. Pre-registration is appreciated to guarantee your handouts and meal. Preregister with Jennifer Heguy by phone (209) 525-6800 or email (jmheguy@ucdavis.edu).

Northern San Joaquin Valley Tomato Production Meeting
Wednesday, January 30, 2013; 8 AM to 11 AM
Doubletree Hotel, 1150 9th Street, Modesto, CA
In conjunction with the California Tomato Growers Association 66th Annual Meeting.
For info on educational portion, contact Brenna Aegerter (209) 953-6114 or email (bjaegerter@ucanr.edu).
For info on CTGA luncheon meeting and exhibition: (916) 925-0225 or ctga@sbcglobal.net.

California Cherry Research Review
Friday, February 1, 2013; 9:30 AM to12:30 PM
Robert J. Cabral Agricultural Center, Stockton
Contact Joe Grant, 209-953-6100
There is no fee for this event.

Processing Tomatoes: Local Evaluation of Full-season Varieties

Statewide yields of processing tomatoes were up again in 2012 over last year, with the preliminary estimate at over 49 tons per acre, continuing an upward trend due in part to improved varieties. This year, our local mid-maturity processing tomato variety trial was located southeast of Tracy in a drip-irrigated field. The trial was transplanted on May 18th, and machine harvested on September 29th (134 days). The top-yielding variety was PX 024 8 1245 (SUR 1245), followed by HM 9905, UG 19406, H 5508 and H 5608. Many thanks to our grower cooperator, Hal Robertson, the California Tomato Research Institute, and the participating seed companies for their financial support.

Later in the winter, the full UC Statewide Variety Evaluation Report with combined results of all trials (both early maturity and mid-maturity) will be available from the UCD Vegetable Research and Information Center website (or I can mail you a copy) at http://vric.ucdavis.edu/veg_info_crop/tomato.htm

Brenna Aegerter, Vegetable Crops Advisor

Variety	Yield[y] (tons/acre)						Soluble solids °Brix	(rank)	PTAB Color	(rank)	pH	(rank)	Disease resistance[z]
PX 024 8 1245	45.3	A					4.7	(13)	22.3	(16)	4.28	(4)	VFFNP
HM 9905	44.4	A					4.7	(13)	21.8	(12)	4.44	(15)	VFFN
UG 19406	44.3	A					4.9	(11)	21.8	(12)	4.21	(1)	VFFNP
H 5508	42.4	A	B				4.2	(15)	21.5	(8)	4.37	(11)	VFFN SW
H 5608	41.7	A	B	C			4.2	(15)	21.0	(2)	4.44	(15)	VFFNP SW
SUN 6366 (STD)	40.7	A	B	C	D		5.0	(9)	21.3	(4)	4.39	(12)	VFFNP
DRI 0319	38.0		B	C	D	E	5.2	(3)	21.8	(12)	4.29	(6)	VFFNP SW
H 9780 (STD)	38.0		B	C	D	E	5.0	(9)	21.5	(8)	4.28	(4)	VFFNP
AB 2 (STD)	38.0		B	C	D	E	5.2	(3)	21.5	(8)	4.26	(2)	VFFP
UG 19306	37.6			C	D	E	5.1	(7)	21.8	(12)	4.27	(3)	VFFNP
AB 0311	36.9				D	E	5.2	(3)	21.5	(8)	4.30	(8)	VFFNP SW
UG 19006	36.4				D	E	4.8	(12)	20.5	(1)	4.29	(6)	VFFNP
BQ 205	36.1				D	E	5.2	(3)	21.3	(4)	4.30	(8)	VFFNP
N 6402	35.6					E	5.3	(1)	21.3	(4)	4.43	(14)	VFFN SW
N 6404	35.6					E	5.3	(1)	21.3	(4)	4.35	(10)	VFFN SW
BQ 163	34.8					E	5.1	(7)	21.0	(2)	4.39	(12)	VFFNP
Mean	39.2						4.9		21.4		4.33		
CV=	8.4						4.8		3.0		1.2		
							0.3						
LSD @ 0.05=	4.71						4		NS		0.073		

y Yield values followed by the same letter are not significantly different.

z Disease resistance information is what is reported to us by the seed companies: V = Verticillium wilt race 1; F = Fusarium wilt races 1, 2 or 3; N = Root knot nematode; P = Bacterial speck race 0; SW = Tomato spotted wilt virus.

Alfalfa Growers:

Get up-to-date information on alfalfa and other forages at the Alfalfa and Forage News blog, brought to you by UC Cooperative Extension.
http://ucanr.edu/blogs/Alfalfa/

Back to Basics: The ABCs of Forage Analysis

High quality forages are a staple in California dairy rations. It's important to know what you're paying for when buying forages, or what nutrients your home-grown forages are providing in the ration. Forages are typically variable in chemical composition. The primary reason for this variability is that forages are harvested at various stages of physiological maturity, but harvest methods, plant variety, soil fertility, and weather conditions also play important roles. One of the most crucial aspects of accurate forage analyses is obtaining a representative sample to send to the lab, something we'll cover in a future article. In this article, we'll cover three major components of feed analysis: dry matter, crude protein, and fiber (ADF & NDF). We'll delve deeper into the different components of forage analysis later, but for now, our intention is to bring a general understanding to the "what's and why's" of basic wet chemistry analysis.

Dry matter and moisture

Dry matter (DM) is basically what remains when the water (moisture) is removed from a feed. For example, silages contain a fair amount of water. In our corn silage example (see table), DM accounts for 36% of the feed, meaning for every 100 pounds of silage fed, 64 pounds of that is water.

Why is that important? Because while water is an essential nutrient, water does not contain energy and energy intake is essential for milk production. This is why nutritionists compare feeds and formulate rations on a DM basis – to take water out of the equation. There are a number of other reasons to know the DM of a feedstuff. To continue with our silage example, one way we use DM is to buy and sell forages. We typically purchase corn silage on a 70% moisture/30% DM basis. At 36% DM, we would be giving away nutrients for free (or if purchasing, would be getting a really good deal). We also sell and purchase alfalfa hay on a 90% DM basis, and this may be how the chemical analyses are reported.*

Dry matter content of forages also tells us something about harvesting conditions. Too much water (moisture) in hay and there will be mold. Too wet or too dry silages reflect harvesting practices that do not support proper fermentation, which is essential for preserving the nutrients in the silage.

***To covert nutrients (or energy) from "90% DM" to "100% DM" basis:**

Nutrient % on 90% DM basis ÷ 0.90 = Nutrient % on DM basis

Examples

6.93% CP on 90% DM basis is 7.7% CP on 100% DM basis

54.5% TDN on a 90% basis is 60.5% TDN on 100% DM basis

CHEMISTRY ANALYSIS RESULTS		
Dry Matter		35.9
Moisture		64.1
PROTEINS	**% DM**	**% CP**
Crude Protein	7.7	
Adjusted Protein	7.7	
Soluble Protein	5.07	66.2
Ammonia (NPN)		
ADF Protein (ADICP)	0.79	10.3
NDF Protein (NDICP)	1.11	14.5
Rumen Degr. Protein	6.368	83.1
Rumen Deg. CP (Strep.G)		
FIBER	**% DM**	**% NDF**
ADF	29.19	68.2
NDF	42.80	
aNDFom		
NDR (NDF w/o sulfite)		
peNDF		
Crude Fiber		
Lignin	3.44	8.04
NDF Digestibility (12 hr)		
NDF Digestibility (24 hr)		
NDF Digestibility (30 hr)		
NDF Digestibility (48 hr)		
NDF Digestibility (240 hr)		
Indigestible NDF 120 HR		

Crude protein

The next component on the lab results is titled proteins. For this article, we'll focus on crude protein (CP). From the results, we see that CP is 7.7% on a DM basis – just to review, 7.7% of the corn silage is protein when water is removed. If this were on a wet basis, the number would be much lower (2.76% Wet Basis), because the protein content would be diluted by the large amount of water.

Crude protein is an estimate of the protein content of a feedstuff, based on the amount of nitrogen measured in the lab. Nitrogen is a component of protein, and the lab method assumes that all protein contains 16% nitrogen (a slight error, because all proteins do not contain 16% nitrogen, and why it's labeled "crude" protein). By doing a little math (100/16), this creates a conversion factor of 6.25 so that %CP = %nitrogen * 6.25.

Why is CP important? Nutritionists use CP to formulate balanced diets. The dairy cows, heifers, and calves on the farm all have dietary requirements for protein that is needed for maintenance and production (milk production, growth, gestation). The CP content of each individual feed is considered when formulating a ration.

Fiber

The two measurements of fiber are **neutral detergent fiber (NDF)** and **acid detergent fiber (ADF).** Hemicellulose, cellulose, and lignin make up NDF, while ADF includes only cellulose and lignin. The NDF components are also referred to as cell wall, and are what create the structure of plants.

Why are NDF and ADF important? One reason is that lignin is indigestible and its association with the cellulose and hemicellulose in the plant cell wall impacts the digestibility of the cellulose and hemicellulose. Cellulose

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and hemicellulose are structural carbohydrates that are digested by the rumen microbes. Digestibility is related to energy; if it is digested, the animal can obtain energy. For example, as the ADF content of alfalfa hay increases with maturity, its digestibility decreases so that the amount of energy obtained by the animal is less with high ADF hay compared with low ADF hay. This relationship between ADF content and digestibility is the basis for marketing hay in CA based on TDN content. Another example of this effect is BMR corn silage. BMR corn has lower lignin content, so that fiber digestion is often improved and thus giving BMR corn silage higher energy content when compared with conventional corn silage.

Your nutritionist will use NDF and ADF in various ways. The fiber (NDF & ADF) content of the diet is important to support milk fat production, enhance rumen function, and promote high DM intake. Acid detergent fiber is sometimes linked to energy calculations and NDF is often linked to DM intake.

Take home message

It's imperative for nutritionists to test forages for quality parameters to formulate rations, but it's also helpful for you to be able to read your forage results and have a basic understanding of the different components. The concept of DM is something everyone working with feed on your dairy, including feeders, should understand.

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Dormant Weed Control in Tree Nut Crops 2012-2013

Weeds have a tremendous capacity to spread within an orchard. The first line of defense is identifying the weeds you need to control, and selecting the best herbicides or cultural practices to control those weeds. If you use the same herbicide(s) each year, a shift to tolerant weed species will ultimately take over and a loss of herbicide effectiveness will occur. Alternating products with different modes of action at least every couple years will improve results and insure herbicides long term viability. The UCIPM web site has charts that show which weeds are controlled by what herbicides, and an excellent weed photo gallery that includes many weed species commonly found in California for easy identification and reference http://www.ipm.ucdavis.edu/.

Pre Emergent Herbicides

Prowl H_2O (pendimethalin) herbicide has excellent grass control and broadleaves especially those germinating in the spring and summer time. Surflan (Oryzalin) and Prowl are similar in their weed spectrum and residual properties. Prowl H_2O and Surflan remain stable on the soil without rainfall for 21 days. Apply them at the higher label rates (4-6 quarts per sprayed acre) for extended weed control. Another strategy is to treat early season November/December for winter weeds with a low rate of glyphosate (Roundup, Touchdown) with a soil residual herbicide such as Chateau, Matrix, Alion, or Pindar GT and then wait to apply the Surflan or Prowl later in February or March to achieve summer long weed control.

Chateau (flumioxazin) is a long-lasting pre-emergent herbicide available for tree, nut, and vine crops. Applied between 8-12 oz. per treated acre, Chateau enhances burndown of small broadleaf weeds and provides residual control of difficult weeds such as fleabane and horseweed (mare's tail) and a host of other winter weeds as they germinate. This has made Chateau an excellent herbicide for use in the fall/early winter timing during the dormant period. This time frame also avoids phytotoxicity to emerging bud tissue in the early spring, especially on young trees. The addition of Rely (glufosinate), Roundup (glyphosate), Treevix (saflufenacil), or Gramoxone (paraquat) is needed to control emerged weeds especially fleabane and marestail.

Matrix FNV (rimsulfuron) is a pre-emergent herbicide active on many winter broadleaf and grass weeds including fleabane, malva, willow weed, and marestail. Its broad spectrum activity on grasses and broadleaf weeds, makes it a good fit for an early fall application timing November/December. It should be tank mixed with a contact herbicide; Roundup, Rely, Gramoxone, or Treevix. Matrix is applied at 4 ounces product per broadcast acre. A second application or use of another pre-emergent herbicide is generally needed in the spring for extended summer weed control. Matrix is very safe on young trees.

Alion (indaziflam) is a new herbicide registered in tree nuts. It is a preemergent, long-lasting soil residual herbicide exceptional in controlling grasses and many broadleaf weeds. It is effective on both winter and summer weeds including fleabane, marestail, sowthistle, and willow weed. At least 1/4 " of water is needed to set and activate soil residual. Since it is strictly a pre-emergent herbicide, it requires a tank mix with a post contact herbicide for emerged weeds; Rely, Roundup, and Gramoxne are all compatible. Alion is a brand new chemistry and has shown excellent results and has an inhibiting cell wall formation MOA (mode of action). This MOA will have an important role in future weed control strategies of weed resistant management.

Pindar GT(oxyfluorfen and penoxsulam) is two herbicides, having pre- and post-emergence activity for use in tree nuts and fruits. Applied in November/December, it provides residual control lasting into spring/early summer. It is especially effective on filaree, malva, willow weed, sowthistle, and many other winter broadleaf weeds. If weeds have emerged, it is recommended to combine it with a post-herbicide Roundup, Rely, or Gramoxone. If heavy grass pressure is anticipated in the orchard, the addition of Prowl or Surflan will benefit long term grass weed control. Within 14 days of application, a ½" of water is needed to set and activate the herbicide.

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Trellis (isoxaben) has been recently registered for use in bearing almonds and other nut and fruit crops. It is a pre-emergent herbicide controlling many winter and summer broadleaf weeds. Applied in the fall/winter time frame will provide 4-5 months of control. It has no post-emergent activity, therefore, it must be tank mixed with Roundup, Rely, or Gramoxone for emerged weeds. Trellis mode of action is unique; it inhibits cellulose development making it a good rotational herbicide to manage weed resistance. If grass weeds are an issue, the addition of a pre-emergent grass herbicide; Prowl or Surflan will be needed.

Post Emergent

Rely (glufosinate) herbicide has become a mainstay for growers needing a broad spectrum burn down herbicide to control tough weeds like fillare, willowweed, or glyphose resistant fleabane and marestail. During the 2012 season, California was in short supply of Rely due to the high demand in the midwest for planting glufosinate corn varieties. In recent years, the development and spread of Roundup resistant weeds is forcing a change from Roundup Ready corn and soybeans varieties to planting Liberty Link varieties which require the use of glufosinate herbicide (Rely, Liberty). With the heavy use expected in corn states, Rely is again anticipated to be in short supply for California growers in 2013. Growers should plan on alternative weed control strategies that will replace the use of Rely. We are confident with the post- and pre-emergent herbicide combinations we have available and used in a timely manner, we can still expect excellent weed control results.

Treevix (saflufenacil) is a new post-emergent contact herbicide offered for almond, nuts, and fruit crops. The use is for tough emerged broadleaf weeds but no activity on grasses. Like all post contact herbicides, treating small weeds 1”- 6” tall with complete spray coverage is important. Treevix is excellent in burning down fleabane, marestail, and willowweed, especially in cooler temperatures beginning in fall through spring time. It has no soil residual activity, therefore, will need to be tank mix with soil active herbicides for long term control. If grasses have already emerged using glyphosate or Gramoxone is needed.

Some growers may prefer multiple post-emergent treatments rather than pre-emergent treatments, if orchard access is limited during the dormant season. Roundup, Touchdown, Gramoxone, Shark, Venue, Rely, Goal, and 2,4-D are registered for use in almond orchards. Glyphosate is moderately effective on purple nutsedge with repeated applications prior to the six-leaf growth stage. Yellow nutsedge can be managed by using 4qts/A of glyphosate at each application. Sandia herbicide has shown excellent results to control nutsedge. The key to nutsedge control is repeated applications before it is able to regenerate new nutlets and tree size allows for orchard shading. Care should be taken to avoid resistance in weed species by repeated use of the same herbicide year after year. Cost comparisons between pre- and post-emergent programs often show that the expense of repeated contact application equals or exceeds the cost of the pre-emergent treatment, especially if you have noxious weeds like fleabane, which are best controlled with these newer pre-emergent materials. Herbicide application equipment should NEVER be used for treating tree foliage! Manufacturer labels providing essential information about the proper use and application rate for all pesticides can be accessed at http://www.agrian.com or http://www.cdms.net.

NOTE: Before using any herbicide always check labels for any use restrictions applicable to your area or soil type.

Table 1. Dormant weed control in an established almond orchard.

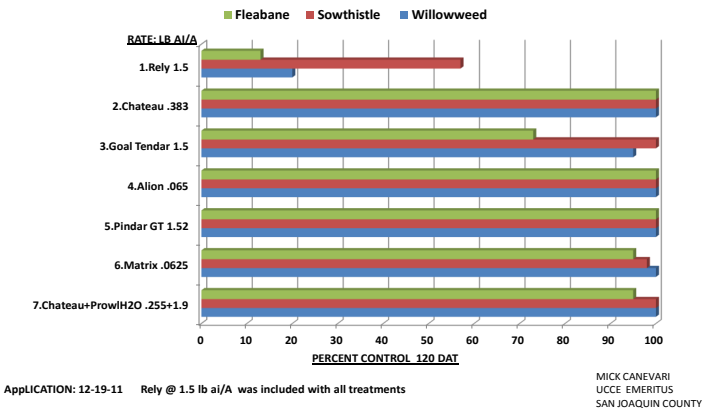
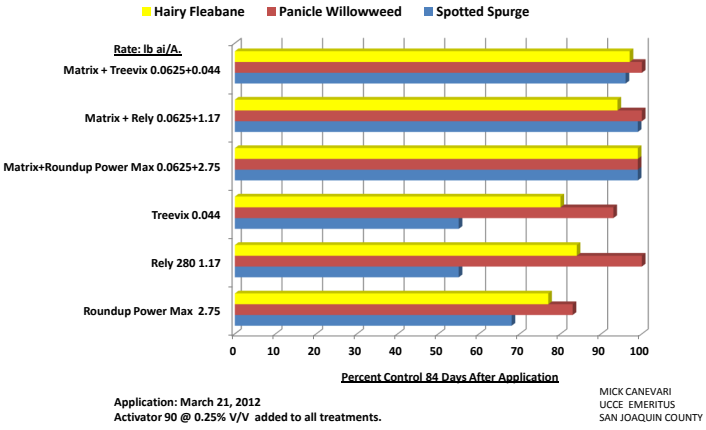


Table 2. Spring application to emerged weeds in an established almond orchard



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Notes from the Field

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The University of California working in cooperation with San Joaquin County and the USDA.