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Tree and Vine Newsletter

Chuck Ingels, Pomology/Viticulture Farm Advisor
Jenny Broome, Ph.D., Area Plant Pathologist

4145 BRANCH CENTER ROAD, SACRAMENTO, CA 95827-3898 *OFFICE (916) 875-6913 FAX (916) 875-6233*
E-MAIL caingels@ucdavis.edu, jcbroome@ucdavis.edu *Web Site:http://cesacramento.ucdavis.edu*

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RESEARCH UPDATE: SYRAH DEFICIT IRRIGATION AND CROP LOAD TRIAL

by Chuck Ingels

Research led by Terry Prichard (UCCE water management specialist) and others over the last decade has shown that controlled deficit irrigation improves red wine quality, although some yield is usually sacrificed. In addition, wineries in recent years have found that lengthening the hang time (delaying harvest) improves wine flavor, but again with some yield loss. This experiment was designed to test an intermediate irrigation treatment to possibly reduce the yield loss, and to determine the effects of different harvest dates and number of spurs left at pruning. This article is a summary of the 2006 report.

The trial, started in 2004, is being conducted in a Syrah vineyard northeast of Galt by Terry Prichard, Paul Verdegaal (UCCE farm advisor, San Joaquin County), and me, with the excellent cooperation of grower Ernie Dosio and manager Carl Maggio. The vineyard was planted in 1998 using FPMS clone 6 on SO4 rootstock and the spacing is 5 x 11 ft. Vines are trained to Livingston Divided Canopy and are shoot-positioned, and they are shoot-thinned to remove non-productive shoots.

The study utilizes 3 irrigation strategy treatments, 3 Brix targets (harvest dates), and 2 crop load levels, with 4 replications of each treatment. The irrigation system was designed to facilitate water delivery independently to the 32 plots, and each plot contained 20 vines in each of three adjacent rows.

Treatments

The irrigation strategies used are:

I-1: Full potential water use (100% crop evapotranspiration [ETc]).

I-2: A strategy in which the first irrigation was withheld until mid-day leaf water potential reached -14 bars (7/17/06), after which weekly irrigation was provided at 50% ETc until 19 Brix (8/26/06), then the irrigation volume was increased to 100% ETc until harvest.

I-3: initial irrigation same as treatment 2, but irrigation volume remained at 50% through harvest.

A similar strategy was used in 2005. The goal of treatment I-2 was to attempt to reduce some of the yield loss, hopefully without reducing juice quality. Irrigation for treatment I-1 began May 31 and for treatments I-2 and I-3 began July 17 (extended rainfall occurred in spring 2006). Actual mid-day leaf water potential through the season is shown in Figure 1.

Two crop load treatments were used: **(S-14)** 14 spurs/vine, resulting in 5.6 primary buds per foot of row, and **(S-18)** 18 spurs/vine, resulting in 7.2 buds per foot of row (a nearly 30% increase).

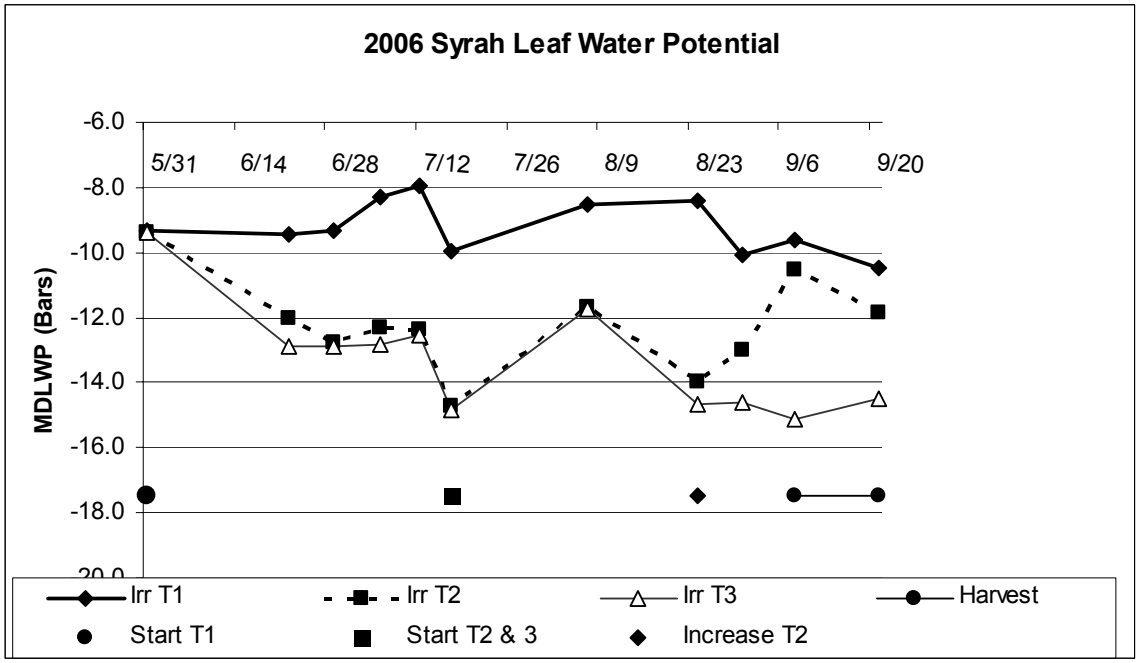
Maturity treatment targets were 24, 26, and 28 Brix (**B-24**, **B-26**, and **B-28**). Harvest dates for 2005 and 2006 were determined by sampling berry Brix in each treatment. Harvest began with the treatments I-2 and I-3 at the 24 Brix and S-14 treatments on Sept 11. Harvests ended October 20 with irrigation treatment I-1 at 28 Brix for both the S-14 and S-18 treatments.

2006 Results and Discussion

The deficit irrigation treatments I-2 and I-3 consumed 66% and 47%, respectively, of the full irrigation treatment I-1. Both the deficit irrigation treatments resulted in higher water use efficiency when compared to the full water treatment.

As might be expected, shoot lengths of the full irrigation treatment I-1 were longest, those of I-3 were shortest, and those of treatment I-2 (with increased water late in the season) were intermediate. Pruning weights followed a similar pattern with I-1 almost double that of I-3. Land surface shading, measured on the day of the increased irrigation of I-2 (8/25/06), followed a similar

Figure 1. Mid-day leaf water potential for vines in the three irrigation treatments (more negative values indicate greater water stress). Treatment 2 (the dashed line) reflects deficit irrigation until late August and full irrigation from then on.



pattern. Significant differences in shoot length were found between spur treatments: the 14-spur treatments had longer shoots than the 18-spur treatments (60 vs. 55 cm), but the total pruning weights were identical.

Yields were significantly higher in the full irrigation treatment than in treatment I-3 and treatment I-2 was intermediate. Treatment I-1 at 25.3 pounds per vine (10.0 tons/acre) compared to the deficit treatments at 22.0 lbs./vine for I-2, and 18.5 lbs./vine for I-3. The yield reductions from full irrigation were 19 and 27 % for treatments I-2 and I-3 respectively. For the Brix treatments, the B-28 (latest harvest) had about 18% lower yield than the B-24 and B-26 treatments. For the spur treatments, S-18 yields were about 12% higher than those of S-14. We also found that by increasing the number of two-bud spurs the yield reduction from 26 to 28 Brix was entirely eliminated.

Berries wer significantly larger in the highest level of irrigation treatment than the other irrigation treatments and larger in the lowest Brix treatment B-24. No significant differences were found between spur treatments.

Irrigation treatments I-2 and I-3 had the highest Brix level, averaging 25.7 Brix followed by I-1 at 24.4 Brix across all Brix and spur treatments. Essentially the full irrigation delayed sugar accumulation, while the increase in irrigation late in the season (I-2) had no effect in comparison to the continual deficit treatment. A comparison of irrigation treatments across the Brix and spur treatments shows that malate content, potassium content, and titratable acidity and pH significantly higher in the full irrigation (I-1) than both deficit treatments.

Comparing the Brix treatments across the irrigation and spur treatments, pH increased with increasing Brix level whereas titratable acidity decreased with increasing Brix level. Malate was significantly higher in the B-24 treatment in comparison to the B-26 and B-28 treatments while the opposite is true for potassium content. Malate concentration typically decreases as the season progresses and is higher under conditions of abundant vegetative growth. The treatment with the highest water consumption (I-1) was significantly higher in malate than the deficit treatments when compared across all Brix treatments. The Brix treatments followed a significant reduction in malate from the B-24 to B-28.

The use of deficit irrigation and extended maturation techniques reduce yield over time as a result of reduced fruit load and smaller berries. The strategy of increasing fruit load by pruning to 30% more primary buds looks promising in recovering some of the yield loss – vine balance seems not to have been affected, no significant delays in harvest were found, and changes in juice components were minimal.

Additional Information

To see the full text of the report for this trial, visit http://cesanjoaquin.ucdavis.edu and click on "LAWR Water Management Specialist" and you can download many of Terry Prichard's vineyard water management publications, including the report discussed above.

Esca (Black Measles) and Petri Disease (Young Esca) of Grapevines

by Jenny Broome and
Doug Gubler, UC Davis Dept. of Plant Pathology

Esca, also known as black measles, and Petri disease or young esca, are caused by a complex of fungal pathogens. Esca typically occurs in older grapevines and is caused primarily by *Phaeoacremonium aleophilum* (*Togninia minima*) as well as other species of this genus. Young esca, also known as vine decline as it occurs on immature grapevines, is typically caused by another closely related fungus *Phaeomoniella chlamydospora*. However, both of these fungi can be found in plants affected by both disorders. When diseased wood is obtained from nurseries or disease occurs in newly planted vineyards, symptoms can be seen in vines as young as two to three years of age.

Symptoms, Pathogen Biology, and Disease Cycle

Esca/Measles. Leaf symptoms of measles include small chlorotic interveinal areas, which look like a "tiger stripe" pattern and which enlarge and dry out. In red varieties, those areas will be surrounded by dark red margins. Severely affected vines will experience leaf drop and shoot tip dieback. The fruit can have small, dark spots, which may be surrounded by a purple ring. In severely affected fruit, the berries will crack and dry out or will raisin or wilt.

The causal fungus isolated from symptomatic vines was *Phaeoacremonium* spp. Recent work has shown in greater detail that there is a group of pathogens that occur as weak endophytic pathogens, meaning they reside systemically within the water-conducting tissues. These fungi belonging to the genus *Phaeoacremonium* produce fungal resting structures called perithecia in old, rotted, vascular tissue of pruning wounds and in cracks in cordons, trunks and spurs. Spores are released from these overwintering structures with rainfall and the sexual spores or ascospores reinfect the grapevine through pruning wounds, which remain susceptible for up to 16 weeks. Insect transmission of sexual spores may also occur. The pathogen then overwinters as perithecia or in the endophytic phase within the grapevine.

Petri Disease/Young Esca. Symptoms of Petri disease include vascular streaking of the woody cylinder, stunted growth, shoot tip dieback, and small, chlorotic leaves. *Phaeomoniella chlamydospora* resides on the wood as specialized fungal structures called pycnidia in 3 to 5-year-old pruning and girdling wounds and spores are released with rainfall during the months of November through April. Symptoms generally are expressed either in the year that new infections occur or one year later.

New diagnostic methods have been developed and include use of sensitive lab tests for fungal DNA called Polymerase Chair Reaction (PCR) tests which can distinguish between five to seven species of *Phaeoacremonium* and the single species *Phaeomoniella chlamydospora.* Several other fungi have also been associated with esca symptoms including *Phialophora spp* and *Caudophora spp*.

Esca/Measles Management

Research is still ongoing on the disease cycle and management options based on understanding the cycle. It is clear that pruning time is not as important as it is with Eutypa dieback. These pathogens are capable of infecting pruning wounds made at any time during the winter and spring. Double pruning alone probably would work best for spur-pruned vines, but larger wounds should be protected. Chemicals used for Eutypa are also effective in protecting against esca pathogens such as Topsin-M (WSB 1%) which is a thiophanate fungicide with a restricted entry interval of 7 days. To use it, mix as a 1% paste and apply to cut or pruned surfaces immediately after cutting. It is registered for esca control where its use is allowed under a Special Local Needs label; check with your County Ag. Commissioner.

Control can also be achieved with use of liquid lime sulfur but the product must be applied such that it gets into the cracks and crevices of the vine because that is where the fungal fruiting bodies reside. Other treatments still under development include use of wax or tree tar to fill the holes on the vine thus physically blocking the fungus from reinfecting the vine. Finally materials such as boric acid at 5000 ppm and Dreft detergent are also effective but are not currently registered for such uses on grapes in California.

Young Esca/Petri Disease Management

It is always important to obtain clean, healthy planting stock and to plant using appropriate cultural practices, and to provide sufficient irrigation and fertilization to young, newly planted vines to avoid establishment problems. These pathogens are common in soil and they occur as epiphytes on the exterior of grapevines. They also are endophytes (live in the water-conducting tissue of grapevines). If the vines are stressed, the pathogens appear to become more virulent and cause disease.

Young esca is a root disease of newly planted vines that were at one time or another put under some kind of stress. Research has shown that predisposition stresses involved in Young esca include early fruiting of the vines (before year three), "J" rooting, and poor irrigation management or water deficit stress. Once the stress has occurred and vines display symptoms, they should be removed and new vines replanted. The entire vineyard

does not have to be removed but rather, only the vines showing symptoms. However, growers have found that some vines suffering from young esca grow out of the condition and recover. There is differential susceptibility of grapevine varieties and rootstocks with all of the Phylloxera and nematode resistant stocks being more susceptible than AXR1 rootstock. For example, 3309C, 101-14, and 5C are very susceptible to *P. chlamydospora* whereas AXR1 is nearly immune to the disease.

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UC Pest Management Guidelines, UC IPM web site, Disease of Grapevines, Esca http://www.ipm.ucdavis.edu/PMG/r302100511.html

New Super Pest: Light Brown Apple Moth

Light brown apple moth (LBAM) is an exotic pest that has recently been discovered in portions of the San Francisco Bay Area, including Marin, San Francisco, Santa Clara, and Contra Costa counties. LBAM is a native pest to Australia and New Zealand, and has become established in Hawaii.

LBAM has been found on over 200 species, including grape, kiwifruit, cane berries, strawberry, apple, pear, many stone fruits, almond, avocado, oak, willow, walnut, poplar, cottonwood, coast redwood, pine, eucalyptus, rose, camellia, jasmine, chrysanthemum, corn, pepper, tomato, pumpkin, beans, cabbage, carrot, alfalfa, and clover.

It was estimated for Australia that LBAM causes AU$21.1 million annually in lost production and control costs, or about 1.3% of gross fruit value, for apples, pears, oranges and grapes. The Calif. Dept. of Food and Agriculture estimates that total lost production and control costs in California for all significant crops could be $133 million per year, not including postharvest treatments or economic costs to the nursery industry. Some countries have specific regulations against this pest, and many others consider it a regulated pest that would not be knowingly allowed to enter. In addition, because LBAM is not established in other mainland states, they would likely impose restrictions on the movement of potentially infested fruits, vegetables and nursery stock.

Adults are light brown, yellowish moths with varying amounts of darker brown, with a wingspan of 5/8 to 1 in. Larvae are green, just under 3/4 in. long at maturity.

In Australia, this moth typically has three generations per year and over-winters as a larva. Adults deposit egg masses containing 20-50 eggs on the upper leaf surface or on fruit. Larvae disperse and construct silken shelters on the underside of leaves, usually near a midrib or large vein. Older larvae roll together leaves and buds or fruit with webbing. Damage to fruit occurs as surface feeding by the larvae. Larvae will occasionally enter the fruit to feed.

Management elsewhere is by mating disruption, parasitoids and various insecticides have been used to control LBAM elsewhere.

The most significant route of artificial spread is likely to be on plants sold through nurseries and destined for commercial, ornamental and garden plantings. Other methods of spread are on green waste and fruit.

Important CDFA web pages:
http://www.cdfa.ca.gov/phpps/pdep/lbam_main.htm
http://www.cdfa.ca.gov/phpps/pdep/lbam_profile.htm

Quarantine maps:
http://www.cdfa.ca.gov/phpps/pdep/lbam-qmaps.pdf

VINEYARD WINTER INJURY

by Chuck Ingels and
Paul Verdegaal, UCCE San Joaquin County

Freezing nighttime temperatures occurred for over two weeks in January 2007, with a low of 19° or 20°F on Jan. 16. A few vineyards in low-lying and cold areas were severely affected, with budbreak delayed until mid April. In a given vineyard block, wide swaths of vines with this delayed growth were present, with healthy vines interspersed or in other parts of the block. New growth was only several inches long when flowering began, so fruit from these vines would need to be removed or cordons cut back for retraining.

Grape varieties differ in their susceptibility to winter injury. The hardest hit have been Pinot Gris, Pinot Noir, Chenin Blanc, and Sauvignon Blanc, and Zinfandel responds with erratic and poor shoot growth. Even a Chardonnay block in the middle of one of a delta island (colder) was fairly severely affected.

Winter injury appears to be most severe when the dormant vines are under stress, such as when the previous crop is excessive or late, or when rainfall is lacking and soil moisture is insufficient. To reduce the possibility of winter injury, avoid overcropping vines and be sure the vineyard receives sufficient irrigation after harvest. But avoid overwatering postharvest so new growth is not pushed in the fall. Also, consider irrigating in midwinter if rainfall is sparse.

ELIMINATE THE WILLIAMSON ACT?

by Maxwell Norton, UCCE Merced County

The Governor is proposing in his May budget revision for the 07-08 budget to eliminate the Williamson Act. Information can be found at: http://gov.ca.gov/may-revise/savings/williamson.html This is not the first time the Williamson Act has been targeted. It can be presumed that future Governors with mainly urban bases of support will target Williamson Act as an easy way to save money.

The last time it was targeted, some counties announced that they would stop renewing contracts since they do not view funding this program as their responsibility. Tulare County has a resolution to that effect. It can be presumed that those counties with the largest Williamson Act costs will be the first to start canceling.

Convincing the urban majority in the legislature that the Williamson Act is worth fighting for is requires a careful strategy. Many of them view the program as another subsidy that other businesses in the state do not enjoy. The argument for Williamson Act will need to be based on its value to all Californians, urban and rural. Benefits most often cited are open space preservation, environmental services of open land, food security, orderly urban growth and maintaining diversity in the local economy. While many farmland preservation tools can be controversial, the Williamson Act seems to enjoy broad support, even from many cities.

NEW PUBLICATIONS

Pear Production and Handling Manual

This book, many years in the making, is now available from the University of California. It is written with California Bartlett pear production in mind, but growers of all varieties will find it useful. The many chapters cover orchard and tree management including varieties, propagation and rootstock selection, training, pruning, and orchard floor management. The section on irrigation and fertilization covers considerations including irrigation systems and scheduling, frost protection, and nutrition. Extensive sections on pest management, and fruit harvesting, storage and handling round out this essential guide. Pub. no. 3483. Price: $25.00. 215 pp. Available in our office (call to be sure) or order online at http://anrcatalog.ucdavis.edu or call (800) 994-8849.

The Home Orchard: Growing Your Own Deciduous Fruit and Nut Trees

Developed especially for use by California backyard orchardists, rare fruit growers, and small-scale growers, *The Home Orchard* offers a comprehensive look at "standard" growing methods, as well as some innovative practices that enthusiasts have developed in recent years, some of which are uniquely suited to the small-scale grower. Included are hundreds of photographs and diagrams that clearly show how to produce the best crops. Photos of several practices, such as key budding and grafting methods, are depicted in step-by-step photos. Pub. no. 3485. Price: $25.00. 202 pp. Available in our office (call to be sure) or order online at http://anrcatalog.ucdavis.edu or call (800) 994-8849.

Weeds of California and Other Western States
This encyclopedic yet easy-to-use 2-volume set covers 262 individual entries, including a full description of 451 species and another 361 plants compared as similar species, representing 63 plant families. Pub. no. 3488. Price: $100.00. 136 pp. Available in our office (call to be sure) or order online at http://anrcatalog.ucdavis.edu or call (800) 994-8849.

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700 H Street, Room 2450
Sacramento, CA 95814

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District 2 – Jimmie R. Yee
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District 3 – Susan Peters
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District 4 – Roberta MacGlashan
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