COOPERATIVE EXTENSION • UNIVERSITY OF CALIFORNIA
SACRAMENTO COUNTY

Tree and Vine Newsletter

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CLARKSBURG WINE GROWER MEETING

Thursday, March 5, 2009
9:00 AM to Noon
Jean Harvie Senior and Community Center, 14273 River Road, Walnut Grove CA 95690
(Stay on River Rd. to south end of Walnut Grove; The Community Center is on the left.)
(a wheelchair accessible facility)

Sponsors:
UC Cooperative Extension – Sacramento, Yolo, & Solano Counties
Clarksburg Wine Growers & Vintners Association

8:30 Sign in
Pastries provided courtesy of Sacramento Valley Farm Credit

9:00 **Welcome**
Tim Waits – President of Clarksburg Wine Growers Association

9:05 **Contracting to deliver grapes and get paid**
Dale Stern – Stern, Van Vleck & McCarron, LLP, Sacramento

9:45 **Saving labor and material costs in pest management**
Chris Storm – Vino Farms, Lodi

10:10 **Break**

10:40 **Vineyard mechanization with an emphasis on fruit and wine quality**
Craig Ledbetter – Vino Farms, Lodi
Lance Vande Hoef – Pellenc America Inc., Santa Rosa

11:30 **District 17's position in California's wine industry**
Jeff Bitter – Allied Grape Growers, Fresno

12:15 **Luncheon –** Courtesy of AGRO Crop Insurance

Revising the Gubler-Thomas Model for Powdery Mildew

by Jenny Broome

Use of the Gubler-Thomas Model for powdery mildew risk assessment by California grape growers has already achieved goals of better disease control by targeting fungicide applications to high risk conditions over many of the temperature ranges seen in California grape growing areas. We are currently working to refine this model for periods of higher temperatures. Better control of powdery mildew of grape has the potential to improve crop yield and quality. Raising the high temperature threshold of the Model would potentially allow for even fewer fungicide applications per season. With global climate change, the need for better understanding of the role of high temperatures on disease and grapevines may well increase in importance.

Over the past two years I have been working with Dr. Doug Gubler and his UC Davis graduate student Peggy Backup on a project to test and refine the powdery mildew risk assessment model. We used lab and vineyard studies to look at the effects of high temperatures above the known optimal temperatures for the fungus. We have carefully tested a range of temperatures and their duration on fungus spore germination, colony expansion and spore production on 4 isolates of the fungus (*Erysiphe necator)* from California vineyards.

We have found that spore germination, colony size, and spore production decreased as a result of either increasing high temperature or duration. As temperature increased from 86° to 108° F shorter times were necessary to reduce growth or actually kill the fungus. These high temperature-dependent reductions in fungus growth can reduce the rate of disease development in the field.

At the lower end of the high-temperature range – 86°, 90°, and 93° F (30, 32, and 34° C) – our lab studies did not show that temperature prevents any of the key biological stages of the pathogen's life cycle, out to 24 hr. Our controlled environment data predict that at 97, 100, 104, and 108° F (36, 38, 40, and 42° C) temperature is increasingly lethal to the pathogen, and slows or reduces spore germination, production and colony growth but the duration required is longer than previously believed. At 97º F between 12 and 24 hours was required to kill the pathogen. For all 3 assays, the duration required to extinguish biological activity reduced as the temperature increased in 2º increments (Fig 1). At 111º F, only ½ to 1 hr was required to extinguish all/most activity. In addition to locating the lethal conditions from 86 to 111º F (30 to 44º C), and from ¼ hr to 24 hr, we also detected sub-lethal conditions that delayed colony growth by up to 6 days.

The effect of high temperatures in the vineyard is most likely to reduce the rate of *E. necator* infections, not to kill the pathogen. Reducing the rate of new infections is important in managing such an explosive disease. In addition, reducing pathogen viability can increase fungicide efficacy. Knowing how long it takes for the fungus to recover from sub-lethal conditions will be very helpful in refining the model. For example, at 97º F, over 90% of colonies survive and grow after 4 or 6 hr of heat treatment, but the growth is delayed by 1.2 or 1.7 days, respectively. These delays increase at sub-lethal conditions, up to 6 days at 20 hr.

While temperature and duration had a significant effect on fungal survival, the isolate tested did not. So far our data do not show that powdery mildew isolates from four different regions (Napa, Delta, Paso Robles, Davis) have different high temperature responses.

In general, our results indicate pathogen survival at higher temperatures and durations than previously reported. Some of the discrepancy is because our laboratory experiments do not account for effects of UV radiation, wind, daily temperature swings, presence of other organisms that eat fungi, sub-optimal humidity, grape tissue age and high temperature related resistance. Powdery mildew epidemics appear to be limited by lower temperature-duration combinations in the field than we see in the lab.

We worked for two seasons in unsprayed vines in a Sacramento County Chardonnay vineyard to study variations in canopy microclimate and powdery mildew. We used a weather station with sheltered ambient air temperature sensor at 2.2 m height above the canopy and 16 specially designed thin wire thermocouples attached to the underside of grape leaves for intensive characterization of the vine canopy microclimate. We ran the model index for this vineyard (Fig 2) with the sheltered air temperature. We found that fully exposed external leaves had higher temperatures on average about 2° F than internal shaded leaves, with maximum differences at times of 10° F (Table 1; Fig 3). We found that internal shaded leaves were closer in temperature to above the canopy sheltered ambient air temperatures (Fig 3). Exposed, external leaves experienced 3 times more hours above the current high temperature threshold for the GT model than internal leaves, or the sheltered ambient air temperatures. We found greater disease earlier in the season on the internal, shaded leaves and less disease appearing later in the season on the external, fully exposed leaves.

We are currently in the process of translating our lab studies and vineyard work into a possible modification of the high temperature threshold for the Gubler-Thomas model. Our data strongly suggest that the powdery mildew risk index high temperature threshold should be revised upward. We intend to use the results from this work to assist both public and private end users of weather data and the model. We thank the American Vineyard Foundation for funding of this work.

Table 1. External and internal grapevine canopy leaf surface temperatures (average of 8 sensors), and above-canopy sheltered temperature, June 1 – Aug. 20, 2008.

Sensor Location	External leaf surface temp. (°F)	Internal leaf surface temp. (°F)	Sheltered temp. above canopy (°F)
Average*	72.3	70.7	69.7
Maximum	105.4	101.2	100.6
Minimum	45.0	44.6	47.4
Number of Hours 70-85F	579	651	665
Number of Hours over 95F	106	30	31

*By proc mixed regression analysis (p=0.0001) external & internal leaf temperatures are significantly different.

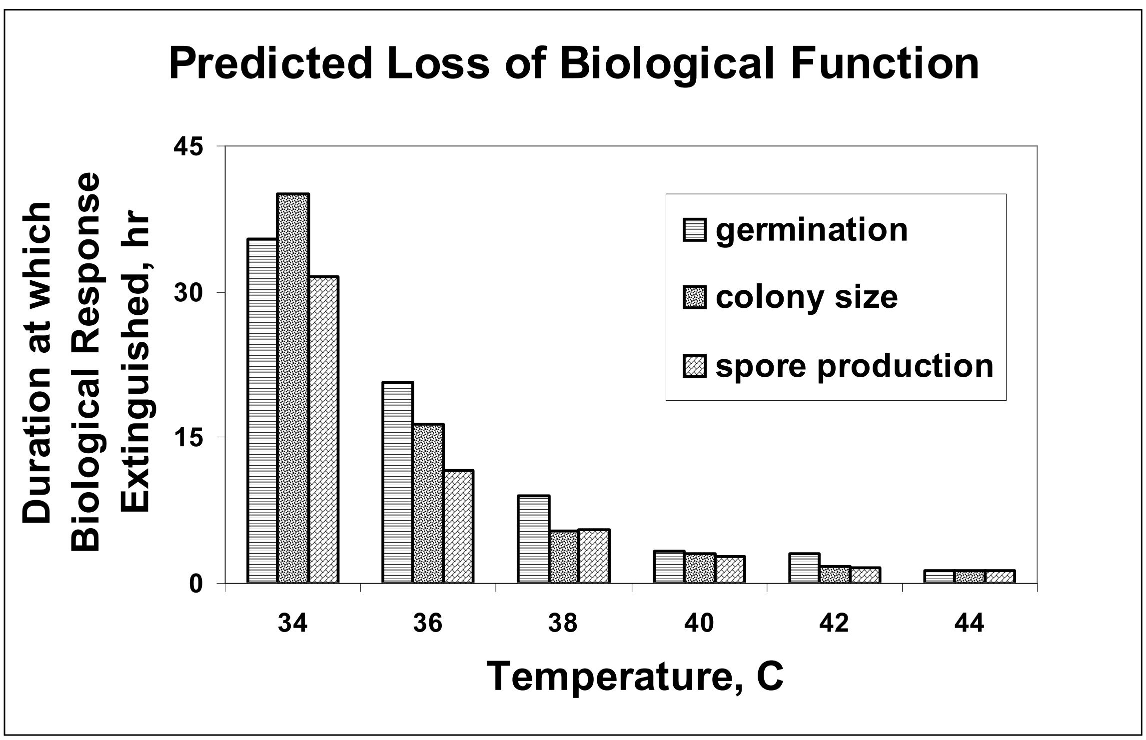

Figure 1. Predicted temperature-dependent loss of biological response as a function of duration of treatment for all 3 assays, (93.2, 97, 100.4, 104, 108, 111º F). Using linear regression analysis of primary data in X-intercepts were graphed

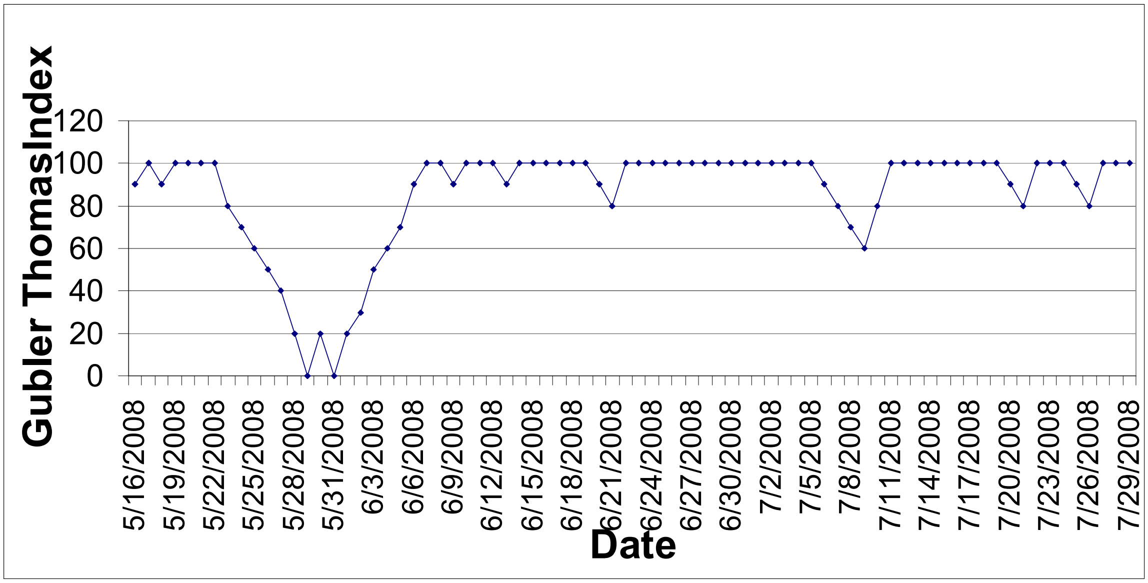

Figure 2. Gubler Thomas grapevine powdery mildew index from Sacramento County Chardonnay vineyard in 2008 using Metos weather station sheltered temperature sensor and index. Note decline in index in early July and high temperatures shown in Fig 3.

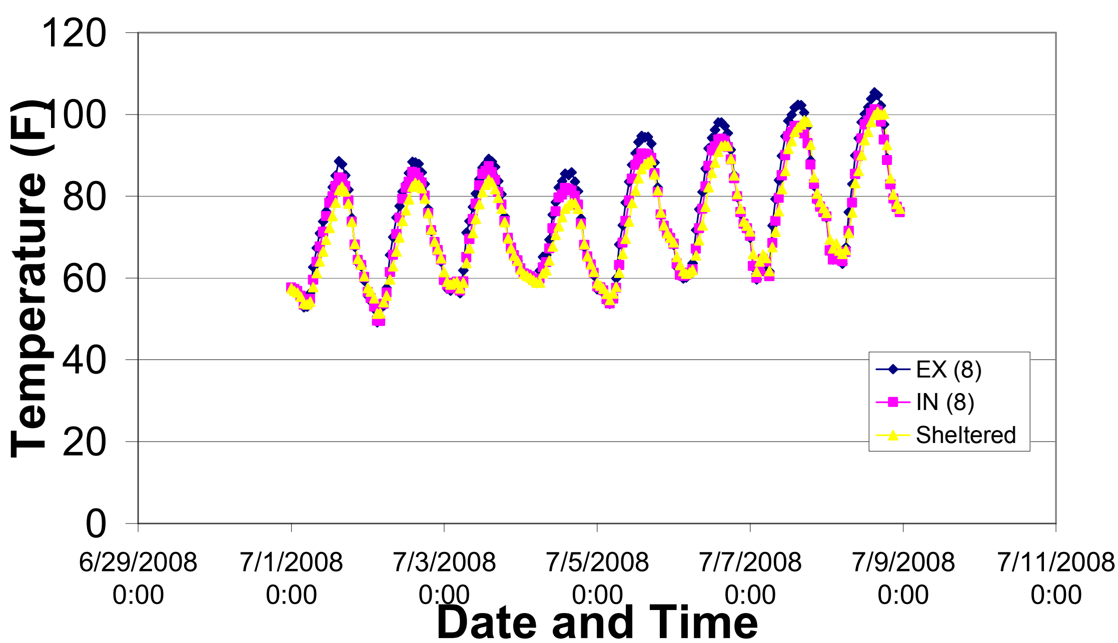

Figure 3. Differences in leaf surface temperatures in shaded internal leaves (IN) as compared to fully exposed, external leaves (EX), and a sheltered temperature sensor 2.2 meters above the canopy, July 1-8 2008, Sacramento, CA.

University of California Cooperative Extension
Sacramento County
2009 Needs Assessment Survey

Name (optional) ______________________________

The University of California Cooperative Extension Sacramento County has a long history of assisting clientele to address current and emerging issues through research and extension educational programs in agriculture, nutrition, food safety, youth and community development.

The economy, chronic disease, changing demographics, and climate changes are a few factors that impact the quality of life and economic health of the county. Your response to the following will assist us to identify research priorities and design outreach programs that address current and emerging issues.

1. **What major challenges do you currently face related to agriculture?**

2. **Prioritize these current challenges.**

3. **List and prioritize potential future challenges.**

Please mail, fax, or e-mail your responses c/o Chuck Ingels (contact information at top of page 1).

Thank you for your participation!