VIT TIPS

San Joaquin Valley Viticulture Newsletter

UC CE University of California Agriculture and Natural Resources Cooperative Extension

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In This Issue

Situation Update and Management Tips for Pierce's Disease and Glassy-Winged Sharpshooter

Ashraf El-kereamy, UCCE Kern County & David Haviland, UCCE Kern County

The history and the importance of Pierce's Disease (PD) in California

Grapevine Pierce's Disease (PD) is caused by the bacterium *Xylella fastidiosa* which is transmitted from diseased vines to healthy vines by the glassy-winged sharpshooter (GWSS). There is currently no cure for this disease and PD can kill grapevines within 1-5 years. PD was first observed by a pathologist named Newton Pierce in southern California near Anaheim in the late 1800s. By the late 1900s an outbreak of this disease destroyed approximately 40,000 acres of grapevines in southern California. The disease was named 'Anaheim Disease' or 'California Vine Disease' and during the 1930s the disease was named Pierce's Disease (PD) after Newton Pierce. Significant attention was given to PD after a disease outbreak in southern California in the late 1990s. Currently, several organizations are trying to control PD and GWSS in southern California to prevent the spread of PD to other areas of grape production. In addition to the control of the GWSS, early detection and removal of infected vines are essential to control this disease. For this strategy to be effective, it is very important to be able to visually identify the infected vines.

Figure 1. Leaf scorching, drying, matchsticks and irregular maturation of the canes caused by Pierce's Disease.

How to recognize PD infected vines

After *Xylella fastidiosa* is transmitted by GWSS to a new vine, the bacterium multiplies by colonizing the xylem of the vine and benefits from the nutrient fluids inside. Colony growth by the microbes results in the formation of plaques that can

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Around the San Joaquin Valley

County Updates

Kern County

Ashraf El-Kereamy

It is the end of table grape harvest in Kern County. The PD/GWSS Board & Advisory Task Force meeting was held at UCCE-Kern on October 19 & 20, 2015. The Board had a tour in the General Beale area of Kern County and heard from growers. They discussed the increase in GWSS populations within Kern County during the last few years, possible causes, and control strategies.

Tulare & Kings Counties

Allison Ferry-Abee

Put it on your calendar, the annual Kern and Tulare County Grape Day will be on Friday, February 12! The focus of the presentations will be on table grapes. Farm advisors and specialists will cover a variety of topics, including plant growth regulators, pest control, and water management. The meeting will be held at the Tulare UCCE office, across the street from the Ag Expo. PCA and CCA hours will be requested. If you are interested in attending, please contact Allison Ferry-Abee at either (559) 905-2428 or aeferry@ucanr.edu for more details.

In the lab of Dr. Gubler at UC Davis, several different fungal pathogens have been identified within the budwood of table grape species. More bud samples from table grapes across the San Joaquin valley are needed.

If you have noticed bud necrosis or stunted shoot growth and/or have concerns about trunk disease in your table grape vineyard, contact your local UC Cooperative Extension viticulture farm advisor about collecting samples.

Madera, Merced, & Mariposa Counties

Lindsay Jordan

While most white grape varieties came off the vine early this year, some red varieties ripened slowly and were not harvested until October or November. If your grapes seemed to stall out and stop accumulating sugar after 19 to 21 °Brix or if you had trouble with your red grapes accumulating sufficient color, it may be worthwhile to get your vines virus tested. While there are many reasons for delayed ripening and poor coloration, they are also symptoms of grape leafroll disease. Even the best management may not compensate for the symptoms of leafroll and there can be important implications for the management of vectors of the virus, like mealybugs, if your vineyard tests positive. If the economic impact from a delayed or reduced harvest is sufficient, replanting the vineyard should be considered. More information about grape leafroll is available here: http://iv.ucdavis.edu/?uid=254&ds=351

Fresno County

George Zhuang

Vineyard floor management will be the priority for grape growers to focus on post harvest. Proper management should factor in the condition of the soil, vines, and weeds on your sites. Soil and plant tissue samples can be useful to assess the need for nitrogen in your vineyard. Identifying the severity and types of weeds in your vineyards can help guide your management decisions. More information can be found on the UC IPM website: http://www.ipm.ucdavis.edu/PCA/pcaweed.html

Remember to RSVP for the San Joaquin Valley Grape Symposium online: http://ucanr.edu/survey/survey.cfm?surveynumber=16548

Using Bud Dissection to Guide Winter Pruning Decisions

George Zhuang, UCCE Fresno County

Introduction

I recently completed bud dissections for the second annual bud fruitfulness survey of raisin and wine grape varieties in Fresno County. The survey aims to determine potential fruitfulness of dormant buds from the same vineyards in Parlier, Easton, and Kerman that were surveyed in 2014. With time, I hope to develop a useful relationship between potential bud fruitfulness and yield in these vineyards and, possibly, as a general indicator of potential grapevine productivity at other similar vineyards.

For raisin type varieties, 50 canes were randomly selected in a vineyard. Buds from nodes 0 to 15 were selected from each cane. For spur-pruned wine grape varieties, 100 spurs with 2 nodes each were also randomly selected in each vineyard and dissected. Number of cluster primordia, from both primary and secondary buds, per node were counted separately under a microscope (Figure 1). To measure the actual fruitfulness, after budbreak in 2015 the same number of canes and spurs were randomly selected in the field and the number of clusters per node was counted. Both potential and actual bud fruitfulness data were averaged per node.

Figure 1. Cross section of a grape bud. The red arrow indicates the cluster primordia in the primary bud. This cluster primordia will develop into a grape cluster the next season.

Results

Similar results were observed between potential and actual fruitfulness for both cane pruned and spur

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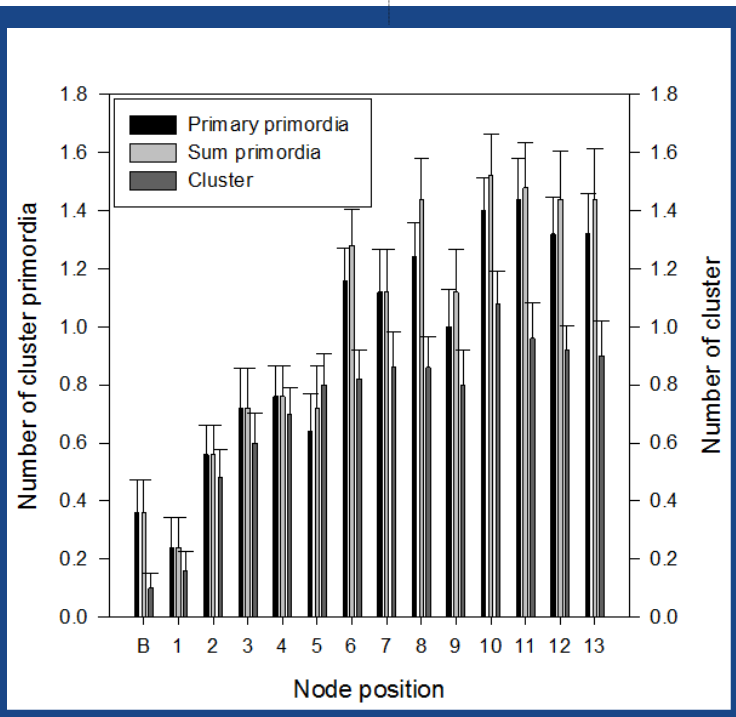

Figure 2. Comparison between the number of cluster primorida, representing potential fruitfulness, and the number of clusters, representing actual fruitfulness, in 2015, at different node positions in Selma Pete, Parlier, CA.

…"PD and GWSS" continued from page 1

Figure 2. Matchsticks and irregular maturation of the canes caused by Pierce's Disease.

eventually occlude the vessel, thus reducing or preventing fluids and nutrient flow through the vine. The first visual symptoms in an infected vine occur between 3 and 18 months after initial infection depending on time of year, vine age, and variety.

The first symptom is often marginal leaf scorching, or dry spots along the margin of the leaf that eventually coalesce into concentric rings of discolored and dead tissues (Figure 1). Some differences in symptom expression among cultivars have been noted, where the scorching in red varieties starts with a reddish discoloration and white varieties exhibit marginal chlorosis.

As the disease progresses (around mid to late summer), leaf blades dry and fall off of the petioles. The remaining petioles stay attached to the leaf and dry down from the tip. They are often referred to as persistent petioles or "matchsticks" (Figure 2). These petioles can be collected and sent to a laboratory for diagnostic analysis of PD.

The second typical PD symptom is irregular maturation of the canes which causes the formation of green areas on the cane known as "green islands" (Figure 2).

In vines that are severely infected, the berries often dry and shrivel prior to harvest. This symptom is referred to as "raisining" (Figure 3).

PD symptoms usually only appear in part of the vine. However, by the time part of the vine is symptomatic the infection is usually systemic. For that reason, simply trimming or removing the symptomatic part of the vine is not an option. The infected vine must be removed or cut off in a way that ensures that the vine is dead and does not regrow.

If any vine was removed due to PD, special attention should be given to neighboring vines as it is expected that they carry the disease, however they may not develop any symptoms until the following season.

Due to the similarity between PD symptoms and symptoms from abiotic conditions that can cause vine stress, samples should be sent to a laboratory for confirmation. Contact your UCCE advisor for help in collecting the samples and for laboratory contact information.

PD management

A successful PD management program should take into consideration the reduction of inoculum and the GWSS population which can be achieved by:

⇒ Monitor the vineyard during the late summer (especially August and September when symptoms are at their peak) and mark the infected vines for immediate removal.

⇒ Keep the vineyard and the surrounding area free of weeds; several weed species are alternate hosts for the bacterium and consequently a source of infection.

⇒ Within vineyards, monitor the GWSS population using yellow sticky traps and follow the guidelines of the UC IPM program.

Area-wide programs to control GWSS

In areas where the GWSS is present, USDA programs are currently in place to control GWSS populations outside of vineyards, particularly in overwintering sites such as citrus. Since the late 1990s, grape growers in the lower San Joaquin Valley have been concerned about how the introduction of the GWSS would affect incidence levels of PD. Fortunately, area-wide treatment programs that target GWSS coupled

Figure 3. Raisining of the grapes in PD infected vine.

with monitoring and roguing programs to remove diseased vines were able to mitigate this threat for nearly a decade. In most areas, these programs continue to be highly successful. However, during the past five years there have been concerns that the effectiveness of area-wide treatment programs have been slipping in eastern Kern County in an area called the General Beale region. Within this area, the effectiveness of GWSS area-wide treatment programs has declined and a major resurgence of the vector and disease has occurred.

General Beale region update

Area-wide treatment programs for GWSS started in 2002 with the famed General Beale Project in southeastern Kern County. From that time until about 2008, one area-wide application of an insecticide plus periodic 'hot spot' treatments provided approximately three years of control. From 2009 to 2011, moderate control was achieved, but it required area-wide applications each season. Then, from 2012 to present, GWSS populations have been on par with (and in 2015 exceeded) the number of GWSS captured in any prior year despite coordinated area-wide treatments on an annual basis. Most of these GWSS were in the General Beale, Edison, and Bena Road regions east of Bakersfield and north of Arvin.

The increase in GWSS populations has had a significant impact on PD incidence in the region. During the period from 2002 until 2009, PD surveys by Jennifer Hashim showed that increases in disease around 2002 slowly tapered away to near undetectable levels by 2009. However, in the past five years PD has returned. In surveys in the General Beale and Edison regions during 2015, thus far we have found PD in 16 of 17 vineyards surveyed. This includes 10 vineyards with more than 20 positive vines in a five-acre sampling area. For vineyards that were surveyed in 2015 as well as in previous years, the number of infected vines per acre has gone up in all but one location. PD is also spreading westward from the core General Beale region and has made significant advances north of Highway 58. Based on surveys thus far, it is possible that the total number of PD positive vines could be in the tens of thousands.

The majority of the PD is in a few isolated vineyards that should be removed immediately. Most other vineyards are still at a level where the identification and removal of symptomatic vines is still practical. In fact, as we conduct our surveys it is becoming more and more common for us to arrive at a vineyard to do a survey, only to find that infected vines have already been marked and removed. In one case we arrived to

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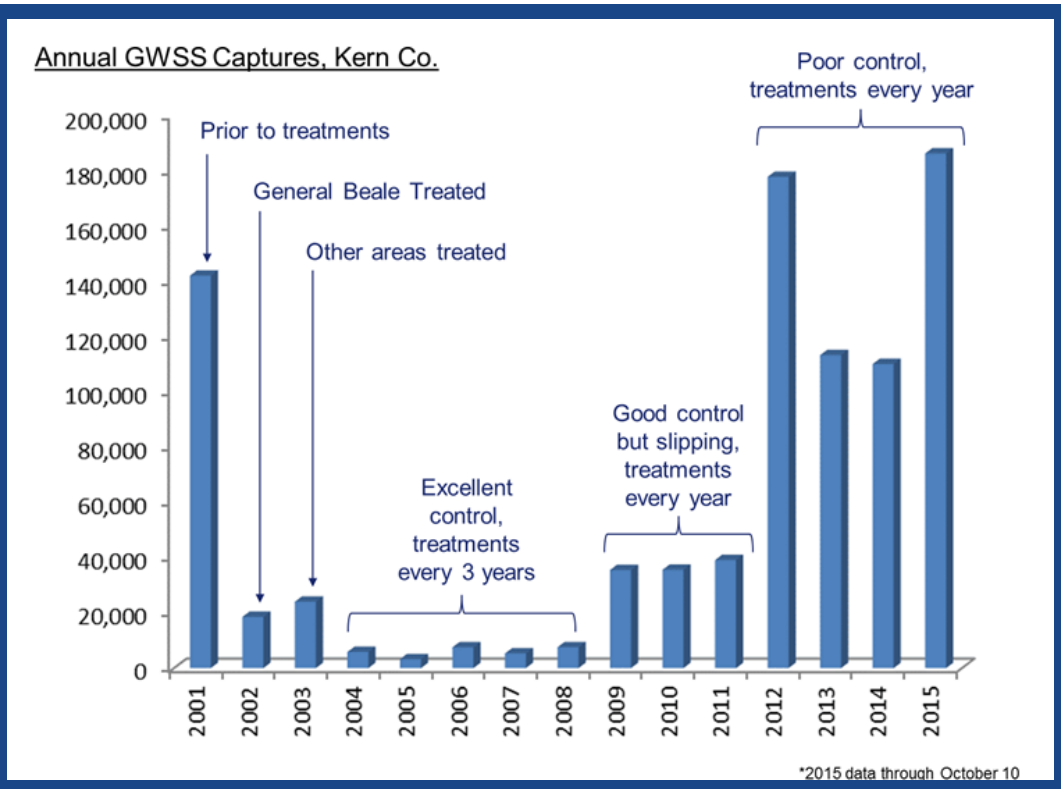

Figure 4. Annual GWSS captures in Kern County, CA. Text in the figure refers to a general timeline of area-wide treatment activities in the General Beale area where most GWSS were captured.

"Bud Dissection" Continued from page 3...

pruned varieties (Table 1 and Figure 2). Variation between potential and actual fruitfulness can be caused by secondary bud fruitfulness and low basal shoot emergence on canes. Potential bud fruitfulness data from bud dissection can be used to predict the actual bud fruitfulness and yield for next year (Table 1).

Utility

The usefulness of bud fruitfulness data increases with each year if the data is repeatedly collected from the same vineyard. For example, comparing next year's data with the data from this year will provide some evidence to suggest yields might be similar, higher, or lower, and this information can inform pruning decisions. Since the data can be collected at any time after harvest, the number of canes or spurs left during pruning can be adjusted based on the fruitfulness data. However, actual yield per vine can vary due to any changes of yield components. Sugar content at harvest is another important factor to determine the raisin yield. In addition, the accuracy of predicting the yield from bud fruitfulness data may vary depending on the site.

I would like to acknowledge support from the San Joaquin Valley grape growers that allowed me to sample their vineyards and technique guidance from Dr. Matthew Fidelibus, UCCE & UC Davis.

Table 1. Potential (primary and secondary) and actual bud fruitfulness data of winegrapes in 2015 and 2016.

Location	Variety	2015		2016
		# primordia/node	# cluster/node	# primordia/node
Easton, CA	Cabernet Sauvignon	2.03	1.99	1.90
Kerman, CA	Cabernet Sauvignon	1.60	1.32	1.61
Kerman, CA	Chardonnay	1.18	1.34	1.45

..."PD and GWSS" continued from page 5

find three irrigators marking symptomatic vines while 15 men with chainsaws followed behind to remove vines. Seeing the dedication of this type of grower to identify and remove vines gives us hope that we can get back on top of this situation.

However, solving the GWSS and PD epidemic is not going to be easy. Researchers and government officials are doing their best to identify ways to restore the efficacy of area-wide treatment programs. This includes work on insecticide efficacy, investigations on the development of resistance, and discussions on what effects climate change (warm, dry winters with no fog) might be having on the number of GWSS that survive the winter. At the same time, in addition to making insecticide treatments, an ever-increasing number of growers are training dedicated staff to identify PD positive vines and mark them for removal. Our hope is that all growers will adopt this practice. History has shown that coordinated efforts to control GWSS in combination with roguing programs for infected vines can be an effective one-two punch at solving the PD problem.

Acknowledgement: Funding for the PD monitoring project was provided by California table grape growers through assessments provided to the Consolidated Central Valley Table Grape Pest and Disease Control District.

Removing PD infected vines to help control the disease.

Vineyard Trunk Diseases

Allison Ferry-Abee, UCCE Tulare & Kings Counties

Trunk disease control isn't always a top priority for vineyard owners and pest control advisors, but it is an essential part of extending the life of a vineyard. Preventing trunk diseases may be the difference between keeping a vineyard viable for 40 years versus ripping it out after 12 years. Because of high replanting costs, the cost of trunk disease prevention is often an excellent investment that pays off over time.

Trunk diseases are usually divided into three groups: Botryosphaeria dieback (also known as bot canker), Eutypa dieback, and esca (also known as black or Spanish measles). The external symptoms are different, but internal symptoms are the same for all three groups: trunk cankers and vascular discoloration, eventually leading to vine death (Figure 1).

Figure 1. Typical internal symptoms of vineyard trunk cankers.
Photo by Renaud Travadon

Botryosphaeria Dieback

Botryosphaeria is caused by many species of fungi, including *Lasiodiplodia theobromae*, *Botryosphaeria* spp. and *Diplodia* spp., among others. Botryosphaeria pathogens can infect over 500 different hosts, including fruit and nut trees and ornamentals. This can be a source of inoculum for vineyards. The most common symptoms of the disease include the dieback of spurs or cordons, and wedge shaped lesions in the vascular system (including in the spurs, cordons or trunk).

Botryosphaeria pathogens can also survive and produce spores on dead wood, so it is important to remove dead infected vines and dispose of them promptly (preferably by burning or chipping into small pieces).

Eutypa Dieback

Eutypa dieback is caused by the fungus *Eutypa lata*. The most common external symptoms are stunted spring foliage. Leaves are typically tiny, cupped and look tattered (Figure 2). Only some spurs or cordons may be affected, and typically the rest of the vine looks perfectly healthy. When the symptomatic areas are removed, you can see vascular discoloration in the woody tissue.

Figure 2. Stunted spring foliage caused by Eutypa.
Photo by Larry Williams

Esca

The most common cause of Esca (or Black Measles) is the fungus *Phaeomoniella chlamydospora*. The external symptoms for esca are very recognizable. Leaves develop interveinal chlorosis in the summer, and fruit develop greasy looking brown spots (Figure 3). These symptoms are not evidence of the fungus itself, but are actually caused by a toxin that the fungus produces. This toxin translocates through the vine and causes cell death.

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…"Trunk Diseases" continued from Page 7

Disease Cycle

The external visual symptoms and causal agents for these diseases are different, but the disease cycles and prevention methods are very similar. Spores are released during the winter to early spring after rain or heavy fog. After release, the spores can infect grape (and sometimes other perennial woody hosts) wounds. From this point of infection, the fungus grows deeper into the vine. It can infect spurs, cordons and even the trunk. The growth of the fungus is very slow, which is why symptoms of the diseases often aren't visible for several years after infection.

In the Central Valley, the period of spore release coincides with pruning. Pruning wounds provide an excellent point of infection, and are often the source of trunk disease entry into the vine. Fortunately, there are several effective methods to manipulate this cycle and prevent spores from infecting pruning wounds.

Controls

You have several options for preventing trunk diseases: 1) delay pruning, 2) double prune, or 3) protect pruning wounds. All of these methods significantly reduce trunk disease infection if performed properly. They can even be combined for added protection.

1) Delay Pruning

Delay pruning as late as possible in the season (i.e. February). There are a couple of ways that this strategy helps reduce trunk diseases. Most rains in the Central Valley are usually in the beginning of winter, so by delaying pruning you can usually avoid the heaviest time of spore release. Perhaps more importantly, though, wounds heal more quickly in spring than in winter. This reduces the amount of time wounds are susceptible to infection.

2) Double Pruning

If pruning late in the season is logistically difficult, an effective technique is to use double pruning. You essentially make two pruning passes. In the first pass (in December, or whenever is most convenient,) canes are "pre-pruned" to 10-12 inches above the spurs for spur pruning, or to 24 inches above the cordon for cane pruning. This first pass is typically done with a mechanical pruner. In the second pass, canes are pruned to the desired spur or cane length.

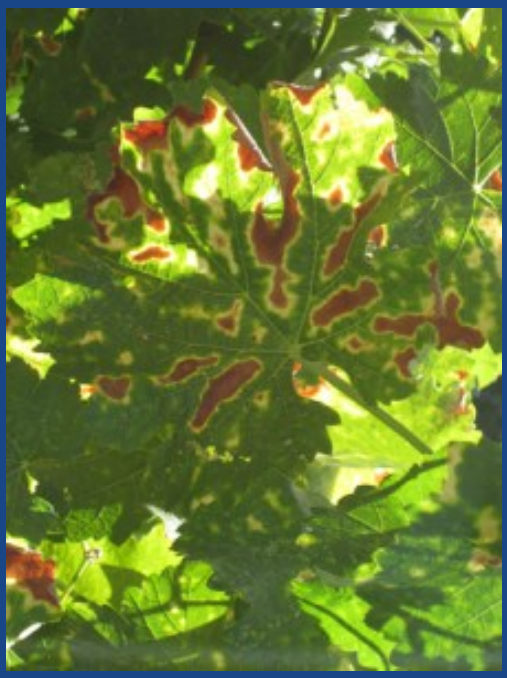

Figure 3. Leaf symptoms of Esca.
Photo by Monica Cooper

The goal of double pruning is to get the time consuming part of pruning done when crews and/or equipment are available, and then get final, quick pruning tasks done when you will most effectively protect vines from disease.

3) Protect Pruning Wounds

There are several fungicides and protectants registered in California for dormant applications for trunk disease control. Please refer to the Grape Pest Management Guidelines, available at www.ipm.ucdavis.edu for specific information on fungicide, rate and timing recommendations. Keep in mind that to effectively protect pruning wounds, you must spray vines from above, rather than from the sides. The goal is to adequately protect as many pruning wounds as possible.

Conclusion

It is important to remember that trunk disease control is purely preventative, and the same methods control all of the above diseases. The time from the point of infection to seeing symptoms can range from 2 to 10 years (depending on the pathogen). This means that even young vines can become infected, but won't show symptoms for several years. Thus, it's important to begin protecting vines every year (using one or more of the above methods) after planting. Even if you've never protected your vines before, this winter is a good time to start!

Upcoming Events

San Joaquin Valley Grape Symposium
January 6, 2016
At the C.P.D.E.S Hall
Easton, CA
Agenda is available at
http://cefresno.ucanr.edu/files/221405.pdf
For information and special needs accommodation, contact gzhuang@ucanr.edu

Annual Kern and Tulare County Grape Day
February 12, 2016
8:00 am to 1:00 pm
4437 S. Laspina St.
Tulare, CA 93274
For special needs accommodation, contact aeferry@ucanr.edu

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Contact your local viticulture farm advisor or UCCE county office to be added to the e-mailing list or if you wish to receive a mailed copy.

Our programs are open to all potential participants. Please contact your local UCCE county office (two weeks prior to the scheduled activity) and/or the event organizer listed if you have any barriers to participation regarding accommodation.

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Contact Us

Questions? Concerns? Follow up? Please feel free to contact us.

Ashraf El-Kereamy
UCCE Kern County
661-868-6226
aelkereamy@ucanr.edu
@ashrafelkereamy

Allison Ferry-Abee
UCCE Tulare and Kings Counties
559-684-3316
aeferry@ucanr.edu
@GrapevineAbee

George Zhuang
UCCE Fresno County
559-241-7506
gzhuang@ucanr.edu
@ZhuangGeorge

Lindsay Jordan
UCCE Madera, Merced & Mariposa Counties
559-675-7879 ext. 7209
lmjordan@ucanr.edu
@LJtheGrape

Matthew Fidelibus
UCCE & UC Davis Dept. of Viticulture and Enology
559-646-6510
mwfidelibus@ucanr.edu
@grapetweets

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