Vit Tips

San Joaquin Valley Viticulture Newsletter

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The beginning of the 2024 growing season is set up for a major powdery mildew outbreak. Heavy Powdery Mildew infections during the 2023 growing season left plenty of cleistothecia to over winter in San Joaquin Valley vineyards. Rain during budbreak and now less than 2 weeks into the growing season and the Grape Powdery Mildew Risk Assessment Index is already showing a high risk for powdery mildew spread. It would be highly advisable to work with your pest management crew to make sure that your vineyard is well protected at the start of this growing season. You can continue to track the Grape Powdery Mildew Risk Assessment Index for the entire season through this UC IPM webpage: https://ipm.ucanr.edu/weather/grape-powdery-mildew-risk-assessment-index/

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Effect of Variety, Cordon Height, and Irrigation on Mechanical Pruned Vineyard in Southern SJV

George Zhuang, UCCE Viticulture Farm Advisor in Fresno County

Introduction

Mechanical pruning (box pruning) is the standard practice for newly planted wine vineyards in the San Joaquin Valley (SJV). According to the 2019 SJV South winegrape cost study (Zhuang et al. 2019), mechanical pruning can reduce production costs from $3,000 to $2,500 per acre resulting in 17% cost savings. With the California minimum wage again increasing to $16 per hour in 2024, the labor savings from mechanical pruning could be even greater now. An understanding of how different varieties perform under mechanical pruning systems is desirable to advise growers on cultural practices for these varieties. Currently, the most used trellis system on wine vineyards are single-cordon or quadrilateral cordons without any catch wire. Cordon height varies from 52-72” above the vineyard floor across various vineyard sites. Also, irrigation management on mechanically pruned vines might be different from hand-pruned vines due to the different canopy shapes and shoot density.

Experimental Design

Four wine varieties including Cabernet Sauvignon, Petite Sirah, Petite Verdot, and Pinot Gris were planted in August 2017, hand pruned in 2018 and 2019, with mechanical pruning starting in 2020. The rootstock used was 1103P for Cabernet Sauvignon, Petite Verdot, and Pinot Gris, while 5BB was used for Petite Shira. The vines were planted with a 6’ by 10’ vine by row spacing. A split block design (2 ×2) was

Table 1. Field plot showing variety location and cordon height of each replicate.

Row – Height	Variety – 1	Variety – 2	Variety – 3	Variety – 4
Row 1 - Low	Pinot Gris	Cabernet Sauvignon	Petite Verdot	Petite Sirah
Row 2 - High	Petite Sirah	Pinot Gris	Cabernet Sauvignon	Petite Verdot
Row 3 - Low	Cabernet Sauvignon	Petite Sirah	Petite Verdot	Pinot Gris
Row 4 - High	Petite Verdot	Petite Sirah	Pinot Gris	Cabernet Sauvignon
Row 5 - Low	Petite Sirah	Pinot Gris	Cabernet Sauvignon	Petite Verdot
Row 6 - High	Cabernet Sauvignon	Petite Verdot	Pinot Gris	Petite Sirah

applied for Cabernet Sauvignon and Petite Shira with two cordon heights and two irrigation treatments replicated three times. The High Cordon height was set at 68”, while the Low Cordon height was set at 52” above the vineyard floor (Figure 1). Sustained Deficit Irrigation (SDI) and Regulated Deficit Irrigation (RDI) were applied to both varieties. SDI was maintained at 80% crop evapotranspiration (ETc) through the entire growing season, while RDI used 60% crop ETc from berry set to veraison then switched to 80% ETc from veraison to harvest. The field plot is illustrated in Table 1.

Results

Data collected on Cabernet Sauvignon show no yield differences between the cordon heights in any of the 4 years (Table 2). The only consistent difference across all years that the data was collected was in leaf area. In all three years that that data was collected (2021 – 2023) the high cordon had more leaf area per vine. Clusters per vine did show differences in 2020 and 2021. However, in 2020 it was the high cordon with more clusters per vine, while in 2021 it was the low cordon that had more clusters per vine. There were no differences in cluster numbers for 2022 and 2023. Berry weight did not show differences across all four years of data. Berry ripeness (Brix, pH, and TA) only showed differences in 2021 where the high cordon was more mature (higher Brix and pH, and lower TA). In the remaining years, no differences in berry ripeness were found.

Figure 1. Vines on low and high cordons side by side

Data collected on Pinot Gris showed even fewer differences between high and low cordon heights. Clusters per vine, Berry weight, Brix, pH, and TA all showed no differences across all three years of data collection. The only data to show differences was for yield in 2022 where the high cordon height outproduced the low cordon height.

Summary

- Cordon height mainly affected the leaf area for Cabernet Sauvignon but not for Petite Sirah (Petite Sirah data not shown). High vigor is the key driver to take maximum advantage of a higher cordon to establish the full canopy (Petite Sirah is less vigorous than Cabernet Sauvignon).
- No yield difference was found between high and low cordon for red cultivars in our study; however, high cordon did increase the yield for Pinot Gris. Higher harvest Brix was found from higher cordon due to its larger canopy (more leaf area per vine). Higher cordon tended to produce better color (berry anthocyanins) due to the elevated cluster zone far away from the vineyard floor resulting in cooler cluster temperature.
- No yield difference was found between RDI and SDI, although smaller berry size was noticed in RDI which tended to produce higher color (smaller berry with higher skin/pulp ratio).

- With the recent advancements, mechanical pruning can now be also applied to CA raisin production. This is due to the revolutionary natural dry-on-the-vine (DOV) raisin varieties such as Ras-1 (BLOOM Fresh) and Sunpreme (USDA ARS) which do not require cane cutting, and whose basal buds are fruitful. The results from this wine grape trial might also be implied to natural DOV raisin production.

Further readings

Zhuang, S., Fidelibus, M., Kurtural, K., Lund, K., Torres, G., Stewart, D. and Sumner, D. 2019. Sample costs to establish a vineyard and produce winegrapes in southern San Joaquin Valley (Fresno, Madera, Merced, and Stanislaus Counties) – Cabernet Sauvignon, Rubired, Colombard, and Chardonnay varieties. Grapes–Wine | Cost & Return Studies (ucdavis.edu)

Table 2 Cabernet Sauvignon data for 2020 - 2023

Cordon Height	Yield (t/acre)	Cluster No./vine	Berry wt (g)	Leaf area/vine (m^2)	Brix	pH	TA (g/L)
2020							
High	16.4	134 a	1.3	N/A	22.8	3.8	3.5
Low	16.3	127 b	1.4	N/A	22.2	3.8	3.7
2021							
High	13.4	108 b	1.2	16.0 a	24.0 a	3.8 a	3.9 b
Low	14.9	126 a	1.3	12.4 b	22.0 b	3.7 b	4.4 a
2022							
High	13.9	176	1.0	20.4 a	25.6	3.8	4.2
Low	13.8	175	1.1	16.7 b	24.7	3.8	4.5
2023							
High	14.7	181	1.4	19.1 a	22.6	4.2	4.9
Low	12.9	176	1.4	17.4 b	23.3	3.9	4.5

Table 3 Pinot gris data for 2020, 2022-2023

Cordon Height	Yield (t/acre)	Cluster No./vine	Berry wt (g)	Brix	pH	TA (g/L)
2020						
High	9.5	119	1.2	20.3	3.7	4.8
Low	8.5	119	1.1	20.9	3.8	5.0
2022						
High	16.7 a	208	N/A	18.4	3.4	7.0
Low	12.8 b	163	N/A	19.9	3.5	6.6
2023						
High	14.5	166	N/A	19.5	3.3	5.7
Low	13.1	167	N/A	18.3	3.3	6.0

Tackle Summer Bunch Rot and Sour Rot Now

By Dr. Justin Tanner, UCCE San Joaquin County Viticulture Farm Advisor

As California vineyards are coming out of dormancy now, the battle against summer bunch rot and sour rot is far from over. The aftermath of the previous season's afflictions, which were fueled by weather conditions that promoted vine vigor and dense canopy growth as well as increasing fungal disease pressure, has growers affected by rot in 2023 focused on preventing a repeat this year. Key to this is the standard practice of removing infected fruit during winter pruning to reset the stage for a clean start this coming season. This critical step involves carefully pruning away dormant canes along with diseased clusters, placing them in the row middles, and incorporating them into the soil. Infected material, such as berries, canes, and leaves, can harbor *Botrytis cinerea*, a primary pathogen in bunch rot (Jaspers et al., 2015) along with many other fungal pathogens. Rigorous sanitation during winter pruning is essential to minimize the potential for disease in the upcoming season, especially in vineyards that experienced high levels of rot last season.

Image 1 Unharvested grapes affected by summer bunch rot. These can be a source of inoculum in the next season if allowed to remain in the vineyard. Diseased fruit should be cut off with final pruning, placed in the row middles, and incorporated into the soil before the start of bud burst in spring to reduce disease pressure next season.

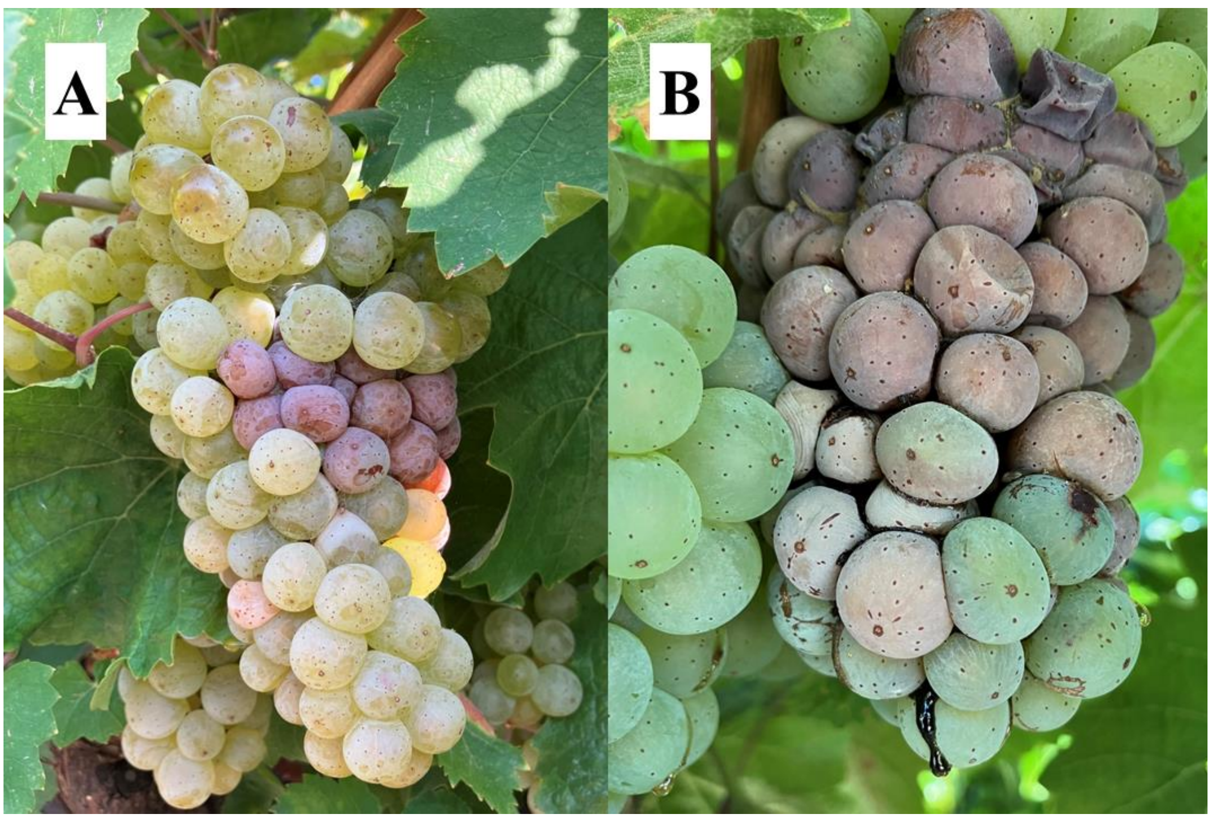
Early Season Vigilance: Canopy Management

Beginning shortly after bud burst, effective and timely canopy management is foundational for disease prevention for the season. The objective is to create a canopy that allows for optimal air circulation and sunlight penetration. This involves strategic thinning and spacing of vine shoots, tailored to each vineyard's site and vine vigor, and production goals. Regular leaf pulling and shoot positioning are essential in maintaining an open canopy, which significantly reduces the humid conditions that favor rot development. Canopy management techniques such as shoot thinning, leaf removal, and light pruning can modify canopy architecture, influencing reproductive performance, and berry ripening. Shoot thinning and leaf removal are particularly effective in decreasing leaf area index and increasing canopy porosity and light interception, positively affecting berry ripening, and reducing disease pressure (Wang, De Bei, Fuentes, & Collins, 2019). Additionally, early leaf removal has been shown to affect the source-sink balance in grapevines, leading to a reduction in fruit set, which could result in looser clusters and improved grape composition (Frioni et al., 2019).

Image 2 Shoot thinning early in the season promotes air circulation, light infiltration and increases spray penetration to help decrease fungal diseases throughout the of the season.

Understanding and Managing Summer Bunch Rot and Sour Rot

Prevention is the most effective approach against summer bunch rot and sour rot. Summer Bunch Rot infects fruit by one of two means. The first is during bloom, where flowers can become infected through the stigma or scar tissue leftover from where the calyptra detached. These infections will then lay dormant until sugar starts to accumulate in the berry post veraison. The second means of infection happens later in the season. Fungal spores can exploit any wounds on the berry skins, such as those caused by mechanical damage, birds pecking, powdery mildew infection scars, feeding and/or oviposition damage from insects including certain moths, wasps, mealybugs, and thrips, or even sunburn. Therefore, minimizing these injuries is crucial, which includes implementing bird control measures, using gentle handling during mechanical operations, managing insects that damage fruit, and employing sunburn prevention tactics like canopy and irrigation management and berry thinning to reduce cluster compaction. Summer bunch rot is a disease complex caused by one or more of multiple organisms such as *Botrytis cinerea*, *Aspergillus tubingensis*, *A. carbonarius*, *A. niger*, *Alternaria* sp. *Cladosporium* sp., *Rhizopus* sp., and *Penicillium* sp. Sour rot is a polymicrobial disease involving yeasts and acetic acid bacteria, particularly in the presence of *Drosophila* fruit flies. Sour rot is primarily caused by native yeasts and acetic acid-forming bacteria. Research has shown that the disease is a result of a complex interaction involving these microorganisms, which leads to the decaying of berries with high amounts of undesirable volatile acidity (Hall et al., 2019).



A) Botrytis and B) Sour rot on clusters of Riesling. While similar in appearance due to oxidative browning of affected berries, sour rot can be easily distinguished by the leakage of fluid and vinegar odor emitted from rotting fruit.

A Preventative Stance

A proactive approach to disease management involves more than just properly timed fungicide applications. It's about creating a canopy environment less conducive to disease. This means balancing vine vigor through careful water and nutrient management, particularly in drought-prone areas like California. Excessive vigor, often resulting from over-irrigation or over-fertilization, can lead to dense canopies that favor disease development. In California's Central Valley, for example, monitoring evapotranspiration using remote sensing data has proven to be an effective tool for optimizing irrigation management, ensuring vines receive adequate but not excessive water, thus reducing disease pressure (Semmens et al., 2016). When it comes to fungicides, the key is timing and rotation. Applications should be strategically timed based on disease forecasts (https://ipm.ucanr.edu/weather/grape-powdery-mildew-risk-assessment-index/) and vineyard conditions, and products should be rotated to prevent resistance build-up.

Impact of Insects on Disease Development

Insects, particularly fruit flies, play a significant role in the facilitation and development of sour rot. The presence of these insects significantly increases the severity and incidence of berry rot diseases (Madden et al., 2017). In grapevines, fruit flies prefer the shelter of a dense canopy which provides a more humid environment sheltered from wind. When sour rot occurs several weeks before harvest and fruit flies are present, simply dropping the fruit below the vine is not enough to prevent it from spreading. New adults emerge from infested fruit after only 7-8 days and will simply migrate back up into the canopy to repeat the cycle of infection and rot if not removed from the vineyard. In mechanically harvested wine grapes, if sour rot occurs close to harvest and rot levels are low, dropping fruit may be done right before harvest to exclude it from compromising the quality of the crop. The emergence of resistance to fungicides and insecticides among pathogens and insect vectors respectively is a growing concern. Studies have shown that *Drosophila melanogaster* populations in vineyards have developed resistance to commonly used insecticides due to their numerous short reproductive cycles within a season, leading to control failures of sour rot (Sun et al., 2019). This highlights the importance of monitoring for resistance and the use of integrated pest management strategies accordingly.

For grape growers, the challenge of managing summer bunch rot and sour rot requires a blend of careful planning, vigilant monitoring, and adaptive management practices. Each season presents an opportunity to learn and refine these strategies, aiming for a balance between environmental stewardship and effective disease control. With diligence and a commitment to these practices, growers can look forward to a season with reduced disease pressure and healthier vineyards. Additional management considerations can be found at https://ipm.ucanr.edu/agriculture/grape/summer-bunch-rot-sour-rot/.

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Table Grapes Needs Assessment Summary

Joy Hollingsworth, UCCE Table Grape Advisor for Tulare and Kings Counties

If you read my profile in this newsletter last spring, you may remember that I am one of the newest UCCE viticulture advisors. One of the first tasks of any new UCCE advisor is to begin assessing the needs of their clientele so we can focus our attention on the most important issues faced by the industry. This was especially important for me because although I grew up in the central San Joaquin Valley, and have spent years working in agricultural research, most of my experience has been with agronomic crops. In order to have a better understanding of grapes, I've spent a lot of time reading, talking to my colleagues, and most importantly, getting feedback from those working in the industry.

To do this, I mailed out an introductory letter and survey to 828 people last March 2023. The names and addresses came from a combination of the Tulare and Kings County Ag Commissioners' list of grape permit holders and the mailing list of my predecessors. I also emailed 338 people from my predecessors' contacts. From those 1166 surveys I received 123 responses, a return rate of about 11%.

Demographic Information

The first four tables show the demographic information that I collected, including occupation, county, and types of grapes grown. As with the rest of the questions, participants could select multiple choices, so the totals added up to more than 100%. The majority of the responses came from growers, those in Tulare and/or Fresno County, with conventionally grown grapes, and was fairly evenly split among table, wine, and raisins (Tables 1-4).

Learning Interests

The next four tables show which topics participants were interested in learning more about (Tables 5-8). For weeds, chemical control topped the list, but there was also strong interest in mechanical control, organics, and weed identification. Nutrient management was a top priority, particularly fertilizer timing and the amount of specific nutrients, but soil health and irrigation were also ranked highly. For alternative management practices, there was the most interest in compost and cover crops, followed by beneficial insects, biostimulants, biochar, and then hedgerows.

Respondents were fairly evenly split among whether they were most, somewhat, or least interested in all three technologies listed: robotic harvesting, robotic pruning, and drones/satellite imagery/soil mapping (data not shown).

Important Pest Rankings

The pie charts (Images 1 and 2) show how respondents ranked specific pests and diseases. While mealybugs and powdery mildew were the biggest issues for most growers, the other issues are still problematic for some.

Source

When asked to rank their preferred information source, respondents were most interested in getting newsletters (both email and hard copies), followed by field days/meetings and webinars, and least interested in blogs and social media.

Summary

Finally, I asked some open-ended questions and for “biggest grape issues”, the most common responses were related to economics/labor/regulations and pest management followed by yield/quality. For “grape issues interested in learning more about”, the most common responses were related to pest management and nutrients, followed by yield/quality, varieties, economics/regulations, and vineyard management.

I truly appreciate everyone who took the time to respond to my survey. It is immensely helpful to ensure that the research and extension program that I put together will meet local needs. Some of the work that I have begun already includes a research trial on sour rot in collaboration with UC Davis specialist Akif Eskalen and fellow advisor Tian Tian, organizing a grape weeds school event last November, and a table grape symposium in February 2024. I plan to continue some of these projects and add a few new ones in the coming year.

As always, I welcome any thoughts or suggestions and can be reached at joyhollingsworth@ucanr.edu or (559) 556-2673.

Table 1 Occupation of Respondents

Occupation	Responses	% of Total Respondents (123)
Grower	96	78
PCA	24	20
CCA	11	9
Industry Rep	11	9
Other	10	8

Table 2 Counties Covered by Respondents

County	Responses	% of Total Respondents (123)
Tulare	70	57
Kings	28	23
Fresno	76	62
Kern	29	24
Other	18	15

Table 3 Type of Grapes Grown or Managed by Respondents

Type	Responses	% of Total Respondents (123)
Table	69	56
Wine	57	46
Raisin	68	55

Table 4 Type of Chemical Control Used by Respondents

Type	Responses	% of Total Respondents (123)
Conventional	112	91
Organic	33	27

Table 5 Weed Control Methods Respondents Interested in Learning About

Weeds Control Info	Responses	% of Total Respondents (121)
Chemical	83	69
Mechanical	54	45
Organic	45	37
Weed ID	40	33
Don't need	14	12
Other	2	2

Table 6 Management Practices Respondents Interested in Learning About

Management Practices	Responses	% of Total Respondents (119)
Nutrient	81	68
Soil Health	69	58
Irrigation	63	53
Mechanization/Automation	48	40
Rootstocks	44	37
Canopy	37	31
Post Harvest	28	24
Salinity	27	23
New Vineyards	24	20
None	9	8

Table 7 Nutrient Management Information Respondents Most Interested In

Nutrient Management	Responses	% of Total Respondents (119)
Fertilizer timings	86	72
Amount of specific nutrients	85	71
Nutrition needs for specific varieties	50	42
Not interested	11	9
Other	4	3

Table 8 Alternative Practices Respondents Interested In

Alternative Practices	Responses	% of Total Respondents (117)
Compost	70	60
Cover Crops	69	59
Beneficial insects	57	49
Biostimulants	44	38
Biochar	22	19
Hedgerows	10	9

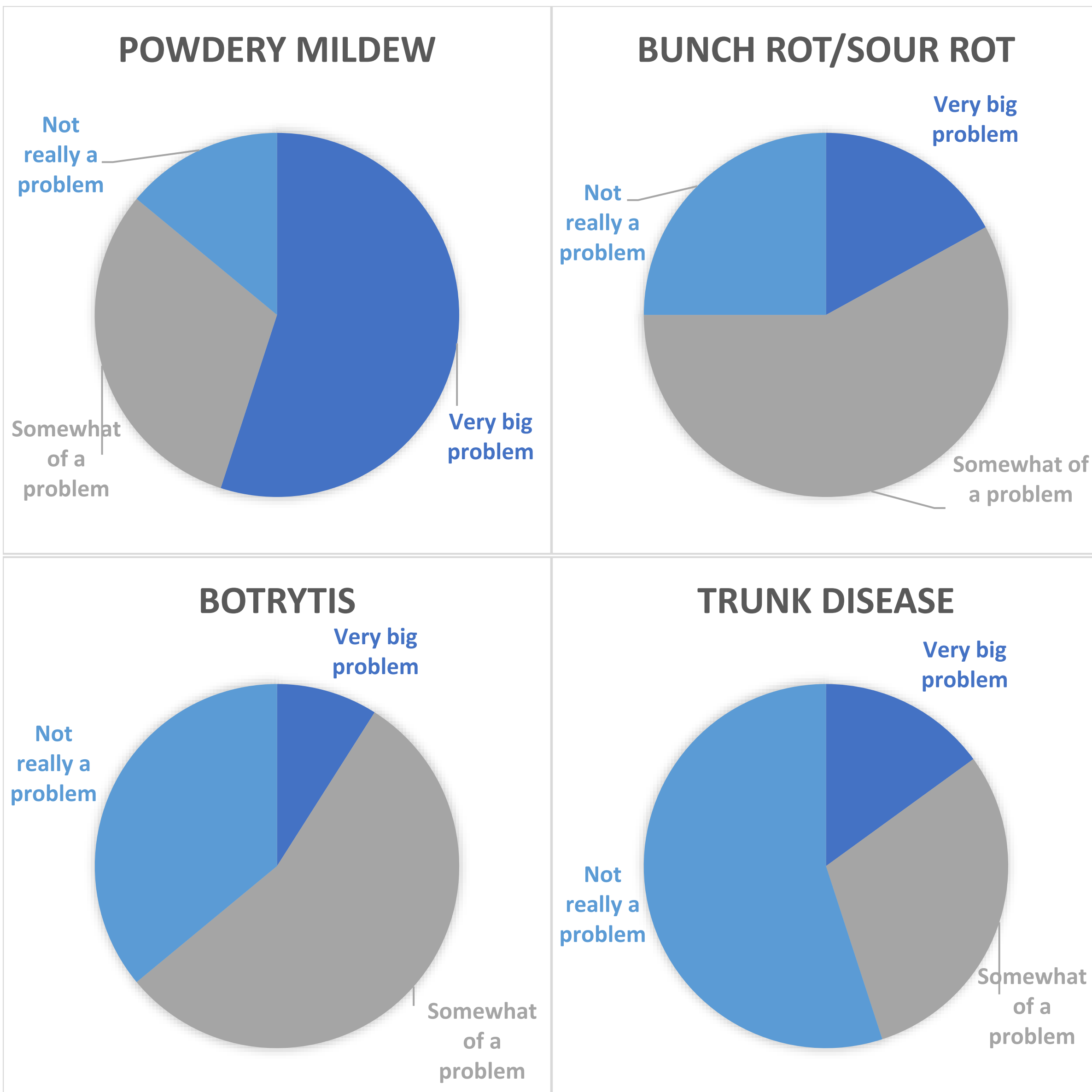

Image 1 Respondent Concern over Powdery Mildew (upper left), Bunch/Sour Rot (upper right), Botrytis (bottom left), and Trunk Disease (bottom right).

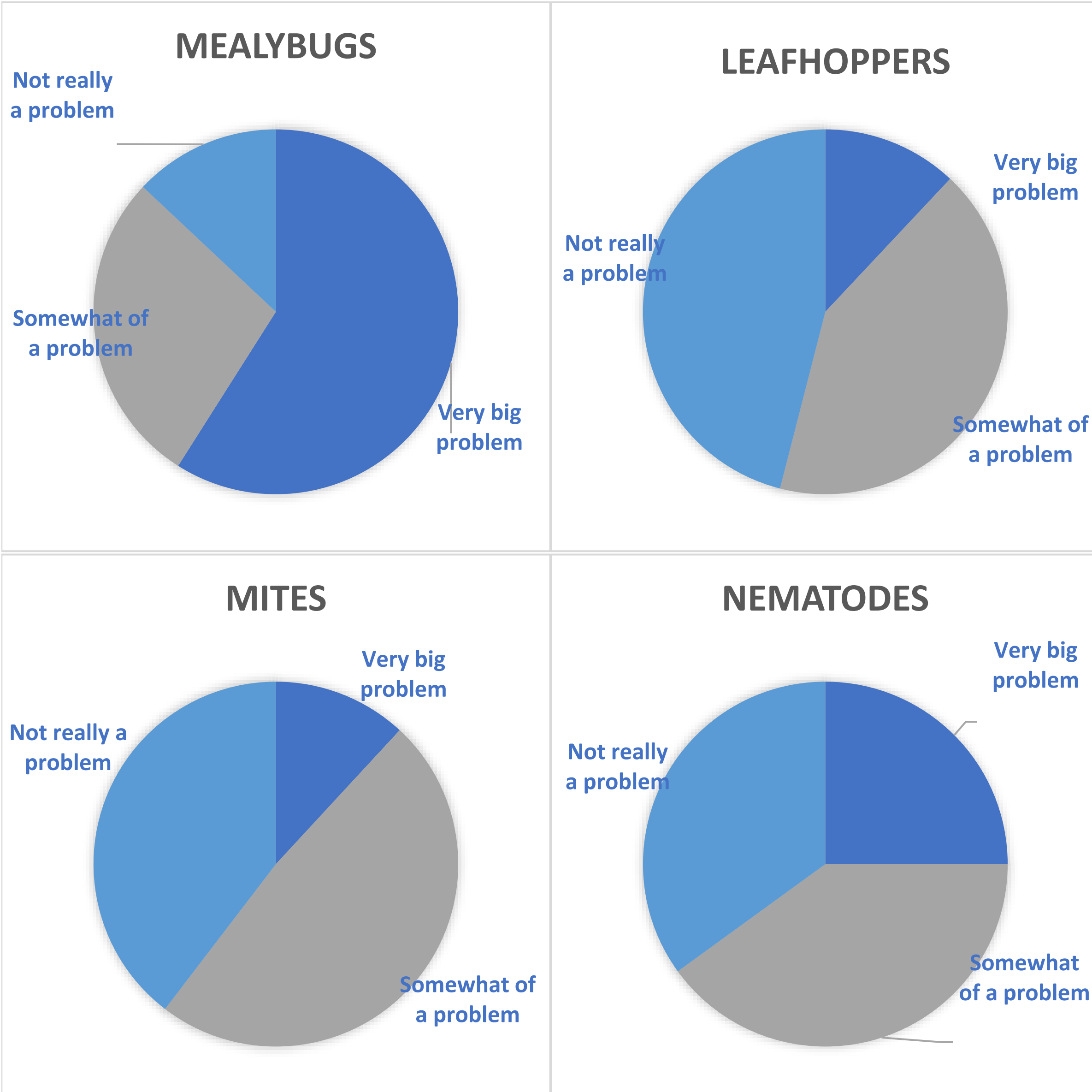

Image 2 Respondent Concern over Mealybugs (upper left), Leafhoppers (upper right), Mites (bottom left), and Nematodes (bottom right).

Impacts of Rootstocks on Performance and Fruit Quality of Mature 'Autumn King' Vines

Tian Tian, UCCE Viticulture Advisor for Kern County

Rootstocks are used in vineyards to protect vines from soil-borne pests, alter the water and nutrient uptake of vines, and improve vine tolerance to drought and salinity. Given the complicated interactions between different vineyard environments, rootstocks, and scions, choosing the appropriate rootstock for a given site remains challenging. It is not uncommon to see the same rootstock has different impacts on yield and berry composition in different vineyards with the same scions. To provide growers with more knowledge on rootstock selection, several studies were conducted in the San Joaquin Valley (SJV) to examine rootstock impacts on popular table grape varieties in the last three decades. Freedom, 1103 Paulsen, and Salt Creek (Ramsey) were identified as the top performers and then used extensively in the industry.

The grape industry is always facing new challenges, with additional restrictions on soil fumigants and the slow development of safe and effective nematicide. Grape growers are more dependent on rootstocks to fight against phylloxera and plant-parasitic nematodes. There are also reports of new nematode isolates overcoming the resistance of rootstocks over time. To address these industry needs, newer rootstocks like 10-17 A, RS-3, and the grapevine rootstocks for nematodes (GRN) were developed by USDA and UC Davis breeders, to offer broader and more durable resistance to soil-borne pests. Field tests provide valuable information on the suitability of these newer stocks for table grapes, particularly for replanting sites with high nematodes and phylloxera pressure.

In addition, concerns over using Freedom rootstock, due to its susceptibility to sudden vine collapse have increased. Sudden vine collapse can cause vines to have stunted growth in the early growing season and then collapse later in the summer. The vine death appears to be associated with a complex of viruses and fungal pathogens that lead to a breakdown of the graft union. Rootstocks like Freedom are sensitive to viruses, leading to it being the most common rootstock involved with sudden vine collapse. In addition, the insect vectors for the viruses involved in sudden vine collapse, mealybugs, are commonly present in vineyards in the Southern San Joaquin Valley. Mealybugs can spread the virus even in a low population. To avoid a potential loss to sudden vine collapse, growers have become more interested in adopting rootstocks other than Freedom.

An additional concern addressed in this study is the complication of time. Given that researchers can only keep rootstock trials for five to seven years, we rarely have the opportunity to evaluate rootstock impact in older vines. Some growers have observed a larger impact of rootstocks as vines age. Luckily, one of the rootstock trials planted by my predecessor Jennifer Maguire was kept by a grower collaborator beyond the typical time frame. With funding from the American Vineyard Foundation and support from grower cooperators and UC colleagues, we were able to collect valuable data before those vines got removed in the spring of 2023.

Experimental vines were planted in 2010 in Ducor, CA with 'Autumn King' as the scion. Vines were on an open Gable trellis system. The soil of the vineyard is the San Joaquin series (fine loam). The vineyard was flood-irrigated but switched to drip irrigation around 2016. The original experiment included vines on 14 traditional and newer rootstocks, along with own-rooted vines. Yet, vines on GRN-5 and RS-34 had low

Table 1. Summary of rootstock selections planted in an 'Autumn King' trial in Ducor, CA. Vineyard was established in 2010

Rootstock	Origin	Parentage
'Autumn King'	USDA, Fresno	*V. vinifera*
Freedom	USDA, Fresno	*V champinii* x *1613C*
Harmony	USDA, Fresno	*V. champinii* x *1613C*
Teleki 5C	Hungary	*V. berlandieri x V. riparia*
Salt Creek (Ramsey)	Texas	*V. candicans x. V. rupestris*
1103-P	Sicily, Italy	*V. berlandieri x V. rupestris*
'Crimson Seedless'	USDA, Fresno	*V. vinifera*
USDA 10-17 A	USDA, Fresno	*V. simpsoni x Edna ((V. lincecumii x V. rupestris) x V. vinifiera)*
RS-3	KAC, Parlier	*(V. candicans x V. rupestris) x (V. riparia x V. rupestris)*
GRN-1 (8909-05)	UC Davis	*V. rupestris x M. rotundifolia*
GRN-2 (9363-16)	UC Davis	*(V. rufotomentosa x (V. champinii* 'Dog Ridge' x Riparia Gloire)) x Riparia Gloire
GRN-3 (9365-43)	UC Davis	*(V. rufotomentosa x (V. champinii* 'Dog Ridge' x Riparia Gloire)) x *V. champinii* c9038 (probably *V. candicans x V. monticola*)
GRN-4 (9365-85)	UC Davis	(*V. rufotomentosa x (V. champinii* 'Dog Ridge' x Riparia Gloire)) x *V. champinii* c9038 (probably V. candicans x V. monticola)

survival rates in the first five years after planting. As such, we collected data from vines on 12 rootstocks as well as own-rooted vines in 2021 and 2022 (Table 1).

Pruning mass. Rootstock showed significant influences on pruning mass. Vines on Salt Creek, GRN 2, GRN 3, Teleki 5C, 1103 Paulsen, and 10-17 A had higher pruning mass than others at dormancy, suggesting those stocks convey more vigor to the scion (Figure 1). The pruning mass of vines on Freedom, RS3, Harmony, Crimson, and GRN 4 remained intermediate among all, while vines on GRN 1 and own-rooted vines had the lowest pruning weight.

Yield. Influences of rootstocks on yield followed a similar pattern as on pruning mass. Vines with larger canopies generally had higher yields. The exception is vines on 10-17A (Figure 2). They were as vigorous as the top performers like vines on Salt Creek, yet the total yield remained intermediate. It is possible vines on 10-17A favored vegetative growth more than reproductive growth. Rootstocks had similar impacts on marketable yield as total yield (Figure 3). It is worthwhile to note that vines on GRN-1 and own-rooted vines experienced sunburn and fruit yellowing, and thus the marketable yield of those two treatments was only 20 to 30% of the top performers.

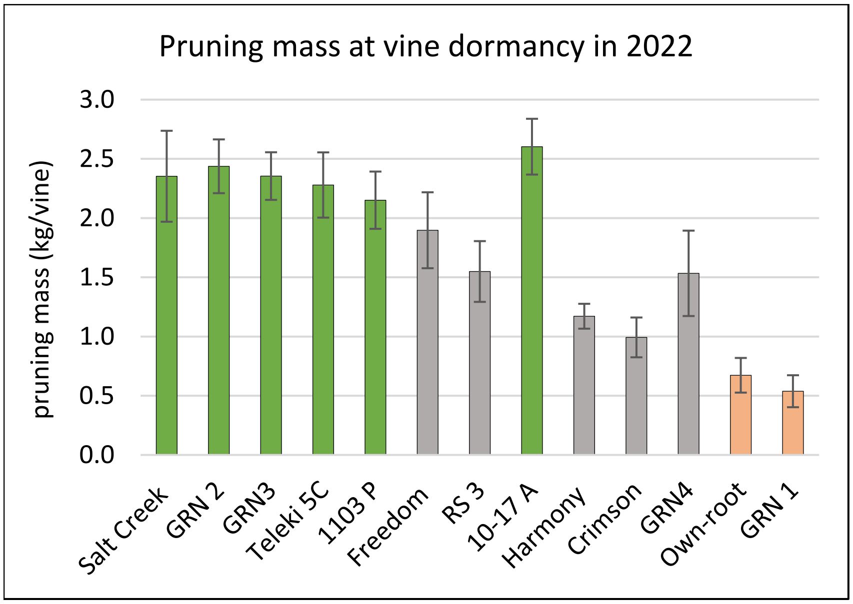

Figure 1. Rootstock impacts on pruning mass of 'Autumn King' vines at dormancy in 2022. This measure reflects vine vegetative growth in 2021. Height of bars indicates the mean yield of each treatment (n=5) and standard errors are shown as error bars.

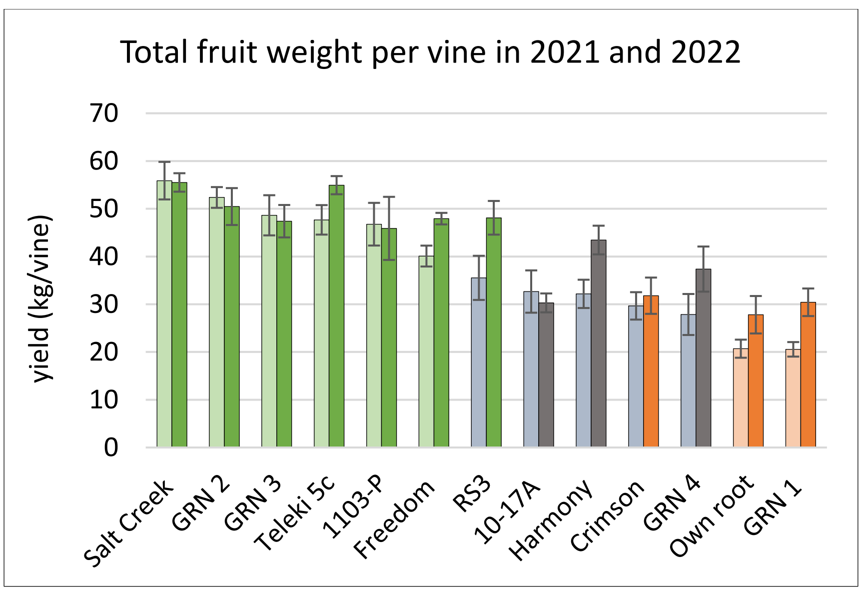

Figure 2. Rootstock impacts on total yield of 'Autumn King' vines. The light and dark shades of bars represent data collected in 2021 and 2022, respectively. Height of bars indicates the mean yield of each treatment (n=5) and standard errors are shown as error bar.

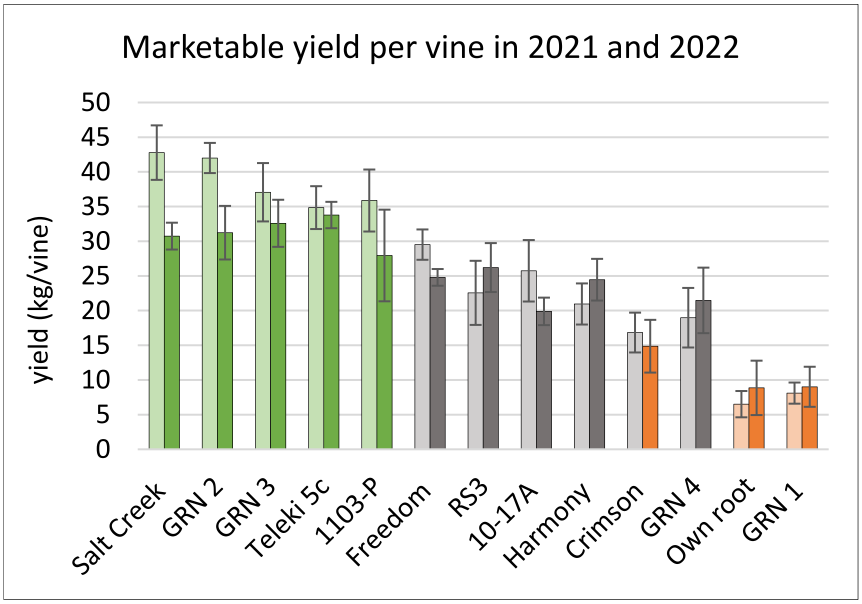

Figure 3. Rootstock impacts on marketable yield of 'Autumn King' vines. The light and dark shades of the bars represent data collected in 2021 and 2022, respectively. The height of the bars indicates the mean yield of each treatment (n=5), and error bars represent standard errors.

Berry composition at harvest. Vines on GRN 2, Salt Creek, and 10-17A had delayed ripening in one of the two years. Rootstock did not have a consistent effect on the pH and titratable acid of fruit juice at harvest.

Soil-borne pests. We observed an overall increase of dagger nematode (*X. americanum*) and citrus nematode (*T. semipenetrans*) populations across all rootstocks as vines age. Yet, vine growth did not show a clear association with nematode population. For example, vines on Salt Creek and own-rooted vines had similar counts for dagger and citrus nematodes, but the former performed way better than own-rooted vines in this trial. It seems vines grew well and would have more tolerance to nematode damage. We did not find phylloxera in this experimental site.

Conclusion. Overall, even though this site had a low population of plant parasitic nematodes in the early years, own-rooted vines experienced a clear decline in growth and yield as vines became older. Rootstocks showed benefits in boosting vine vigor, increasing yield, and extending vineyard longevity. GRN 2, GRN 3, and Teleki 5C could be the alternative options for traditional rootstocks like Freedom, 1103 Paulsen, and Salt Creek, which convey moderate to high vigor to the scion. In cases where scions are already vigorous, rootstocks like GRN 4 and RS-3 can be good options. GRN-1 is unlikely a suitable rootstock for table grape vineyards.

Acknowledgment. I would like to thank our grower cooperators, Leroy Kuntz and Konrad Kuntz, for their generous support. The help and support from Matthew Fidelibus, Don Luvisi, Ashraf El Kereamy, and Andreas Westphal are greatly appreciated. Special thanks go to Minerva Gonzalez, our viticulture technician, for her technical support over the course of this experiment. I also thank Karl Lund and Matthew Fidelibus for reviewing this article.

Trialing Nematode Resistant Rootstocks for Use in The San Joaquin Valley

Karl Lund, UCCE Viticulture Advisor for Madera, Merced, and Mariposa Counties

Rootstocks are an integral part of viticulture. The rootstock controls the interaction of the whole vines with the soil profile. This puts the rootstock in charge of the uptake of nutrients from the soil, water uptake, and defense against soil pests. As such different rootstocks will have a wide range of effects on a vineyard that can majorly change the canopy, yield, and longevity of that vineyard. When new rootstocks are being developed, or soon after release, trials should be conducted to help growers understand how new rootstocks compare to previously available stocks. Two newer groups of rootstocks were released with advanced nematode resistance. The first of these is the RS rootstocks series, RS3, and RS9, which have strong resistance to aggressive strains of root-knot nematode. The second is the GRN rootstock series, GRN1, GRN2, GRN3, GRN4, and GRN5, which have moderate to strong resistance to a wide range of nematodes. While both groups of rootstocks have been well-tested for nematode resistance, their effect in the vineyard has been much less well-documented.

To test the performance of these rootstocks in the San Joaquin Valley (SJV) several different trials were planted, two of which I have overseen for the past 6 growing seasons. The first of these was planted just outside of the city of Madera. It was planted in 2009 with an eight-foot by ten-foot spacing (within and between rows, respectively) with Petite Verdot as the scion. This site has both RS rootstock, and all 5 GRN rootstocks, as well as Freedom and 1103P as standard controls. Each replicate in this vineyard consists of an 8-vine panel replicated 5 times. The second trail is located a bit north of the city of Merced. It was planted in the fall of 2016 on a five x eleven-foot spacing (within and between rows) with Malbec as the scion. This site has both RS rootstocks, with GRN2, GRN3, GRN4, and 1103P as a standard control. Each replicate consists of an entire row of 388 vines with 4 replicates per rootstock. Overall, this means that the Madera site has a larger variety of rootstocks, while the Merced site has a larger number of vines from which to collect data.

Water Stress

The ability to supply water to the scion is one of the major differences between different rootstocks. During the 2021 and 2022 growing seasons the Merced vineyard site saw the same number of days with temperatures at or above 100 ^{o}F. However, the distribution of these days was different between the two growing seasons. The 2021 growing season started hot with June and July seeing 8 more days with temperatures at or above 100^{o}F in comparison to June and July of 2022. On the other hand, the 2022 growing season ended hot seeing 8 more days in August and September with temperatures at or above 100^{o}F than the 2021 growing season. In addition, the 2021 growing season also started with extremely dry soil conditions that led to many California vineyards having delayed growth problems at the beginning of the season. The differences in these two growing seasons mean that the water stress at the Merced site was high at the start of the 2021 growing season, while during 2022 it was high towards the end of the season.

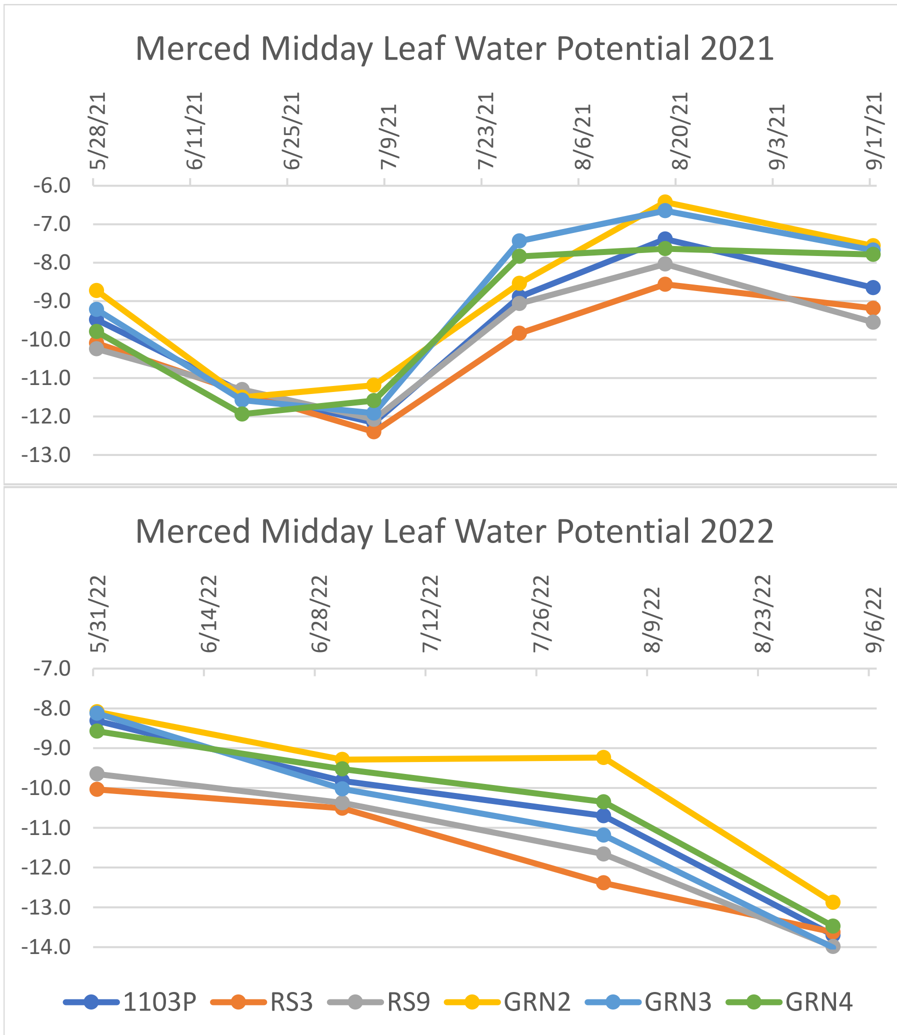

Image 1. Midday Leaf Water Potential data from 2021 (top) and 2022 (bottom) for the Merced trial site show water stress differences between the two different growing seasons.

The differences in the growing seasons were expressed in the midday leaf water potential (Image 1). The early stress of the 2021 growing season leads to a decline in leaf water potential in late June and early July before lower stress levels return in August and September. In contrast, in 2022 water potential generally declined through the growing season, especially during August and September. Despite these differences, the performance of the rootstocks is similar between the two years. GRN2 is normally the least water-stressed rootstock or is in the lower water-stressed group. On the other side, vines on RS3 or RS9 were more stressed throughout both seasons. For most of the season vines on GRN3, GRN4, and 1103P were similar to vines on GRN2 or segregated into a separate moderately water-stressed group.

The one exception to this general rule is when GRN3 is put under sudden high levels of water stress. Two dates when this can be seen are 6/18/2021 and 9/1/2022. Both of these dates were extremely hot, and all vines became more stressed on those dates. In both cases, vines on GRN3 quickly changed from low or moderate water stress to highly stressed. While vines on GRN3 quickly become more water-stressed, they also recover quickly. After the heatwave in 2021, the vines on GRN3 recovered from the high levels of water stress. GRN3 is the least water-stressed rootstock after the first data collection point after the heat wave ended and only comes in with more stress than GRN2 for all remaining data collection points.

At the Madera trial, we see comparable results to Merced. In Madera, GRN2 and Freedom are constantly the two least water-stressed, or among the least water-stressed group. On the other end,

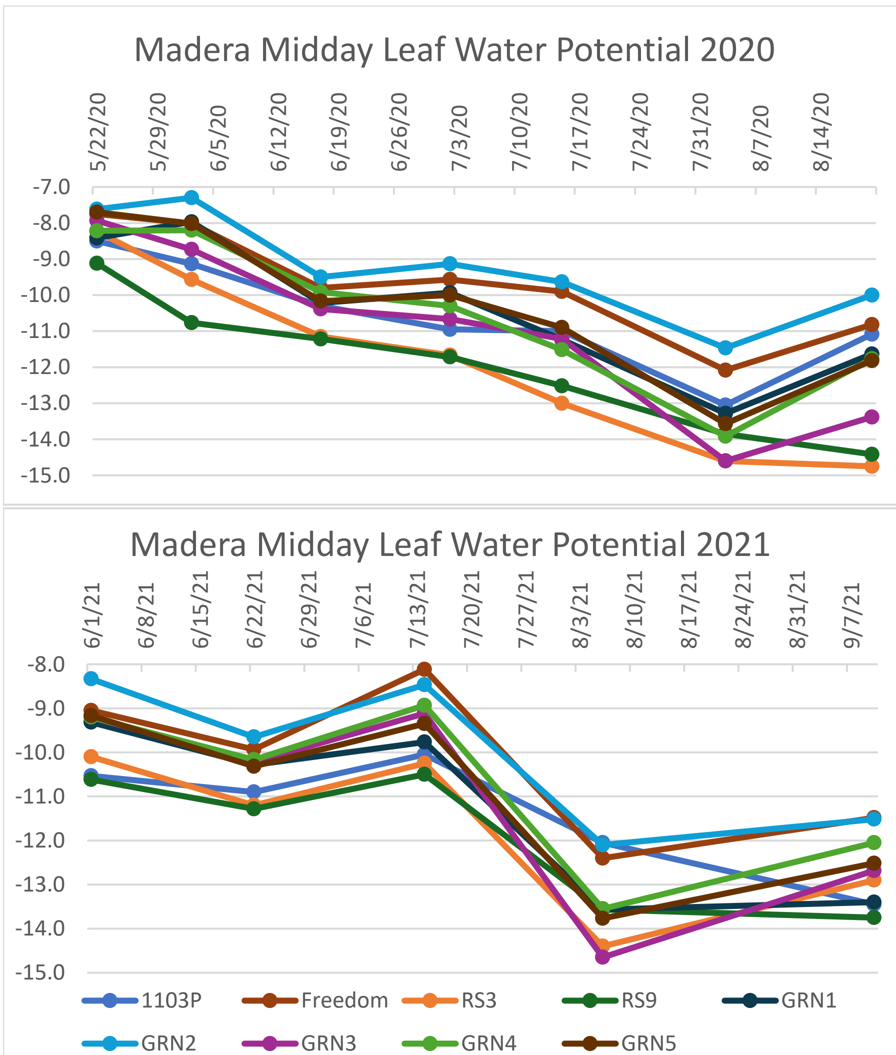

Image 2. Midday Leaf Water Potential data from 2020 (top) and 2021 (bottom) for the Madera trial site.

RS3 and RS9 are normally among the high water-stressed group. 1103P is not well adapted to the Madera trial site and performs below expectations. During 2021, 1103P spent most of its time in the high water-stress group, while in 2020 it spent most of its time at the bottom of the medium water-stress group. GRN1, GRN3, GRN4, and GRN5 will be grouped either in the low water-stress group or as an independent medium water-stress group.

The Madera vineyard site uses a post-veraison dry down to add late-season water stress as part of their fruit quality program. This can be seen in the data during the first week of August in both years. Much like during the heatwaves at the Merced site, all the vines at Madera become more stressed during the yearly dry-down. Also just like at Merced, during the dry-down in Madera GRN3 jumps into the high water-stress group and becomes one of the most water-stressed vines. And again, just like in Merced, after the initial dry down in Madera GRN3 recovers after irrigation is increased. The agreement between the two sites with GRN3 gives a good overall look at how it handles water stress. Whether the water stress is due to purposeful (Madera site) or accidental reduction in irrigation, or due to elevated water need from a heatwave (Merced site), GRN3 cannot handle these events and becomes overly water stressed. The data also supports that once the events leading to elevated water stress have been removed GRN3 recovers rapidly.

Nutrient Uptake

As rootstocks control the interaction of the plant and soil, different rootstocks will uptake different nutrients differently. Understanding these differences allows a vineyard manager to better dial in their nutrient management program. To test these differences petiole samples were collected in Merced at bloom and veraison in 2018, 2019, and 2021. At each sampling, Potassium, Calcium, and Magnesium were affected by rootstock. Chloride and Manganese were usually affected as well, and Zinc and Boron were also commonly affected. Phosphorus and Sodium were occasionally affected by rootstock, Copper was only affected by rootstock at one timepoint during bloom of 2018, while Nitrogen and Iron were not affected by the rootstock at any timepoint. At the vineyard in Madera, samples were collected at veraison in 2021. While this is only at one time point it allows for a comparison between the two different vineyard locations.

Potassium uptake shows a consistent pattern in Merced. GRN2, GRN3, and GRN4 rootstocks have higher potassium concentration levels than RS3, RS9, and 1103P. In Madera GRN2, GRN3, GRN4, GRN5, and Freedom, had the highest K uptake. RS9 has switched from the low concentration level group in Merced to the higher uptake group in Madera. GRN1 has joined RS3 and 1103P in the low potassium concentration level group.

Calcium shows a similar uptake to potassium at the Merced vineyard. GRN2, GRN3, and GRN4 again have higher concentration levels than RS3 and RS9. This time 1103P is in the higher concentration level group. In Madera a consistent pattern with Merced with GRN2, GRN3, GRN4, and 1103P being in the high concentration level group. Freedom, GRN1, and GRN5 all also join the higher concentration level group in Madera. Finally, RS3 and RS9 again were in the lower concentration level group.

Magnesium shows a reversal of the pattern seen in the previous two nutrients at the Merced Vineyard. GRN2, GRN3, and GRN4 all show low concentration levels, while RS3, RS9, and 1103P show higher concentration levels. While the Madera samples do not statistically separate, the trend holds steady

Table 1 Concentration Level Comparison of Rootstocks at the Merced Trial from 6 timepoints over 3 years. The concentration levels are only compared to other rootstocks within the trial and not an overall uptake level.

Rtstck	N	P	K	Ca	Mg	Ch	Mn	Zn	B
1103P	ND	ND	Lower	Higher	Higher	Lower	Higher	Mod	Higher
RS3	ND	ND	Lower	Lower	Higher	Mod	Lower	Higher	Lower
RS9	ND	ND	Lower	Lower	Higher	Mod	Lower	Higher	Lower
GRN2	ND	ND	Higher	Higher	Lower	High - V High	Higher	Lower	Higher
GRN3	ND	ND	Higher	Higher	Lower	Higher	Higher	Lower	Higher
GRN4	ND	ND	Higher	Higher	Lower	Higher	Higher	Lower	Higher

N = Nitrogen, P = Phosphorus, K = Potassium, Ca = Calcium, Mg = Magnesium, Ch = Chloride, Mn = Manganese, Zn = Zinc, B = Boron

ND = No Difference, Mod = Moderate

with 1103P, RS3, and RS9 having higher magnesium concentrations than the remaining rootstocks.

Chloride shows higher concentrations in GRN3, GRN4, and especially GRN2. GRN2 had the highest concentration in 5 of six times and moved into a separate very high concentration group during both 2021 sampling events. As chloride can become toxic in grape leaves this may be an early indication that GRN2 may have problems in high chloride situations. 1103P shows the lowest chloride concentration at 5 of 6 time points, separating into its own super low concentration category for 3 of the 6 time points. 1103P is considered to have moderate salinity tolerance compared to other standard rootstocks, meaning GRN3, GRN4, and especially GRN2 should be considered to have a lower tolerance for salinity. RS3 and RS9 are generally in between the other rootstocks at the Merced trial. Sometimes they slide into the lower concentration group with 1103P and sometimes they group with GRN3 and GRN4. Indicating they probably have a better salinity tolerance than GRN2, GRN3, and GRN4, but lower tolerance than 1103P. At the Madera trial, Freedom took over the highest chloride concentration group. This matches its lower level of salinity tolerance. GRN2, GRN3, GRN4, and GRN5 are now in the middle group confirming their high uptake (but not as bad as Freedom) from the Merced trial. RS3, RS9, GRN1, and 1103P again show up in the lower concentration group.

GRN2, GRN3, GRN4, and 1103P had higher concentrations of Manganese than RS3 and RS9 at the Merced trial. The Madera trial showed a stark change in results from Merced. In Madera 1103P and GRN4 remain in the high concentration group and are joined by GRN5 and Freedom; as well as RS9 which was in the concentration group in Merced. RS3 is still in the lower concentration group in the Madera Trial, along with GRN1; and is now joined by GRN2 and GRN3 which had previously been in the high concentration group.

Zinc showed high concentration levels in RS3 and RS9 at the Merced trial. At the Merced trial, GRN2, GRN3, and GRN4 have low zinc concentration levels. 1103P sits in between the two groups. Here again, we see major differences between Merced and Madera. In Madera, the data shows that 1103P, GRN2,

Table 2 Concentration Comparison of Rootstocks at the Madera Trial from 1 timepoint. The concentration levels are only compared to other rootstocks within the trial and not an overall uptake level.

Rootstock	N	P	K	Ca	Mg	Ch	Mn	Zn	B
1103P	ND	ND	Lower	Higher	ND	Lower	Higher	Higher	Higher
Freedom	ND	ND	Higher	Higher	ND	Higher	Higher	Lower	Mod
RS3	ND	ND	Lower	Lower	ND	Lower	Lower	Mod	Lower
RS9	ND	ND	Higher	Lower	ND	Lower	Higher	Mod	Higher
GRN1	ND	ND	Lower	Higher	ND	Lower	Lower	Lower	Mod
GRN2	ND	ND	Higher	Higher	ND	Mod	Lower	Higher	Higher
GRN3	ND	ND	Higher	Higher	ND	Mod	Lower	Higher	Mod
GRN4	ND	ND	Higher	Higher	ND	Mod	Higher	Mod	Mod
GRN5	ND	ND	Higher	Higher	ND	Mod	Higher	Mod	Mod

N = Nitrogen, P = Phosphorus, K = Potassium, Ca = Calcium, Mg = Magnesium,
Ch = Chloride, Mn = Manganese, Zn = Zinc, B = Boron
ND = No Difference, Mod = Moderate

and GRN3 form the higher concentration group. RS3, GRN5, RS9, and GRN4 form the middle concentration group, while Freedom and GRN1 form the lower concentration group.

Boron is an element that can become deficient on the east side of the San Joaquin Valley, while growers only an hour's drive away on the west side of the San Joaquin Valley have to deal with boron toxicity. At the Merced trial, RS3 and RS9 showed lower concentration levels of Boron. GRN2, GRN3, GRN4, and 1103P all generally show higher concentration levels, with GRN2 and 1103P often being near the top. At the Madera trial, RS3 again shows the lowest concentration level of Boron, and GRN2 and 1103P are again at the top. However, RS9 has again switched groups from the low concentration group to the higher concentration group. The identification of RS3 showing low concentration could make it important for areas with high boron levels in soil or irrigation water.

Canopy Growth

The growth of the canopy can be affected by the rootstocks' ability to uptake water and nutrients. Canopy growth differences can be seen easily when touring either of the rootstock trials. There are always some year-to-year differences in growth patterns, but the general growth pattern has remained the same over the past several growing seasons. For these trials canopy growth was measured using a Paso Panel placed under the canopy to evaluate the width of the canopy at each data collection point. As both vineyards involved in this work were on a single high-wire trellis, there was a maximum canopy size that each vineyard could achieve. Once the canopy has reached this maximum size any additional growth would no longer increase the width of the canopy but add additional length to the canopy.

At the Madera site, the vines grafted on GRN2 and Freedom are always the largest canopies. The vines grafted on GRN4 and GRN5 normally group with those grafted on GRN2 and Freedom but are slightly

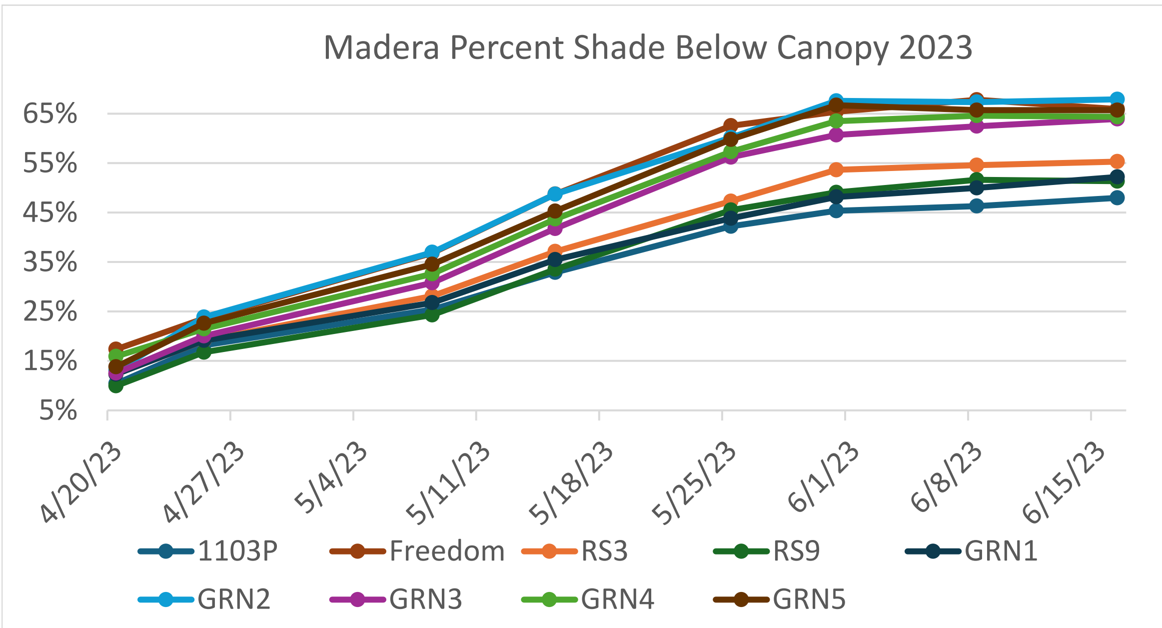

Image 3 Percent Shade Below Canopy at Madera Vineyard Site 2023.

smaller through the early growing season. Overall, the canopies on these four rootstocks all hit the maximum canopy size every year. The vines grafted on GRN3 are another step behind those on GRN4 and GRN5, but also normally hit maximum canopy size at the Madera vineyard site as it did in 2023 (Image 3). In some years, the vines grafted on GRN3 do not make it to the maximum canopy size and stay slightly smaller than those on Freedom, GRN2, GRN4, and GRN5.

As was mentioned back in the water stress section, 1103P is not well adapted to the Madera Vineyard site. As such the vines grafted on 1103P are normally one of the smallest canopies every year at this site. The vines grafted on RS9 and GRN1 also consistently have smaller canopies and group with vines grafted 1103P. The canopies of vines grafted on RS9 and 1103P do lead to some sun-related fruit damage at the Madera vineyard site. Vines grafted on GRN1 will also have some mild fruit exposure issues, but they are much less than those grafted on RS9 and 1103P. Vines grafted on RS3 are also on the smaller side of canopy sizes, in 2023 it grouped with 1103P, RS9, and GRN1 (Image 3). However, in some years they do achieve a large enough canopy to separate into a medium-sized canopy group with the vines grafted on GRN3.

The Merced vineyard site is again similar to the Madera site for canopy growth. The vines grafted on GRN2 again have the largest canopy throughout most of the growing season. In Merced, the vines grafted on GRN3 have a larger canopy and groups with GRN2 in the large canopy group. The vines

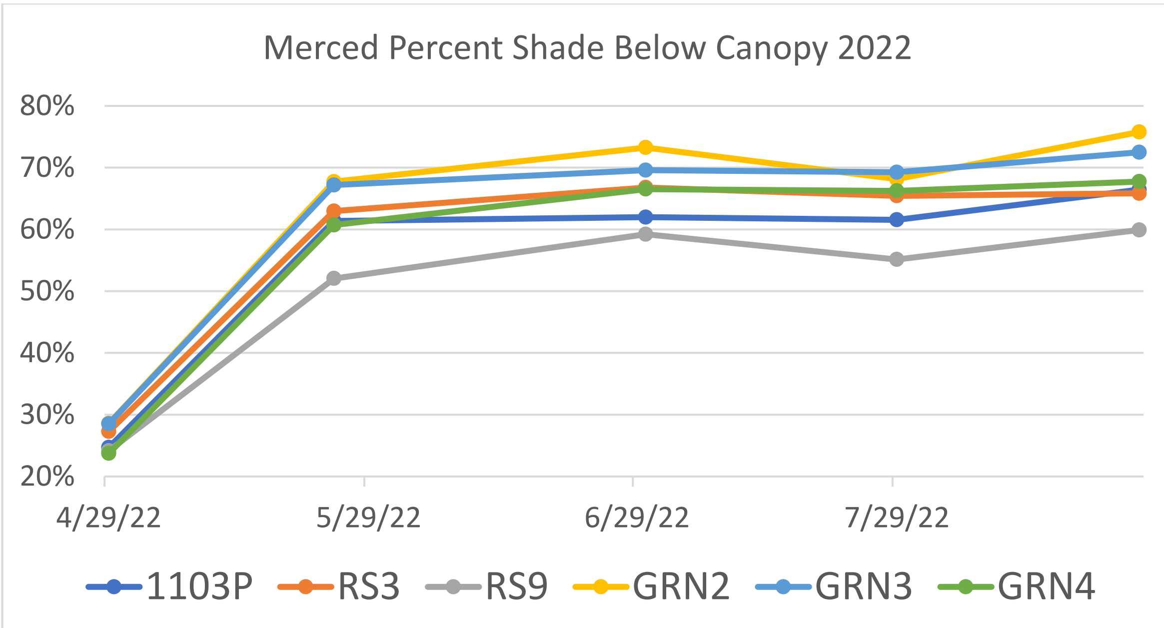

Image 4 Percent Shade Below Canopy at Merced Vineyard Site 2022

grafted on GRN4, RS3, and 1103P make a moderate canopy size group that does group with the large canopy group at some collection points. 1103P is much better adapted to the Merced Vineyard site, so this is more representative of where it is expected to align. The vines grafted onRS9 again sit in the small canopy group (Image 4). The vines grafted on RS9 have canopies that are small enough in Merced to receive sun-related fruit damage in most growing seasons.

Yield

Yield is going to be influenced by every factor that has been discussed so far. Both the flowers and resulting berries will require water and nutrients to properly grow. A strong canopy is needed to supply the berries with sugar to help them mature, as well as provide them protection from the San Joaquin Valley sun. In Madera, the yields from the rootstocks break into 5 separate groups. Freedom stands alone with the largest yield at over nineteen tons per acre. GRN2 and GRN3 are in the next group with approximately sixteen tons per acre. GRN1, GRN4, and GRN5 are in the third group with between fourteen and fifteen tons per acre. RS3 is next and is between thirteen and fourteen tons per acre, while RS9 and 1103P are in the bottom group with below twelve tons per acre. Overall, this shows a general matching between canopy size and yield at the Madera site. The five members of the large canopy group are among the six highest yielding. The three smallest yielding rootstocks all come from the small canopy group. The one outlier is GRN1, which is among the small canopy group, but is in the middle yield group, and overall had the fourth-highest yield in Madera.

The picture gets more complicated when looking at the yield results from Merced. The vineyard had not yet reached maturity when the last harvest data was collected and was suffering from the results of the delayed spring growth seen across the state back in 2021. The data did not separate into groups due to the large amount of variability seen across the research block. Overall GRN3 had the highest yield followed by RS3. RS9, followed closely by GRN4 and 1103P then followed, while GRN2 had the lowest yield. This is a vastly different picture in general, but a couple of constants do show through. GRN3 is again at the top of the yield ladder, while RS3 and GRN4 outproduced 1103P. However, the vast shift in production of RS9 and GRN2 is perplexing. Should we believe the yield data from Madera or Merced? Unfortunately, the vineyard where the research trial is located was top-grafted at the beginning of 2023. I won't be able to collect more data from that vineyard again until at least 2025.

To help solve this mystery it is helpful to check in with other trials run with these rootstocks. George Zhuang working on wine grapes in Fresno County found that GRN2 took longer to fully establish and produce large yields. Tian Tian working on table grapes in Kern County also found that GRN2 took a couple extra years to establish itself, with low yields in the beginning before climbing to become a high-yielding rootstock. Her work also identified GRN2, GRN3, and 1103P as all belonging to the highest-yielding group of rootstocks. With Freedom, RS3, and GRN4 being intermediate producers. Lastly, Rhonda Smith working on wine grapes in Sonoma County again found that GRN2 had the largest vine (canopies). She also found that RS3 and RS9 had the smallest canopies and low yields.

Incorporating the information from both of my trials and the work done by other UCCE researchers, GRN1 has good yields with a smaller-sized canopy. GRN2 has a consistently large canopy, low levels of water stress, and can have large yields. It does typically take a couple of extra years for vines on GRN2 to reach their full potential. GRN3 has consistently large yields, with a solid canopy. GRN3 can become water stressed quickly. GRN4 has good yields and a good canopy. Overall, my only complaint about GRN4 is that it doesn't stand out as good or bad in any of the data, which isn't the worst thing to complain about. GRN5 also has good yields and a good canopy similar to GRN4. RS3 can have moderate yields and canopy but is often on the smaller side for both. RS3 is always on the higher end for water stress. RS9 is always on the smaller end of canopy growth often leading to overexposed fruit. RS9 is also always on the higher end of water stress.

Introducing Our New IPM Advisor, Idongesit U. Mokwunye

Idongesit U. MOKWUNYE earned a BSc in Zoology from the University of Lagos, an MSc from the University of Ibadan, and a PhD from the Federal University of Agriculture, all in Nigeria. Dr. Idongesit worked as a nut crop Entomologist at the Cocoa Research Institute of Nigeria (CRIN) for over 15 years. She was the Head of the Crop Protection Division of the institute. Her research interests include integrated pest management, chemical ecology, extension entomology, and economic entomology. Specific research studies include the population dynamics of the cashew stem girdler as it correlates with weather parameters; its damage potential on various accessions and associated yield and economic loss; bio-ecology of tea mosquito bug on cashew and spray trials on cocoa mirids. In addition, she is experienced in plant/insect volatile extraction and insect behavioral bioassays. She has over 25 research publications in highly rated journals to her credit. She has served as a resource person engaging stakeholders in outreaches and facilitating training programs on Integrated Pest Management (IPM). She is a fellow of African Women in Agricultural Research and Development (AWARD), the Orange Knowledge Program (OKP) of the Netherlands Government, and the Scientific Exchanges Program of the USDA. She is a member of a few international and local professional bodies such as the Entomological Society of America (ESA), Entomological Society of Nigeria (ESN), and Nigerian Women in Agricultural Research and Development (NIWARD) among others. She has served in various leadership capacities such as the Acting Program Leader and Secretary of the Cashew Research Program, CRIN, Treasurer, ESN Ibadan Chapter, and the financial secretary, of the NIWARD CRIN Chapter. Dr Idongesit is passionate about self-development, mentoring, and volunteering. One thing on her bucket list is to go on a cruise across the continents.

She is committed to bringing her expertise and experience in pest management to bear in her new position as an Area IPM Entomology Advisor. She plans to connect and engage meaningfully with a diverse clientele to understand their needs, priorities, and perspectives regarding pest management issues and how to be better served. She will also collaborate with UC colleagues and other partners to conduct demand-driven, applied research and innovative extension programs on IPM that will meet the needs of the growers in line with UC ANR culture and values. Generally, she wants to play her part towards achieving healthy food systems, environments, communities, and Californians.

Dr Idongesit will be covering tree fruit and nut crops such as pistachio, almond, walnut, table grapes, and stone fruits in Madera, Tulare, Fresno, and Kings Counties. She can be reached at imokwunye@ucanr.edu or 559-807-0257.

Upcoming Meetings

UC ANR Vineyard IPM Day at San Joaquin County

Date: April 1st, 2024, 7:30 AM-12:00 PM

Location: UCCE San Joaquin County office, 2101 E Earhart Ave, Assembly Room1, Stockton, CA 95206

Meeting Agenda

7:30 am: Registration and coffee

7:50 am: Welcome

8:00-8:30 am: Powdery Mildew and Bunch Rot Management Overview

8:30-9:00 am: Use Weather Stations to Understand and Respond to Disease Pressure

9:00-9:30 am: Spotted Lanternfly – Be on Lookout for This Invasive Pest

9:30-10:00 am: Break and refreshments

10:00-10:30 am: Sprayer Calibration to Maximize the Efficacy of Your Spray Program

10:30-11:00 am: Vineyard Trunk Disease Management

11:00-11:30 am: Vineyard Soil Pest and Disease Management

11:30-12:00 am: Remote Sensing on Grapevine Leaf Roll Virus Detection

Continuing Education: 3.5 PCA and 3.5 CCA hours have been requested.

Any questions? Email Justin Tanner at jdtanner@ucanr.edu or call (209) 953-6100

Upcoming Meetings

Virtually On the Road in Paso Robles

Sponsored by UC Davis Department of Viticulture and Enology

Date: April 5th, 2024, 9:00 AM-12:00 PM

Location: Zoom Webinar

Meeting Agenda

9:00 am: What does it mean to apply regenerative agricultural practices to grape growing?

9:30 am: Irrigation with recycled water

10:00 am: Advances in single vine resolution irrigation

10:30-10:45: Break

10:45 am: Grapevine mineral nutrition

11:15 am: Foundations for a modern grape breeding program

11:45 am: Wrap-up/Questions

Free registration:
https://ucdavis.zoom.us/webinar/register/WN_6g2fWNTNTyGh_nkeu3bddA#/registration

Upcoming Meetings

On the Road in Kern County

Sponsored by UC Davis Department of Viticulture and Enology

Date: April 10th, 2024, 9:00 AM-1:00 PM

Location: Hodel's Country Dining, 5917 Knudsen Dr, Bakersfield, CA 93308

Cost: $30/person (includes breakfast and lunch)

Registration: https://www.eventbrite.com/e/on-the-road-in-kern-county-april-10-2024-tickets-853792776177?aff=oddtdtcreator

Complete Agenda Coming Soon. Confirmed speakers include:

David Block, Professor, Departments of Viticulture & Enology & Chemical Engineering, UC Davis

Akif Eskalen, Professor of Cooperative Extension, Department of Plant Pathology, UC Davis

Matthew Fidelibus, Professor of Cooperative Extension, Viticulture, Department of Viticulture and Enology, UC Davis

Ben Montpetit, Associate Professor & Chair, Department of Viticulture & Enology, UC Davis

Tian Tian, Viticulture Farm Advisor, Kern County, University of California Cooperative Extension

Upcoming Meetings

Oakville Grape Day

Sponsored by UC Davis Department of Viticulture and Enology

Date: June 5th, 2024, 8:00 AM-2:00 PM

Location: Oakville Experimental Vineyard, 1380 Oakville Grade Rd, Oakville, CA 94562

Cost: $100/person (includes pastries, coffee and lunch)

Registration (closes on May 31st at 5pm): https://www.eventbrite.com/e/oakville-grape-day-tickets-713810144357?aff=oddtdtcreator

Complete Agenda Coming Soon. Confirmed speakers include:

Outdoor Presenters:

Mark Battany, Water Management and Biometeorology Advisor, San Luis Obispo/Santa Barbara Counties

Akif Eskalen, Professor of Cooperative Extension, Department of Plant Pathology, UC Davis

Guillermo Garcia-Zamora, Vineyard Manager, Department of Viticulture & Enology, UC Davis

Justin Tanner, Viticulture Farm Advisor, San Joaquin & Stanislaus Counties, University of California Cooperative Extension

Indoor Presenters:

Luis Diaz Garcia, Assistant Professor, Department of Viticulture & Enology, UC Davis

Cristina Lazcano, Associate Professor of Soil Ecology, Department of Land, Air & Water Resources, UC Davis

Dario Cantu, Professor, Department of Viticulture & Enology, UC Davis

Beth Forrestel, Assistant Professor, Department of Viticulture & Enology, UC Davis

UC SANTA CRUZ

Join Our Research Project: Seeking Interviewees!

Effects of On-Farm Solar Development on California's Farms

We are conducting a study on the effects of on-farm solar development on California's farms and irrigation water use. Specifically, there are numerous funding programs available that support **on-farm solar development**. However, the question remains: **Is it truly a beneficial choice for farmers?** We aim to gain insights into how water usage impacts farmers' choice regarding solar development.

WE ARE LOOKING FOR:

- Farmers who have considered or implemented on-farm solar development, as well as those who have chosen NOT to pursue it

What's Involved?

- Participate in a one-hour confidential and in-depth interview session
- Share your perspectives, challenges, and successes regarding irrigation and renewable energy

Compensation:
$20 Amazon gift card

Why Participate?

- Contribute to groundbreaking research on the impacts of on-farm renewable energy
- Share your unique insights and experiences as a farmer in CA
- Help shape future policies and practices related to solar development and water allocation

Confidentiality:

- Any information shared will be treated with the utmost confidentiality
- All data will be anonymized and reported in aggregate form to ensure privacy

Please fill out the [Google Form] or scan the QR code to schedule an interview, in person or on zoom.

Your insights are crucial in helping us understand the effects of on-farm solar and inform policies that support farmers in California. Thank you for considering being a part of our research!

Siyu Luo, PhD student & Co-Principal Investigator sluo33@ucsc.edu, 559-446-7004
Elliott Campbell, Professor & Principal Investigator elliott.campbell@ucsc.edu, 831-854-7948
Department of Environmental Studies, University of California, Santa Cruz