HOW A CALIFORNIA VITICULTURIST USES BIOLOGICAL CONTROL AND CULTURAL PRACTICES TO COMBAT PESTS

← Biocontrol: How Strawberry Growers Are Leading The Way

by **Thomas Grandperrin**

Published on November 29, 2021

While augmentative releases of beneficial insects and mites are becoming increasingly popular in vineyards, it is still rare to find a grower in California with over a decade's worth of experience using augmentative biological control.

David Gates is the senior vice president of vineyard operations at Ridge Vineyards, a winery with a facility in Sonoma County and another one in the Santa Cruz Mountains. When I learned that David has an extensive history in this emerging field, I reached out to him and he was generous enough to share some of his time and insight with me.

David is in charge of the 320 acres of estate wine grape production in Sonoma county as well as the 140 acres in the Santa Cruz Mountains. After the last 40 acres get certified in 2022, all Ridge's estate vineyards will officially be organic. The winery also works with several growers in Sonoma County to complement their estate vineyards and also get grapes from Contra Costa County and Paso Robles.

David Gates
among the oldest

vines that he farms, planted in the early 1890's in Geyserville, Alexander Valley, Sonoma County

During our conversation, we discussed how pest pressure varies according to the location and variety of the vine, beneficial insects he has used in his vineyards, and some of the cultural practices he implemented to limit pest pressure.

PEST PRESSURE VARIES ACCORDING TO THE LOCATION AND VARIETY OF THE VINE

Even with the best effort to create biodiversity and implement cultural practices, organic winegrowers still face some pest challenges. David shares that "*Our main pests in Sonoma County are mealybugs, in particular the vine mealybug. It came into our vineyards for the first time about five years ago. We have other mealybugs that tend to be an issue occasionally, but not as bad as the vine mealybug because they don't have as many generations per year. Vine mealybug is also problematic because it overwinters underground on the root system and it likes to feed on the vine under the bark.*"

Pest pressure can vary significantly depending on the location of the vineyard. In the case of spider mites, he explains that "*We mostly deal with Willamette mites. We occasionally get Pacific mites in Sonoma County, but we have never seen any in our Monte Bello Estate in the Santa Cruz Mountains*".

The first step is to understand how entomology varies within regions, and the next one is to assess the economic threat of each pest. These threats should be known for both the likely level of pest pressure as well as potential increases. For example, when a pest is detected, the

economic threshold will depend on the variety of the vine. In the case of the Willamette mite:

"If you have 10 spider mites per leaf on a Zinfandel vine, the vine turns yellowish, like it's going to give up the ghost. You can have 20 mites per leaf on a petite sirah, it's nice and green and really doesn't seem to be affected."

While Pacific mites' presence has been limited in their vineyards, he admits that it is a threat they constantly need to look for.

"*Like the grape or obscure mealybug, you can see the population of Willamette mites coming and they're much easier to deal with. But Pacific mites can just blow up, a bit like the vine mealybug.*"

"Using chemical control, whether it's organic or synthetic, is kind of the last resort"

So if a pest such as the vine mealybug is detected, what are the control options for both organic and conventional winegrowers? One thing is certain, it is a difficult pest to control with pesticides.

"*When the vine mealybug is hiding in the bark or under the ground on the roots, you can't get at it with any kind of insecticide, whether that's an organic-based or synthetic insecticide. You can try to hit the crawlers but that's kind of a little too late. Some conventional growers in California have been able to contain this pest if they catch it in time by using some insecticides that they either inject into the soil or spray on the vines*".

But even if some conventional growers successfully keep their vine mealybug population under control using conventional pesticides such as Imidacloprid (a neonicotinoid), they should get ready for upcoming regulations. David thinks that *"Imidacloprid has been so overused, it's going to become the Roundup of insecticides when we're eventually going*

to find out that it's everywhere. I believe that both are on the verge of being banned in California".

He clarifies why he thinks this class of insecticides is problematic in the long term. "*Not only are we seeing a little bit of resistance popping up here and there, but, more importantly, because they're so widely used, they are getting out into the environment, they are long-lived, especially when they're in sediment and sludge if there's erosion. They are also really bad for invertebrates*."

He explains that organic insecticides can also have a negative impact.

"*They are usually more broad-spectrum and can also kill some beneficial insects and pollinators. The good thing though is that they are more ephemeral, they are short-residual. So you have to really be targeted if you're going to use them. For me, using chemical control, whether it's organic or synthetic, is kind of the last resort.*"

Secondary pests can be a real problem for viticulturists spraying their vineyards. Using all means available and trying to completely eliminate a pest population might not be the best strategy to follow.

"*If you look at the population growth of beneficial versus pest insects, pests populations tend to increase very rapidly. The beneficial insects, however, start slow and then they gradually grow their population. So if you spray at the inopportune time you'll decrease both populations of beneficials and pests, but the pest insect then rebounds much more quickly. So unless you can do inundative releases of beneficials after the spray, you can end up with a bigger problem."*

He argues that this issue is not new. *"It's what happened with older conventional insecticides that were used a lot and very effective against certain pests. But then you would end up with secondary pests that would blow up because you basically wiped out all the beneficials. It's all about*

balance. Anytime you think in nature or in farming that you can get rid of a problem completely, you're losing, you're not going to win."

PREVENTING PEST EMERGENCE THROUGH CULTURAL PRACTICES AND BIOLOGICAL CONTROL

So if there are a lot of drawbacks associated with the use of insecticides, what options are available to viticulturists? David believes that limiting the use of pesticides requires a more holistic approach to pest management and that there is no silver bullet that can solve a pest issue. The first step is to minimize pest pressure through cultural practices that both organic and conventional growers can adopt. David explains that in the case of mites, one of the things a viticulturist can do in order to minimize mite pressure "*is to keep the vines less dusty and less stressed*".

He reports that at Ridge vineyards "*we really look at the cultural practices we can use to minimize mites. We mow every other row and our turnaround, keeping that native weed and grasses there as opposed to disking everything so that when we're turning tractors around with a sprayer, we're not blowing dust all over the place. That's huge. That works quite a bit.*" He also adds that when they can, they irrigate in between veraison and harvest to avoid stressed vines.

For the powdery mildew control program of their Zinfandel wine grapes, the team at Ridge Vineyards uses sulfur spray instead of sulfur dust. "*That's important because studies have shown that dust early in the season will really exacerbate mite problems. And dust later in the season will do the same thing, but to a lesser extent,*" David explains.

David has been a long-time user of augmentative biological control releases. "*Around 2004, before we transitioned to organic, we were weaning ourselves off of using miticides occasionally for mites. I discovered the sixspotted thrip, a voracious predator that eats an amazing amount of mites, both at the larvae and adult stage. I found an*

entomologist, Enrique Rodríguez, who raises them in the San Joaquin valley and we did some inundative releases at a rate of about a thousand per acre."

He explains that "*We put them on hotspots and they're pretty amazing. They're almost like a spot treatment of a chemical application because you release them as adults and they're immediately eating. They go to where the mites are. They eat them, they lay eggs right away, and once they clean up an area of a hotspot, then they'll fly away and find more mites.*"

David also releases predatory mites in his vineyards. "*There are some predatory mites that have been widely grown and released in California that worked fairly well, especially as a preventative measure.*"

Over the years, Ridge Vineyards relied the most on *Californicus* and *Persimilis* predatory mites.

He advises people interested in biocontrol that "*Predatory mites are very active and not that expensive, but you have to put them on early. They don't work as well if you have a large, sudden influx of spider mites, whether it's Willamette or Pacific*."

As most successful integrated pest management (IPM) practitioners would recommend, he insists on the importance of scouting. "*You have to do your scouting and as soon as you see a few mites showing up, you need to get the predatory mites out.*"

The choice of the predator species depends on the pest pressure and the weather conditions. As an example, he explains that "*Californicus works a little bit better in hotter regions. Persimilis works better in the Santa Cruz mountains, where it stays a little bit cooler. As for sixspotted thrips, they like hot weather. They're used to the San Joaquin valley and*

hundred-degree days. So they thrive in Sonoma, but they don't do as well as up in Montebello."

IPM practitioners also need to take into account the potential pesticide or fungicide sprays that will be used during the season before choosing a predator species. "*Sulfur is the backbone of our mildew control program, and thankfully, both Persimilis and Californicus have somewhat of a tolerance to it. But whatever we release has to be tolerant to sulfur because it's going to be out in the vineyard.*"

David and his team at Ridge Vineyard are also constantly looking at how best to control vine mealybug and confine it. He admits that "*it's been a struggle. In our five separate ranches in Sonoma county, four of them have it. The one in Alexander Valley still doesn't have vine mealybug. We're trying to keep it that way.*"

He comments that "*It is currently much more expensive to try to control the vine mealybug organically. Labor cost to release the beneficials by hand is probably the biggest thing. The use of drones to release natural enemies could be a good time-saver.*"

One of the most famous predators of the vine mealybugs is a little lady beetle called *Cryptolaemus*. "*If you see a weeping vine, that means that there are vine mealybugs under the bark. You can put one or two Cryptolaemus adults or larvae on that vine. While it doesn't eliminate the vine mealybug, it keeps it under control really well, along with some other practices that everyone else is doing, such as pheromone sprays or tags.*"

Cryptolaemus adult on a grape mealybug egg sack

THE “DREAM” OF BIOCONTROL ADOPTERS: LONG TERM ESTABLISHMENT OF BENEFICIALS

The goal of many growers who are new to augmentative biological control is to reach long-term establishment of the natural enemies in their vineyards. While it is a long-term and challenging goal to attain, it is not an impossible target to aim for. David comments that they had released predatory thrips and mites for about 10 years and ended up with enough of them establishing. *“We just didn’t have a mite problem anymore so we didn’t need to do inundative releases. That lasted for almost ten years, until 2020 when we did another release of 600*

predatory thrips per acre. We use them as a cleanup, but we still put out Persimilis or Californicus, especially at Montebello, where it's cool enough that the sixspotted thrips are not quite as active."

He adds that even though the spider mite pressure was surprisingly low this 2021 season, they did an early predatory mite release in Sonoma and mid-season one at Monte Bello.

Based on his experience, David believes that "*predatory mites and sixspotted thrips can establish themselves over time in a vineyard, but you always need to watch and see if you need to do an inundated release. Sometimes it's just that numbers-wise they need a little help in the early season to try to catch up to an infestation.*"

David observes that the purchase of natural enemies has become much easier than in the past. For their predatory mites needs, Ridge Vineyard works with the company Koppert Biological Systems. *"It's almost like ordering up a chemical. If they don't have it this week, they'll have it next week. And as long as you give them an idea of what you need, they can raise them pretty easily.*"

As they are living organisms, certain precautions must be taken though. "*Beneficials are often shipped out in a box with a cool cold pack. If we get them in the afternoon, we keep them in a cool dark place, our wine cellar, and then we take them out in the morning and then we release them. So it's important that your staff know what to do when they receive them*".

COST OF CONVENTIONAL PESTICIDES VERSUS BIOLOGICAL CONTROL

A recurring question of conventional growers exploring the possibility of using biocontrol is about the cost of inundative releases of beneficial insects in comparison to conventional sprays.

David suggests growers look beyond the unit cost of a product. "*I think overall, you can actually save money when it comes to Willamette mites control in Zinfandel in Sonoma county. And those Zinfandel vines are pretty susceptible to spider mites*."

He details, "c*onventional growers will often do calendar spray every season, whether or not it is going to be a bad mite year. They see a few mites that get to a certain threshold and spray. That's a constant cost. The chemicals that they use are not super expensive, but they're not cheap either*!"

He highlights the additional challenge that comes with the use of chemicals. "*You also have to make sure that you rotate them. Otherwise, you run the risk of developing resistance.*"

As an example, he explains that on their Sonoma organic vineyards the initial cost of beneficials was a little bit higher than a spray. "*In any single season where you're doing three sixspotted thrips releases and maybe one Californicus release, that's going to be a little bit more per acre*."But it's over time that biocontrol can make the difference budget-wise. "*Say in year five, you could end up only needing to do one release of predatory thrips. Then you're below the cost of conventional. Your conventional costs are steady, maybe even going up a little bit as labor and chemical costs go up. The organic costs will be a little bit higher on the front end as your beneficial insects get established. But it's going to vary each year depending on the severity of the mite outbreaks that year, and over time it should go down.*"

In his own experience, "*for almost 10 years, we didn't have to buy any predatory thrips at all until last year (2020). So it had been about eight years since we had purchased any sixspotted thrips and we were doing nothing for mite control except the cultural practices that are good to do regardless of how you farm – whether you're conventional, organic, or biodynamic, you should be doing everything you can to keep the dust down in the vineyard.*"

In the case of vine mealybug, David reminds growers to try to control ants as much as they can. "*The invasive Argentine ant farms the mealybugs for the honeydew. We currently use a liquid ant bait with little ant bait stations but it is also labor-intensive. I know Monica Cooper, the farm advisor for Napa county, did her Ph.D. on insect control, mostly ants. She's been evaluating a simpler, more efficient delivery method, using toxin-laced polyacrylamide crystals.*"

"YOUR BEST SCOUTS ARE THE FIELD WORKERS"

David and his team have always done scouting, and even more since they've transitioned into organic. "*Some pests such as spider mite or diseases such as mildew typically show up in the same areas every year. So you should scout everything, but you pay particular attention to those areas where you have that hotspot.*"

He points out that the same thing applies to the vine mealybug, except that it can pop up very quickly in other areas. "*Look for signs of mealybug in the wintertime and in the spring, and note those so you can pay special attention to those areas. But continue to scout all around it so that you can find any flare-up that shows up.*"

He shares that his viticulturist, Mauro Maldonado, and trained summer interns are in charge of scouting the vineyards, especially the hotspots. But he believes that "*your best scouts, however, are the field workers. In our vineyards, we do a lot of things by hand. And because we're organic, we usually spray every seven to 10 days for mildew control. That means that the tractor driver sees every single row on every single ranch. So are your farm workers, when they're suckering, they're touching every vine. So after training them on what to look for, they tell us what they see, and then we can take corrective answers or actions*."

Vineyard crew, Angelita Villegas-Guzman, working in Chardonnay at Monte Bello

ATTRACTING BENEFICIALS AND COMBATING WEEDS USING COVER CROPS IN THE VINEYARD

The old school practice of using cover crops has seen an increase in adoption in the past few years and has gained awareness among a broader public through the growing regenerative agriculture movement.

David has worked withUC Berkeley's Miguel Altieri to design a cover crop plan which attracts beneficial insects, competes with undesired weeds, and improves the soil structure. "*He came up with this beautiful cover crop that actually works in California, which gives us flowering*

plants most of the summer and into the fall. It's super easy because two of them are weeds. One of them is Phacelia tanacetifolia which is also called the Purple or Blue Tansy. It has a springtime bloom and really has a lot of flowers. Then there's one that bridges between that and late summer: the Ammi majus. It's an annual that comes up and goes right away but has a big umbrella flower. And then the last one is the wild carrot, which most people consider a weed and I love it! And it comes up and it will live a couple of years. It starts blooming typically in late June – early July. And it'll go all the way through harvest. And the beneficial insects love it. You seed that once in the fall, and then it's good for a year or two."

Cover crop on alternate rows in the spring, right before incorporation

For viticulturists interested in using this cover crop mix, David explains that seeds of *Phacelia* and *Ammi majus* can be bought pretty easily but that *"you can't find wild carrots anywhere, so we collect our own seed. You just get the flower buds when they're dried up and it works very well. Low-maintenance."*

While the transition to organic grape growing presents its set of challenges, examples like David Gates's at Ridge Vineyards show that the initial investment in time and resources can pay off and bring several advantages which conventional viticulture practices don't offer.

Have you converted your vineyards to sustainably certified or organic recently? Are you using cover cropping or biological control in your vineyard? Reach out to us, we'd love to hear your story!

UAV-IQ is helping organic and conventional growers implement biocontrol in an efficient and cost-effective manner by using drones to release beneficial insects and mites exactly when and where they're needed to suppress pests.

Related Articles

Browse All Categories

Mating Disruption, A Gateway To Sustainable Pest Management Practices In Nut Systems?

Mar 18, 2021

A discussion with Emily Symmes of Suterra on the use of mating disruption and insect traps, and on the future of augmentative biological control in nut cropping systems.

Why A Leading Central Coast Vineyard Is Transitioning To Organic Production

Jan 28, 2021

A discussion with Greg Gonzalez of Scheid Vineyards on the importance of the vineyard crew's role in an IPM program, and on misconceptions about the cost of transitioning to organic.

How Forward-thinking Vegetable Growers Are Getting Ahead Of Upcoming Pesticide Regulations

Jan 20, 2021

A discussion with Alejandro Del-Pozo about the need for vegetable growers to get ahead of upcoming pesticide regulations by using conservation and augmentative biocontrol in vegetable crops as well as new technologies available to IPM practitioners.

FOLLOW US ON