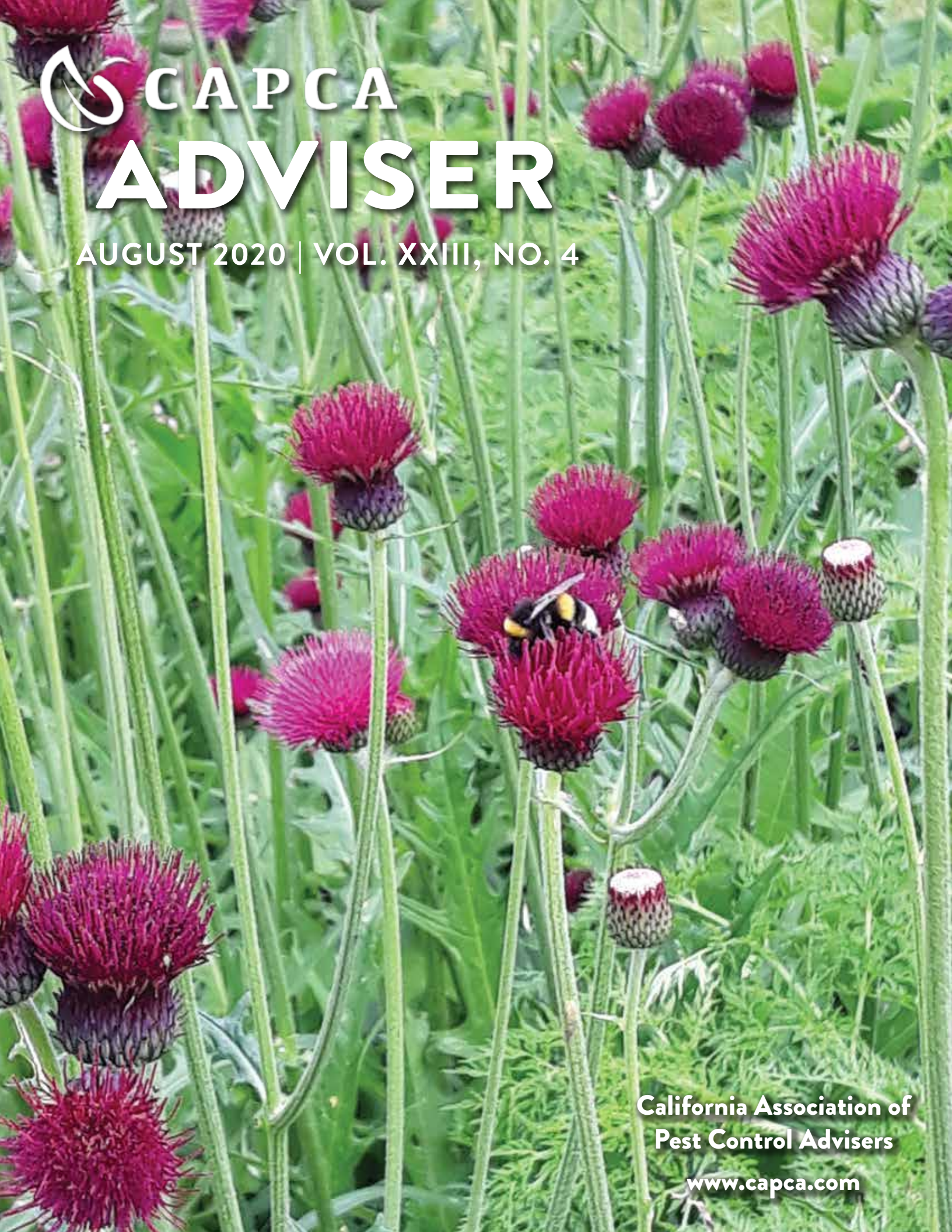
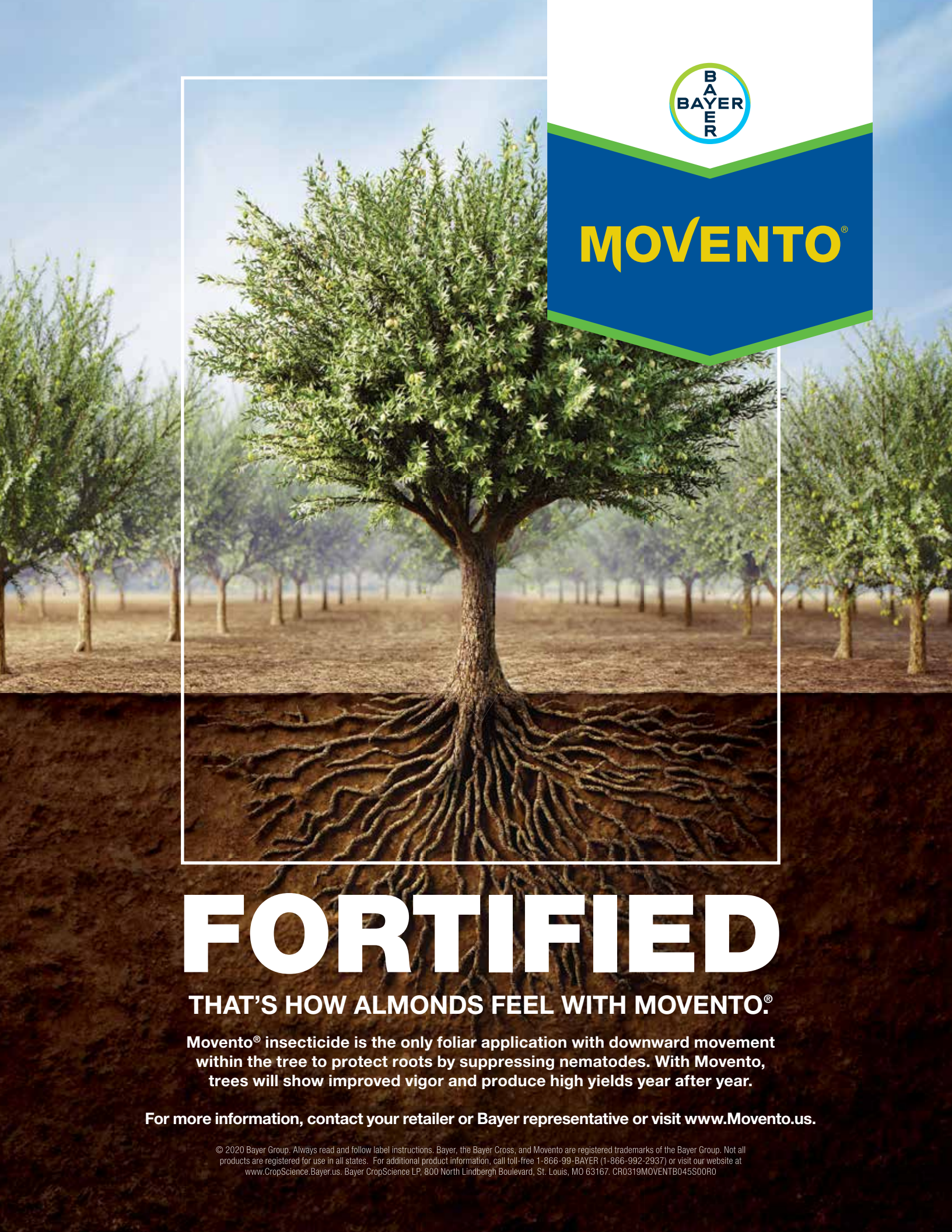


# CAPCA ADVISER

AUGUST 2020 | VOL. XXIII, NO. 4

California Association of Pest Control Advisers

www.capca.com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# Table of Contents

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# From the Editor

## Conference is not canceled – *it's moving online!*

PCAs are finding new ways to do the things that keep us professional, compliant, and connected. CAPCA members have spent the last 45 years gathering in person each fall to network, learn and connect with peers. As we approached the 46th Annual CAPCA Conference at the beginning of 2020, we had planned the very same concept, but in light of current restrictions to our usual gathering of 1800 PCAs and Industry Representatives, we are moving online. Over the past month, the CAPCA Board and staff have been reimagining the CAPCA Conference to serve the needs of our members requiring CE, allow space for stakeholders to connect, and industry reps to share relevant updates.

Registration should open in July for all participants to access the On-Demand Continuing Education including Label Updates, Virtual Exhibit Hall and a Live Session including the CAPCA Business Meeting, Awards Ceremony and Keynote Speaker. This virtual event will feature CCA Only breakout sessions and a Nitrogen Management Update, along with the CDPR CE you expect from CAPCA Conferences. All CE Sessions will be broken into 1-3-hour segments so you can watch on demand the sessions you are most interested in and acquire only the hours you need. Content will be available to all registered attendees October 12 – 31st, 2020. More schedule details coming soon, pre-registration will open at $150 per attendee through September 15th.

This event is designed for our members and industry stakeholders alike to connect during this unconventional time. Whether it is your first Conference or your 46th – we hope you will tune in to keep raising the bar of professionalism for PCAs!

Ruthann Anderson, Editor
ruthann@capca.com

**CAPCA EDITORIAL STAFF**
Ruthann Anderson - Editor
Joyce Basan - Deputy Editor
Crystelle Turlo - Individual Membership & Chapter Projects
Sylvia Stark - Advertising Sales Manager
Rachel Taft - Executive Assistant

Graphic Design - Rosemary N. Southward
southwardr@comcast.net

**MISSION & PURPOSE**
California Association of Pest Control Advisers (CAPCA) is a non-profit voluntary mutual benefit association that represents 75% of the 4,000 California EPA licensed pest control advisers. *CAPCA's purpose is to serve as the leader in the evolution of the pest management industry through the communication of reliable information.*
CAPCA is dedicated to the professional development and enhancement of our members' education and stewardship which includes legislative, regulatory, continuing education and public outreach activities.

**PUBLISHING INFORMATION**
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# Got CE Hours?

Rick Harrison, CAPCA Chair

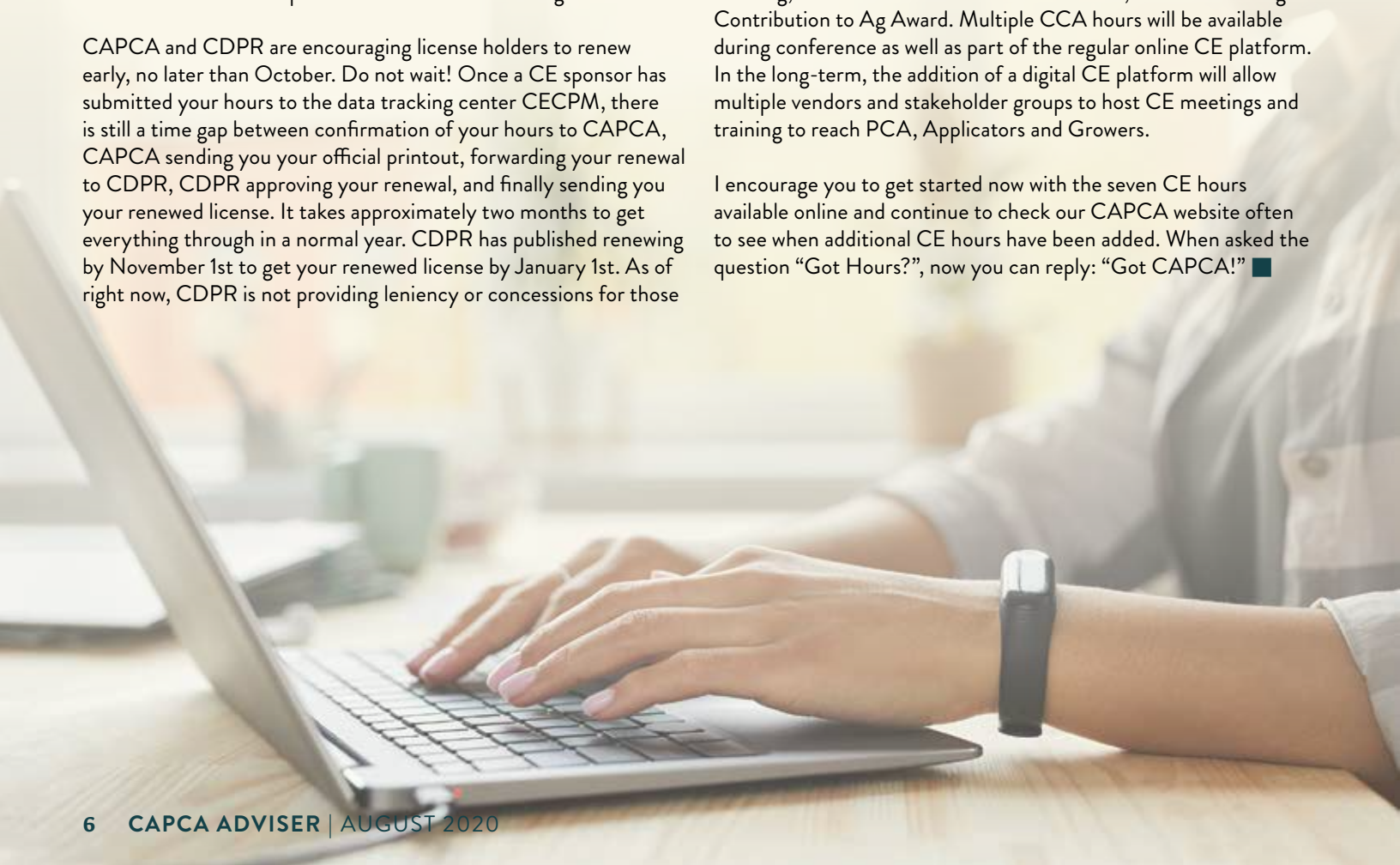
License renewal time is quickly approaching. Have you received your official Continuing Education Hours report? If not, login to the CAPCA website and see what hours have been tracked for you. Are you one of the many who have not begun picking up Online CE hours? Many people are holding out for that once familiar "In-person" CE meeting. The liabilities involved with in-person meetings, increase in COVID-19 confirmations, and government ordinances have forced most organizations, including CAPCA, to focus efforts on Online CE courses.

CAPCA members can access free online CE hours through the end of July by logging in at https://capca.com/onlinece. Associate members can also access the hours by paying their $45 Associate Membership dues. Today there are at least 7 hours available, and we're currently in the approval process with DPR for additional hours replacing what you could have received at in-person meetings. CAPCA has not yet launched our full paid version of online CE but we anticipate a launch sometime in August.

CAPCA and CDPR are encouraging license holders to renew early, no later than October. Do not wait! Once a CE sponsor has submitted your hours to the data tracking center CECPM, there is still a time gap between confirmation of your hours to CAPCA, CAPCA sending you your official printout, forwarding your renewal to CDPR, CDPR approving your renewal, and finally sending you your renewed license. It takes approximately two months to get everything through in a normal year. CDPR has published renewing by November 1st to get your renewed license by January 1st. As of right now, CDPR is not providing leniency or concessions for those who have not completed their hours during the renewal period. Don't expect them to. If you are waiting until the last minute like many people do, it will burden CDPR which is already without resources or operating with reduced personnel to process your renewal in a timely manner.

Since CAPCA was established, I can't recall a time when we had to cancel our Annual Conference. By implementing short-term opportunities and long-term goals we hope to provide PCAs with solutions for their required CE hours just like you would have received if you had attended local CE meetings or conference in person. In the short term we will continue to provide online CE only, with additional hours added once approved by CDPR. In addition, we are currently working with CDPR to finalize a bundle of CE hours for our virtual conference that will be available October 12 – 31, 2020. The format is similar to our regular conference with general session, breakout sessions, business meeting, CAPCA Member of the Year Award, and Outstanding Contribution to Ag Award. Multiple CCA hours will be available during conference as well as part of the regular online CE platform. In the long-term, the addition of a digital CE platform will allow multiple vendors and stakeholder groups to host CE meetings and training to reach PCA, Applicators and Growers.

I encourage you to get started now with the seven CE hours available online and continue to check our CAPCA website often to see when additional CE hours have been added. When asked the question "Got Hours?", now you can reply: "Got CAPCA!" ■



ADVERTORIAL

# MAXIMIZE FALL POTASSIUM INPUTS

**When it comes to innovation, American farmers are often looking for more efficient practices, and the agricultural industry continues to push the boundaries of crop yield by combining innovation and ingenuity. California's tree nut and vine crops are an excellent example of this.**

In permanent crops, yield is directly tied to nutrient removal, and permanent crops remove large amounts of potassium ($K^+$) each year. It is vital to consider novel solutions to supplement potassium in the soil.

Potassium is found within the plant cell solution and is critical for multiple processes within the plant, including proper cellular function, protein synthesis, enzyme activation, balancing pH at the cellular level, and stomatal gas exchange. Potassium is an essential element, and a deficiency will result in loss of yield and quality.

Potassium is found in three different forms in the soil. Much is found in the primary mineral pool and is not plant available on an annual K fertility program. A smaller pool of potassium is bound to cation exchange sites or trapped between clay particles, and an even smaller amount is found in the soil solution. Potassium is most available for root uptake when it is free in the soil solution, but soil chemistry plays a role in $K^+$ availability. The one plus charge of $K^+$ reacts readily with negatively charged soil particles, trapping $K^+$ and making it unavailable for crop use.

Fall-applied sulfate of potash (SOP) applications are a key input to replenish soil $K^+$ levels, ensuring strong productivity for next season. One approach to minimize the soil-nutrient interactions is to apply concentrated bands of SOP along tree and vine rows. A banded application allows producers to overcome tie-up potential by saturating the fixation capacity of a small zone in the soil, ensuring there is potassium available for uptake. Integrating the technology in **Resurge®** will support these applications to an even greater extent.

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# Focusing on pesticide stewardship in our regulatory environment

Josh Huntsinger, Agricultural Commissioner/Sealer of Weights and Measures, Placer County;
President, California Agricultural Commissioners and Sealers Association

Steward, shepherd, caretaker; these are all words with significant agricultural roots. To me, they sound very warm and nurturing, and maybe not the type of words you would associate with pesticide use. However, as I take a step back and realize where California's regulatory environment is headed, I see no alternative to being a steward, shepherd, and caretaker of pesticides for anyone who relies on their continued availability. Whether you are a PCA, farmer, or applicator, I hope you are already thinking in terms of stewardship anytime you interact with pesticides.

Many in the agricultural industry realize that the public does not understand what it takes to grow crops and provide a safe and secure food supply to our nation and the world. They do not know what IPM is, or how PCAs and growers utilize its principals to make pest control decisions. They are not aware of the many regulations in place designed to protect the public, farm workers, the environment, and ensure that crops are free of harmful pesticide residues.

While attending CAPCA's annual conference a few years ago, I found myself having breakfast with a tableful of PCAs from throughout the state. Based on a recent experience I had in Placer County, I asked them the following question, "If you, as a PCA, were shipping a pallet of pesticide to one of your growers, and you knew the label required a chemical resistant apron for mixing and loading, would you make sure the grower or applicator was aware of the requirement, and either ask them if they needed aprons, or throw some in with the shipment for them to use?" I was a little surprised with the responses I got, which ranged mostly from "No" to "It depends how good a customer they are." I found the answers concerning from an agricultural commissioner's perspective because I know that if that grower does not have the proper PPE, and their employee mixes that pesticide without it, my documentation of that violation will create a statistic and a story about how agricultural workers are treated as well as problems associated with the use of that specific material (in addition to a fine!).

Is the grower or applicator ultimately responsible for the safety of their employees? Absolutely! However, my hope is that each and every person involved in that application, from start to finish, would take some responsibility for ensuring that all rules are followed, not because it is a regulatory requirement, but because it is the right thing to do, and it will help to preserve the availability of crop protection materials. It is NOT the time to have a "Not my job" attitude when it comes to pesticide stewardship. The statistic that is created when the agricultural commissioner documents a pesticide violation feeds into a bigger, statewide story about pesticide use, regulatory compliance, and worker protection. Your stewardship of each and every individual application impact both the future availability of crop protection materials and the public's perception of the agricultural and pest control industries.

Someone once told me that regulations reflect past sins. The regulations we are now contending with for chlorpyrifos, neonicotinoids, fumigants, pyrethroids, carbaryl, groundwater quality, surface water quality, air quality, worker safety, and schools notification are all reflections of past problems that were documented as a result of someone not caring or understanding that a whole industry was relying on them to do the right thing. ■


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# Meet Placer's Ag Commissioner, Josh Huntsinger

By CAPCA Staff

Placer County's Agricultural Commissioner, Sealer of Weights and Measures, Josh Huntsinger, has just over twenty years of service, having served briefly in Nevada County and then in Placer County since 2000. He graduated from Sierra College in 1998, and then from Cal Poly in 2000 with a Bachelor of Science degree in Fruit Science.

Talking about his background in the industry, Huntsinger says: "My grandparents, aunts and uncles were farmers, so I spent quite a bit of time on farms as a kid around the state between Tulelake and Reedley." He spent high school and college years working for various farms growing everything from Christmas trees to apples, including two years on Cal Poly's citrus and avocado enterprise project. "The farm where I spent the most time was one of the first three CCOF certified organic peach farms in the state back in the early '90s. The hardest work I ever did was 'nucing' beehives for a large beekeeper. That work consisted of 10-12 days bent over beehives in the sun, wind, rain, and even snow on occasion!"

In his current position, Huntsinger says the role of the Ag Commissioner/Sealer is a balancing act working for the Secretary of California Department of Food and Agriculture, the Director of the Department of Pesticide Regulation and his own County Board of Supervisors. "Beyond the standard regulatory responsibilities, my Board expects me to be THE advocate for agriculture within our county structure. I oversee the PlacerGROWN agricultural marketing program and spend a lot of time working with our land use agency on agricultural projects where I take on more of an economic development and farmer-advocate role." On the regulatory side, Huntsinger says his goal is to "couple good communication and proactive collaboration with clear boundaries and a strong enforcement stance". He really stresses that he would much rather discuss situations beforehand to find solutions; "Far too often, I see folks 'winging it' and hoping everything works out or that they do not get caught. Collaborative solution finding is much more enjoyable than enforcement for me (and the industry!)... As I tell my growers and PCAs, 'I would much rather talk through a

situation ahead of time and figure out something together that works for you while meeting the regulatory requirement.' I love receiving calls from the industry where we can figure out a solution together."

Huntsinger maintains a respectful, collaborative relationship with the industry and local PCAs. "I take the term 'public servant' very seriously, and I strive to do my best to serve the agricultural industry and act as a facilitator who ensures that farmers can grow their crops." His office gets a number of calls from PCAs, growers and applicators about complex application situations. "Between weather conditions, nearby sensitive sites, permit conditions and label restrictions, many applications now require a great degree of pre-planning and coordination to ensure they can move forward without creating drift hazards or violations. My staff and I really enjoy working with the agricultural industry to help ensure that farmers can protect their crops from pests while ensuring that applications do not negatively impact the public, workers and environment."

Like many other areas of the state one of the major concerns for agriculture in the county is the growing ag/urban interface due to increasing residential construction. Huntsinger notes, "Besides paving over productive farmland, urban growth and the resulting interface with farmland creates a huge challenge for the remaining farmers, my staff and me as we do our best to keep the farmer farming while protecting the folks in nearby houses. Although Placer County has a strong Right to Farm ordinance, many (new) residents are unaware of it and are surprised and distressed when they realize what intensive farming activities are allowed (and encouraged) to take place near their homes. Educating residents on what farming is allowed and how we are keeping them safe while allowing the farmer to farm is a big part of my job."

Placer County has a small but growing wine industry and recently, increasing walnut and almond acreage in the western portion that was once predominately rice. In terms of dollars, the biggest crop in the county is rice, and by acreage cattle, but their best know commodity are Satsuma mandarins. "Our region hosts the Mountain Mandarin Festival in Auburn every November which brings 40,000 people to Placer County who love all things orange. While mandarins are certainly not our biggest crop by acreage or dollar value, they really get people excited about Placer County agriculture!" Huntsinger notes that the pest and diseases are typical of what you would expect in the Sacramento Valley.

Asked about current programs relevant to CAPCA membership, Huntsinger said that his biggest priority for this year was a new county beekeeping ordinance. "Currently, Placer County has almost no requirements for beekeeping in our code. Therefore, when complaints arise, there is no standard in place to guide us on what is allowed or acceptable. Coupled with the public's

Of note, citrus red scale is not established in Placer County: "That is a big deal for my [mandarin] growers as it allows them to farm with little to no insecticide use beyond an occasional application of oil. Our UCCE Farm Advisor works closely with our growers and coordinates the regular release of parasitic wasps to seek and destroy any latent populations of red scale that may have snuck in."

low tolerance for honeybees, and a small subset of beekeepers who are acting irresponsibly by putting way too many bees near houses or other beekeepers, bee issues are the number one agricultural complaint received by my office. I am working to remedy this situation by developing a comprehensive beekeeping ordinance similar to what many other counties have. My goal is to create a set of rules to protect responsible beekeepers while providing relief from some of the irresponsible behavior that has impacted many in the community. I will be doing a great deal of public outreach around the draft ordinance this summer and want input from the agricultural community to develop the best possible ordinance."

Talking about highlights, Huntsinger says he can't pinpoint a single event in his career but rather the many opportunities the role has afforded him: to advocate for agriculture at the state and national level, meeting US Supreme Court Justice Antonin Scalia while in the Ag Leadership program, and the multiple times he has spoken at CAPCA Conferences. His dedication and passion for agriculture, both locally and more broadly, are evident and he clearly works hard to be an advocate and seek collaborative opportunities to support the industry. Huntsinger says, "[W]e are at a point in time where we must do a better job of telling our story. The public has very little to no understanding of the role that both the PCA and Agricultural Commissioner play to ensure sustainability of our agriculture as it relates to farmers, food, safety, and society. The common narrative is of the farmer spraying their crops willy-nilly without a plan, reason, or accountability. We know there are thousands of educated and dedicated professionals out there working hard to ensure that the world is fed while the public, farm workers and environment are protected. We all need to do a better job of sharing that message." ■

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*Pictured left is a treated field using a combination of microbial products; GO Isolates® and Isoguard®. qPCR showed no Sclerotinia sps.*

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# CAPCA Membership benefit explained:
# Do you know about these member benefits?

Crystelle Turlo, Individual Membership & Chapter Projects Director

For 45 years, CAPCA has worked to provide our Active Members a robust list of benefits. And while most members do take advantage of our most popular offerings, many of you may not be familiar with our lesser known benefits.

Active Members in good standing are eligible for election as a State Director and can participate on a CAPCA committee. Active Members are encouraged to volunteer with their chapter to support local events, network, and provide community outreach. Elections take place typically in late summer and we invite you to participate in your chapter elections this year. Be on the look-out for an email regarding your upcoming chapter elections or reach out to your chapter president for more information. To contact your local chapter, go to www.CAPCA.com/chapters/ and click on the chapter that you are affiliated with or would like to participate in.

Active Members in good standing also have the rights to vote on any item of business submitted to a vote of the membership. As stated in our Bylaws, CAPCA holds an annual meeting every year in the 4th quarter of the year. This year, we ask that you attend the live virtual conference meeting in October 2020. CAPCA is your association and your professional interests are important. By participating you can ensure that the professionalism of your license continues to be recognized within the industry.

All Active Members know that CAPCA tracks CE hours, but did you know that members can easily request a copy of their official CE cert on the CAPCA website? We can send a printout to your physical address or email you a copy that you can print out at home at your convenience. Simply, log into your account and go to your "Hours Report," complete the form on the bottom and click "Place CE Hours Request." We will follow up with an official CE cert.

All CAPCA members have specific rights that are outlined in our Bylaws.

If you are interested in receiving a copy of the Bylaws or have questions and or need assistance in utilizing any of your member benefits, please reach out to the state office. We will be happy to help! ■

## CAPCA STAFF CONTACTS

**RUTHANN ANDERSON**
CAPCA President/CEO
*Adviser* Editor
ruthann@capca.com
(916) 928-1625 x7

**JOYCE A. BASAN**
Programs/Communications Dir.
*Adviser* Deputy Editor
joyce@capca.com
(916) 928-1625 x2

**CRYSTELLE TURLO**
Individual Membership &
Chapter Projects Director
crystelle@capca.com
(916) 928-1625 x1

**SYLVIA STARK**
Advertising Sales Manager
Advertising/Publications
sylvia@capca.com
(916) 607-0059
or (916) 928-1625 x9

**RACHEL TAFT**
Executive Assistant
rachel@capca.com
(916) 928-1625 x5

CAPCA

2600 River Plaza Drive, Suite 250 - Sacramento CA 95833
(916) 928-1625 - Fax (916) 928-0705
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Licensed PCAs must join as Active Members

- ☐ *2020 = $160.00
- ☐ 2021 = $160.00
- ☐ 2019 = $210.00

**ASSOCIATE MEMBERSHIP**
Non-PCAs - printout not provided

- ☐ 2020 = $45.00
- ☐ 2019 = $45.00

**STUDENT MEMBERSHIP**
Must provide proof of full-time student status. May not hold a DPR license.

- ☐ 2020 = (no fee)

* A late fee of $50.00 will be charged for any 2020 Active Membership paid **after** October 31, 2020

- ☐ I DO NOT WANT CAPCA TO UTILIZE EMAIL TO COMMUNICATE BUSINESS OR C.E. MEETING NOTICES TO ME
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- ☐ I DO NOT WANT $7.00 OF MY DUES TO GO TO CAPCA PAC** (Political Action Committee)

**Update your email communication preferences through the CAPCA website https://capca.com/manage-my-communications/**
*You can now define which crop team, chapter and event notifications you want to receive.*

*NEW FOR 2020 - HEMP CROP TEAM - UPDATE YOUR PREFERENCE IF YOU WOULD LIKE TO JOIN*

Which of the following categories are important to your work as a PCA (check all that apply):

- ☐ Aquatics
- ☐ Berries
- ☐ Citrus & Subtropicals
- ☐ Cotton
- ☐ Deciduous Fruits
- ☐ Forage/Silage
- ☐ Golf/Sports Turf
- ☐ Grains
- ☐ Grapes
- ☐ Rice
- ☐ T/O, Landscape
- ☐ Tree Nuts
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# CAPCA Conference Goes Online in 2020

The CAPCA Board has decided in the best interest of the Association and its Members to transfer our normally scheduled event to an online event this year.

We are moving forward with putting our energy into a great online program for attendees to engage in Continuing Education and other virtual activities for 2020. We will be in touch in the coming days to communicate opportunities for you and your company to participate.

Registration opens in July.

Watch our website https://capca.com/conference as updates become available.

Continuing Education hours are pending.

All CE Sessions will be broken into 1 -3 hour segments so attendees can watch on demand the sessions they are most interested in and acquire only the hours they need.

Content will be available to all registered attendees October 12th – 31st, 2020.

More schedule details coming soon.

Pre-registration will open at $150 per attendee through September 15th, 2020.

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY • DEPARTMENT OF PESTICIDE REGULATION

# *Early Renewal* REMINDER

The Department of Pesticide Regulation (DPR) will mail out renewal packets in August to license and certificate holders with surnames or business names starting with the letters A–L.

## AVOID PROCESSING DELAYS

Submitting earlier allows DPR staff additional time to deal with issues or problems that could delay processing your license.

## SUBMIT BY NOVEMBER

Please mail your application before November so that your license or certificate can be issued before it expires. If you submit before October, you will be renewed by early December and you can register with the County before the New Year.

## RENEW APPLICATORS FIRST

For pest control businesses, the qualified applicator must be renewed before the business license can be renewed.

**If you do not receive your application,** please contact the licensing program at LicenseMail@cdpr.ca.gov or download a blank application at: www.cdpr.ca.gov/docs/license/lictypes.htm

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# COVID-19 losses mount for California agriculture

Brad Hooker, Agri-Pulse Associate Editor

We've all watched as COVID-19 led to shuttering schools, restaurants and other food services facilities as government leaders and businesses tried to stop the spread of this horrible pandemic. With traditional food supply chains upended, California growers were severely impacted. Now, we finally have a better idea of the economic impact.

A study commissioned by a coalition of California farm groups shows an industry grappling with massive losses related to the COVID-19 pandemic ranging from $6 billion to nearly $9 billion, or about 18% of the state's total farm gate sales last year. The study is available at https://www.cfbf.com/wp-content/uploads/2020/06/COVID19_AgImpacts.pdf

"The impact is being felt in rural communities throughout the state that rely on agriculture for their residents' livelihoods," said Farm Bureau President Jamie Johansson. "We want legislators and regulators to bear that in mind and avoid making farming even more costly and difficult in California."

State lawmakers and the governor's administration have been racing through negotiations to pass a budget bill in June and begin to reconcile a deficit projected to be as high as $54 billion. The resulting cuts in spending are likely to hurt critical programs for the industry, and policy advocates are closely watching proposals to further raise fees on farmers.

Already this year, the industry has lost $2 billion due to both market disruptions and a jump in production costs following the outbreak, according to the report. Factoring in secondary impacts to the broader food economy, the total loss in output value is expected to be $13 billion.

On the jobs side, state unemployment figures for April show a 13% loss for farm, processing and manufacturing sectors statewide. In agriculture, more than 94,000 jobs were lost. Adding in the food service and retail sectors, the number skyrockets to 800,000. Some of those jobs have likely returned since May, however.

Rural regions experienced much higher spikes. Kern, Tulare, Imperial and Monterey Counties are showing ag-related job losses ranging from 27% to 81%.

The report warns of the broader economic disruption to come for California's most vulnerable populations.

"The economic impacts fall disproportionately on impoverished, rural counties in the state," the authors write. "Impacts to farm jobs, processing, and income tend to fall on workers that reside in economically disadvantaged communities in these rural counties."

When it comes to the industry, markets that were already seeing broad disruption at the start of the year will experience the deepest economic impacts.

Dairy will be hit hardest, losing up to $2.3 billion, according to the report. The sector began the year on a positive note, with the state completing its first year in the Federal Milk Marketing Order. Dairy farmers were pulling out of a difficult four-year period and beginning to see improvement in milk prices.

With the sudden closure of restaurants and schools during the pandemic, farmers and processors scrambled to pivot supply chains to meet demand spikes from groceries and food banks.

"There was such an enigma around where the demand was and where the supply needed to go," said Anja Raudabaugh, CEO of Western United Dairies.

Grape growers, meanwhile, stand to lose up to $1.7 billion this year. The California winegrape sector has been facing a severe oversupply issue, following decades of record growth. While the situation was compounded by several factors, the trade war with China played a large role in crippling an emerging market that was seeing 400% growth.

Along with trade uncertainty, the report points out that the economic fallout comes at a time when California agriculture is facing broad disruption on other fronts – from water availability to rising labor costs due to new overtime and minimum wage laws, along with other water and air quality regulations that are raising compliance costs.

In third place following grapes, the flowers and nurseries sector will lose up to $740 million from the pandemic fallout. Though florists were among the first to reopen under Gov. Gavin Newsom's phased plan, the sector has long been shrinking in California as costs rise along with competition from Latin America.

When the impacts of the shutdown first began to sink in, the state flower commission was quick to announce the sector was "is "teetering on economic devastation," with farmers, distributors and

retailers facing poor odds for survival. Mother's Day is traditionally the biggest season for flower sales and keeps those businesses afloat through the summer. The reopening of flower shops came just days before the holiday and at a time when public health officials were advising not to visit older loved ones.

Along with the loss in direct sales, farmers and businesses across the food chain have absorbed a wave of higher operating costs. The logistics involved in moving crops to new markets is a significant factor, but measures taken to increase employee health and safety and prevent further COVID-19 infections have been costly as well. This includes social distancing on packing lines, spending more time on cleaning and sanitizing and purchasing personal protective equipment.

On the opposite end, the report notes that some farmers have seen a modest rise in sales. Rice, processed tomatoes, canned fruit and other shelf-stable products saw a boost in demand, as panic buying cleared grocery store shelves in the first weeks of the governor's stay-at-home order. Sales for dry beans jumped by 20% during that time.

Another bittersweet glimmer of hope within the report is that California's competitors in agriculture may be experiencing worse economic effects from the pandemic, increasing demand for California products.

The report acknowledges that many more changes are still to come. For one, the industry raised concerns over access to crop protection materials during the stay-at-home order. That could reveal further disruptions during the summer growing season and add to losses.

A second wave of the pandemic or localized outbreaks could increase those impacts as well. Other economists have warned of a second wave in the recession, as more businesses supporting retail, restaurants and other frontline industries face closures. This could cause a drop in demand for the state's high-value crops.

More economic aid will be needed, the report advises.

"Federal support programs under the Families First Coronavirus Response Act (FFCRA) and Coronavirus Aid, Relief, and Economic Security Act (Cares Act) are welcome relief but provide insufficient funding to offset economic losses," the authors write.

The 65-page study, the first to tally the coronavirus impacts on California agriculture, was conducted during late April and May and relies on available production, export and pricing data as well as surveys and interviews.

ERA Economics, a consulting firm led by agricultural economists from UC Davis, produced the survey for a coalition led by the Farm Bureau and including UnitedAg, Ag Association Management Services Inc., the California Fresh Fruit Association, California Strawberry Commission, California Tomato Growers Association and Western Plant Health Association. ■





# Silicon undeniably supports plant health

By: Wendy L. Zellner, Ph. D., The University of Toledo, Toledo, OH

Silicon plays a critical role in plant health. Plants cultivated in limited silicon environment are more susceptible to biological pests and environmental stress. Silicon-fed plants are not just physically stronger, their internal immune response, or physiology, is enhanced. This allows them to respond and adjust to the adverse growing conditions more quickly, indicating the significance of this nutrient in the plant's defense response.

To begin, all plants absorb and accumulate silicon. Current descriptions give a misdirected view that most plants accumulate low concentrations of silicon. Essential nutrients are categorized as either macronutrient (containing greater than 1,000 ppm) or micronutrients (containing less than 1,000 ppm). Using these same parameters, silicon is a macronutrient for tomato, which is often referred to as a low-accumulator or silicon excluder. Even plants that accumulate silicon as a micronutrient, such as basil, tobacco, and onion, have enhanced stress tolerance when adequate silicon is supplied. At the other end of the spectrum are the hyperaccumulators, rice and sugarcane, that accumulate up to 10% Si in their leaves. This, however, seems to be the exception, not the norm. Most monocots and over 70% of reported dicots accumulate silicon in their leaves at macronutrient concentrations (Table 1). When plants are cultivated in silicon-limited environments, they become more susceptible to disease whether they accumulate silicon as a macro- or micronutrient.

Silicon's role in defense goes beyond the physical barrier theory and likely involves physiological changes in cellular contents of silicon treated plants. Tolerance to foliar pathogens with silicon treatment is the most dramatic and is easily visible to the naked eye (Fig. 1). Interestingly, scientists are finding out the reduction of fungal diseases is not due to failure of the pathogen to gain entry into the plant, but as a result of changes in the plants' internal environment, limiting adequate materials, such as sugars, amino acids and organic molecules, that would support development and spread of the infection. There are many reviews in the literature highlighting the protective role in plant-pathogen interactions for a wide range of fruits and vegetables (Table 2). Bacterial and viral infections are also managed more efficiently when plants are grown with adequate silicon.

Similar to findings for fungal and bacterial diseases, insect herbivory is also drastically reduced in silicon-treated plants. For some insect-host relationships, penetration events are not reduced, while feeding time and egg counts are lower. Damaged areas are also reduced in non-phloem feeding herbivores. This again suggests that silicon-fed plants have changes to their internal environment, reducing the viability of these insects.

Silicon protection does not just stop at biological agents, but also helps with environmental stress, such as salinity, drought, temperature extremes, and heavy metal stress. Most of these events lead to water and nutrient imbalances. When plants have adequate silicon, they can adjust their internal environment to negate water loss, while dealing with these adverse conditions. This is often observed with reduction in transpiration as well as reduced levels of malondialdehyde (MDA), a marker for lipid peroxidation that correlates to oxidative stress. Enzymes and hormones also change between control and silicon-treated plants, but their pattern of change is not always similar when studies are compared. Even with these contradictions in enzymatic and hormone concentrations, the end result is that plants return more quickly to an internal balance, or homeostasis, with silicon treatment.

Post-harvest protection in both fruits and vegetables is another benefit of silicon. In these cases, the fruit or vegetable is dipped in higher concentrations of silicon, usually in the form of liquid potassium- or

**Table 1:** Macronutrient and Micronutrient Silicon Accumulating Plants

| Macro Si Accumulators: | |
|---|---|
| Almonds | 1,800 |
| Apples | 3,200 |
| Asparagus | 2,400 |
| Avocados | 2,300 |
| Blueberry | |
| Broccoli | |
| Cauliflower | |
| Clementine | 2,500 |
| Cucumber | 10,164 |
| Grape | 3,700 |
| Lettuce | 7,000 |
| Mustard | 30,000 |
| Okra | 2,041 |
| Pumpkin | 4,591 |
| Spinach | 2,500 |
| Strawberry | 3,000 |
| Summer Squash | 3,497 |
| Sunflower | 5,180 |
| Tomato | 2,000 |
| Valencia | 3,000 |
| Walnuts | 1,300 |
| Watermelon | 6,340 |
| Winter Squash | 2,031 |

| Micro Si Accumulators: | |
|---|---|
| Basil | 678 |
| Onion | 500 |
| Spinach | 152 |
| Swiss Chard | 152 |
| Tobacco | 290 |

*This is an abbreviated list of silicon accumulation in plants. Values are average concentrations reported in the literature. Data for blueberry, broccoli and cauliflower were not easily translated to ppm, but were determined to be in the macronutrient range.*


**Figure 1:** *Peanuts grown without calcium silicate (control) developed more symptoms throughout their leaves compared to silicon-treated plants.*

calcium silicates. This leads to a longer shelf life with reduction in many of the diseases that afflict produce during storage. Apples, avocados, carrots, lemons, and strawberries have all shown postharvest protection. Reduction in ethylene and CO2 and increases in cytokinins are likely involved in the response.

Silicic acid and silica nanoparticles are two known forms of plant-available silicon. They can be supplied through a number of products that include both liquid and solid fertilizers, depending on the production styles. Since plants need available silicon at the time of stress, ensuring a continual supply in the growing media or through foliar applications provides protection to the previously listed situations. While the mode of action for silicon protection is still unclear, its positive benefits to plant health is undeniable. ■

## Is Silicon Supplementation Needed for your Production?

*Some final questions to consider on whether silicon supplementation is needed for crop production.*

- Are you growing in silicon-limited soils or media?
  - What media are the plants growing in?
    - mineral-rich soils tend to have more plant-available silicon than heavily cultivated soils, with soil-less medias, including hydroponics, containing the least
- Are you irrigating with silicon-limited water?
  - surface or ground water have higher plant-available silicon than rainwater
- Are you cultivating plants that accumulate macronutrient concentrations of silicon?
- Is there a good chance for disease from environmental or biological factors?
  - Salinity, heat/drought, high UV, heavy metals
  - Mildews, root rots, bacterial blights, viral infections
  - Aphids, thrips, nematodes, mites

*If you answer yes to any of these, then silicon fertilization may help give that additional protection, allowing for the plants not just to strive, but to thrive when growth conditions become challenging.*

**Table 2: A condensed list of Silicon-induced tolerance to economically important diseases.**

| Hosts | Diseases | Pathogens |
|---|---|---|
| Arugula | Black spot disease | *Alternaria japonica* |
| Asparagus | Stem blight | *Phomopsis asparagi* |
| Avocado, Soybean, Bell Pepper | Phytophthora root rot | *Phytophthora cinnamomi, P. sojae, P. capsici* |
| Bean | Angular leaf spot | *Pseudocercospora griseola* |
| Bean, Cucumber, Strawberry | Anthracnose | *Colletotrichum lindemuthianum; C. orbiculare, C. acutatum* |
| Bitter gourd, Tomato | Pythium root rot | *Pythium aphanidermatum* |
| Cucumber | Black rot | *Didymella bryoniae* |
| | Crown and root rot | *Pythium ultimum and P. aphanidermatum* |
| | Gray mold rot | *Botrytis cinerea* |
| Cucumber, Grape*, Melon, Muskmelon, Pumpkin, Strawberry, Tomato*, Zucchini Squash | Powdery mildew | *Podosphaera xanthii, Uncinula necator, Sphaerotheca xanthii, S. macularis, Oidiopsis sicula, Oidium necolycopersici* |
| Cucumber, Lettuce, Melon, Tomato* | Fusarium wilt | *Fusarium oxysporum* spp., *F. semitectum* |
| Lettuce | Down mildew | *Bremia lactucae* |
| Melon | Alternaria | *Alternaria alternata* |
| Melon, Muskmelon | Pink rot | *Trichothecium roseum* |
| Muskmelon | Bacterial fruit blotch | *Acidovorax citrulli* |
| Onion | White rot disease | *Sclerotium cepivorum* |
| Pea | Leaf spot | *Mycosphaerella pinodes* |
| Peach | Brown spot | *Monilinia fructicola* |
| Strawberry | Pestalotia leaf spot | *Pestalotia longisetula* |
| Tobacco | Tobacco Ringspot Virus | *Tobacco ringspot virus* |
| Tomato | Bacterial speck | *Pseudomonas syringae pv. Tomato* |
| | Bacterial wilt | *Ralstonia solanacearum* |
| Watermelon | Gummy stem blight | *Didymella bryoniae* |
| Yellow Passion fruit | Bacterial Spot | *Xanthomonas axonopodis pv. Passiflorae* |

**Indicates different studies have shown contrasting results with silicon treatment.*

# Nitrogen fertilizer management and groundwater quality regulation

Tim Hartz, UC Davis Extension Specialist, Emeritus

Protecting groundwater from pollution with nitrate coming from agricultural sources has been a focus of government regulatory interest for more than a decade. Although California's various Regional Water Quality Control Boards are taking somewhat different approaches to this issue, a common theme in their regulatory programs is evaluation of growers' nitrogen fertilization practices by comparing the amount of N applied to a crop with the amount of N assumed to be removed in harvested products. In theory, N applied but not removed at harvest is at risk of eventual loss to the environment through leaching, runoff or gaseous loss to the atmosphere. It is important to note that not all N applied but not removed in that year's harvest is lost to groundwater. In perennial crops a substantial amount of N can be sequestered in wood and roots. In crop rotations some N left in a field can be taken up by a subsequent crop. Nitrogen transformations in agricultural systems can be quite complex; N loss by volatilization and denitrification, or long-term sequestration in organic matter, can be substantial in certain cases. However, research projects in California and elsewhere support the general concept that as N applied (in fertilizer, organic amendments and irrigation water) increases above the harvest N removal, the *potential* for nitrate leaching to groundwater increases.

Crops vary widely in both the typical amount of N applied and in the amount of N removed with harvested products. Table 1 lists the estimated amount of N in a ton of marketable yield for some of California's major crops. These N removal values were developed through a survey of existing published data; research is currently underway to refine these values to ensure they are broadly representative of current California conditions. By comparing your clients' N application rates with the estimated N removed at their yield level you will see that the gap between N applied and N removed (A-R) can be quite different among crops.

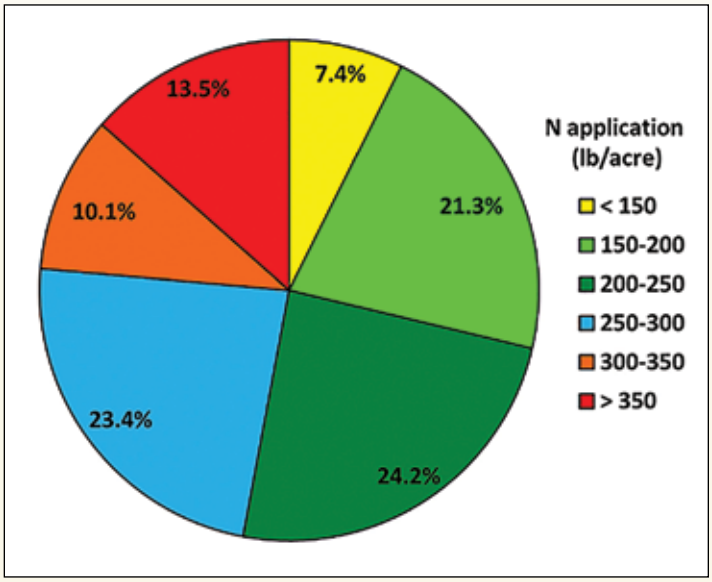
Growers in the Central Coast region, and in areas of the Central Valley designated as highly vulnerable to nitrate leaching, have been required to report annual crop-specific N application rates for several years; this requirement for N use reporting will undoubtedly expand in coming years. These reports provide data on the variability in N use rates among growers. Fig. 1 illustrates this variability for Central Coast celery production, but the same pattern is repeated across many crops, and both production areas. Depending on the crop, from 10-25% of fields report N rates far in excess of the industry average. While very high N rates may be justified in some fields by correspondingly high yields, available data suggests that N fertilization rate and yield are not highly correlated for most crops. Clearly, growers using N rates substantially greater than industry norms risk increased regulatory scrutiny.

**Table 1.** Estimated N content of harvested material. Data from Geisseler, 2016*.

| Crop | N removal with yield |
|---|---|
| **Perennials** | |
| Almond | 136 lbs/ton of kernels |
| Oranges | 3 lbs/ton of fruit |
| Pistachio | 56 lbs N/ton dry yield (CPC) |
| Walnut | 32 lbs N/ton in-shell |
| Wine grapes | 3 lbs/ton of grapes |
| **Annuals** | |
| Cotton | 44 lbs N/ton lint & seed |
| Corn silage | 8 lbs N/ton @ 70% moisture |
| Lettuce | 3 lbs/ton of fresh weight |
| Processing tomato | 3 lbs/ton of fresh weight |
| Wheat | 43 lbs N/ton @ 12% moisture |

** this reference contains N removal data for many other crops*

**Fig. 1.** Nitrogen application rate on celery, Central Coast region; 2017 grower-reported data. The graph depicts the percent of acres in each N application range.



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*[1]Source: BRANDT Field Trials 2016-2018*

In my experience growers have a variety of reasons for using high N rates. Among the most common is a recognition that their irrigation distribution uniformity may be suboptimal, and a high N application rate limits the chance of N deficiency in any part of the field. Mobile Lab programs in both the Central Coast and the Central Valley show that irrigation distribution uniformity below 80% remain common, even for low volume systems like drip or microsprinkler. In coming years compliance with the Sustainable Groundwater Management Act (SGMA) will provide an incentive to upgrade irrigation efficiency, and 'insurance' N application based on poor irrigation control should decline over time.

Some growers also believe that higher N rates may enhance product quality or postharvest life; this is particularly true for some leafy green vegetables. However, there is substantial evidence from California research that refutes this concept; in general, an N rate sufficient to maximize crop yield is sufficient to maximize product quality (Breschini and Hartz, 2002; Frischi et al., 2003). In fact, there is solid evidence that high N rates can be detrimental to crop production, primarily by increasing pest problems. Many studies have shown that high N rates increase insect populations (Godfrey and Hutmacher, 2001; Daane et al., 1995). This is intuitive, since plant material richer in N will better support insect growth and reproduction. Similarly, excess N can increase susceptibility to diseases such as hull rot of almond (Saa et al., 2016) and brown rot on peaches (Daane et al., 1995).

Whatever the rationale, using high N fertilization rates will become increasingly difficult to justify as regulatory pressure to protect groundwater quality increases. Consultants must play a significant role in helping their clients become more efficient with their nitrogen inputs. ■

*For the vegetable industry UC has published a new reference manual "Efficient nutrient management in California vegetable production". This manual contains in-depth information about all aspects of fertility management, with chapters on soil testing, macro- and micronutrient management, efficient irrigation, organic production, and environmental protection. It can be ordered at https://anrcatalog.ucanr.edu/*

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# Marrone Bio Innovations' BioUnite™ program offers new solutions to California growers

SUSTAINABILITY UPDATE

***BioUnite program enables California growers to address mid-season pest management needs.***

California growers are gaining an edge as they address mid-season pest control issues through the implementation of the company's novel BioUnite program.

Marrone Bio launched BioUnite to provide growers with integrated pest management programs that harness the power of biology with the performance of chemistry resulting in a more efficient food production system that is affordable, sustainable, safe, and easy to use. BioUnite provides specific biological prescriptions that growers integrate into their operations, taking the guesswork out of using biologically derived materials with their standard crop protection program.

BioUnite™
with Marrone Bio Innovations

Marrone Bio supports the BioUnite program with research that spans from initial discoveries through hands-on field trials. Almond growers are currently treating for navel orangeworm larvae, which bore into and consume the nut fruit, damaging quality, and yield, and reducing the value farmers receive for their crop. In extensive 2018 field trials, Marrone Bio Innovations' Venerate® biological insecticide, when tank mixed with a standard insecticide, reduced nut damage by an additional 2% as compared with the standard insecticide program. This Venerate BioUnite program results in a 6-to-1 return on investment to the grower. In grapes, the BioUnite concept integrates Haven® plant stress manager into the grower vine management program. Field trials demonstrated Haven resulted in an 18% yield increase, delivering a 6-to-1 return on investment. Also in grapes, when Regalia® biofungicide was added to the growers' disease management program, Regalia provided a 57% improvement in disease control as compared to the standard treatment.

"*Growers around the world are faced with the challenge to meet diverse consumer demands for greater choice, affordability, and availability,*" said Kevin Hammill, Chief Commercial Officer for Marrone Bio Innovations. "*Growers need innovative, cost-effective tools to operate in a dynamic, changing marketplace. We believe that BioUnite offers growers an exciting new resource to meet consumer demands,*" concluded Hammill.

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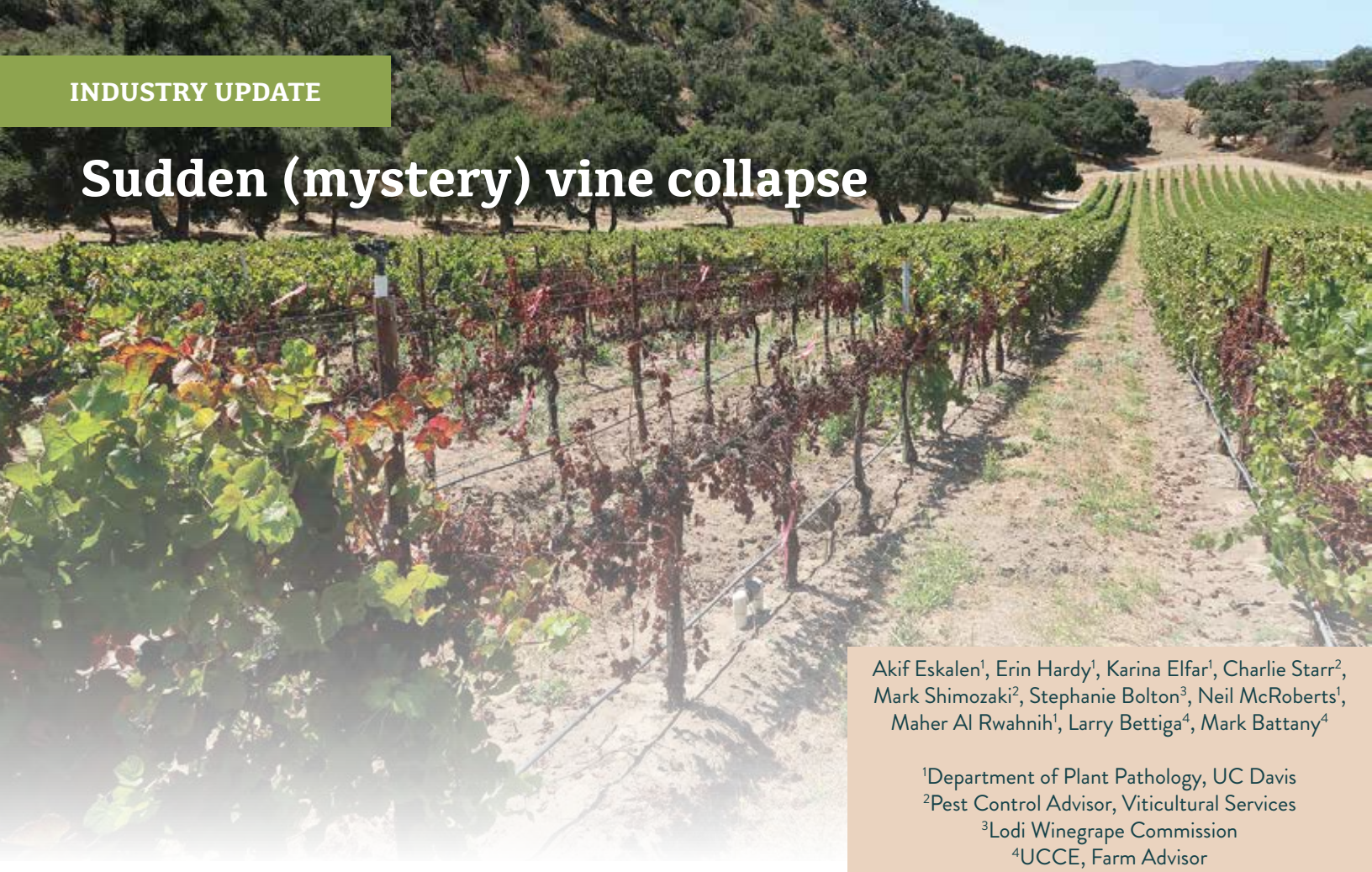
INDUSTRY UPDATE

# Sudden (mystery) vine collapse



Akif Eskalen[1], Erin Hardy[1], Karina Elfar[1], Charlie Starr[2], Mark Shimozaki[2], Stephanie Bolton[3], Neil McRoberts[1], Maher Al Rwahnih[1], Larry Bettiga[4], Mark Battany[4]

[1]Department of Plant Pathology, UC Davis
[2]Pest Control Advisor, Viticultural Services
[3]Lodi Winegrape Commission
[4]UCCE, Farm Advisor

## Background

Since 2011, grape growers in the San Joaquin Delta, Central Valley, and Coastal counties of California have reported Sudden Vine Collapse (SVC), in which patches of vines within the vineyard, especially the ones on virus-sensitive rootstocks (Freedom, 039-16 and 101-14, among others), quickly die with no apparent cause (Fig. 1A). In some cases, patches are so large that can be seen via satellite images on Google Earth, with levels of loss that have caused growers to remove entire vineyards (Fig.1B. The affected vines were mostly older vines (>5 year-old) grafted on Freedom rootstock, although different varieties have experienced the collapse in various locations including San Joaquin, Stanislaus and coastal grape growing counties in CA. In 2018, the disease has reached an economic threshold of destruction where in was affecting increasing number of grape growers economically to gain greater attention.

## Symptoms

Early in the season, stunted shoot growth or dead arms (Fig 2A). Later, during the summer, entire vines start dying quickly in circular patches within the vineyard. In some cases, death is so fast that leaves remain dry on the plant (Fig 2B). Examined vines show a clear lack of feeder roots (Fig 3A), with grayish-purple lesions in the bark of scaffold roots. At the graft union level, the scion portion often appear swollen, with a necrotic line (Fig 3B). In many cases, rootstocks showed internal wedge-shaped cankers which were absent in the scion (Fig 3CD). Furthermore, mealybugs and common grapevine trunk disease (GTD) symptoms were observed in all affected vines (Fig 4B).

## Mealybugs

Mealybugs are pests of grapevines that spread between vines and vineyards through animals, farm workers, equipment, ants, and other means. They are phloem feeders, which enables them to effectively infect plants with viruses when their stylets penetrate the plant tissue. Two of the viruses that they vector are Grapevine leafroll-associated viruses and vitiviruses (Selvarajan et al. 2016). These insects are found in moist and warm environments, including areas of California where SVC has been reported.

## Synergy between grapevine viruses

Vines infected with a single viral species usually show mild to strong symptoms, and the yield is significantly reduced but usually the vine will not collapse. However, mixed infections with grapevine leafroll viruses (e.g. *Grapevine leafroll-associated virus 3*) and vitiviruses (*e.g. Grapevine virus A, Grapevine virus F*) can exacerbate symptoms and lead to vine decline (Golino et al., 1993; Rieger, 2019).

**Grapevine Trunk Diseases:** Grapevine trunk diseases (GTD) are currently one of the most important challenges for viticulture worldwide. These destructive diseases are caused by a broad range of wood-colonizing fungal pathogens, which primarily infect grapevines through wounds resulting from pruning, freezing, sunburn, and insects. In most occasions, a single vine is infected with more than one of these fungal pathogens. Characteristic GTD symptoms include poor vigor, distorted leaves and shoots, shoot and tendril dieback and berry specks caused by fungal toxins produced by some of these pathogens. SVC-symptomatic vines had characteristic GTD symptoms including esca diseases but these

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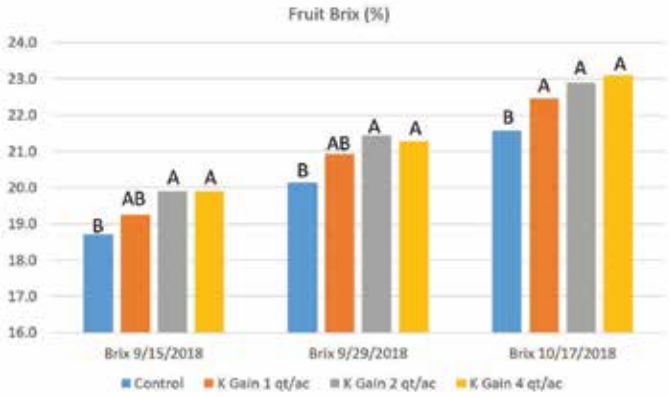


Figure 1. Effect of K Gain application on fruit brix in wine grapes. Data not connected by the same letter are significantly different between treatments at a given sampling date at 0.05 level of significance.

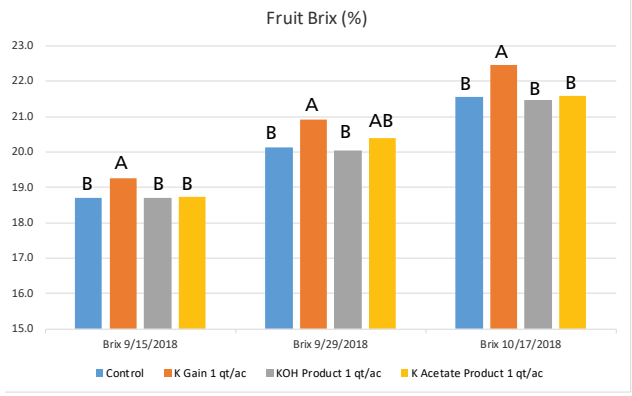


Figure 2. Effect of foliar application of different potassium fertilizer products on fruit brix in wine grapes. Data not connected by the same letter are significantly different between treatments at a given sampling date at 0.1 level of significance.

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**FIGURE 1: (A)** Sudden Vine Collapse in Paso Robles, California; **(B)** Patches of collapsed vines during summer 2019, Lodi, California



**FIGURE 2: (A)** Stunted shoot growth and dead arms early in the season; **(B)** Quick death of vines during the summer



**FIGURE 3: (A)** Lack of feeder roots; **(B)** Swelling and cracking on graft union bark; **(C)** Rootstock cut with cankered wood; **(D)** Presence of *Neofusicoccum parvum* pycnidia, a common grapevine trunk pathogen that causes Bot canker and dieback




symptoms were not consistently observed in each vine sampled in this study. Perennial cankers produced by fungi on grapevines may cause spur, cordon and trunk dieback and the eventual death of the entire vine. Previous studies have also shown that fungal pathogens in the Nectriaceae family cause grapevine black foot diseases and can cause severe root rot on plants predisposed by stress, poor root development, poor vine nutrition and heavy cropping.

### Hypothesis and Study

Four vineyards exhibiting SVC in the Lodi American Viticulture Area were sampled in July 2019 (Table 1). Samples were collected from the roots, rootstock, scion, cordon, spurs, and leaves of the selected vines. From each vineyard, three vines of varying conditions were selected. One healthy-looking, one declining, and one advanced decline vine were sampled. Samples from each tissue were plated and cultured on media that selected for fungal growth. Isolated fungi were then identified using PCR. For the leaf and rootstock samples, high-throughput sequencing was done to characterize the entire microbial profile of the vines. Additionally, to assess the extent of girdling at the graft union, an iodine starch test was performed by spraying iodine onto each of the root samples and evaluating the starch content. Iodine turns dark blue in the presence of starch, allowing us to estimate the amount of starch being transported from the leaves to the roots.

**TABLE 1:** Age, grape variety, and rootstock of vineyards used in this study

| Site | Planted | Grape Variety | Rootstock |
|---|---|---|---|
| Vineyard 1 | 1993 | Cabernet Sauvignon | Freedom |
| Vineyard 2 | 1992 | Chardonnay | Freedom |
| Vineyard 3 | 2013 | Pinot Noir | Freedom |
| Vineyard 4 | mid 1990s | Chardonnay | Freedom |

The results from this testing showed that, in each of the vines with moderate to severe decline symptoms, both Grapevine leafroll-associated virus 3 and a vitivirus, Grapevine virus A or Grapevine Virus F, were present. In some of the healthy-looking vines, only Grapevine leafroll-associated virus 3 was present, but the vitivirus was not. A myriad of Grapevine Trunk Disease (GTD) pathogens were isolated from the vines sample, both healthy-looking and symptomatic. These included *Fusarium* sp., *Diplodia seriata*, and *Diaporthe* sp. among others. However, no single fungal pathogen was consistently found in affected grapevines (Table 2).

Research shows that, while these leafroll-associated viruses and vitiviruses cause mild symptoms individually, they are capable of causing more severe disease when both are involved (Al Rwahnih et al. 2009, Rowhani et al. 2018). Vitiviruses can cause problems in certain rootstocks individually, and co-infection with a leaf-roll associated virus raises the titer of vitivirus, thus increasing pathogenicity. Freedom rootstock is most susceptible to co-infection by Grapevine leafroll-associated viruses and vitiviruses (Rowhani et al. 2017). Furthermore, the stress exerted on the

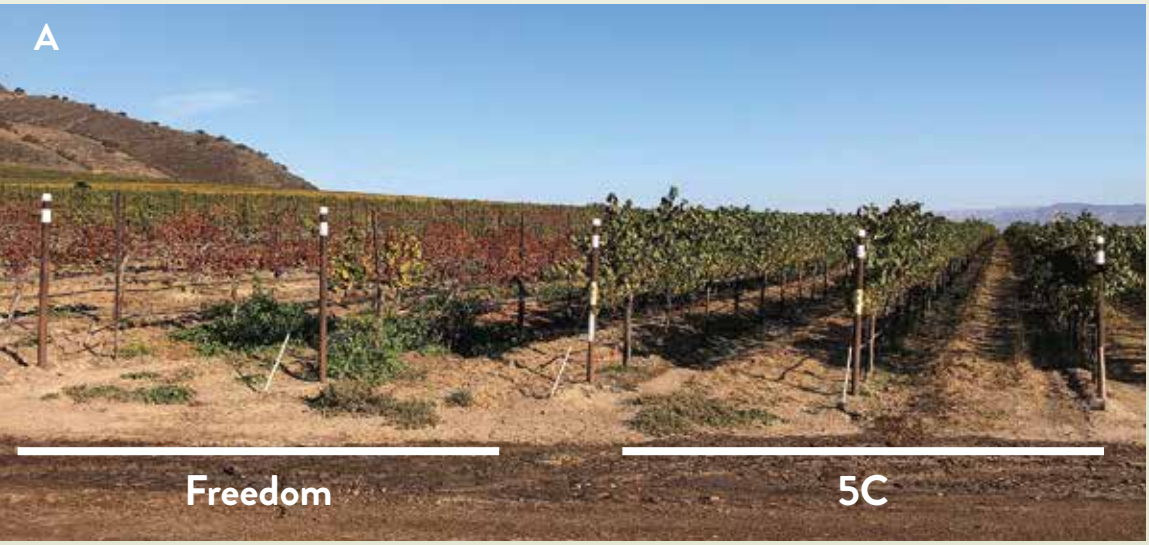
vines by the viral infection likely renders the affected vines more susceptible to infection by fungal pathogens including the ones that causes GTD. Moreover, previous studies have shown that viral infection can cause graft incompatibility in certain rootstock (Golino 1993). In this case, the efforts of the rootstock to reject the scion following infection causes girdling at the graft union, preventing the flow of water and nutrients throughout the vine. The inability for the plant to transport starch leads to starch depletion in the roots and a subsequent lack of feeder roots, further preventing the vine from acquiring necessary nutrients from the soil. All of these factors contribute to the collapse of the vine.

In conclusion, we hypothesize that SVC is not caused by a single pathogen, but the result of a disease complex in which vines are predisposed to root stress due to co-infection by a leafroll virus (GLRaV-3), vitiviruses (GVA, GVF) and possibly others. Consequently, infected vines rapidly die by an additional infestation of fungal pathogens associated with grapevine trunk diseases and black foot disease.

### Management

- Effective vector (vine mealybug) control.
- Remove collapsed vines from the vineyard.
- Transition to less susceptible rootstocks when replanting. ■

**FIGURE 4: (A)** SVC on vines grafted on Freedom but not on 5C rootstocks; **(B)** Large colonies of mealybugs under the bark of rootstock present in all collapsed vines



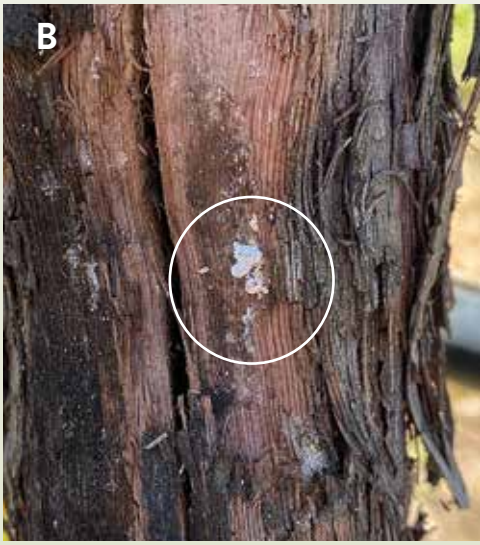




**TABLE 2. Preliminary ranking of vines based on external disease symptoms**

| | | | | | Viral Pathogens | | | | Fungal pathogens | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Vineyard | Vine | Ranking[1] | Vine Condition | Mealybug Present | GLRaV-3 | GVA | GVF | Feeder Roots Present | Grapevine Trunk Diseases | Fusarium spp. | Oomycetes |
| 1 | 1 | 4 | Advanced Decline | + | + | - | + | - | + | + | - |
| | 2 | 3 | Declining | + | + | - | - | some | + | - | - |
| | 3 | 1 | Healthy Looking | + | + | - | - | Present | - | - | - |
| 2 | 1 | 4.5 | Advanced Decline | + | + | + | + | - | + | + | - |
| | 2 | 3 | Declining | + | + | + | + | some | + | + | - |
| | 3 | 1 | Healthy Looking | + | + | - | - | Present | - | - | - |
| 3 | 1 | 3 | Advanced Declining | + | + | + | - | - | + | + | - |
| | 2 | 3 | Declining | + | + | + | - | some | + | + | - |
| | 3 | 1 | Healthy Looking | + | - | - | - | Present | - | - | - |
| 4 | 1 | 4 | Advanced Decline | + | + | + | - | - | + | + | + |
| | 2 | 3 | Declining | + | + | + | - | some | + | + | - |
| | 3 | 1 | Healthy Looking | + | + | + | - | some | - | - | - |

[1] Ranking on a scale of 1-5. 1: Healthy looking 2: Beginning Decline 3: Declining 4: Advanced Decline 5: Dead

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# Documenting the impact of Western flower thrips and Impatiens necrotic spot virus (INSV) in lettuce fields in the Salinas Valley

Daniel K. Hasegawa, Research Entomologist, U.S. Department of Agriculture-Agricultural Research Service
Alejandro Del-Pozo, Area IPM Advisor, University of California Statewide IPM Program and Cooperative Extension
JP Dundore-Arias, Assistant Professor, California State University Monterey Bay

## Summary

Western flower thrips (*Frankliniella occidentalis*) and Impatiens necrotic spot virus (INSV) are current and economically relevant issues in lettuce in the Central Coast. Since first reported in 2008, research on INSV has been intermittent, with many information gaps on the biology and ecology of thrips as vectors and the epidemiology of this viral disease. Likewise, despite anecdotal evidence of co-occurrence of INSV with lettuce drop, one of the most common and destructive soilborne diseases caused by the fungal pathogens *Sclerotinia* spp., the effects of these mixed infections on plant productivity remain unknown.

The current research highlights recent efforts to address these gaps in knowledge. In the summer of 2019, a total of 2,100 individual Romaine lettuce plants were evaluated from two commercial fields to document the timing and severity at which INSV can affect lettuce productivity and market quality. Findings from this study include: 1) Romaine lettuce plants exhibiting minor INSV symptoms can still possess market quality, 2) while thrips pressure may be low, INSV can still show strong disease symptoms in lettuce, 3) co-infections of INSV and *Sclerotinia* contributed to 30 to 40% of all the lettuce that was not harvested, and 4) strategies to manage thrips and INSV can be improved by focusing on when thrips infestations may occur. This is particularly true during transition periods where older fields are being harvested and disced, and adjacent fields are being planted with new lettuce. Overall, these studies enhance the understanding of the epidemiology of thrips-transmitted INSV in lettuce cropping systems and provide novel information that can improve IPM strategies.

## Approach

Two commercial Romaine fields on a single ranch in the Salinas Valley were chosen to be evaluated based on high levels of reported INSV incidence in the surrounding areas. The first field (referred to as F1) consisted of 40-inch beds of Romaine, while the second field (referred to as F2) consisted of 80-inch beds of Romaine. Both fields were about 10 acres in size and grown from August 8 to October 10 of 2019. In F1, the orientation of lettuce plants per scouting location consisted of 6 seed lines of lettuce across three 40-inch beds and 7 plants per row. In F2, the orientation per scouting location consisted of 6 seed lines of lettuce across one 80-inch bed and 7 plants per seed line. Twenty-five equally distant scouting locations in a 5 x 5 grid that spanned the entire 10-acre field were marked off. At the center of each scouting location, 42 Romaine lettuce plants were selected, marked and used for weekly evaluations. Each plant was evaluated in the field for INSV symptoms on a weekly basis beginning the week after thinning (week 3), and until the week before harvest (week 9).

A numeric INSV severity scale ranging from 0 to 5 was developed to evaluate the initial occurrence and progression of disease symptoms: 0 = no INSV symptoms; 1 = small and few brown necrotic spots with yellowing of leaves, sometimes stunting of new growth in the heart; 2 = moderate levels of brown necrotic spots and yellowing of leaves, sometimes stunting of new growth in the heart; 3 = high levels of brown necrotic spots and yellowing occurring in multiple leaves, stunting; 4 = obvious brown necrotic spots and yellowing occurring in multiple leaves including within the heart, stunting, distortion of leaves; 5 = plant is dead (Fig. 1A).

Concurrent with the weekly field evaluations for INSV, a single lettuce plant was selected weekly from each transect. Each plant was adjacent to and south of the 42 plants that were evaluated weekly and was representative of INSV severity for the transect. Selected plants were brought back to the laboratory and evaluated for: 1) number of thrips per plant, 2) thrips damage, 3) enzyme-linked immunosorbent assay (ELISA) values for INSV from thrips, and 4) ELISA values for INSV from lettuce plants. Every week, 25 new lettuce plants were selected for analysis, and continued for the duration of the field evaluations (weeks 3–9). For F1, these protocols were implemented at weeks 1 and 2 as well, which took place prior to thinning.

A numeric scoring system was used to assess thrips feeding damage based on the number of scars present per leaf: 0 = no scars; 1 = 1 to 25 scars; 2 = 26 to 50 scars; 3 = 51 to 75 scars; 4 = 76 to 100 scars; 5 = greater than 100 scars. The scores for all evaluated leaves were averaged and used as a final score for the sampled plant.

## Results and Discussion

Both fields were adjacent to and near Romaine fields on the same ranch that were infected with INSV (estimated ≥25% incidence). In each field, a total of 1,050 Romaine plants were marked at week 3 (post-thinning), which were equally distributed across 25 scouting locations spanning the entire 10-acre field. Each week until harvest (week 9), every plant was individually scored for INSV using a symptom severity scale (Fig. 1A). Weekly evaluations revealed a rapid spread of INSV, likely due to older adjacent lettuce plantings that served as reservoirs for INSV and thrips populations (Fig. 1B–C). At week 9, over 75% of the lettuce was infected with INSV. Thrips that were collected from fields at week 9 also tested positive for the virus (data not presented), which poses a threat to subsequently planted lettuce in adjacent fields. This phenomenon was supported by our ability to detect INSV in lettuce plants as early as the first week after planting (data not shown). The data emphasizes the need to consider previous and subsequent lettuce plantings, such that the timing of thrips management should begin

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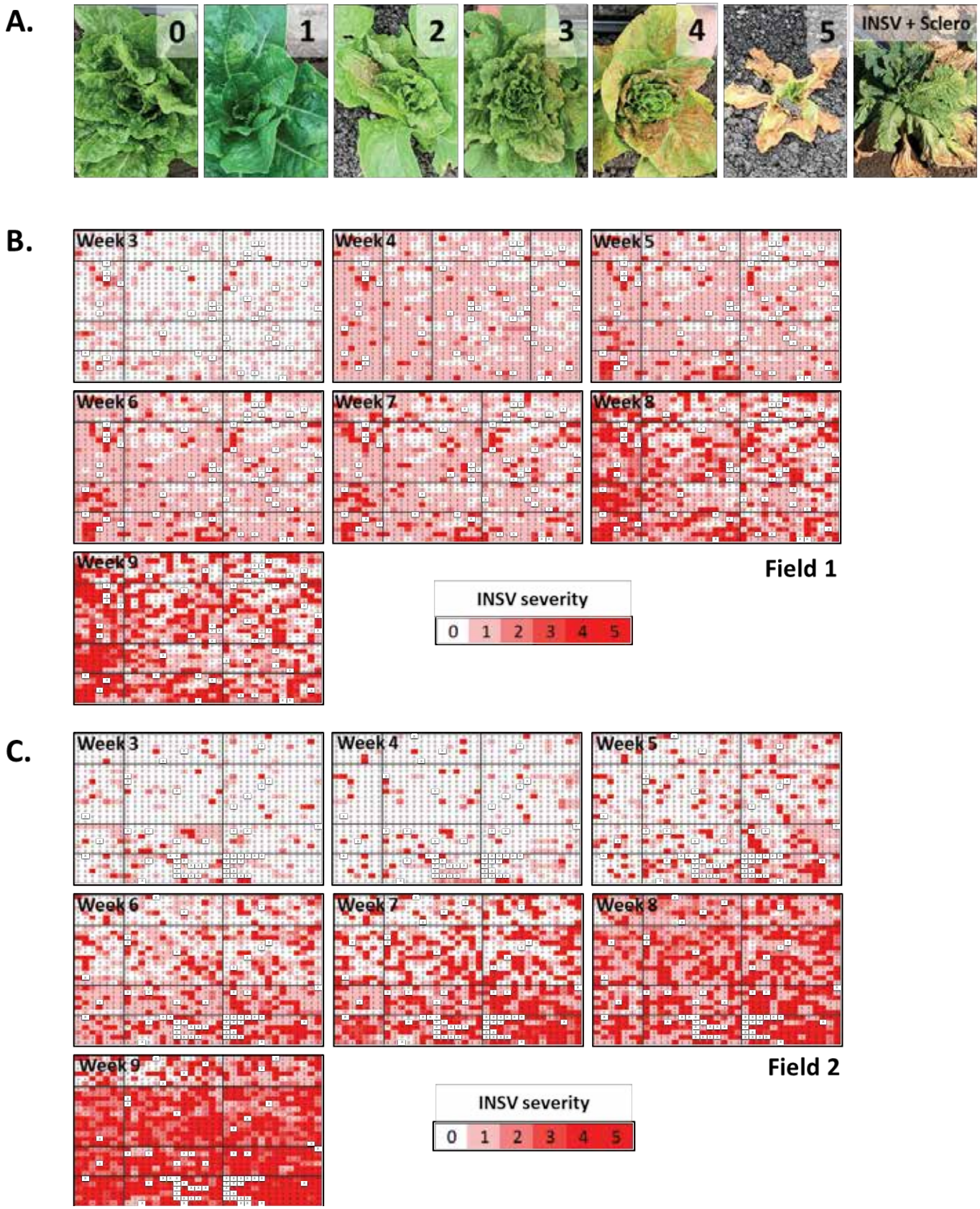
**Figure 1.** Weekly evaluations of lettuce plants capture the progression of Impatiens necrotic spot virus (INSV) severity in two fields. **A)** Lettuce plants were evaluated weekly using an INSV severity scale from 0 to 5. Field 2 was also evaluated two days after harvest to document the presence of *Sclerotinia* spp. (Sclero) **B)** Field 1. C) Field 2. Credit: Daniel K. Hasegawa, USDA-ARS.



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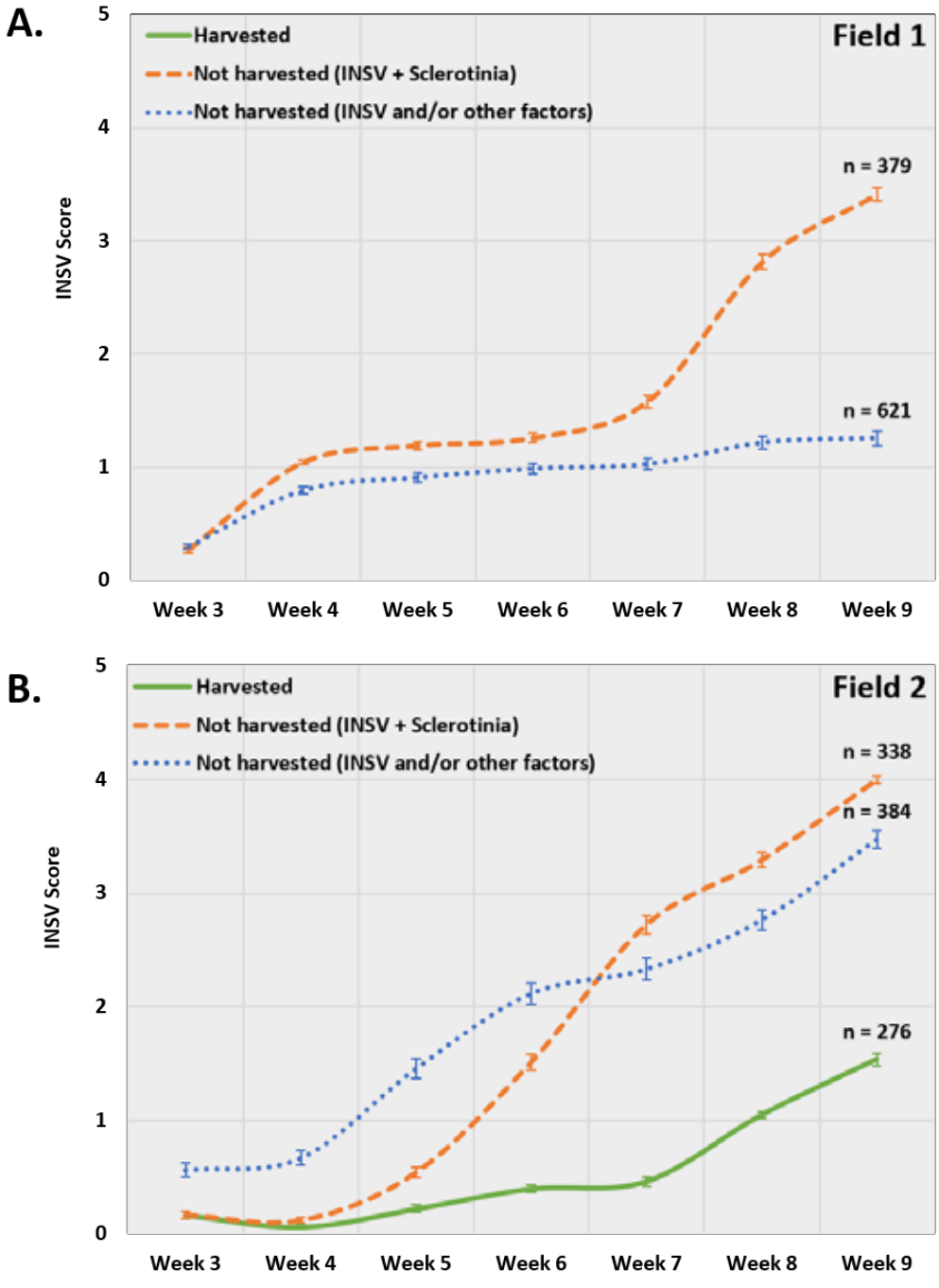
during the transition period in which thrips from older fields migrate to newly planted adjacent fields (i.e., after harvesting and discing of fields).

From the two fields that were evaluated, only 27% of lettuce from one field (F2) was harvested. Interestingly, those plants had an average INSV rating of 1.54, suggesting that lettuce plants showing mild symptoms of INSV can still possess market quality (Fig. 2). Considering that INSV can take up to 10 to 14 days to develop symptoms in lettuce, it is likely that these plants were infected mid- to late-season (e.g., during the 6th–8th week), but due to the lack of strong INSV symptoms, still maintained market value. This data further emphasizes the need for thrips management early in the season to reduce crop loss due to INSV. Our data also suggests that while thrips pressure can be very low (based on the lack of thrips seen on a plant, or the lack of scarring due to feeding damage), INSV can still show strong disease symptoms in lettuce (data not shown). Future studies will include determining the minimum thresholds for

**Figure 2.** Impatiens necrotic spot virus (INSV) scores for lettuce plants based on their market quality. INSV scores for individual lettuce plants were averaged for each week and grouped by their outcome: Harvested (green line); Not harvested and showed symptoms of *Sclerotinia* infection (orange dashed line), Not harvested but did not show signs of *Sclerotinia* infection (blue dotted line). A) Field 1, which was not harvested. B) Field 2. Error bars represent standard error means. n = number of samples



1) the number of thrips and, 2) feeding times that are required for thrips to transmit INSV to lettuce.

Lastly, we observed that about 30 to 40% of the unharvested lettuce was co-infected with INSV and *Sclerotinia*, suggesting that this type of mixed infection had a large impact on the market quality in these fields. Cultures of thrips, INSV, and *Sclerotinia* have been established and future studies will explore the interplay between the insect and pathogens to further understand the effects of this type of mixed infection on plant health and quality.

These studies highlight the timing and severity at which INSV can affect lettuce productivity and market quality and suggests that strategies to manage thrips and INSV can be improved by focusing on the timing at which thrips infestations may occur. This is particularly true during transition periods where older fields are being harvested and disced, and adjacent fields are being planted with new lettuce. Furthermore, although INSV infection is correlated with thrips pressure, infection can also occur under circumstances where pressure appears to be low. ■

**Acknowledgements and Authors**
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Daniel K. Hasegawa: USDA-ARS; 1636 E. Alisal St., Salinas, CA 93905; daniel.hasegawa@usda.gov

Alejandro Del-Pozo: UCCE & UC IPM; 1432 Abbott St., Salinas, CA 93901; adelpozo@ucanr.edu

JP Dundore-Arias: CSUMB; Building 53, Room E305, Seaside, CA 93955; jdundorearias@csumb.edu

# Fungicide application timing to control stem rot and aggregate sheath spot of rice

Luis Espino and Whitney Brim-DeForest, Rice Farming Systems Advisors, University of California Cooperative Extension

In 1920, Charles Chambliss, then agronomist in charge of rice investigations with the United States Department of Agriculture, wrote in the *Farmers' Bulletin 1141 - Rice Growing in California*, that "No diseases have been found to affect the rice crop of California." This disease-free period continued until the 1960s, when seed rot, seedling disease, and stem rot were recognized as problems that could affect the stand and yield of rice.

Since then, four diseases have become major constrains of rice production in California. Stem rot, aggregate sheath spot, blast, and kernel smut can be serious problems some years in some areas of the Sacramento Valley. Other diseases, such as bakanae and false smut, are uncommon. This might change in the future. For example, kernel smut was first detected in California in the mid 1980s, did not become widespread until the mid 2010s, and then became a major problem in the northern Sacramento Valley in 2018.

Stem rot (caused by *Sclerotium oryzae*) (fig. 1) and aggregate sheath spot (caused by *Rhizoctonia oryzae-sativae*) (fig. 2) are found at low levels in most rice fields. Before the ban on rice straw burning was put in place, burning was the main management tactic for these diseases. At the end of the season, these pathogens produce sclerotia (fig. 1), which are resting structures that allow them to survive in the field during the host-free period. Over time, as sclerotia accumulate in the field, the disease becomes more severe, resulting in dead leaves, lodging, panicle blanking, and yield reduction. Burning the straw eliminates the sclerotia and reduces the inoculum going back into the soil. In the late 1990s, the fungicide azoxystrobin was registered on rice for blast control. Subsequent trials have shown that this fungicide also has activity against stem rot and aggregate sheath spot. Currently, close to 50% of the rice acreage is treated with azoxystrobin.

A recurring question regarding the use of fungicides in rice is what the best timing of azoxystrobin application is. To control blast, the application should be done at the early heading stage, to protect the panicles from becoming infected. Treatments at this time also result in stem rot and aggregate sheath spot incidence and severity reduction. However, PCAs experiencing problems with stem rot or aggregate sheath spot wondered if, for those diseases, a better application timing might be the mid tillering stage (35 to 45 days after seeding). At mid tillering, the canopy has not completely closed, which would allow the fungicide to reach the tillers at the water line, where stem rot and aggregate sheath spot infections start. Additionally, most growers apply a clean-up herbicide at this time; tank mixing the fungicide with the herbicide would result in application cost savings. To determine the best timing of fungicide application for these two diseases, eighteen fungicide trials were conducted between 2017 and 2019 in several locations of the Sacramento Valley.

FIG. 1

FIG. 2

**Figure 1.** *Tiller affected by stem rot showing sclerotia forming inside*

**Figure 2.** *Tiller with aggregate sheath spot lesions*

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This is especially true in the fight against powdery mildew, according to Syngenta Agronomic Service Representative Garrett Gilcrease. “Not only does powdery mildew degrade and reduce vegetative growth, it also restricts the plants ability to achieve a high level of photosynthesis. This reduction leads to lower yield, quality and Brix levels. By controlling these infections, growers allow for the maximum amount of healthy plant material to execute photosynthesis and other natural processes,” Gilcrease explains. With additional tissue free of pathogens, plants can fight water stress and senescence much better. “All plant tissues contend with environmental stressors like heat, wind and solar radiation,” Gilcrease says. “Plants with more clean tissue can better regulate temperature and water use, allowing fruit to size up before ripening.” The unique chemical formulation of Miravis Prime provides excellent disease protection that helps plants reach their peak potential.

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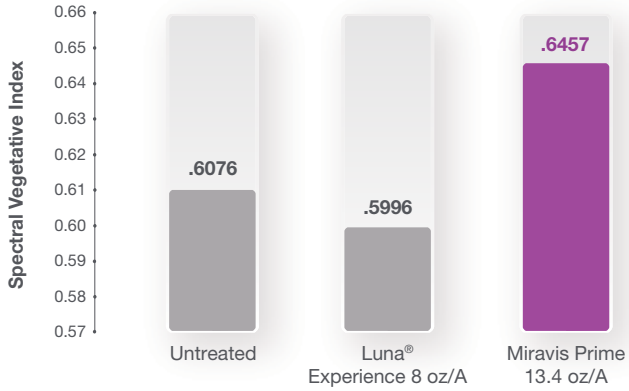
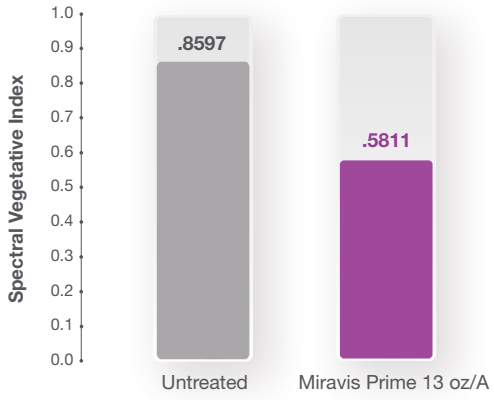
**Spectral analysis demonstrated plant health benefit from Miravis Prime fungicide applications on grapes in California field trials, 2019**

Ukiah Grapes - Photosynthesis




Overall amount and quality of photosynthetic material in vegetation.
*Assessments 18 days after treatment*

Hickman Grapes - MSI (Water stress)




Leaf water content; higher values indicate greater water stress and less water content
*Assessments 62 days after treatment*

Product performance assumes disease presence.
All photos are either the property of Syngenta or are used with permission.
Performance assessments are based upon results or analysis of public information, field observations and/or Syngenta evaluations.
Trials reflect treatment rates commonly recommended in the marketplace.


Miravis® Prime

syngenta®

**Table 1.** Average percentage disease severity reduction and number of trials (in parenthesis) conducted in the Sacramento Valley between 2017 and 2019.

| Disease | Azoxystrobin at mid-tillering | Azoxystrobin at mid boot | Azoxystrobin at early heading |
|---|---|---|---|
| Stem rot | 9<br>(9) | 23<br>(4) | 28<br>(13) |
| Aggregate sheath spot | 21<br>(8) | 76<br>(4) | 57<br>(13) |

The trials included registered and experimental products. In this article, we report results with azoxystrobin applied at 114.5 gr ai/a. Application timings tested were mid tillering, mid boot (4-inch panicle inside the boot), and early heading (when 20-50% of panicles have emerged from the boot). At draining, a 25-tiller sample was cut from each treatment plot and tillers evaluated for disease lesions. Disease severity was evaluated using a scale from 0 (no disease) to 4 (tiller rotted through for stem rot or lesions reaching the panicle for aggregate sheath spot).

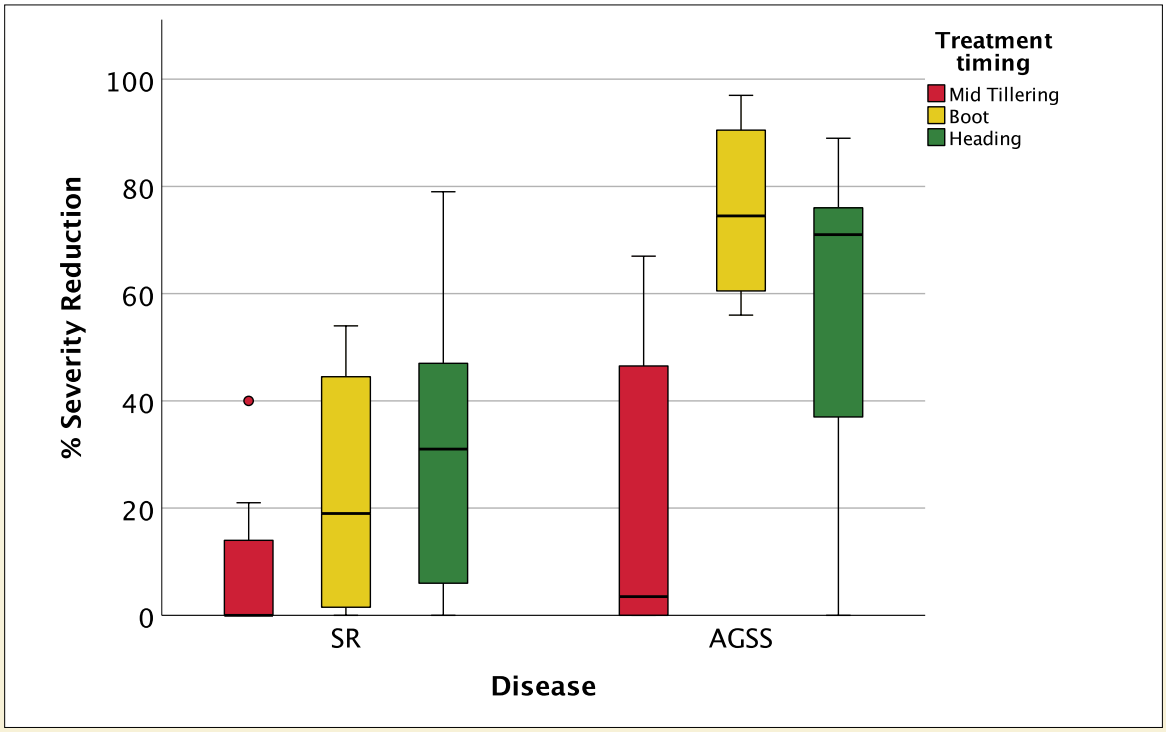
Usually, one of the two diseases is more prevalent than the other, therefore, we only evaluated one disease per trial. In most stem rot trials, the incidence (the proportion of tillers showing disease lesions) of the disease was high, reaching 100% in one trial. Aggregate sheath spot incidence was more variable, with more than half the trials having an incidence larger than 25%. Severity of both diseases was variable, but overall, stem rot trials had a higher level of severity than stem rot.

Azoxystrobin reduced stem rot severity the most when applied during the early heading stage and the least when applied at mid-tillering (table 1). When applied at mid boot, the reduction was similar to when azoxystrobin was applied at early heading, however, only four trials included this application timing. When azoxystrobin was applied at mid-tillering, half the trials did not see any severity reduction (fig. 3).

Average reduction of aggregate sheath spot severity was highest when azoxystrobin was applied at the mid boot stage (table 1). Again, only four trials included this timing. When azoxystrobin was applied at the early heading timing, there was a lot of variability on the results; however, half the trials resulted in more than 70% severity reduction (fig. 3).

The trials showed that the best application timing to control stem rot with azoxystrobin is early heading. For aggregate sheath spot, mid boot seems to be the best timing; however, application at early heading provided good control for both diseases. The least effective timing for both diseases was mid-tillering. For those growers and PCAs that want to target smut and stem rot or aggregate sheath spot, application of fungicides controlling those diseases at the mid boot stage (the timing for smut) might be an option. ■

**Figure. 3.** Percentage reduction in stem rot (SR) aggregate sheath spot (AGSS) severity by application of azoxystrobin at three different timings. Boxes represent 50% of the data, and the whiskers represent the upper and lower 25% of the data. The line inside the boxes represents the median. The small dot represents an outlier.



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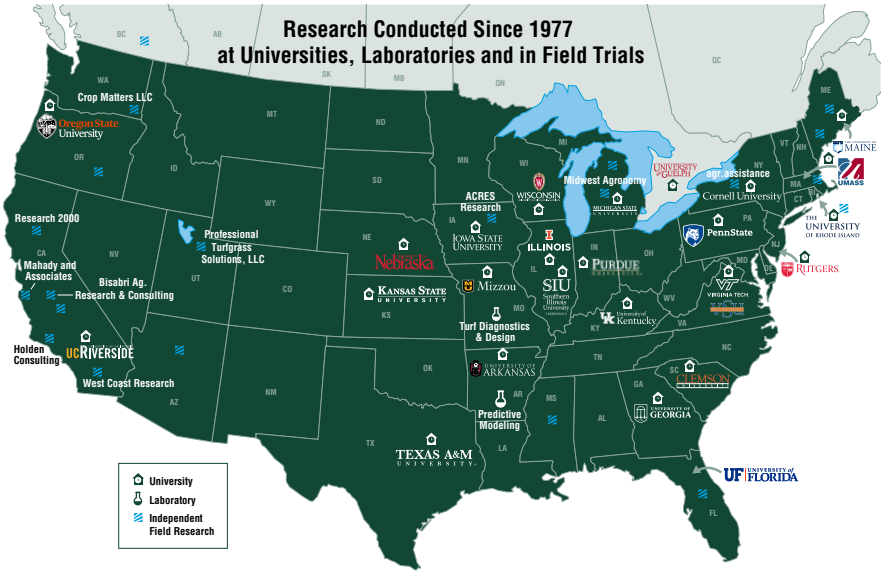


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**We Are the Industry Leading Providers of Liquefied *Ascophyllum nodosum* – Guarantee®, Guarantee® Hi K, Guarantee® Complex, and Stress Rx® Ag.**

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**Manufactured Sustainably in the USA**

# A Mid-Season Snapshot

By AgroLiquid's Agronomy Team

After soil testing, the nutritional plant tissue analysis is the most important tool to understand what is happening in the plant regarding the nutritional effects on its physiology. Only the plant analysis can identify the actual nutrient status of a plant.

## Best Use

The best use of a tissue analysis is for deciding the next steps of a nutritional program. It's also a great tool to help identify hidden deficiencies in the crop. Sometimes, the plant analysis is the best way to accurately diagnose what we are seeing in the plant, since it isn't always easy to identify the real cause of the problem. This is especially true when trying to identify a disease or a nutritional deficiency - or both.

## Mid-Year Report Card

It is important to keep in mind that the plant analysis is just a snapshot, at a point in time, of the nutritional status of the plant. Because plant physiology is dynamic, it is necessary to compare plant analysis results with what we expect to see on a plant during the particular growth stage we sampled. Of course, *how* dynamic the physiology of the crop is correlated with the type of crop, so what the plant analysis can tell us differs from one crop to another. A plant analysis is almost like a mid-year report card. How does your crop nutrition plan look, graded against the best in the class?

For intensive crops with a long season, such as greenhouse tomatoes or peppers, or open field chilies, eggplants or papayas, growers may prefer to do a plant analysis every month to ensure the plants are in shape to keep up the production.

In tree crops, we can take one to three plant analyses per year. A tissue analysis made before starting the season, in conjunction with a soil test, is the best way to determine the fertilizer program for the oncoming season. Sometimes a plant analysis before blossom can help us decide if we should do foliar application to assure the best yield, and a final analysis will tell us how well prepared the tree is for the dormant period and sprout time.

Row crops may only need one tissue analysis before the reproduction stage in order to determine if a fertilizer program is

in need of a correction. In this case, it is very important to do it on time before the next opportunity to apply a fertilizer.

If you are interested in a full review of your crop's nutrient trends throughout the season, you may want to pull a tissue sample weekly throughout the growing season. For this type of analysis, pull tissue samples from the same places in the field, at the same time each week. Nutrient levels will vary dependent on growth stage of the crop, weather patterns, and other variables.

### Sampling Methodology

Regardless of crop type or analysis schedule, it is very important to make a plan of how many tests will be completed during the season – with both plant and soil analysis. For the results of the tissue analysis to be useful, it is necessary to use a standard sampling methodology. The sampling procedure includes the following aspects:

1. Selection of the tissue to sample
2. Sampling and
3. Preparation of samples for shipment to the laboratory

An important note, when there is an abnormal area in the field, it is necessary to take plant tissue samples and have an analysis from this area separate from the remainder of the field. It is also highly recommended to do a soil test of the same abnormal spot, in order to have as much information as possible. Having analysis of the normal and abnormal areas will help determine the origin of what is happening, and concentrate efforts to solve the problem.

When sampling a field, it is critical the correct plant part and stage of growth be sampled, and of course the lab be clearly informed of this. The lab will calibrate their testing to those conditions, thus the correct identification of which nutrients are low or high depends on accurate information provided to the lab.

### Dial In Your Management Plan

It only takes about five minutes to properly pull plant tissues to send for analysis. A plant nutrient analysis typically costs about $20. The time and overall investment involved in acquiring this important mid-season snapshot of your crop is small, compared to the potential opportunity gained. Tweaking applications, finding unseen deficiencies, or pinpointing nutrient uptake trends can help dial in your crop nutrient management strategy for a better return on your fertilizer dollar. ■

# CAPCA

## *Dedicated to Supporting PCAs*

### MISSION & PURPOSE

*CAPCA's mission is to facilitate the success of the PCA and to represent our 3,000 members who provide pest management consultation for the production of food, fiber and ornamental industries of California.*

*CAPCA's purpose is to serve as the leader in the evolution of the pest management industry through the communication of reliable information.*

*CAPCA is dedicated to the professional development and enhancement of our members' education and stewardship which includes legislative, regulatory, continuing education and public outreach.*

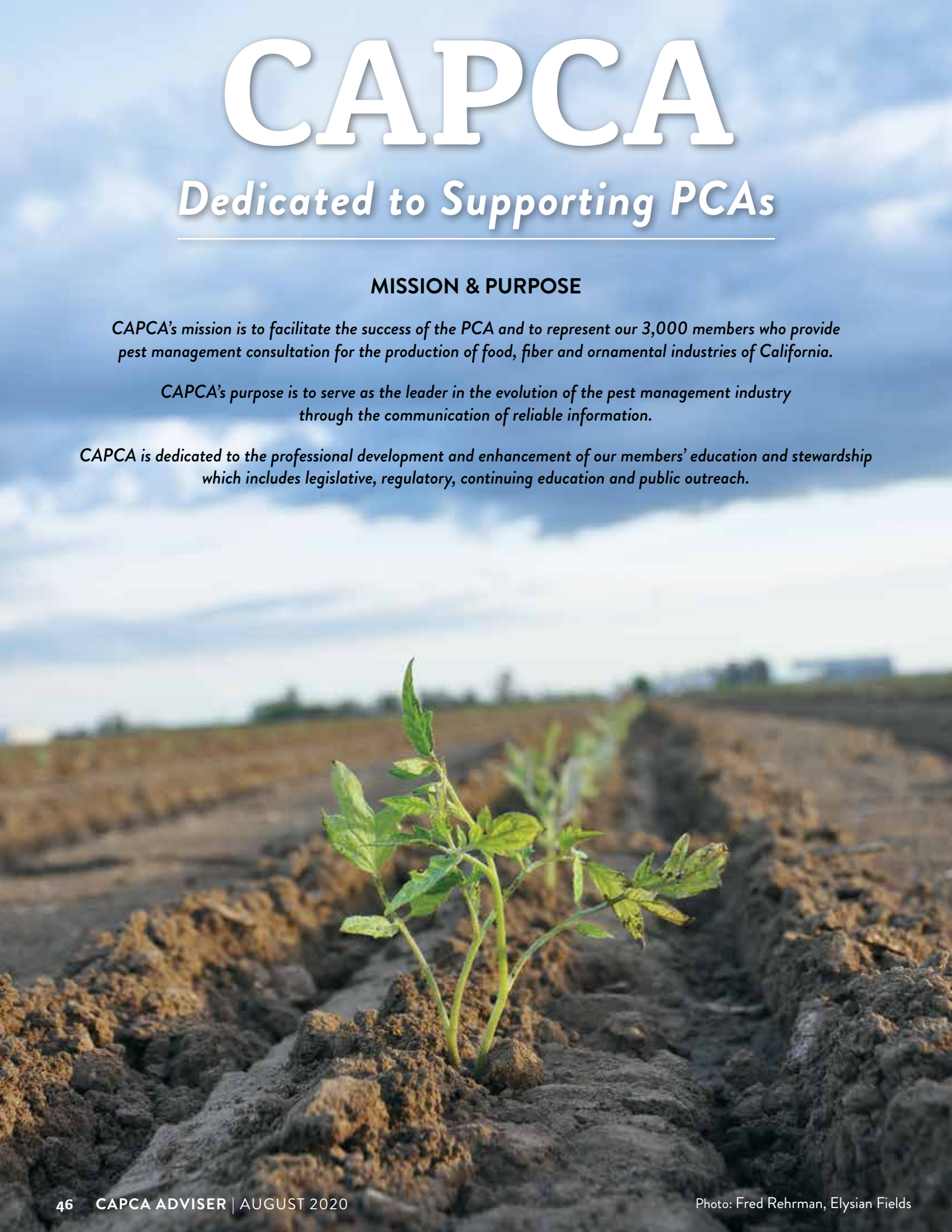



Photo: Fred Rehrman, Elysian Fields

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Unique mode of action valuable for insecticide resistance management

Highly specific mode of action won't harm nontarget organisms

Ideal for Integrated Pest Management (IPM) programs

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**NOTE:** Some of the following job opportunities are abbreviated postings. To view the complete posting, please log into your membership access on our website at https://capca.com/my-account/

## Territory Sales Manager - Remote; must reside Northern California

**ICL Group**

**Description:** This position is responsible for gaining incremental business in end-user accounts, leveraging the entire ICL Specialty Fertilizer product portfolio and the array of technical services, as well as managing and maintaining the base business in the assigned geography. Geography is defined as Northern CA, HI, Northern NV, UT.

**Qualification, Requirements & Duties:** The four main responsibilities include: prospecting, general sales activity, relationship building, communication, and compliant follow-up. Requirements include: bachelor's degree in Ag business, horticulture, or related science is preferred. Must reside in Northern California. At least 5 years of horticultural industry sales experience. Ability and willingness to travel overnight ~50% of the time. Capable of lifting at least 50 pounds. Valid driver's license and proven safe driving record.

**Apply:** Please visit https://careers.icl-group.com/job/Territory-Sales-Manager/650646200/ and click on the "Apply now" button to submit your resume.

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## Pest Control Adviser - San Joaquin Valley

**SRP Farms**

**Description:** The Pest Control Adviser will supervise the pest and disease management program for all crops we produce.

**Duties, Qualifications & Requirements:** Monitoring increase blocks, Almonds, Raisins, Pistachios, Walnuts, and Pomegranates for pest problems, including but not limited to insects, diseases, and weeds; monitoring plant development, nutrition and weed status; write pest control recommendations to address pest issues; work with management to maximize plant quality and yield; other technical tasks as assigned.

**Qualifications:** Bachelor's degree in Agricultural Science, Plant Science or related field strongly preferred and 3+ years' experience, or equivalent combination education and experience. Must have an active Pest Control Adviser (PCA) license with the following categories: A, B, D, E, and G; self-starter, independent personality, ability to multi-task and manage both short and long-term goals; excellent planning and scheduling abilities; bilingual English-Spanish preferred but not required. Experience with permanent crop. Must have a clean driving record. Work assignment may include days, nights, weekends and holidays.

**Apply:** Please forward resume directly to lstevens@srpfarms.com.

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## Area Citrus IPM Advisor - Lindcove REC, Exeter, CA

**UC ANR**

**Description:** The Area Citrus IPM Advisor is responsible for conducting research, extension and education programs in integrated pest management for arthropod pests of citrus with the goal of improving production and economic viability of citrus production in the San Joaquin Valley.

**Duties, Qualifications & Requirements:** A minimum of a master's degree in entomology or closely related field is required at the time of appointment. A Ph.D. in entomology is preferred. The position requires a combination of knowledge and experience in IPM of arthropod pests in citrus production, ability to address immediate issues/develop forward-looking programs having a positive impact on the environment and economic viability of the growers and the community, to work with regulators to develop policies related to citrus pest management, ability to acquire external funding.

**Apply:** To be considered, submit the Application Packet via UC Recruit by visiting: https://recruit.ucanr.edu by July 20, 2020.

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## Pest Control Adviser (PCA) – Hawaii

**Description:** Seeking an experienced PCA responsible for managing existing accounts and training a PCA trainee.

**Qualifications, Requirements & Duties:** Experience with citrus, coffee, potatoes, onions, and tree nuts. Assist customers with the proper product selection and use of products based on agronomic needs. The PCA should be capable of maintaining and developing profitable customer relationships.

**Apply:** Contact PCAJob2020@gmail.com, phone (559) 549-7700.

THANK YOU

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# CAPCA 2020 Sustaining Membership Levels

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|---|---|---|---|---|---|---|
| | $600 | $2,000 | $3,000 | $5,000 | $10,000 | $25,000 |
| Sustaining Member Acknowledgement on the CAPCA website and in each issue of the *Adviser* | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Subscription(s) to *Adviser* Magazine | 1 | 1 | 1 | 1 | 2 | 2 |
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| Subscription(s) to *Applicator Alerts* | 1 | 1 | 1 | 1 | 1 | 1 |
| 50% Ad Discount in *Applicator Alerts* | Business Card Size Only | Business Card Size Only | Business Card Size Only | Any Ad Size | Any Ad Size | Any Ad Size |
| ½ Page *Adviser* Ad (October issue excluded) | | ✔ | | | | |
| Complimentary Mailing Labels | | 1 | 2 | 2 | 3 | 5 |
| Early Reservation for Conference Exhibit Booth (Opens March 2020 to Bronze and April 2020 to non-members) | | ✔ | ✔ | ✔ | ✔ | ✔ |
| *Adviser* Advertorial* | | | 1 | 1** | 1** | 1** |
| Comp Conference Registration(s) | | | 1 | 2 | 2 | 3 |
| Conference Exhibit Booth Discount (Limit 4) | | | | $100 | $200 | $300 |
| One-Page Ad in *Adviser* | | | | | 1 | 3 |

* October issue fills quickly, first come, first served

** October issue guaranteed if booked by Feb. 2020

CAPCA

For additional information, contact Ruthann Anderson: (916) 928-1625 x7

# NEW ONLINE CONTINUING EDUCATION OPPORTUNITIES FROM CAPCA

CAPCA's mission is to serve as a leader in the industry and continue to provide quality education. In a changing world, that mission and our service to members hasn't changed. At the end of May we released 2 hours of online CE content free to 2020 Members (Active and Associate). ***Additional hours launched in June and are available for Active and Associate Members for FREE through the end of July. If you are a CAPCA Active or Associate member, all you need to do is log in!*** Look out for pricing and non-member access announcements in August!

https://capca.com/onlinece

At this time DPR has not amended their renewal deadlines or requirements, and we don't expect that to change. CAPCA advises members and licensees to plan to renew with the correct number of hours on the timeline set out by DPR: submit your renewal packet by November 1st to obtain your license by January 1st of 2021; all CE hours for those renewing in 2020 must be earned by December 31st of this year.

## Field Worker Safety Training

**1.0 DPR (1.0 Laws)**

Field Worker Safety Training is an interactive, click-driven course that includes some video segments. This course primarily focuses on the requirements of a fieldworker training course that would meet compliance with the California Code of Regulations. The course is designed for licensees with the content suited best for Categories D and O.

This course was developed in partnership with the Riverside County Ag Department. CAPCA would like to thank County Ag Commissioner Ruben Arroyo and his staff for helping transition this outreach to an online course.

## CAPCA Spring Online CE

**2.0 DPR (0.5 Laws, 0.5 Aerial, 1.0 Other)**

A three-part video series featuring speakers from CAPCA's 2019 Annual Conference. Sessions are 15 minutes, 30 minutes and 38 minutes, each followed by a quiz. (Please note: at this time, once begun, a session cannot be paused or returned to without losing progress.)

## Southern CA Invasive Species Update

**2.0 DPR (2.0 Other)**

A two-part presentation from Dr. Beatriz Nobua-Behrmann, Urban Forestry Advisor with UCCE, on the Invasive Shot Hole Borer, and from Dr. Mark Hoddle, Dept. of Entomology, UC Riverside, on the South American Palm Weevil.

Thank you to Dr. Hoddle and Dr. Nobua-Behrmann for their time and support to provide quality education to CAPCA Members.

## Laws and Regs Update

**1.0 DPR (1.0 Laws)**

Riverside Agricultural Commissioner Ruben Arroyo provides a statewide update on Agriculture and Pesticide concerns of Ag Commissioners: latest Active Ingredient issues such as 1,3-D mitigation, neonicotinoids and bee notification; PPE alternatives, 2ee reminders and agriculture/pesticide concerns for the Southern California Region.

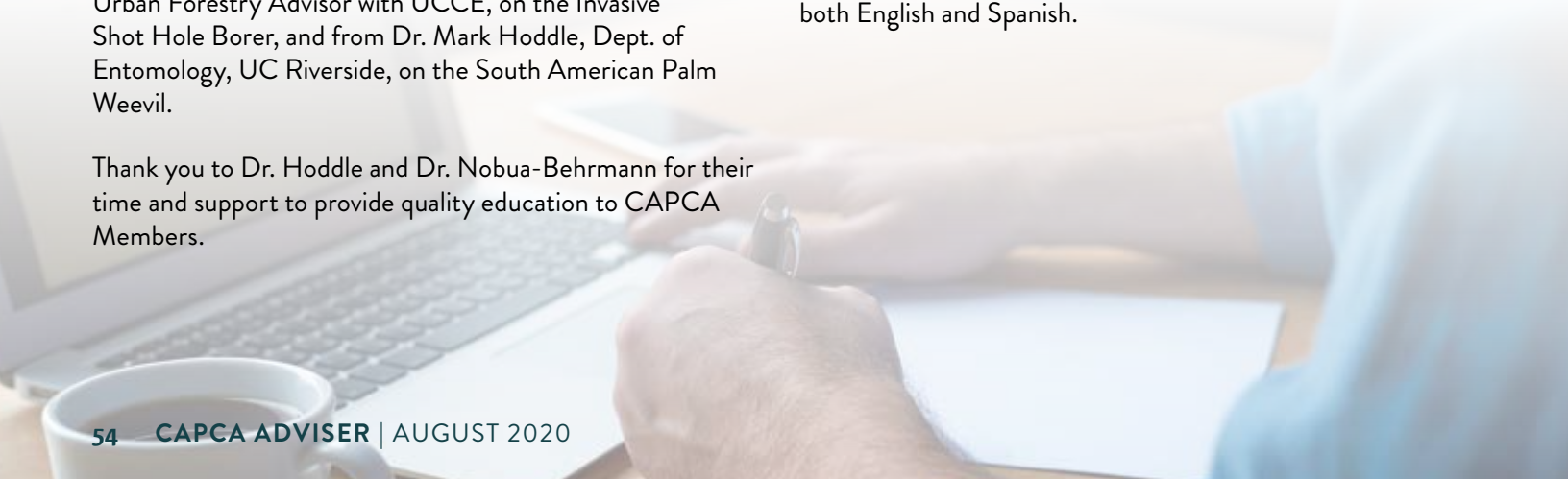
We thank Mr. Arroyo for his time and willingness to provide education to CAPCA Members.

## Paraquat Dichloride Toxicity, Label Changes, and Closed System Requirements

**1.0 DPR (1.0 Laws)**

Paraquat Dichloride: Toxicity, Label Changes, and Closed System Requirements is an interactive, click-driven course that includes some video segments. This course primarily focuses on understanding the toxicity of paraquat-dichloride, label changes and closed system requirements.

This course was developed in partnership with the Kings County. CAPCA would like to thank Mario Gutierrez, Elvis Martinez and Jimmy Hook for helping transition this outreach to an online course. Thank you to our course sponsor Syngenta for supporting the publication of this education in both English and Spanish.



# Kern Chapter Awards Scholarships

This May, the partnership between Southern Valley Chemical and the Kern County chapter of CAPCA awarded a number of Thomas C. Griffin Memorial Ag Scholarships, to Kern County high school and college students. There were four $1,000 scholarship winners: Annie Filkins, a Biology major at Grinnell College; Yesenia Ventura-Ramirez, a Ag Business major at CSU Fresno; Jared Flores Retijin, a Plant Science major at Bakersfield College; and Sugar Gupta, a Biology major at UCLA.

It is with great pleasure that we support these Kern County students who are pursuing their goals of helping our industry in the very near future.

-Roger Williams, Kern County CAPCA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Coragen® insect control does more to protect the quality and optimize the yield of your vegetable crop. Powered by Rynaxypyr® active, it stops insect feeding within minutes of application, and its long-lasting residual lasts for up to three weeks. All the more reason to make Coragen insect control part of your integrated pest management program.

Coragen insect control is one of 40+ FMC products that qualify for the Product Financing of the FMC Freedom Pass program.

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