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California Association of Pest Control Advisers

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[1]Source: BRANDT Field Trials 2016-2018

CAPCA
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Did You Know?

Did you know less than 10% of your dues goes toward hours tracking? While hours tracking may seem like the most tangible of member benefits for PCAs, there are so many benefits and services that CAPCA funds with your dues each year. If you haven't been following along, CAPCA staff have been highlighting new benefits and changes in each Adviser issue. This month printing your Official Cert from the CAPCA Member log in is highlighted on page 16. As the CAPCA team continues to build new value and benefits for our members, we want to remind you that your dues go beyond the value of your official cert and support the activities of the state office. In addition, your dues support Chapter programs like the Chapter Dividend CE program this year which provides Chapters the opportunity to release online CE at CAPCA.com and develop an income stream at no cost to the Chapter while in-person events continue to be impacted by COVID.

During CAPCA Board meetings and leadership discussions the most frequently discussed item is Advocacy. A CAPCA member recently told me, "Being a member of CAPCA gives me a seat at the table for every conversation a PCA should be in." CAPCA maintains your seat at the table in regulatory discussions, with County Ag Commissioners addressing local and statewide issues, through mentoring discussions with the next generation of PCAs yet to join your ranks and so much more.

This past quarter you:

- Worked with Farm Bureau and various stakeholders to provide feedback and concerns to DPR on the proposed Kern County notification program.
- Sparked discussion around the lack of testing available to PCAs which resulted in the PCA exams being re-opened at the Sacramento DPR Office. With over 200 prospective PCAs in the queue, it will take time to get everyone an exam, but exams are back underway with ongoing discussions on how to move forward with virtual exams.
- Supported meetings with stakeholders on how best to build a coalition and talking points around the Mill Tax Assessment (see page 14 for a recent update on this evolving issue).
- Sat on a number of committees including the Alliance of California Farmers and Ranchers alongside grower groups to provide ongoing support for the growers you serve in action as well as through financial collaboration.
- Worked with BeeWhere stakeholders to finalize the first pass through integration from a rec writing program to BeeWhere for more streamlined bee checks during bloom (see page 32 for more details).

We are committed to CAPCA membership being an investment in you and your career.

Ruthann Anderson, Editor
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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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Anti-vaxx is Anti-pesticide

Patrick Dosier, CAPCA Chair; patrick.dosier@gmail.com

The astonishing speed of development, the lack of long-term studies, and the novel nature of the Covid-19 vaccines are valid reasons to raise questions. To believe that the scientific community, or the pharmaceutical industry, are acting with malice is irrational and dangerous. PCAs are responsible to advocate on behalf of sound science and balanced risk.

The author receives the Pfizer-BioNTech mRNA vaccine as a Phase 1B agricultural worker.

The vaccines are safe. Questions are healthy. Conspiracies are a delusion.
Vaccine usage began way back in 1796, when a British doctor, named Edward Jenner found that milkmaids were immune to smallpox because they had been exposed to less virulent cowpox. Mercifully, the world is now free of this devastating disease. As the world has subsequently learned, vaccines are one of the greatest medical achievements in human history.

The first two Covid-19 vaccines are also medical achievements. They are the first mRNA vaccines approved for widespread use as anti-viral immunizations. mRNA technology has been studied for decades and has already been used clinically in cancer immunotherapy.[10] The vast majority of physicians are convinced that these vaccines are safe.[13] The conspiracy theorists on the Internet cite evidence that is misconstrued, or that are statistical outliers. This is how science works: we disregard obvious outliers. People with concern about the general safety, efficacy and the gaps in Operation Warp Speed's testing should bypass the Internet forums and consult their family doctor.[3,4]

Not long after Dr. Jenner's momentous discovery, the anti-vaxx movement began.[9] Then, as today, the foundation of the so-called movement consisted of self-serving con artists. They were peddling "all-natural cures" or making a buck off of sensationalized news.

Today's anti-vaxx message is being fueled by three groups: those who profit from "natural remedies",[10] those who profit from hyped media attention and, notably, the psychological operations units of foreign governments.[1,2,8] This latter group is realizing a golden opportunity to undermine the stability of the United States by creating, promoting, and sponsoring anti-vaxx propaganda designed to keep our economy under lockdown and to sow conflict.

All three prey on the fear, uncertainty, and doubt of concerned citizens. Fear-based messaging is highly effective. They also exploit the fact that convincing someone not to take action is much easier than convincing them into action.

Vaccination is not a panacea. Herd immunity is the goal.
We are exposed to loads of media which is critical about the efficacy of the vaccines, or which overexaggerates the extremely low risk of allergic reaction. It is true that the vaccines are not 100% effective. It is also true that the few individuals who have caught Covid-19 after vaccination have universally experienced mild symptoms.[3] Vaccinated people will not overrun our ICUs. Most will not get sick at all.

As of this writing, the misinformation du jour is that the vaccine can lead to infertility in women. Women are encouraged to "Wait and see." This infertility risk has been soundly debunked by the medical community,[14] and it makes no sense scientifically once one understands how the vaccines work.

The real problem is not what happens to the individual who is reluctant to get the vaccine. Yes, a young person is very likely to survive Covid-19. The problem is that this young person will continue to spread the virus – too often to loved ones who may be less resilient to the infection. As the virus spreads through a community, it will eventually find its most susceptible hosts.

Viruses also mutate as they spread. Thus, the chance of mutations goes down when more people are immune to infection. If a virus mutation becomes dominant within a community, that is typically because it is more virulent (that is, it is more easily transmitted

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from one person to another). So, the faster we achieve herd immunity (which occurs when at least 70% of people are immune), the faster we can eliminate community spread and can close the window on the possibility of mutation into more virulent strains.

Children will not be receiving the Covid-19 vaccines in 2021, so about 20% of the population will not be vaccinated. This means that the required population percentage for herd immunity is set that much higher because the 70% immunity threshold refers to the entire community, including children who are not yet being vaccinated.

Anti-vaxxers are also largely anti-pesticide and anti-GMO. Do not give them an audience.

Yet another surprise from this pandemic is the prevalence of anti-vaxx rhetoric in our agricultural community. The pandemic has been politicized from the start. The government has repeatedly botched the response and failed to communicate effectively or honestly. Do not let these facts prime you for misinformation.

Governor Newsom is receiving anti-vaxx and other unscientific messaging from this segment of his base, and possibly from his own family.[6] Now, similar groups are advocating the fraudulent use of the apiary notification system,[7] and they are pressuring DPR to launch a public-facing statewide pesticide notification program, in service of their anti-pesticide agenda.

The same people peddling "natural remedies" and over-hyped media coverage are profiting from absence marketing. Consumer risk from pesticides[12] and GMOs[5] have been consistently debunked, yet unscrupulous firms continue to profit from fear-based marketing which promotes the absence of something.

Preying on the fear of some unfounded, or infinitesimally small, risk is the strategy of the anti-vaxx, anti-pesticide and anti-GMO groups. The total elimination of risk is not possible, and any attempt to do so will come at great cost to society.

Giving a platform, being a receptive audience, or lending any credibility to anti-vaxx rhetoric will only mean that these groups are more effective when they return their attention to agriculture.

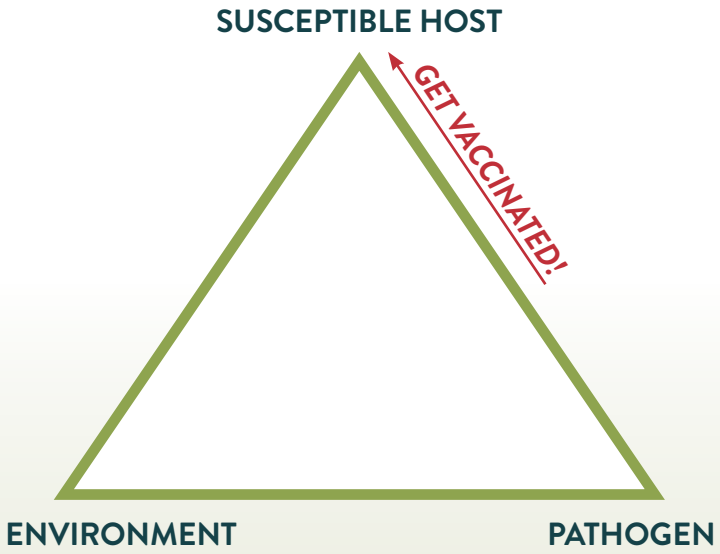
As a PCA, you have a duty to advocate for vaccine acceptance within your community.

Actually, you have two responsibilities as a PCA:

1. Get vaccinated. Don't be a spreader. Don't get rogued.

2. You are a voice of sound science and balanced risk within your community. As a plant doctor, you understand the principles of disease management. Patiently explain the benefits of vaccines to people who are hesitant. Share why you decided to be vaccinated. Use an analogy from your experience on the farm. Challenge conspiracy theorists by asking questions that force the person to verbalize untenable aspects of their position. People are listening. Hesitant people will make decisions based on the voices they hear around them. Your duty is to be a voice of reason and an advocate for community health. ■

"The Cow-Pock—or—the Wonderful Effects of the New Inoculation!" Illustration by James Gillray (1756-1815), pub. 1802. Wikimedia Commons



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Meet Your Directors

NIC VANHERWEG
Chapter: Central Coast
Employer: Arysta Lifesciences
Education: BS Crop Science, Cal Poly SLO
Year of PCA License: 2009
Additional Licenses/Certificates: QAL, CCA
Specialties: vegetables, berries

JACKIE TABAREZ
Chapter: Central Valley
Education: BA Ag Studies, CSU Stanislaus
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Additional Licenses/Certificates: PAC
Specialties: tree nuts, vines

MICHAEL TERRY
Chapter: Desert Valleys
Employer: M Terry Ranch
Education: BS Agribusiness, Oregon State
Year of PCA License: 2012
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Specialties: vegetable crops, farm technology

ADAM TAVARES
Chapter: Fresno-Madera
Employer: ADAMA
Education: BS Crop Science, CSU Fresno
Year of PCA License: 2009
Add'l Licenses/Cert's: QAL, Water Distrib. #1
Specialties: permanent crops, row crops

MIKE HAUPT
Chapter: Kern County
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Year of PCA License: 2017
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Specialties: IPM, orchard mgmt, almonds, pistachios

SEAN MORELOS
Chapter: Monterey Bay
Employer: Nutrien Ag Solutions
Education: BS Cal Poly SLO
Year of PCA License: 1997
Additional Licenses/Certificates: QAL
Specialties: lettuce, grapes, strawberries, cole crops

ANNA PAGE
Chapter: NorCal
Education: BS Ag Business, CSU Chico
Year of PCA License: 2014
Specialties: tree crops, rice

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– Kevin Davies,
Tehama Angus Ranch

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Meet Your Directors

DAVID DRUCKER
Chapter: San Diego
Employer: Nutrien Ag Solutions
Education: Cal Poly SLO 1982, Ag Science
Year of PCA License: 1983
Additional Licenses/Certificates: CCA
Specialties: wine grapes, avocados, citrus, strawberries, landscape ornamentals

LEONARD DUNN
Chapter: San Francisco Bay
Employer: City of Sunnyvale
Education: UC Davis
Year of PCA License: 1976

EDGAR TUNA
Chapter: SoCal
Education: Agriculture Engineer
Year of PCA License: 1975
Specialties: nursery, greenhouse, turf, landscape, golf, irrigation

PAUL SQUIRES
Chapter: Sutter Buttes
Employer: Squires Ag Consulting, Inc
Education: BS CSU Chico
Year of PCA License: 1994
Specialties: rice, tomatoes, alfalfa, corn, sunflowers, seed crops

COREY THOMPSON
Chapter: Tri-County
Employer: Basin Fertilizer
Education: BS CSU Chico
Year of PCA License: 2009
Add'l Licenses/Cert's: NW CCA, OR PCA, QAC
Specialties: potatoes, alfalfa, Timothy hay, small grains, forage, range, pasture

DENNIS FULLER
Chapter: Tulare-Kings
Employer: Adama
Education: Cal Poly SLO
Year of PCA License: 2013
Specialties: walnuts, almonds

PATRICIA DINGUS
Chapter: Ventura
Employer: YARA
Education: Cal Poly SLO
Year of PCA License: 2009
Additional Licenses/Certificates: CCA, QAL
Specialties: vegetables and berry production

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MANZATE® PRO-STICK™ FUNGICIDE

It's Never Enough:
The cause-driven abuse of the mill tax

George Soares, Kahn, Soares & Conway

Many in agriculture but few in urban settings know that all pesticides, including those used for pet care, disinfectants and household cleaners commonly found under the kitchen sink pay an extra "mill tax" on top of prescribed state and local sales taxes, for products needed to grow safe and healthy food and to ensure that homes and hospitals are sanitized to counter the spread of COVID.

A mill is the equivalent of one-tenth of one cent per dollar of pesticide sales which doesn't sound like much until you do the math. Historically, the tax was 8 mills but has grown to 21 mills over the decades, which now annually raises tens of millions of dollars. These funds, along with other fees paid by chemical companies, are used by the State Department of Pesticide Regulation (DPR) to register pesticides, ensure safe use, and partially fund the work of county agricultural commissioners.

Now DPR has hatched a plan that will more than double the tax to 45 mills for the most restricted use pesticides and cost pesticide users an additional $45 million each year. An alleged justification by DPR is that reserves are running low so pesticide users need to write bigger checks. Closer to truth may well be that government is attempting to force consumers away from specific classes of chemicals, whether scientifically justified or not.

Whatever the motivation, DPR is sending a mixed message and undercutting its very existence in the process. DPR correctly asserts that it has the highest regulatory standards in the United States, which should shift the burden of proof to groups claiming otherwise and threatening lawsuits. Instead, DPR has a lengthening record of apologizing to accusers who can't be appeased and seemingly with each apology users are collectively more vulnerable to pests and diseases.

According to DPR, products it registers for use in California are safe, so long as used in accordance with label directions. Why then did DPR sanction the unprecedented banning of a specific chemical used in most other states and essential to destroying harmful pests and diseases in California? How is it that science used by DPR to establish product safety is ignored when the product is banned with no effective alternatives in the marketplace?

There is evidence as well that DPR is neglecting its duties while expanding its focus into social responsibility, using questionable authority. On the duty end, DPR is delinquent in licensing various professions subject to its authority. On the expansion end, DPR is pushing a mill tax increase to hire several dozen personnel to engage in nebulously phrased activities such as enhancement of community engagement and facilitating more sustainable pest management.

DPR has taken upon itself to "provide a market signal to pesticide users to transition to less harmful chemicals in favor of other tools." Ignored in this proposed action is the reality that fumigants, for example, are required by statute for importing and exporting numerous products to and from California.

What to do? Perhaps a good starting point would be critical thinking and more informative communication before venturing into the unknown under the guise of benefitting the public interest. ■

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Membership Updates

Crystelle Turlo

Thank you for being a CAPCA member. As we move further into 2021, we would like to update and remind our members of some recent changes that we have made in the last year.

Official CE Certificates

All Active members now have access to view and print their Official CE Certificate from their CAPCA.com account. If you are not able to access your hours after logging in or if you do not have a CAPCA.com account, please request assistance at support@capca.com.

Un-official CE Certificates

Un-official CE Certificates will not be mailed in 2021. Active members have access to their continuing education hours at CAPCA.com. If you have not renewed your CAPCA membership for 2021, you will not be able to view your hours.

Membership Stickers

Due to the CAPCA staff continuing to work remotely, membership stickers will no longer be sent. After renewing your dues online at CAPCA.com, members will receive an email confirming their renewed membership. If you need confirmation of payment, please let us know.

Updating Email Preferences

At CAPCA, Membership is our focus, and we would like to make sure that our members are receiving important communications. If you are not receiving our emails, we ask that you please consider updating your communication settings so that you are not left out of updates and reminders that we send out digitally. Updating your preferences is easy! After logging into your CAPCA.com account, from the dashboard, you will click "Membership" from the menu on the left. At the top, you will have the Email Preferences box. If it is already clicked, you are not receiving emails from CAPCA. Un-click the box to start receiving digital updates directly to your inbox.

Continuing Education

CAPCA has worked tirelessly to create a robust online CE catalog at CAPCA.com. If you are looking for additional hours – including CCA only hours, we invite you to explore our educational offerings. We are proud to provide hours that are available on-demand at your convenience.

Finally, if you have taken a CE course and it is not showing up on your Official CE Certificate, there may be a couple different reasons for this:

1. The sponsor of the continuing education course you took has turned in the hours for that course, but you do not see those hours on your Official CE Certificate. To resolve this issue, confirm the course hours you took were reported by contacting the sponsor. If they have, we ask that you give us a call at CAPCA and let us know. We will research why you did not receive credit on your Official CE Certificate and work to fix the issue.

2. The sponsor has not reported the Continuing Education hours. For this instance, reach out to the sponsor and simply ask them to turn in their hours. Unfortunately, some sponsors are not turning in their hours because they do not know how or they do not understand the value of reporting their hours to the industry.

If the meeting sponsor advises that they do not know how to report the hours, let us know so that we can offer assistance and information on the process. If a sponsor chooses not to voluntarily report their Continuing Education hours, you will need to track the CE hours that you took with that sponsor and submit a verification of attendance form with your DPR renewal for those hours. Note - CE meeting sponsors are required to provide all attendees with a verification of attendance form. To eliminate this extra step, we encourage all PCAs ensure that any Continuing Education hours that they take will be reported by communicating directly with the sponsor. This will allow for all your hours to show up on your Official CE cert so that you do not have to go through the long and difficult process of tracking one or two courses during the two years you are accumulating hours.

We would like to thank each one of our Members for their support as we continue to create, develop, and improve your benefits. ■

Photo: J. McNutt

Photo: "Monitoring the Harvest," by CAPCA member, H. Lauchland

Ag Commissioner Profile: Chrisandra Flores

By CAPCA Staff

Sacramento County's Agricultural Commissioner and Sealer of Weights & Measures, Chrisandra Flores, has served in her current position since August 2019. She began her service with the County in January 2017, as the Chief Deputy Agricultural Commissioner. Prior to her arrival in Sacramento, she served as the Nevada County Agricultural Commissioner and Sealer. Her career in the industry began in 2006 with the El Dorado County Agricultural Department after working the preceding summer as a seasonal employee conducting noxious weed abatement in El Dorado and Alpine Counties. She says that she knew immediately she wanted to become a permanent member of the department, "The programs conducted by the County Agriculture Departments are so varied and unique that every day is different. I was always drawn to working in the field and serving the public."

Flores attended Santa Rosa Junior College to complete her lower division courses before transferring to the University of California, Santa Barbara where she graduated in 1993 with a Bachelor of Arts Degree in Environmental Studies, with an emphasis in Natural Resource Management. Her early work experience included working as a Park Aide for Sonoma County Parks, as a Certified Utility Arborist for Western Environmental Consultants, Inc., as a Certified Arborist for TruGreen Land Care, and as an independent Consulting Arborist. She was an International Society of Arboriculture Certified Arborist for 13 years as well. Reflecting on her experience Flores says, "It was fitting that I would eventually stumble upon a career with the County Ag Department where I loved the purpose of promoting and protecting agriculture and the natural environment. I have recently come to learn that agriculture is in my DNA. My great-great grandfather, Francisco Flores, was born in Sonora Mexico and immigrated to California in 1876 at the age of 19, to become a farmer in San Luis Obispo. And his son, (my great grandfather Alonzo) was a farm laborer, for many years. Little did he know that his great granddaughter would become an Agricultural Commissioner who would strive to assist and protect the farming community."

In her role as Agricultural Commissioner, Flores works under the jurisdiction and direction of the County Executive, the Board of Supervisors, the California Department of Food and Agriculture, and the Department of Pesticide Regulation. She explains, "The Agricultural Commissioner works in conjunction with various federal, state, regional and local agencies and is responsible for the enforcement and implementation of federal, state, and local rules and regulations designed to protect people, the environment and the agricultural industry." With all the different agencies involved and levels of regulation administered by her department, the role

of Agricultural Commissioner is often nuanced and complicated. One of the many challenges in her job is staying up-to-date on the relevant information that either currently affects agriculture or may affect it in the future.

Specific to the future of agriculture in Sacramento County, Flores is concerned with the encroachment of the urban interface into agricultural areas. "As the need for housing, jobs, services and infrastructure increases, the agricultural land closest to existing urban areas is sold by aging farmers to developers and is paved over," she says. "I am deeply concerned about the future existence of the agricultural industry in Sacramento County. The County does not have strong enough protections in place to prevent the continual conversion of prime agricultural land to urbanized uses. The conversion will continue until such time as measures are implemented to protect agricultural land in perpetuity." This may be a surprising concern to many who associate Sacramento with a large urban center, not agriculture. But, although the County is the 6th most populated county in the state, Sacramento County farmers grow agricultural commodities on over 217,000 acres of land, most consisting of prime agricultural soil. Citing the County's top agricultural statistics, Flores explains, "Sacramento County is home to over 35,000 acres of grape vines. Wine grapes are the highest valued commodity grown in the County with a gross production value in 2019, of over $175 million dollars. Market milk, produced from family-owned dairies, was Sacramento County's

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second highest valued commodity in 2019 at a gross production value of over $52 million dollars. The total gross production value of all agricultural commodities produced in the County in 2019 was close to half a billion dollars!"

Other concerns to the County's agricultural sector include the introduction of non-native, invasive pests and diseases as well. Flores' department conducts year-round trapping for Asian Citrus Psyllid, and seasonal trapping for non-native fruit flies, Japanese beetles, gypsy moth, light brown apple moth, glassy-winged sharpshooters, and European grapevine moth. "It is not unusual or unexpected when we intercept an invasive pest or disease. Sacramento County has a current infestation of Japanese beetles in two separate areas of the county, which will be undergoing an eradication program in the spring."

Asked about her relationship with the industry, CAPCA and local PCAs, Flores says that it's marked by collaboration. "Two of our Senior Ag Biologists, who work closely with the industry in the South County, have worked for the department for over 20 years each. They have long standing relationships with growers, PCAs and CAPCA members who conduct business in the area. It is our mission to disseminate relevant information, educate, and communicate as efficiently and effectively as possible, so as to ensure the safe use of pesticides and the health and safety of our farmers, farm workers, applicators, and residents." She notes that at the onset of COVID-19, her department added a lot of resources to their website and transitioned to conducting business electronically where possible, such as with business registrations and the issuance of restricted materials permits. She says, "I'd just like to remind the industry, CAPCA members and PCAs that my department is here for you, anytime! We love getting questions from you and assisting where we can. We are here to serve you and the more you reach out, the better our collaboration will be." Flores speaks highly of the work that her department does and is proud of the service they provide to the community. "I can honestly say that I work with the best group of people that I have ever worked with throughout my working career. Every single employee, of the Sacramento County Agricultural Commissioner's Office, is a dedicated public servant who cares, tremendously about what they do and who they serve. We truly have a wonderful team, so please don't hesitate to reach out."

Flores herself is also personally dedicated to seeing positive change in the community that she serves: "When I can influence a positive change or create something that has a positive effect on people, I am internally rewarded. What is even more rewarding is working collaboratively with others to better our small world, in some fashion." Asked about a specific highlight in her career, she is excited to share how as Nevada County Agricultural Commissioner she initiated and created, in conjunction with the Nevada County Resources Conservation District Executive Director, an "Ag in the Classroom" program for the county and an annual Nevada County Farm Day for elementary school students. "We modeled the program after El Dorado County's distinguished program, and it was a success! The agricultural community and school districts embraced the concept wholeheartedly. Watching the 1st through 3rd graders, learn about agriculture and their natural environment, with hands-on venues and activities, while admiring the industry champions as they proudly demonstrated what they do on a daily basis, was a real highlight of my career." ■

(L-to-R): Senator Galgiani, Debbie Thompson (retired Deputy Ag Commissioner), Mike Lao (Sac Co Diversified Hmong Farmer), Chris Flores, and Mike Lao's mother. The Senator distributed N95 masks to Mr. Lao, and the group toured Lao's production site.


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5.0 Total DPR Hours (2.0 Laws & 3.0 Other)

CCA Hours pending as of 2/16/21

CE Accreditations will be updated as they are approved.

Label Update

1.0 Laws DPR Hours | CCA Hours Pending

Piercing Sucking Insects and Their Control

1.0 Other DPR Hours | CCA Hours Pending

James A. Bethke, Floriculture & Nursery Advisor Emeritus, UCCE

Disease Management

1.0 Other DPR Hours | CCA Hours Pending

"Improved Nutrition - Part of IPM for ACP/HLB"

Steve Petrie, Ph.D., Yara Dir. of Agronomic Services

"Biochar IPM"

Robert Masson, University of AZ, Yuma County Cooperative Extension

SoCal CAPCA Update

1.0 DPR Hours (0.5 Laws & 0.5 Other) | CCA Hours Pending

"Glyphosate Alternatives & Organic Herbicides in Avocados"

Sonia Rios, Area Subtropical Hort. Advisor, UCCE Riverside & San Diego Counties

"Riverside County Ag Commissioner's Updates"

Ruben Arroyo, Riverside County Ag Commissioner

Vertebrate Control

1.0 DPR Hours (0.5 Laws & 0.5 Other) | CCA Hours Pending

Niamh Quinn, South Coast Research & Extension Center

Fighting Disease Pressure Through Plant Nutrition

CCA Hours Pending (No DPR Hours)

Abe Isaak, AgroLiquid Field Agronomist

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Licensed PCAs must join as Active Members

- ☐ 2022 = $160.00
- ☐ *2021 = $160.00
- ☐ 2020 = $210.00

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Non-PCAs - printout not provided

- ☐ 2022 = $45.00
- ☐ 2021= $45.00

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

- ☐ 2021 = (no fee)

* ***A late fee of $50.00 will be charged for any 2021 Active Membership paid after December 31, 2021.***

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- ☐ Grapes
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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.

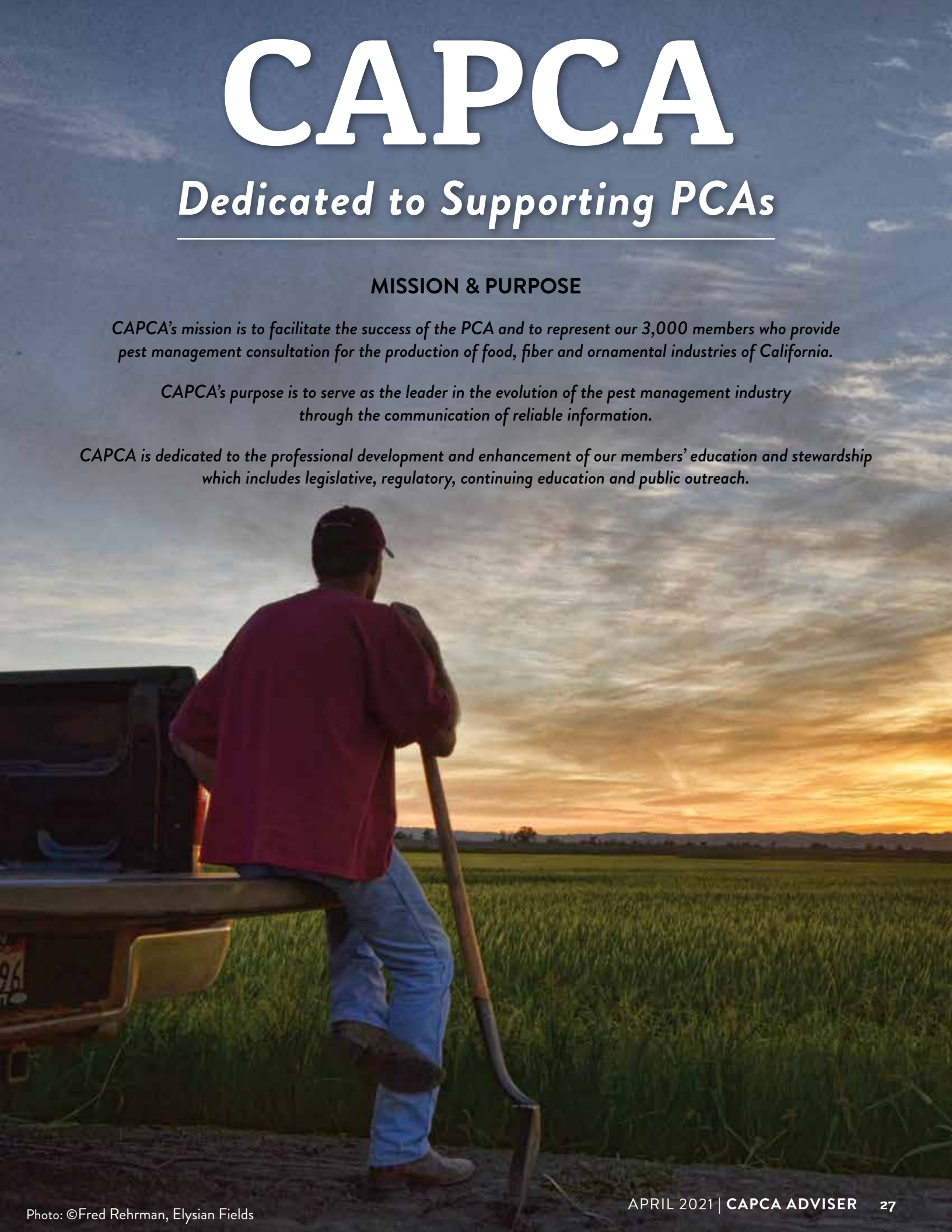

Photo: ©Fred Rehrman, Elysian Fields

Young Orchard Weed Management

Weeds in young orchards compete with trees for orchard resources such as sunlight, water and nutrients. This can lead to reductions in growth and future yields. If weed stands are allowed to mature, not only are they harder to control via chemical and mechanical methods, but they can also create cover for small rodents such as gophers, which can damage tree trunks, root systems and irrigation systems.

Weed management can be particularly difficult in newly planted and young orchards because rapid weed growth is accelerated by actions necessary to establish and grow trees, including frequent irrigation and fertilizer inputs, as well as abundant sunlight hitting the orchard floor due to small tree size. In addition, weed control is challenging because tree trunks may still be green and sensitive to contact and systemic herbicides, which can cause severe trunk damage and canopy stress (Fig. 1). Finally, while weeds are present in every orchard, there is variation in weed species composition and density, especially in young orchards. For these reasons, weed control can be one of the most obstructive facets of establishing a new orchard.

Figure 1. Image on the left shows the tree trunk of a second leaf almond just after the removal of a nursery carton. You can see the “hardened-off” trunk above the yellow line and the tender green bark below the yellow line where the nursery carton used to be. The image on the right shows the necrotic tissue (dark brown) and trunk gummosis observed 5 weeks after a treatment.
Glufosinate + Glyphosate (1.5 + 2.75lbs/ac)

Post-emergent materials are often used for control of weeds in newly planted trees. Contact products (or burn-down herbicides) eliminate the leaves and green stems of plants that they contact, while systemic herbicides enter the plant and move to the actively growing tips of the plants they contact. Post-emergent herbicides require repeated treatment to control weeds throughout the season, and careful timing of these short-lived products is necessary to control weeds in young orchards. Caution should be used when applying either form of post-emergent materials. Crop safety is usually achieved by prudent application, being extra cautious with windy conditions, spray rig height, and nozzle selection. When selecting a post-emergent herbicide program for young orchards keep in mind that some label restriction may apply (Fig. 2)

california almonds®
Almond Board of California

Post-emergent Herbicides Registered for Young Orchards:

Common Herbicide Name	Notes from Labels
Carfentrazone	Not OK on green bark
Clethodim	Only for non-bearing
2, 4-D	OK to use after 1st leaf
Diquat	Only for non-bearing
Fluazifop-p-butyl	
Glyphosate	Not OK on green bark
Glufosinate	Not OK on green bark
*Paraquat	Not OK on green bark
Pyraflufen	Not OK on green bark
Saflufenacil	
Sethoxydim	

Figure 2. Post-emergent herbicides labeled for young orchards including applicable label restrictions.
* Additional 2019 EPA "USE RESTRICTIONS" to consider. For more information:
https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=39297

An underutilized tool in young orchard weed management is the application of pre-emergent products. Pre-emergent herbicides control weed seedlings as they germinate, halting the development of seedling shoots and roots, ultimately preventing establishment. Pre-emergents' bind to organic matter and soil to limit leaching and mobility once applied to provide residual control. Clearing berms of leaf litter and skeletal remains of any resident vegetation from last season will help evenly distribute and incorporate the pre-emergent for optimal control. Most of these products require between 0.25-0.75 inches of rain/irrigation for proper incorporation and effectiveness. Applications are usually made in winter for the control of cool season species, but these herbicides can provide residual control throughout a greater portion of the year, if properly timed and applied. By targeting follow-up applications that take advantage of California's late spring rains, residual control can be extended into the summer months for the control of warm season species. When selecting a pre-emergent herbicide program for young orchards, keep in mind that label restriction, such as "time of first use," may apply (Fig. 3).

Pre-emergent Herbicides Registered for Young Orchards:

Common Herbicide Name	Notes from Labels (Time of first use)
EPTC	Well-established
Flumioxazin	Established for 1 season, needs carton
Indaziflam	Established for 1 season
Isoxaben	
Norflurazon	18 months
Oxyfluorfen	
Pendimethalin	
Oryzalin	
Penoxsulam	9 or 15 months (soil)
Rimsulfuron	Established for 1 season

Figure 3. Pre-emergent herbicides labeled for young orchards including applicable label restrictions.

Source for pre- and post-emergent graphs:
Jarvis-Shean, Katherine, et al. Young Orchard Handbook. UC Cooperative Extension Capitol Corridor, 2018.




Legislature keeps focus on pesticides, despite limited hearings

Brad Hooker, Agri-Pulse

While the pandemic and reopening schools have taken center stage at the start of the Legislature's 2021 session, lawmakers have not lost sight of longstanding environmental and social justice goals.

Much of the focus in the agricultural community is on an ambitious budget proposal by the Department of Pesticide Regulation to overhaul the mill assessment for pesticide sales. The proposed tiered structure would levy higher fees on the more toxic pesticides, based on federal signal words.

The nonpartisan Legislative Analyst's Office has recommended higher fees and a more aggressive timeline to backfill the department's budget deficit sooner and support expanded programs in air monitoring and community engagement. The Western Agricultural Processors Association has argued fumigants would "unfairly be assessed the most" under the plan. A broad agricultural coalition is strongly opposing the measure.

For the second year in a row, Bay Area Assemblymember Rebecca Bauer-Kahan has begun the session with a controversial measure proposing more pesticide restrictions. Her new bill would ban seeds treated with neonicotinoids, the second attempt to prohibit this type of seed recently. The Department of Pesticide Regulation is also looking into the issue after rejecting a petition by environmental groups.

Bauer-Kahan last year proposed to increase fines for spray drift violations by fivefold. That measure lost momentum as the pandemic stalled legislative actions.

"Improper application of pesticides can cause significant harm to agricultural communities and their workers," commented Bauer-Kahan on the bill. "Illegal uses of pesticides have caused numerous illnesses to farmworkers in the fields and have severe public health concerns for families living adjacent to the fields being treated."

Bauer-Kahan sits on the Assembly Environmental Safety and Toxic Materials Committee, which will have an outsized role in debating pesticide-related policies this year, since debates in subsequent hearings will again be limited. As seen with Senate bills related to banning or reviewing chlorpyrifos as a product in California, Committee Chair Bill Quirk of Hayward tends to support new regulatory proposals on pesticides.

Several other bills offer technical adjustments that may impact the pest control industry in California, though the language will likely evolve over time. An omnibus bill tackling a number of regulatory codes offers technical adjustments to state requirements related to medical tests for workers exposed to pesticides and specifically a chemical found in organophosphates that is tied to neurological development.

One bill returning from an earlier session would centralize authority for managing cotton pest abatement districts within Southern California. Senator John Laird of Santa Cruz, meanwhile, has a measure that would add two more members of the general public to CDFA's Agricultural Pest Control Advisory Committee. Republican Asm. Frank Bigelow, who represents a section of the Central Sierra Range, has introduced a bill related to county agricultural commissioners, though the text has yet to be fleshed out.

Sen. Ben Allen of Santa Monica, who co-led a two-year effort to ban certain single-use plastics in packaging, has introduced a measure that would require the Department of Toxic Substances Control (DTSC) to take immediate action on consumer products and chemicals of concern, including pesticides. Momentum has been gaining in recent years to tackle a deep structural budget deficit within DTSC and enable the department to pursue more investigations more quickly.

On the conservation side, a bill by Asm. Carlos Villapudua of Stockton would provide $5 million in CDFA technical assistance grants to encourage on-farm conservation practices promoting pollinator habitat and forage opportunities.

As with 2020, policy committees must adjust to a limited number of hearings, since space is tight at the capitol due to social distancing requirements. Many bills will fall by the wayside without fanfare and others may sail through with minimal public debate. ■

CAPCA
AT THE CENTER OF PLANT HEALTH

Each session, the Advocacy Committee prioritizes bills to watch and engage with that align best with CAPCA's mission and the PCA license:

AB 567 (Bauer-Kahan D) Pesticides: neonicotinoids: prohibited use.

Existing law generally regulates pesticide use by the Department of Pesticide Regulation, and requires the Director of Pesticide Regulation to endeavor to eliminate from use any pesticide that endangers the agricultural or nonagricultural environment. A violation of those provisions and regulations adopted pursuant to those provisions is generally a misdemeanor. Existing law requires the department, on or before July 1, 2018, to issue a determination with respect to its reevaluation of neonicotinoids, and to adopt control measures necessary to protect pollinator health within 2 years, as specified. This bill would prohibit the use of a neonicotinoid on a seed, as specified. Because a violation of this prohibition would be a misdemeanor, the bill would impose a state-mandated local program. The bill would require fine or penalty moneys collected for a violation of this provision to be deposited in the Department of Pesticide Regulation Fund and to be available, upon appropriation by the Legislature, for the administration and enforcement of this provision. This bill contains other related provisions and other existing laws.

SB 489 (Laird D) Pest control: Agricultural Pest Control Advisory Committee.

Existing law establishes the Agricultural Pest Control Advisory Committee within the Department of Food and Agriculture for the purposes of advising the Secretary of Food and Agriculture in all matters concerning licensing, certification, and regulation of persons and firms licensed or certified for pest control operations. Existing law sets forth the composition of the advisory committee, including one member representing the general public. This bill would increase, from one to two, the members representing the general public and would make a conforming change.

SB 751 (Gonzalez D) Environmental justice.

Summary: Existing law requires the Secretary for Environmental Protection to convene a Working Group on Environmental Justice composed of various representatives, as specified, to assist the California Environmental Protection Agency in developing an agencywide environmental justice strategy. This bill would state the intent of the Legislature to enact subsequent legislation to promote environmental justice by ensuring that disadvantaged communities, often low-income communities of color, do not continue to be overburdened with unfair shares of pollution.

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Applicators have access to online bee checks in CalAg Permits ***https://beewhere.calagpermits.org/***. Applicators/Growers intending to apply any pesticide labeled toxic to bees to a blossoming plant shall, prior to the application, inquire of the commissioner, or of a notification service designated by the commissioner (BeeWhere), whether any beekeeper with apiaries within one mile of the application site has requested notice of such application.

By law, applicators must use BeeCheck information to notify beekeeper(s), at least 48 hours in advance of the application, of:

- The time and place the application is to be made.
- The crop and acreage to be treated, the method of application, the pesticide and dosage rate of the pesticide to be applied.
- Contact information in case beekeeper needs to communicate prior to application.

§ 6654. Notification to Beekeepers.
(a) Each person intending to apply any pesticide toxic to bees to a blossoming plant shall, prior to the application, inquire of the commissioner, or of a notification service designated by the commissioner, whether any beekeeper with apiaries within one mile of the application site has requested notice of such application.

(b) If the person performing pest control is advised of a request for notification, he or she shall notify the beekeeper, at least 48 hours in advance of the application, of the time and place the application is to be made, the crop and acreage to be treated, the method of application, the identity and dosage rate of the pesticide to be applied and how the person performing pest control may be contacted by the beekeeper. This time may be increased or decreased by the commissioner, or by an agreement of both the beekeeper and the person performing the pest control work.

(c) This section shall apply statewide. However, from March 15 through May 15 in a citrus/bee protection area, if there are conflicts between the provisions of this section and those of section 6656, section 6656 shall prevail. ■

Note:
Authority cited: Section 29102, Food and Agricultural Code.
Reference: Section 29102, Food and Agricultural Code

Agrian develops a bee notification within its recommendation form

Agrian recently developed a new notification with its Recommendation (REC) form. The Alert will remind PCAs of the voluntary access BeeWhere when applying a crop protection product that is considered toxic to bees.

This notification was developed to help Crop Advisors, Applicators, and Growers in California know when they are applying a crop protection product that is considered toxic to bees. The notification will offer the opportunity to be directed to BeeWhere https://beewherecalifornia.com/, to initiate a Bee Check for the area surrounding the application site.

When writing a REC in Agrian with a pesticide product label that has "toxic to bees" or similar statements on it, a notification will populate in the REC for the author of the REC to acknowledge. The in-REC notification will provide hyperlinks to the BeeWhere website, should the individual want to log in and perform a Bee Check at that time.

Upon completion of the REC, the BeeWhere notification statement will populate on the REC document, along with the original "Toxic To: Bees" REC statements of the past. The Bee notification on the REC document will give recipients of the REC an opportunity to be informed and perform a Bee Check per their regulatory responsibility.

This feature is provided to Agrian users in cooperation with the California Association of Pest Control Advisers (CAPCA) and the County Agricultural Commissioners and Sealers Association (CACASA). Should you have any questions about the Bee Notification, please contact Agrian's Regulatory Department at regulatory@agrian.com. ■

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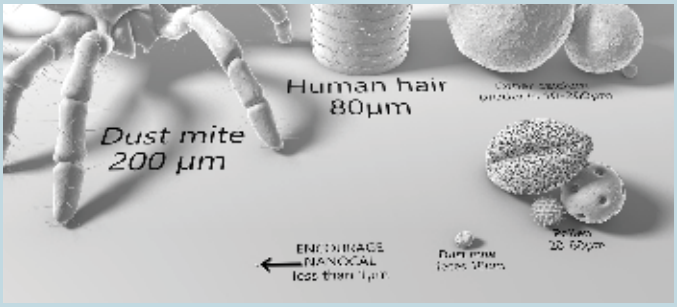

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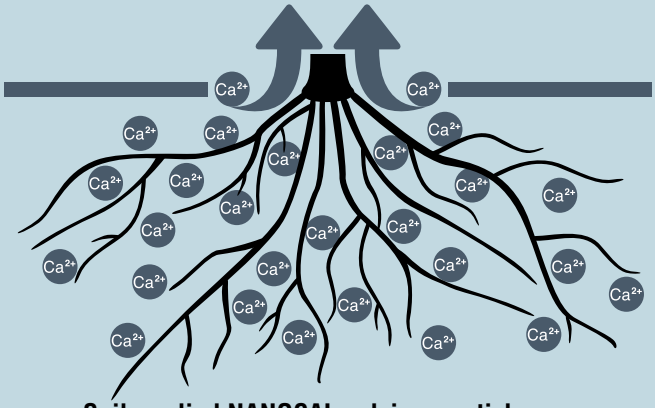

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A scholarship opportunity is available for students interested in careers in the pest management industry. The scholarship is sponsored by the California Association of Pest Control Advisers (CAPCA) and is administered by the Stanley W. Strew Educational Fund, Inc.

The CAPCA Scholarship will provide $3,000 to a selected college student actively engaged in a PCA career pathway. The scholarship recipient will be selected by the SWS Board of Directors.

Applications are available for students who are currently attending college in an agricultural/horticultural related field or who are entering or returning to college in an agricultural/horticultural related field in the fall and will have a junior level status.

Nominees should submit a completed application form and copies of their transcripts. ***Applications must be postmarked no later than May 7, 2021*** and submitted with required letters of recommendation so that the committee can make final selections. The student selected will be notified in July.

For application information please contact CAPCA at (916) 928-1625 or email rachel@capca.com

https://capca.com/scholarships-awards/

Photo: Fred Rehrman, Elysian Fields

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What does a huanglongbing-positive Asian citrus psyllid find mean?

Monique J. Rivera, Cooperative Extension Specialist, University of California, Riverside
Neil McRoberts, Professor, Plant Pathology Department, University of California, Davis
Holly Deniston-Sheets, Data Analysis and Tactical Operations Center Coordinator, Citrus Research Board, Visalia, CA

Two huanglongbing (HLB) carrying adult Asian citrus psyllids (ACPs) have been found in California in the last six months. The first was found in a commercial citrus grove in Riverside, in August of 2020. The second was found in Fallbrook, San Diego County, on a residential property. The find in Riverside was in a commercial citrus grove—an old block of citrus that was in organic transition. The California Department of Food and Agriculture (CDFA) inspected the block and thoroughly sampled trees to determine if a HLB-positive (HLB+) tree was present. CDFA did not detect a positive tree from the grove. So, what does a HLB+ Asian citrus psyllid really mean for a citrus grower? There are two important responses to that question.

1. The bacterium is present and is successfully being transmitted through the population.

The issue of accurately assessing the significance of a positive ACP detection is complicated by the fact that the HLB bacterium is unevenly distributed throughout a plant in the initial stages of infection. However, a HLB+ ACP indicates that the bacterium is present in the psyllid population and may be present somewhere in a tree as well. There is evidence to suggest that the build up of HLB in ACP populations is a strong predictor of future HLB infections in citrus.

The transmission of HLB is complex and still not fully understood. Although HLB has been thought of as a classical vectored disease, it is emerging that there are subtleties in the relationship between the vector and the pathogen. Evidence is accumulating that adult insects may be poor at acquiring the bacterium in comparison with nymphs. If this proves to be true, then opportunities to reduce spread of the bacterium by interrupting the life cycle of the insect may be important.

One of the challenges facing California is a lack of data demonstrating how the range of climates that occur here might affect the insect's life cycle. We've been trying to clarify this by looking at how temperatures in different areas of the state correspond to data from ACP experiments in growth chambers. Results so far largely agree with observational data on the prevalence of ACP in different areas of the state.

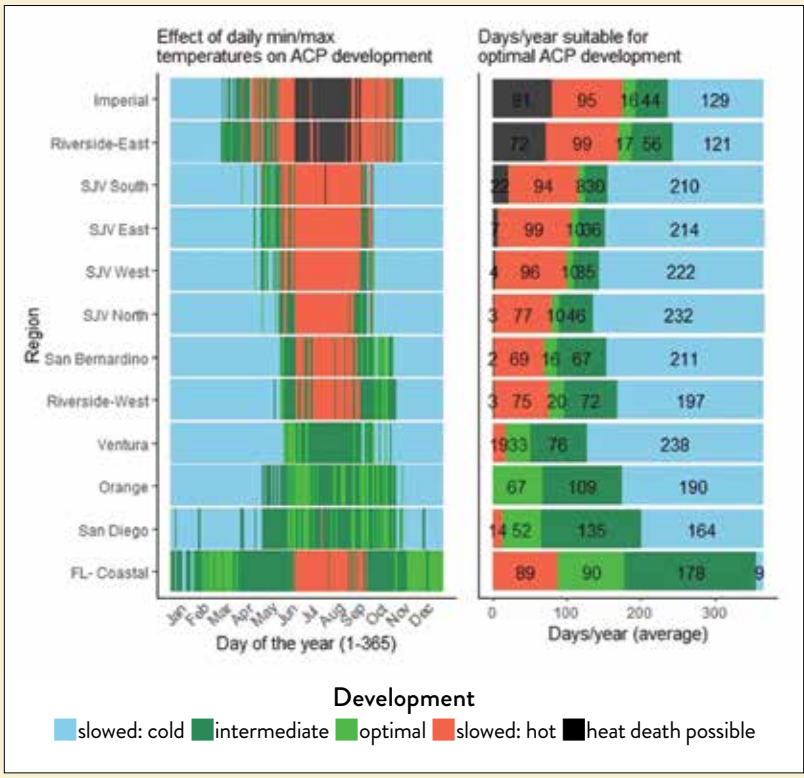

Figure 1. The effects of average maximum (max) and minimum (min) daily temperatures on Asian citrus psyllid (ACP) development. SJV = San Joaquin Valley (includes Kern, Kings, Fresno, and Tulare counties). Temperature categories are divided as follows: "slowed: cold" indicates a minimum temperature below 52°F; "optimal" temperatures indicate maximum temperatures between 77 and 82°F; "intermediate" temperatures indicate maximum temperatures between 82 and 90°F; "slowed: hot" indicates maximum temperatures between 90 and 104°F; "heat death possible" includes maximum temperatures greater than or equal to 104°F. FL-Coastal = Florida Coast USDA Hardiness Zone 10A.

2. There could be HLB+ trees in the future in the region. What can be done now?

While not definitive, it is likely that a HLB+ tree will show up in the region in the future. HLB can take years to detect in a tree with the current standard of detection. The best course of action is to prevent the build up of ACP populations in the region through area-wide suppression. The vast majority of ACP sampled in California have no detectable level of HLB bacteria in them (Fig. 2); continued

area-wide suppression of ACP will help maintain this situation. An infected ACP may transfer the bacterium to its progeny while exposing the tree to the bacterium, which is how the bacterium will persist in the population. Preventing ACP from breeding is the best way to prevent HLB from getting a foothold in California citrus.

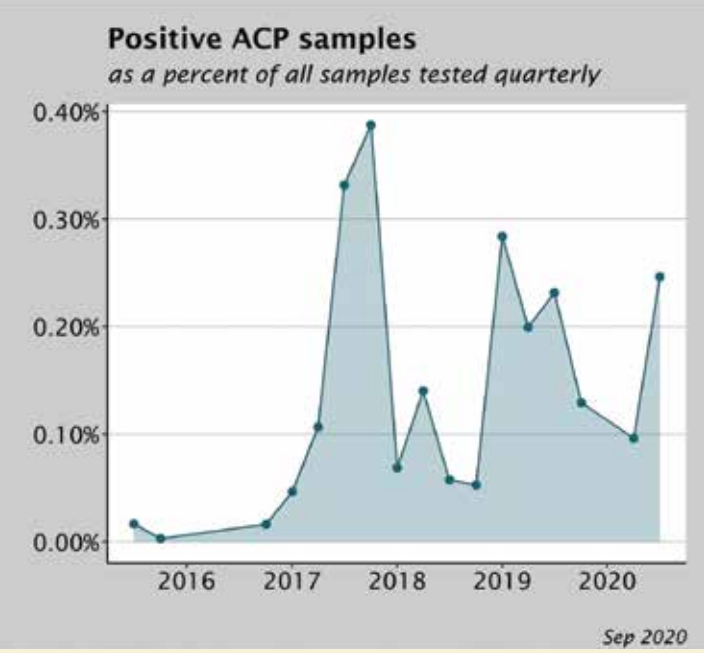

Figure 2. Percent of Asian citrus psyllid (ACP) samples that tested positive for the disease-causing bacterium in California from 2016 to 2020.

Grapefruit tree infected with huanglongbing, USDA U.S. Horticultural Research Laboratory, Fort Pierce, FL. Note the thin leaf canopy and conspicuous yellowing. Photo: Neil McRoberts, UC Davis.

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We are currently establishing a project to assess the percentage of ACP infected with the bacterium in commercial groves. This will expand the scope of ACP testing in California, which has otherwise been conducted by the Citrus Pest and Disease Prevention Division from sentinel locations in groves. This work is critical to understanding the current state of affairs in California's fight against the spread of the pathogen. Although ACP are well established in southern California, it is still critical to the citrus industry at large to prevent the establishment of ACP, and potential introduction of HLB, in the San Joaquin Valley where 70% of citrus production occurs.

Information about HLB and ACP and the situation in California is available from a number of sources:

- Citrus Insider (https://citrusinsider.org/) is run by the California Citrus Pest and Disease Prevention Committee (CPDPC). This joint initiative between the citrus industry and CDFA is focused on preventing HLB from damaging commercial citrus. If you don't already know your Grower Liaison with the program, you can find them here: https://citrusinsider.org/resources/grower-liaisons/

- The University of California Agriculture and Natural Resources (UC ANR) maintains a couple of useful websites related to HLB. Recommended products for treating ACP are listed at https://ucanr.edu/sites/ACP/Grower_Options/Grower_Management/ACP_Effective_Insecticides/. Interactive maps of quarantine boundaries, ACP trapping results and other information is at https://ucanr.edu/sites/ACP/Distribution_of_ACP_in_California/. And if you are interested to learn more about the scientific research going on to try to help with the HLB problem, this website has fact sheets, podcast interviews with scientists and more: https://ucanr.edu/sites/scienceforcitrushealth/

- Finally, a deeper dive into the facts and figures for the epidemic in California, and reports on the problems the CPDPC is grappling with can be found at https://www.DATOC.us/ ■

Right: White wax exudate produced by Asian citrus psyllids (ACPs) feeding on new citrus growth being fed on by an Argentine ant. The waxy exudate is a useful first sign to look for when scouting for ACP presence. Photo: Timo Rohula, UC Riverside.

Right: Along the central ridge of Florida, where most citrus is grown in Florida, a tree edge is completely dead due to huanglongbing infection. Photo: Monique J. Rivera, UC Riverside.

Left: Symptomatic leaves from a citrus tree infected with huanglongbing. Note the asymmetrical mottling and corky veins. The corky vein symptom is highly indicative of huanglongbing, but does not occur until infection is well-established. U.S. Horticultural Research Laboratory, Fort Pierce, FL. Photo: Neil McRoberts, UC Davis.

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Using drones for summer w

Photo 1. Field studies in the Sacramento Valley compared the performance of a small six-rotor UAV drone sprayer versus a traditional manned airplane for applying insecticides for summer worm control in alfalfa hay fields, 2020. Photo credit: I. Grettenberger.

By Rachael Long, UCCE Yolo County, Dr. Ken Giles, Dr. Xuan Li, Bill Reynolds

Use of drones, UAV unmanned aerial vehicle, for pesticide applications in agricultural crops is escalating and becoming a reality for farm production. Drone technology provides an additional tool for growers to control pests on farms, supplementing traditional ground and aerial spraying practices. This could be especially helpful where there's a shortage of farm labor for applying pesticides or for small, tough to reach places that require spot treatments.

Drone trials, Sacramento Valley, 2020. We compared the performance of a small six-rotor UAV sprayer (PV35) versus a traditional manned airplane for applying insecticides for armyworm and alfalfa caterpillar control in alfalfa hay fields in 2020 (Photo 1). These summer worm pests can be highly damaging to alfalfa as the larvae feed on the foliage, causing significant yield and forage quality losses if left uncontrolled. We conducted trials in two alfalfa fields using the insecticide chlorantraniliprole. In each field, one area was sprayed by airplane and the other by drone to compare the efficacy of each application method. Application rates were 10 gallons per acre (gpa) for field site #1 and 5 gpa for field site #2.

Spray cards (water sensitive paper) were placed in the alfalfa canopy prior to spraying to assess spray coverage for both application methods. Plant samples were taken after the fields were sprayed to determine the insecticide residue concentrations on the alfalfa plants. Summer worm and natural enemy counts were taken using a standard sweep net to compare the efficacy of the different spray application methods on pest and beneficial insects.

Drone trial results. The spray cards revealed that both drone and airplane insecticide application methods had equivalent spray coverage. The drone application had a bit more variability in terms of spray deposition uniformity than by airplane. This was not due to inherent qualities of the drone, but instead that the drone-based spray technology needs to be fine-tuned. Airplanes have been used for applying pesticides for decades and that technology is refined. Drones are new and there's a bit more work that needs to be done to fine tune them for optimum pest control in crops, such as exploring different nozzle types for best coverage.

worm control in alfalfa hay

Figure 1. Insecticide residue concentrations on alfalfa plants showed equivalent coverage for drone and airplane application methods at 5 gpa and 10 gpa.

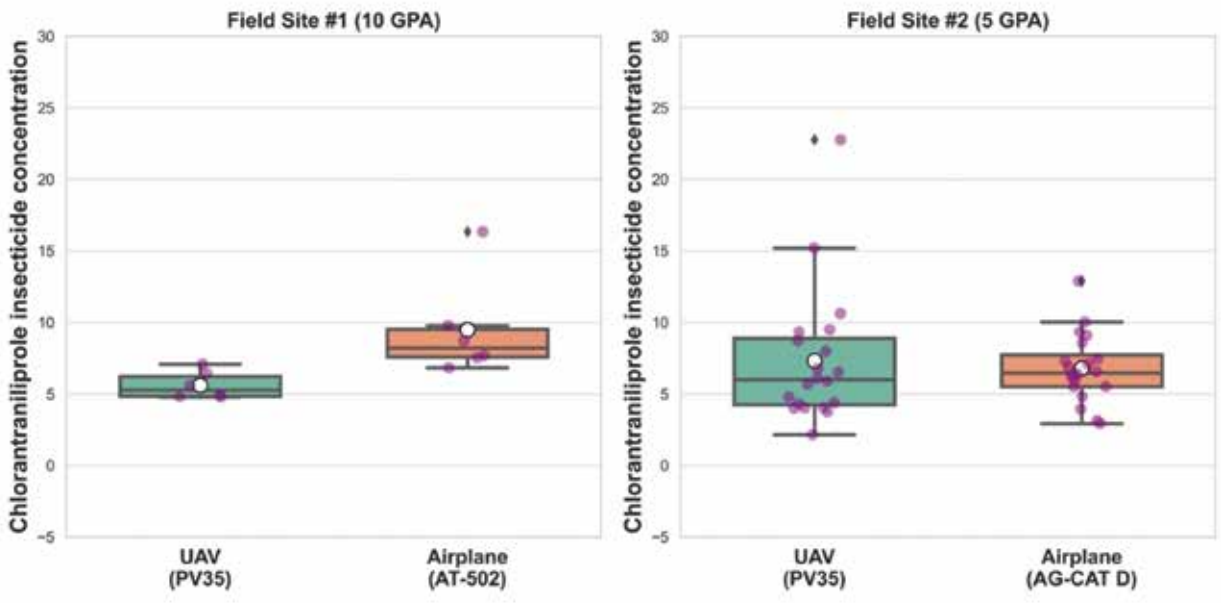


Figure 2. Both drone and airplane application methods at 5 gpa and 10 gpa with chlorantraniliprole showed equivalent summer worm control 3-7 DAT compared to the untreated control, dashed line.

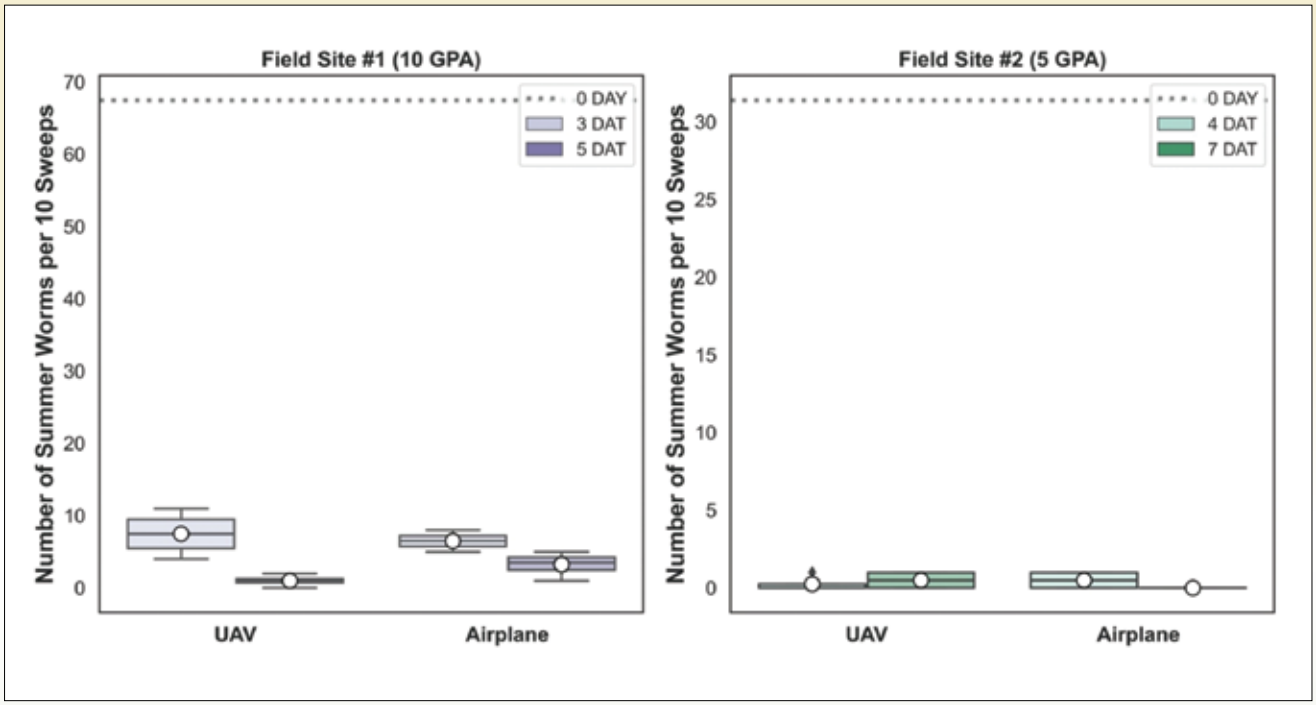
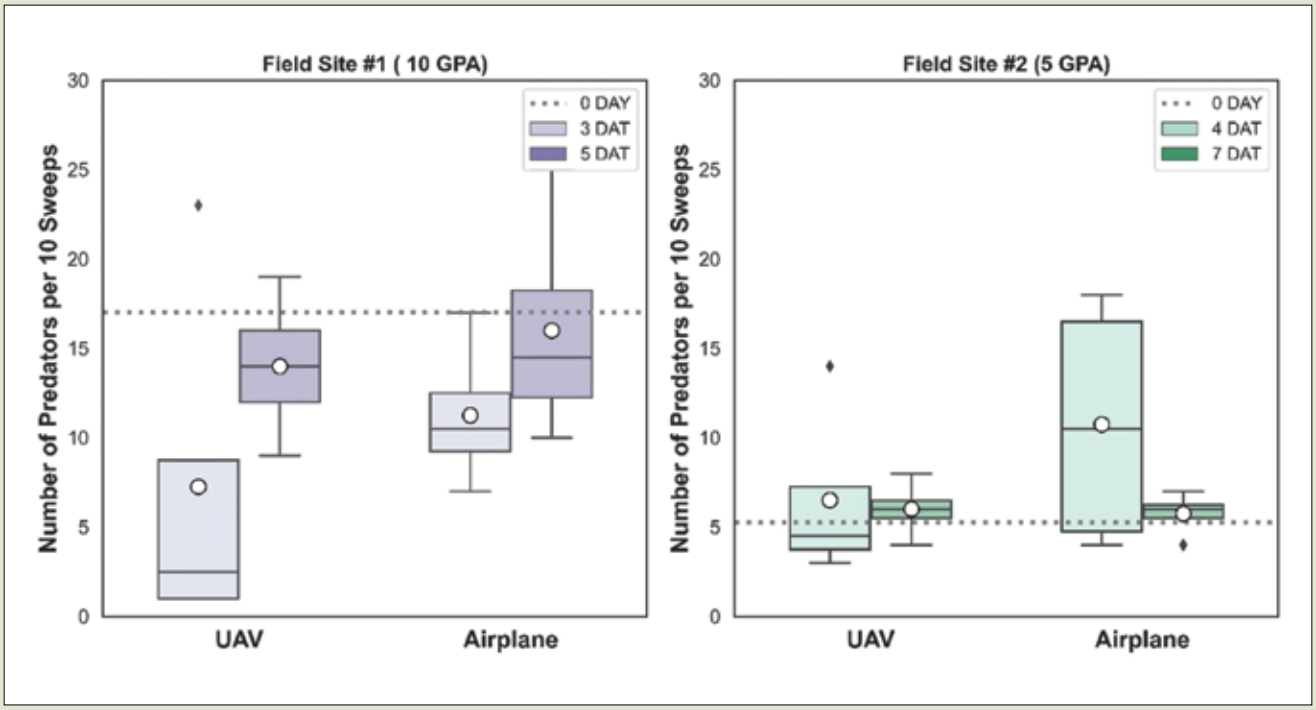


Figure 3. Both drone and airplane application methods at 5 gpa and 10 gpa with chlorantraniliprole showed similar numbers of predatory insects 3-7 DAT compared to the untreated control, dashed line.



There were few differences in the insecticide residue concentrations on the alfalfa plants between the drone and airplane application methods for both 5 and 10 gpa spray rates (Figure 1). Likewise, there were no differences in summer worm counts between the two treatment methods with both drone and airplane applications significantly reducing summer worm counts compared to the untreated control at both 5 gpa and 10 gpa, 3-7 days after treatment, DAT (Figure 2). Chlorantraniliprole conserved natural enemy predators, such as lady beetles, in both application methods (Figure 3).

Future of drones in California. Drones are a viable option for aerial application of insecticides for pest control in alfalfa fields. Overall, there were no significant differences in insecticide spray coverage, insecticide residue on plants, and summer worm control between the drone and airplane insecticide application methods. Drones could provide an additional tool for growers to manage pests in their fields. California now has a specific UAV unmanned ag pilot license category which means that the pilot of the drone is not required to have a commercial pilot certificate, only the UAV certificate.

A current limitation for the use of drones for aerial spraying of crops is the 55-pound weight limit mandated by FAA regulations (Federal Aviation Administration) on drone carrying capacity. Some drone companies have obtained certificates for handling more than 55-pounds in California, helping to pave the way for more people to use drone technology on a larger scale in crop production. However, it could still be awhile before the 55-pound weight limit is lifted nationwide for more people to use this technology. ■

Acknowledgements. *This work was in collaboration with Dr. Ken Giles, UC Davis Department of Biological and Ag Engineering, Xuan Li, John Andaloro, Edward Lang, Lawrence Watson, and Issa Qandah FMC Corp., and Bill Reynolds Leading Edge Aerial Technologies. We thank PCAs Ryan Payne and Josh Cook and Harlan Family Ranch and Payne Farms for their support and participation in this project.*

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Mid-Season Micros

By Abe Isaak, AgroLiquid Agronomy Manager, West Region

Crop nutrition management can be challenging. Each cropping system is a unique environment, and different soil types hold varying amounts of nutrients and release them differently, which can make it tricky to manage crop nutrition effectively.

The production of a crop is what provides a return and that's why we want nutrition to be associated with crop production. Excesses of some nutrients can interfere with the utilization of good levels of other nutrients. Higher rainfall amounts will cause some nutrients, such as potassium, to move down in the soil. With dry climates, high evaporation rates will keep cations at the surface. In addition, arid areas are often receiving irrigation water. Since the irrigation water generally carries other nutrients, the top of the soil starts acting like a coffee filter and the soil can take on the properties of the water.

Focus on Micros

With bloom behind us, let's focus on some of the critical micronutrients. The first step in making a micronutrient recommendation is to have the most up-to-date information from the plant in the form of a soil and leaf tissue sample. While soil test analyses will provide details as to what nutrients are present in the soil, and leaf tissue samples will explain which nutrients are actually available for uptake by the plant. It is important to keep in mind that the leaf tissue analysis is a snapshot, at a certain point in time, of the nutritional status of the plant. Then, depending on the crop being evaluated, compare the plant analysis results with what is expected in a plant at the same growth stage. 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?

Micronutrients, just like all nutrients, can easily be tied up in the soil by other positively and negatively charged ions. Knowing which micronutrients are tied up is key when making a recommendation in-season. Many crops respond well to mid-season applications of micronutrients, but keep in mind that the raw material source as well as the chelate used to transport nutrients to the plant is vital to the success of an application.

Zinc (Zn)

Zinc is generally regarded as the most commonly deficient micronutrient in California soils. Its deficiencies show up in plants as reduced leaf size, interveinal chlorosis, and reduced bud formation. Other factors that lead to Zinc deficiency are having basic or alkaline soils, low organic matter (OM) and high phosphorus in the soil. Zn is important in the production of indole acetic acid (IAA), a naturally occurring plant hormone. Zinc also plays a key role in having an even or uniform maturity at harvest time. Some common crops where a supplemental Zn application may have to be made during the season are: tree nuts, tomatoes, corn, cotton, grapes and citrus. A foliar application may be the best way to apply Zinc for an in-season application.

Manganese (Mn)

Manganese is also a commonly deficient micronutrient in California. Mn deficiencies show up as interveinal chlorosis on leaves. Because manganese is not very mobile in the plant, deficiencies will show up in the youngest leaves first. Mn plays a vital role, along with iron, in chlorophyll formation in plants. Deficiencies of manganese are worsened in sandy soils with a pH above 6. Mn deficient symptoms will also show up in cool and wet weather conditions for an extended period of time. Foliar applications of Mn and Zn are common in tree nuts and citrus throughout California.

Iron (Fe)

Iron, along with manganese, is the key nutrient needed for chlorophyll formation in plants. Ironically, an iron deficiency can show up as a result of applying too much manganese. Typical iron deficiencies show up as interveinal chlorosis on leaves, twig dieback,

and can even cause plant death in severe circumstances. Deficiencies usually appear in high pH soils, calcareous soils, soils with excessive phosphorus, and soils with poor drainage. Corn, alfalfa, and tree nuts have all shown iron deficiencies in California.

Boron (B)

Cell division in plants is reliant on adequate amounts of boron, as well as the secondary nutrient calcium. Having proper levels of boron in plants during pollination and fruit development is crucial for each plant to reach its yield potential. Some symptoms of boron deficiency include: reduced flowering, and thickened and wilted leaves. Boron availability decreases as soils start to dry out from the winter and spring, therefore boron deficiencies will tend to show up more in drought conditions. Boron toxicity has been known to show up in rare cases in California. If toxicity symptoms are present, get your irrigation water tested as that is usually the culprit to boron toxicity.

Copper (Cu)

Plants are rarely deficient in copper because such a low amount is needed for most crops. Copper is used for photosynthesis in the plant as well as seed development. Stunted growth along with leaf margin chlorosis are common symptoms of copper deficiency. A copper deficiency can be made worse by applying high rates of nitrogen to the plant. If copper is not present in the soil, the plant's yield potential can be greatly reduced due to the plant aborting flowers. Cu is the most immobile micronutrient; therefore, a foliar application is the best way to apply copper to the plant.

Molybdenum (Mo)

Molybdenum is a micronutrient that plays a large role in symbiotic fixation of nitrogen by legume crops. Mo also aids in iron and phosphorus metabolism in the plant. Symptom deficiencies show up as poor growth and reduced nodulation in legume crops. High levels of molybdenum are toxic to grazing animals such as livestock.

Making a Recommendation

When making a sound nutrient recommendation be sure to use all available tools at your disposal. Soil samples, leaf tissue samples, irrigation water tests, crop removal nutrient calculators and past yield data are all important factors in making a smart recommendation. Always keep in mind that too much of a nutrient can be as bad – or worse – than too little. Also, be sure to use the 4R method when planning your recommendations: Right source, Right rate, Right time, and Right place. If you have questions or concerns about a crop nutrition plan, remember there are experts in this field available for consultation. Using all of these available resources will help guide sound recommendations, and a sustainable future for our industry. ■

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Leading Biopesticides

Biopesticides and their role in integrated pest management

Surendra K. Dara, Entomology and Biologicals Advisor, University of California Cooperative Extension

Biopesticides contain active ingredients of natural or biological origin that include plant extracts, microorganisms, microbial metabolites, organic molecules, minerals, or other such natural materials that have pesticidal properties. Pests such as herbivorous arthropods, pathogens, parasitic nematodes, mollusks, rodents, and weeds cause significant crop damage when they are not managed. Pest suppression is a critical part of crop production to maintain plant health, prevent yield losses, and optimize returns. As agriculture advanced from subsistence farming to a global enterprise, crop protection also evolved over millennia. When farming was less organized, nature maintained a balance and provided solutions initially. Then natural solutions were actively implemented until industrialization led to the use of synthetic inputs in the 20th century. While synthetic fertilizers and pesticides contributed to a tremendous improvement in the yield potential, the indiscriminate use of some of them and the resulting damage to the environment and human health steered food production in the recent past towards organic farming with the use of nature-based solutions.

Although biopesticides have been around for a few decades, the growth of organic farming gave an impetus to the biopesticide industry during the past few years resulting in the development of new active ingredients and improved formulations. Now, biopesticides are considered an important part of integrated pest management (IPM) strategies in both organic and conventional systems. With a considerable industry investment in research and development, the quality and efficacy of biopesticides have also significantly improved. This has also contributed to optimizing the cost of some formulations. However, there is still a need to fill the knowledge gaps in biopesticides and their use. Depending on the active ingredient, the mode of action for biopesticides, their target pests, their storage and handling, and the use strategies are quite diverse, and a thorough understanding of these aspects is critical for their successful use. As emphasized in the new IPM model (Dara, 2019), while biopesticide use is an integral part of crop protection, understanding the pest biology, using biopesticides appropriate for the target life stage of the pest, applying them at the right time and rate using the right technology, avoiding incompatibility issues, building and sharing effective use strategies, and continuously investing in research and outreach are essential elements of biopesticide use. This article provides an overview of various biopesticide categories and general strategies for their successful use.

Biopesticides can be used for managing arthropod pests, bacterial or fungal pathogens, plant-parasitic nematodes, weeds, and snails and slugs (Fig. 1). Some formulations or active ingredients have multiple roles and can be effective against more than one category of pests. While some active ingredients are very specific to a particular pest or related species, others have a broad-spectrum activity. Based on the source, biopesticides can be placed in four broad categories: i) botanicals, ii) microbials, iii) toxins, and iv) minerals and other natural materials.

Botanical extracts: Plants are a rich source of numerous phytochemicals or secondary metabolites that have a wide range of properties including pesticidal activity. Acids, alkaloids, flavonoids, glycosides, saponins, and terpenoids in plant extracts or oils obtained from seeds and other plant parts are some of the compounds present in various biopesticides (Pino et al. 2013). Azadirachtin, BLAD (polypeptide from sweet lupine seeds), citric acid, essential oils, pyrethrins, soybean oil, and extract of the giant knotweed are used for their acaricidal, insecticidal, fungicidal, nematicidal, or herbicidal properties.

Microbials: Some of the microbial pesticides have live microorganisms (such as entomopathogens, *Bacillus* spp., *Streptomyces* spp., and *Trichoderma* spp.) while others (such as *Burkholderia rinojensis* and *Chromobacterium subtsugae*) have heat-killed microorganisms and fermentation solids as the active ingredients. Entomopathogenic microorganisms [*Bacillus thuringiensis* (bacterium), *Beauveria bassiana* and *Cordyceps fumosorosea* (fungi), *Heterorhabditis* spp. and *Steinernema* spp. (nematodes), and granuloviruses and nucleopolyhedroviruses] primarily kill their hosts through infection; microbe-based fungicides antagonize plant pathogens through competitive displacement and production of toxic metabolites; nematophagous fungi parasitize plant-parasitic nematodes; and plant pathogenic bacteria, fungi, and viruses infect and suppress weeds. Bacteriophages, which are viruses that parasitize bacteria, are used against the plant pathogenic species of *Clavibacter, Erwinia, Pseudomonas, Xanthomonas, Xylella*, and other genera.

Toxins and other organic molecules: There are multiple examples of toxic organic molecules derived from various organisms. Avermectins from the bacterium *Streptomyces avermitilis* and spinosad from the bacterium *Saccharopolyspora spinosa*, strobulurin from the mushroom *Strobuluris tenacellus*, and cerevisane from the yeast *Saccharomyces cerevisae* are some of the microbial toxins that are effective against insects, plant-parasitic nematodes, or snails

and slugs. A venom peptide from the Blue Mountains funnel-web spider, *Hadronyche versuta*, from Australia is a recently developed insecticide active ingredient with its unique mode of action class. Chitosan, a polysaccharide from the exoskeleton of shellfish, is a fungicide.

Minerals and other natural materials: Diatomaceous earth, mineral oil, and minerals such as sulfur are used for controlling multiple categories of pests. Potassium salts of fatty acids of plant or animal origin, known as insecticidal soap, have insecticidal and fungicidal properties. Organic acids such as acetic acid and citric acid are derived from plants and have fungicidal and herbicidal properties. Since these are different from other botanical extracts, they are placed in this category.

Except for the microbial pesticides that have live microorganisms, most biopesticides have chemical molecules of microbial, fungal, botanical, or mineral origin and work through various modes of action similar to synthetic pesticides. Several synthetic pesticides are developed from natural molecules. Abamectin, pyrethroids, neonicotinoids, spinetoram, and storbulurins are synthetic analogs based on avermectins, pyrethrins, nicotine, spinosad, and strobulurin, respectively, and were developed for improved stability, safety, or ease of commercial-scale production.

Integrated pest management and resistance management: Biopesticides are very diverse in their origin and mode of action and have been successfully used in several cropping systems for managing a variety of pests. They have complex interactions with plants, soil microbiota, pests, and environmental conditions. It is critical to have a good understanding of the source of biopesticides and how they act on their target pests. Certain biopesticides may have special storage and handling requirements or tank-mixing restrictions. It is essential to refer to the manufacturer's guidelines or label instructions to avoid incompatible tank-mix combinations, understand proper application sequences, and to store, transport, and apply under unfavorable conditions. While it is very important to use biopesticides as a part of the IPM program, caution is warranted to avoid repeated use of the same or a similar type of biopesticide. Pests can develop resistance to biopesticides just as they do to synthetic pesticides (Dara 2020).

Strategies for using biopesticides: From the seed or transplant treatment to soil or foliar application, biopesticides can be used throughout crop production. Certain combinations can have an additive or a synergistic effect on pest suppression. At the same time, certain inputs or practices can negatively impact biopesticide efficacy. For example, alkaline tank-mix components breakdown the protein coat of entomopathogenic viruses and *Bacillus thuringiensis*. Botanical oils can be incompatible with cold water. Some fungicides such as captan and thiram are incompatible with entomopathogenic fungi like *Beauveria bassiana* while several others are compatible (Dara et al. 2014).

Investing in biopesticides: Environmental safety and resistance development are two major concerns for excessive use of synthetic

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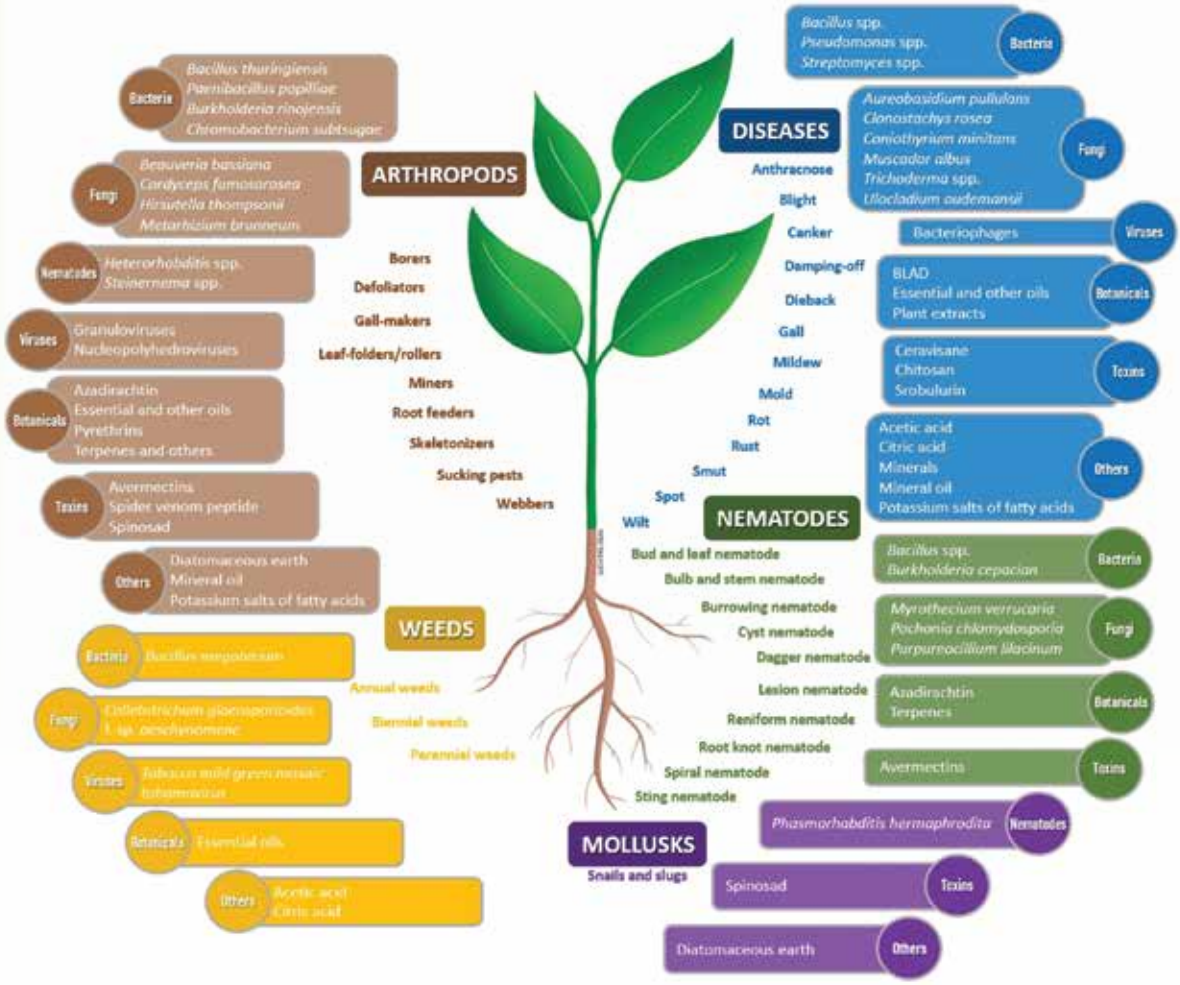
Fig. 1. Biopesticide active ingredients and their categories against various pests.



pesticides and incorporating biopesticides into IPM will help address both issues. Substituting biopesticides for synthetic pesticides will reduce the total amount of the latter during a production season and their potential negative impact on the environment and human health. Several biopesticides are not harmful to pollinators and in some production systems, pollinators are used to deliver biopesticides to the crops they pollinate. Adding biopesticides to the standard crop protection program will also increase pest control efficacy. Additionally, by not continuously using synthetic pesticides, the risk of resistance will be reduced and thus their efficacy will continue to be maintained. Although some biopesticides can be more expensive than synthetic pesticides, investing in them will be a good strategy for both the short-term benefit of effective pest suppression and the long-term benefit of a healthy and resilient ecosystem. Since pests do not have boundaries, area-wide implementation of good agricultural practices with a balanced use of synthetic and natural inputs is necessary for maintaining the productivity of the cropping systems.

Productive collaborations among the pesticide industry, researchers, extension educators, and the grower community are critical for successfully using biopesticides for sustainable food production. While research helps to develop effective formulations and their use strategies, outreach helps with the implementation of those strategies. ■

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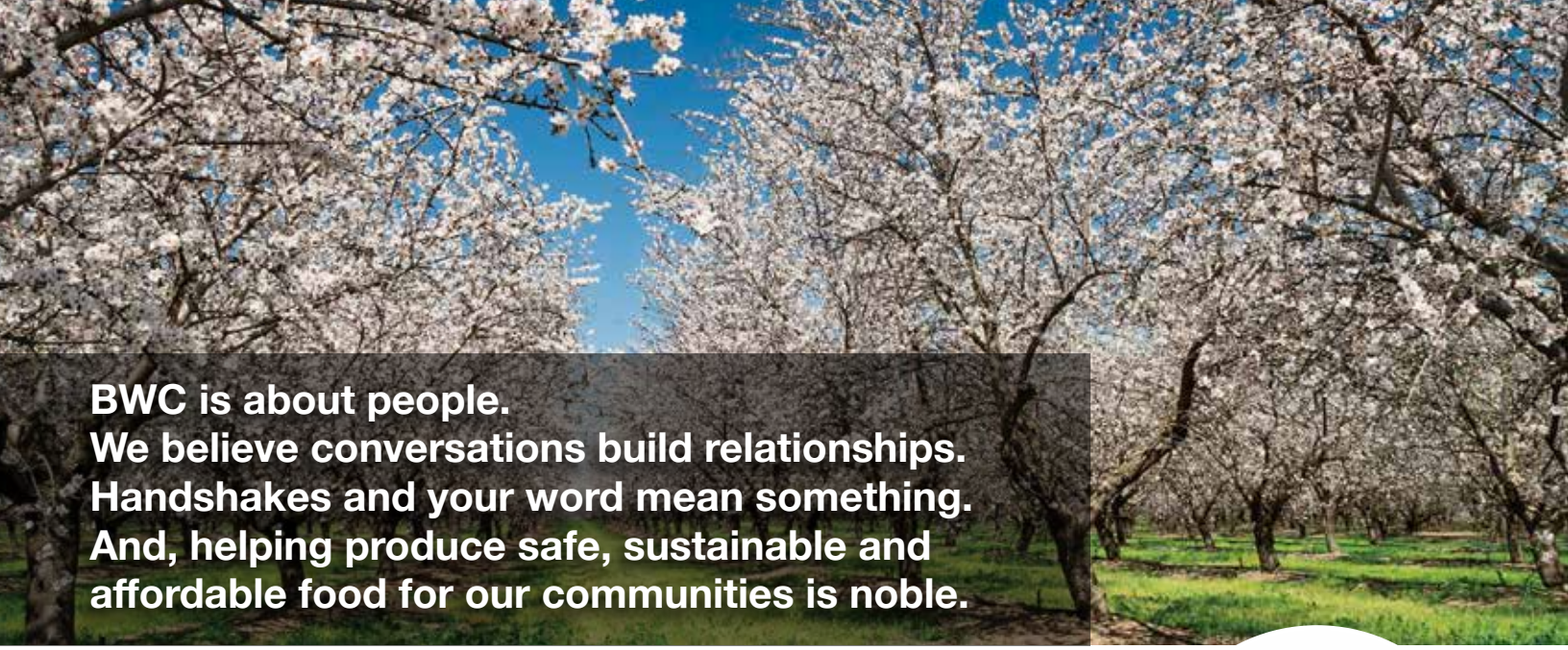

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SoCal CAPCA Chapter Notice

The SoCal CAPCA Chapter wishes to acknowledge Rex Baker for his years of support and service to the agricultural/horticultural industries. He will be missed.

Rex Otho Baker

June 20, 1938 – November 27, 2020

On the evening of November 27, 2020, Rex passed away after a difficult three-week battle with Covid at Kaiser Hospital in Riverside California. Rex was 82 years old.

Rex was born in San Diego, CA on June 20, 1938. He was the youngest of two boys born to Irene & Harold Baker. He grew up in San Diego with his mother Irene and older brother Bruce, after having lost his father Harold when Rex was seven. He grew up surrounded by his large, extended family.

After high school, he moved to Pomona to attend Cal Poly Pomona, where he later graduated with a Bachelor of Science in Ag Biology. Rex then served in the Armed Forces for two years during the Vietnam War. When he returned, he worked for San Diego County Ag Dept, working his way up to becoming the Deputy Ag Commissioner.

He met the love of his life in a business class in San Diego. Rex & Mary Ann would go on to share 45 years of an amazing life, filled with love and joy.

In 1976, he was recruited to become an Ag professor at Cal Poly Pomona. He taught there for 27 years. He loved teaching, and guiding his students into successful careers. He even joined some in building a successful pest management business.

Rex was a devoted dad to his two children, Brad and Jenna. He was always there for them, to listen, help, and support. He especially treasured the years they all attended Cal Poly Pomona together. One of his favorite roles lately was to be Papa & Best Buddy to his grandson, Jake.

Rex is survived by his wife, Mary Baker; children, Brad Baker and Jenna Colburn; grandson, Jake Colburn; and numerous other relatives and friends.

Photo: "Planting Cotton Seed," by CAPCA member, A. Barbeiro

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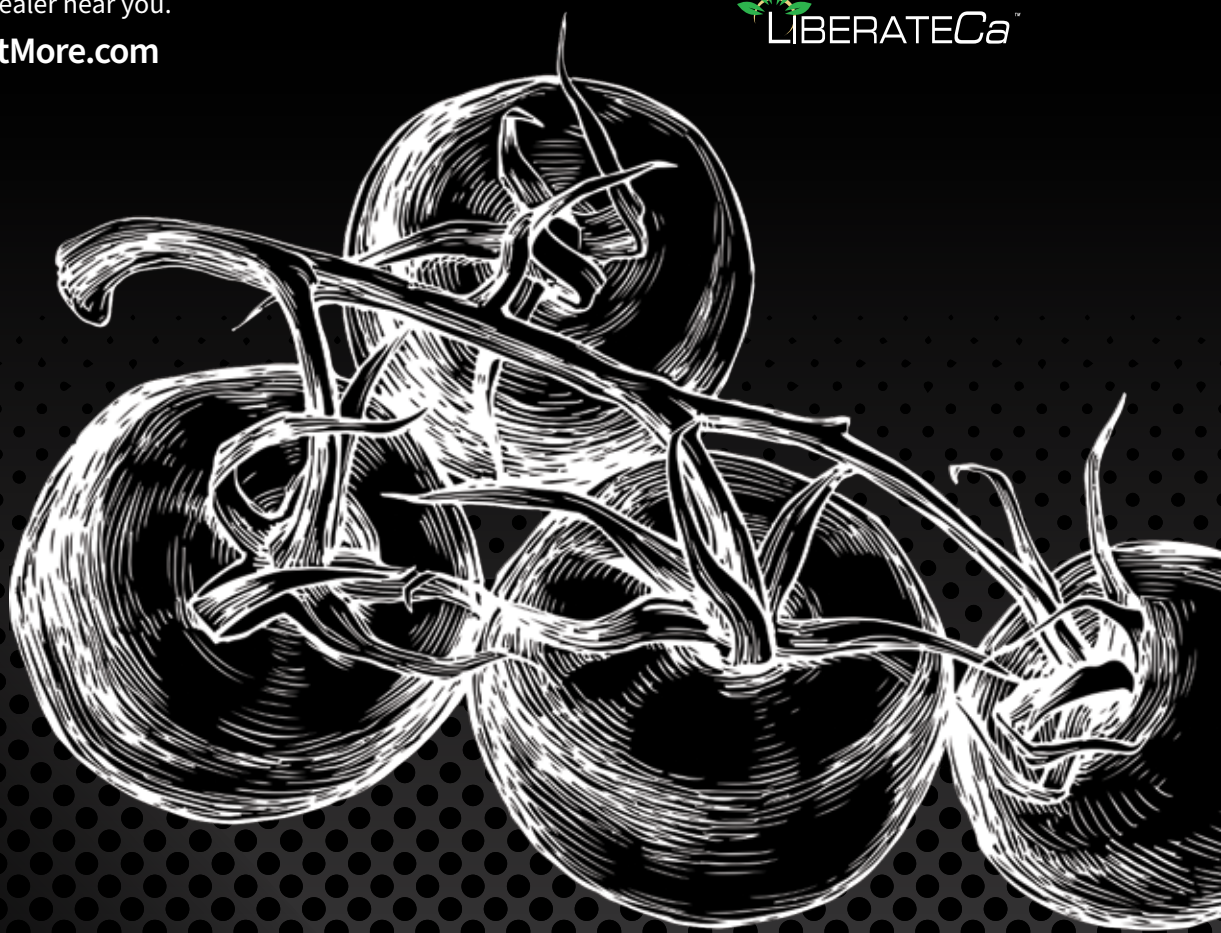

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