

The background of the cover is a vibrant blue with a circular, textured pattern that resembles a fingerprint or a similar scientific motif. Two ants are visible: one is positioned near the top center, and the other is larger and positioned in the lower-left quadrant, both appearing to be on the surface of the blue pattern.

CAPCA ADVISER

OCTOBER 2022 | VOL. XXV, NO. 5



California Association of
Pest Control Advisers

www.capca.com

The Brandt logo is written in a bold, italicized, red sans-serif font with a registered trademark symbol (®) to the right.The product name 'Nordox® 75 WG' is displayed in a white sans-serif font on a green rectangular background.The section header 'High Performance Copper Fungicide and Bactericide' is written in a white sans-serif font on a red rectangular background.

- Wettable granule fungicide and bactericide that contains 75% metallic copper
- Even release of copper ions for reliable, long lasting disease control
- Superior retention and rain fastness
- Easy to mix, dust-free formulation
- OMRI Listed



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INSECTICIDE

Only Radiant[®] SC insecticide controls worms, thrips and leafminers. (“3 Bugs. 1 Jug.”) And university trials in Arizona and California show that Radiant outperforms other commonly-used vegetable insecticides on all three of these pests. As a member of the spinosyn class of chemistry (IRAC Group 5), Radiant controls pests like no other class of chemistry used in vegetables. The Re-Entry Interval is only 4 hours, and the Pre-Harvest Interval is 1 day for most crops.

PCA License 50th Anniversary and Our Future

Every opportunity I get, I remind regulators, elected officials and members of the public that this year is the 50th Anniversary of the PCA license. There is a decades-long tradition of professionalism, innovation and stewardship among PCAs, led through the efforts of CAPCA leadership, Chapter volunteers, Membership and Staff. We are at a horizon point, some of the last original licensees and members are planning their retirements. These members were part of the original formation discussions that established the purpose of CAPCA and set the course we are on today.

This summer has been marked with comment period after comment period; the Advocacy Committee and leadership went from reviewing changes to Certification and Training for Pesticide Handlers to reviewing draft goals developed by the Sustainable Pest Management Workgroup. The amount of opportunity and change on the horizon for the PCA pushes the license to continue to evolve.

And as I reflect on various proposed regulation changes from this summer and all that it may bring, I know that CAPCA continues to be in the right spot to support the license as we navigate a new foundation for the next 50 years of the PCA license. If you want to be part of laying the foundation for the next 50 years, consider joining the work of your local chapter to share your professionalism or lend your voice to the Advocacy Committee to ensure new regulation is grounded in the muddy boots' reality of licensees.



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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.

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CAPCA's lead on QR codes protects your license

By Patrick Dosier

At this year's CAPCA Conference, PCAs will notice a big change: no more Scantrons. CAPCA's leadership determined now is the time to proactively respond to forthcoming regulations, escalating criticism from environmental justice, and frankly, considerable levels of cheating.

The forthcoming regulations are coming from DPR's updated interpretations (see DPR Notice 22-003) of Federal Regulations (40 CFR Part 171). Like all regulations, there is a lot to sort through here. However, DPR intends to make stricter rules around CE verification of attendance, attendee identity, and attendee attention. In other words, they want to confirm that PCAs actually showed up to CE, that they are the person they claim to be, and that they are not distracted/absent during the CE content. DPR is proposing new ways to confirm all this for both in-person and online CE.

Why are we doing this?

DPR is under immense pressure from the well-funded and well-organized environmental justice coalition (EJC), who are against all things pesticide. DPR staff have personally witnessed, and documented, license holders intentionally and unintentionally cheating on CE hours. CAPCA's leadership tends to agree with the view that the prevalence of any cheating in PCA CE attendance undermines the credibility of the entire PCA license program. It must be stopped.

The consequence of unmitigated cheating has been laid clear: DPR will instead require manual re-testing of license holders within secure testing facilities. CAPCA Leadership believes that cleaning up our CE verification system is vastly preferable to this re-testing option. CAPCA Leadership also believes that if we take the lead in self-regulation, we take ammunition away from our EJC critics.

CAPCA has been at the table with DPR early and often regarding this issue. We have suggested ways to make it simple to implement, ways to modernize it, and ways to improve accuracy. We have pushed back on draconian measures and those that violate license holders' privacy rights. We have also requested some room to innovate and experiment so that we can develop a system that is convenient for all stakeholders to use.

What to expect at Conference

Conference attendees will be provided a unique name badge with a QR code and a photo taken at the time of the required ID check. The upcoming regulations ask for an accounting of when attendee arrives and leaves the course, along with ID checks for each course. CAPCA chose the QR code system as means to track time accurately, along with a photo to serve as an ongoing ID verification instead of asking you to produce your photo ID every time you enter a CE course.

As you enter a CE event, a CAPCA volunteer will be standing by a stanchion with a tablet where you will scan in your code. Whether you leave the room for the bathroom, a



phone call, or because you no longer wish to attend, you will be asked to scan out. If you check back into the meeting in less than 15 (cumulative) minutes, then you will not lose any CE credit.

I understand that people are uncomfortable with change; the Scantrons are part of a long legacy in our profession. I understand that having to check in and check out feels oppressive. However, the reality is that it is the consequence of years of cheating by a small fraction of the CDPR license and certificate holder community. We need to stop the cheating before the consequences become even more severe. PCAs are the boots-on-the-ground leaders of IPM in California, and CAPCA won't let anyone undermine that position.

I encourage PCAs who wish to provide constructive feedback on improving the QR system to speak with one of the CAPCA staff or board members at Conference. If you wish to voice concerns, or to make the argument as to why we should enable cheating, please find me at Conference. ■



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2022 CAPCA CONFERENCE

October 9-11, 2022 | Disneyland Resort | Anaheim, CA



Annual CAPCA
Conference &
Agri-Expo

REGISTRATION IS NOW OPEN!



<https://capca.com/conference>

CONFERENCE SCHEDULE:

SUNDAY, OCTOBER 9, 2022 - 3.5 DPR Hours

Nitrogen Management Session - 2.5 CCA Hours Only

Crop Roundtable Meeting: Wine & Table Grapes (+ *General Session = 3.0 CCA Hours total*)

Exhibitor Presentations

MONDAY, OCTOBER 10, 2022 - 7.0 DPR Hours

General Session

Exhibitor Presentations

TUESDAY, OCTOBER 11, 2022 - 3.5 DPR Hours

General Session

Exhibitor Presentations

CE Hours and Program Information:

Anaheim Continuing Education Program

October 9-11, 2022 | Disneyland Resort, Anaheim CA

<https://capca.com/conference/conferenceprogram/>

DPR Hours Total: 14.0 (1.5 Laws & 12.5 Other)

Please note: No Label update session will be held in Anaheim

REGISTRATION PRICING:

Full Attendee Registration for licensees needing CE credit:

CAPCA Member: \$515 (*Members save \$80*)

Non-Member: \$595

Companion Registration: \$395

(*Companion Registration available Aug. 31-Oct. 3, 2022*)

Online pre-registration closes 10/3/22. Availability of onsite registration depends on capacity. Full Attendee+ pricing only.

4.0 DPR Hours (Laws) Conf. Label Update Program (online only) will be available for purchase starting in October.

Orchard Success and Why It Pays to Focus on Root Health

Below the surface of the soil, where plant roots are meant to thrive and provide a healthy support system, is the place to start your orchard health program.

Root health is a basic necessity impacting orchard health for many years. Sustainability, production and growth are all compromised by poor root health.

Sampling and Monitoring

With permanent crops like almonds, the biggest threats to tree root systems are destructive nematode species that feed on them, leaving trees struggling to take up sufficient nutrients and water. Whether the orchard is a new re-plant or mature, growers should consider soil sampling for nematode levels and continue to monitor for diseases that can also erode soil health.

According to the California Department of Food and Agriculture, nematodes reduce vigor and yield in tree nuts, causing 15 to 20 percent yield loss on average but sometimes as much as 50 percent.¹

Fumigation

Restrictions on soil fumigant use due to air quality concerns make pre-plant soil fumigation less likely to be a permanent nematode management solution. In addition, nematode populations in soil can rebuild over two or three years, threatening the health of maturing trees, and additional applications to suppress nematodes after fumigations are necessary.

Nematicides and insecticides are reliable post-plant protection against nematodes. "Research shows annual applications, as trees establish root systems, can add to crop yields," says Rob Kiss, Bayer Customer Business Advisor in central California.

Nematicide and Insecticide Solutions

Velum® One is a nematicide that can be easily applied via drip and microjet chemigation.

It suppresses a wide range of nematodes and

*Nematode populations can **rebuild over two or three years**, threatening the health of maturing trees.*

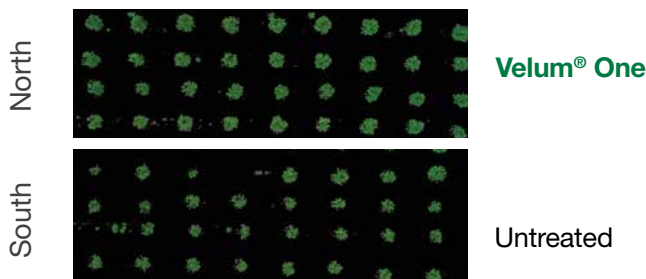
*Nematodes reduce vigor and yield in tree nuts, causing **15 to 20 percent** yield loss on average but sometimes as much as **50 percent**.¹*

has been shown to protect root health and help establish the crop. Trials conducted in California showed that *young almond orchards treated with Velum One saw improved canopy diameter by more than half (58%) as well as improvement in yield.*

Movento® insecticide can be applied as an in-season foliar spray. It moves through the leaves, down to the roots, protecting the roots from the effects of nematode feeding.

Velum® One Helps Establish Young Almond Orchards

Velum One-treated trees show 58% increase in canopy diameter (green canopy pixels).



Velum One applied at 6.5 oz. per acre, spring 2017, via drip irrigation. Trees planted in January 2017.

Fungicide Solutions

Serenade® ASO applied through chemigation colonizes the roots, helping to protect them from damage caused by soil-borne diseases. Healthier roots improve soil health and plant nutrient and water uptake.

Summary

Growers looking for an optimal start for their newly planted orchards and maturing trees should continue to be vigilant in managing soil pests and diseases in order to extract the maximum production and value from their orchards.

Making sure the root systems are protected from soil diseases and pests will give trees every chance to produce up to their full potential and ensure the long-term vigor and health of your orchard.

Learn more at: www.BayerCropScience.us

¹California Department of Food and Agriculture 2015 Specialty Crop Block Grant Program Project Abstracts.

IMPORTANT: This bulletin is not intended to provide adequate information for use of these products. Read the label before using these products. Observe all label directions and precautions while using these products.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS.

Not all products are registered in all states and may be subject to use restrictions. The distribution, sale, or use of an unregistered pesticide is a violation of federal and/or state law and is strictly prohibited. Check with your local dealer or representative for the product registration status in your state. Bayer, Bayer Cross, Movento®, Serenade®, and Velum® are registered trademarks of Bayer Group. For additional product information, call toll-free 1-866-99-BAYER (1-866-992-2937) or visit our website at www.BayerCropScience.us. Bayer CropScience LP, 800 North Lindbergh Boulevard, St. Louis, MO 63167. ©2021 Bayer Group. All rights reserved.



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VINTRE adjuvant is specifically designed to improve spreading and wetting on trees and vines. When combined with dormant oil, it delivers superior coverage and effectively reaches nooks and crannies for better protection using less oil. It can also be applied with other pesticides for maximum protection from damaging pests.



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 The Burchell Nursery, Inc.
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 Trapview NA, LLC
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Continuing Education Program Speakers



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RUBEN ARROYO
Riverside County Ag Commissioner
CACASA Update

JIM HARTMAN
Deputy Ag Commissioner, Los Angeles Co.
Managing Burrowing Rodents



DR. FRANK BYRNE
University of California, Riverside
*Neonicotinoid Alternatives for Asian Citrus
Psyllid Management in California*

VICTORIA HORNBAKER
Citrus Pest & Disease Prevention Div.
*Asian Citrus Psyllid and Huanlongbing
Treatment and Quarantines*



CHRIS CHEN
UC Cooperative Extension
*Wine and Table Grape Roundtable,
Abiotic Stress in Vines*

DR. IGOR LACAN
UC Cooperative Extension
*Diagnosis and Management of Phytophthora
Diseases in the Ornamental Landscape -
Sudden Oak Death and Others*



DR. OLEG DAUGOVISH
University of California Cooperative
Extension, Ventura
Soil-borne Pest Management

DR. CHRIS MCDONALD
Natural Resource Advisor, SoCal
*Using Organic Herbicides on Roadsides and
ROW: Evaluating Costs and Effectiveness*



DR. BEN FABER
UC Agriculture & Natural Resources
Avocado Herbicide Alternatives to Glyphosate

KYLE MCABEE
McAbee Ag Consulting, Inc.
Wine and Table Grape Roundtable



CAPCA CONFERENCE 2022

Continuing Education Program Speakers

FEATURED KEYNOTE SPEAKER:

ANTHONY LAFAUCE

The Clyde Group

*Taking Pride in Protecting California:
Why Don't We Get Credit for What We Do?*



DR. KARLA MEDINA

Certis Biologicals

*Nematicide Landscape 2022 and Beyond:
Implications for Current and Upcoming
Products*



DR. IVAN MILOSAVLJEVIC

University of California, Riverside

*Maximizing IPM of Argentine Ant and
Spa Sucking Pests (with Biodegradable
Hydrogels, InfraRed Sensors, and Cover
Crops)*



DR. MELISSA O'NEAL

ProFarm

*The Future of Biologicals and How
Biologicals Improve Your IPM Program*



JOHN RONCORONI

UC Cooperative Extension

*Best Management Practices for Weed
Control in Vineyards*



JEFF RASMUSSEN

Delmart Farms

Wine & Table Grape Roundtable

DR. SCOTT STEINMAUS

California Polytechnic University

Wine & Table Grape Roundtable



DR. EMILY SYMMES

Suterra & UCCE

*Wine & Table Grape Roundtable, and
Lessons Learned After 50+ Years of Mating
Disruption: A Deep Dive into MD Science and
Systems*



NANCY VOORHEES

Clarke Mosquito Control Products

*Trends in Mosquito Control in California
Mosquito and Vector Control Districts*



DR. DREW ZWART

Bartlett Tree Research Laboratories

*Disease and Insect Management in Trees and
Shrubs*



**Annual CAPCA
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Agri-Expo**

Nitrogen Management & Irrigation Update

CAPCA Annual Conference Breakout Session



Approved for 2.5 CCA Hours Only

October 9, 2022

9:00 a.m. to 11:50 a.m.

Program included in registration

No DPR credit available with Nitrogen Management & Irrigation Update



**Annual CAPCA
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Agri-Expo**

CAPCA would like to acknowledge the contribution and support of CDFA FREP in the development of this year's Nitrogen Management & Irrigation Update program.

POWDERY MILDEW MANAGEMENT DISEASE CONTROL IN GRAPE PRODUCTION

Powdery mildew can be a devastating disease for grapes. This fungal pathogen can result in reduced vine growth, yield, and fruit quality. The fungus can survive winter as chasmothecia, known as 'resting spores,' on the grapevine and nearby host sites, as well as mycelia infecting tissue inside dormant buds. Additionally, this fungus has been shown to have developed resistance to some commonly used fungicides.



Becky Garrison, thegrapevinemagazine.net

Combat powdery mildew and manage the development of resistance through prevention, such as dormant applications and continued measures throughout the growing season to protect plant tissue by reducing spores and inhibiting fungal development.

Year-Round Disease Control

Whether your vineyard is freshly planted or well established, BioSafe Systems' product solutions deliver innovative grower options from dormancy through harvest. For versatile grape powdery mildew control, **PerCarb®** and **OxiDate® 5.0** work harmoniously in tank-mix and rotational programs to reduce disease pressure by eradicating spores and mycelium. OxiDate 5.0 knocks down plant pathogens on-contact and disinfects plant surfaces, while PerCarb provides on-contact activity with residual control.

Applying PerCarb during dormancy will help reduce the pressures of overwintering powdery mildew chasmoth-

ecia and botrytis spores hiding in the bark and woody structures of the vine. During the growing season, the most important growth stages to manage mildew are before and after bloom and through bunch closure. The use of PerCarb rotated with OxiDate 5.0 in a program comprised of oils and effective systemic/residual chemistries season long will provide the best protection against powdery mildew, thus insuring solid yields with the highest quality grapes California is known for.

BioSafe Systems' Brand of Disease Control

Since 1998, BioSafe Systems has led the industry in the manufacturing of peroxyacetic acid (PAA) based foliar disease control solutions. With our proprietary PAA technology and peroxide materials, we support growers with sustainable, effective and versatile growing solutions that maximize their bottom-line and quality. We strive for maximum efficacy with each of the products we manufacture, while holding true to our core mission of providing "simply sustainable" chemistries.



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STUDENT NETWORK EVENT

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SUNDAY, OCTOBER 9, 2022 | DISNEYLAND RESORT | ANAHEIM, CA

For more information about the Student Network Event, visit capca.com/pca/events/
12:00 p.m. - 4:30 p.m.

STUDENTS:

1-Day Student Network Event (Sunday Only) \$100

Companion Pass for Conference Program (including Student Networking Event) \$395

COMPANY RECRUITER REGISTRATION:

For information, contact support@capca.com



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Sponsorships are Available!
<https://capca.com/conference/sponsor-information/>

THE FIGHT FOR RESIDUAL CONTROL

This summer's heat brought mite pressure, and effective solutions seemed scarce. The ways in which California growers fought through the season were harrowing, from product shortages to supply chain delays. One solution that many turned to in the chaos was Envidor® miticide, a valuable tool that may have been lost if it weren't for a few dedicated growers and industry professionals. Partnering with Gowan USA's adept regulatory team, agricultural commodity groups like the Almond Board of California, California Walnuts and California Fresh Fruit were able to make a significant impact on the available mite solutions for years to come. **As a result, in late June of 2022, Gowan USA was pleased to announce the EPA's rescission of a cancellation order for the active ingredient spiroadiclofen, allowing for the continued application of Envidor® now and into the future.**

This result was based on work done by Gowan's regulatory team and included data Gowan submitted to the EPA, allowing for the completion of risk assessments and registration review decisions for spiroadiclofen. In addition, this submission included Gowan's commitment to implement label changes that adequately address the EPA's risk concerns. As a result, Gowan has submitted an amended label for EPA's review for the sole end-use Envidor® product that reflects the risk mitigation proposed by the Agency.

"Gowan purchased Envidor® in 2020 and went right to work providing data and working with agricultural commodity groups who need and want Envidor to defend the registration and allow continued use," says Cindy Smith, Agriculture Relations Director for Gowan USA.

Spiroadiclofen is an IRAC Group 23 acaricide that inhibits lipid biosynthesis in a wide spectrum of mites, including the Tetranychidae and Eriophyidae, Tenuipalpidae, and Tarsonemidae families. It is active against all life stages of mites, including eggs, nymphs, and female adults, providing an initial "knockdown" effect and excellent residual control. Spiroadiclofen has active registrations in many horticulture crops such as tree nuts, citrus, apples, avocados, grapes, pears, and other fruit and plantation crops.



A cornerstone of Gowan's Muddy Boots philosophy is to support growers and distribution partners in meeting the challenges of controlling destructive weeds, insects, or pathogens infesting crops.

"Gowan believes the continued registration of Envidor keeps a critical residual product solution in citrus, tree nuts, tree fruits, and vines, allowing us to better serve growers' needs in these crops," says Eric McEwen, Director of Marketing for the US and Canada for Gowan USA.

In addition to Envidor, Gowan USA supplies other foundation California miticide program products of Onager Optek, Magister SC, Nexter SC and Savey. All of these products are supported by seasoned local Gowan USA professionals working for a company which invests in export tolerances for labeled crops to support California agriculture.

Gowan Group is a global, family-owned agriculture solutions business headquartered in Yuma, AZ, USA. Gowan specializes in developing, marketing, and manufacturing global agriculture inputs such as crop protection products, seeds, and fertilizers. Gowan began in 1962 as a local crop consultancy business, helping growers identify the right crop protection solutions to help their farms thrive. Today, Gowan has over 27 entities in 15 countries and sales in over 70 countries. Across the world, the Gowan Tribe strives to understand the needs of local markets and provide solutions to critical pest problems. Using sound science and the coordination of regulatory, marketing, and sales expertise, Gowan then brings products to market that are essential for growers.



2022 SWS Scholarship Winner Announced

Each year CAPCA, through the Stanley W. Strew (SWS) Education Fund, awards a scholarship to an exceptional student who is pursuing a career in the pest management industry. The Stanley W. Strew Educational Fund, Inc., Mission Statement says: “We promote and communicate the development and implementation of educational and scholarship programs to ensure the future prosperity of our nation’s food, fiber and ornamental enterprises.” The Fund is dedicated to establishing educational opportunities and career growth avenues for the students of today and the leaders of tomorrow.

The Stanley W. Strew Education Fund administers these programs. Applications were posted on CAPCA’s website and distributed to universities and interested students. The CAPCA Scholarship recipient receives \$3,000. **This year we congratulate our 2022 Stanley W. Strew Scholarship recipient, Aalexias Woolf.**

Aalexias Woolf **2022 CAPCA Scholarship Recipient**

Aalexias is a Senior at CSU Fresno, set to graduate in the Spring of 2023. She is majoring in Plant Science with emphasis on crop production. Aalexias hopes to obtain her PCA license and CCA certificate. After graduation, she wants to dive right into the industry and become a PCA or a sales rep. Aalexias has had the support of Syngenta over the course of her college career, as she has interned with them for the past three summers. As the oldest of four children, Aalexias will be the first in her family to graduate with a college degree, something she is proud to proclaim and share with the world. Along with her internship with Syngenta, she has also been involved with many on and off-campus extra curriculars, such as the FFA Field Day Committee and the Agricultural Leadership Council. Every single reference she gave had nothing but praise for her hard work, dedication, and positive attitude toward life and her education. Aalexias is a strong student with tremendous drive to get the job done. It is with great pleasure and excitement that we announce Aalexias as our 2022 Stanley W. Strew Scholarship recipient.

We received the following letter from Aalexias this summer:

Hello, my name is Aalexias Woolf and I am so thankful to be selected as a recipient of the 2022 CAPCA/Stanley W. Strew Scholarship. It truly means so much to me that I was given this opportunity and your generosity is truly appreciated. This scholarship is going to help me become the first person in my family to graduate college with a degree. I am the oldest sibling, so setting a good example to my three younger siblings is very



Aalexias Woolf

important to me. I wanted to extend my gratitude to you for helping me make my dream of graduating college become a reality.

I am currently in my final year at Fresno State and will be graduating in the Spring of 2023. I am majoring in plant science with an emphasis on crop production. I have interned with an agricultural chemical company, Syngenta, for the past three summers and it has sparked my interest to become a PCA or sales rep once I graduate. I have hopes to obtain my PCA and CCA licenses once I have taken all the necessary coursework to do so. It is my hope to go straight into the industry and get as much first-hand agriculture experience before going back in my later years to teach agriculture education. I have a passion for the agriculture industry and teaching, so I am excited to possibly educate young minds on the industry that feeds the world. Besides going to school full-time, I am also involved in multiple clubs on campus. I am heavily involved in the agricultural ambassadors program, the FFA field day committee, the agriculture leadership council, the plant science club, and CAPCA as a student member. I also devote any free time to the FFA organization both at the local level and state levels. I help judge at various speaking competitions and serve as a team leader for multiple conferences that are held up and down the state of California.

I truly am so grateful for your scholarship support to college students like myself. This scholarship allows me to truly devote extra time and effort to my studies and for that I am extremely thankful. Thank you for not only investing in me, but my future aspirations as well.

With many thanks, Aalexias Woolf

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PCA Profile: Jan Hall, San Diego Chapter

By CAPCA Staff

Jan Hall graduated from Michigan State University with a BS degree (1978) and MS degree (1980) in Plant Pathology. She obtained her PCA license in 1982, soon after coming to California.

The major crops Jan consults in include nursery and greenhouse grown ornamentals, as well as greenhouse grown herbs, vegetables and cannabis/hemp. She specializes in plant pathology and pest management.

Jan spent 28 years in ornamental production for Paul Ecke Ranch. “As a technical services manager, I provided crop diagnostics, support and protocol guidelines for Ecke’s production line with our customers around the country as well as on our own production site,” explains Jan. “I also coordinated all pest management programs and was responsible for internal and external university research projects and worked with the CDFA and USDA/ APHIS on movement of plant material and regulatory issues.”

Jan has worked for Target Specialty Products in San Marcos since 2009. “Soon after coming to California, I took the PCA exam in case the license was needed for the Ecke Ranch. I continued to learn more about pest management while collecting CEUs every year.”

“Having my PCA license was a requirement for my position at Target Specialty Products. I have a sales territory in Southern California and am a Senior Horticultural Advisor and the Business Manager for the Nursery Team. My responsibilities with customers involve consulting, problem solving, development of educational programs, demonstration of products and equipment, and advising clients how to use same to reduce costs, improve pest control and crop quality, and revenue.”

When explaining her job to people outside the industry or who are unfamiliar with PCAs, Jan says she likes to focus on the cooperative relationships she has in the industry: “I view my role as part of a partnership with





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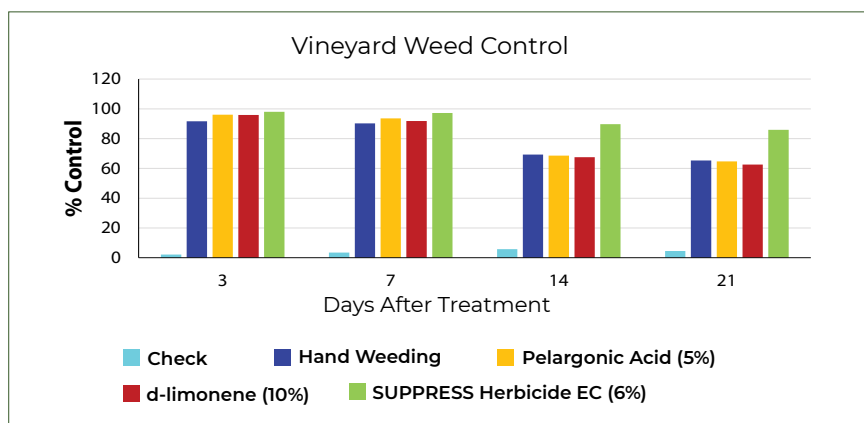
SUPPRESS® Herbicide EC, the market leader in certified organic herbicides, was the first effective herbicide to be approved for use on all certified organic food crops. With years of grower-proven efficacy and university testing, SUPPRESS Herbicide's patented and proprietary formulation consistently provides fast and effective burndown on a wide variety of grasses and weeds.

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SUPPRESS® Herbicide EC consistently demonstrates fast and effective burndown in years of university and field trials.

Grower Trial, 2017



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my customers. I try to help customers solve problems and improve quality and profitability.”

When asked if she has had any personal experiences or previous jobs that she feels really help her in her current career, Jan says “Having the experience in production, research, and working with regulatory people have definitely helped in my career at Target. I’ve personally experienced many of the production issues my customers encounter.”

Helping clients solve issues has always been very satisfying for Jan. A particularly rewarding point in her career was the co-founding of a plant virus working group: “I co-founded a plant virus working group that brought researchers, commercial production companies, and diagnostic industry representatives together to solve virus detection issues in the ornamental industry. I’ve been able to promote the use of Agdia Immunostrips to growers, allowing them to quickly diagnose virus issues and take the proper action to minimize crop loss.”

Thinking back on how she became involved with CAPCA, Jan relates: “I originally joined CAPCA to track my CEUs,

but have valued the support from CAPCA on regulatory issues for PCAs.” Over the years her involvement continued to grow. “I am currently the President of the San Diego Chapter of CAPCA. Our chapter focuses on holding three strong CEU opportunities each year, with the Nursery Greenhouse Seminar being our flagship seminar.” Her chapter also works to support local researchers and students. “We work with local colleges to engage students in the industry, inviting students to our seminars, offering scholarships for the annual CAPCA Conference, and offering to reimburse San Diego students for the PCA exam registration after successfully passing the exam.”

Looking toward the future, Jan sees the importance of CAPCA supporting PCAs as continuing to play an essential role in the industry. “I look forward to CAPCA continuing to be a voice for PCAs in dealing with regulatory issues, offering quality CEUs, and encouraging new college graduates to obtain their PCA license and join our industry.”

Jan is married to Ron and has two grown children, Chris and Ron. She enjoys gardening and crafts. ■

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MANAGE GRAPEVINE PRUNING DISEASES

ADVERTORIAL

Diseases such as ESCA are imminent threat to grapevines, especially immediately after pruning is completed. While growers have a number of options to “cover” the wound, a highly effective biofungicide is available featuring a proven combination of two species of beneficial *Trichoderma* fungi that are active against the pathogens across a wide range of environmental conditions.

ESCA is a grapevine wood disease that affects vine yield and longevity, particularly troublesome in vineyards with a history of grapevine pruning disease. The main causal agents are the deuteromycetes fungi *Phaemoniella chlamydospora* and *Phaeoacremonium* spp, and the basidiomycete *Fomitiporia mediterranea*. The pathogens most relevant to California growers include *Eutypa lata*, *Neofusicoccum parvum* and *Phaeoacremonium minimum*. Recent studies show excellent control of these three using a new viticultural tool.

“The advantage to our product Bio-Tam® 2.0 is that the two species of *Trichoderma* fungi colonize the pruning wounds and form a shield that prevents pathogenic fungi from spreading within the plant,” according to Duane Canfield, marketing manager for SePRO Ag, based in Carmel, IN.

TREATMENT OF GRAPEVINES

Pruning of grapevines should be conducted after the peak of low temperatures has passed. A single, directed application of

Bio-Tam® 2.0 is used at a rate of 1/lb/acre diluted in 25 to 50 gallons of water. A dye in the tank-mix will help ensure thorough coverage of all susceptible tissue, including cordons, spurs and all cut surfaces. Application should be made within 24 hours of pruning, and a respray is needed if rain occurs within six hours of treatment.

The combination of two active species works in a broader temperature range, *T. gamsii* starts working at 44.6°F and *T. asperellum* at 53.6°F, allowing for a wide application window across varying environmental conditions. These strains were selected for high activity against fungi responsible for pruning diseases.

A second application of Bio-Tam® 2.0 is recommended when:

- Pruning high risk vineyards:
 - Vineyards with a history of grapevine pruning disease
 - New vines replanted over a highly infested area
 - Where high disease pressure from the surrounding area is present

- Rainfall or high humidity persist resulting in environmental conditions favorable to disease development.

Double pruning is another common activity, and it is recommended to wait until the second pruning pass if environmental conditions do not favor disease development into tissue beyond where the final pruning cuts will occur. Under this scenario, apply Bio-Tam® 2.0 within 24 hours of the second pruning cuts.

SAFETY PROFILE

“Safety is key for this biofungicide,” Canfield said. “These fungi strains are safe for the vines, organic or conventional, but also safe for workers with a four-hour REI. This is key to ensure continued pruning operations.”

Additionally, Bio-Tam® 2.0 meets NOP standards, is OMRI-Listed, has a zero-day PHI and offers no limitations on exports.

Excerpts* from UC Davis | Studies 2019-2020

| | Location/yr | Bio-Tam | Conventional Industry Standard | Control (Inoculated) |
|--|---------------|---------|--------------------------------|----------------------|
| Mean % infection of <i>Eutypa lata</i> | Davis/'19 | 7.69% | 92.31% | 100.00% |
| | Elk Grove/'20 | 5.00% | 10.00% | 75.00% |
| | Kern Co./'20 | 0 | 5.00% | 25.00% |
| Mean % infection of <i>N. parvum</i> | Davis/'19 | 70.51% | 64.10% | 100.00% |
| | Elk Grove/'20 | 0.00% | 10.00% | 75.00% |
| | Kern Co./'20 | 10.00% | 10.00% | 45.00% |
| | Yolo Co./'20 | 0.00% | 0.00% | 40.00% |
| Mean % infection of <i>P. minimum</i> | Yolo Co./'20 | 5.00% | 20.00% | 70.00% |

*For complete summaries and research details visit https://ucanr.edu/sites/eskalenlab/Fruit_Crop_Fungicide_Trials/

A UNIQUE PRODUCT

“With grapevine pruning so important, Bio-Tam® 2.0 has been marketed primarily as a biofungicide to address those economically devastating diseases,” according to Duane Canfield, marketing manager for SePRO Ag.

“But globally including in the U.S., Bio-Tam® 2.0 is widely used to control soil-borne diseases in vegetable, fruit, row, and ornamental crops, as

well as to protect cuttings and bare-root transplants.”

Bio-Tam® 2.0 aggressively colonizes the soil rhizosphere and outcompetes pathogens for nutrients and space, surrounding soil to form a living barrier that is antagonistic to disease infection from major disease-causing fungi including *Pythium*, *Phytophthora* and *Rhizoctonia*. Inoculating early enables the crop to establish quickly, weather in season abiotic

stresses and increase yields. This disease protection actively grows along with the crop.

The unique blend of two highly active *Trichoderma* strains provides consistent performance across a wider range of environmental conditions (soil temperature, soil pH, organic matter) when compared with single species formulations.



SePRO Corporation | Carmel, IN
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Renewing your CAPCA Membership

Crystelle Turlo, Chief Operations Director

Typically, when CAPCA members think of October, they think of the annual Conference. But did you know that October is also the time that our individual members start renewing their CAPCA membership as well? Historically, the CAPCA state office processes most of our members renewals from October to February and sometimes can receive over 100 dues renewals a day during those months.

As we move forward during this “busy” time, CAPCA has some tips that our individual members can utilize so that we can get your membership renewed correctly and quickly.

- To make a purchase at CAPCA.com, you must be signed in first. Without being signed in, you will not be able to purchase your membership or register for an event.
- To sign in, click the “Login” button at the very top of your screen.
- CAPCA staff cannot tell you what your password was set to; but we can reset it/or send you a link to reset it. To reset your password, email support@capca.com for quick assistance.
- Our system does not allow us to update your Username.
- Do not create a new account because you cannot access your current account. Keep in mind that your account at CAPCA.com should be connected to your PCA license number. If you make a new account with an existing account attached to your license number, you will not be able to access your CE report. If you cannot log in, please contact support@capca.com for a help.
- The “Renew Now” button on the Member Dashboard has a glitch and will land you on an Error page. CAPCA staff is aware of the problem and is working with our website developers to fix it. To renew your membership from the Member Dashboard, follow these simple steps:
 - Click on the “CAPCA” button on the top-left side of the page under the Main Menu.
 - After landing back at the CAPCA home page, hover over the “Membership” button on the menu at the top.
 - By hovering over the button, it will create a drop-down menu with an option of “Renew Membership.”
 - Click “Renew Membership.”
- Remember, Active PCA’s need to purchase Active Membership. If you have an Active PCA license and purchase an Associate Membership, a CAPCA staff member will reach out to you to let you know that the Associate Membership dues will be refunded back to you.
- The CAPCA office is closed on the weekends and Membership renewals are not managed during that time. Use support@capca.com for assistance.
- Our final tip is that if you do reach out to CAPCA staff and do not connect with anyone on your first try, please be patient and leave a voicemail or use support@capca.com. As mentioned previously, we may be processing hundreds of dues renewals and are working as fast as we can to ensure your membership is up to date. Contacting multiple staff members and leaving multiple messages slows the staff down since we will be returning calls to members that may have already spoken to other staff and had their problem resolved.

We sincerely appreciate your membership and want to provide the best possible customer experience for our members. By providing these tips, we hope that you are able to renew your membership quickly and efficiently in 2022. ■



<https://capca.com/membership/>

CONQUER YOUR FIELD

OVERCOME THE THREAT OF PESTS WITH KEMIN'S BOTANICALS.



KEMIN.COM/CONQUERYOURFIELD

When pests like two-spotted spider mites, Asian citrus psyllids, western flower thrips, lygus bugs, spotted winged drosophila, navel orange worm, or aphids threaten your field, preventative sprays with botanical oil-based biopesticides early in the season are the key to success.

As an expert in essential oils, we supply growers with contact miticides, insecticides, and repellents made with a proprietary rosemary oil blend – TetraCURB™ MAX – and garlic oil – AlliCURB™ – that effectively control key pests on your high-value crops, thanks to their multiple modes of action, potency and ease of use.

Michael Hull, Kemin Crop Technologies' Technical Services Manager, is an entomologist passionate about botanical oils. Below, he shares with growers and PCAs his tips and best practices to be successful when using biological products.

Here are 4 key features of our botanical oil-based biopesticides growers and PCAs should know.

KEMIN'S BOTANICAL OIL-BASED BIO-INSECTICIDES:

1 PROVIDE USERS WITH THE BEST RESULTS WHEN USED AS PART OF A PREVENTATIVE SPRAY PROGRAM

Botanical products typically do not have the same knockdown abilities as their conventionals. Therefore, having a proactive approach instead of a reactive one and spraying early and consistently at a lower rate will ensure the pest populations remain manageable throughout the growing season. Moreover, many insects have historical seasonal emergences. Therefore, knowing your target pest life cycle can aid in timing preventative sprays.

2 WORKS THANKS TO MULTIPLE MODES OF ACTION, RESULTING IN A LOWERED CHANCE OF PESTICIDE RESISTANCE DEVELOPMENT TO OCCUR

Insects develop resistance when single MoA chemistries are repeatedly used. Hence, products with multiple modes of action provide growers with different ways to control insects with one single product. This reduces the likelihood of insects developing resistance and the number of new chemicals that must be applied. Also, repellency as a MoA enhances contact insecticides by deterring insect activity in applied acres. These activities include feeding, mating, and ovipositing on affected plants. Applications need to be made often to maintain effective repellency.

"We recommend that growers include Kemin's botanical biopesticides into an Integrated Pest Management program. Adding our products into a tank mix with other chemistries or in rotation adds additional modes of action and potential synergistic effects to a program, leading to higher knockdowns of target pests and an increased likelihood of successful control."

– Michael Hull, Technical Services Manager at Kemin Crop Technologies

3 CAN BE JUST AS ECONOMICAL FOR GROWERS AS CONVENTIONALS WHEN USED CORRECTLY

Higher rates are generally recommended for higher pest pressure. Therefore, keeping the population low can help lower the cost of application. The lower rate, most times, can be sprayed repeatedly on crops without risks of phytotoxicity and can keep pest populations at bay.

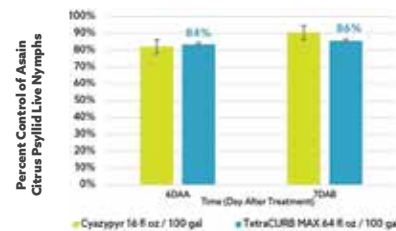
4 HAVE DEMONSTRATED PERFORMANCE IN FIELDS

TETRACURB MAX CONTROL (%) OF TSSM MOTILE LIFE STAGE



TSSM Field Trial 2021 – RCB Design with 5 replicates of 25 feet long strawberry beds with two plant lines in each bed • One application once a week for four weeks after pre-counts reached economic threshold TetraCURB MAX at 64 fl. oz./100 gal. water (0.5%) | Positive control: Industry standard (A.I.: Chromobacterium subtsugae) at 3 lbs/acre | Negative control (NC): Untreated • Foliar spray with backpack sprayer with wrap-around boom at 100 gal./acre • Motile counts prior to the first application and once 24-48 hours after each application. SD-22-24664

TETRACURB MAX CONTROL OF ASIAN CITRUS PSYLLID IN SWEET ORANGE



ACP Field trial, 2021 - RCB Design with a min. 6 replications per treatment; 3-5 trees per plot • 2 applications (A at pest threshold, B at 21 DAA). TetraCURB MAX at 64 fl. oz./100 gal. | Positive Control: Group 28 insecticide, A.I Cyazypyr (Cyantraniliprole 10.20%) at 16 fl. oz./acre | Negative Control (UTC): Water • Foliar spray at 125 gal/acre • Nymphal count at 6DAB and 7DAB. TD-22-8185

CHECK OUT OUR RECORDING IN THE 2022 LABEL UPDATE SESSION TO LEARN MORE ABOUT OUR PRODUCTS



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Richard Jones, Sales Manager California | 626-372-1153 | Richard.Jones@kemin.com

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Agriculture responds to DPR's pest management roadmap

Brad Hooker, Agri-Pulse

The Department of Pesticide Regulation is circulating a draft roadmap for transitioning California agriculture away from the use of conventional pesticide products.

The sustainable pest management report emanates from the 2019 cancellation of the insecticide chlorpyrifos and the administration's attempt to find suitable replacements. CalEPA realized the issue was much larger than one pesticide and funded a work group to consider ways to avoid unintended consequences. The 18-month effort will result in the final report.

"What we are trying to do as a state is accelerate the system-wide adoption of safer and more sustainable pest management practices that are in many places underway across the state," DPR Director Julie Henderson told *Agri-Pulse* in a recent interview. "What we're trying to do is really identify what supports and resources are needed to have a more widespread adoption of those practices and to accelerate that adoption to better protect public health and the environment in California."

According to the proposal, the roadmap is an ambitious and achievable strategy that depends on strong state leadership and thoughtful collaboration across the system. The report was meant for discussion and is still far from finalized.

A coalition of nearly two dozen farm groups have submitted their comments in response to the work group recommendations. Like many of agriculture's rejoinders to pesticide proposals presented by the Newsom administration or as bills in the Legislature, the coalition cautioned that California already has robust standards for pesticide oversight and enforcement that add another layer to federal regulations. And California agriculture, in turn, "boasts an impressive compliance rate."

The coalition struggled to understand the rationale for such significant changes in the system as proposed in the draft roadmap.

The report seeks "audacious goals" with 90% reductions in pesticide-related illnesses, in exposure to the environment and for residue on food, according to a coalition letter

to Henderson. The industry groups took issue with tying chronic illnesses to pesticide use without documenting a direct causation or ruling out the potential effects of chemicals from couches and makeup. It also pointed out that CalEPA agencies already closely monitor the air and water for hazardous levels of pesticide and that imported foods have a sometimes abysmal track record for residue compared to California's 98% compliance rate.

The agricultural organizations also worried about slashing the use of pesticides overall and the impacts that could have on combatting invasive pests and diseases and managing vegetation on farmland that has been fallowed due to drought or the implementation of the Sustainable Groundwater Management Act. DPR is already in the process of approving new regulations to limit the use of neonicotinoids, while creating a statewide pesticide notification system and increasing fines for violations.

"While we appreciate the WG's charge was to be bold, this draft cannot be legitimate if it's not based in what's possible and practical," they write, adding that the timelines are unreasonable and many of the recommendations ignore budget shortfalls, regulatory roadblocks and other hurdles. "We believe that the draft should state emphatically that these costs should not be borne by farmers but rather be public costs."

They warn against portraying farmers as "environmentally negligent, willfully applying high-risk pesticides without a basis to do so."

The work group will finalize its recommendations as it wraps up meetings in the coming months. Henderson stressed to *Agri-Pulse* that any new DPR actions will come with plenty of engagement with the agriculture community.

"We are endeavoring to do this in a way that better protects public health, the environment—but really does continue to support a thriving agricultural sector," said Henderson. "We—with the engagement of all of our stakeholders—believe we can do that and are just looking forward to continuous engagement with all of them."



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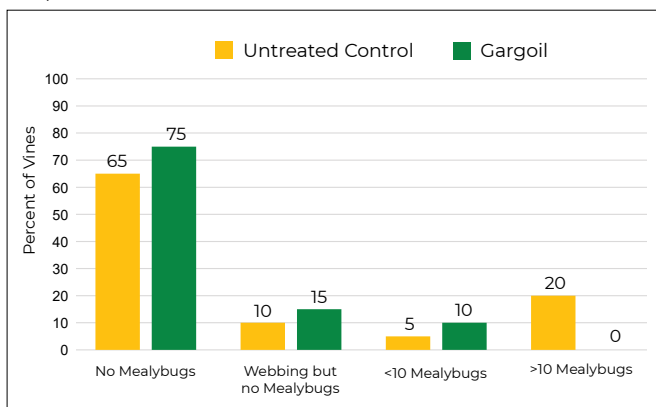
Gargoil® Insect, Mite & Disease Control targets pests including mites, aphids, mealybugs, thrips, whiteflies, psyllids and other soft-bodied insects. Gargoil® can also help control immature forms of larger insects such as worms and scale. Disease control includes botrytis and powdery mildew.

ADVANTAGES

- Apply throughout the season, even day of harvest, no PHI
- No limits on the number of applications per year
- Easy-to-use plant-based product approved for use on all crops

Gargoil® for the Control of Mealybugs on Grapes

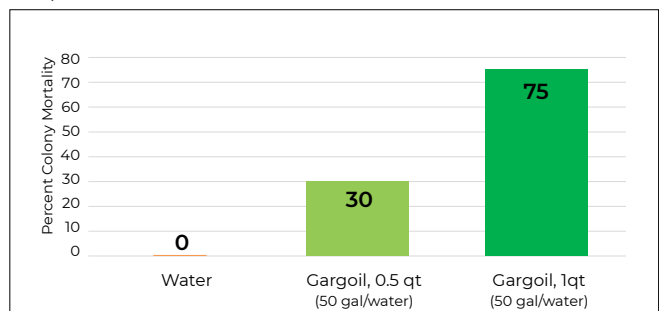
Cooperator Trial, 2022



- Two (2) applications: Applied in early spring and again one month later
- Application made through the drip irrigation system

Gargoil® for the Control of Rosy Apple Aphid

Cooperator Trial, 2019



- 15 infested shoots ID'd and flagged, N=5
- Mortality was assessed microscopically after 72 hrs
- Application made with hand sprayer until runoff
- High rate (2 qt) would have better mortality than achieved in this trial
- Application on June 23, 2019
- Water control mortality was 0%



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Knowledge is Key to Successful Integrated Nematode Management

Dr. Karla Medina, Field Development Manager Southeast US, Certis Biologicals

It is estimated that for every human on Earth there are 57 billion nematodes. Their number is larger than any other multicellular animal on the planet. A single handful of soil will house thousands of these microscopic worms. In vegetable systems, they are one of the main pests in the soil that growers face and they can be one of the most underestimated yield-limiting factors.

For generations, growers relied upon fumigants, especially methyl bromide, to effectively control species of plant-parasitic nematodes that can damage a wide variety of crops. But, since 2005 with the EPA phase-out of methyl bromide, growers have been diversifying their nematode management options, evaluating alternatives as they slowly look to move away from fumigants as a class.

Understanding Nematodes and Their Damage

With nematodes, like with most other animals, there are a variety of feeding specializations and habits. We have plant parasitic nematodes and beneficial nematodes, which compose the vast majority in soil ecosystems. Nematodes play a critical role in soil health, especially in terms of nutrient cycling, as they help regulate organic matter decomposition, provide a food source, and can be involved in disease prevention.

While not all nematodes are plant-parasitic, it is these pests that cause significant damage to a wide host of agriculture crops. Most plant-parasitic nematodes feed on the roots of a plant, making them difficult to detect. Root knot nematodes, considered one of the most damaging nematodes worldwide, use their sucking mouth parts to pierce roots, feed, extract nutrients and even inject secretions into the root. The damage that nematodes can cause to plants can be deceptive to identify. Hundreds or thousands of nematodes piercing a developing root system will cause significant mechanical injury.

Some endoparasitic nematodes, like root-knot, completely enter the root system and become immobile while others will also enter the roots but remain migratory. Root knot nematodes are identified by the damage they cause—visible galls and knots on roots—which causes physiological issues for the plant. Cyst nematodes don't form galls, but their cysts can be visible on the outside of roots. Similarly, lesion nematodes, which are also endoparasitic but remain migratory, mostly feeding in the cortex, can cause damage through root lesions.

Foliar nematodes can disrupt photosynthesis for a plant while many ectoparasitic nematodes, like sting and stubby root, can cause plants to have a short, stubby root system. In some cases, nematodes can even carry viruses that cause plant disease, such as the case with grape fan leaf transmitted by dagger nematodes and Tobacco Rattle Virus, transmitted by stubby root nematodes, which causes corky ringspot disease on potato.

Damage through a reduction in root density means that roots become less effective at taking up water and nutrients. This compromises the health of root systems by increasing susceptibility to disease, low nutrient uptake, pests, and abiotic stressors. It is not uncommon for growers to treat symptoms of nematode damage without first identifying the root cause.

Identification of Nematodes for Effective Control

While some plant-parasitic nematodes feed above ground, the vast majority are underground, living and moving in soils and feeding on and in plant roots.

When testing and sampling for nematodes, it is important to remember that the pests do not move very far in a field on their own. Large geographic spread is typically caused by human or animal activity or water or soil runoff. Weeds are prime hosts to nematodes and can result in hotspots of nematode activity.

Because most nematodes are microscopic, detection and identification require regular soil testing. While nematodes do not move horizontally in the soil very far, they can move vertically through the soil profile. In the off-season, testing should occur much deeper to account for this move.

Seasonal fluctuations caused by temperature, moisture and soil conditions also can impact soil testing.

Bacterial feeding nematodes will peak when decomposition of crop residue occurs while plant-parasitic nematodes will be most present when roots are present.

It's important to understand the life cycle of nematodes to know how to best interpret results when sampling and testing efficacy. There is no best tool for sampling, and it can be done at random or in a systematic approach ensuring a high number of subsamples per plot. The key factor is to monitor.

Depending on timing of the soil crop rotation, nematode life cycle, and environmental conditions, sampling in the soil root zone and even deeper in the subsoil is recommended. Samples should be taken at various times depending on whether you are trying to diagnose or predict nematode pressure during the growing season and even pre-plant and post-harvest for the most robust data set possible.

A New Era of Biological Nematicide Control

When methyl bromide started officially being phased out, innovators and manufacturers of biological inputs responded with a host of new bionematicide products. With the decrease in reliance upon fumigants for complete control, growers have increased adoption of these bionematicides for effective integrated nematode control.

The usage of nematicides based on microbials, plant extracts or biochemicals has increased in the past decade. Most registered active ingredients in the US fall into these categories: microbials based on bacteria and fungi, from live or dead microorganisms, plant extracts and biochemicals.

These bionematicides offer many advantages beyond their

effective control of plant-parasitic nematodes that can significantly damage crops. They are very robust with proven efficacy, in many cases as much as synthetic controls. They are effective on a wide range of soil types and temperatures, and they have an increased shelf life (in some, up to two years).

Because their activity is very specific against plant-parasitic nematodes, they will not impact the beneficial nematode community, carrying through a positive effect on soil health. Additionally, bionematicides are sustainable as they decompose quickly with no detrimental effects of accumulation, avoiding residues and environmental impacts.

Bionematicides can be applied before plant or at plant, during the season or post-harvest, which gives this category much more flexibility than synthetic controls. With bionematicides, best practice is to apply in sufficiently moistened soil for optimal establishment in and around the root zone. Low soil temperature can decrease the activity of a live microbial control agent, but plant parasitic nematodes are also less active in cold soils.

Table 1. Nematicides based on microbial or plant extract and biochemicals registered in the US

| Origin | Type | Active ingredient (s) | EPA Reg# | Use site* | Product | | | |
|---------------|-------------------------------|--|--|---|--|----------------|--------|--------|
| Microbials | Bacterium | Live | Spores | 1. <i>Bacillus licheniformis</i> strain FMCH001 2. <i>Bacillus subtilis</i> strain FMCH002 | 279-3618 | ST | Liquid | |
| | | | Spores | <i>Bacillus firmus</i> strain I-1582 | 423-1512 | ST/Turf | Dry | |
| | | Spores | 1. <i>Bacillus firmus</i> strain I-1582 2. Clothianidin | 7969-459 | ST | Liquid | | |
| | | Spores | <i>Bacillus amyloliquefaciens</i> strain MBI600 | 71840-27 | ST | Liquid | | |
| | | Spores | 1. <i>Bacillus amyloliquefaciens</i> strain MBI600 2. <i>Bacillus pumilus</i> strain BU F-33 | 71840-19 | ST | Liquid | | |
| | | Spores | 1. <i>Bacillus amyloliquefaciens</i> strain MBI600 2. cis-Jasmone | 55146-162 | ST | Liquid | | |
| | | Spores | <i>Bacillus amyloliquefaciens</i> strain PTA-4838 | Several | ST | Liquid | | |
| | | Spores | <i>Pasteuria</i> spp. (<i>usgae</i> B11, <i>nishizawae</i> Pn1, <i>penetrans</i> , (<i>Hoplolaimus galeatus</i>)-PH3, (<i>Rotylenchulus reniformis</i>)-Pr3 | Several | ST | Liquid/Dry | | |
| | Dead | Non-viable bacteria cells and spent fermentation media | <i>Burkholderia rinojensis</i> strain A396 | 84059-14 | AG | Liquid | | |
| | | Non-viable bacteria cells and spent fermentation media | <i>Chromobacterium subtsugae</i> strain PRAA4-1 | 84059-27 | AG | Dry | | |
| | | Fungus | Live | Spores | <i>Purpureocillium lilacinum</i> strain 251 (synonym <i>Paecilomyces lilacinus</i>) | 264-1191-70051 | AG | Liquid |
| | | | | Spores | <i>Purpureocillium lilacinum</i> strain 11 (synonym <i>Paecilomyces lilacinus</i>) | 82074-16 | NA | Dry |
| | Spores | | | <i>Muscador albus</i> strain SA-13 | 84059-26 | NA | Dry | |
| | Dead | Non-viable fungus fermentation solids and solubles | <i>Myrothecium verrucaria</i> strain AARC-0255 | 73049-67 | AG | Dry | | |
| | Plant Extracts & Biochemicals | Plant extract + chitosan | 1. Saponins of <i>Quillaja saponaria</i> 2. Chitosan | 92032-1 | AG | Liquid | | |
| Plant extract | | Saponins of <i>Quillaja saponaria</i> | 82572-1 | AG | Liquid | | | |
| Plant extract | | Azadirachtin | Several | AG | Liquid/Dry | | | |
| Plant extract | | Neem Oil | Several | AG | Liquid | | | |

* Please refer to each active ingredient labels available at EPA-Pesticide Product and Label System for complete use sites. ST=seed treatment, AG=agricultural crops, NA=not commercially available.

Integrated Nematode Management is Key for Successful Control

Like integrated pest management, a combined approach to nematode control is the key for success throughout the growing season. There are five pillars to an effective integrated nematode management program, mixing both agronomic practices and treatment.

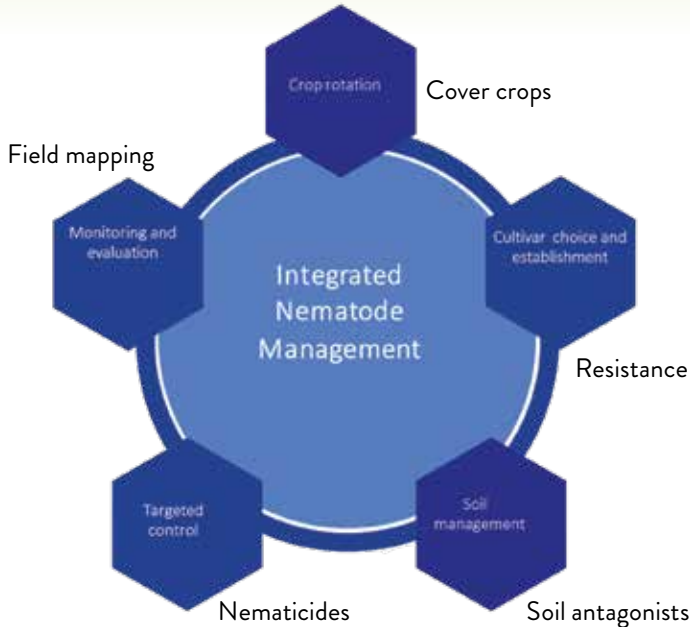


FIG. 1. Cited from book titled “Integrated Nematode Management: State-of-the-Art and Visions for the Future” with open access at <https://www.cabi.org/bookshop/book/9781789247541/>. Figure kindly shared by Johan Desaegeer, Associate Professor University of Florida GCREC, one of the book’s editors.

Some practical tips that help ensure the success of an integrated approach are:

- 1. Focused Sanitation of Equipment**— Nematodes don’t move large distances on their own, meaning that humans or other animal activity is responsible for most of that motility. To cut down on this movement, growers should be diligent about cleaning equipment, especially when moving fields, to ensure that there is no soil attached that can be transplanted.
- 2. Plant or Tuber Sanitation**— Plants can be another factor when transporting nematodes, especially for ones that have a lot of roots. Steaming transplant roots can be effective treatment to reduce the chance of nematode travel.
- 3. Cover Crops**— Cover cropping is vital to protection of soil health for a variety of reasons, but growers who use this practice should be careful to choose a cover crop that is a non-host for nematodes to reduce population build during the off-season. Depending on the nematode, the susceptibility of each cover crop can vary. In Florida for example, sunn hemp (*Crotalaria juncea* L.) is a legume used in the summer and is a poor host to root-knot nematodes.

Summary:

Effective control of plant-parasitic nematodes requires an understanding that eradicating damaging nematodes is not the goal—the key is to manage them by adopting practices with a positive impact on soil health for long term benefits in the cultivation of our crops. A deeper understanding of the pest and a more data-driven approach to treatment is revolutionizing the ag industry and while fumigants still dominate the market for treatment, growers who are turning to an integrated approach, implementing agronomic practices with a combination of synthetic and biological treatment, are finding success on-par or better. ■



Keep Your Grapes Cleaner and Greener

California is the fourth-largest grape producer in the world for a reason: Its climate is ideal for producing this delightfully versatile crop. The flip side is California's climate also is ideal for disease development.

"Powdery mildew is here all year round. It's a pathogen that infects all tissues of grapes – leaf tissue, shoot tissue and the actual berries themselves," says Garrett Gilcrease, Syngenta agronomic service representative in California. "If it's bad enough, it'll actually take down the whole entire cluster, and that just adds a whole other layer of inoculum. It also allows a pathway for other pathogens to infect, so *Botrytis* has a much easier time infecting grapes when it's got that pathway of powdery mildew."

One of the major challenges with *Botrytis* is that by the time you spot it in the vineyard, it's already a problem. The fungus overwinters in berry mummies, and after a rain or irrigation is applied, sclerotia germinate, producing spores and infecting flowers. The fungus becomes dormant until later in the season, when sugar concentration is higher; then it grows and spreads throughout the infected berry, which can split and ooze while the pathogen sporulates on the surface and spreads to nearby rows.

That's why, Syngenta Product Marketing Lead Raj Iragavarapu says, specialty crop producers – particularly grape growers – need the power that Miravis® Prime fungicide brings to the field and vineyard. "With dual, highly efficacious active ingredients, Miravis Prime controls those difficult diseases that impact their marketable yield opportunity," he says. "The result: Crops are cleaner and greener."

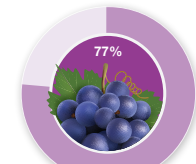
Miravis Prime offers:

- **Two powerful active ingredients.** ADEPIDYN® technology and fludioxonil provide preventive and curative activity for excellent disease control.
- **Flexible Management.** Miravis Prime can recharge and complement integrated pest management programs.
- **Translaminar Activity.** The proprietary formula accumulates heavily into the wax layer and translocates through the leaves. Research trials show vines treated with Miravis Prime produce less diseased fruit for higher marketable yield potential.
- **Stability.** Miravis Prime remains stable on the leaf surface for even distribution and protection.

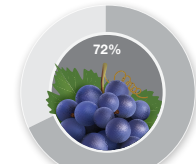
For more insight into your grape vineyards and how to manage disease pressure, earn PCA continuing education credit with the Miravis Prime Grapes Learning Module, available online at SyngentaUS.com/Grapes. You can also contact your local retailer or Syngenta representative.

Miravis Prime helps increase marketable bunches

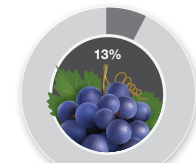
Marketable bunches (%)



Miravis® Prime



Competitor Product



Untreated

Grape: Zinfandel
Three applications: Bloom, bunch closure and veraison
USWB0F1022016. California

Example Programs for Disease Control on Grapes

Seasonal Calendar



| DISEASES | Leaf Unfolded | Leaf Development | Early Flowering | Fruit Set/Swell | Fruit Development | Veraison | Preharvest |
|-------------------------|---------------|------------------|-----------------|-----------------|-------------------|----------|------------|
| WESTERN GRAPES | | | | | | | |
| Powdery mildew | | | | | | | |
| Botrytis | | | | | | | |
| Summer bunch rot | | | | | | | |
| Phomopsis | | | | | | | |

* Do not use on Concord, Concord Seedless or Thomcord. On *V. labrusca*, *V. labrusca* hybrids and other nonvinifera hybrids where sensitivity is not known – the use of Revus Top®, Inspire Super® or Quadris Top® fungicide by itself or in tank mixtures with materials that may increase uptake (adjuvants, foliar fertilizers) may result in leaf burning or other phytotoxic effects. Note: Suggested timing for Syngenta brands. Incorporate alternate products according to their label for a complete disease program.



Disease present:
Powdery mildew
Grow More Experience
site California; 2017



Spinosad-laced hydrogel baits effectively control Argentine ants in California citrus

Ivan Milosavljević^{1,2}, Nicola A. Irvin^{1,2}, Michael Lewis², and Mark S. Hoddle^{1,2}

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Why is Argentine Ant control necessary?

Argentine ants (AA), *Linepithema humile*, form strong relationships with honeydew producing sap sucking pests (SSPs) in citrus and other crops (e.g., grapes) (Fig. 1). AA protect SSPs from their natural enemies (i.e., predators and parasitoids; [NEs]) and in return for this protection AA are rewarded with honeydew, a sugary waste product that results from sap feeding (Milosavljević et al. 2017) (Fig. 1). Additionally, AA move SSPs to new parts of the orchard thereby driving pest infestations, and increased SSP populations provide more honeydew to AA which in turn increases ant populations. AA tend a diverse variety of SSPs in citrus (e.g., mealybugs, and brown soft scale), including, Asian citrus psyllid (ACP), *Diaphorina citri*, the vector of *Candidatus Liberibacter asiaticus* (CLAs), a bacterium that causes huanglongbing (HLB), a lethal citrus disease (McCalla 2019; Milosavljević et al. 2017, 2021). In southern California

citrus, AA protects more than 85 percent of SSP colonies and over 55 percent of ACP colonies from NEs (Tena et al. 2013). The consequence of ants protecting SSPs from NEs are increased costs of pest control. Therefore, AA control is a critical component of integrated pest management (IPM) programs for SSPs in citrus, especially programs that rely heavily upon biological control.

The loss of chlorpyrifos in California drives a new approach for Argentine ant control

Chlorpyrifos, a contact insecticide, is the only product registered for AA control in citrus, and its use has now been banned in California because it poses significant risks to human health (CDPR 2019). In response to this ban, the California Department of Pesticide Regulations (CDPR) funded work to develop an alternative ant control technology. The approach our team took was the

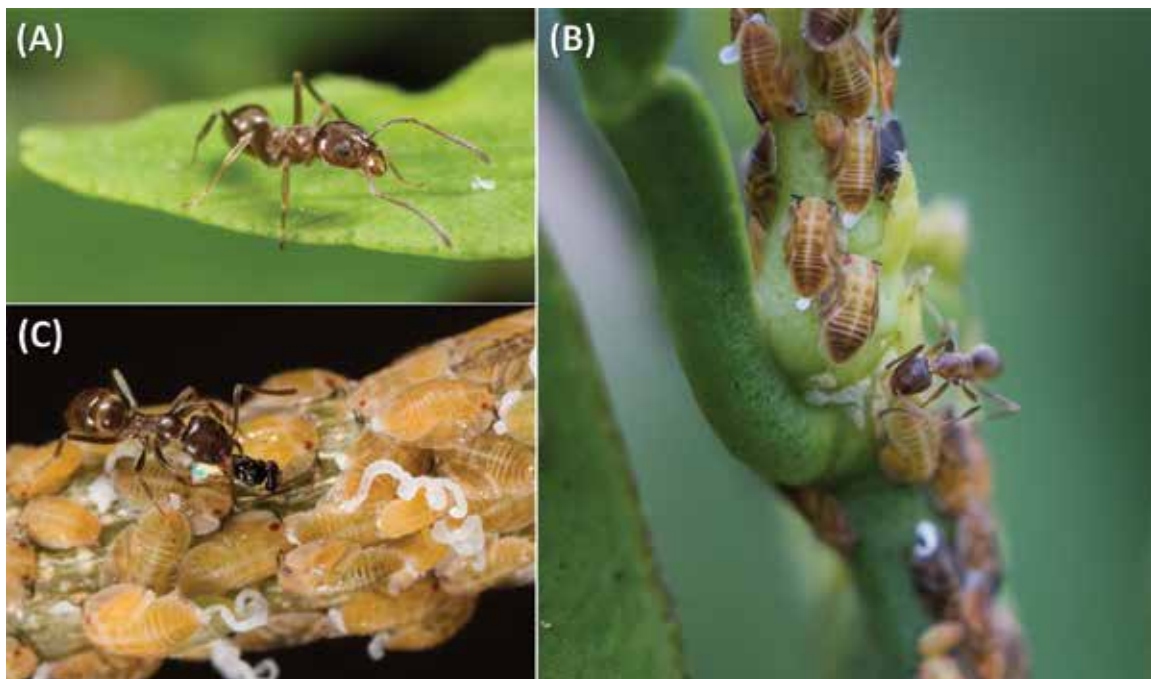


FIG. 1. (A) An Argentine ant foraging on a citrus leaf. (B) Argentine ants tend an Asian citrus psyllid colony to collect sugary honeydew; (C) Argentine ant attacking *Tamarixia radiata*, a key natural enemy of Asian citrus psyllid. Photos: Mike Lewis, Center of Invasive Species Research, UC Riverside



TOOLS FOR YOUR ORGANIC INTEGRATED PEST MANAGEMENT STRATEGY

DEFINITION OF INTEGRATED PEST MANAGEMENT (IPM)*

“An ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment.”

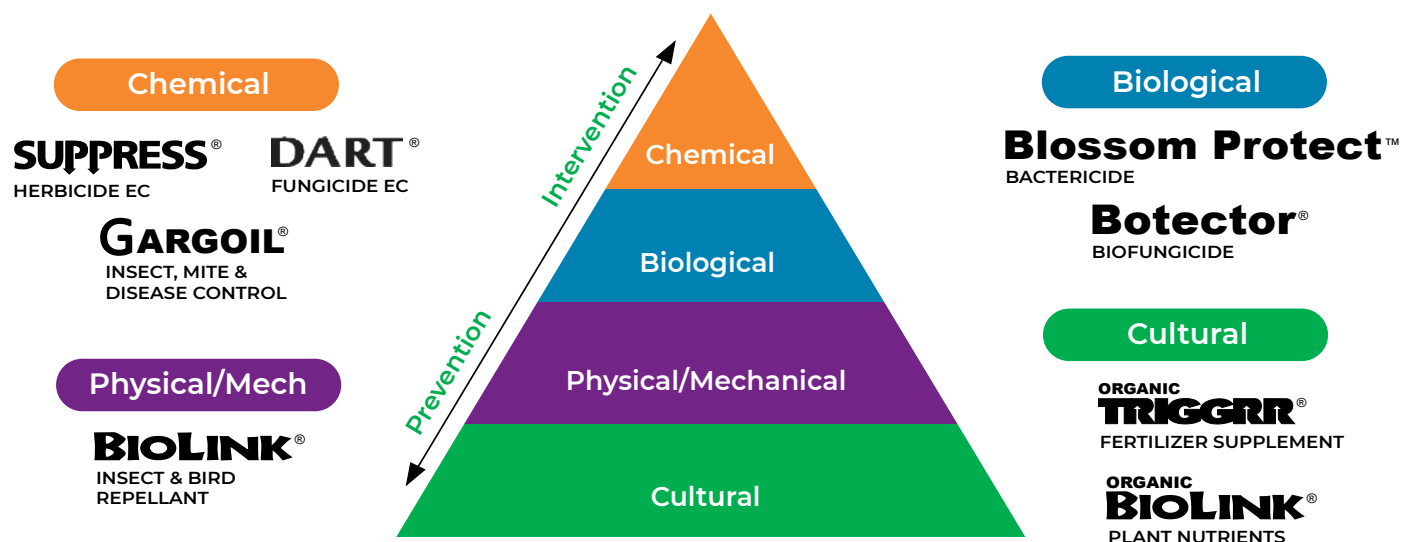
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* California DPR definition of IPM

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development of biodegradable alginate hydrogel beads (HGBs) (Schall et al. 2018). These beads are impregnated with ant trail pheromone and infused with a 25% sucrose solution laced with ultra-low concentrations of insecticide (0.0001%). HGBs are easily made from inexpensive commercially available materials, and they require no field maintenance as they biodegrade (Fig. 2). HGBs can be easily distributed under trees where rapid AA recruitment occurs. Foraging ants imbibe the toxic sucrose water, return it to the nest to feed brood and queen(s) which kills them, and this results in colony collapse. Consequently, HGBs may provide an alternative to plastic bait dispensers (Fig. 3) that are used in liquid baiting programs for AA control (McCalla et al. 2020). Rapid (< 5 days) long term (> 3 months) control of AA results from repeated HGB applications (~3-4 applications ~3 weeks apart over summer) and this can result in long-term reductions of SSPs in citrus. Populations of SSPs collapse when ants are controlled because NE efficacy increases markedly as AA are no longer present to harass and attack NEs (Schall & Hoddle 2017; McCalla 2019).

In pursuit of alternative insecticides for Argentine ant control

Using CDPR funding our lab demonstrated that thiamethoxam, a neonicotinoid insecticide, when delivered to AA using HGBs is highly efficacious (McCalla et al.

2020). However, there are increasing concerns over using neonicotinoids for pest control. Consequently, we investigated the efficacy of alternative chemistries for use in HGB's for AA control. A very promising insecticide, spinosad, an organically registered product, was identified from laboratory trials for incorporation into HGBs (Milosavljević & Hoddle 2021). This insecticide has been moved into the field evaluation pipeline for comparison to thiamethoxam, the “gold standard” against which we measure the efficacy of different products for AA control. Field trials in three commercial citrus orchards were run over July through December 2021. Experiments compared the efficacy of HGBs loaded with low (0.0001%) and high (0.001%) concentrations of organically approved spinosad, low (0.0001%) and high (0.001%) concentrations of thiamethoxam, and control treatments lacking insecticide treatments. Insecticide treatment groups received a series of three HGB applications each spaced 3 weeks apart at a rate of 250 g of hydrogel per tree. HGBs were hand-distributed (it is possible to mechanically distribute HGBs under trees) on recently irrigated soil (< 48 h) (Fig. 4). Timed visual estimations of the number of AA workers ascending and descending each tree trunk were used to measure treatment effects on densities of foraging AA. Preliminary statistical analyses have indicated that AA densities in plots treated with insecticide-laced HGBs were around three-to-four

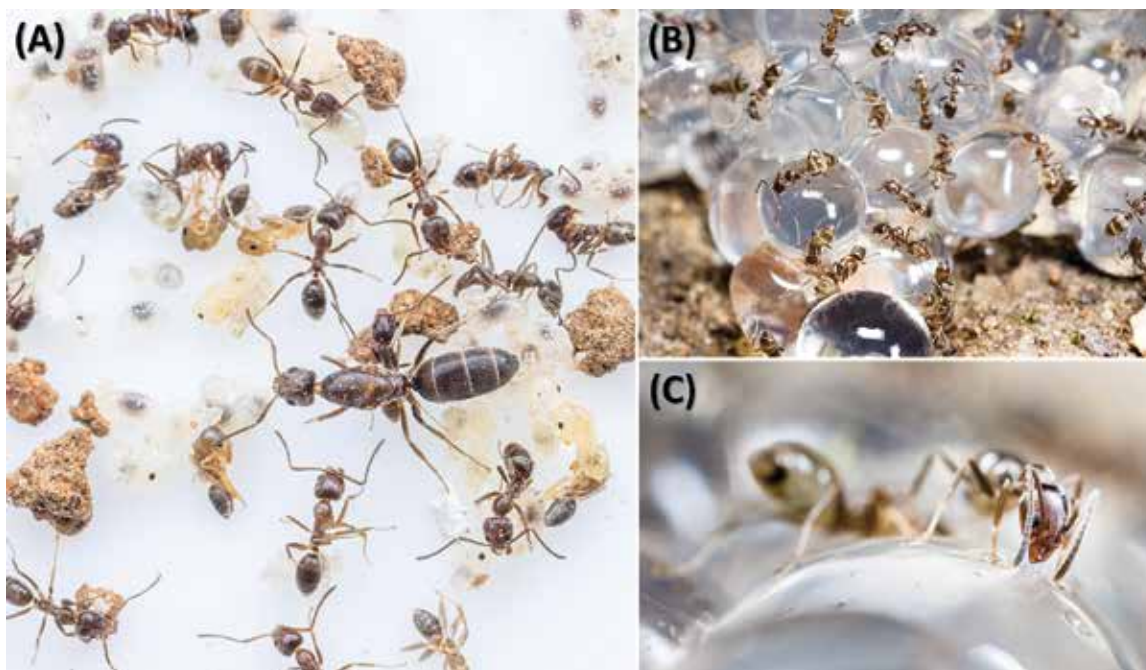


FIG. 2. (A) Argentine ant colony in the lab. Alongside the large queen are workers, pupae, and grub-like larvae. (B) Argentine ants imbibing sugar water laced with an ultra-low concentration of insecticide contained within biodegradable hydrogel beads. (C) Close-up of Argentine ants feeding from an alginate hydrogel bead filled with toxic liquid bait. *Photos: Mike Lewis, Center of Invasive Species Research, UC Riverside*



FIG. 3. Liquid baiting with plastic bait dispensers necessitates initial investment in bait dispensers and continuous labor costs for servicing. *Photos: Mike Lewis, Center of Invasive Species Research, UC Riverside*

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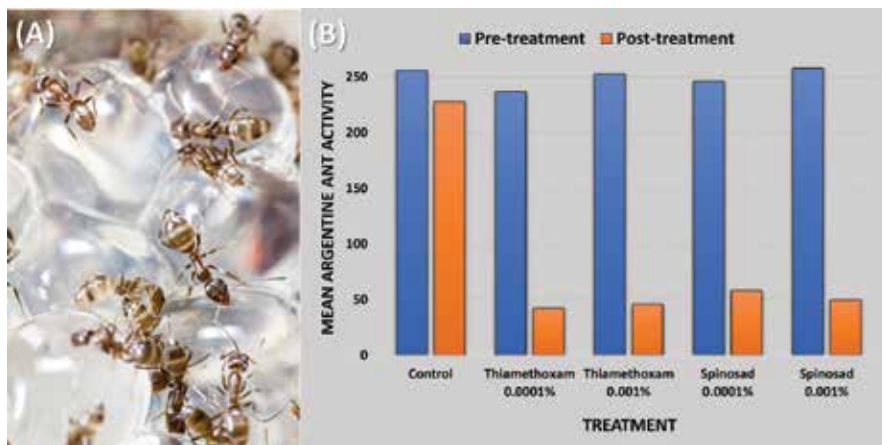


FIG. 4. (A) Argentine ants feeding on hydrogels soon after deployment. (B) Comparison of mean Argentine ant activities as estimated visually (number of ants traversing tree trunks per 1-min observation) on hydrogel-treated and control citrus trees across all sites on baseline sampling dates (blue bars) and following three HGB applications (orange bars). *Photos: Mike Lewis & Ivan Milosavljević, Center of Invasive Species Research, UC Riverside*

times lower than control plots lacking insecticides (Fig. 4). Importantly, the impacts of low and high concentrations of spinosad and thiamethoxam on foraging AA were statistically similar. This finding suggests that the 0.0001% concentration of spinosad provides significant suppression of AA populations, and its efficacy is similar to our “gold standard,” thiamethoxam, for AA control.

We conclude that HGBs have significant benefits compared to current AA treatment options in citrus. Insecticide delivery to AA in HGBs provides a level of control that is highly competitive with commercially available products and applications are highly targeted to ants foraging on the soil which preserves NEs that attack SSPs in the canopy. Organic growers may be able to benefit from the use of HGBs to control AA as our work has demonstrated that an organically approved spinosad formulation provides effective ant control. More work is needed to optimize the use of HGBs for AA control. We are currently determining the minimum amounts of HGB and frequency of applications needed to control AA in commercial citrus.

Acknowledgements

This work was supported in part by the California Department of Pesticide Regulations (CDPR) grant 20-PMG-R005 awarded to MSH and by the U.S. Department of Agriculture’s (USDA) Agricultural Marketing Service through Specialty Crop Grant 19-0001-031-SF administered by the California Department of Food and Agriculture (CDFA). Materials presented here are solely the responsibility of the authors and do not necessarily represent the official views of the CDPR, USDA, or CDFA. We thank Jordan Weibel (CDPR) and Sheila Morco (CDFA) for their assistance with grant management. We are grateful to citrus growers who provided access to orchards to do this work. ■

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Learning From Nature, ENHANCING NUTRIENT USE EFFICIENCY WITH THE AID OF BIOSTIMULANTS

This article expands on our previous advertorial, published in CAPCA's April's issue, about the use of biostimulants in agriculture.

Microbial consortium biostimulants are formulated with diverse beneficial microorganisms that work together to stimulate rhizosphere's natural processes such as nutrient mineralization, complexation, uptake, and availability; tolerance and mitigation of abiotic and biotic stress; and improved genetic expression, all working to improve crop performance. Vessey describes these microorganisms as Plant Growth-Promoting Rhizobacteria (PGPR) and mycorrhizal fungi¹.

Biostimulants can enhance **nutrient use efficiency**, by improving absorption and metabolic transformations inside the plants². Furthermore, microbial activity supports root growth, Nitrogen fixation, and Phosphorus solubilization, potentially playing an important role in improving nutrient use efficiency, a topic of high economic and regulatory impact in California agriculture.

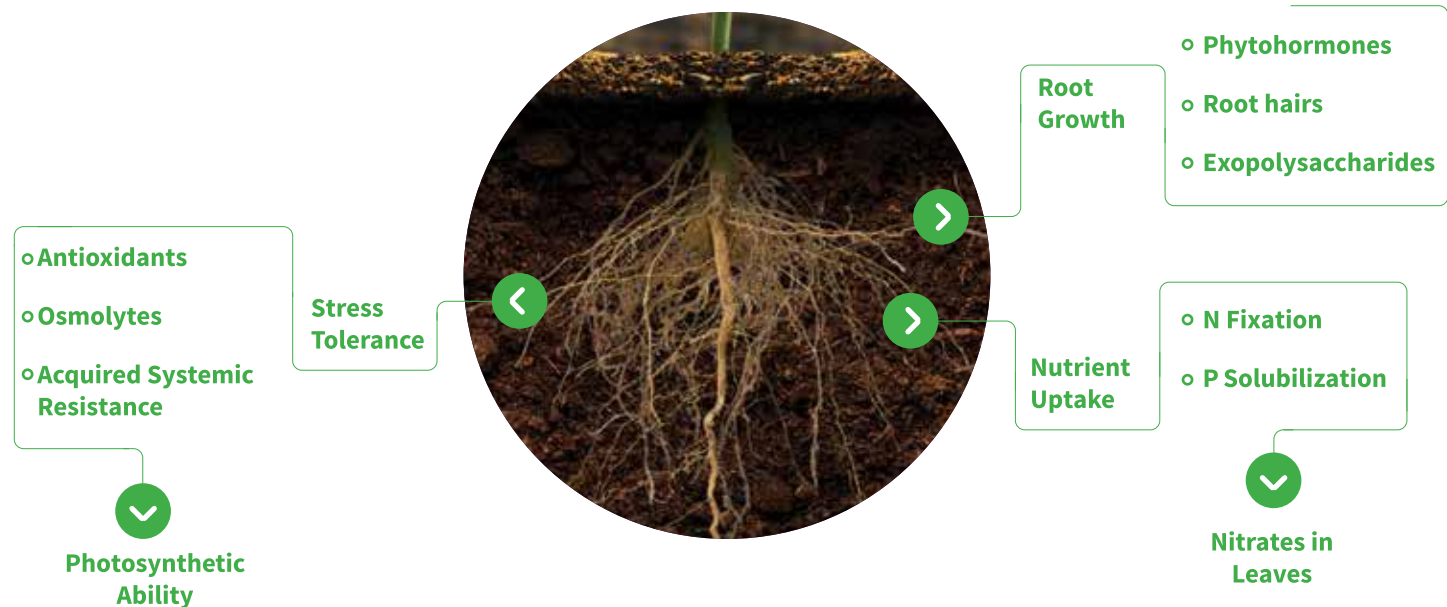
These gains in overall efficiency help improve overall crop performance, by reducing biotic and abiotic stresses that may be limiting to both plant performance and economic yield.

Increasing inputs costs and challenging production conditions, are compelling arguments for the use of biostimulants. As a result, **PCAs** are increasingly engaging the aid of microbial biostimulants to improve drop performance and their client's bottom-line results.

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The Influence of Microbial Biostimulants in Nutrient Use Efficiency



1. Vessey JK. Plant growth promoting rhizobacteria as biofertilizers. Plant Soil. 2003; 255:571-586.
2. Du Jardin, P. 2018. Biostimulants for enhancing nutrient use efficiency. Biostimulant World Congress. Presentation.



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Using infra-red sensors and the Internet of Things to automate Argentine ant counts



FIG. 1. Argentine ant worker patrolling a citrus leaf Photo: Mike Lewis, UC Riverside

Mark S. Hoddle¹, Shailendra Singh^{2,3}, Eamonn Keogh^{2,3}, Lin Cong⁴, Yehua Li⁴, Weixin Yao⁴, Francesc Gomez-Marco¹, Christina D. Hoddle¹, Nic Irvin¹, Michael Lewis¹, and Ivan Milosavljević¹

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Argentine ant, *Linepithema humile* (Fig. 1), native to parts of South America, is an invasive pest that has been present in Southern California since 1905. This pest ant has established widely around the world due to accidental movement into new areas by humans. In invaded regions massive ant populations cause problems in natural (e.g., ants interfere with native nectar feeders), urban (e.g., infestations of trailing ants in kitchens), and agricultural areas. In agricultural crops, like citrus and grapes, Argentine ants form relationships with sap sucking pests that excrete honeydew (Fig. 2). Honeydew is a sugar-rich waste product that ants harvest and return to underground nests to feed nest mates. An undesirable outcome of this mutualism is that ants protect honeydew producers from the predators and parasitoids that attack these pests. Because ants get food for these protective services and biocontrol agents are harassed or killed by patrolling ants both pest and ant populations increase in size which can result in pest densities that are damaging and may need treating with insecticides.

Even though Argentine ant is a well-recognized pest in citrus there are no standardized approaches to monitoring ant densities to assist control decision-making. Two methods for monitoring Argentine ants include timed visual counts of ants on tree trunks (Fig. 3A) or use of sugar water filled monitoring vials (Fig. 3B) to measure number of ant visits to a sucrose resource over a 24 hour period. The amount of liquid imbibed from a monitoring vial provides an estimate



FIG. 2. Argentine ants harvesting honeydew from Asian citrus psyllid nymphs. Photo: Mark Hoddle, UC Riverside

of the number of ants that visited the vial. Both of these methods have shortcomings. Visual counts are labor intensive and quickly become inaccurate when ant densities are high and counting fatigue sets in. Monitoring vials may over estimate ant activity as ants are attracted to the sugar water inside vials. In addition to an absence of efficient



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*Fiocco, David. *Farmers value digital engagement, but want suppliers to step up their game*. Apr 2021, McKinsey & Company.
**Goedde, Lutz. *Agriculture's connected future: How technology can yield new growth*. Oct 2020, McKinsey & Company.
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FIG. 3. Estimates of Argentine ant densities in citrus orchards can be made by (A) timed visual counts of ants on tree trunks (Photo: Mark Hoddle), or (B) the use of monitoring vials filled with 25% sucrose solution (Photo: Mike Lewis).

monitoring tools there is also no scientifically-determined action threshold that once crossed could result in initiation of treatment applications (e.g., liquid baits) for Argentine ant control (see. Milosavljević et al. in this issue of CAPCA Adviser provides more details on liquid baits for ant control.)

There is a clear need to develop an accurate, time, and labor efficient method for monitoring Argentine ant in agricultural crops. Any new tools developed for ant monitoring would ideally be accurate, cheap, automated, unaffected by heat, rain, and irrigation water, have low maintenance and power requirements, have no effect on ant behavior, and provide user-friendly data summaries that are accessible on the cloud via an App on a smart device. One approach our team has been exploring is the development and field evaluation of infra-red (IR) sensors to count ants in citrus. An IR sensor is composed of an IR emitter that projects an infra-red beam to an IR receiver and this beam is blocked when an object passes through it. This process is similar to a door chime in a shop that rings when a customer enters and breaks a beam spanning the doorway thereby audibly notifying the shop attendant. For the IR sensors, this break in connectivity due to a transient blockage (i.e., an ant moving through the IR beam) can be detected by programmable hardware and the number of IR beam breaks can be recorded which provides an estimate of the number of ants that have passed between the IR emitter and receiver.

A critical question with respect to use of IR sensors in orchards to count ants is where do you place them? Fortunately, the solution to this question is easy. Argentine ants exhibit a rigid highly stereotypical behavior in orchards with respect to irrigation lines (e.g., polyethylene tubing)

that sit on top of soil under trees. Ants use these long straight runs of smooth pipes as “super-highways” (Fig. 4) to move from subterranean nests to off-ramps near tree trunks which they ascend before making the return trip back to the nest with collected honeydew. The reason these pipes are used is because they are straight and smooth which maximizes foraging efficiency by reducing transit times between nests and food sources.

With assistance from students and faculty in the Computing and Engineering Department at UC Riverside and computer engineers with FarmSense, we developed waterproof IR



FIG. 4. Argentine ants use polyethylene irrigation pipes that sit on the soils surface as “super-highways” to move from underground nests to tree canopies where they collect honeydew. Photo: Mark Hoddle



POTASSIUM NITRATE: KEY ALLY FOR SUSTAINABLE AGRICULTURE BUSINESS

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The farmers' need for producing more food and using less land in controlled environments is transforming agriculture and making inhouse cultivation a fast-growing activity. In this increasingly challenging situation, incorporating the right fertilizer in the right amount becomes even more important. Whether it is wheat, almond or tomato, potassium nitrate is without a doubt the preferred potassium and nitrogen source for growth and balanced nutrition under any conditions.

Numerous studies show that nitrate in potassium nitrate enables the plant to minimize chloride uptake whenever it is present in the soil solution or the irrigation water. Similarly, the potassium in KNO₃ counteracts the harmful effects of sodium. Therefore, potassium nitrate is highly recommended for salt-sensitive crops or when irrigation is being done with poor quality water.

Nitrate is non-volatile and enhances the uptake of potassium (K⁺) together with other essential cations like calcium (Ca⁺⁺) and magnesium (Mg⁺⁺).

The use of potassium nitrate is indispensable to increase the nitrate (NO₃⁻)/ammonium (NH₄⁺) ratio, which positively affects plant performance during all growth stages.

Less water, better yields.

Being responsible for opening and closing the stomata, potassium minimizes plant transpiration and reduces its water requirements. Adequate potassium nutrition in the plant enhances its water sourcing efficiency. Additionally, KNO₃ prevents salinity build-up and eliminates the need for additional irrigation to remove salts from the soil.

Research shows that potassium nitrate (KNO₃) results in a higher value product and more return on investment for the grower.

Trials also show that nitrate-fed plants utilize water more efficiently than ammonium-fed plants. This difference becomes even more significant when potassium concentration in the soil solution is low.

The nitrate in KNO₃ increases the pH of the root surface. Uptake of nitrate by the roots causes a release of hydroxyl anions (OH⁻), creating a slightly alkaline environment in the root zone, which improves acidic soil properties. Additionally, nitrate in potassium nitrate enhances the formation of organic acids (carboxylates), which facilitates the release of phosphate and micronutrients from soil particles to the soil solution.

KNO₃ is compatible with other fertilizers and allows multiple application methods. Unlike ammonium, the nitrate in potassium nitrate is non-volatile, so there is no need to work it into the soil when it is applied by top dressing or side dressing.

Crop resistance.

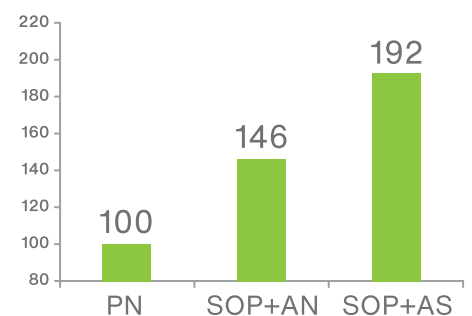
More than 2,400 studies have confirmed that the right levels of nitrogen and potassium improve crop resistance. Adequate additions of a good quality potassium source, such as KNO₃, result in the reduction of bacterial infections up to 70%; fungal infections 63%; insects and mites 60%; viruses 41%; and nematodes 33%.

Potassium in potassium nitrate has a positive impact on parameters such as fruit size and appearance, nutritional value, flavor and aroma, shelf life and the processing quality for industry. An adequate supply of potassium helps to obtain both high yields and quality, resulting in a higher value product and more return on investment.

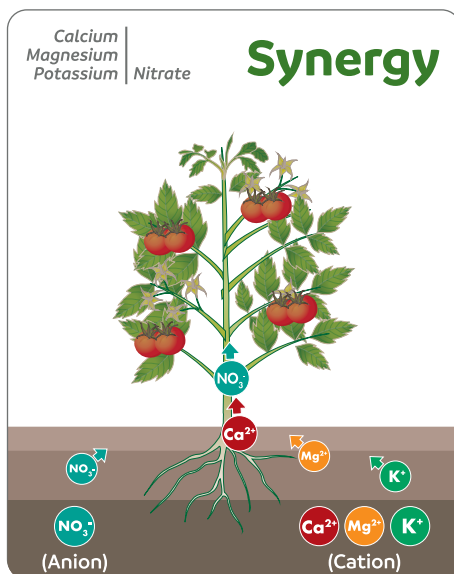
With KNO₃ up to 92% lower contribution to soil salinity than K₂SO₄ + N source

EC = electrical conductivity

Relative EC (%) at Equal N and K Nutrient Input



AN= ammonium nitrate
AS= ammonium sulphate



sensors that could be mounted onto irrigation pipes using 3D printed clamps (Fig. 5). These sensors are an Internet of Things (IoT) tool that can automatically collect and transmit data through a communications network. Sensors are programmed to wake from hibernation once an hour every hour to count ants for a set time period (e.g., 1 minute) and record the number of ants on the pipe that pass through the IR beam that spans the width of the pipe. The sensor then relays data to a Gateway which moves data over the LTE cellular network to a cloud-based server where data are stored and updated every hour. In commercial citrus orchards, we have connected 200 sensors at a time to a Gateway to automatically move ant count data to the cloud. Cloud-stored data is accessed using a Farmsense App and can be viewed in near real time. The interface provides the user fine resolution data summaries such as heat maps showing varying levels of intensity of ant activity in different areas of the orchard over time and the numbers of ants moving along pipes each hour of the day and night (Fig. 6). Sensors also have the capacity to provide information on battery power and they can be outfitted with temperature and humidity readers and GPS tags to provide details on environmental and locality factors that could be affecting ant activity at different locations and times in the orchard.

An obvious shortcoming with counting ants on pipes is that these ants are not in the canopy tending sap sucking pests



FIG. 5. IR sensor clamped onto an irrigation line in a commercial citrus orchard. *Photo: Mike Lewis*

and harassing natural enemies. A reasonable question to ask would be: “Since ants use pipes to move from subterranean nests to collect honeydew in the canopy is there a relationship between the numbers of ants on pipes and the numbers of ants on tree trunks?” If there is a relationship could we use this to estimate the number of ants moving into the citrus canopy by using counts of ants moving on

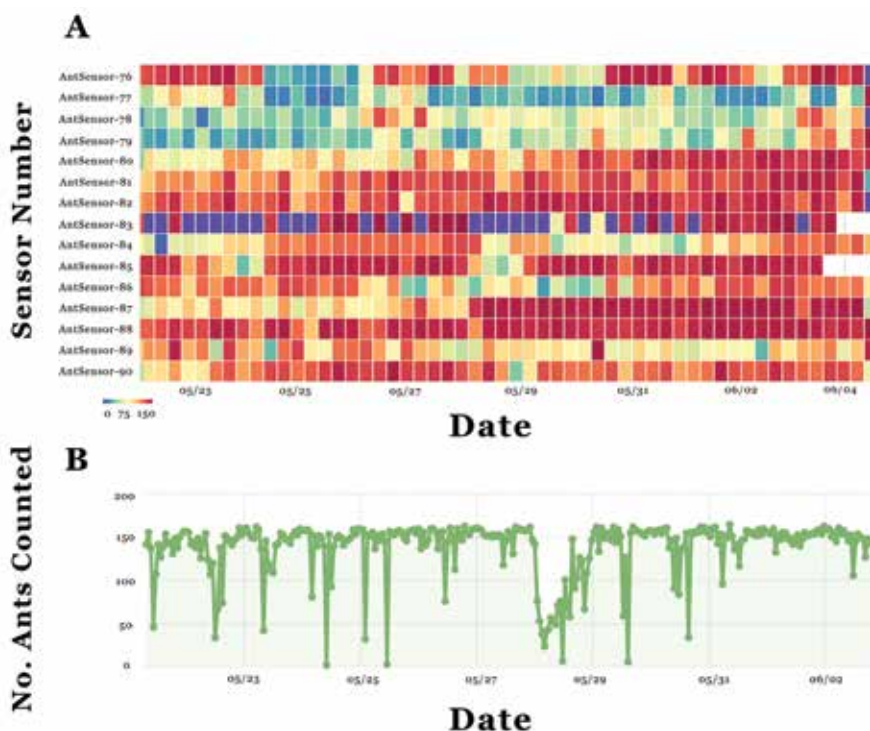


FIG. 6. The FarmSense Ant Count App can generate (A) heat maps of ant activity, and (B) provide individual sensor counts for ants. *Plate prepared by Mike Lewis*

pipes? To answer these questions we generated a very large data set by counting ants on pipes and counting ants on citrus trunks immediately adjacent the pipe where the pipe counts were taken. With help from a Ph.D. student and faculty in the Statistics Department at UC Riverside, we were able to determine through complex statistical analyses that there is a very strong relationship (>85%) between the numbers of ants counted on pipes and trunks. Determining the strength of this relationship and being able to describe it mathematically now enables us to build this equation into the FarmSense App enabling it to convert IR counts of ants on pipes to estimates of ants on trunks that are tending sap sucking pests in the canopy. Now that we can use IR sensors to automate ant counts to provide an estimate of the number of ants moving into canopies we need to compare these estimates to the “Action Threshold.” The “Action Threshold” is the density of ants, which once exceeded, warrants control to minimize negative impacts by ants on the free pest control services provided by natural enemies. At this time, we don’t have a good estimate for the Action Threshold for Argentine ants in citrus. This is an important problem we are currently working on.

This automated approach to monitoring Argentine ant is using a cheap new tool (i.e., an IR sensor) and exploiting the IoT (i.e., an App to access ant count data stored in the

cloud) to improve the accuracy of pest management while simultaneously reducing labor costs associated with pest monitoring. We see this type of advance in pest monitoring as part of an accelerating and exciting trend that is paving the way for the innovative high-tech future of agricultural pest management. ■

Acknowledgements

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Advances in cover cropping for enhancing natural enemies of Asian citrus psyllid in Southern California citrus orchards

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Can flowering plants enhance biological control of Asian citrus psyllid?

In Southern California citrus, generalist predators such as hoverfly larvae (Diptera: Syrphidae), feed on immature Asian citrus psyllid (ACP). Life table and videography studies have demonstrated that hoverfly larvae cause significant mortality of ACP (Kistner et al. 2017). Hoverfly larvae are predacious, while adults require nectar and pollen for energy and egg maturation, respectively. Incorporating a flowering cover crop (also known as insectary plantings) in orchards is one way to enhance natural enemy populations with the intention of improving pest control by providing natural enemies with shelter and food (Silva et al. 2010). Research conducted by our laboratory demonstrated that flowering buckwheat (Fig. 1A) and alyssum (Fig. 1B) are attractive to predatory hoverflies (Fig. 1C). Coccinellids also feed from buckwheat flowers (Fig. 1D). When incorporated into citrus orchards, these insectary plants increased hoverfly oviposition and predator abundance which resulted in a 10% decrease in the number of immature ACP surviving to adulthood (Irvin et al. 2021). We built on these findings by determining (1) when hoverflies are active in citrus orchards and (2) when and where to sow flowering plants in orchards to attract hoverflies. The work reported here was conducted in a commercial citrus orchard in Mentone, San Bernardino County CA.

Identifying periods of hoverfly activity

To ensure that cover crop flowering is synchronized with periods of hoverfly activity, we monitored hoverflies from May through November 2021 using two methods: 1) deploying 20 vertically positioned yellow sticky traps every two weeks throughout the orchard, and 2) conducting monthly 3-min timed counts of hoverflies observed on weeds and citrus foliage in 20 areas throughout the orchard. Results from both the trap catches and visual counts demonstrated that hoverfly activity in Southern California is most prevalent in spring and fall and this is when flowering cover crops would be most beneficial to hoverflies (Fig. 2). This finding is important as ACP populations tend to be greater in spring and fall as well (Milosavljević et al.

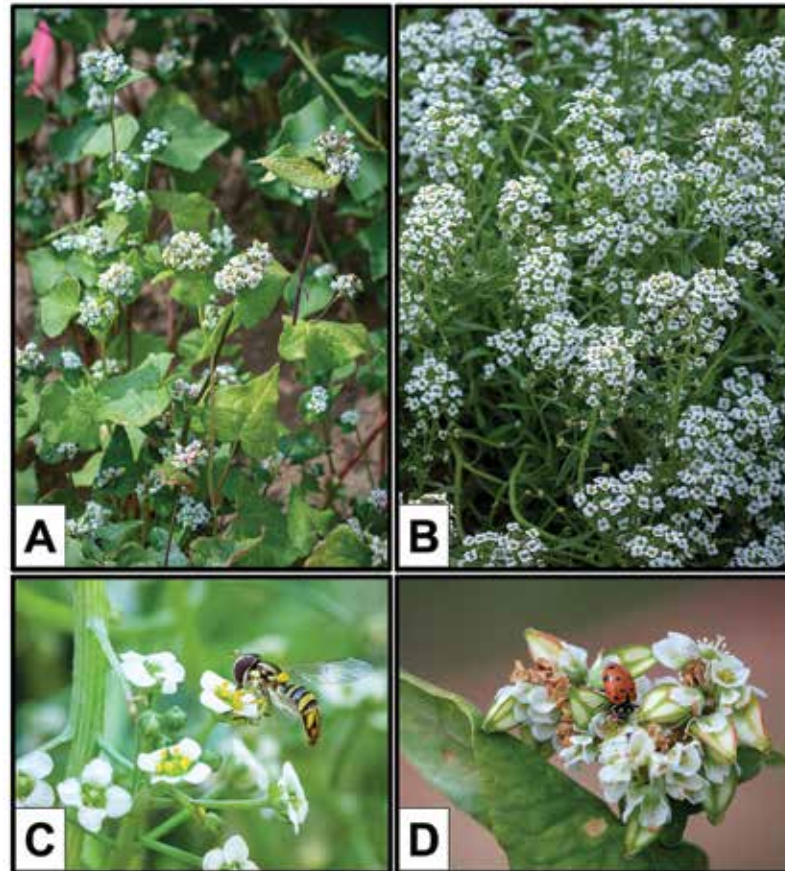


FIG. 1: (A) Flowering buckwheat (*Fagopyrum esculentum*); (B) Flowering alyssum (*Lobularia maritima*); (C) Hoverfly adult feeding from an alyssum flower; (D) Predatory ladybug feeding from a buckwheat flower.

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Thorough Kill of Weeds

Embed Extra is systemic, taken into plants through above-ground foliage, then traveling through phloem toward roots. The weed kill process is thorough, but not rapid, and foliage “burn” won’t likely be visible within the first 24 hours. Burndown is not as rapid as glufosinate, paraquat or PPO herbicides, but weed control can be more thorough on several weed species. The slower movement of Embed Extra through the plant, by contrast, allows it to thoroughly kill weeds. That weed kill, down to the roots, can prevent regrowth.

Near-Zero Volatility and Low Drift Potential

Embed Extra contains 2,4-D *choline*, a completely new form of 2,4-D with near-zero volatility. All other 2,4-D herbicides used in California are an *amine* formulation. The use of choline salt to bind 2,4-D choline makes for a much more stable form of the herbicide. 2,4-D choline boasts an 87.5% reduction in volatility compared with 2,4-D amine and a 96% reduction over 2,4-D ester – resulting in near-zero volatility and minimal potential for physical drift.



- ▲ Untreated at 36 days after treatments
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2021). Extreme summer temperatures may force hoverflies in Southern California into summer dormancy when conditions become unfavorable. This time of year may also be difficult for cover crop growth, not only because of heat, but also for the need for water to sustain these plants.

When and where to sow flowering plants to enhance hoverflies

Buckwheat and alyssum seed are commercially-available and seed was sown in 10 plots throughout the orchard on March 29th, 2021 at the recommended sowing rate (buckwheat: 3 lb per 1000 square feet; alyssum: 1 ounce per 1,000 square feet) in a 20 x 3.2-foot strip, in the open center between tree rows. Supplemental irrigation was provided. Drought conditions in Southern California in mid-July 2021 restricted water availability to growers which significantly reduced the amount of available water to irrigate cover crops. Sowing flowering plants early spring (late-February) and allowing the plants to die off over the summer before re-sowing in the fall (early-September), would help synchronize nectar production with hoverfly activity, while minimizing water costs to maintain these plants.

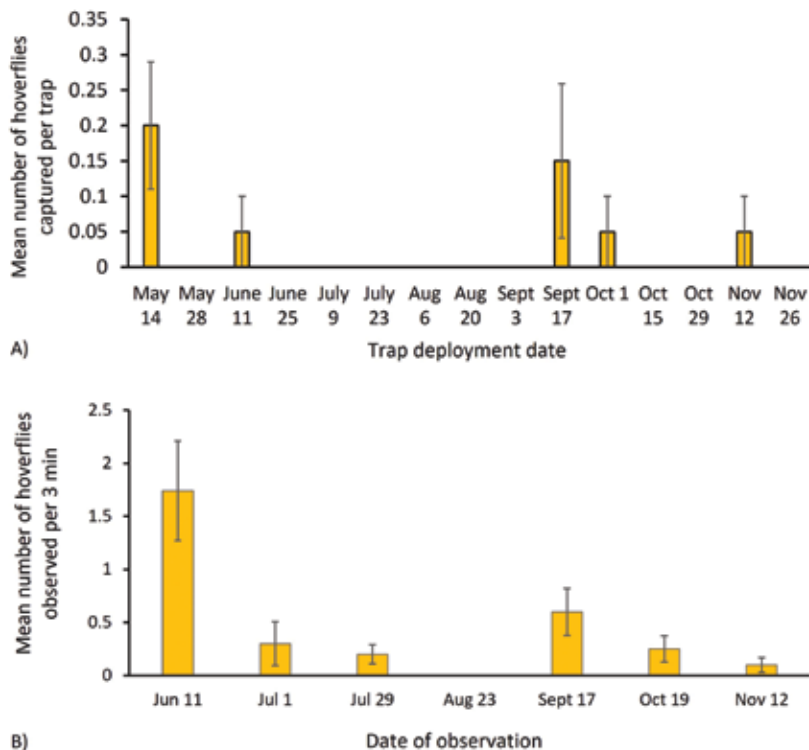


FIG. 2: (A) The mean number of hoverflies captured across 20 vertically positioned yellow sticky traps deployed throughout the orchard every two weeks from May 14th through November 26th, 2021; (B) The mean number of hoverflies counted during 3 min. timed observations of weeds and citrus foliage throughout the orchard each month from June 11th through Nov 12th, 2021.

Successful germination of alyssum and buckwheat seeds in UCR potting mix maintained in a greenhouse at UCR



FIG. 3: Trial conducted in a greenhouse to compare seed germination rates between pots containing orchard soil and pots containing potting mix. On average, 23.6 ± 3.6 alyssum seeds and 1.0 ± 0.32 buckwheat seeds germinated in UCR potting mix compared with zero alyssum and buckwheat seeds in soil collected from an orchard. We suspect that pre-emergent herbicide residues negatively affect germination rates of cover crop seeds.

Non-existent germination of alyssum and buckwheat seeds in soil collected from field plots at the study site.



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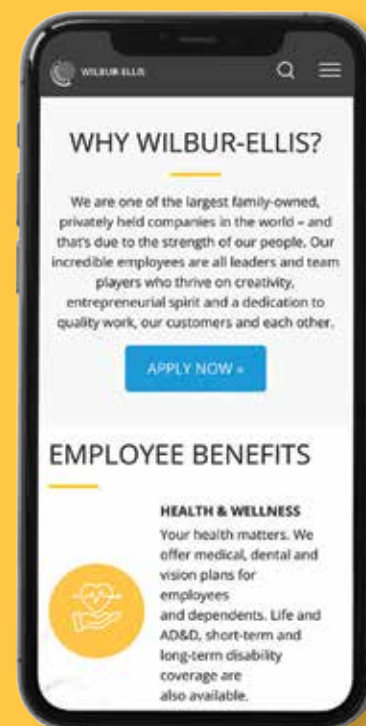
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Residue of pre-emergent herbicides, such as Simazine and Krovar, may be problematic for cover crop germination when seeds are planted in between tree rows. Germination trials with buckwheat and alyssum seeds that were planted in soil collected from orchards or potting mix clearly showed that orchard soil with pre-emergent herbicide residues negatively affected seed germination (Fig. 3). The effects of pre-emergent herbicides applied to soil between trees may be mitigated by transplanting seedlings or planting seeds within tree lines. When buckwheat seeds are planted within tree lines in spring, germination rates are 2.5 times greater when compared to germination rates for seeds that are sown between rows. Planting seeds within tree rows where there is partial shade, may eliminate the need for supplemental watering to keep cover crops alive.

Can flowering alyssum enhance populations of hoverflies in the fall?

To assess the effects of cover crops on hoverfly abundance in citrus orchards, plots of transplanted alyssum 20 x 3.2 feet in size and control plots containing no flowering plants were set up between tree rows throughout the orchard in June

2021 (Fig. 4). The number of hoverflies foraging on alyssum flowers were counted during 3-min timed observations in alyssum plots six times across October and November, 2021. Additionally, on these dates, the number of hoverflies foraging on flowering weeds (e.g., see list of weeds in the subsequent section) in control plots was also recorded. On average, 13 times more hoverflies were counted on alyssum compared with weeds in control plots (Fig. 5). This demonstrates that flowering alyssum is attractive to hoverflies, and suggests that providing flowering alyssum in citrus orchards in the fall may attract and retain hoverflies, boosting populations of hoverflies for biological control of ACP and other citrus pests. Consequently, this may also increase the number of overwintering hoverfly pupae to start the spring generation of these predatory insects (Campbell and Davidson, 1924).

Identifying weed species and abundance of flowers

Flowering weeds in orchards may provide resources for hoverflies and other natural enemies. It is unknown what the densities and species of flowering weeds are in citrus orchards throughout the year under normal orchard

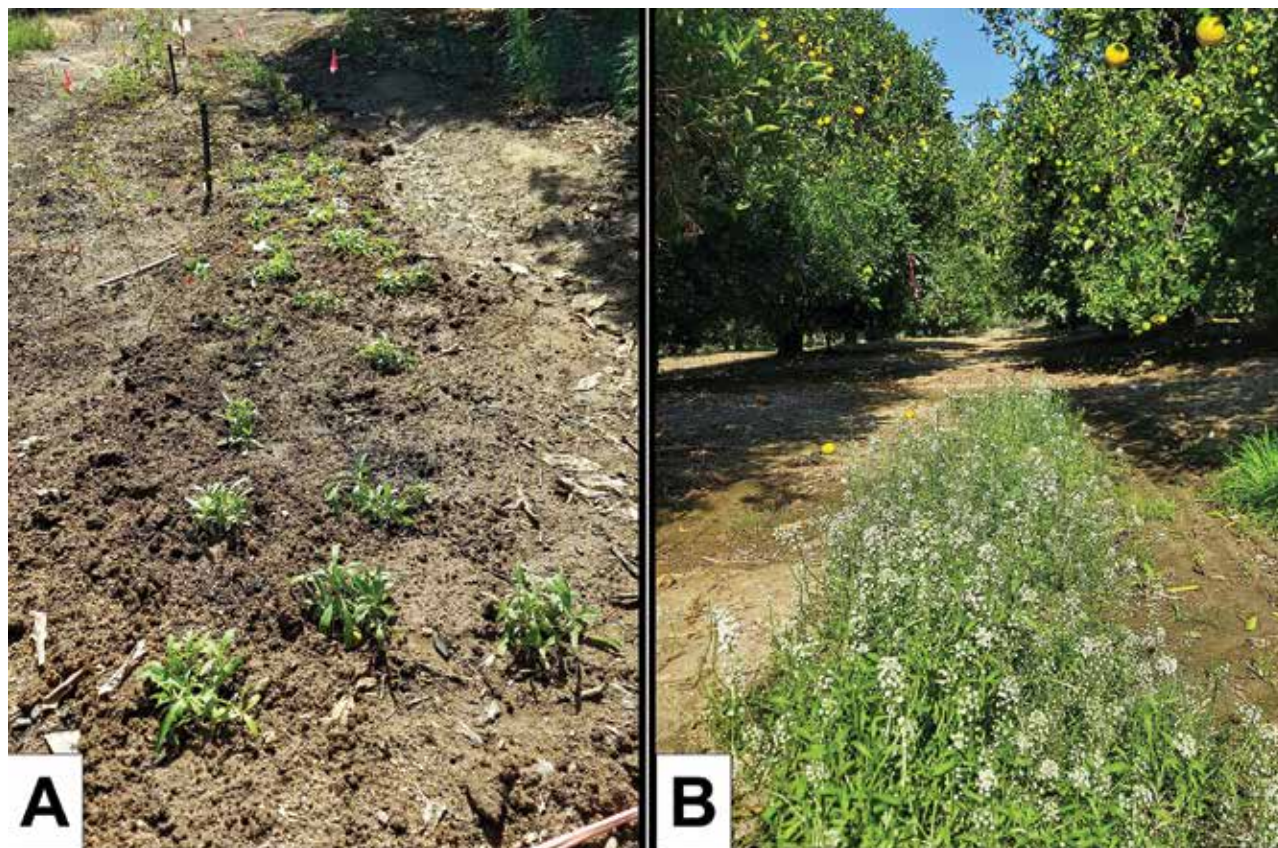


FIG. 4: (A) Alyssum plants were transplanted between tree rows in June 2021 and flowered six weeks later. Transplanting was necessary to overcome poor seed germination rates which was possibly due to pre-emergent herbicide residues. (B) Alyssum flowering profusely in fall 2021, which attracted and fed adult hoverflies. Fall and spring are times of year when hoverflies and ACP are most active in citrus orchards.

practices of herbicide use and mowing. To better understand weed biodiversity in citrus orchards we conducted monthly transect walks to determine the identity and number of flowering weeds. Forty transects, each 49 x 3.2 feet long, were conducted monthly at random locations in the orchard over May through November, 2021.

Six main weed species were identified from transect surveys: scarlet pimpernel (*Lysimachia arvensis*), sow thistle (*Sonchus* sp.), mustard (*Brassica nigra*), sweet clover (*Melilotus indicus*), stinking chamomile (*Anthemis cotula*), and prickly lettuce (*Lactuca serriola*) which flowered at different times. However, not all flowering resources function as food sources for natural enemies due to flower morphology that may prevent natural enemies from accessing nectar, or nectar maybe of poor quality (Karp et al. 2018). Surveys suggest that hoverflies prefer foraging on alyssum when compared with weeds (Fig. 5). Additionally, survey results showed that general orchard practices and the hot dry climate removed most flowering weeds from June-Nov (Fig. 6). These findings collectively illustrate the need for providing flowering plants, like alyssum, to sustain hoverflies in citrus orchards.

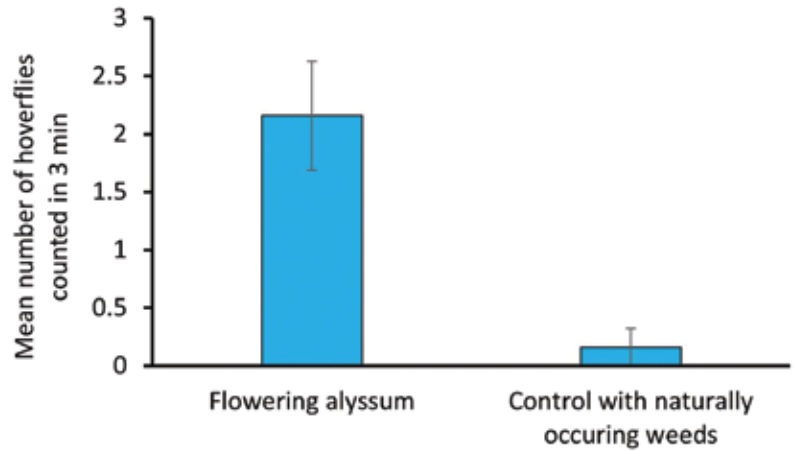


FIG. 5: The mean number of hoverflies counted during 3 min. timed observations in flowering alyssum plots compared with control plots containing weeds in a citrus orchard in fall 2021.



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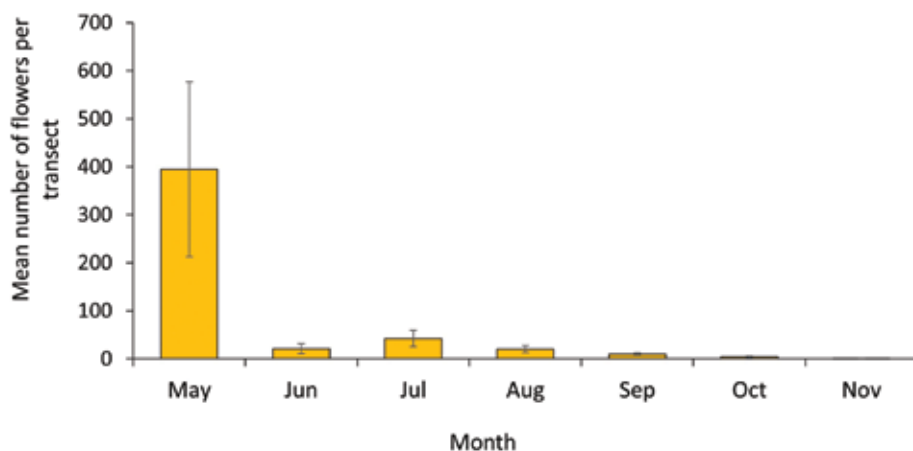


FIG. 6: The mean number of flowers on weeds observed along forty 49 x 3.2 feet long transects each month.

We are currently conducting studies in two commercial citrus orchards to determine if increased numbers of hoverflies due to cover crops results in lower pest densities. These field studies are also assessing different methods for passively monitoring hoverflies (e.g., vertical vs. horizontal yellow sticky cards and different types of pan traps), which curiously is something that has so far proven difficult. At the end of this field season we will have a much better understanding of the contributions insectary plantings and hoverflies provide in controlling ACP and other citrus pests and how best to monitor hoverflies with traps.

Acknowledgements

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STOP DAMAGE BEFORE IT BREEDS

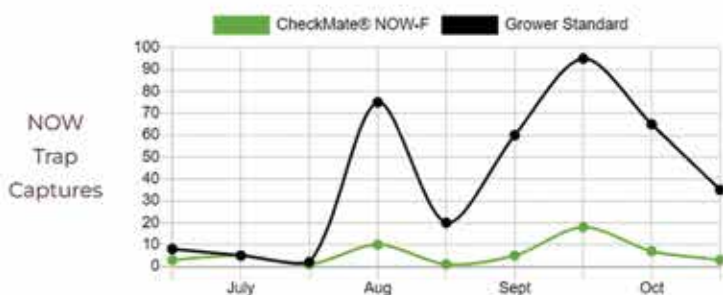
Suterra's Sprayable Pheromone Helps Control NOW Populations



The demand for a responsive, preventative navel orangeworm management was clear when growers treated over 100,000 acres with CheckMate® NOW-F when it was introduced in 2019. The number of treated acres more than tripled by 2021 because of clear evidence on the farm that it drove down pest populations, reduced damage and increased marketable yield.



Until recently, navel orangeworm management lacked a mating disruption option that could be applied reactively based on in-season conditions. CheckMate® NOW-F, the first and only sprayable pheromone specific to navel orangeworm, offers exactly that. Instead of requiring up-front investments before the season's pest pressure is known, sprayable pheromone provides PCAs and growers the flexibility to apply precisely when and where needed.



PCAs and growers know that prevention is the foundation of the "IPM Pyramid" for any pest. Applying Suterra's sprayable pheromone at any point during the season effectively prevents a significant portion of the next generation of pests

from ever existing, stopping damage before it breeds. Reducing NOW population density with **mating disruption maximizes the impacts of other in-season inputs** like insecticides simply because there are fewer larvae to kill.

With an average material cost under \$30 per acre per application, CheckMate® NOW-F offers an affordable and flexible option to reduce NOW damage. It is uniquely designed to be tank mix compatible with many common agrochemicals and is an easy addition to spray programs.

Performance should be evaluated relative to other sprayable materials like insecticides, with these key differences in mind:

- Controlled-release microencapsulated pheromones are longer acting than most insecticides.
- Species-specific active ingredient is safe for all non-target species like bees.
- Mechanism of action does not require thorough foliar coverage, so it can be efficiently applied at lower volumes and higher speeds than insecticides.
- Minimal REI allows for easy integration into operational schedules.
- Exempt from MRLs with zero pre-harvest interval.
- Provides protection for all varieties and multiple shakes up until the day of harvest and beyond.

To learn more about this innovative IPM approach, ask any grower who uses CheckMate® NOW-F or visit www.Suterra.com/CheckMateNOW



The true armyworm continues to be an issue for rice growers

Luis Espino, UCCE Farm Advisor, Sutter-Yuba Counties

Over the past several years I have provided updates regarding the problems armyworms have posed for rice growers. If you have been following the issue, you are probably familiar with the research and outreach efforts the rice industry has undertaken to improve the management of this pest. In this article I would like to summarize some of the research and offer some practical observations about management of armyworms in rice.

The large armyworm outbreak of 2015 made the industry realize that insecticides that could provide good armyworm control at both infestation times (mid-season and heading) were not available. Growers and PCAs had been relying on pyrethroid insecticides for the management of this pest when worm populations seemed high. During the outbreak, pyrethroids failed to provide good control. Since then, I have conducted several field trials with registered and experimental products. Figure 1 shows a summary of six trials conducted between 2018 and 2022.

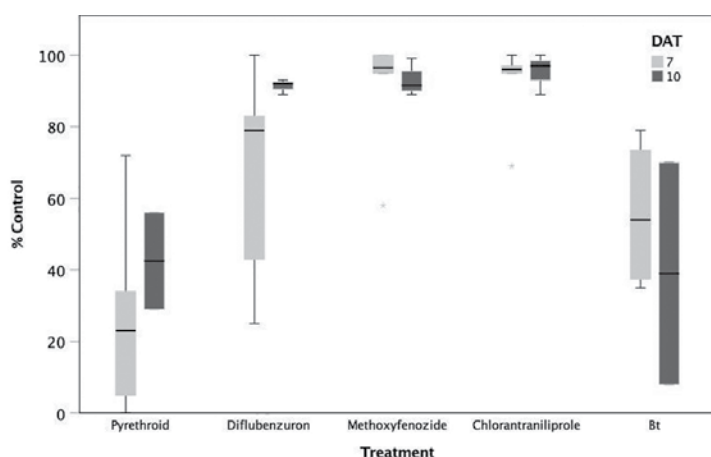


FIG. 1. Boxplot of percentage armyworm control at 7 and 10 days after treatment (DAT) with registered and experimental insecticides for six armyworm trials conducted between 2018 and 2022. Treatments were applied in late June or early July. Pyrethroid and Bt insecticides were used at label rates, diflubenzuron at 2 oz/a, methoxyfenozide at 0.16 lb/a, and chlorantraniliprole at 0.047 lb/a. Asterisks indicate outliers.



Photo: Ian Grettenberger

The trials show that pyrethroids provide about 50% control. When armyworm populations are not very high, this low level of control may appear good enough, but when populations explode like in 2015, 50% control is just not enough. In some fields with a history of armyworm problems, a pyrethroid insecticide was tankmixed with the clean-up herbicide application made 35 to 45 days after seeding to save on insecticide and application costs. While I have not conducted trials with this application timing, in these fields I have observed that control is very little to non-existent. Using an insecticide against armyworms at this timing could be classified as a “preventive” application because at that time it is not known if populations are going to be high enough to warrant a treatment. While preventive applications have their place, I don’t think they are appropriate to manage armyworms.

Two insect growth regulators provide the best control for armyworms in rice, methoxyfenozide and diflubenzuron. Both have good residual and provide excellent control of small and large larvae. Diflubenzuron is registered on rice. Products containing methoxyfenozide have not received a Section 3 registration for rice yet, but one product has received a Section 18 registration for rice yearly since 2015. The Section 18 registration needs to be approved every year to allow the product use.* The main difference between the two insecticides is that methoxyfenozide works slightly faster, resulting in quicker control than diflubenzuron. Figure 1 shows that methoxyfenozide provided more

Ferroxx AQ® and Sluggo Maxx®



consistent control a week after the application, but after 10 days, the level of control for both insecticides is similar. Another difference is that diflubenzuron has an 80 day preharvest interval, precluding its use during heading, while methoxyfenozide preharvest interval is only 14 days.

While both diflubenzuron and methoxyfenozide are considered insect growth regulators, they have different modes of action. Diflubenzuron inhibits the biosynthesis of chitin, which is the main component of the worm's exoskeleton. Methoxyfenozide is an ecdysone mimic; affected worms are tricked into initiating the molting process, resulting in their death. For resistance management, alternating the use of these two insecticides would be a good strategy.

Chlorantraniliprole is not registered on rice, but I have tested this product several years due to its control of similar pests in other systems. Chlorantraniliprole has shown very good activity against armyworms, very similar to methoxyfenozide; if it were to become available in rice, it would be a great addition to the toolbox, providing a different mode of action for resistance management.

Unfortunately, *Bacillus thuringiensis* (Bt) insecticides don't have a good fit in the rice system. In rice, armyworms are not easily noticeable until they start causing significant defoliation. This defoliation is caused by fifth and sixth instar larvae. Small larvae (first to fourth instar) eat very little and their feeding can hardly be seen since it mostly occurs in lower leaves under the canopy. Bt insecticides are very good at killing young larvae, but do not do a good job of killing larger larvae. In the trials I have conducted, Bt insecticides reach 40 to 70% control. These insecticides kill the young larvae present in the field, but do not kill the large worms that eat the most. Spraying preventively with Bt, as described above for pyrethroids, may turn out to be a waste of money because worm populations may not reach treatable levels or the short residual may not control larvae originating from eggs laid later.

Having effective insecticides to manage a pest is a key component of IPM. In the case of armyworms, the availability of methoxyfenozide and diflubenzuron allow growers and PCAs to monitor their fields; if a treatment is needed, they can confidently use one of these products to reduce the population below economic levels. If these products were not available, more preventive applications of pyrethroid insecticides would occur, increasing risks to the environment.

The most powerful MRL-exempt slug and snail baits—period.

Slugs and snails simply can't resist Ferroxx AQ and Sluggo Maxx slug and snail baits. Their highly palatable Micro-pellets® deliver the **iron phosphate formulation** to the maximum number of baiting points.

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When monitoring for armyworms, one should focus on defoliation and presence of worms. Past research and trials I have conducted show that when defoliation is higher than 25% of the foliage of the plant, a yield reduction can be expected. While this is easy to understand, it is very challenging to determine in the field. In the trials I conducted, we trimmed certain percentage of the height of plants across plots to reach the desired level of defoliation. In the field, defoliation does not occur in this manner. Defoliation can be observed in lower and upper leaves, and worm feeding wounds are irregular in shape, making it difficult to determine the exact level of defoliation (fig. 2). There is no easy method to determine defoliation percentage; growers and PCAs have to rely on their experience to decide if defoliation is approaching 25%. Fortunately, human brains are excellent at making estimations and recognizing patterns, so trusting your eyeballing of defoliation is the best method. To confirm the

presence of worms, open up the canopy and look for worms at the base of the plants and in leaves. If worms are not easy to find, most likely the worms have already cycled out and there is no need for treatment. ■

*For additional information on Section 18 product, visit <http://www.calricenews.org/2022/06/13/intrepid-2f-section-18-approved-for-armyworm-control/>



Fig. 2. Rice defoliation caused by armyworm is difficult to quantify in the field. With experience, growers and PCAs can estimate if the defoliation is higher than 25% of the total foliage present at the time in order to justify an insecticide treatment.

NUTRITION FOR NEXT SEASON STARTS HERE

Post-Harvest Potassium

For world-class athletes, the rest and recovery period following an event is crucial. The human body is capable of some amazing things, but without proper care after exertion, athletes may not be at peak form for the next event. Similarly, in California, our world-class tree and vine crops need a period of recovery after harvest to prepare for the next season.

For permanent crops, building up to the fruit-bearing phase is extremely energy intensive. Once the fruit is removed, trees and vines get a chance to recover, but the window is short before the onset of winter dormancy. During this brief post-harvest period, crops get a chance to "build up strength" before returning to the following season's main event of fruit development.

Research has shown that essentially all of the potassium an almond tree needs, during bloom and early leaf out, comes from what it has stored from the previous season. Seeing that almond trees have up to 90 lbs. of K₂O/1,000 kernel lbs. removed (270 lbs. of K₂O for a 3,000 lb. crop) from the orchard at harvest, there may not be enough potassium available early the following season. Replenishing some of the removed potassium with post-harvest applications of potassium fertilizer can be extremely beneficial to the next season's early development.

Post-harvest nutrition doesn't negate the importance of early season nutrition. However, it could be viewed as a kick starter, ensuring that the tree does



ALL OF THE POTASSIUM AN ALMOND TREE NEEDS, DURING BLOOM AND EARLY LEAF OUT, COMES FROM WHAT IT HAS STORED FROM THE PREVIOUS SEASON.

indeed have the stored nutrition needed to start the growing season off in peak form.

Solubility of applied nutrients is an important consideration when choosing a post-harvest fertilizer. The window between crop removal and dormancy in certain crops and varieties can be very narrow. This means that the nutrients delivered to the crop need to be readily available to ensure that they are quickly absorbed by the roots and stored for the following season.

Crop Vitality® provides two effective options to provide readily available potassium to permanent crops – KTS® and K-Row 23®. For decades, KTS has been chosen by growers, because of its blending versatility, its ease of use, and most of all, its effectiveness. K-Row 23 is newer to the market and has been steadily growing in popularity because of the flexibility it provides growers with its wide range of recommended application rates. Both products are equally effective at delivering potassium to the crop during the recovery post-harvest period. Because both products are liquids, they can be conveniently injected into fertigation systems where the irrigation water can deliver the nutrition directly to the plant roots.

When time is of the essence, prepare your trees for next season with applications of KTS or K-Row 23. Contact your Crop Vitality representative for more information at info@cropvitality.com



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In a world of challenging supply chain, logistical, and global economic and environmental issues, what continues to drive Albaugh as *Your Alternative*?

Innovation.

"Innovation has become a mantra for Albaugh," says Mark Helt, Albaugh VP - Commercial. "We are always searching for new ways to deliver better performance and return on investment, whether through proprietary or post-patent crop protection products. And the recent investments we have made in technology, business assets, infrastructure and people are enabling Albaugh to better serve our customers here in the U.S. and around the world."

Developing unique and novel technologies through strategic partnerships is the heart of our Global Innovation Platform. Through this platform, we launched F Value® Technology to deliver advanced performance and return on investment to newly formulated fungicides. This led to the introduction of MiCrop® fungicide, an optimized formulation of propiconazole and azoxystrobin, for tree, vine, cereals and rice growers in 2021. Albaugh has also partnered with the California Cooperative Rice Research Foundation to develop the ROXY® Rice Production System (RPS). Currently in developmental trials, ROXY RPS will be the first non-GMO herbicide tolerant trait in rice, owned and developed by the rice growers of California*.

Building a broader, better-balanced and stronger-resourced company was the goal of Albaugh's acquisition of Rotam Global AgroSciences Limited earlier this year. This acquisition

added a number of new active ingredients to our portfolio including: abamectin, acetochlor, oxamyl, methomyl and several sulfonylurea herbicides, plus manufacturing facilities in China and India, and strong competencies in research and development that will be key to future growth and development of the business.

Delivering quality products, conveniently and efficiently is core to our business. Albaugh's U.S. manufacturing is housed at our 75-acre flagship facility in St. Joseph, Mo. This central location gives significant operational and logistical advantages and now we are expanding this facility to better serve our customers into the future. In 2021, the company purchased 25 acres across from the plant to add additional production capacity, upgrades in packaging technology, and warehousing for finished product. Construction of the new two-acre facility is underway with target completion slated for Q2 of 2023.

People are central to success and Albaugh has invested in resourcing across sales, technical service/product development, marketing and other supporting roles. "Albaugh has always managed growth thoughtfully and strategically to ensure that we are always delivering the best quality, value and service," says Helt. "Our true strength is in combining our talents to seek innovative solutions and act decisively to achieve them."

From our humble beginnings as a one-truck operation to the global enterprise that we are today, Albaugh has never lost sight of our founding principle: to provide high quality products and great service at competitive prices.

We invite you to check us out online or follow us on social media and see how Albaugh's innovative spirit continues to make us *Your Alternative*.



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CAPCA
AT THE CENTER OF PLANT HEALTH

Mission & Purpose

CAPCA's mission is to facilitate the success of the PCA and to represent our 3000 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.



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Presentations from the 2021 CAPCA Annual Conference

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Healthy Soil Improves Crops

Although you can't see what's happening beneath the soil, it makes all the difference when it comes to your crops. Healthy soil will affect the level to which crops can sustain the life cycles of plants, animals, and humans. Soil also determines the water and air quality throughout the environment for the surrounding habitat of humans and wildlife.

If you invest in the health of your soil, you'll increase the capacity of crops to withstand variability in weather conditions, including heavy precipitation or drought because healthy soil holds nutrients and water and increases root strength to

resist weather patterns. Strong roots support the plant, improve water and nutrient uptake, fight pests and diseases below the surface, and develop stronger crops for improved crop yield.

Assess Your Soil's Health

The imperative aspects of soil health are nutrient provision and cycling, protection from pathogens and pests, water intake, and reducing soil erosion. Physical soil indicators include aggregate stability, topsoil depth, soil density, and more, and the main chemical factors are pH and soil nutrients important for plant growth.

Biological soil health is vital since it affects the microbial makeup of the soil, organic matter, pests like nematodes, and with other diseases that thrive under the ground and affect growing crops, determining crop health and yield.

Best Practices to Improve Soil Health

Even small steps can make a difference in the outcome of crops as you implement more sustainable practices to improve soil health.

Improve Soil Erosion Control

Many crops leave much of the ground uncovered, so cover provide a canopy on the soil and improve soil properties

CERTISBIO.COM



to store nutrients for future seasons. Highly tilled soil also increases erosion and loses a large amount of carbon, resulting in decreased root health and crop yield, so implement erosion control methods by reducing tillage, adding grass waterways, buffer strips, and cover crops.

Prevent Pests and Diseases

Putting new practices into place will improve soil health, but the existing threat of nematodes and diseases beneath the soil will remain. Evaluate with soil testing to know what pests live in the soil and take ongoing

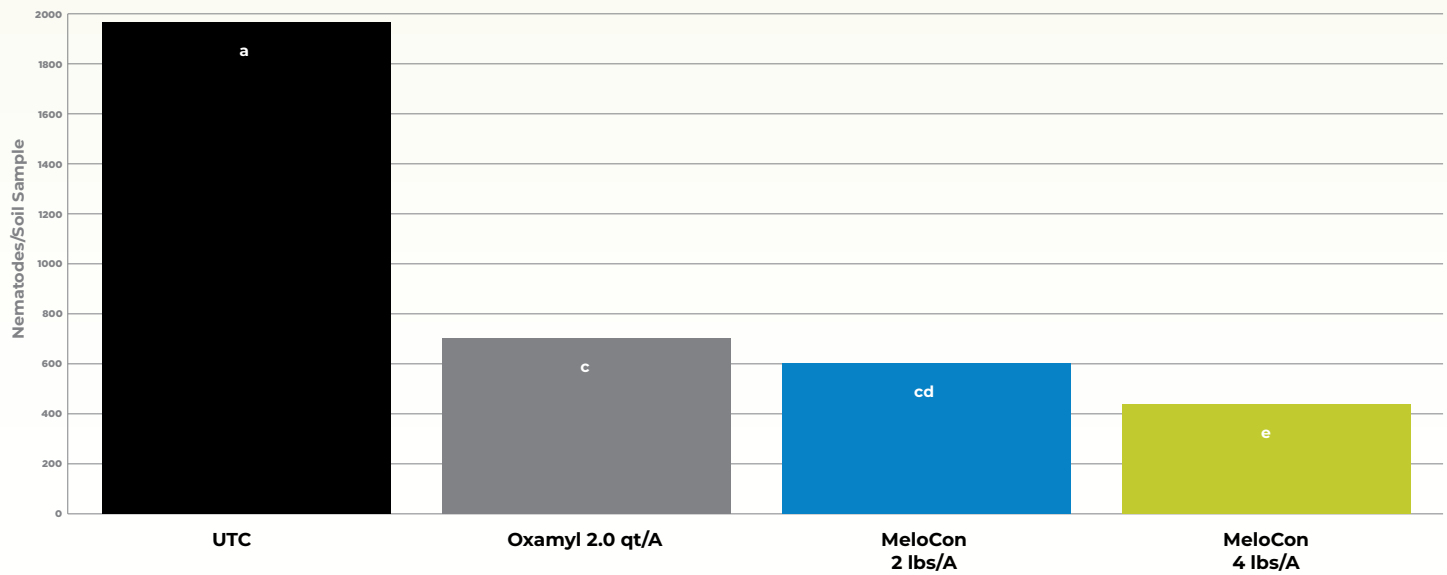
preventive measures to ensure blueberry crops stay safe.

The biggest problem with under-the-surface pests and diseases is that they could destroy crops before you realize there's a problem, so use a biofungicide soil application to protect from diseases and apply a nematicide to control lurking plant-parasitic nematodes.

Promote healthier roots and increased yield with nature's defense against yield-robbing nematodes at all life stages, suitable for use in organic and conventional crops.

Competitive Advantage On Cucumber Crops MeloCon against Root Knot Nematodes

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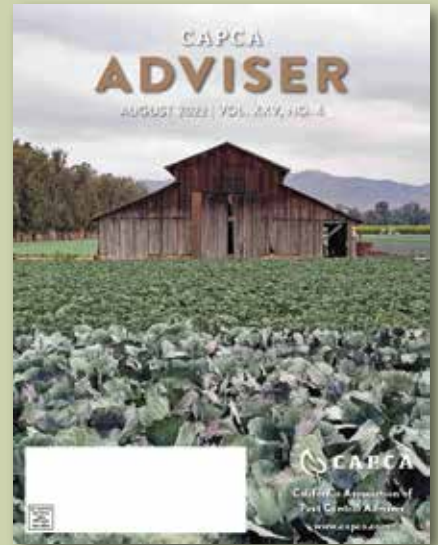
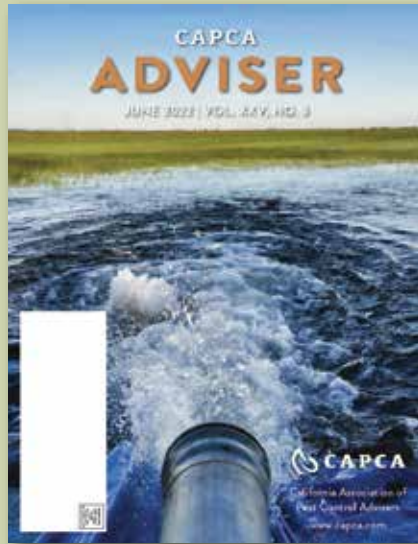
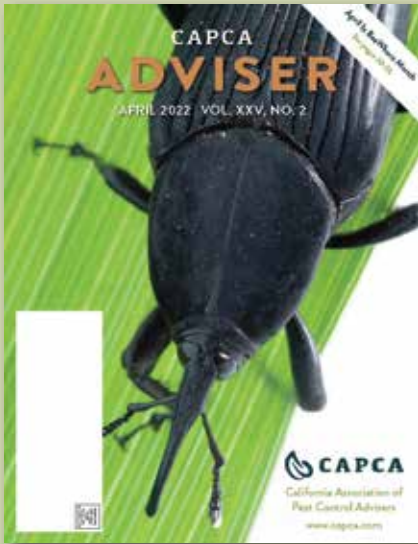
Trial was inoculated with root knot nematode J2 egg solution one week after transplant.

VARIETY
Cross Country

TREATMENTS
A = 2 weeks before transplant
B = at transplant
C = 4 weeks after transplant

APP. VIA DRIP
12 in. emitter spacing,
0.5 gal/min/1000 linear ft,
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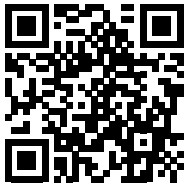


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CHEMIGATION vs. FOLIAR APPLICATION

KPHITE® 7LP is a true systemic material exhibiting movement through both the xylem and phloem tissues of the plants'. Entering the plant either through the hydrophilic channels and pores of the leaf or taken up by the plant's root hairs, it quickly transports itself throughout the plant system. University trials consistently show either application method to be equivalently effective.

When chemigations include fertilizer materials, use jar tests to determine compatibility. Field applications indicate compatibility with most materials including UN32 and KTS, avoid calcium. Because of the exceptional solubility of *KPHITE® 7LP*, inject into the later part of the irrigation dependent upon soil profile.



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Survey of weedy rice infestation and severity in California rice fields

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²Rice Junior Specialist, University of California Cooperative Extension, Butte County

Introduction

Weedy rice (*Oryza* spp. L.) is a rice weed that belongs to the same genus and species as cultivated rice (*Oryza sativa* L.). This weed is a major problem in various rice-growing regions worldwide, including the United States. In California, weedy rice was a problem weed during the first decades of rice production, but its distribution and importance decreased after the adoption of water seeding and certified seed. However, in recent years, there has been a significant expansion in the distribution of weedy rice in California rice lands.

Weedy rice is a problem in rice production because of its red pericarp, shattering, and dormancy. Weedy rice kernels shatter easily before harvest, returning to the soil instead of being removed with harvest. Because of its dormancy, weedy rice seeds survive in the soil during the winter. Some weedy rice seeds may germinate in the spring and compete with cultivated rice for space and resources; others remain dormant in the soil for years. Anecdotal evidence indicates that weedy rice can remain viable in the soil for more than 10 years. When weedy rice densities are high, red kernels can contaminate conventional rice, increasing milling costs.

Weedy rice can reduce cultivated rice yields significantly depending on the infestation severity. Field studies of weedy rice competition have shown yield losses ranging from 22% to 90%. Studies show that the growth rate and grain yield of cultivated rice are reduced with increasing weedy rice density. For example, in the southern U.S., cultivated rice yield can be reduced 20% to 48% when weedy rice density increases from 2 to 5 plants per square feet. In California, infestations have not reached these levels yet. But yield reductions in greenhouse studies in California show reductions in yield of 69% in seed weight per M-206 plant at the highest weedy rice density measured (approximately 4 plants per square foot).

Weedy rice around the world has evolved to different biotypes through several independent origins from diverse sources. Understanding the phenotypic traits of weedy rice biotypes is essential in the identification and management of weedy rice infestations. In California, five biotypes have



FIG. 1. Weedy rice biotype 1 in the field. Photo: Luis Espino, UCCE



FIG. 2. An immature panicle of weedy rice biotype 2 in the field. Photo: Luis Espino, UCCE

GET AHEAD OF POWDERY MILDEW FOR NEXT SEASONS GRAPES

Lime-Sulfur Solution™

Agricultural Fungicide

BECAUSE THE DISEASE HITS QUICKLY, YOU NEED TO HAVE A PRODUCT IN PLACE BEFORE THE DISEASE OCCURS.

Climate conditions in the western United States allow for powdery mildew to flourish and attack crops. *Vitis vinifera* is especially susceptible to this powdery mildew/disease, meaning grapes are under constant risk of infection – and, unfortunately, this mildew/pathogen is resistant to a number of fungicides.

Since the disease hits quickly, you need to have a product in place before the disease occurs. That’s why using dormant applications of OMRI-certified Lime-Sulfur Solution™ from NovaSource is an important first step to your Integrated Pest Management (IPM) program in the prevention of powdery mildew infection.

Dormant applications of Lime-Sulfur Solution will enable growers to reduce the overpowering supply of inoculum, begin the season with less powdery mildew pressure, and maximize the effectiveness of in-season fungicide applications as powdery mildew pressures are reduced.

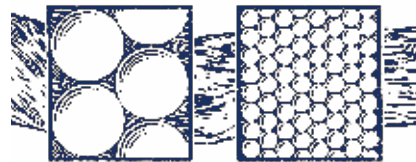
The argument for making dormant applications is to delay the onset of disease in the spring or reduce the overall amount of disease when it does hit. It is a disease control strategy that considers the overall inoculum pressure and delays the disease onset.

Lime-Sulfur Solution works on contact. It penetrates and sticks to plant surfaces. Once it dries, rainfall and other moisture will not wash it off. Lime-Sulfur Solution is not temperature-driven, so it can be applied any time during the dormant stage. And the small particle size of Lime-Sulfur Solution enables it to cover targeted surfaces more evenly, allowing for a more complete protection of grapes.

Lime-Sulfur Solution is highly alkaline, so when it contacts a chasmothecium, it can penetrate the outer shell, destroying the ascospores inside before they can germinate and infect new tissue.

When making dormant applications of Lime-Sulfur Solution, agronomist recommend thoroughly wetting the cordons and the upper trunk area, where chasmothecia like to take residence. By spraying heavily into those areas, you can kill a lot of the ascospores in chasmothecia. Make sure the spray volume is high enough to get good wetting.

In addition to protection against powdery mildew, Lime-Sulfur Solution™ controls pests such as scale insects, peach twig borer, silver mites, brown mites and red mites. It also protects against coryneum and leaf curl.



MICRONIZED SULFUR VS LIME-SULFUR SOLUTION

With its small particle size, Lime-Sulfur solution disperses more evenly and sticks more tenaciously so you get residual control and extended protection.



When chasmothecia are allowed to overwinter, spring rains and irrigation prompt the release of ascospores. The ascospores then infect new tissue.

Learn more about Lime-Sulfur Solution at www.novasource.com



Always read and follow label instructions.

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been confirmed. These biotypes differ in their appearance, weediness, and distribution.

After several decades without reports of weedy rice, a weedy rice biotype was found infesting rice fields in Colusa and Glenn counties in 2003. Over the next 10 years, reports of infestations were sporadic and not well documented. In 2016, five more biotypes were found infesting over 10,000 acres of rice fields in eight counties. By 2019, weedy rice was present in over 100 fields, totaling 14,000 acres. Because this weed constitutes a serious threat to the rice industry in California, we conducted a detailed survey of infested fields so that baseline infestation data is available to the industry. This information will be used to target education efforts and evaluate the effectiveness of management practices.

Methods

The survey was conducted in 2020 and 2021. Over 10,000 acres of rice were inspected, identifying infested basins within each field, their acreage, infestation severity, and weedy rice biotype. Biotypes 1, 2, 3, 4, and 5 were surveyed (Fig. 1, 2, 3, 4 and 5).

Weedy rice was identified visually relying on plant height, ligule presence, leaf pubescence, and pericarp color. Seeds from suspected plants, when not mature, were soaked in 3% potassium hydroxide (KOH) solution. Weedy rice seeds soaked in KOH stain red, while cultivated varieties show no color change (Fig. 6). In some cases, when field identification could not confirm the identity of weedy rice, the entire suspected plants were collected and grown to heading in the greenhouse (many of the unknown samples were collected before heading). Infestation severity was rated using a system that ranged from 0 to 6, with 0 being the absence of weedy rice, and 6 being 25% or more of the basin infested (Table 1).

TABLE 1. Rating system to assess the severity of weedy rice infestation. Ratings were assigned to individual basins within each field visited.

| RATING | DESCRIPTION |
|--------|---|
| 0 | No weedy rice found / fallow or rotated to different crop |
| 1 | Less than ten individual plants and no plant patches |
| 2 | More than ten individual plants and no plant patches |
| 3 | Less than five patches of plants |
| 4 | More than five patches |
| 5 | 10% to 25% of basin infested |
| 6 | 25% or more of basin infested |



FIG. 3. Weedy rice biotype 3 in the field. Note the long awns on the end of each seed. *Photo: Luis Espino, UCCE*



FIG. 4. Weedy rice biotype 4 in the field. Note the long awns on the end of each seed, as well as the black hull color. *Photo: Luis Espino, UCCE*

SMART, SUSTAINABLE INSECTICIDES TO FIT YOUR GROWERS' NEEDS

Pest management continues to be an evolving issue California growers face. From resistance development to the loss of foundational chemistries, getting it right in the field, orchard or vineyard is more critical than ever. The margin for error is slim.

FMC has you and your growers' backs for their pest challenges and insecticide needs. With an innovative portfolio of insect control

solutions and unique active ingredients, FMC is dedicated to advancing the level of control achieved by California growers.

As you plan with your growers for next season and beyond, count on FMC to bring you new and effective solutions for pests ranging from alfalfa weevil to navel orangeworm and beyond.



- Altacor® eVo insect control powered by Rynaxypyr® active is the newest solution from FMC, providing fast and long-lasting residual control of key pests, including navel orangeworm, peach twig borer, codling moth, oriental fruit moth and other damaging pests in tree nuts, pome and stone fruits.
- Altacor eVo utilizes an optimized formulation with a low tank mix use rate of 1.1-2.2 oz./A to better meet your growers' needs for less packaging and handling.
- It offers all the same benefits of Altacor insect control powered by Rynaxypyr active but with a higher active ingredient load.



- Steward® EC insecticide delivers fast, broad-spectrum control on a wide range of Lepidopteran pests, such as pyrethroid-resistant alfalfa weevil and cutworm, to help growers protect alfalfa and cotton yields.
- It delivers fast-acting and long-lasting residual control for up to 14 days.
- Steward EC insecticide serves as an excellent option for insect pest management and insect resistance management programs.



- Mustang® Maxx insecticide offers a pyrethroid chemistry, delivering pyrethroid chemistry, delivering quick knockdown of key alfalfa pests like alfalfa weevil, armyworm, grasshopper and more.
- It works on contact or by ingestion and can be applied at-plant, pre or postemergence via air or ground.
- Mustang Maxx insecticide has a short three-day preharvest interval for cutting or grazing applied alfalfa and a seven-day pre-harvest interval for seed harvesting.

To learn more about the FMC insecticide product portfolio, visit booth #1100 at the CAPCA Annual Conference & Agri Expo on October 9-11 or visit ag.fmc.com.

Results

Of the total surveyed acres, 3,400 acres constituted basins confirmed to be infested with weedy rice. Table 2 provides a breakdown by county of the total acres surveyed and the acres infested. Table 3 shows the acreage of each infestation severity rating. Most infestations were rated not higher than level 3 and only 16% of infested acres were rated as level 4 or higher. Table 4 shows the acreage infested with each biotype and the percentage of infestation for each biotype. Biotype 1 was most common (70% of the basins) followed by biotype 2 (20%). Of the total area surveyed no basins were found to contain biotype 5.

TABLE 2. Area of inspected fields and infested basins per county, 2020–2021.

| Counties | Acres inspected | Acres infested (basins) |
|--------------|-----------------|-------------------------|
| Butte | 1803 | 410 |
| Colusa | 1226 | 330 |
| Glenn | 1155 | 388 |
| Placer | 305 | 32 |
| San Joaquin | 877 | 555 |
| Sutter | 3318 | 652 |
| Yolo | 1288 | 0 |
| Yuba | 2965 | 1025 |
| TOTAL | 12,937 | 3392 |

TABLE 3. Acreage of weedy rice infested basins by severity and percentage (%) of infested acres. Infestations were rated on a scale of 1 to 6.

| Rating ^a | Basin acres | % |
|---------------------|-------------|------------|
| 1 | 785 | 23 |
| 2 | 919 | 27 |
| 3 | 1165 | 34 |
| 4 | 296 | 9 |
| 5 | 168 | 5 |
| 6 | 59 | 2 |
| TOTAL | 3392 | 100 |

^a1 = <10 individual plants, 2 = >10 individual plants, 3 = less than 5 patches of plants, 4 = 5 or more patches, 5 = 10%-25% of basin infested, and 6 = 25% or more of basin infested.

TABLE 4. Area of basins infested with weedy rice by individual weedy rice biotype and percent of acreage infested (%).

| Biotype | Infested acres | % |
|--------------|----------------|------------|
| 1 | 2395 | 71 |
| 2 | 692 | 20 |
| 3 | 292 | 9 |
| 4 | 13 | 0.4 |
| 5 | 0 | 0 |
| TOTAL | 3392 | 100 |

Discussion

The survey showed that the area of basins infested with weedy rice is 80% lower than the previous estimate of infested acres. This reduction is due in part to the fact that we are now recording basins and not whole fields. For example, previously, if a field only had one basin infested, the whole field would have been considered infested, and therefore, the acreage estimate would have been inflated. By focusing on basins, we have a more accurate measure of the true infested acreage in California. Additionally, by recording infestations by basin, we will be able to monitor the expansion or contraction of weedy rice acreage within single fields.

The use of infestation severity levels will allow us to track the progression of weedy rice infestations within basins. We plan on surveying fields every three to five years. By comparing severity levels over time and using management information provided by growers and PCAs, we will be able to evaluate which management practices are more successful in reducing the severity of weedy rice infestations.

Since 2016, we have identified over 100 fields as infested with weedy rice. Our field survey showed that 41 of those fields were not infested in 2020 or 2021. Some of these fields had been infested with biotype 5. Our previous research showed that biotype 5 was the least weedy of all



FIG. 5. Weedy rice biotype 5 in the field. Note the clear taller height of the weedy rice plant above the canopy of the rice variety. Photo: Timothy Blank, California Crop Improvement Association

Do More With Less



Almond trial shows using less fertilizer compared to conventional treatments yields better results.

For the fourth year in a row, research trials proved PrG™ and Kalibrate® outproduced the grower standard in yield by an average of 152 lbs/A and produced an average of 2,940 lbs/A.

By investing in research, we remove the guesswork innately involved in producing a crop, and develop the ideal timing and delivery methods of the best crop nutrient products on the market. Armed with the knowledge and confidence achieved through this extensive research, our agronomists make scientifically based recommendations to sustainably optimize yield potential.

Trial Details: Each plot consists of five trees and was replicated six times across the orchard. Throughout the growing season, 50 gallons per acre (gal/A) of UAN-32 was applied as a constant in every plot.

The Results: Over the course of the four-year study, the average of the “Grower Standard” plot of 10-34-0 + potassium thiosulfate yielded an average of 2,788 lbs/A. On the full AgroLiquid program plot, using both PrG + Kalibrate yielded a four-year average of 2,940 lbs/A. This 152 lbs/A yield increase was achieved with 55.5 gal/A less applied fertilizer.

AgroLiquid’s crop nutrient research starts with the grower. Grower pressures are making nutrient management a critical component in agriculture today. The one constant is the desire to sustainably produce a quality crop. To get to the next level of production, growers must have the technology to succeed and take their operation to the next level.



Trial Conclusion:

- Four-year average **152 lbs/A yield more** than the grower standard
- AgroLiquid program netted **5.5% more profit** over the grower standard
- An additional **\$1,600 per acre** over the course of the four-year trial*

*Profit calculated using almond market prices current to each year of the trial.

Conventional grower standard

Total applied program 142 gal/A

Yield 2,788 lbs/A

10-34-0 applied four times during the season for a total of 45 gal/A
 Potassium thiosulfate applied five times during the season for a total of 45 gal/A
 EDTA Zinc (Zn) applied four times during the season for a total of 2 gal/A

AgroLiquid plot

Total applied program 86.5 gal/A

AgroLiquid’s PrG applied four times during the season for a total of 18 gal/A
 AgroLiquid’s Kalibrate applied five times during the season for a total of 16.5 gal/A
 EDTA Zinc (Zn) applied four times during the season for a total of 2 gal/A

the known biotypes, with low dormancy. The absence of biotype 5 in our survey confirms that this biotype is the least weedy and relatively easier to eliminate than other biotypes. Unfortunately, since the survey was conducted, other suspect fields infested with biotype 5 have been identified.

Our survey shows that some biotypes are geographically aggregated. Type 3 is found only in the northwest part of the valley, while type 2 is found mostly in the southeast. As mentioned earlier, the first weedy rice biotype identified in 2003 was type 3. The survey showed that type 3 infestations have not expanded much but the type is still present in some of the fields identified in 2003. That it has been present in those fields for close to 20 years, even with the cultural control methods utilized by growers, confirms its persistence and weediness. Type 4 is only found in one field, but it has persisted there for more than 5 years. Type 1 is the most widely distributed, and it is present across the valley. Coincidentally, type 1 is the most difficult type to identify and has very strong weedy characteristics.

The information generated by the survey will allow the rice industry to assess the evolving threat of weedy rice. The information will also help growers, PCAs, Extension, and researchers evaluate the efficacy of management practices such as fallow, stale seedbed, roging, and spot spraying. ■



FIG. 6. Potassium hydroxide (KOH) test shows pericarp of weedy rice stained red, while cultivated varieties (control) remain white. *Photo: Luis Espino, UCCE*

KEEPING BERMS BARE

By: Pedro Hernandez, Product Development Senior Project Manager

Weed control in perennial crops (TNV) is an important agronomic practice a grower must implement throughout the year to grow a high-quality crop with maximum yields. Weeds not only compete for sunlight, water, and nutrients, but they can also interfere with irrigation and harvest and may harbor damaging insects and diseases that can transfer to the crop.

Over the years, growers have relied heavily on a rotation of postemergence herbicides such as glyphosate, paraquat, and glufosinate to manage troublesome weeds, and they have been successful with this strategy until certain weeds started to develop resistance to these herbicides. Marestalk, fleabane, annual bluegrass, palmer amaranth, junglerice, and Italian ryegrass are among those weeds that have developed resistance to postemergence herbicides in California orchards and vineyards. Further, there are weeds such as stinging nettle, lambsquarters, malva, knotweed, filaree, henbit, panicle willowherb, primrose, and yellow nutsedge that may not be resistant but can be tolerant to herbicides, making them very difficult to control. These hard-to-control weeds have caused growers to adopt a different strategy requiring the incorporation of preemergence herbicides into weed control programs. In the past, growers utilized old chemistry like oryzalin, oxyfluorfen, pendimethalin, simazine, and trifluralin. But in recent years, more efficacious herbicides such as indaziflam, rimsulfuron, and flumioxazin have entered the market, providing longer residual and a broader spectrum of control. Even with the introduction of newer herbicides, weeds continue to be problematic, and growers need new tools to aid in managing troublesome weeds.

CRAZE® from Nichino America, Inc. is a broad spectrum and long-lasting preemergence herbicide for use in all tree nut crops (including almond, walnut, pistachio, pecan, and hazelnut), grapes, and nonbearing stone fruit crops. The active ingredient in CRAZE is orthosulfamuron, a HRAC Group 2 Herbicide. This herbicide, an ALS inhibitor, works by inhibiting the enzyme responsible for the production of branched chain amino acids (valine, leucine, and isoleucine) essential for plant growth. CRAZE has demonstrated broad spectrum and long residual control of many broadleaf weeds including marestalk and fleabane and strong suppression of grasses and yellow nutsedge. Unlike other preemergence herbicides which only provide preemergence efficacy, CRAZE offers excellent pre- and postemergence control of many broadleaf weeds. CRAZE has proven excellent control of weeds known to be resistant to postemergence herbicides, making it an essential tool to manage herbicide resistance. CRAZE has demonstrated excellent crop safety and compatibility with other pre- and postemergence herbicides. CRAZE alone will provide excellent control of some of the most difficult weeds including marestalk, fleabane, malva, henbit, stinging nettle, filaree, panicle willowherb, knotweed, primrose, and lambsquarters. In combination with other preemergence herbicides, CRAZE offers excellent residual control of a variety of grass weeds. One of the features that separates CRAZE from other Group 2 herbicides is its strong preemergence and postemergence suppression of yellow nutsedge and solanaceous weed species. CRAZE is an excellent tankmix partner with standard herbicides as it offers a different mode of action and strengthens the control spectrum, especially on troublesome weeds like fleabane and marestalk.

Preemergence Efficacy of
Craze on Fleabane in Almond



Untreated



4.5 Months After Treatment
Craze @ 8.6 oz/A

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Potassium Nitrate **experts**

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DIAMOND LEVEL



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Extend Almond Bloom for Increased Nut Set

Each year between February and early March, California almond orchards burst with beautiful flowers as almond buds begin to bloom — and time is of the essence to set a good crop.

The longer the bloom, and if weather cooperates, the better your chances for each of those almond blooms to become pollinated, and the better your chances for a strong nut set and yield potential.

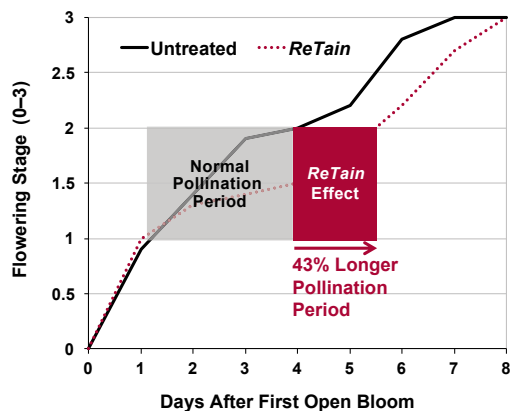
“Keeping the almond bloom viable longer is important for pollination — especially if wind, cloudy days or rain interfere with bees foraging,” said Kevin Forney, Valent PGR product development manager. “By keeping the flower alive longer, growers can help ensure the success of their investment.”

Keep Flowers Alive Longer

There’s never been a way to keep almond flowers viable longer. Until now. *ReTain*® Plant Growth Regulator for California extends the viability of almond bloom, allowing more opportunity for nut set, thus ensuring optimum crop load potential.

ReTain works by reducing the blooms’ production of ethylene, a naturally occurring plant hormone, thus delaying flower and stigmatic senescence. This results in flowers being viable longer, which allows more time for pollination to occur.

“*ReTain* is a proven technology with established use patterns for fruit and nut set in California cherries and walnuts,” Forney said. “*ReTain* offers an innovative use for increasing nut set in almonds to ultimately provide growers with an enhanced crop load potential.”

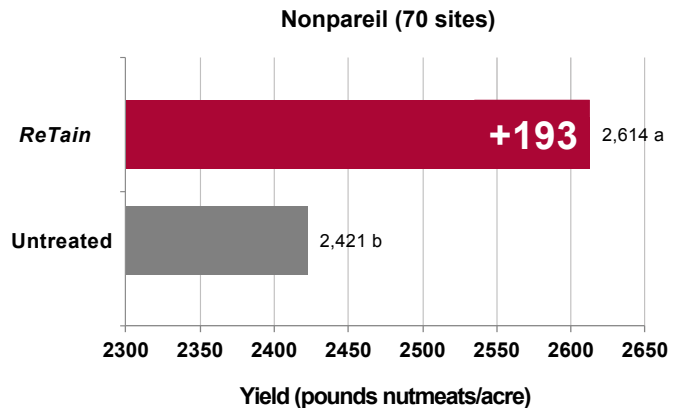


Extend the Pollination Period

Field studies have demonstrated that *ReTain* extends the life of an almond bloom for a 43% longer pollination period over the untreated check.

Boost Nut Set for Optimized Yield Potential

In 70 commercially applied research trials over five years, *ReTain* increased Nonpareil almond yields by an average of 193 pounds of nutmeats per acre over the untreated check.



Apply from 30 to 60% Bloom

ReTain can be applied from 10% bloom to petal fall, but best results have been demonstrated when applied from 30 to 60% bloom. *ReTain* is easy to use, with only one water-soluble pouch needed per acre.

“To capitalize on a longer almond bloom and, most importantly, increased nut set, growers can rely on *ReTain*,” Forney said.

To learn more, visit valent.com/ReTainCA or contact your PCA.



CHROME



GOLD



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Post-Harvest in trees and vines: Key to root development and nutrients storage

Studies and best practice examples corroborate it. When it comes to trees and vines, post-harvest fertigation is fundamental to ensure next season's crop success.

BY JW LEMONS, PCA & CENTRAL VALLEY
ACCOUNT MANAGER, VERDESIAN LIFE SCIENCES

WHY POST-HARVEST? Fertigating at this stage is good for the roots. After the fruits have been collected, studies show, roots become the stronger sink for carbohydrates to fuel their growth, and access to readily available essential macro and micronutrients, such as nitrate and potassium, can boost their development.

Nutrients storage is another reason. After heavy fruit and nut load, the tree's nutrient reserves are significantly reduced. Post-harvest fertigation, provided leaves are still photosynthetically active, will assure that the tree can reload nutrient reserves to be well prepared to support next season's early development.

Tree crops grown in cooler climates with low temperatures during dormancy stage in winter, will be faced with low soil temperature in early springtime and therefore limited root activity, even if ambient temperature is mild. In these conditions, tree crops and grape vines mainly rely on stored nutrients in the stem and roots.

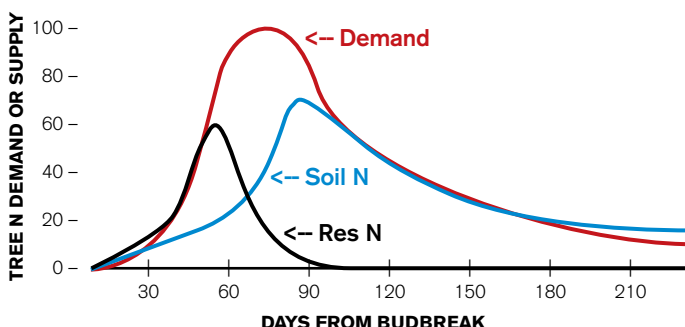
In the case of many tree fruit and nut crops, post-harvest fertigation could also reduce the "on-off" years incidence, where one year of heavy fruit load is followed by a year of low fruit yield. This phenomenon may be related to depleted nutrient stocks in the tree after heavy fruit load and nutrient export with harvested fruits from the orchard, rendering the tree crops unable to support a consecutive year of abundant fruit yield.

At the early bloom and fruit initiation stage, the tree fully depends on nutrient reserves, stored in the tree itself. The most important nutrients that are needed to top-up at this period are nitrogen (N) and

potassium (K). Up to 30% of the total annual application of N & K nutrient should be applied at this period. It is important to select readily available nutrient sources, such as potassium nitrate which will provide immediately available N in the form of nitrate, while tree crops need to be replenished with K, as significant amounts of K are exported with the harvested fruits from the orchard.

Verdesian Life Sciences offers several late season potassium solutions including **Steric K DS** for soil application, and **ReKovery** as a foliar potassium correction post-harvest. For micronutrient corrections, ask your Verdesian representative about **PolyAmines** solutions, which can include boron and zinc. Post-harvest potassium applications is a reasonable strategy IF you are on a soil that is able to hold the potassium.

TREE-N DEMAND/SUPPLY



SOURCE: Lailiang Cheng, Cornell University



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Most people don't see the amount of recommendations that go into a crop each year. But the time you put in is more than a simple decision.

At Verdesian Life Sciences, we understand – that's why we offer a full portfolio of yield-pushing solutions from seed treatments and fertilizer enhancers to nutrients and biostimulants. Talk to your retailer about how solutions from Verdesian Life Sciences can help maximize your profits through plant health.

Advisors'
The [^] Nutrient Use Efficiency People.®



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* October issue fills quickly, first come, first served

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| Pesticide Use & Bees (English) | 11/10/2022 | 9:30 - 10:30 am | 1.0 (1.0 Other) |

For registration or additional information, contact Miranda Jachens, mjachens@cfbf.com or (916) 561-5594

◆ Oro Agri

◆ UC IPM Webinars

| WEBINAR TITLE: | DATE: | TIME: | CE HOURS: |
|--|------------|----------------|-----------------|
| Managing Voles, Rats, and Mice in Orchards | 10/26/2022 | 3:00 - 4:00 pm | 1.0 (1.0 Other) |

For registration or additional information, contact Petr Kosina, pkosina@ucanr.edu or (530) 750-1237

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Vestaron Corporation

Description: Join our fast-growing and dynamic company in the development of peptide-based pesticides. While managing field studies in the western US, the position will engage with independent researchers, academia and distributor partners. Must have entrepreneurial passion for providing new technical solutions to stakeholders while helping to develop a high-performance start-up culture.

Duties, Qualifications & Requirements: Main duty is to manage field research trials with 3rd party cooperators. Responsibilities include developing protocols, placing/ tracking studies, analyzing results and making technical recommendations. Requires 50% travel to service territory responsibilities and work from your home office, ideally in California. Will work with sales and marketing to support education on new technologies. Ideal candidate has a MSc (PhD preferred), strong background in entomology/ agronomy, CA PCA license (or ability to obtain one), familiarity with ARM, and experience in western US agriculture.

Apply: See full job description and instructions to apply at <https://www.vestaron.com/careers/>

Corporate Farm Account Manager – Kern(base), Kings, Tulare & Fresno Counties

Buttontwillow Warehouse Company

Description: Manage pricing, orders, forecasts/supply for select corporate accounts. Expected to grow current market share of fertilizers, specialty products and crop protection products with select corporate farms in Kern, Kings, Tulare, and Fresno County; Attend monthly meetings and trainings as required; Assist in all other related duties as requested by Regional Manager.

Duties, Qualifications & Requirements: Ability to recognize new Innovation and creativity to adopt to an ever changing environment; Minimum of 3 to 5 years' experience and established industry relationships; High Organizational skills able to self-start, maintain detailed records and accommodate various competing tasks within a given time period; Excellent sales and customer service; Certified Crop Adviser License (CCA), Qualified Application License (QAL), Bachelor's degree in agronomy, soils, plant/crop science or related field, CA Pest Control Advisor License.

Apply: Apply online: <https://bwcag.com/careers/>

Pesticide Safety Education Program Coordinator – Davis, CA

UC Agriculture & Natural Resources

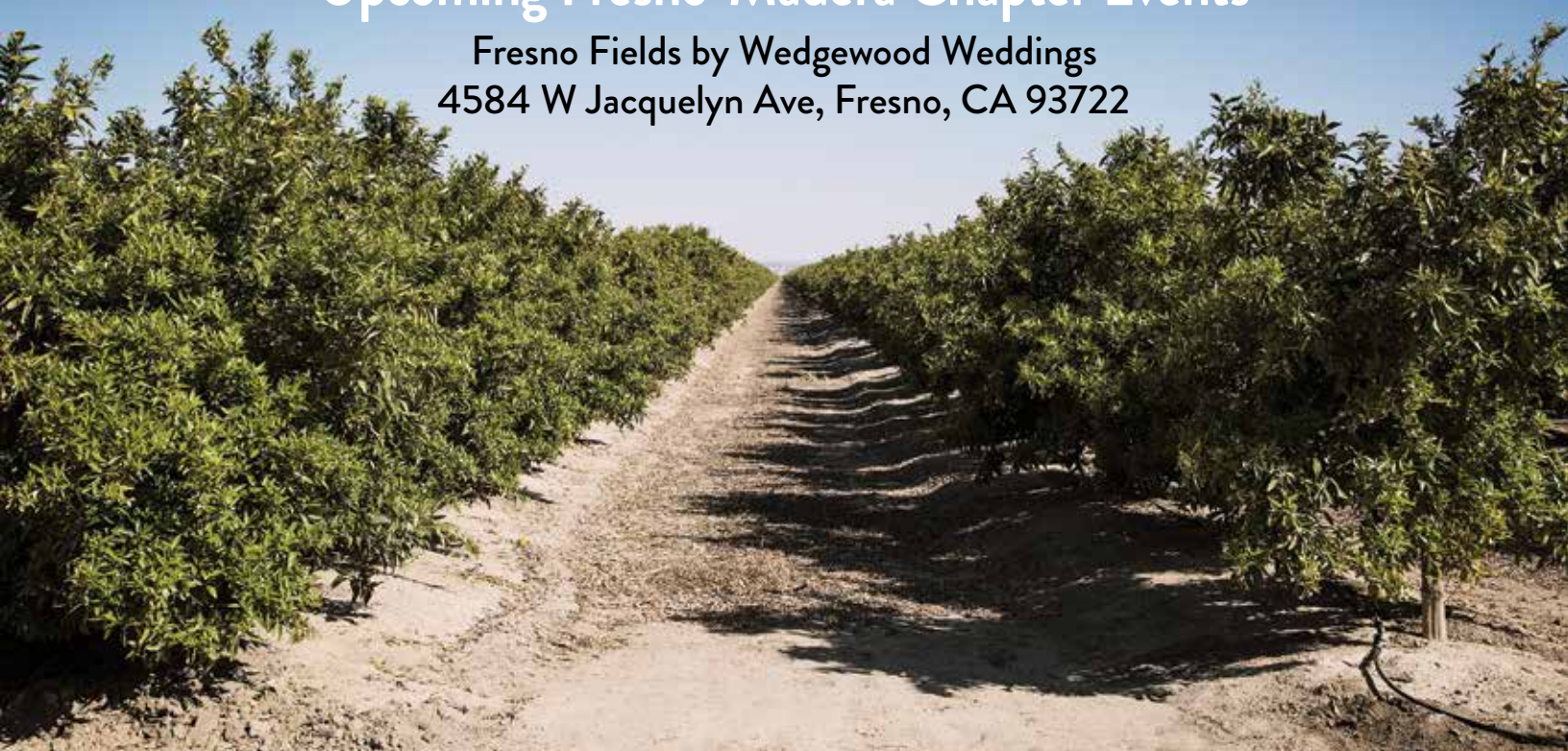
Description: The position is responsible for coordinating, developing, and delivering educational programs in pesticide safety for users of pesticides in California. It provides objective information about pesticide safety and promotes sound decision making to reduce pesticide risks to human health and the environment in the context of IPM. Full description: <https://ucanr.edu/About/Jobs/?jobnum=2236>

Duties, Responsibilities & Requirements: Master's degree in an appropriate field related to pest management is required at the time of appointment and strong background in a pesticide safety and education. In-depth knowledge of state and federal pesticide regulations, pesticides, and pesticide application methods; Ability to communicate and extend technical information to audiences with widely varying levels of literacy and language limitations; Ability to work with people with disparate views and values; Literacy in online communications and with software to support extension education programs; Ability to secure extramural funds.

Apply: Please visit: <https://recruit.ucanr.edu/> and choose "applicants." Closing date: your application must be received by October 7, 2022.

Upcoming Fresno-Madera Chapter Events

Fresno Fields by Wedgewood Weddings
4584 W Jacquelyn Ave, Fresno, CA 93722



Fresno-Madera Chapter Fall CE Meeting

Thursday, September 22, 2022
8:00 am - 3:00 pm

Meeting Location:
Fresno Fields by Wedgewood Weddings
4584 W Jacquelyn Ave, Fresno, CA 93722

NOTE: The pre-registration window has closed.
Onsite Registration (space permitting): \$85

DPR Hours Approved: 6.5
(5.5 DPR Other, 1 DPR Laws)

For additional information visit

<https://capca.com/events/september-22-2022-capca-fall-ce-meeting/>

or contact Adam Tavarez: AdamT@Amvac.com



Fresno-Madera Label Update Meeting

Thursday, November 3, 2022
8:00 am - 4:30 pm

Meeting Location:
Fresno Fields by Wedgewood Weddings
4584 W Jacquelyn Ave, Fresno, CA 93722

Pre-Registration: \$50 Member, \$60 Non-Member

Onsite Registration (space permitting)
\$65 Members, \$75 Non-Members

Lunch is included
(guaranteed for pre-registered attendees only)

For registration or additional information visit

<https://capca.com/events/fresno-madera-chapter-label-update-meeting-november-3-2022/>

or contact Krista Tavarez: krista.tavarez@syngenta.com





Desert Valleys Chapter Annual Member Appreciation Lunch

Thursday, November 3, 2022

12:00 p.m. - 4:30 p.m.

Farm Credit West Conference Room,
485 Business Parkway, Imperial, CA
Luncheon & Meetings start at 12:00 p.m.

Luncheon provided at all meetings
CAPCA Members/IID Employees = No Charge
All Others = \$25

(Meeting dates & times are subject to change)

Contact Desert Valleys Chapter for more information
<https://capca.com/chapters/desert-valleys/>



SoCal Chapter March 2022 meeting with local Ag
Commissioner and County Board of Supervisors





Ventura Chapter
June 2022 Board Meeting

Get Involved With Your Local CAPCA Chapter Today!

CAPCA Chapters are currently participating in a Chapter Ranking program to build a little friendly competition and reflect value for all the volunteer lead activities happening at your local chapter. CAPCA Chapters are doing a lot in their community and for their profession.

We encourage all CAPCA PCA members interested in serving on their Chapter Board or participating in local Chapter events/activities to contact their local leadership members: <https://capca.com/chapters/>

Get Involved Today!



50 YEAR ANNIVERSARY

The Almond Conference

The Almond Conference has been held every year since 1973, making this the 50th consecutive year. The event now attracts more than 250 exhibitors and covers the latest advancements in growing, producing and supplying high-quality, great-tasting, and healthy almonds!

This year's agenda will be packed with content focused on helping growers improve ROI, including but not limited to:

Tuesday:
Water Supply
Pollination

Wednesday:
Irrigation
Fertigation

Thursday:
Rootstocks
Pest Management

Make plans now to join your fellow almond industry members at The Almond Conference on December 6-8 at the SAFE Credit Union Convention Center in downtown Sacramento.

Register now at Almonds.com/Conference