Topics in Subtropics Newsletter

University of California Cooperative Extension

Fresno, Kern, Madera, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Tulare, & Ventura Counties

News from the Subtropical Tree Crop Farm Advisors in California

Editor: Ashraf El-kereamy **Fall 2025 Vol. 26 (iv)**

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Advancing Citrus IPM Through Education and Collaboration: 2025 Extension Highlights from Citrus Entomology Program at Lindcove REC

Sandipa Gautam, UCCE Area Citrus IPM Advisor
UC Statewide IPM Program Operations

In 2025, Area Citrus IPM Advisors at Lindcove Research and Extension Center (LREC) organized a series of focused extension and outreach activities bringing together pest control advisors (PCAs), growers, and industry partners to address emerging and persistent pest issues in California citrus. Five major events were organized throughout the year, providing 15 continuing education units and advancing integrated pest management (IPM) knowledge for more than 250 attendees.

Citrus Thrips Field Day

The first event was organized on April 24, and addressed the persistent challenge of *citrus thrips*, a key pest affecting fruit quality and marketability. Participants learned to identify citrus thrips at various life stages, distinguish them from western flower thrips, and evaluate the role of natural enemies in thrips suppression. Discussions emphasized effective use of insecticides, treatment thresholds, and resistance management strategies. The program also included an open forum on Fuller rose beetle (FRB) mitigation and updates to UC IPM guidelines, giving attendees the opportunity to share field-level experiences and feedback with regulators and researchers.

Figure 1. Sandipa Gautam speaking to the Citrus thrips field day attendees (left); attendees evaluating results of citrus thrips field trial (right).

Citrus Mealybug Management Field Day and PCA round table

On May 7th, the citrus entomology program organized a field day focused on *citrus mealybug*, an increasingly problematic pest in California citrus. The event covered mealybug biology, phenology, identification, and monitoring techniques, including trap use and field scouting. Research results from pesticide trials and best management practices were presented, followed by an update on the role of natural enemies and ongoing studies assessing biological control potential in regional orchards. Hands-on microscope activities allowed participants to identify mealybug life stages, parasitism levels, and differentiate parasitized colonies. The event concluded with a session by David Haviland on sugar-feeding ants and their interference with biological control, highlighting integrated approaches for managing sap-sucking pests.

There was a second event on citrus mealybug, a PCA Roundtable on September 3rd focused on late season infestation and best management practices. This roundtable facilitated peer-to-peer learning and exchange of field insights on *citrus mealybug management*. The discussion centered on current pest pressures, successes and limitations of available control tools, and adaptation of management programs under varying orchard conditions. PCAs shared results from grower trials and explored regional strategies for improved efficacy. The collaborative format encouraged open dialogue, allowing UC IPM to align research and extension priorities with stakeholder needs.

Figure 2. Speakers, Sandipa Gautam and David Haviland at the Citrus mealybug field day on May 7th. Hands-on activities with mealybug and predators' life stages were a highlight of the event (top row). PCA roundtable on September 3 discussed current challenges and sharing experiences from the field and identified future needs (bottom row).

California Red Scale and Natural Enemies Workshop

A comprehensive workshop on *California red scale (CRS)* equipped PCAs with the skills to recognize key life stages of the pest and its natural enemies, *Aphytis melinus* and *Comperiella bifasciata*. The event was organized on October 1. Lectures and microscope sessions covered identification of scale instars, sex differentiation, parasitism levels, and field sampling techniques (Figure 3). The workshop also reviewed the effects of climate on CRS population dynamics, recent advancements in biological control, and the integration of chemical and mating disruption strategies. Participants engaged in practical fruit evaluations and a knowledge quiz to reinforce learning.

Figure 3. Attendees at the California red scale and natural enemies workshop. This teaching workshop focuses on pest and natural enemy life stages identification.

Second Annual Fall Citrus Meeting

The year concluded with the 2nd Annual Fall Citrus Meeting, which brought together UC ANR specialists, researchers, and citrus industry leaders for a full-day program addressing diverse production challenges. Topics included updates on biofertilizers for HLB management, pesticide laws and regulations, spray penetration efficiency, and pest outlooks for the upcoming season. Presentations also highlighted weed and disease management, emerging pathogens such as *Botryosphaeria* and *Neoscytalidium* canker, and international perspectives on IPM. The meeting concluded with a panel discussion to integrate research, regulation, and field experience. With 5.5 CEUs offered, this event served as a capstone for 2025 citrus IPM education and industry engagement.

Figure 4. Speakers and attendees at the 2nd Annual Fall citrus meeting. Speakers from top left to right, namely Drs. Ashraf El-Kereamy, Jim Cranny, Themis Michaleids, Synda Khedar, Subhas Hajeri, Georgios Vidalakis, Jorge Angeles, Sandipa Gautam, Bodil Cass, Peter Larbi, and Chris Greer. Together, these extension and outreach events delivered to citrus industry stakeholders exemplify UC ANR's continuing commitment to advancing science-based pest management, strengthening professional competency, and supporting sustainable citrus production across California. In addition, the continuing education units offered through these programs provide PCAs and CCAs with much-needed credits for license renewal while ensuring they stay current on the latest research findings and management strategies.

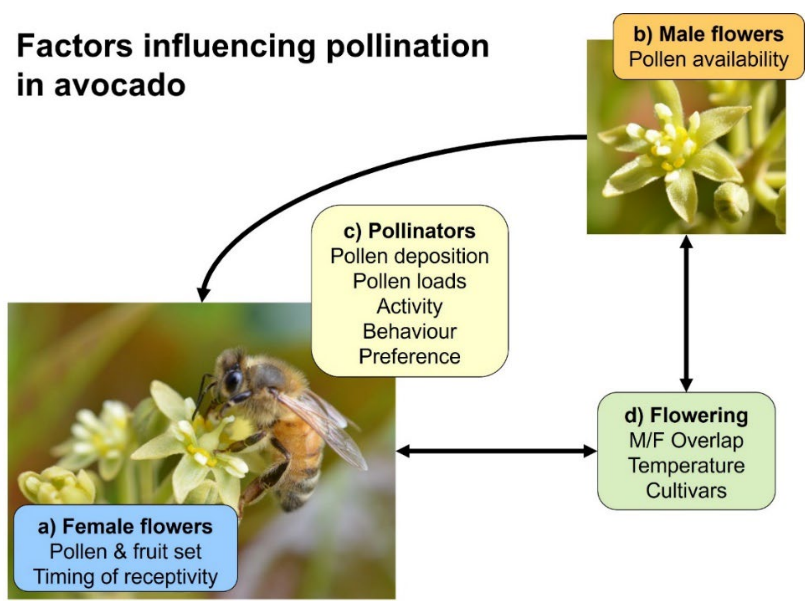
Avocado Flowering and Fruit Set – Major Issues of Hass Production: Notes from 2023 meeting just prior to 10th World Avocado Congress in Auckland, New Zealand

This session was composed of five presenters: Edwin Solares (University of California, Davis, US), Nick Gould (Plant and Food Research, New Zealand), Iñaki Hormaza (IHSM La Mayora-CSIC, Spain), David Pattemore (Plant and Food Research, New Zealand), and Ben Faber (University of California, Ventura, CA, US). The goal of the session was to identify potential problems with avocado productivity (from flower initiation through to fruit set) and identify gaps in our understanding to drive discussions around any further work required to produce "*the avocado of the future*". The session started highlighting the issue that theoretical yield potential is thought to be around 32.5 t/Ha yet average yields are 10 t/Ha at best. Much of this low yield is due to unbalanced year-to-year flowering in trees, poor fruit set, high fruit abscission, and recurrent vegetative flushing. Session presenters reviewed these areas in detail and led a wider discussion to identify the research and knowledge gaps going forward.

The genetics of flower initiation. The genetic control of floral initiation is complex, controlled by a series of regulatory genes. The identity and region within the genome of the location of these genes is an important step forward towards control of things like flower timing or intensity leading to positive impacts on alternate bearing, yield and tree health. At this time, genome reconstruction is needed to validate experimentally the genes implicated in flowering.

Flower quality. An avocado tree may produce one million plus flowers during spring but only a small percentage (up to 0.1%) of these set and hold fruit. The reasons for this are many and complex with pollen availability and transfer being a key factor (as discussed below), however even when flowers are hand pollinated successful fruit set only occurs on around 3-7% of flowers pollinated. When callose deposition is used as an indicator of ovule viability we see that situations can occur where only 10% of flowers open in their female stage are actually viable. This low flower viability appears to be associated with wet /waterlogged soils and cold weather. Even so, flower viability in apparently healthy trees may still be as low as 40% on a given day. Viability also decreases over time and may be associated with resources competition as fruit set on early flowers competes for carbohydrates and other resources with later flowers. This is because the likelihood of a flower setting and holding a fruit is associated with the carbohydrate status of the flower, the greater the amount of carbohydrate (both starch and total soluble sugar) in the pistil of the flower, the greater the chance of setting fruit.

Pollination. In addition to having a healthy tree in the right state to be able to flower and bear fruit (as discussed above), pollination and fruit set are dependent on four major components (summarized in figure right):



Factors influencing pollination:

a) The female flower needs to be ready, pollen needs to arrive and grow to the ovule and weather needs to be right.
   - Does cultivar of pollen matter?
   - Is cross-pollination a benefit due to compatibility **or** flower timing?
   - Under what conditions do stigma remain receptive in the male phase?

b) The male flower needs to produce viable pollen and is it timed to female stage?

c) The pollinators need to visit the male flower when pollen is viable and be able to move it to the female state with enough pollen when it is receptive and the weather is right for both pollinator and fruit set.
   - What behaviours lead to high pollen loading & pollen deposition?
   - How do different species differ in behaviours that affect pollen deposition?
   - What factors increase or decrease attraction of pollinators to flowers?
   - How do we support effective pollinator populations in orchards?

d) With flowering, is there female/male overlap, is the temperature right for flowering, are cultivars compatible?
   - How do patterns of floral timing differ between regions and seasons?
   - Can we predict cultivar flowering overlap patterns in a changing climate?
   - How does weather and cultivar influence timing of dehiscence and viscosity of pollen?

Conclusions and questions to be answered in the future:

Whilst we have a solid understanding of the basics of avocado flowering and pollination and we understand why pollination is challenging, more nuanced understanding is required to develop methods of increasing pollination. Key areas of future research were identified as:

- Frost/low temperature tolerance
- Precocity
- High yield/low AB
- Bearing fruit inside canopy
- Do we need pollinators?
- Is self-pollination feasible?
- Biostimulants

Detailed, location specific pollination studies are time consuming and difficult, but they are supplying us with the best answers, going forward there is a need to better co-ordinate and fund these studies between countries.

Woodpecker Damage in Avocado

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Recently we were called out to inspect trees that had unusual cankers. Unusual, because it was a cluster of about 20 trees and the cankers had insect larvae in the liquid sap that had accumulated in the cankers. When I see an avocado tree like this with discrete white cankers going up and down a branch or trunk, I immediately think of bacterial canker: https://ipm.ucanr.edu/agriculture/avocado/bacterial-canker/#gsc.tab=0

The canker is a tree's reaction to stress, usually lack of water, which allows a bacteria to break through the bark and cause a lesion that fills with liquid sap. The sugar rich sap leaks out and leaves a residue at the site of infection. It creates a pocket of the sap and there is a flap of bark covering the pocket.

In this case, there was no pocket, but there was a hole that had collected sap and there were what appeared to be fly larvae bathing in the sap. The holes were neatly drilled into the bark, but only less than an inch deep and about ¼ inch wide. All the holes were of a similar dimension. These trees were distressed. They looked like root rot infected trees and they had dead roots – prime targets for Invasive Shot Hole Borer. Could they have been attacked by the borer and created these random cankers? The holes were too shallow for polyphagous shot hole borers, and there were no galleries where the borer would cultivate fungus for food. The thought was that it might be some other, new boring insect, so infected branch samples were taken and put into net covered incubator to see what might emerge from the holes………. Nothing.

What was going on? There are holes that are drilled into avocados, as well as other trees by woodpeckers. Often this is to look after boring insects or to store acorns. This is commonly seen in old trees or poles. When they are going after a storage site in a tree, the birds usually make a regular pattern. Below is a case of stored acorns in an avocado branch without the white sap. The sap probably has been washed out over time by rain, and the wound has healed. In this coastal area, it's commonly acorn woodpeckers that do this storage activity.

While we were debating the problem in this recent case, the grower staked out the trees, and by gosh there were four downy woodpeckers that were rat-a-tat tatting on the trees. They would fly from the avocados to a post nearby. They were the ones making the symmetrical holes. But the holes weren't large enough for acorns, and we weren't getting any insect emergence (aside from the few fly larvae that was found in a few holes). What were they doing making all these holes?


Well, it may be that the woodpeckers are also going after the sap. There are sapsuckers, woodpeckers that go after sap and the insects that are attracted to the sap. Downy woodpeckers are noted mostly for going after insects not acorns, but these ones may have developed a taste for sugary avocado sap in this case, as well as for the insects that might show up there. It's a nice story, and at least it wasn't some new insect pest ravaging avocados.

Pest Control Districts Expanding Service to Multiple Citrus Pests

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Abstract
The Alliance of Pest Control Districts (APCD), a joint-powers entity formed by four San Joaquin Valley (SJV) citrus pest control districts (PCDs), has broadened its mandate from targeted eradication of *Citrus tristeza virus* (CTV) to comprehensive detection and management of multiple exotic pests and pathogens threatening citrus production. This transition integrates historical infrastructure with contemporary molecular diagnostics, geographic information systems (GIS), and risk-based field surveillance to address *Candidatus* Liberibacter asiaticus (causal agent of Huanglongbing, HLB), Asian citrus psyllid (*Diaphorina citri,* ACP), Citrus yellow vein clearing virus (CYVCV), Citrus leprosis virus, brown citrus aphid (*Toxoptera citricida*), flat mites (*Tenuipalpus phoenicis*), and severe citrus tristeza virus (CTV) strains. Operational capacity includes mapping of ~210,000 commercial acres, servicing >50,000 ACP traps, multi-pest visual inspections, and a CDFA-permitted laboratory conducting ELISA and PCR

analyses. Future enhancements will incorporate DNA metabarcoding and artificial intelligence for rapid pest identification for insects caught on yellow panel sticky traps.

Introduction

Huanglongbing (HLB) has devastated citrus industries globally, with Florida's orange production reduced by 92% since the 2003–04 season. In California, over 10,000 trees have tested positive for HLB and been removed since 2012, accompanied by sporadic ACP detections in the SJV. Concurrently, CYVCV was confirmed in Tulare County in 2022, prompting the California Department of Food and Agriculture (CDFA) to establish a quarantine on October 1, 2025. These threats underscore the escalating multi-pest pressure on California's citrus industry, which accounts for 84% of U.S. utilized production in the 2024–25 season, contributing to a national crop value of $2.84 billion (esmis.nal.usda.gov). Established PCDs, operating under California Food and Agricultural Code §8401 et seq., have demonstrated efficacy in areawide pest suppression for over eight decades. The restructured APCD leverages this framework to deliver scalable, science-driven surveillance across participating districts while extending contract services to non-member growers.

Historical Context and Institutional Evolution

Our Roots Run Deep—Over 80 Years of Grower-Led Defense. PCDs originated in response to citrus red scale (*Aonidiella aurantii*) in 1939, with the Southern Tulare County Citrus Pest Control District (STCCPCD) achieving population suppression through coordinated biological and chemical control (Howard and McKenzie, 1956). Subsequent districts were formed in Tulare (1947), Fresno (1958), and Kern (1960) counties (Fig. 1). A 1959 Joint Powers Agreement (California Government Code §6500) unified five PCDs into the Central California Citrus Pest Control Agency, later refocused on CTV following its 1963 detection. The transition from greenhouse indexing to ELISA in the early 1990s enabled the processing of >400,000 samples annually. In 2007, the monoclonal antibody MCA13 was adopted to differentiate severe exotic CTV strains from endemic mild isolates, prompting the establishment of localized abatement zones around the Citrus Clonal Protection Program (CCPP) at the Lindcove Research and Extension Center. The 2008 ACP incursion in San Diego catalyzed the Citrus Pest Detection Program (CPDP). A CDFA-permitted PCR laboratory was commissioned in 2015. Rebranding to APCD in 2023 incorporated Tulare County PCD and expanded the pest portfolio.

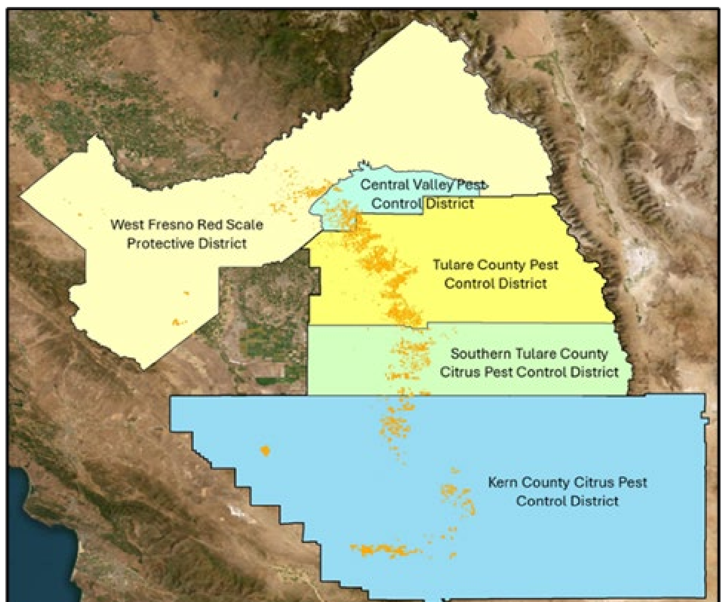

Fig. 1. Citrus Pest Control Districts of the San Joaquin Valley.

The Technical Advisory Committee (TAC) comprising University of California, USDA, CDFA, and county agricultural commissioner representatives provides evidence-based guidance on protocol refinement and on prioritizing emerging threats. Today, four PCDs strong under APCD, we're laser-focused on any pest or disease threatening your trees and yields—from ACP and HLB to CYVCV, citrus leprosis, brown citrus aphid, exotic CTV, flat mites, and more. With staff, labs, and data centralized in Tulare, we're your efficient, grower-driven hub.

Our Mission in Action: Detect, Control, Eradicate

We're all about:

- Leading detection and eradication efforts.
- Backing research to crush these threats.

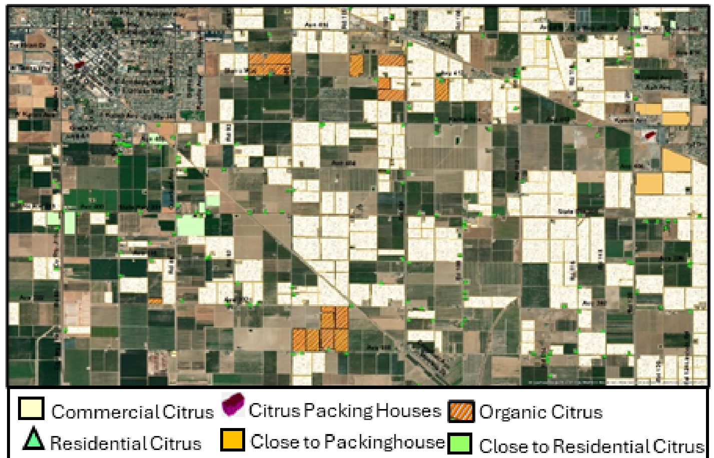

Fig. 2. Commercial citrus map showing selected citrus blocks based on risk factors, as described in the figure legend.

Current Operational Framework

1. GIS-Based Acreage Delineation:
Commercial citrus within participating PCDs (~210,000 acres; 305,000 tax acres at 100 trees/acre) is mapped and updated using ArcGIS on a four-year rotation. Dedicated personnel maintain spatial and ownership databases critical for risk stratification and regulatory compliance.

2. Boots-on-the-Ground Field Work:

a) ACP Trapping – 4,500+ high-risk sites (organics, near packing houses, highways) (Fig. 2) across nine territories from Kern to Fresno (Fig. 3). Nine seasonal trappers hit them biweekly in spring/fall: three off-season (winter and summer) near hot spots like packing houses, residential citrus, and major highways. In addition, keep an eye on the major entry points to the valley, such as weigh stations and truck stops along the I-5, Hwy-126, Hwy-58, and Hwy-41.

b) Multi-Pest Inspection – Perimeter visual surveys target symptomatic foliage and vector arthropods. Suspect plant samples and associated insects are collected for laboratory diagnosis and confirmation (Fig. 4).

3. Laboratory Diagnostics:
The Tulare-based, fully equipped lab facility performs trap screening, serological (ELISA), and molecular (PCR) analyses under CDFA non-regulatory permits (Fig. 5). Sample submission from growers is facilitated via standardized protocols available at www.apcd.ca.gov or by calling us.

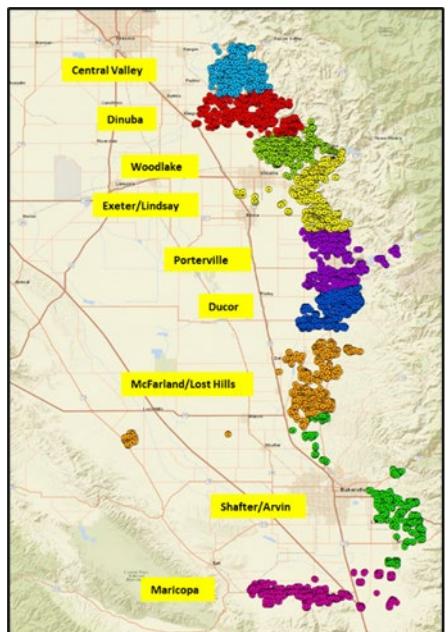

Fig. 3. Nine trapping territories covered by nine trappers, servicing 4,500 sites.

Fig 4. Field operations include trapping, perimeter survey via visual inspection for insect pests and diseases, and sample collection.

4. Abatement Services:

Properties with ≥25 trees are classified as commercial under the Food and Agriculture Code. We treat “non-commercial" 25+ tree properties, in coordination with CDFA and grower liaisons, during ACP triggers, mitigating reservoir hosts in residential and abandoned groves.

Fig 5. APCD Lab operations include screening yellow panel traps and testing insect and plant samples using serological and molecular methods, such as ELISA and PCR.

5. Outreach

APCD has contracts with Grower Liaisons, Judy Zaninovich (for Kern and Fresno Counties: contact - jsleslie@msn.com, 559-703-8691) and Jessica Leslie (Tulare County: contact - jess.leslie@hotmail.com, 559-901-4208), and they will continue to work closely with the CDFA, Citrus Pest and Disease Prevention Program in response to ACP and/or HLB detections.

Future Directions

- **Interagency Synergy** – Formal memoranda with CDFA to enhance the surveillance in the valley.
- **Molecular Diagnostics Improvement** – Integration of DNA metabarcoding for bulk environmental samples and machine-learning classifiers for automated pictorial pest identification.
- **Trap Network Optimization** – Sensor-enabled lures and remote imaging to reduce labor intensity while increasing temporal resolution.

Conclusion

The APCD represents a scalable model of grower-funded, science-driven pest exclusion. By consolidating historical expertise with advanced diagnostics and risk-based deployment, the program positions the SJV to sustain citrus productivity amid escalating transboundary pest pressure.

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For sample submission forms and program updates: www.apcd.ca.gov

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Soil Biological Management for Enhanced Citrus Yield and Health

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Introduction:

California's citrus industry, a cornerstone of the state's agricultural economy, faces increasing pressure from water limitations, soil degradation, and climate variability. With decades-old orchards rooted in soils that are often depleted, and increasingly stressed, innovative and sustainable solutions are urgently needed. One promising avenue lies beneath the surface in the form of beneficial soil microbial communities. These microbes, including bacteria, fungi, and actinomycetes, perform crucial roles in nutrient cycling, water retention, disease suppression, and organic matter decomposition. They form the foundation of soil health and play a key role in the resilience and productivity of citrus orchards. Examples of the beneficial microbes are listed in Table 1.

Table 1: Beneficial microbes' categories and species

Category	Microbial Species
Phosphate-solubilizing / mobilizing microbes	*Bacillus circulans*, *B. subtilis*, *Pseudomonas striata*, *B. polymyxa, Glomus sp.*, *Gigaspora sp.*, *Acaulospora sp.*
Nitrogen-fixing microbes	*Azotobacter sp.*, *Clostridium sp.*, *Nostoc sp.*, *Klebsiella sp., Azospirillum sp.*, *Acetobacter diazotrophicus, Rhizobium sp.*, *Frankia sp.*, *Anabaena azollae*, *Trichodesmium sp.*
Zinc-solubilizing microbes	*Mycorrhiza sp.*, *Pseudomonas sp.*, *Bacillus sp.*
Potassium-solubilizing / mobilizing microbes	*Bacillus mucilaginosus*, *B. circulanscan*, *B. edaphicus / Bacillus spp.*, *Aspergillus niger*
Sulfur-oxidizing microbes	*Thiobacillus sp.*
Plant growth-promoting rhizobacteria (PGPR)	*Pseudomonas sp.*, *Erwinia sp.*, *Bacillus sp.*, *Streptomyces sp.*, *Xanthomonas sp.*

Research from multiple cropping systems has confirmed that promoting beneficial microbial activity can significantly enhance plant growth, fruit quality, and long-term orchard sustainability. In citrus orchards where trees may persist in the same soil for years enhancing soil microbial health is not merely beneficial but essential. Fortunately, practices such as cover cropping, applying organic fertilizers, mulches, manures, and incorporating biofertilizers provide practical and proven ways to stimulate and support these microbial communities. Furthermore, advances in soil microbiome analysis technologies now allow researchers and growers to characterize microbial diversity and function in detail. These diagnostic tools enable informed decision-making and targeted interventions by identifying imbalances, gaps, or opportunities within the soil microbial ecosystem.

Strategies to Enhance Beneficial Microbial Communities

1. Cover Crops

Cover crops such as legumes, grasses, and brassicas are increasingly being used between citrus orchard rows to build organic matter and improve soil structure. These living plants not only reduce erosion and suppress weeds but also support microbial activity by releasing root exudates rich in sugars, amino acids, and organic acids that fuel microbial growth. Their biomass, when mowed and incorporated, provides food for soil organisms that in turn cycle nutrients back to the trees. Studies have shown that cover cropping increases microbial diversity and abundance, particularly of beneficial fungi such as arbuscular mycorrhizae that form symbiotic relationships with citrus roots. Moreover, cover crops improve water infiltration and retention, reduce compaction, and buffer temperature extremes all of which support microbial and root health. An additional benefit is the enhancement of beneficial insect populations. Flowering cover crops attract pollinators and natural predators of common citrus pests, supporting integrated pest management and reducing the need for chemical insecticides.

Introducing cover crops into existing orchards can be operationally complex. They require additional labor and equipment for mowing, seeding, and irrigation coordination. In drought-prone regions, growers may worry about competition for limited water. The timing of termination and species selection also require careful management to avoid negative impacts on tree growth or harvesting logistics.

2. Organic Fertilizers

Organic fertilizers such as compost, manure, and green waste serve as critical inputs for rebuilding soil fertility and microbial activity. Unlike synthetic fertilizers that deliver nutrients in soluble, often leachable forms, organic fertilizers release nutrients slowly and steadily. They also contribute to the buildup of soil organic carbon, which supports long-term microbial metabolism and soil structure. Organic fertilizers not only enhance biological activity but also improve key physical and chemical properties of soil, including porosity, aggregate stability, water-holding capacity, and buffering of soil pH. These properties are vital for improving root development, moisture availability, and nutrient retention, especially under variable irrigation conditions.

Securing consistent and high-quality organic materials can be a barrier. Transport and application can also be expensive, and nutrient content is highly variable requiring testing and adjustments in nutrient budgeting.

3. Biofertilizers

Biofertilizers consist of microbial inoculants designed to improve plant growth through biological nitrogen fixation, phosphorus solubilization, hormone production, or suppression of pathogens. These inoculants colonize the rhizosphere and interact with the plant's root system to facilitate nutrient absorption and defense mechanisms. Phosphorus-solubilizing bacteria, for example, release organic acids that make phosphorus more available. Mycorrhizae extend the root zone through their hyphal networks, enhancing water access and nutrient exchange.

Adoption remains limited due to lack of awareness, limited access to high-quality products, and variability in field performance. The efficacy of biofertilizers depends on many factors soil pH, organic matter, microbial compatibility, and correct timing. Improper storage or handling may render the inoculants ineffective.

Soil Microbes and Disease Suppression

One of the most important ecosystem services provided by beneficial soil microbes is the natural suppression of plant pathogens. A diverse and active soil microbiome can outcompete harmful microbes, produce antimicrobial compounds, and trigger plant immune responses that protect against disease. In citrus systems, these mechanisms can reduce the incidence of root and soil-borne pathogens such as *Phytophthora*, *Fusarium*, and nematodes, thereby enhancing root health and nutrient uptake.

There is also growing interest in the potential role of soil microbial communities in mitigating the impacts of Huanglongbing (HLB), or citrus greening disease. Recent studies suggest that healthier root systems and rhizosphere microbial communities may help delay symptom expression, reduce tree decline, and support improved tolerance under infection. Some soil-applied biologicals and organic amendments have been observed to improve canopy health and prolong productivity in HLB-infected trees likely through microbial-mediated improvements in nutrient uptake and systemic stress resistance.

Leveraging Soil Microbiome Analysis

One of the most promising developments in this area is the emergence of soil microbiome analysis tools. Using DNA sequencing and microbial profiling technologies, researchers and growers can now obtain detailed snapshots of soil microbial populations, monitoring of soil health, and microbial shifts over time.

Conclusion

The foundation of a healthy citrus orchard lies in the soil and more specifically, in the invisible web of microbial life that supports it. By fostering beneficial microbial communities through cover crops, organic fertilizers, and biofertilizers, citrus growers can improve yields, soil health, pest resistance, and water use efficiency. Emerging tools such as soil microbiome analysis now give researchers and growers unprecedented insight into what’s happening underground, allowing for smarter, more targeted interventions. Though implementation challenges exist, the ecological and economic benefits of building a biologically rich soil ecosystem are substantial.

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Matthew Fatino joined UC ANR as the Cooperative Extension Subtropical Crops advisor in San Diego and Riverside counties this past July. His background is in horticulture and agronomy with formal training as a weed scientist in both row and tree crops. Matthew received a BS in Fruit and Crop Science from Cal Poly San Luis Obispo, working in the orchards on campus and as a research assistant on campus and with an agricultural chemical company on the Central Coast. He continued his research career at University of California, Davis, where he received an MSc and PhD in Horticulture and Agronomy with an emphasis in weed science. He briefly worked as a post-doctoral researcher at UC Davis before starting his position with UC ANR.

Matthew's graduate research focused on developing a management program for the invasive parasitic weed branched broomrape in California processing tomatoes. His research evaluated existing herbicide programs from around the globe, refined new programs for use under California cropping conditions, as well as developed cultural methods for reducing branched broomrape attachment in-season. As a part of his dissertation work, Matthew collaborated with chemical companies and tomato industry partners on providing data needed to successfully acquire a 24(c) Special Local Need label for chemigated rimsulfuron in tomatoes for branched broomrape control. In addition to his dissertation research, Matthew conducted numerous herbicide screenings and evaluations in tree and vines crops throughout the Central Valley of California. He has worked with almonds, pistachios, walnuts, pomegranates, winegrapes, olives, and agave grown for spirit production. He has worked extensively with the USDA IR4 program to generate registration support data for specialty crops grown in California, with the goal of giving growers additional tools to manage weeds and other pests within their operations.

Matthew is continuing his work with the USDA IR4 program evaluating a range of pesticides in various subtropical crops in his region. He hopes that the data generated from these studies can help register new tools for use in the multitude of different specialty crops grown in San Diego and Riverside counties. Matthew's research and extension program will continue to focus on pest management as well as general production of avocados, citrus, dates, and other subtropical crops that his stakeholders produce. He is currently working with PCA's, growers, and grove managers to get a pulse on the needs of the industry in Southern California and using this information to guide the development of his research program.

Matthew has been fortunate to have begun his extension program already, speaking to a diverse group of audiences about weed management in various subtropical cropping systems, both conventional and organic, and making farm calls with producers. Engaging with stakeholders is why Matthew chose this job, and he looks forward to continuing to serve subtropical crop producers in Southern California.

Topics in Subtropics

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