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Features from your Advisors

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ADVANCED ON-FARM WATER DELIVERY SYSTEMS: A VITAL APPROACH FOR CLIMATE-RESILIENT FARMING IN THE DESERT REGION

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Introduction. Optimizing irrigation practices is essential for developing sustainable and climate-resilient farming. Advanced irrigation is a fundamental aspect of modern agriculture that seeks to enhance water efficiency, promote crop health and productivity, and contribute to sustainable and resilient agriculture. This article aims to identify and assess proven and novel on-farm water delivery technologies that may assist growers in the desert region navigating a drier future.

Improved surface irrigation systems. Surface irrigation systems, including furrow, border, and basin irrigation are traditional, widely used, and cost-effective methods in the desert region. However, managing these systems efficiently is challenging due to high water demand and considerable time required for water to advance across the field. For instance, multiple irrigation events between harvests in alfalfa and perennial grasses sometimes result in water applied exceeding the soil water depletion level, leading to percolation below the crop root zone, depending on soil textures.

Various techniques can be used to enhance efficiency in surface irrigation systems. Techniques such as land leveling for uniform irrigation, reducing field length, using blocked-end furrows, implementing cut-back irrigation approach, setting appropriate irrigation cutoff time, and surge irrigation are effective in improving efficiency. Automated surface irrigation is considered an advanced technology that uses automated gates, wetting front advance sensors, and flowmeters to determine the cutoff time and regulate the flow rate (Fig. 1). This advanced irrigation technology may improve irrigation system efficiency and reduce labor cost, soil erosion, and site movement of pesticides and nutrients. Utilizing this technology may reduce scalding (due to flooding and high temperature injury) in alfalfa grown on heavy soils by eliminating standing water at the end of the field.

Fig. 1. Two automated surface irrigation fields in Imperial Valley. Two different automated gates are demonstrated in klein grass and alfalfa fields.

An assessment was conducted in a commercial field equipped with automated surface irrigation in the low desert over a four-month period. The measurements indicated that the tailwater runoff was reduced to 5.2% of the total applied water on average over the study period. In one of the irrigation events, this measure was reduced to 4.3% of the total applied water (Fig. 2).

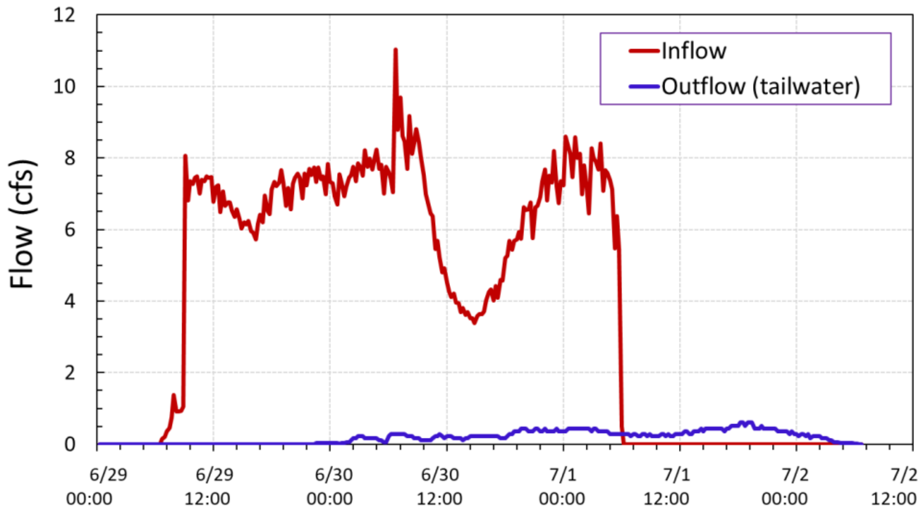

Fig. 2. Inflow rate and tailwater runoff rate over an irrigation event in a klein grass field equipped with automated surface irrigation.

Implementing a tailwater recovery system in surface irrigation systems is another water conservation tool that may improve efficiency. It is particularly feasible for fields equipped with subsurface drainage systems, where recoverable irrigation runoff and/or subsurface drainage outflows are collected. Both portable and permanent tailwater recovery systems are commonly adopted by growers in the Imperial Valley (Fig. 3). Our recent research showed an average electrical conductivity of 3 dS m^{-1} for on-farm drainage water, which can be reused for irrigating some forage crops.

Fig. 3. Tailwater recovery system in Imperial Valley. The figure shows (a) a semi-permanent tailwater recovery system (pump and accessories) and (b) an open drainage canal as its water supplier.

Subsurface drip irrigation (SDI). Drip irrigation has revolutionized crop production systems in western states of the US by increasing yields and water productivity in many crops. Our previous studies in the desert region demonstrated that SDI has the potential to conserve water (13-64%) and N fertilizer (15-40%) and improve yields (5-40%) in alfalfa, lettuce, sweet corn, dehydrated onions, and spinach (Table 1).

Table 1. Advantages and disadvantages of utilizing SDI in the desert cropping systems. Results from evaluating 43 commercial fields in the low desert region are reported here (the average values of water saving, N fertilizer saving, and yield increase for each commodity are reported).

Crop	Water conservation	N fertilizer conservation	Yield increase	Other benefits	Pitfalls
Sweet corn (drip vs. furrow)	2.2 ac-ft/ac (37%)	26%	5%	-	-
Alfalfa (drip vs. flood)	1 ac-ft/ac (13%)	-	2.4 t/ac (25%)	-	Gopher Salinity
Dehydrated onions (drip vs. furrow)	2.5 ac-ft/ac 64%	40%	1.5 t/ac (10%)	Less downy mildew	Salinity
Dehydrated onions (drip vs. semi-solid set sprinkler)	0.7 ac-ft/ac 18%	16%	-	Less downy mildew	Salinity
Lettuce (drip vs. furrow)	0.7 ac-ft/ac (20%)	20%	35% - 40%	Food safety (vs. sprinkler)	-
Spinach (drip vs. sprinkler)	-	15%	-	2-5 times less downy mildew Food safety	Economic feasibility

Growers may face several challenges when irrigating alfalfa and other perennial grass using an SDI system, including high capital cost, maintenance issues, rodent control, crop germination and establishment, and crop rotation. Alfalfa fields under SDI can become ideal habitats for gophers, necessitating continual monitoring (Fig. 4). Extensive rodent infestation and lack of timely maintenance may lead to abandonment of the system if serious issues arise. Effective irrigation scheduling in combination with occasional irrigation using sprinkler or surface irrigation are practical strategies to control salinity.

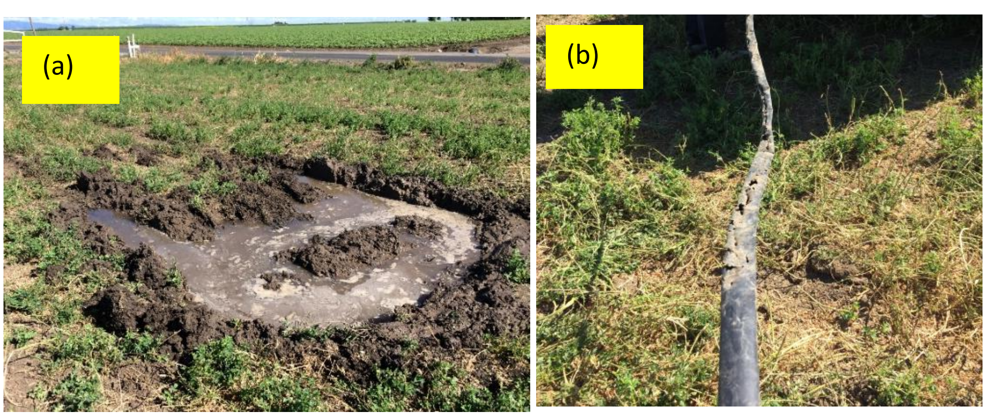

Fig. 4. (a) Large leak (b) and drip-tape damage due to gopher issue in an alfalfa field.

New generation of sprinkler irrigation systems. Sprinkler irrigation allows for more flexible irrigation scheduling compared to conventional surface irrigation. Various types of sprinkler irrigation systems are available, including center pivot, linear move, solid set sprinklers, wheel line systems, and big gun sprinklers. The new generation of linear move (Fig. 5) and center pivot sprinkler irrigation systems are proven to enhance irrigation efficiency, reduce energy and water costs, and increase crop yields.

These advanced efficient sprinkler irrigation systems provide an ideal platform for adopting variable rate irrigation (VRI) technology to address temporal and spatial variabilities. VRI technology offers clear advantages, particularly in fields with soil variability, making it an optimal tool for more site-specific irrigation management.

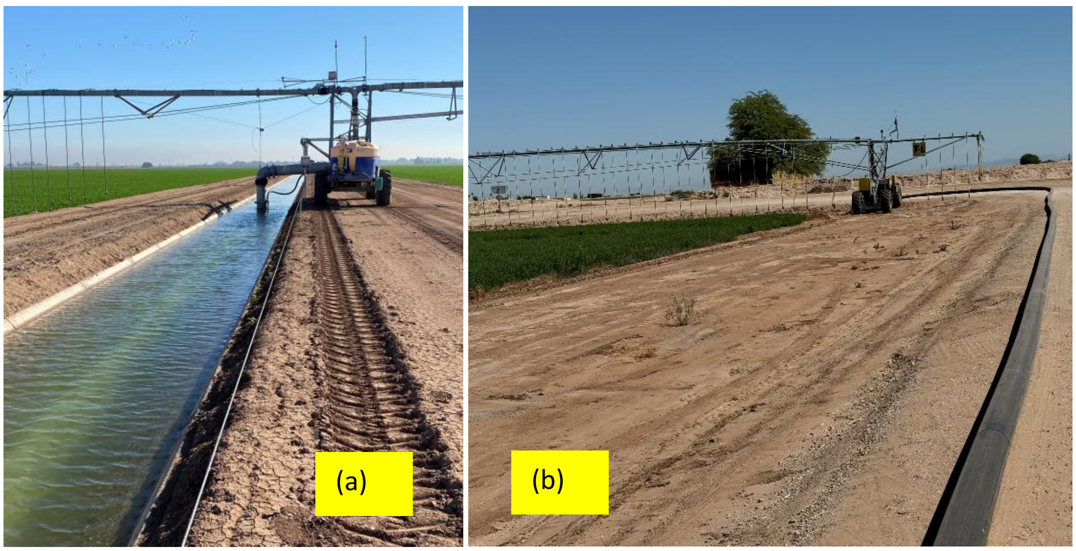

Fig. 5. Alfalfa fields under linear move sprinkler irrigation systems (a: open ditch water supplier and b: drag hose system in the Imperial Valley).

Both linear move and center pivot irrigation systems could struggle to provide sufficient water for high water use crops like alfalfa during the summer months in the desert region. The frequent light water applications associated with these systems can lead to some salinity accumulation (Fig. 5), which must be leached during the fall and winter months when system capacity exceeds crop water requirements. Proper management of water applications to match crop water needs and allow for adequate leaching may help control soil salinity. Salt accumulation (an average ECe of 7.9 dS m^{-1}) was observed below 30 inches in depth across two alfalfa fields with silty clay soil after two years of using linear move sprinkler systems in the low desert region.

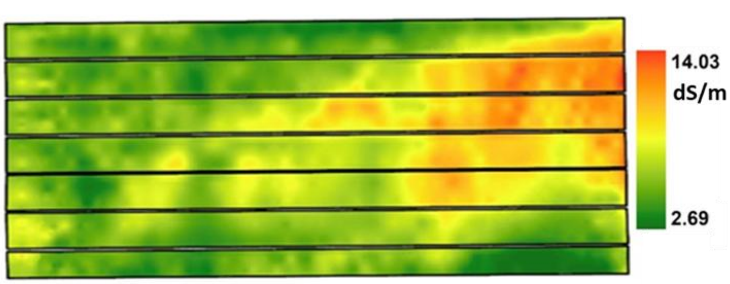

Fig. 6. Salinity map (EC_e map) of an alfalfa field irrigated using a linear move sprinkler system in the low desert. The survey demonstrates that the salinity was increased up to 14 dS m^{-1} in part of the field.

Conclusions. Adopting advanced irrigation technologies is essential for achieving greater efficiency and water savings. Transitioning from conventional surface irrigation to more efficient systems, such as automated surface irrigation, low-energy precision application linear move and center pivot sprinklers, as well as subsurface drip irrigation, has shown promises in conserving water, fertilizer, and energy. These systems may also enhance yields and reduce labor costs. Given the large-scale nature of farming and the growing demand for water conservation in the desert region, there are substantial opportunities to adopt these tools and technologies effectively. This could lead to a new era of improved irrigation management and efficiency, developing sustainable and climate-resilient farming in the region.

NEW CATTLE ID REQUIREMENTS – WHAT HAS CHANGED?

Gabriele Maier[1], Kelsi Williams[2], and Kavishti Kokaram[3]

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As of April 25, 2024, the United States Department of Agriculture (USDA) updated the federal rules for cattle and bison identification **for interstate movements** (9 CFR Part 86.4). One of the most important changes is that as of November 5, 2024, NUES eartags (silverbrite tags and Bangs tags) will no longer be recognized as official identification for interstate movement of cattle and bison. The move to electronic ID will allow for faster and more accurate tracing of cattle movements, which becomes crucial during an animal disease outbreak and reassures trade partners the safety and security of the US food supply. The United States Department of Agriculture has long been discussing the move to electronic IDs in cattle and bison to aid in rapid traceability and containment of disease during an outbreak, and finalized the rule in April 2024 after considering all public and industry comments. Official identification for interstate movement of cattle and bison has been required since 2013. While having to change the type of ID for interstate movement of certain types of animals may seem as a burden to producers at first sight, the widespread use of this technology will make the cattle industry and food supply chain in the U.S. more robust and should be regarded as a step in the right direction for producers. All details are available on the USDA Animal Disease Traceability website (https://www.aphis.usda.gov/livestock-poultry-disease/traceability). Additional information may be found on the California Department of Food and Agriculture's website under the Animal Disease Traceability page. In a nutshell, here are the most important details that ranchers need to be aware of with respect to the updated Federal ADT rule.

Types of cattle to which the updated Federal rules apply:

- All **sexually intact** cattle and bison 18 months of age or older for interstate movement (feeder steers, for example, are not affected)
- All **dairy** cattle regardless of age, sex, or current use (breeds or offspring of breeds used to produce milk, including but not limited to Ayrshire, Brown Swiss, Holstein, Jersey, Guernsey, Milking Shorthorn, and Red and Whites)
- All cattle and bison used for **rodeos, shows, exhibitions, or recreational events to include fairs**

ID types approved for the above classes of cattle for interstate movement as per the Federal rule:

- **Official ear tag** that is both **visually and electronically readable (see Figure 1)**
- **Registered brands** accompanied by an official brand inspection certificate when agreed upon by both the shipping and receiving State or Tribal animal health authorities.

- **Breed association tattoos** for registration purposes accompanied by the breed registration certificate when agreed to by the shipping and receiving State or/Tribal animal health authorities.
- **Group/lot identification** when a group of animals is managed together as one group throughout the pre-harvest production chain (state specific, uncommon in cattle)
- **Always check with the State Animal Health Officials of the receiving state to verify their state specific movement requirements.**

If my cattle already have NUES metal ear tags, do I need to switch them to electronic tags?

No, if cattle had visual-only ear tags applied before the November 5, 2024 deadline, there is no need to switch them to electronic ID tags. However, producers may still apply an electronic ID to their animals if they choose.

Are official electronic ear tags available through CDFA?

Yes, you can receive electronic ear tags free of charge while supplies are available from your CDFA animal health branch office. Animal health branch district offices are in the following locations:

Redding (530)225-2140
Modesto: (209)491-9350
Tulare: (559)685-3500
Ontario: (909)947-5932

Before you will be able to receive or purchase electronic IDs, you need a premise ID number or PIN. A PIN is a unique ID assigned to a geographic location where livestock are managed. You can verify with your CDFA office whether you already have a PIN. There is an online form available on the CDFA website to request a PIN if needed through your local CDFA District office.

Where can I purchase official electronic ID tags for cattle or bison?

A list of USDA approved electronic ID tags is available on the CDFA website. A premise ID is required to purchase Official ID from any manufacturer.

How do I apply the electronic ID in the ear?

If using button-style EID ear tags; apply ear tags to a clean site between cartilage ribs 1/3 from the head and 2/3 from the tip of the ear. Wipe away dirt or debris with a rag +/- some alcohol. This guide shows where to place the tags. For metal EID tags, please refer to the manufacturer's guidance for application. It is highly recommended that producers use a tag applicator made by the same manufacturer and intended for that style tags to avoid retention issues.

What about movement of sexually mature cattle for grazing to pasture in a neighboring state?

The pasture-to-pasture or seasonal movement permit process has not changed, only what is considered official ID for interstate movement. An application for a pasture-to-pasture permit may be found on the [CDFA - AHFSS - AHB - Animal Disease Traceability]() page. For additional information, please call the Animal Health Branch permit line at 916-900-5052.

Where can I get more information on this topic?

As mentioned earlier, there is a lot of detailed information on the CDFA Animal Disease Traceability website. If you have specific questions that this article or the websites cannot answer, please contact your local CDFA office or Dr. Kelsi Williams with CDFA at (916) 203-0267 or at [kelsi.williams@cdfa.ca.gov]().

Figure 1. Example button style available through CDFA for purchase, or example matched pair style available for purchase.

AREA-WIDE MONITORING OF KEY INSECT PESTS ACROSS THE IMPERIAL VALLEY: MAY 2025 UPDATES

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Since the first week of August 2024, the UCCE Entomology program at Imperial County has maintained a yellow sticky trap network across the Imperial Valley. This trap network aimed to facilitate landscape-level monitoring of the population dynamics of adult whiteflies, western flower thrips, flea beetles, and aphids throughout the year. The trap set up in each site consists of a 6 X 12 in (15.2 x 30.5 cm) yellow sticky trap (Olson Products, Medina, OH), shaped into a cylinder, attached to a wooden stake using a binder clip, and positioned about 60 cm above the ground (Fig. 1A and 1B). The traps are distributed throughout the Imperial Valley, covering the major agricultural areas (Fig. 1C). Insects that are attracted to the yellow color of the traps and those that land on the surface of the trap during the flight get trapped on their sticky surface. The traps are replaced weekly and are examined in the laboratory under a stereo microscope to count the pest population.

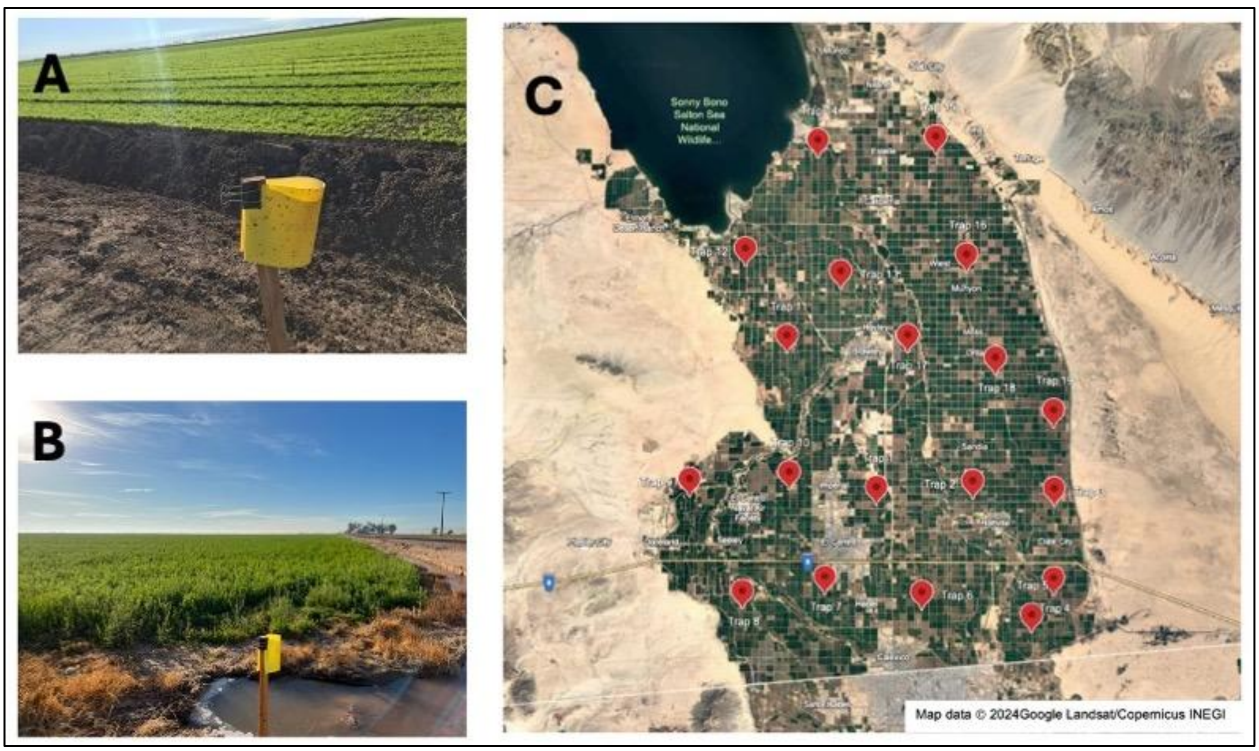


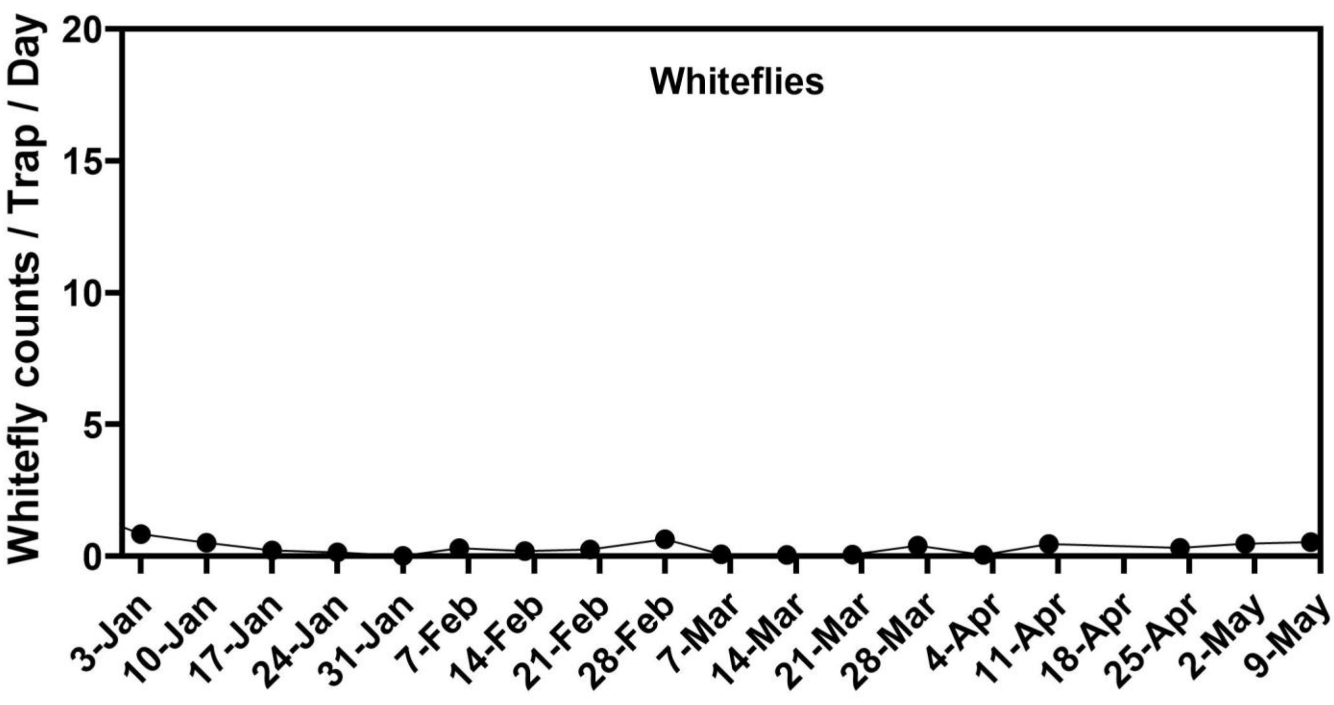
Fig. 1 A & B) Yellow sticky traps in various fields, and C) Trap locations across the Imperial Valley.

Insect count data from these traps identify the adult insect activity of targeted pests around the field. Since several biological (crop type, crop age, presence of weed hosts, etc.), physical factors (temperature, wind, precipitation, etc.), and farm operations (insecticide sprays, dust from the land preparation, crop harvest, etc.) can influence insect counts in the traps, the insect numbers in sticky traps do not always strongly correlate to the actual infestation levels in the grower's field. Despite this, the trap counts are a valuable indication of adult insects' movement across the landscape. Moreover, collecting the trap data across multiple years will help establish a baseline of pest activity across the season. This historical pest data can then be compared with current pest activity in the traps to identify population trends. The traps are also being screened for potential invasive insect pests, including Asian citrus psyllids, spotted lanternflies, Mexican fruit flies, etc.

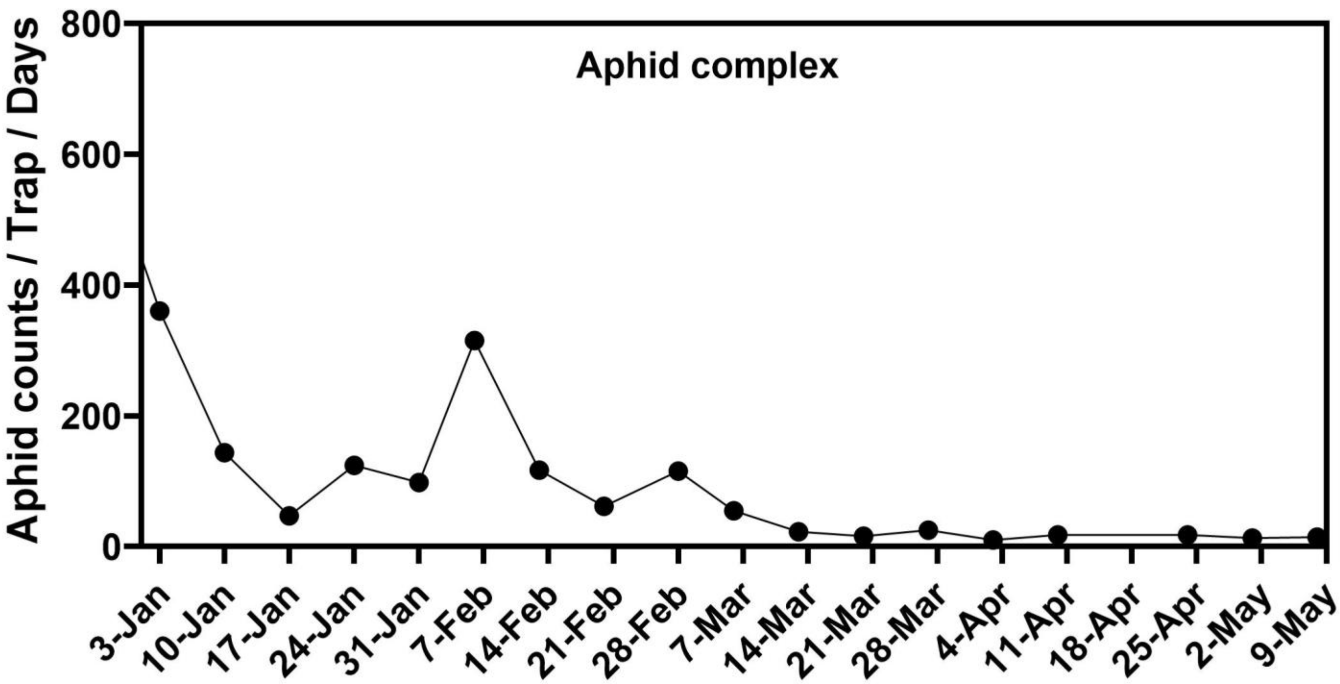
Insect count updates until 8th May 2025

The insect counts from the monitoring trap network are presented below. Each dot in the graph represents the average insect count from 19 traps across the Valley for that sampling week, and the value is expressed as insect counts per trap per day.

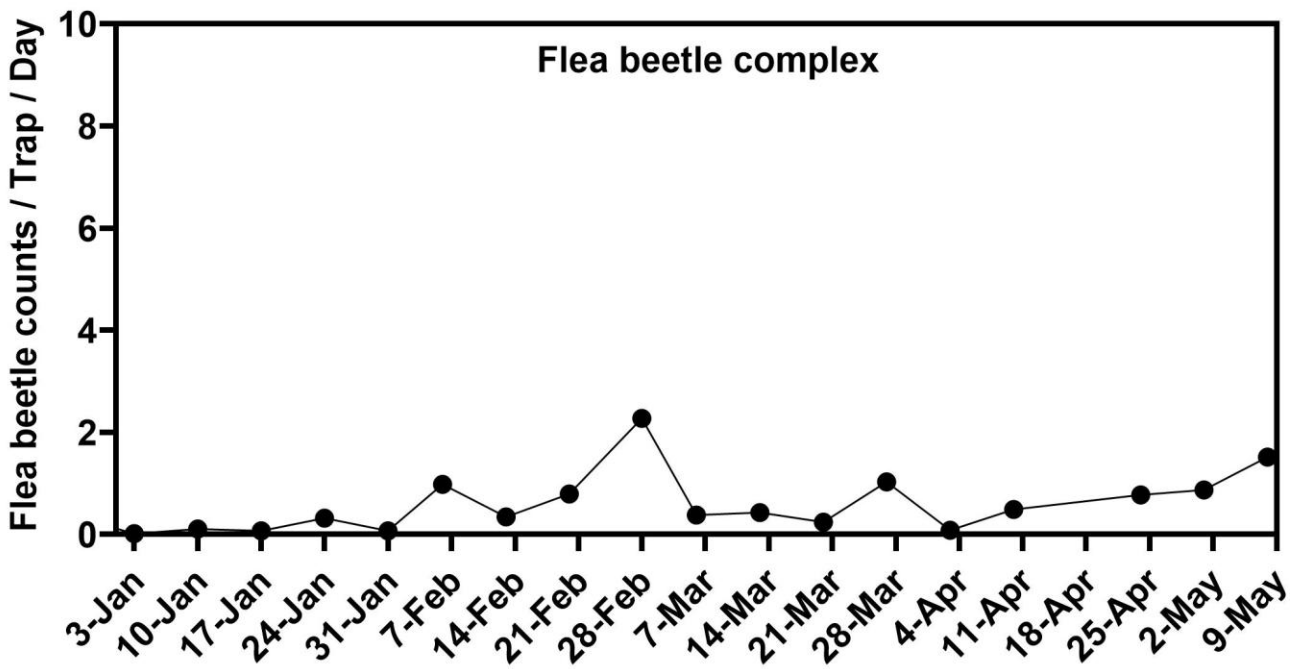
Whiteflies: The whitefly counts in the traps consisted mainly of sweetpotato whitefly (*Bemisia tabaci* MEAM1). Additionally, a small fraction (< 5%) comprises bandedwinged whiteflies, *Trialeurodes abutilonia*, and other minor species. Over the last few months, the number of adult whiteflies captured in our traps has been very low. That being said, I scouted various melon fields across the Imperial Valley over the last few weeks, though variable, some low levels of whitefly activity were observed in almost all these fields. As the temperature rises, expect their number to increase in the susceptible crops, even if our trap captures stay low, as these trap captures represent the overall activity across the Valley and are less predictive of individual field situations.



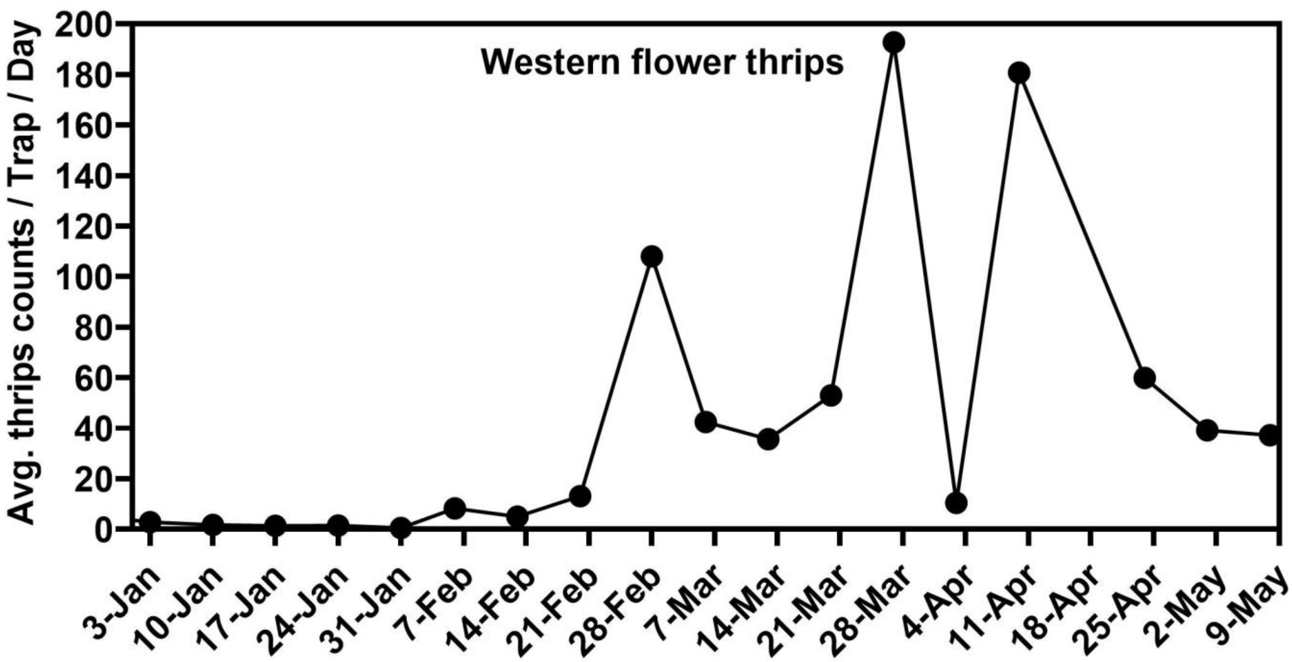
Aphids. The trap count data of aphids below do not focus on any single species but represent the aphid complex in the Valley. We are observing relatively low alate aphid activity in the Imperial Valley.



Flea beetles. The flea beetle counts in the traps comprised the pale-striped flea beetle, *Systena blanda*, the desert corn flea beetle, *Chaetocnema ectypa,* and other minor species. Their counts are relatively low on the traps, but their numbers have increased slightly in recent weeks.



Western flower thrips. While the traps contained several thrip species, only western flower thrips, *Frankliniella occidentalis,* the major thrip species of concern for several crops in Imperial Valley, were counted to provide more specific data. In the most recent observation, their number in the traps has declined considerably from its peak in late March and mid-April. However, they are maintaining moderate adult activity across the Valley. Keep an eye out for their number in susceptible crops like peppers, tomatoes, and melons.



Additional biweekly updates of trap capture data are available from the UCCE Imperial County Entomology webpage, which can be accessed at https://ucanr.edu/county-office/cooperative-extension-imperial-county/imperial-valley-areawide-pest-monitoring. If you are interested in additional data from this project or have questions or comments, contact Arun Babu at (442) 265 -7700 or arbabu@ucanr.edu. This project is supported by the Imperial County Agricultural Benefit Program grant (2024-2027).

FALL 2024 UPDATES FROM THE FARM SMART PROGRAM AT THE UC DESERT RESEARCH AND EXTENSION CENTER

Mariana Gonzalez-Castro, Community Education Supervisor, UC DREC

A Message from the New Manager

Hello, my name is Mariana Gonzalez Castro, and I am the new Community Education Supervisor for the Farm Smart program at the University of California's Desert Research and Extension Center (UC DREC). I am excited to be back with the team, as I previously had the privilege of interning and volunteering for Farm Smart. It has been a rewarding journey, and having witnessed the growth of Farm Smart in my previous roles, I find it inspiring to return as the manager and continue contributing to our mission. This fall has been an exciting season, and I'm proud to share with you the highlights of the events and initiatives we've accomplished.

Fall Programs and Community Events

Our fall season has been filled with energy and growth! We're thrilled to have hosted several exciting events and programs that brought the community together. Below is a summary of some of the key highlights:

7th Annual Read with a Farmer

In collaboration with the Imperial County Farm Bureau, we're proud to celebrate the 7th Annual Read with a Farmer event. This year's event was a huge success, reaching over 850 participants on September 25th, 2024. Thirty local farmers visited classrooms across Imperial County, reading to third-grade students about the world of agriculture and sharing their insight. This experience not only brought the community together but also sparked an early interest in agriculture for many young learners. Thank you to the Farm Bureau and our local farmers for continuing this tradition of agricultural education and literacy.

Alfalfa is Ice Cream in the Making

Our Dairy program, Alfalfa is Ice Cream in the Making, reached 625 participants during the month of October. During the program, participants gain an understanding of the importance of the cattle industry as a whole and learn about the characteristics and anatomy of cattle. We proudly highlight that California is the #1 Dairy state, with cattle being Imperial County's top commodity. Additionally, participants learn that Imperial County is the #1 producer of alfalfa, which plays a key role in feeding our cattle along with other essential foods that are part of cattle nutrition. Students visit our center's feedlot to observe the animals and their diet, including the "mixed ration" they eat. They also get hands-on experience with dairy products by making their own butter, gaining a deeper appreciation for the connection between agriculture and the food we consume.

Fall Festival Program

From November to December, our Fall Festival program provided a hands-on experience where students learned about the crops grown during the fall season, with a special emphasis on corn. This year, we welcomed over 700 participants to explore the many uses of corn, both as food and non-food items. During the program, students explore the different parts of the corn plant, and how it can be grown almost everywhere else in the world. They also learn how corn is harvested, shucked, and shelled before it is processed into a variety of products. Through this interactive experience, students gain a deeper understanding of how this essential crop plays a role in both agriculture and everyday life.

CARES Fall Festival and Resource Fair

On November 15th, 2024, Farm Smart hosted the 3rd Annual CARES CPRC Fall Festival and Resource Fair, an event focused on community care, support, and wellness for families with children with special needs, ages 0-26. With 226 attendees, the event highlighted local resources and partnerships, promoting health and wellness while offering support to families in need. Families enjoyed a variety of fun activities from arts & crafts, games, a free lunch at our picnic area, and hay wagon rides to our corn maze.

Intern Highlights: Welcoming New Faces & Celebrating Continued Growth

This season, we were fortunate to welcome many exceptional interns to our Farm Smart team, each bringing their own unique skills and enthusiasm to the program.

Jaiden Arreola: Jaiden Arreola, a kinesiology student from Imperial Valley College, joined our team this fall. Jaiden's fresh perspective and dedication have already made a meaningful impact on our programs. His enthusiasm and eagerness to learn have made him a valuable addition to our team, and we are excited to see how his journey with us continues to unfold.

Emily Delgado: We were also thrilled to welcome back Emily Delgado, who previously completed a Farm Smart internship. Emily is currently studying agricultural systems management at the University of Arizona. This fall, she took on a project focused on colored carrot research and outreach, contributing to our efforts to promote colored carrots, healthy eating, and agricultural education. Her return to Farm Smart has been a reminder of the lasting impact of our interns, as Emily brings her experience into the project, further enriching our outreach and the community we serve.

Gema Gutierrez: Gema Gutierrez has been an integral part of our team for the past two years. Gema is currently studying Leadership and Learning Innovation with an emphasis in Community Education at the University of Arizona. Gema brings a wealth of experience, particularly in working with various programs, such as the Farm to School program. Her deep commitment to agriculture and her hands-on experience makes her an essential mentor for our newer interns. We're grateful for Gema's hard work and the positive impact she has on our team!

Azalia Huereque: We also would like to spotlight Azalia Huereque, our dedicated Lead Intern. Azalia is currently studying pre-veterinary medicine at Arizona State University and has quickly become an invaluable part of our team. As Lead Intern, Azalia takes on the crucial role of training and mentoring new interns, ensuring that they have the support and knowledge they need to succeed. Her leadership and passion play a significant role in shaping the next generation of interns and contributing to the overall success of our program.

Learning to Lead Program

In collaboration with Imperial Valley College, we were also excited to welcome four new interns from the Learning to Lead: Cultivating the Next Generation of Diverse Food and Agriculture Professionals Program. This impactful program is dedicated to fostering the next generation of leaders in food, agriculture, and natural resources sectors, while also opening pathways to federal sectors careers, including opportunities with the USDA.

Through their internships, Erick Barrios, Jose Guillen Jr., Eva Lepe, and Michelle Trejo will all gain real-world experience that aligns with their academic programs and career goals. This hands-on experience in agriculture not only broadens their professional horizons but also empowers them to make a meaningful impact in the field. We're thrilled to be a part of their journey as they prepare to become leaders in food and agriculture.

Margarita's Leadership and Ongoing Commitment to Community Engagement

We are proud to highlight a significant achievement by Margarita Desilagua, a former Farm Smart intern and now a dedicated volunteer. Margarita developed and launched a new initiative specifically tailored to the students of the ASPIRE Program (After School Program Integrating Recreation and Education). The ASPIRE program, run by the Imperial County Probation Department, offers pro-social activities and educational enrichment for youth ages 9-13 in rural areas. Margarita's program built upon the ASPIRE program's existing framework by offering engaging team building activities, and opportunities that promote collaboration, personal growth, and positive social interactions. Her leadership and vision helped bring this program to life, offering meaningful experiences that aligned with the goals of the ASPIRE program, including hosting ASPIRE students during the winter break.

Margarita's leadership in this tailored program is a true testament to the power of community engagement. As a former Farm Smart intern, she not only identified the needs of the ASPIRE students but also took the initiative to create a program that would empower and uplift them. Her advocacy for youth in rural areas and her dedication to providing positive, engaging activities are making a real difference. We are incredibly proud of the work Margarita has done and are grateful for her continued commitment to making a lasting impact on the lives of these young individuals.

ENVIRONMENTAL DNA ANALYSIS REVEALED COVER CROPPING IN THE LOW DESERT INCREASED MICROBIAL ACTIVITY AND IMPROVED NUTRIENT CYCLING AND OKRA CROP YIELD

Philip Waisen[1], Jimmy Nguyen[2], Esther Lofton[3], Oli Bachie[2], Ali Montazar[2], and Ana Resendiz[2]
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Introduction

In desert ecosystems, high summer temperatures deteriorate soil organic matter content to negligible levels, compromising microbial activity and nutrient cycling, affecting overall soil health. The reduced organic matter then compromises the soil's ability to support beneficial microorganisms, hinders nutrient cycling, and contributes to soil degradation. Cover cropping offers several benefits for sustainable and regenerative agriculture, including soil organic matter building, promoting microbial activity, nutrient cycling, soil protection, and weed suppression. Cover crops help to protect the soil from erosion, especially wind erosion in the desert, and can also improve soil structure and water infiltration. Leguminous cover crops can fix atmospheric nitrogen, enriching the soil and reducing the need for synthetic fertilizers. This study examines the effects of three cover crops including Sunn hemp, cowpea, and Sudangrass on the soil microbial activity, nutrient cycling, and okra crop yield. Soil microbes such as bacteria and fungi play a fundamental role in decomposing organic matter, converting nutrients into usable forms for plants, and facilitating various biogeochemical cycles. They are essential for making nutrients like nitrogen, phosphorus and potassium available to plants, thereby supporting plant growth and overall ecosystem health. Symbiotic bacteria like *Rhizobium flavum*, can convert atmospheric nitrogen into forms usable by plants through a process called nitrogen fixation or arbuscular mycorrhizal fungi such as *Rhizophagus irregularis* form a symbiotic relationship with plants to enhance plant nutrient and water uptake, and in turn, receive carbohydrates from the plant.

Materials and Methods

A field trial was conducted in the summer of 2024 at the Coachella Valley Agricultural Research Station (33°31'15.0"N 116°09'04.8"W) to examine the benefits of three cover crop species on microbial activity, nutrient cycling, and okra crop yield. The cover crops included cowpea ‘Chinese Red’, Sunn hemp ‘Tropic Sun’, and Sudan grass ‘Sudex’; seeding rate and seed sources are given in Table 1. A weed-free fallow treatment was included, and the experiment was arranged in a randomized complete block design with 3 replications (Fig. 1). Each experimental plot was 230 ft × 6 ft, enough for a single pass with a tractor. Cover crops were directly seeded using a handheld planter in a single seed line on 36-inch raised beds and drip irrigated for two months of cover crop establishment. Soil physical, chemical, and biological parameters were documented right before cover crop termination; the nematode community was also documented a month after the cover crop termination by mowing and rototilling. Soil directly adhered to cover crop roots was sampled in the top 8 inches from 6 plants, composited, drawn subsamples, stored in dry ice, and sent out to a commercial laboratory for environmental DNA (eDNA) or metagenomics analysis. Metagenomics analysis was performed using 16S rRNA and ITS sequencing for bacterial and fungal communities, respectively. Nematodes were extracted from 100 mL of soil subsample by the Baermann Funnel method and morphologically identified to genus level using an inverted microscope and grouped into trophic or feeding groups, including bacterial feeding, fungal feeding, omnivorous, and herbivorous or plant feeding nematodes. Okra yield was recorded weekly for a month. Data were analyzed using IBM SPSS Statistics version 30.0 (IBM Corp., Armonk, NY). Means were separated using the Waller–Duncan *k*-ratio (*k*=100) t-test and only true means were presented. Pearson Correlation Analysis was performed to draw relationships between okra yield and measured parameters.

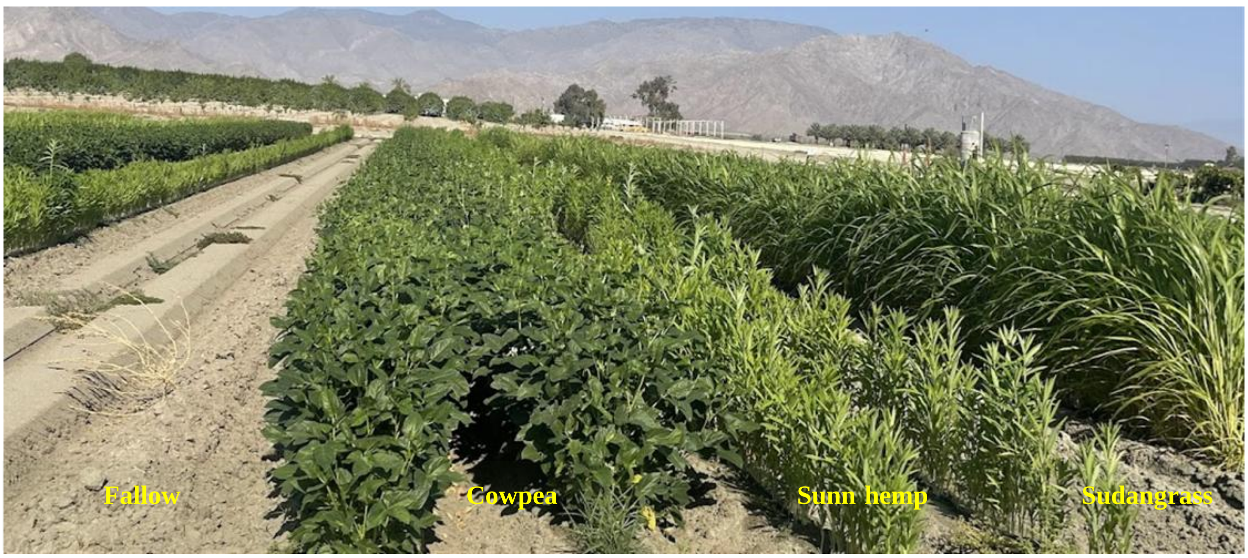

Figure 1. Cover crop stands six weeks after planting at the Coachella Valley Agricultural Research Station.

Table 1. Cover crop species, variety, seeding rate, and seed sources.

Cover Crop	Species	Variety	Rate	Source
Sunn hemp	*Crotalaria juncea*	Tropic Sun	40 lb/ac	Percher Seeds
Cowpea	*Vigna unguiculata*	Chinese Red	40 lb/ac	Percher Seeds
Sudangrass	*Sorghum bicolorxS. bicolor*	Sudex	40 lb/ac	Johnny’s Selected Seeds
Fallow	-	-	-	-

Table 2. Nitrate nitrogen, phosphorus, exchangeable and soluble potassium, and the percent soil organic matter a month after cover crop termination.

Cover Crops	N (lb/ac-ft)	P (lb/ac-ft)	Kex (lb/ac-ft)	Ksol (lb/ac-ft)	SOM (%)	pH (units)	Salinity (dS/m)
Sunn hemp	59 a	24 a	227 a	56 ab	0.65 a	8.17 b	1.08 ab
Cowpea	65 a	23 a	231 a	68 a	0.59 a	8.13 b	1.35 a
Sudangrass	41 a	27 a	240 a	54 ab	0.64 a	8.20 b	1.11 ab
Fallow	48 a	24 a	239 a	50 b	0.62 a	8.30 a	0.91 b

N=nitrate nitrogen, P=phosphorus, Kex=exchangeable potassium, Ksol=potassium in solution, and SOM=percent soil organic matter. Means (*n*=3) followed by the same letter(s) across rows are not different from each other, according to the Waller–Duncan *k*-ratio (*k*=100) *t*-test.

Microbial activity

Based on the eDNA or metagenomics analysis using 16S rRNA sequencing of rhizosphere soil from different cover crop treatments, all the cover crop treatments generally increased both the species relative abundance and diversity of bacteria compared to the untreated fallow (Fig. 2).

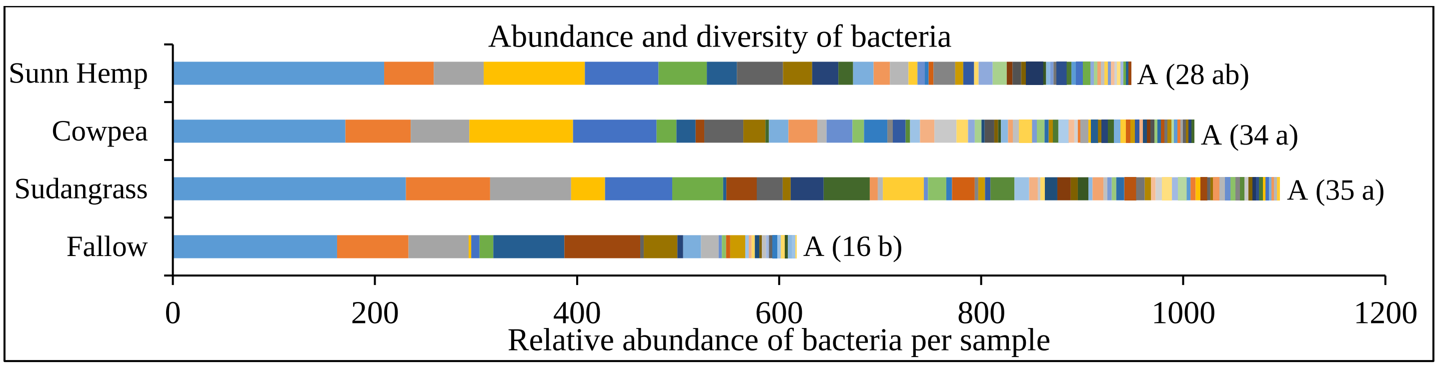

Figure 2. Bacterial species abundance (bars) and diversity (numbers in parentheses) in the cover crop root zones right before termination. Each color code represents a unique species (species list not shown). Bars and numbers represent means (*n*=3), and the means followed by the same letter(s) are not different, according to the Waller–Duncan *k*-ratio (*k*=100) *t*-test.

A total of 136 species of bacteria (list not shown) were detected of which one species *Streptomyces ipomoea* was a plant pathogen and the remaining 135 were non-plant pathogens performing various ecosystem services including decomposition of crop residues or other organic materials and nutrient cycling. Although no significant difference observed, the abundance of bacterial species was increased by cover crop treatments in this order Sudangrass>Cowpea>Sunn hemp>Fallow, where all the cover crops numerically increased the count compared to untreated fallow treatment (Fig. 2). Following the similar pattern, however, the species diversity or the number of unique species recruited in the rhizosphere of the cover crops was significant, where Sudangrass and cowpea treatments significantly increased the species diversity recording 35 and 34 species, respectively, compared to fallow only having 16 species (Fig. 2). Sunn hemp recruited 28 species but statistically not different from fallow or Sudangrass and cowpea treatments.

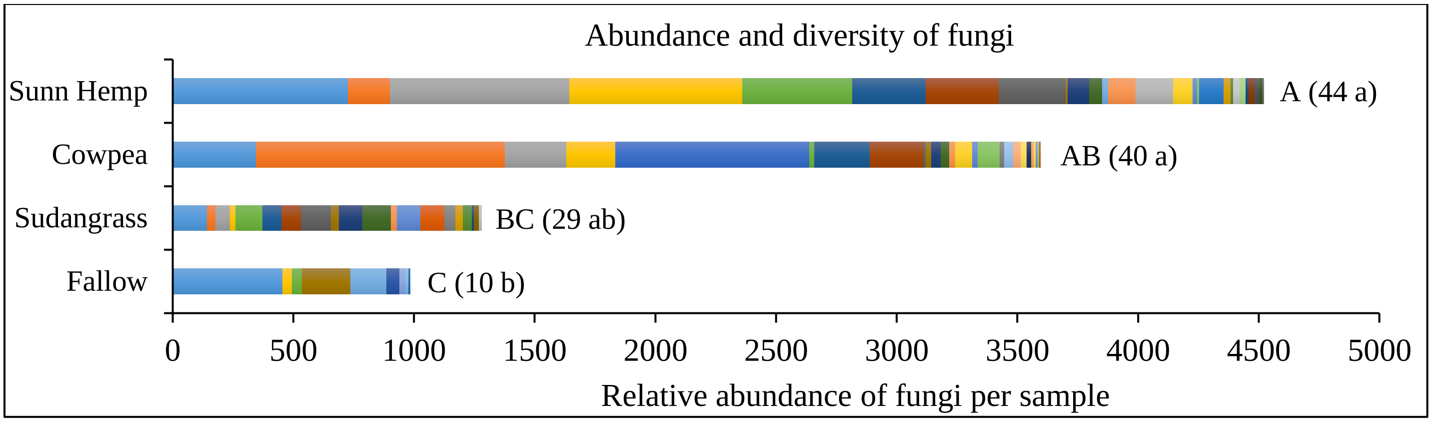

Figure 3. Fungal abundance (bars) and diversity (numbers in parentheses) in the cover crop root zones right before termination. Each color code represents a unique species (species list not shown). Bars and numbers represent means (*n*=3), and the means followed by the same letter(s) are not different, according to the Waller–Duncan *k*-ratio (*k*=100) *t*-test.

In the same way on fungal community, eDNA analysis using ITS sequencing of rhizosphere soil from different cover crop treatments revealed that all the cover crop treatments increased both species abundance and diversity of fungi compared to untreated fallow (Fig. 3). Together, 52 species of fungi were detected in soil of which 12 species were plant pathogens (*Alternaria alternata*, *Aspergillus flavus*, *A. niger*, *Colletotrichum gloeosporioides*, *Curvularia tsudae*, *Fusarium delphinoides*, *F. oxysporum*, *F. solani*, *Myrothecium roridum*, *Rhizopus arrhizus*, *Septoriella phragmitis*, and *Waitea circinate*), and 40 species were non-plant pathogens performing various ecosystem services including decomposition and nutrient cycling. The cover crop treatments increased fungal species abundance in this ranking Sunn hemp>Cowpea>Sudangrass>Fallow and increased the species diversity by 44>40>29>10, respectively (Fig. 3). Like bacteria, the fungal diversity was significant, where Sunn hemp and cowpea increased significantly compared to fallow control. Unlike bacteria, however, fungal abundance response to treatments was significant, where Sunn hemp and cowpea significantly increased the abundance of fungi compared to fallow control (Fig. 3). Response of fungal abundance and diversity to Sudangrass was not different from fallow or Sunn hemp and cowpea.

Based on morphological identification, the abundance of nematode genera was categorized into different trophic or feeding groups including bacterivores, fungivores, omnivores, and herbivores. The total nematode abundance responded to different treatments in this order Sunn hemp>Fallow>Cowpea>Sudangrass or 48>41>34>19, respectively (Fig. 4). Although not significant, Sunn hemp cover crop numerically increased the total nematode abundance compared to fallow control treatment (Fig. 4). Stunt nematode, *Tylenchorynchus* spp. was detected in the soil, but it did not cause any visible symptoms on okra.

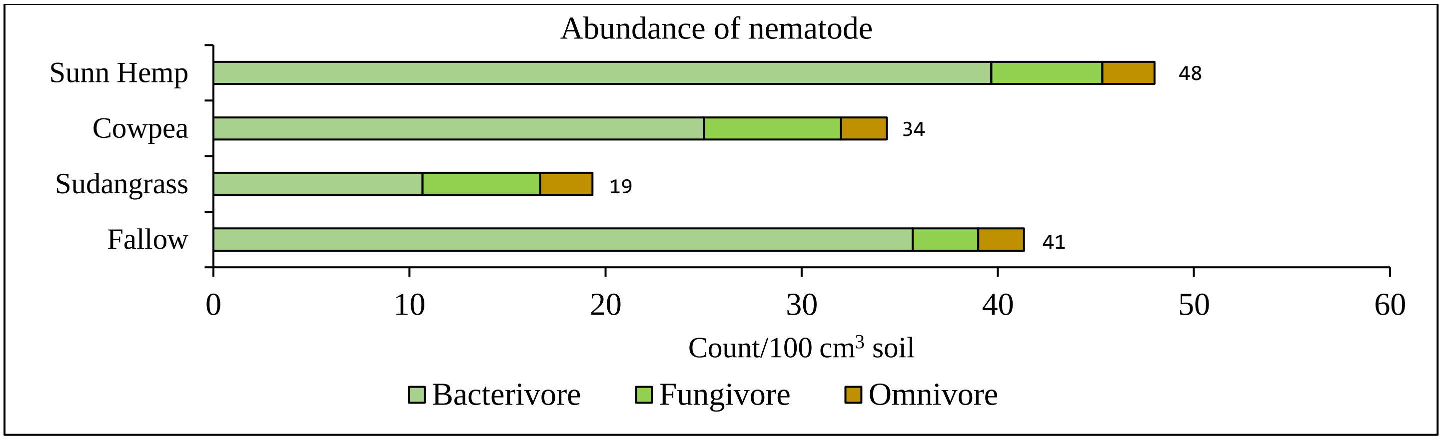

Figure 4. The abundance of beneficial nematode trophic or feeding groups bacterivores, fungivores, and omnivores in the cover crop root zones right before termination. Each color code represents a trophic group and the value on the bar is the total nematode abundance. Bars represent means (*n*=3), and the means are not different, according to the Waller–Duncan *k*-ratio (*k*=100) *t*-test.

Okra yield

Weight of okra fruit per acre significantly increased in Sunn hemp and cowpea cover crop treatments compared to fallow (Fig. 5). Apparently, the yield increase was directly related to the nitrate nitrogen and potassium concentration in the soil as well as fungal diversity and abundance as demonstrated by regression lines and scatterplots (Fig. 6). The relationships are positively correlated and statistically significant, suggesting that cover crop treatments stimulated microbial activity, promoted nutrient cycling, and improved okra yield. No direct relationship was observed between okra yield and bacterial abundance and diversity.

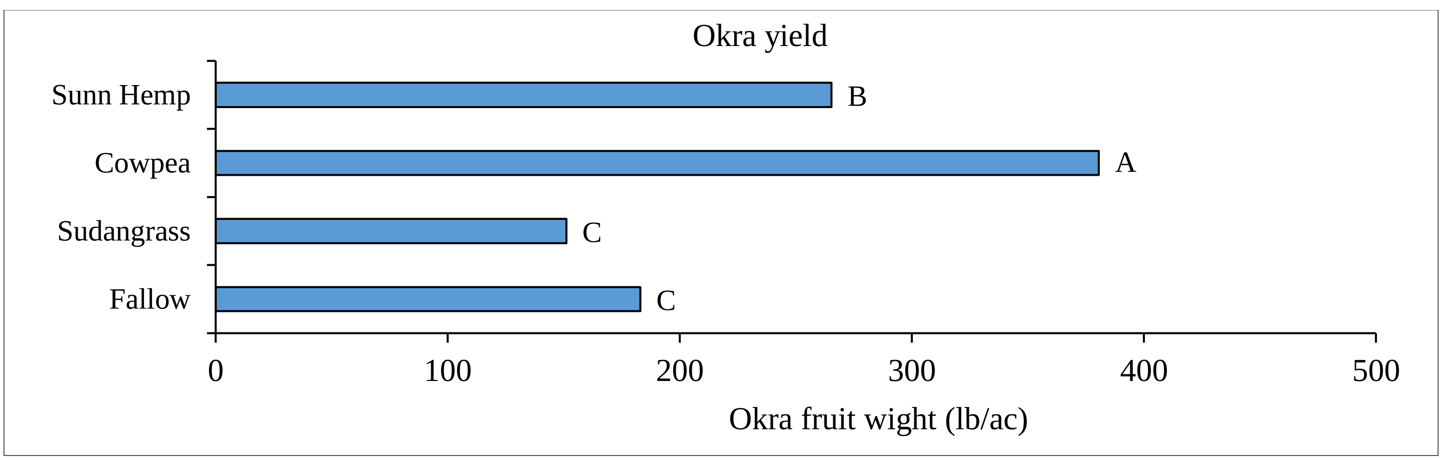

Figure 5. Okra yields as affected by different cover crop treatments. Bars represent means (*n*=3), and the means followed by the same letter(s) are not different, according to the Waller–Duncan *k*-ratio (*k*=100) *t*-test.

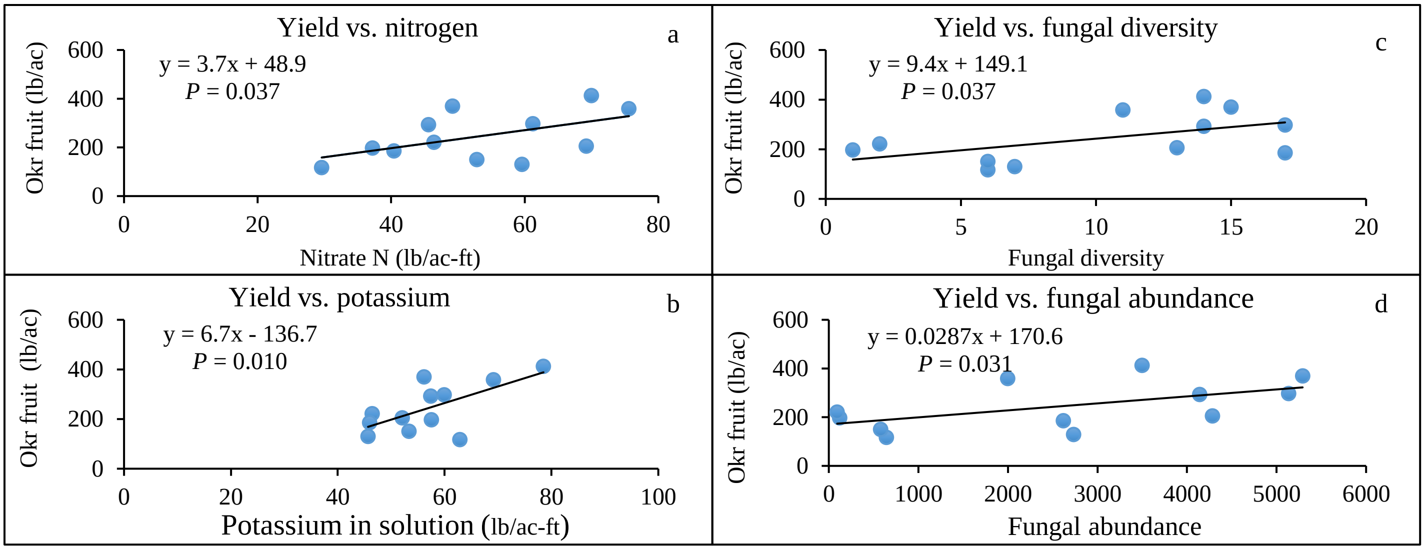

Figure 6. Relationships between okra yield and a) nitrate nitrogen, b) potassium in solution, c) fungal diversity, and d) fungal abundance. The relationships are statistically significant according to Pearson Correlation Analysis.

Discussion

This study comprehensively investigated the effects of cultivating leguminous (cowpea and Sunn hemp) and poaceous (Sudangrass) cover crops to stimulate microbial activity, enhance nutrient cycling, and improve okra yield. This is the extension of our recent work investigating pre-plant benefits of summer cover crops in low desert vegetable production (Waisen et al, 2024). In low desert vegetable production systems, fields are often left to fallow starting at the end of spring crop and through summer. Summer temperatures in the desert go above 110°F burning soil organic matter content to undetectable levels and compromising microbial activity because microbes depend on the organic matter to perform ecosystem services like decomposition. Soil organic matter recorded in this study was too low ranging from 0.59-0.65% (Table 2). This means soil conservation interventions such as composting and cover cropping are needed to safeguard and improve microbial activity and nutrient cycling for the benefit of subsequent cash crops. Microbial activity is critical to decomposition of organic matter, carbon sequestration, nutrient cycling, soil health, and plant health (Singh et al, 2023). In this study, all 3 cover crops generally increased microbial activities as reflected on the abundance and diversity of bacterial and fungal species in the soil. In particular, Sunn hemp and cowpea cover crops significantly increased fungal species abundance and diversity or cowpea and Sudangrass increased bacterial diversity. In addition, a numerical increase in total nematode genera was observed in Sunn hemp. As a result of the increased microbial activities, nutrient cycling was enhanced as depicted in a significant increase in potassium by cowpea. Although not significant, nitrate nitrogen was higher in cowpea and Sunn hemp. Positive relationships observed between okra yield and nitrogen, potassium, fungal species diversity, and fungal species abundance further emphasized the importance of cover cropping. Sunn hemp and cowpea cover crops stood out yielding 265 and 381 lb/ac. The okra crop yield increase by cowpea and Sunn hemp was consistent with our previous findings, where Sunn hemp and cowpea yielded 402 and 543 lb/ac, respectively (personal communication). While Sudangrass did not increase bacterial species abundance, fungal abundance or diversity, nematode generic abundance or okra crop yield, one should not ignore soil building and plant-parasitic nematode control ability (Paudel et al., 2021). Putting together, the increase in microbial activities and nutrient cycling resulted in increased okra yield in Sunn hemp and cowpea. Although 14 plant pathogens (12 fungi, a bacterium, and a nematode) were detected in the soil, none of them appeared to cause noticeable impact on okra yield as no significant difference in their abundance was observed among the treatments.

Conclusion

Cover cropping can be a viable option for vegetable or okra producers in low desert growing conditions. Both leguminous cover crops Sunn hemp and cowpea performed better than Sudangrass in improving microbial activities, enhancing nutrient cycling, and improving okra yield.

Acknowledgments

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References

Paudel, R., Waisen, P., and Wang, K. H. 2021. Exploiting the innate potential of sorghum/sorghum–sudangrass cover crops to improve soil microbial profile that can lead to suppression of plant-parasitic nematodes. Microorganisms 9(9):1831. https://doi.org/10.3390/microorganisms9091831

Singh, I., Hussain, M., Manjunath, G., Chandra, N., and Ravikanth, G. 2023. Regenerative agriculture augments bacterial community structure for healthier soil and agriculture. Frontiers in Agronomy 5:1134514. https://doi.org/10.3389/fagro.2023.1134514

Waisen, P., Nguyen, H. J., Mosase, E., Bachie, O., Montazar, A., and Resendiz, A. 2024. Pre-Plant Benefits of Summer Cover Crops in Low Desert Vegetable Production. Imperial Agricultural Briefs 27(8):98-105. (Access)

BERMUDAGRASS MITE: PEST STATUS AND MANAGEMENT IN THE IMPERIAL VALLEY

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Introduction. During the last couple of months, several calls were received from pest control advisors (PCAs) and growers about the Bermudagrass mite pest status and management options in the Imperial Valley. This article aims to provide information about this pest, its biology, damage, and management options.

Pest origin. The Bermudagrass mite, also known as the couch grass mite, *Eriophyes cynodoniensis* (Sayed), is a microscopic arachnid pest that specializes in Bermudagrass. This pest is believed to be native to tropical Africa, similar to its plant host, Bermudagrass, *Cynodon dactylon* (L.) Pers. Bermudagrass mites were first identified in the United States from samples collected from a Bermudagrass lawn in Phoenix, Arizona, in 1959, and were detected in Bermudagrass lawns in Imperial Valley around 1960 (Tuttle and Butler 1961). Growers have observed and reported increased damage from it in recent years.

Pest description. Adult mites are white to cream-colored worm-like pests with two pairs of forward-facing legs (Fig. 1A). The lifecycle consists of eggs, a short larval stage, two nymphal stages, protonymph and deutonymph, and adults. A single female can lay up to 50 eggs in her lifetime. The eggs are deposited under the leaf sheath and can hatch within 2-3 days. The nymphs resemble adults, except they are smaller in size. From egg to adult, the mites can complete their lifecycle within 5-10 days in summer months (80 -110°F). In Imperial Valley growing conditions, the mites seem to be active throughout the year.

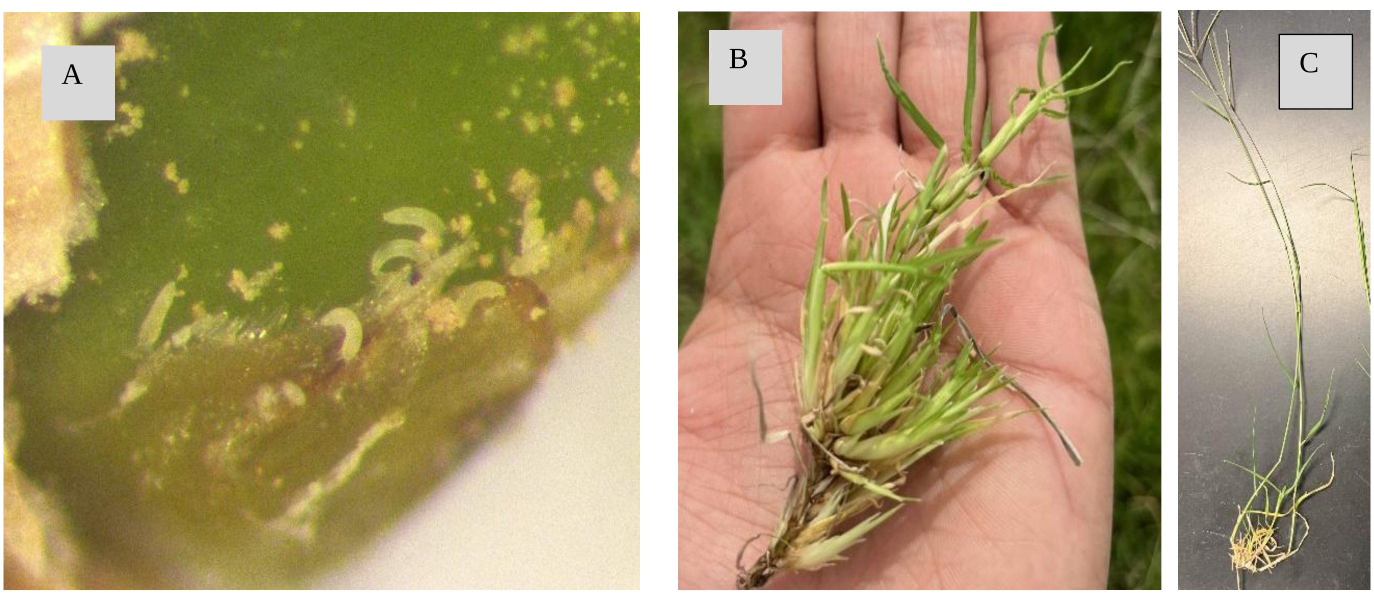

Figure 1. A) Bermudagrass mites feeding near the stem nodes beneath a removed leaf sheath. B) The bermudagrass mites damage symptom known as witches' broom, and C) Bermudagrass showing moderate mite damage symptom, with some shoots developing normally.

Damage. Bermudagrass mites mostly feed near plant stems, especially around nodes, and are protected under the leaf sheath. During the spring, they are often found feeding near the meristematic tissues of auxiliary buds. These mites have mouthparts adapted for piercing the plant cells and sucking the plant juices. Both nymphs and adults extract plant juice. During feeding, they inject salivary secretion containing chemicals into the plant cells which trigger various physiological responses in the plants, including reduced growth, highly shortened internodes, and multiple side shoots arising from the main shoot. Damaged shoots appear as a tuft or rosette commonly referred to as witches' broom (Fig. 1 B). Shoots with witches' brooms turn yellow, then brown, and gradually die off. Thus, heavy infestation can possibly reduce hay yield and seed production in the affected fields. In the field, some infested shoots might develop normally, while the other auxiliary shoots arising from the same stolons show severe damage symptoms (Fig. 1C). Developing shoots in the infested clump often produce a weak seed head, while the severely damaged shoots do not produce seed heads.

Dispersion. Bermudagrass mites are known to disperse passively through air currents (Jeppson et al. 1975). Likely, they can also disperse through irrigation water during the flood irrigation of the fields. During harvest, the mite can disperse through the grass clippings scattered across the fields (Brown and Chong 2024). Moving equipment between the fields without proper cleaning can also move the mites from an infested field to the next. While the vegetative propagation using the infested plants can spread the mite infestation to newly planted areas, bermudagrass mites cannot survive in the seeds; therefore, propagation through the processed seeds does not initiate a new infestation (Boeri et al. 2018).

Monitoring. Bermudagrass mites are eriophyid mites; their microscopic size makes it challenging to monitor them in the field. The adult Bermudagrass mite is less than 0.2 mm long and is not visible to unaided eyes. In comparison, the adult two-spotted spider mite, barely visible to the unaided eye, is about ~1 mm in size. Detecting the bermudagrass mite requires a hand lens of at least 15x magnification.

Figure 2. Bermudagrass mite early damage symptoms.

Searching for damage symptoms is an easy way to identify infested plants. To detect live mites, collect grass shoots, preferably the ones with damage symptoms. Remove shoots close to the ground. Pull the leaf sheaths away from the stem, one at a time, starting from the base of the shoot, and examine the exposed portion of the stem around the node. In Imperial County's growing conditions, some early damage symptoms (Fig. 2) can start to be visible from late

February to early March when new growth starts, and the witches' brooms will be apparent by mid-April. Inspect multiple locations within a field, as the mite infestation levels can be highly variable across a field.

The UCCE Imperial County Entomology program is happy to assist the growers and PCAs in identifying the presence of Bermudagrass mites in their fields. Growers and PCAs can submit fresh grass samples for inspection free of cost. When collecting the samples from the fields, collect shoots from the various parts of the fields, especially from the field margins and irrigation ridges. During the sample collection, harvest the plants close to the ground, as there is a higher chance of finding the mites towards the base of the stems.

Management. While most research studies have focused on controlling Bermudagrass mite infestation in turf grass, currently, little information is available for managing this pest in hay and seed-producing fields. To reduce infestation, an integrated approach utilizing various management tactics, including nitrogen fertilizer and water management, insecticide options, and mowing operations, is currently recommended.

Cultural management practices that promote a uniform, vigorous plant stand will reduce the severity of Bermudagrass mite damage. Prolonged water stress worsens the appearance of Bermudagrass mite damage symptoms. Similarly, increased nitrogen application increases the mite population levels and the number of shoots with damage symptoms (Brown and Chong 2023). Since nitrogen applications are necessary for maintaining the yield and quality of hay and seed production, it is advised to maintain the application rate at optimal levels instead of withholding it altogether.

During severe infestations, scalping the fields by mowing close to the ground in early spring and collecting and disposing of the debris can remove a large portion of the Bermudagrass mite population and may reduce the subsequent damage. However, the reduction of the mite population and damage observed can be temporary, as the mite can repopulate within a couple of months.

In the Imperial Valley, some growers conduct spring burning of dormant Bermudagrass fields, which removes the above-ground thatch layer. Burning can also remove/reduce the above-ground pests in the dead grass layer. While the burning of Bermudagrass thatch is routinely practiced in the Palo Verde Valley, air quality concerns and regulations can limit this practice in Imperial County.

Achieving effective chemical control is difficult, as Bermudagrass mites are protected under the leaf sheath. There are miticides registered in the bermudagrass with efficacy against various spider mites of the family Tetranychidae (two-spotted spider mite and Banks grass mite). Bermudagrass mite belongs to a different family, Eriophyidae, and products effective against tetranychids may not be effective in managing this pest. A number of insecticides are registered for use in California for Bermudagrass hay and seed production fields, but local efficacy data for managing this particular pest do not exist. For turfgrass, pyrethroid insecticides such as bifenthrin and deltamethrin have been suggested as a management measure (UC IPM 2016). However, studies from Florida and Australia suggested that the application of pyrethroids is less effective in managing bermudagrass mite damage (McMaugh and Loch 2012, Boeri et al. 2018), and the pyrethroid application can sometimes worsen the spider mite infestation (Gerson and Cohen 1989).

Insecticide efficacy trials conducted at the University of Florida in turf grasses suggest that the abamectin application was most promising in reducing the bermudagrass mite damage among the various insecticides they tested (Boeri et al. 2018). However, this product is not registered for use in California's Bermudagrass hay or seed production.

To identify the new insecticide options to manage the bermudagrass mite in the hay and seed crop in California, we are testing various insecticide options, including abamectin (Agri-Mek® SC, Syngenta Corporation), quinazoline (Magister® SC, Gowan Company), and isocycloseram (Plinazolin technology, Syngenta Corporation) for their efficacy (Fig. 3). None of these insecticides are currently registered for the Bermudagrass mite management in California. Thus, these efficacy trials will serve as a first step towards identifying and registering products for managing this pest in the low-desert cropping system.

Figure 3. Insecticide efficacy trial plots, Imperial Valley, 2025.

Acknowledgement

We thank Gustavo Gamboa Paredes for technical assistance and Frank R. Miranda (Alamo River Agronomy LLC) and Steven Emanuelli (J. Emanuelli & Sons farming) for their continued cooperation in various projects.

Selected References

Boeri PA, Benda ND, Unruh JB et al. 2018. Biology and management of the bermudagrass mite, Eriophyes cynodoniensis. University of Florida, Institute of Food and Agricultural Sciences Extension, ENY-342.

Brown MS, Chong JH. 2023. Bermudagrass mite (Acari: Eriophyidae) infestation worsens in response to increasing nitrogen fertility and decreasing irrigation volume but not mowing height. Journal of Economic Entomology 116(6):2124-2134.

Brown MS, Chong JH. 2024. Removing grass clippings reduces bermudagrass mite (Acari: Eriophyidae) infestation during turfgrass regrowth. Experimental and Applied Acarology 93(1):1-8.

Gerson U, Cohen E. 1989. Resurgences of spider mites (Acari: Tetranychidae) induced by synthetic pyrethroids. Experimental & Applied Acarology 6(1):29-46.

Jeppson LR, Keifer HH, Baker EW. 1975. Mites injurious to economic plants. University of California Press, Berkeley & Los Angeles, USA.

McMaugh P, Loch D. 2012. TU10004: Screening chemicals for control of eriophyid mites in four warm season turf grasses. Final Proj. Rep. Horticultural Innovation Australia Ltd., Sydney, Australia.

Tuttle DM, Butler GD, Jr. 1961. A new Eriophyid mite infesting Bermuda grass. Journal of Economic Entomology 54(5):836-838.

UC IPM. 2016. Agriculture: turfgrass pest management guidelines: Bermudagrass mite. https://ipm.ucanr.edu/agriculture/turfgrass/bermudagrass-mite/#gsc.tab=0 [Accessed 13 May 2025].

IMPERIAL VALLEY CIMIS REPORT AND UC WATER MANAGEMENT RESOURCES

Ali Montazar, Irrigation and Water Management Advisor, UCCE Imperial, Riverside, and San Diego Counties

The reference evapotranspiration (ET_o) is derived from a well-watered grass field and may be obtained from the nearest CIMIS (California Irrigation Management Information System) station. CIMIS is a program unit in the Water Use and Efficiency Branch, California Department of Water Resources that manages a network of over 145 automated weather stations in California. The network was designed to assist irrigators in managing their water resources more efficiently. CIMIS ET data are a good guideline for planning irrigations as bottom line, while crop ET may be estimated by multiplying ET_o by a crop coefficient (K_c) which is specific for each crop.

There are three CIMIS stations in Imperial County include Calipatria (CIMIS #41), Seeley (CIMIS #68), and Meloland (CIMIS #87). Data from the CIMIS network are available at: http://www.cimis.water.ca.gov/. Estimates of the average daily ET_o for the period of May 1st to July 31th for the Imperial Valley stations are presented in Table 1. These values were calculated using the long-term data of each station.

Table 1. Estimates of average daily potential evapotranspiration (ET_o) in inch per day

Station	May		June		July	
	1-15	16-31	1-15	16-30	1-15	16-31
Calipatria	0.27	0.29	0.31	0.32	0.32	0.31
El Centro (Seeley)	0.29	0.31	0.34	0.36	0.33	0.31
Holtville (Meloland)	0.29	0.31	0.33	0.34	0.32	0.31

For more information about ET and crop coefficients, feel free to contact the UC Imperial County Cooperative Extension office (442-265-7700). You can also find the latest research-based advice and California water & drought management information/resources through link below: http://ciwr.ucanr.edu/.

SEEDS FOR BEES

Project *Apis m.*

Photo by Kathy Keatley Garvey.

What is *Seeds for Bees*?

Seeds for Bees encourages the use of **cover crops** to increase the density, diversity, and duration of bee forage in California. Seeds For Bees provides growers with free or subsidized cover crop seeds designed by Project *Apis m.*, along with technical support.

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Critical factors of cover crops

- Determine objectives and function
- Site specification
- Timing

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$15m Farm to Community Food Hubs program
$23m USDA Local Food for Schools programs

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to End Hunger and Build Resilient Communities, setting a goal to build farm to school programs that serve 80% of all California students.

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The Imperial County workshop (previously scheduled on May 6) has been rescheduled. **It will now be held on May 14 from 4-6 pm at El Centro Library – Community Meeting room (1198 N Imperial Ave, El Centro, CA 92243).** See the updated list of Environmental Justice Advisory Committee workshops below.

California Department of Pesticide Regulation

Get Involved

Join us at one or more of our upcoming DPR workshops to discuss the Environmental Justice Advisory Committee the department is creating.

MAY 7, 6-8 p.m.
Oxnard Performing Arts Center
800 Hobson Way, Oxnard, CA 93030

MAY 8, 6-8 p.m.
Shafter Ford Theater – Tin Cup Room
1101 E Lerdo Hwy, Shafter, CA 93263

MAY 13, 6-8 p.m.
Twin Pine Casino
22223 CA-29, Middletown, CA 95461

***Updated:* MAY 14, 4-6 p.m.**
El Centro Library – Community Meeting Room
1198 N Imperial Ave, El Centro, CA 92243

MAY 15, 6-8 p.m.
Virtual Zoom Webinar
https://us02web.zoom.us/j/86424764765

- SPANISH INTERPRETATION WILL BE PROVIDED -

TO REQUEST INTERPRETATION IN OTHER LANGUAGES, EMAIL LANGUAGEACCESS@CDPR.CA.GOV 10 BUSINESS DAYS PRIOR TO THE EVENT.

Learn more about the EJ Advisory Committee https://bit.ly/41Oghx5

Send us your comments EJACinfo@cdpr.ca.gov

On April 4, 2025, the California Department of Pesticide Regulation announced five workshops in May to share information and gather public input on the department's work to establish a new Environmental Justice Advisory Committee (EJAC).

Contact EJACinfo@cdpr.ca.gov with any workshop questions. For more information, see DPR's website.

El taller en el condado Imperial (previamente programado para el 6 de mayo) ha sido reprogramado. **Ahora se llevará a cabo el 14 de mayo de 4 a 6 p. m. en la Biblioteca El Centro-Community Meeting room (1198 N Imperial Ave, El Centro, CA 92243).** Consulte la lista actualizada de los talleres del Comité Asesor de Justicia Ambiental a continuación.

Participe en nuestros talleres

Participe en nuestros próximos talleres para conversar sobre el desarrollo del Comité Asesor de Justicia Ambiental perteneciente al Departamento de Reglamentación de Pesticidas.

7 DE MAYO, de 6 p. m. a 8 p. m.
Oxnard Performing Arts Center
800 Hobson Way, Oxnard, CA 93030

8 DE MAYO, de 6 p. m. a 8 p. m.
Shafter Ford Theater – Tin Cup Room
1101 E. Lerdo Hwy, Shafter, CA 93263

13 DE MAYO, de 6 p. m. a 8 p. m.
Twin Pine Casino
22223 CA-29, Middletown, CA 95461

***Actualizado:* 14 DE MAYO, de 4 p. m. a 6 p. m.**
El Centro Library – Community Meeting Room
1198 N. Imperial Ave, El Centro, CA 92243

15 DE MAYO, de 6 p. m. a 8 p. m.
Seminario web virtual por Zoom
https://us02web.zoom.us/j/86424764765

- SE PROPORCIONARÁ INTERPRETACIÓN AL ESPAÑOL -

PARA SOLICITAR INTERPRETACIÓN EN IDIOMAS ADICIONALES, ENVÍE UN CORREO ELECTRÓNICO A LANGUAGEACCESS@CDPR.CA.GOV 10 DÍAS HÁBILES ANTES DE LA REUNIÓN.

¿Desea obtener más información sobre el comité? https://bit.ly/41Oghx5

Envíenos sus comentarios EJACinfo@cdpr.ca.gov

El 4 de abril de 2025, el Departamento de Reglamentación de Pesticidas (DPR) de California anunció cinco talleres en mayo con el objetivo de informar y recopilar las opiniones del público sobre sus esfuerzos para crear un nuevo Comité Asesor de Justicia Ambiental (EJAC).

Comuníquese con EJACinfo@cdpr.ca.gov si tiene alguna pregunta sobre los talleres. Para obtener más información, visite el sitio web del DPR.