


Imperial County Agricultural Briefs

University of California
Agriculture and Natural Resources

Features from your Advisors

October 2020 (Volume 23 Issue 9)

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POSSIBLE ENVIRONMENTAL EFFECTS ON LOW DESERT ALFALFA

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In the month of September 2020, damaged alfalfa (Figure 1) was brought to our attention by a pest control advisor (PCA) near Blythe, CA. Affected areas of the plant are mostly near the top or middle layer leaves, which exhibited chlorotic, discoloration or some sort of blotching. Roots, stems and flower portions of plants are intact and unaffected.


Figure 1: appearance of foliar alfalfa damage in alfalfa field, Blythe, CA (Photo Courtesy: Michael Rethwisch)

Similar symptoms were noted in almost every alfalfa field.

Eight (8) alfalfa growers' fields were visited in the Imperial Valley, a week after the Blythe observations. Most of them had very similar symptoms (Figure 2) as noted from the Palo Verde Valley.

Alfalfa foliage in Imperial Valley showed more of whitish spots than extended leaf blotching which characterized the plants Blythe observations. Other than discolorations, plants were intact and showed no apparent stress. The initial thought was that the problem could be environmental, potentially due to one of the southern California wildfires, such as the El Dorado fire near Yucaipa.

Figure 2: alfalfa plant appearances, from fields 1, 2 and 3, respectively. Photo curtsey: Jorge Celis and Tayebeh Hosseini)

Air pollution in Blythe, CA based on the National Weather Service (NWS) station located at the Blythe airport at the time observation (accessed October 5, 2020, about 2 weeks after crop observation) on alfalfa, was as shown in the map (Figure 3). It was difficult to go back on NWS data and obtain air pollution conditions on the exact date of crop observation

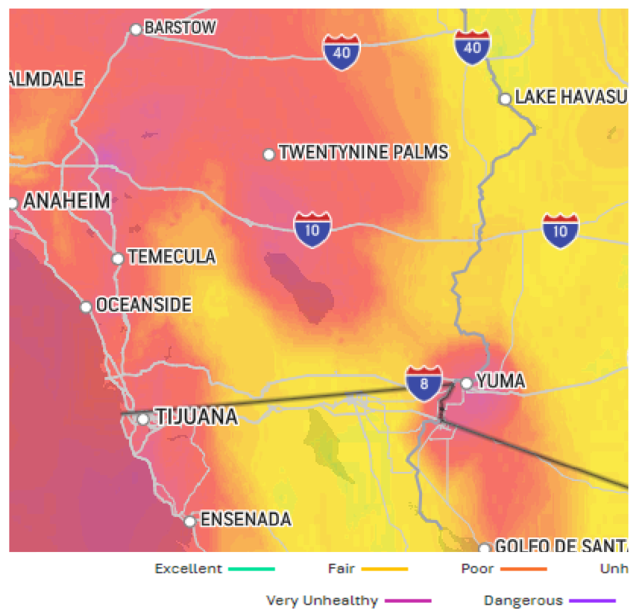

Figure 3: Air condition in Blythe, CA at time of crop damage (source: Aaccuweather.com)

Environmental conditions have previously been noted to cause similar symptoms in California alfalfa (Figure 4). This was thought to be ozone damage. The University of California Integrated Pest Management guidelines for abiotic stresses also suggest that symptoms of peroxyacetyl nitrate on alfalfa leaves may resemble those described for ozone injuries, but the lesions may be larger.

Similar damage to Imperial County alfalfa has also been previously noted by Bachie and Devkota in 2017 in Brawley, CA.   The authors showed plants that looked similar (Figure 5) to what were currently observed in the Imperial Valley. The authors referred to these abnormalities as “mysterious symptoms”.

These 2017 plants had intact root systems and nodulation regardless of the spotty whitish leaf discolorations (Bachie and Devkota, 2017). While there were various suggestions from potential environmental factors or nutrient deficiency to pathogenic issues, there was no conclusive diagnosis, although it appeared that the mature alfalfa plants had minor crown rot, caused by a mix of *Rhizoctonia solani* and possibly *Fusarium oxysporum* or *F. solani* (UC pathological specimen diagnosis). When fields were revisited after 3 months when initial plants were harvested and made new growth, the symptoms were gone (Bachie & Devkota 2017), suggesting that the symptoms were not infectious.

Figure 4: symptoms from UC statewide IPM project (UCANR publication 3430)

Many air pollutants (e.g., ammonia, chlorine, hydrogen chloride, hydrogen fluoride, or sulfur dioxide) can cause plant damage, but only the photochemical oxidants (ozone and peroxyacetyl nitrate) are of major concern. They are formed by the reactions of oxygen, nitrogen oxides, and organic molecules in the presence of sunlight (*UC IPM Pest Management, Guidelines: Alfalfa,* UC ANR Publication 3430. R. Davis, C. A. Frate, and D. Putnam). Common symptoms of ozone pollution are yellowing, flecking, and blotching in leaves, premature senescence, and early maturity. Ozone stimulates respiration, inhibits oxidative phosphorylation, and changes membrane permeability (Gheorghe and Ion, 2011). High levels of ozone may cause a bleached stippling on upper leaf surfaces. High concentrations of ozone are associated with low wind velocities and bright sunlight. Prior to the smoke from fires, high temperatures of 120^{o} F., which were also accompanied by bright sunlight were noted in the low desert.

Figure 5: alfalfa plants with leaf discolorations (source: Bachie & Devkota 2017)

Most of the polluting gases enter leaves through stomata, following the same pathway as CO2, of which ozone is considered the most damaging phytotoxic air pollutant in North America. Injury is most likely during hot, humid weather with stagnant air masses, although symptoms on one cultivar can differ from the symptoms on another (Brust 2013).

Due to the tissue collapse induced by ozone, leaves may be prone to infection by pathogens such as *Alternaria* sp (early blight) and may senesce sooner. Symptoms of ozone damage can appear on one side of a plant or stem depending on the source of pollution and micro-climate. Gheorghe and Ion, 2011 showed that another gaseous compound **Sulfur dioxide (**SO_2) and its by-product sulfuric acid usually result in dry, papery blotches that are generally white, tan, or straw-colored and marginal or interveinal (Figure 6). This is also close to the symptoms observed on alfalfa in Blythe, CA. Gaseous forms that may affect plants can also be oxidized and form reduced forms of carbon (CO_2, CO, CH_4), of nitrogen (NO_2, NO, N_2O_4, NH_3, NH_4+), SO_2, O_3, C_6H_6 vapors, Hg, volatile phenols, C_{l2}, etc. that may also harm plants (Gheorghe and Ion, 2011).

Figure 4: SO_2 damage to potato (source: burst 2013)

Crop injury from air pollutants results in reduced photosynthetic rates and early aging, which adversely affect crop yield and quality (Davis et.al.))

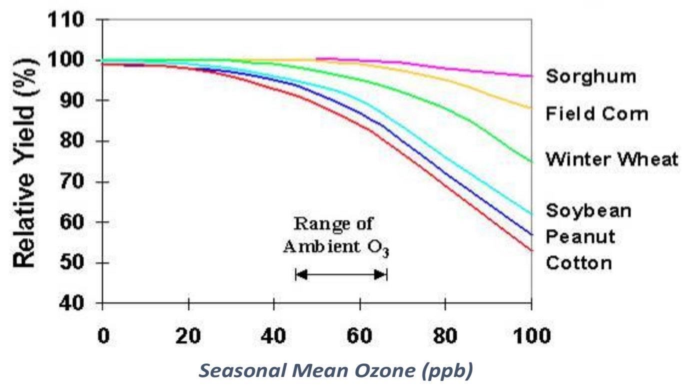

Figure 7: Effect of ozone on yield of crops (Heck et al., 1893, cited in Gheorghe & Ion, 2011)

Atmospheric pollutants may also have a negative effect on the plants; they can have direct toxic effects, or indirectly by changing soil pH followed by solubilization of toxic salts of metals like aluminum or cover the leaf blade reducing light penetration and blocking the opening of stomata (Gheorghe and Ion, 2011). More than 3,000 substances that are not part of the atmospheric composition, falling in the atmosphere can be considered air pollutants. Although yield reductions are usually with visible foliar injury, crop loss can also occur without any sign of pollutant stress. Ground-level ozone causes more damage to plants than all other air pollutants combined. In many crops, the higher the ozone concentration, the higher is a consistent crop yield loss for many crop species (Figure 7).

In summary, alfalfa plants in the area may have been exposed to some kind of abiotic or biotic factors that might have resulted in leaf discoloration. There is no firm conclusion on what may have caused the widespread alfalfa leaf discoloration and what could its potential impact on alfalfa yield is. We encourage alfalfa growers and Pest Control Advisors (PCAs) to keep an eye on similar crop discoloration appearances and contact the Riverside County CE in Blythe, CA at mdrethwisch@ucanr.edu or the Imperial County Cooperative Extension, obachie@ucanr.edu

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Gheorghe I. F. and B. Ion. 2011. The Effects of Air Pollutants on Vegetation and the Role of Vegetation in Reducing Atmospheric Pollution. DOI: 10.5772/17660. https://www.intechopen.com/books/the-impact-of-air-pollution-on-health-economy-environment-and-agricultural-sources/the-effects-of-air-pollutants-on-vegetation-and-the-role-of-vegetation-in-reducing-atmospheric-pollu

SEEDLING ALFALFA 2019 INSECTICIDE TRIAL RESULTS

Michael D. Rethwisch, Crop Production & Entomology Advisor, UCCE Riverside County – Palo Verde Office

Newly seeded alfalfa in the low desert is subject to attack by various insects that can result in death of very young alfalfa plants if not controlled. Insect species that can damage new alfalfa include spotted alfalfa aphid (*Therioaphis maculata*), cowpea aphid (*Aphis craccivora*), western flower thrips (*Frankliniella occidentalis*), and silverleaf whitefly (*Bemisia tabaci*). Less frequently two spotted-spider mites (*Tetranychus urticae*) and various species of bean thrips (South American bean thrips *Caliothrips phaseoli*; North American bean thrips *Caliothrips fasciatus),* can also occasionally be present and result in damage and necessitate treatments for control in the low desert.

A newly planted commercial field of ADesert Blend@ alfalfa located near Ripley, California, that was fairly heavily infested with spotted alfalfa aphids was selected for this experiment. Infestation was creating honeydew that was evident on soil surface beneath the plants, with some plants wilting from the feeding pressure and concern that plant death would occur due to continued feeding. Alfalfa was approximately 2-3 inches tall when the trial was initiated, and there was more bare ground than row planted alfalfa when the field was examined.

Treatments were applied late morning to early afternoon of November 4, 2019, with a battery powered sprayer equipped with a boom and four (4) 8002-VS nozzles calibrated to deliver 18.6 gpa. Plots were 25 foot long x 14 feet wide, with a randomized complete block experimental design utilized and four (4) replications of treatments.

Insecticides applied were Beleaf^{7} 50 SG, Danadim^{7} Progress, PQZ^{TM}, Sefina^{TM} Boscalis, Sivanto^{TM} Prime, Transform^{7} WG, and Warrior II with Zeon^{7} Technology. All treatments had the modified ethylated vegetable oil (ESO) concentrate Hasten-EA^{TM} added as an adjuvant at approximately 18.9 oz/acre (0.7% v/v).

Of these treatments, only the active ingredients in Beleaf^{7} (flonicamid), Danadim^{7} Progress (dimethoate), Sivanto^{TM} (flypryadifurone), and Warrior (lambda-cyhalothrin) were registered for usage on California alfalfa hay when applied. The other products/active ingredients were included as some are already registered and used on alfalfa in other states, and/or may be so registered in California.

Plots were sampled at three (3) days post treatment, brushing the insects off the alfalfa onto a modified 11.5 inch long manila folder page. Four (4) such samples were collected in each plot for a total of 46 row inches.

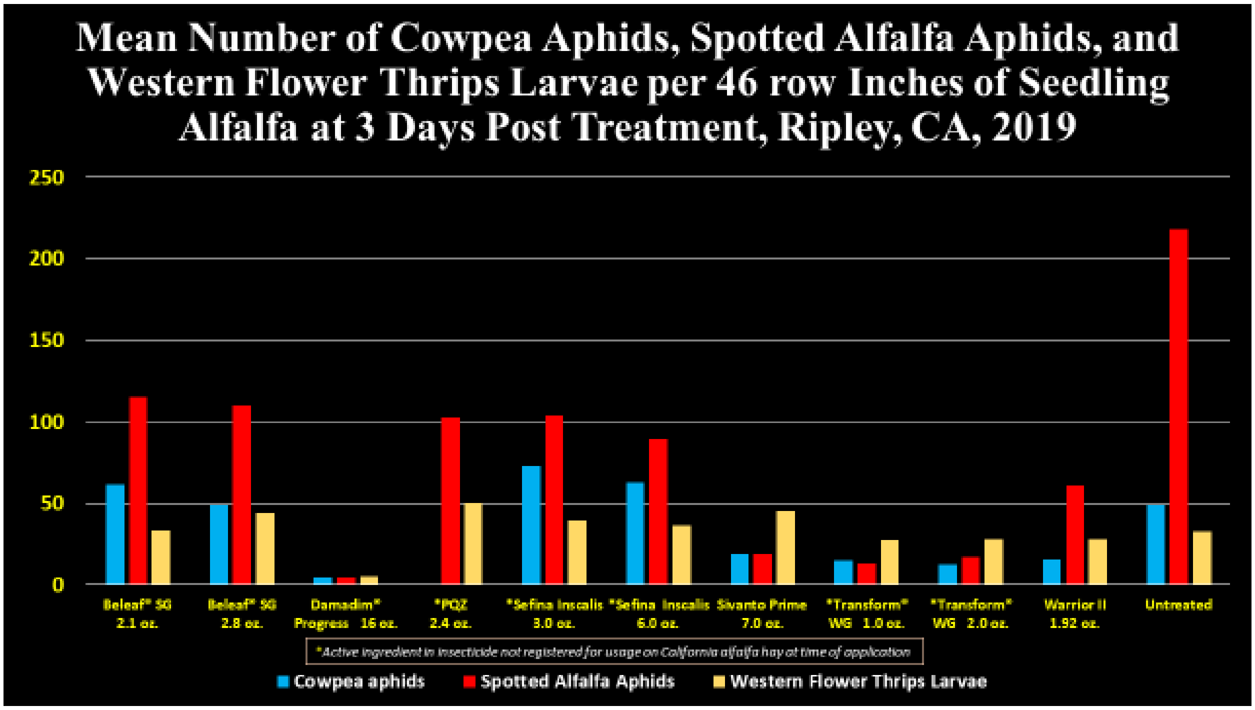
The dimethoate containing insecticide (Danadim® Progress) resulted in fewest numbers of spotted alfalfa aphids at three (3) days post treatment, followed by treatments in Group 4 (Sivanto™ and Transform®), and then Warrior (Table 1). The other insecticides did not result in as rapid of reduction in insect populations as these products. Similar results were also noted for cowpea aphids. Danadim® Progress was also the only insecticide that significantly reduced numbers of western flower thrips larvae compared to untreated alfalfa by three days post treatment.

Table 1. Mean number of spotted alfalfa aphids, cowpea aphids, and western flower thrips nymphs/46 row inches of seedling ADesert Blend@ alfalfa at three days post treatment, Ripley, California, 2019

Treatment and rate/acre		Cowpea aphids	Spotted Alfalfa Aphids	Western Flower Thrips Larvae
Beleaf® SG	2.1 oz.	61.5 ab	115.3 de	33.3 b
Beleaf® SG	2.8 oz.	49.0 ab	110.0 cd	44.3 b
Damadim® Progress	16 oz.	4.3 a	4.3 a	5.3 a
*PQZ™	2.4 oz.	65.8 ab	102.5 bcd	50.0 b
*Sefina™ Inscalis	3.0 oz.	72.5 b	104.0 bcd	39.0 b
*Sefina™ Inscalis	6.0 oz.	62.5 ab	89.3 a-d	36.5 b
Sivanto™ Prime	7.0 oz.	19.0 ab	19.0 abc	46.0 b
*Transform® WG	1.0 oz.	14.5 ab	12.8 ab	27.0 ab
*Transform® WG	2.0 oz.	12.3 ab	17.3 abc	28.0 ab
Warrior II	1.92 oz.	15.3 ab	60.5 a-d	28.0 ab
Untreated		49.0 ab	218.0 e	32.7 b

Means in columns followed by the same letter are not statistically different at the P<0.05 level of probability (Student=s T test, JMP Pro 13.0.0).

**Active ingredient in product not currently registered for usage on California alfalfa hay*



Insecticide efficacy for whiteflies was also obtained by collecting five (5) stems/plot at seven (7) days post and counting numbers of whitefly nymphs at each node with the uppermost node near/at the growing tip being designated at node #1.

In this experiment, cotyledon leaves and leaves at the next two nodes above the cotyledon node were heavily infested with whitefly nymphs on November 4. Numbers of nymphs declined as more recent/newer growth was microscopically examined. Nymphs were noted even on foliage of uppermost node at 7 days post treatment, indicating eggs had been deposited even on newest growth, and had enough heat units for a few eggs to hatch.

Although most whitefly nymphs were on foliage of the lowest nodes (nodes 5-8) when stems were collected, the uppermost nodes are considered to better represent the insecticide activity against whitefly nymphs. Means of whitefly nymphs from foliage at selected upper stem nodes show these differences when comparing nodes 1-4 where statistical differences were noted vs. that obtained for whitefly nymph numbers from nodes 1-5 from this experiment (Table 2).

Fewest overall whitefly nymphs per plant were noted from Sivanto™ Prime treated alfalfa (17.0), roughly 60% fewer than untreated alfalfa (39.9). No other treatment reached 25% reduction when the entire plant was used, with much of this attributed to insecticides not reaching the older leaves, differences in time to move to growing tips, and/or differences in insecticide systemic activity. A second sampling to determine changes in efficacy over time was not completed.

Table 2. Mean number whitefly nymphs on foliage at selected nodes from seedling ADesert Blend@ alfalfa growing tip end at seven days post treatment, Ripley, California, 2019.

Treatment and rate/acre	Node 3 (from tip)	Node 4	Node 5	Nodes 1-4	Nodes 4-5	Total Nymphs/stem
Beleaf® SG 2.1 oz.	2.5 ab	6.2 b	5.6 a	9.8 bc	11.8 a	30.9 ab
Beleaf® SG 2.8 oz.	1.3 ab	1.3 a	3.2 a	2.9 a	4.4 a	32.4 ab
Damadim® Progress 16 oz.	0.8 a	1.7 ab	5.8 a	3.5 ab	7.5 a	38.8 ab
*PQZ™ 2.4 oz.	1.3 ab	1.2 a	3.9 a	3.5 ab	5.1 a	32.7 ab
*Sefina™ Inscalis 3.0 oz.	1.6 ab	3.8 ab	6.9 a	5.8 abc	10.7 a	44.2 b
*Sefina™ Inscalis 6.0 oz.	1.3 ab	3.1 ab	5.1 a	5.5 abc	8.1 a	31.0 ab
Sivanto™ Prime 7.0 oz.	0.9 a	1.6 a	2.6 a	2.9 a	4.2 a	17.0 a
*Transform® WG 1.0 oz.	1.5 ab	3.9 ab	5.3 a	6.4 abc	9.1 a	34.4 ab
*Transform® WG 2.0 oz.	1.3 ab	3.3 ab	7.6 a	4.8 abc	10.9 a	41.6 ab
Warrior II 1.92 oz.	0.8 a	2.1 ab	4.5 a	3.3 ab	6.7 a	34.1 ab
Untreated	3.1 b	6.1 b	10.1 a	11.0 c	16.3 a	39.9 ab

Means in columns followed by the same letter are not statistically different at the P<0.05 level of probability (Student=s T test, JMP Pro 13.0.0).

**Active ingredient in product not currently registered for usage on California alfalfa hay*

YOUR INPUT NEEDED TO HELP TO DIRECT ALFALFA RESEARCH

DEADLINE: OCTOBER 19, 2020

The National Alfalfa and Forage Association (NAFA) has been successful in establishing the first-ever alfalfa checkoff, securing federal funding for a competitive alfalfa research program ($3 million annually), and securing recurring funds for ARS alfalfa research ($3 million in new money). NAFA is collaborating with the Agricultural Reserach Service, National Institute of Food and Agriculture, University researchers/extension, industry members, and alfalfa farmers to develop a research strategy to best meet the needs of the alfalfa industry.

To help determine the research needs, NAFA has developed an on-line survey to facilitate input from various segments of the alfalfa (both seed and forage) industry. Here is your chance to provide your views of problems needing attention, but the needs to be completed by October 19. The address for the on-line survey as follows: *https://www.surveymonkey.com/r/WLRT973*

There will be a virtual session in December that will present and discuss the survey results. Let's do our part to make sure that southern California needs are known and included in the survey.

4-H is excited to launch *Career Spark Interviews,* a unique opportunity for ALL YOUTH ages 13 and up to **explore career paths** by connecting with highly successful young professionals in diverse industries.

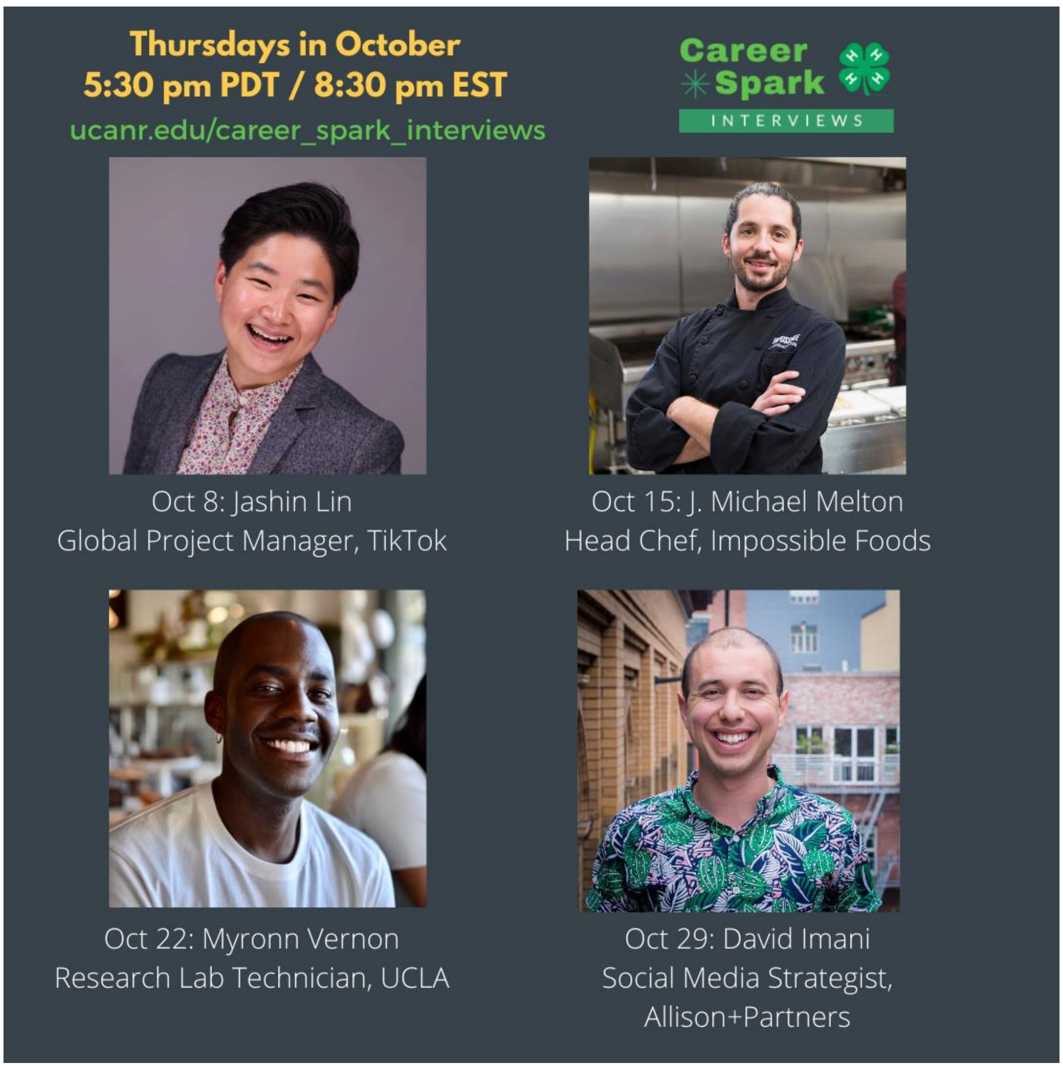
LIVE interview/ Q & A webinars every Thursday at 5:30pm PT beginning October 8th to December where youth can ask questions

(Register at https://ucanr.co1.qualtrics.com/jfe/form/SV_8HRsx0VsrAfujqt)

Key Takeaways for youth:

- Learn what decisions young professionals made in high school and beyond that helped them on their career path
- Learn about diverse, unique or unknown job opportunities within industries of interest
- Discover the characteristics that all successful young professionals have in common

This engaging format is open to **ALL YOUTH ages 13 and up Free**



Join the Imperial County's University of California Cooperative Extension (UCCE-Imperial) for the

Building Our Local Foodshed: Gardening Webinar Series

Webinar #1- Lets Get Started! Gardening in the Low Desert

When: Wednesday, September 9th, 2020 10:00-10:30 AM PT
Where: Virtual Webinar via Zoom - Register Here!

This webinar, led by Kristian Salgado, UCCE-Imperial Climate Smart Agriculture, Community Education Specialist, introduces the physical, mental, and environmental benefits of gardening and how to begin your very own garden at home this Fall. Useful videos, websites, and access to print material will be shared.

Webinar #2 – Water Wise: Gardening Water Management Practices

When: Wednesday, September 23rd, 2020 10:00-10:30 AM PT
Where: Virtual Webinar via Zoom - Register Here!

This webinar, led by Dr. Ali Montazar, UCCE Irrigation and Water Management Advisor, covers various water management and conservation practices to use water more efficiently in desert gardening.

Webinar #3 – Virtual Garden Kick-Off!

When: Wednesday, October 7th, 2020 10:00-10:30 AM PT
Where: Virtual Webinar via Zoom - Register Here!

This webinar, led by Chris Wong, UCCE – Community Education Specialist for the CalFresh program, will walk you through all the steps to keep your garden productive and healthy.

Webinar #4 – Organic Pest Management 101

When: Wednesday, October 21th, 2020 10:00-10:30 AM PT
Where: Virtual Webinar via Zoom - Register Here!

This webinar, led by Dr. Oli Bachie, UCCE-Agronomy and Field Crop Advisor, covers the most common pests you might experience growing food in Imperial County, such as how to control and prevent weeds, organic insect control and plant disease control all which reply on organic approaches and techniques.

Webinar #5 – Using Livestock in Your Garden and Food Safety

When: Friday, November 6th, 2020 10:00-10:30 AM PT
Where: Virtual Webinar via Zoom - Register Here!

This webinar, led by Brooke Latack, Livestock Advisor, will cover a variety of food safety topics, including how to incorporate and utilize livestock, like chickens, into your garden safely.

Webinar #6 – Harvest to Table: Using Herbs in the Kitchen

When: Wednesday, Nov. 18th, 2020 10:00-10:30 AM PT
Where: Virtual Webinar via Zoom - Register Here!

This webinar, led by Farm Smart staff, Stacey Amparano and Stephanie Collins, will demonstrate how to use, infuse and preserve your home garden herbs.

2021 Field and Vegetable Crops Guidelines

Cost: $40.00 for each

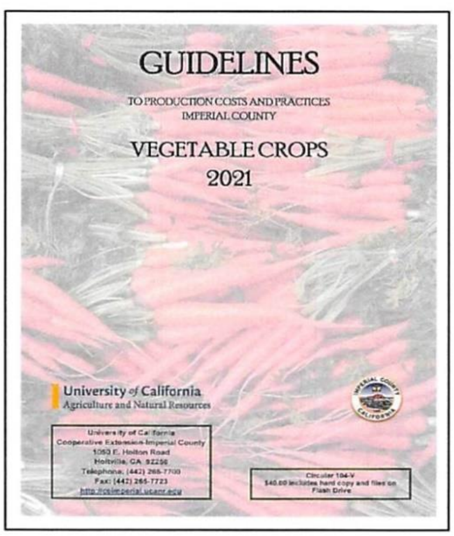
Available for purchase

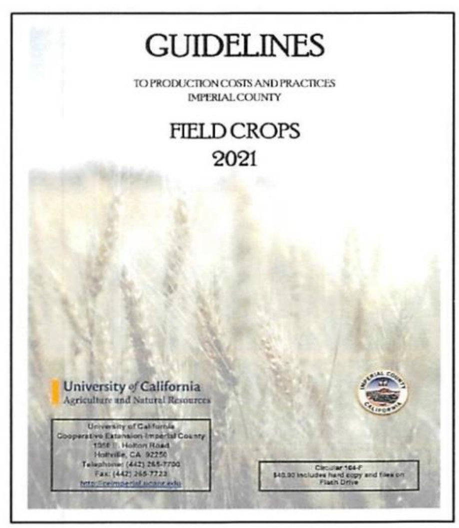
Due to COVID-19 restrictions, our office is closed to the public.

If you wish to purchase the Guidelines, you can mail in your check specifying which book(s) you wish to purchase. We will mail out the Guideline Book(s) you request along with the USB drive. OR You can call and make arrangements to stop by the office and purchase. We can only take a check or cash (exact cash). No Credit transactions. Hours for purchase are 10 am – 1 pm or 2 pm – 4 pm Monday through Thursday.

Make Check out to and mail to:

Imperial County Cooperative Extension
1050 Holton Road
Holtville, CA 92250





IMPERIAL VALLEY CIMIS REPORT AND UC WATER MANAGEMENT RESOURCES

Ali Montazar, Irrigation & Water Mgmt Advisor, UCCE Imperial & Riverside County

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.cim is.water.ca.gov. Estimates of the average daily ET_o for the period of October 1 to December 31 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 inches per day

Station	October		November		December	
	1-15	16-31	1-15	16-30	1-15	16-31
Calipatria	0.21	0.18	0.13	0.11	0.09	0.09
El Centro (Seeley)	0.22	0.18	0.14	0.12	0.10	0.09
Holtville (Meloland)	0.20	0.16	0.13	0.11	0.09	0.08

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/.