*Imperial County* *Agricultural Briefs*

University of California
Agriculture and Natural Resources
UC Cooperative Extension

## Features from your Advisors

# *March 2019 (Volume 22 Issue 3)*

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# DOWNY MILDEWS OF VEGETABLES IN IMPERIAL COUNTY

*Alex Putman, Assistant Cooperative Extension Specialist and Assistant Plant Pathologist, UC Riverside*

## Highlights

- Weather conditions have been generally unfavorable for downy mildew this winter, but the risk is elevated over the next week or so (Mar. 6-11)
- Spinach downy mildew is active in both Holtville and Yuma
- Lettuce downy mildew is active in both Yuma and Coachella Valley
- We have not heard reports of onion downy mildew
- If you see downy mildew (of any crop)—please tell us! If on onion, we are interested in collecting samples

## Downy Mildew Background

The downy mildews are a group of pathogens that cause foliar diseases of a wide range of plants. In Imperial County, downy mildew is typically a concern for growers of cole (Brassica) crops, lettuce, onion, and spinach. Typical symptoms include yellowing of the upper side of leaves in a defined circular or angular area that expands in an irregular pattern (see photos after next page). Spores, which the pathogen uses to spread and reproduce, appear as a white to dark brown, dark purple, or black fuzz on the back of the leaf.

Although many plant species are affected by downy mildew, a given plant (and its very close relatives) are each infected by a different host-specific species of the downy mildew pathogen. For example, all four crops mentioned above are each infected by a different downy mildew species that does not infect any of the other three crops. However, the lettuce downy mildew pathogen can infect prickly lettuce, a close relative of domesticated lettuce. In contrast, although beet crops (sugar beet and Swiss chard) are relatives of spinach, the downy mildew pathogen that infects beets cannot infect spinach.

Regardless of crop, downy mildew is generally more severe in cool and humid conditions. Research conducted in Canada on onion, for example, found that when temperatures in the onion canopy rise above 75°F during the day, production of downy mildew spores that night is reduced. Infection by these spores the next morning is slowed when air temperatures in the canopy climb above 70°F. Leaf wetness is required for production of spores, and subsequent infection of new healthy plants.

Current Status of Downy Mildew in the Region

So far, it has been a mostly quiet year for downy mildew in the low desert of California to my knowledge. In early December, we received a report of downy mildew of kale in both the Imperial Valley and Coachella Valley. This report is associated with the storm event that occurred from December 5 to 7 that brought rain, humidity, and cooler daytime temperatures. From then until most of February, temperatures have generally been cool (under 75°F), which should favor downy mildew. However, except for two storms in the first two weeks of January that brought 1 to 2 days with rain and humidity, it has been dry overall in the Valley during this period. We have not received a report of onion downy mildew from the region this winter. In the last couple of weeks, we have received reports of lettuce downy mildew in the Coachella Valley and spinach downy mildew in the Yuma area, but these outbreaks were not severe. Just recently on March 5, we found spinach downy mildew within an organic research trial at the UCANR Desert REC station in Holtville.

Growers and PCAs should remain vigilant, however. A storm just passed through the Imperial Valley on March 5, dropping some measurable precipitation through some of the area. Beginning Thursday March 7, temperatures are forecasted to drop, with high temperatures remaining below 70°F for the following 4 days. There is a chance of elevated humidity during this period, and a chance of more rain on Monday Mar. 11. In addition to these weather factors, crops such as onion likely have a full and dense canopy at this point in the season, which creates a microenvironment significantly more humid than the free air above it. Given the combined occurrence of recent downy mildew activity in the region, recent weather and short term forecasts, and full crop canopies, the risk of downy mildew is relatively higher than normal over at least the next week.

Tell Us if You See Downy Mildew

If you encounter downy mildew on any crop, please tell us so we can warn others that the disease is active in the general area. In addition, this knowledge will help ongoing research we are conducting in the area. One trial we are conducting is with onion to evaluate if weather data can be used to make more precise warnings of onion downy mildew activity and help schedule fungicide applications. We are also interested in collecting samples of onion downy mildew to assist others in developing lab-based tools to detect and study the pathogen.

Who is Alex Putman?

I started as an Assistant Cooperative Extension Specialist on the University of California, Riverside campus about 3 years ago. I am a pathologist working with diseases of vegetables in Southern California counties including Imperial and Riverside. In these counties, we are currently focusing our extension and research efforts on downy mildew of vegetable crops. However, I am interested in hearing from you which crops and diseases are most problematic for you, and what your needs are in the area of diseases of vegetables. Please feel free to contact me at 951-827-4212 or aiputman@ucr.edu.

Spinach downy mildew

Onion downy mildew

Spinach downy mildew

Onion downy mildew

Photo credit: top left, B. Watt, Univ. of Maine; top right, A. Putman; bottom left, M. McGrath, Cornell; bottom right, G. Holmes, Cal Poly SLO Bugwood.org

# INSECTICIDE EFFICACY RESULTS FOR BLUE ALFALFA APHID AND PEA APHIDS, 2018

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

Blue alfalfa aphids and pea aphids can be major pests of alfalfa, with blue alfalfa aphids especially so due to the toxin they inject into alfalfa plants as they feed on plant juices. Reduced levels of insecticidal control of blue alfalfa has been noted in recent years.

In 2018 warm temperatures near 90 in mid-February resulted in very few ladybird beetles remaining in area alfalfa fields, thus control of aphids was basically unchecked by natural enemies and necessitated reliance upon insecticides for control.

Two field trials were conducted in 2018 to evaluate and document insecticide efficacy against these aphids, with the first applied in late February when temperatures were cooler and the second applied in late March when much warmer temperatures were present.

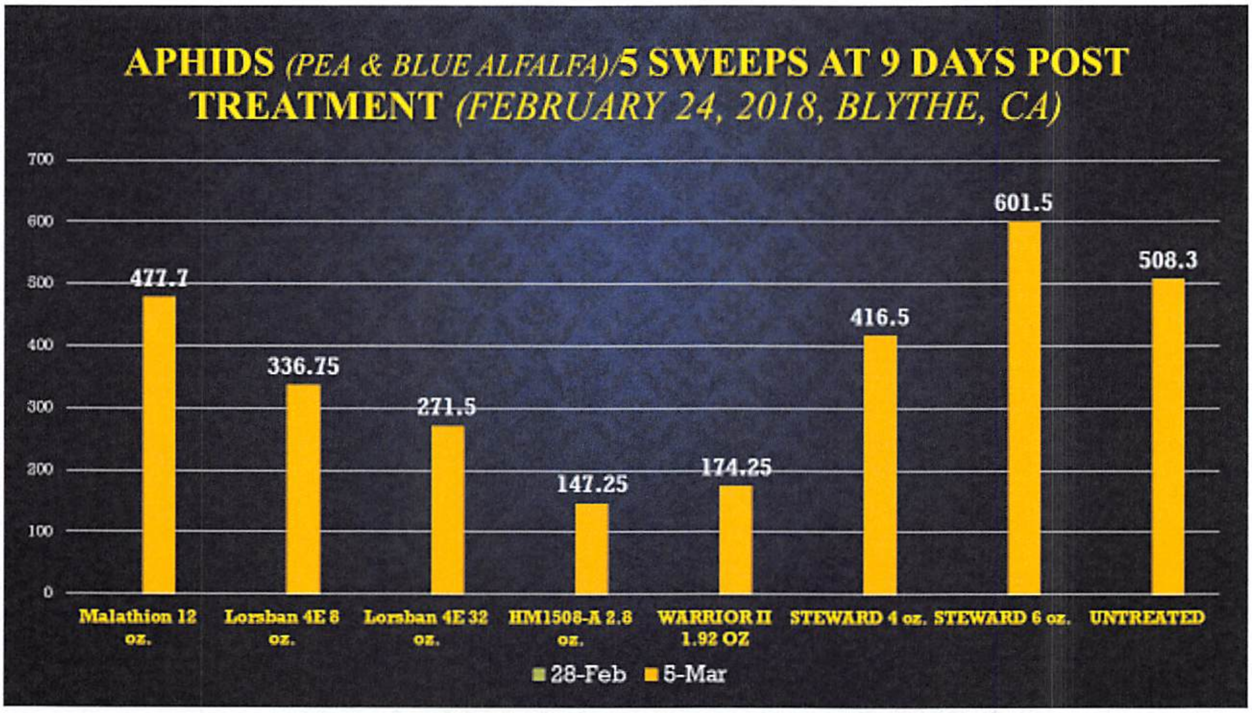
Insecticides applied in late February included the organophosphate insecticides Lorsban and Malathion, the pyrethroid insecticides Warrior II and a numbered compound from Helena AgriSciences (HM-1508-A), and Steward. Insecticides applied in late March were the two pyrethroids (Warrior II and HM-1508-A), two rates of buteniloid insecticide Beleaf 50WG, and two neonicitinoid insecticides (Sivanto Prime and Transform WG). The latter two insecticides have acropetal systemic action (moves from treated plant parts upwards/outwards towards new growth). Beleaf 50WG causes death from starvation, as aphids' mouthparts are unable to function properly after the insects have encountered this product.

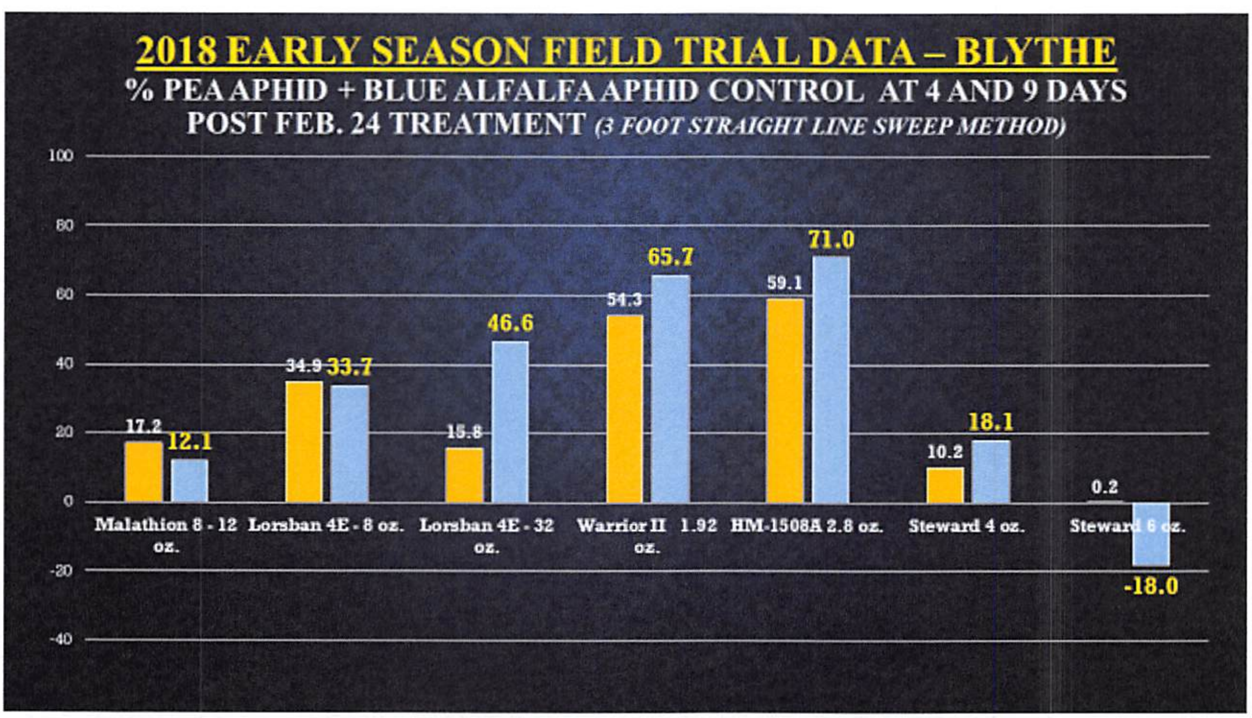
All applications were applied with a battery powered back-pack sprayer with a boom in equipped with 4 8002-VS nozzles, with a finished spray volume of 18.6 gallons/acre. Plots were 25-foot-long (12 beds wide early, 28 foot wide later) and sampled with a 15 inch diameter sweep net on a frequent basis thereafter (usually 2x/week). Sweep sampling method used was a three (3) foot long, deep foliage dip sweep which allowed standardized comparisons between the two sites and application dates as the February treated area was to bedded alfalfa, making 180 degree sweeps difficult.

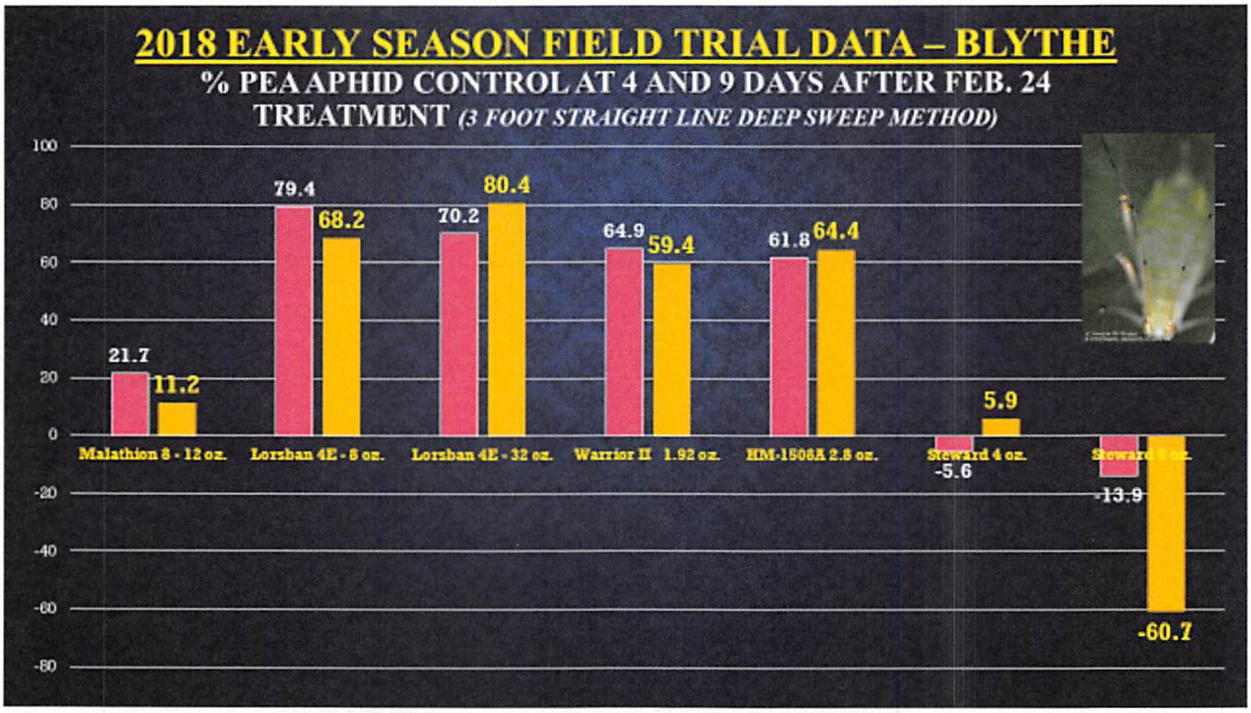
Sampling consisted of 5-10 sweeps per plot, transferring insects to plastic containers which were then frozen, and insects later separated to species and counted.

Control of pea aphids was noted to be usually higher than blue alfalfa aphid for most insecticides. Very few insecticide treatments were noted to surpass 80% control of the latter pest.

Aphid numbers and control percentages are provided in the accompanying graphs and table.




2018 EARLY SEASON FIELD TRIAL DATA – BLYTHE
% PEA APHID CONTROL AT 4 AND 9 DAYS AFTER FEB. 24
TREATMENT (3 FOOT STRAIGHT LINE DEEP SWEEP METHOD)
100
80
60
40
20
0
-20
-40
-60
-80
21.7
11.2
79.4
68.2
70.2
80.4
64.9
59.4
61.8
64.4
5.9
-5.6
-13.9
-60.7
Malathion 8 - 12 oz.
Lorsban 4E - 8 oz.
Lorsban 4E - 32 oz.
Warrior II 1.92 oz.
HM-1508A 2.8 oz.
Steward 4 oz.

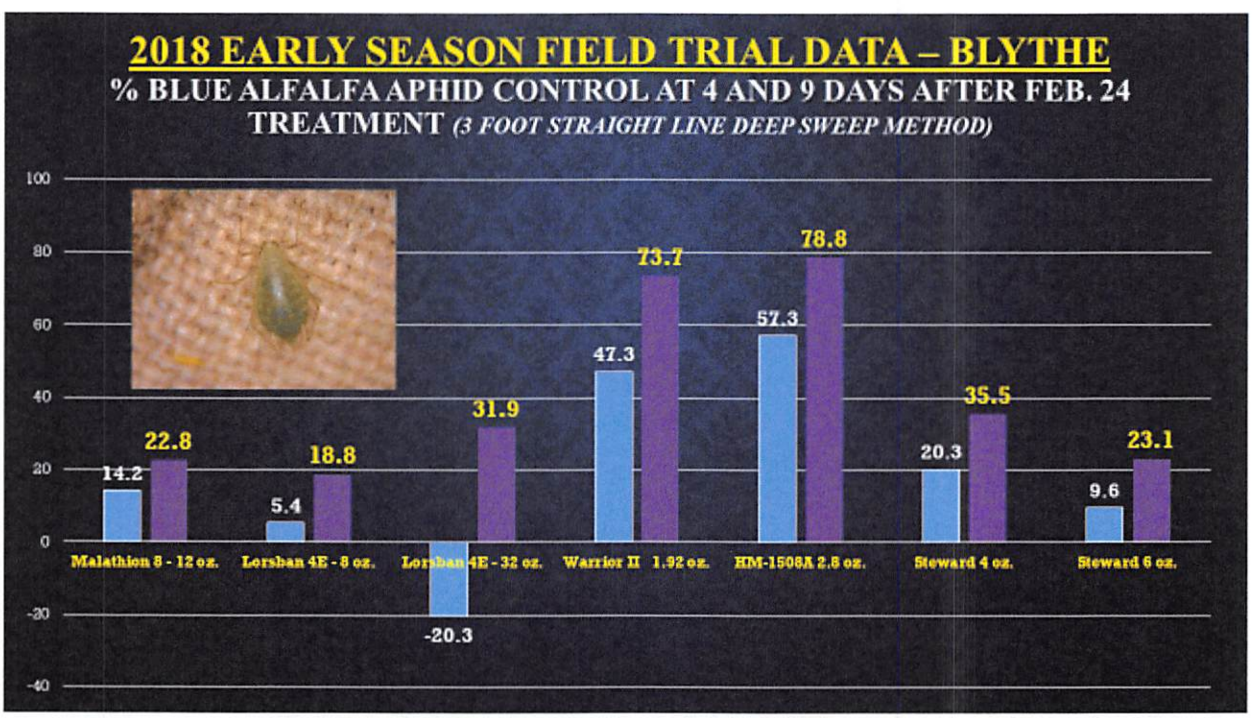
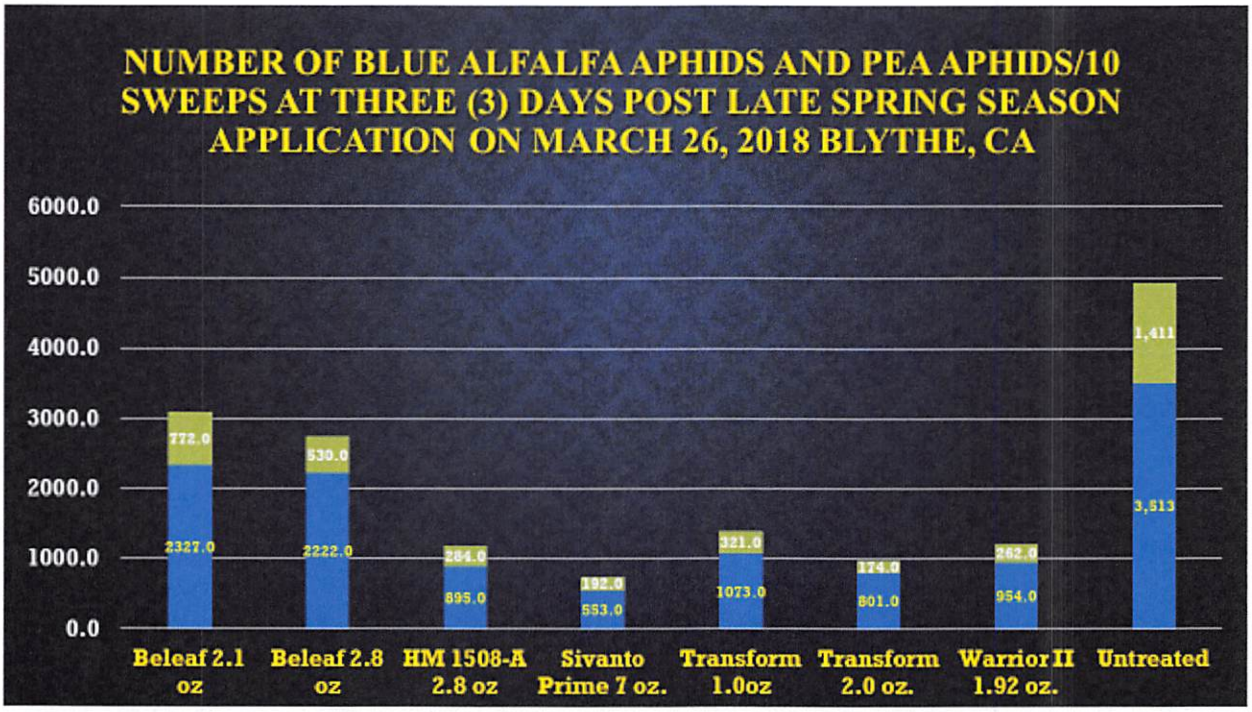

2018 EARLY SEASON FIELD TRIAL DATA – BLYTHE
% BLUE ALFALFA APHID CONTROL AT 4 AND 9 DAYS AFTER FEB. 24
TREATMENT (3 FOOT STRAIGHT LINE DEEP SWEEP METHOD)
100
80
60
40
20
0
-20
-40
14.2
22.8
5.4
18.8
-20.3
31.9
47.3
73.7
57.3
78.8
20.3
35.5
9.6
23.1
Malathion 8 - 12 oz.
Lorsban 4E - 8 oz.
Lorsban 4E - 32 oz.
Warrior II 1.92 oz.
HM-1508A 2.8 oz.
Steward 4 oz.
Steward 6 oz.

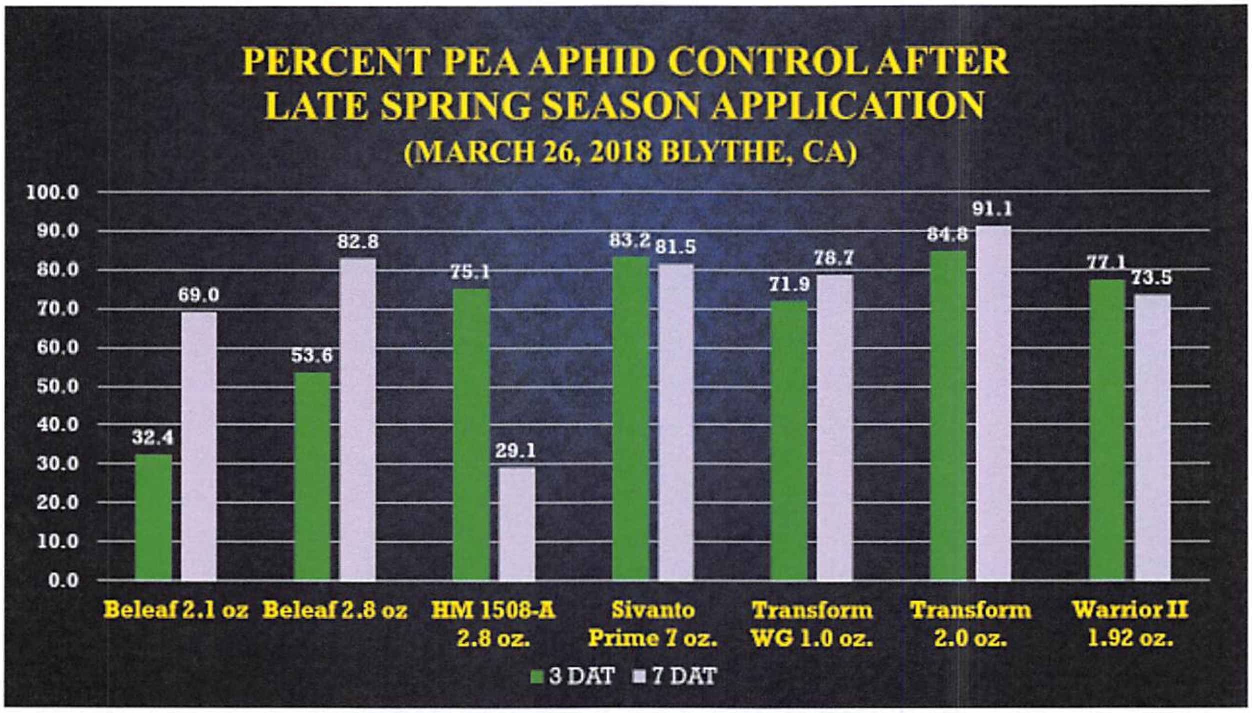
**Table 1. Mean number of blue alfalfa aphids, pea aphids and total aphids/10 sweeps following insecticide application on March 26, 2018, Blythe, California.**

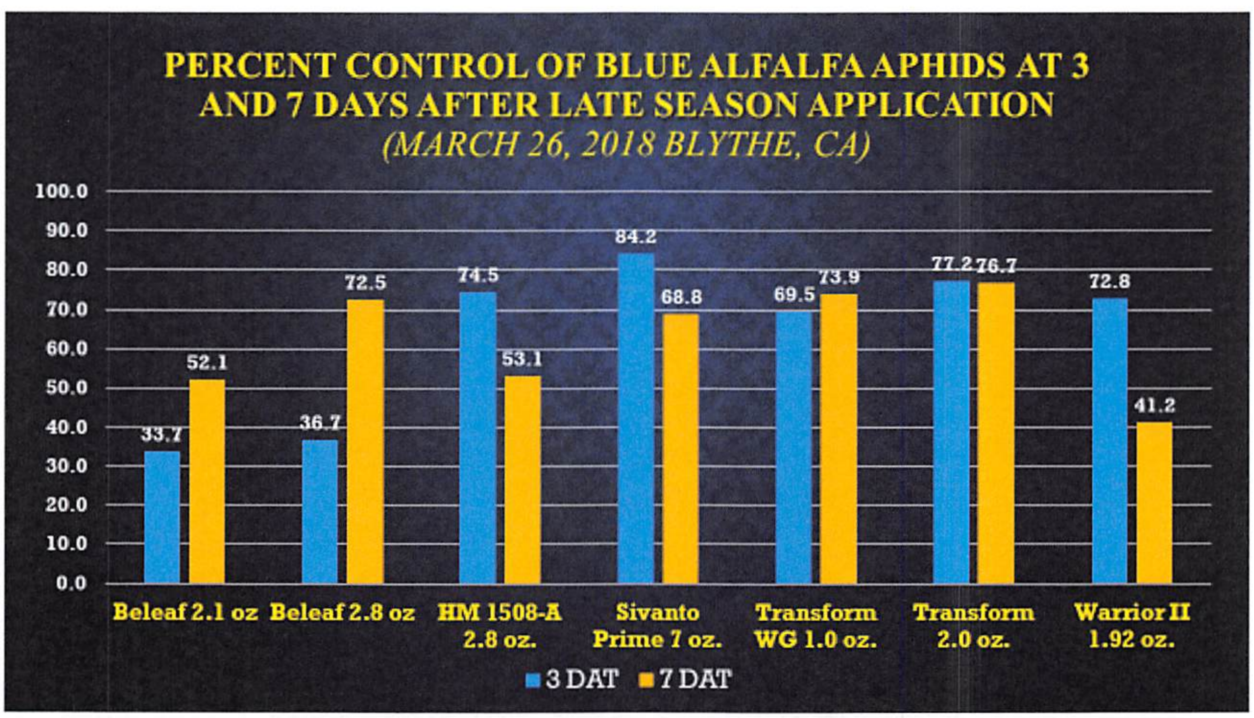
| Treatment | Rate/Acre | Blue alfalfa aphids | | Pea Aphids | | Total Aphids | |
|---|---|---|---|---|---|---|---|
| | | March 29 | April 2 | March 29 | April 2 | March 29 | April 2 |
| Beleaf® 50 SG | 2.1 oz. | 2,327ab | 611.0a | 772ab | 120.0a | 3,099ab | 731.0ab |
| Beleaf® 50 SG | 2.8 oz. | 2,222ab | 350.0a | 530ab | 66.5a | 2,752ab | 416.5a |
| HM 1508-A | 2.84 oz. | 895a | 598.3a | 284ab | 274.5a | 1,179a | 872.8ab |
| Sivanto Prime | 7.0 oz. | 553a | 397.5a | 192a | 71.8a | 745a | 469.3a |
| *Transform WG | 1.0 oz. | 1,073a | 332.5a | 321ab | 82.5a | 1,394a | 414.8a |
| *Transform WG | 2.0 oz. | 801a | 296.5a | 174a | 34.5a | 975a | 331.0a |
| Warrior II | 1.92 oz. | 954a | 749.8ab | 262a | 102.8a | 1,216a | 852.5ab |
| Untreated check | ------ | 3,513 b | 1,274.9 b | 1,411 b | 387.3a | 4,654 b | 1,662.2 b |
| | *P value* | *<0.0001* | *0.0005* | *0.023* | *0.064* | *<0.0001* | *<0.002* |

*Means in columns followed by the same letter are not statistically different at the 0.05 level of probability (Tukey's HSD test, JMP Pro 13).*

***Transform WG insecticide is not currently registered for usage on alfalfa hay.**




PERCENT PEA APHID CONTROL AFTER LATE SPRING SEASON APPLICATION
(MARCH 26, 2018 BLYTHE, CA)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
32.4
69.0
53.6
82.8
75.1
29.1
83.2
81.5
71.9
78.7
84.8
91.1
77.1
73.5
Beleaf 2.1 oz
Beleaf 2.8 oz
HM 1508-A 2.8 oz.
Sivanto Prime 7 oz.
Transform WG 1.0 oz.
Transform 2.0 oz.
Warrior II 1.92 oz.
3 DAT
7 DAT


PERCENT CONTROL OF BLUE ALFALFA APHIDS AT 3 AND 7 DAYS AFTER LATE SEASON APPLICATION
(MARCH 26, 2018 BLYTHE, CA)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
33.7
52.1
36.7
72.5
74.5
53.1
84.2
68.8
69.5
73.9
77.2
76.7
72.8
41.2
Beleaf 2.1 oz
Beleaf 2.8 oz
HM 1508-A 2.8 oz.
Sivanto Prime 7 oz.
Transform WG 1.0 oz.
Transform 2.0 oz.
Warrior II 1.92 oz.
3 DAT
7 DAT

# ROOT-KNOT NEMATODE RESISTANCE IN BELL PEPPER

*Antoon Ploeg, Dept. Nematology, University of California Riverside, Riverside CA*
*Jose Luis Aguiar, University of California Cooperative Extension, Riverside, CA*

## Introduction

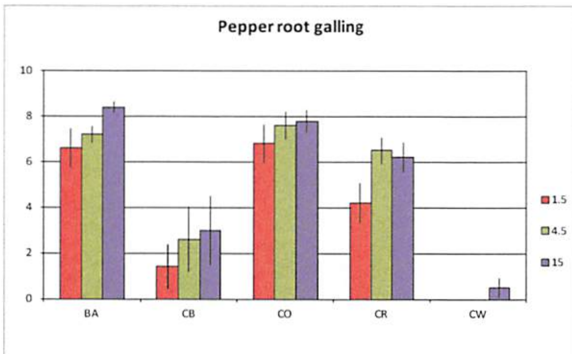
The Southern root-knot nematode (*Meloidogyne incognita*) can cause serious damage to peppers. The symptoms on the roots consist of galling but are generally not as dramatic as on some other vegetable crops such as tomatoes and carrots. Peppers are excellent host of root – knot nematode and nematode root populations can reach very high levels. Above-ground symptoms are not specific, but can include chlorosis, wilting under optimum soil moisture, stunting, and increased susceptibility of plants to fungal or bacterial root pathogens. See Figure 1, below for symptoms of root knot nematode galls on bell pepper.

In the Coachella Valley of Southern California, approximately 5,000 acres are cropped with bell peppers mostly on lighter sandy soils. High temperatures and sufficient soil moisture during the growing season are ideal conditions for nematode multiplication. The use of fumigant nematicides for nematode control is becoming more and more restricted, as they have adverse effects on the environment and general human health. Potential alternative nematode management methods include new less toxic non-fumigant nematicides and/or use of host plant resistance.

Figure 1: Bell pepper with root knot nematode galls (left) and roots stained, and nematode eggs masses (light blue dots on roots) becoming obvious (right).

## Initial Greenhouse Trials on Plant Resistance to Root-knot nematodes

Two nematode resistant (CB and CW) and three susceptible (BA, CO, and CR) bell pepper varieties were grown in nematode-infested soil of three different nematode inoculation levels in potted greenhouse experiments. The inoculation levels were 1,500, 4,500, and 15,000 juveniles (J2) per growing pots. The inoculum nematodes originated from commercial pepper field soils in Coachella Valley. At the time of crop harvest, root symptoms and nematode reproduction were evaluated. The trial was conducted in a greenhouse of the Department of Nematology, University of California Riverside. Results on root gall ratings and final J2 counts are shown in Figure 2.



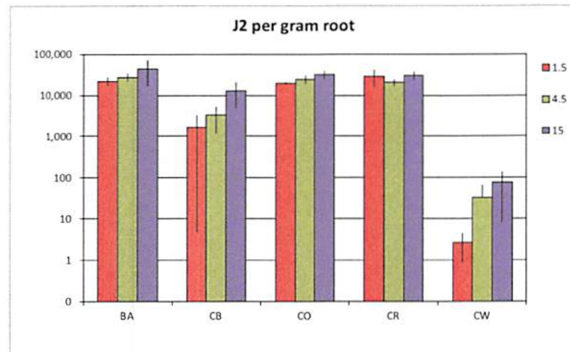




Figure 2. Root galling per variety (left) and Root-knot nematode juveniles (J2) (right) at harvest under three initial inoculation levels.

As expected, the three susceptible varieties responded with obvious root symptoms (galling intensity) and yielded high nematode numbers at the time of harvest. There were differences between the two resistant varieties: 'Carolina Wonder' (CW) exhibited the highest level of resistance, whereas 'Charleston Belle' (CB) was moderately resistant, particularly in the formation of galling. The resistant 'Carolina Wonder' (CW) and the three susceptible varieties; Baron (BA) and Coachella mini bells (CO) and Crusader (CR) were then grown at two nematode-infested field locations: one in Coachella Valley (CVARS) and one at Irvine (SCREC).

**Field Trial Results**

Figure 3, below shows root galling in the susceptible variety; BA and the resistant variety; CW.

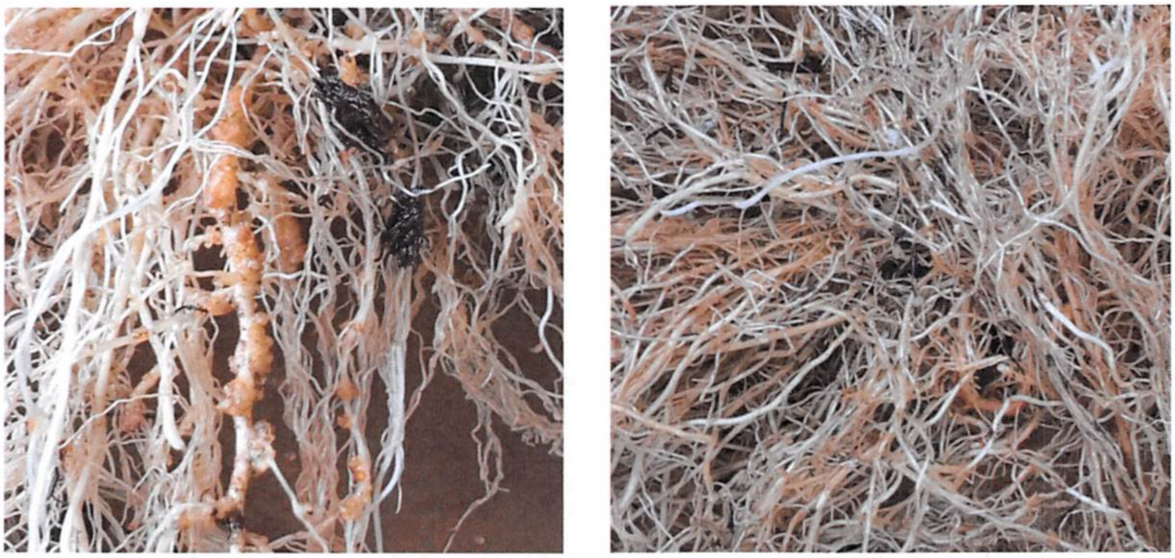


Figure 3. Baron (BA) with Root-knot nematode galling (left) and Carolina Wonder (CW) a Root-knot nematode resistant variety (right).

Response of the resistant variety 'Carolina Wonder' was very different at the two field trial locations. At SCREC, Irvine the resistant variety reduced root nematode levels by more than 99%. At the CVARS, Coachella site, the resistant variety still had obvious root galling and high nematode levels with a reduction of only 50% (Figure 4).

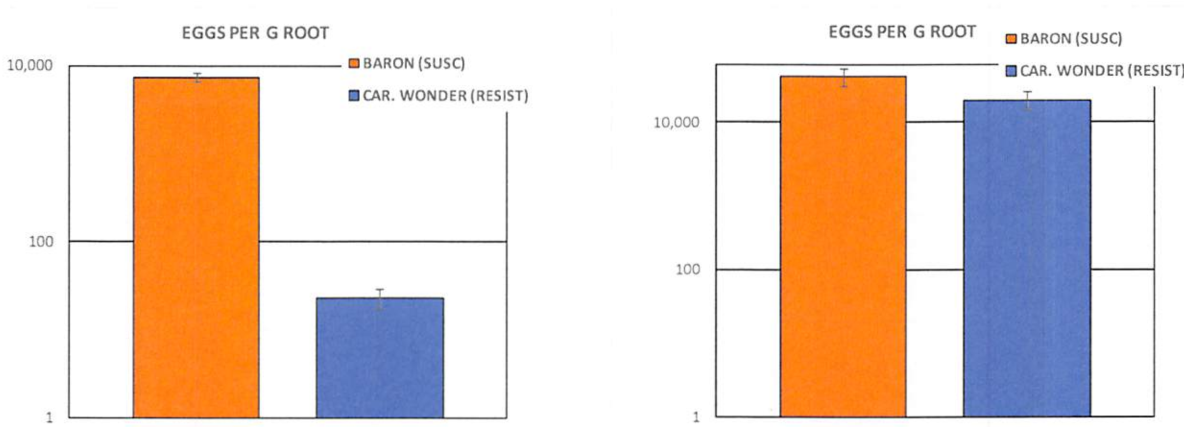



Figure 4. Root-knot nematode infestation in field-grown susceptible and resistant bell pepper at SCREC, Irvine (left) and CVARS, Coachella (right).

When nematodes were isolated from the CVARS were inoculated on to new resistant plants in greenhouse pots, they did not infest these resistant plants (Figure 2) and at SCREC field trial (Figure 4). This shows that the CVARS field nematode population itself was not inherently virulent on resistant pepper plants and that variation in environmental factors such as soil temperature may also contribute the virulence of the nematode.

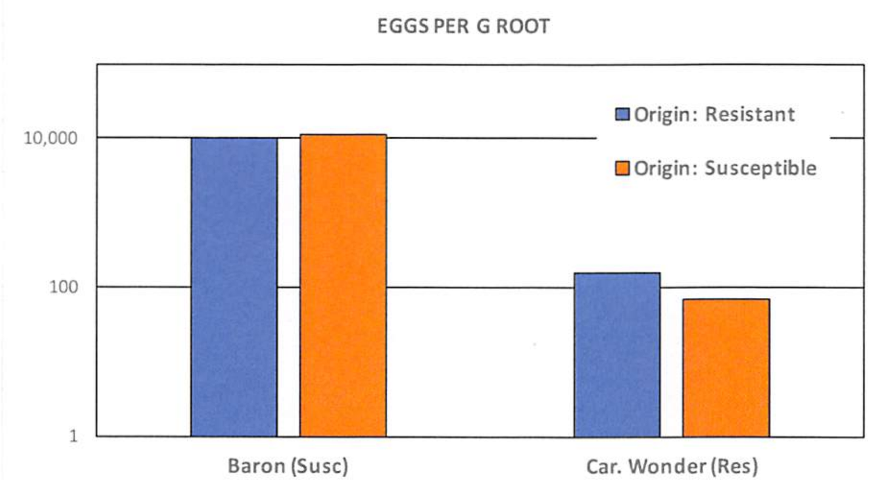



Figure 5. Nematode eggs per g root

Currently we are investigating if differences in soil temperature profiles between the two field sites can explain the different results. It is important to know why and when nematode resistance in bell pepper is compromised. In the most recent field studies (2018 season), this resistance-breaking was not observed, and at both locations the resistant variety remained virtually free of nematodes.

For more information, please contact Antoon Ploeg (Antoon.ploeg@ucr.edu) or Jose Aguiar (jlaguiar@ucanr.edu)

# Agronomic Crops & Irrigation Water Management Field Day

UCCE

Presented by the
University of California
Cooperative Extension
Imperial County

## SAVE THE DATE

Date: Thursday, April 11th
Time: 7:00am - 12:15pm (Registration begins @ 6:30an)
Address: UC Desert Research & Extension Center
1004 E. Holton Road, Holtville, CA 92250

ADMIT ONE

NO COST TO ATTEND | SPONSOR The Event | DONATE To The Event

***For more information you can contact Ali Montazar amontazar@ucanr.edu and Oli Bachie obachie@ucanr.edu or the office at (442) 265-7700***

***More Information to follow regarding the event; topics, agenda, CEU's, etc.***

# LIVESTOCK RESEARCH BRIEF

UC CE | University of California Agriculture and Natural Resources | Cooperative Extension

1050 E. Holton Rd.
Holtville, CA, 92250
(442) 265-7700

Hello,

In this March 2019 edition, a study comparing the effect of source and concentration of tannin supplementation on Holstein steer performance during late stage finishing.

If you have any comments, questions, recommendations, or know someone who would like to be included on the mailing list, please feel free to contact me.

Best wishes,


**Brooke Latack**
Livestock Advisor
UC Cooperative Extension – Imperial, Riverside, and San Bernardino counties
1050 E Holton Rd
Holtville, CA 92250
442-265-7712
bclatack@ucanr.edu
http://ceimperial.ucanr.edu/Livestock/

# EFFECT OF DELAYED IMPLANTS ON CALF-FED HOLSTEIN STEERS[1]

Brooke Latack
Livestock Advisor

## Introduction

Tannins are compounds found in many plants consumed by cattle and other ruminants. Very high concentrations of tannins in the diet can negatively impact digestion and growth performance. However, at low concentrations tannin supplementation has improved growth performance of feedlot cattle, particularly during the early feeding period, and may reduce methane emission. The effect of tannins on growth performance during the latter finishing phases has been inconsistent. This study evaluates the effect of level and source of supplemental tannin on growth performance of calf-fed Holstein steers in the late finishing phase.

## Methods

Two 84-day studies were conducted:

1. 96 Holstein steers (478 ± 6.5 kg) were sorted into 16 pens (6 animals/pen). Steers were supplemented with condensed tannins at a concentration of 0%, 0.2%, 0.45%, or 0.6% of the diet on a dry matter basis.
2. 96 Holstein steers (392 ± 4 kg) were sorted into 16 pens (6 animals/pen). Steers were supplemented with either 0% tannin, 0.6% condensed tannin, 0.6% hydrolysable tannin, or a combination of 0.3% condensed and 0.3% hydrolysable tannin.

The same basal finishing diet was fed in both studies (Table 1). Ambient temperatures ranged from 22.3-40.5°C and humidity averaged 26%.

## Results and Implications

**Trial 1:** Supplemental tannin increased (6.5%) ADG. The gain response tended to increase with increasing tannin level. DMI also increased with the increasing concentration of tannin supplementation. Enhancements in gain efficiency and dietary NE were maximal with 0.2% supplemental tannin (Table 2).

**Trial 2:** Supplementation of 0.6% tannin increased ADG (6.8%) and gain efficiency (3.3%). The improvement in ADG and gain efficiency was largely due to the increased DMI (Table 3). Supplemental tannin did not affect estimated dietary NE (efficiency of energy utilization).

Overall, tannin supplementation enhanced DMI and ADG of calf-fed Holstein steers during the late finishing phase. Differences in growth-performance due to tannin source (condensed vs hydrolysable) were not appreciable.

**Table 1.** Experimental diet composition

| Ingredient Composition, % DM | |
|---|---|
| Steam-flaked corn | 64.56 |
| DDGs | 15.00 |
| Sugarcane bagasse | 10.00 |
| Molasses cane | 5.00 |
| Yellow grease | 2.50 |
| Urea | 0.90 |
| Limestone | 1.50 |
| Magnesium oxide | 0.14 |
| Trace mineral salt | 0.40 |
| Monensin mg/kg | 30.00 |

**Table 2.** Growth performance treatment effects for trial 1

| | Supplemental condensed tannin (%DM basis) | | | |
|---|---|---|---|---|
| Item | 0 | 0.2 | 0.4 | 0.6 |
| Weight, kg | | | | |
| Initial | 476 | 477 | 478 | 479 |
| Final | 591 | 597 | 602 | 605 |
| ADG, kg | 1.37 | 1.42 | 1.48 | 1.50 |
| DMI, kg/d | 11.2 | 11.1 | 11.5 | 11.7 |
| ADG/DMI | 0.122 | 0.128 | 0.129 | 0.129 |

**Table 3.** Growth performance treatment effects for trial 2

| | Tannin treatments (0.6% of diet DM basis) | | | |
|---|---|---|---|---|
| Item | None | Condensed | Soluble | Combination |
| Weight, kg | | | | |
| Initial | 392 | 391 | 393 | 391 |
| Final | 520 | 528 | 528 | 529 |
| ADG, kg | 1.53 | 1.64 | 1.61 | 1.65 |
| DMI, kg/d | 10.0 | 10.3 | 10.2 | 10.7 |
| ADG/DMI | 0.152 | 0.159 | 0.157 | 0.155 |


References

1 Rivera-Mendez, A., Plascencia, A., Torrentera, N., and Zinn, R.A. Effect of level and source of supplemental tannin on growth performance of steers during the late finishing phase. 2016. Journal of Applied Animal Research. 45:1, 199-203.

## IMPERIAL VALLEY CIMIS REPORT AND UC WATER MANAGEMENT RESOURCES

*Ali Montazar, Irrigation and Water Management Advisor, UCCE Imperial and Riverside 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 March 1st to May 31st 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 | March | | April | | May | |
|---|---|---|---|---|---|---|
| | 1-15 | 16-31 | 1-15 | 16-30 | 1-15 | 16-31 |
| Calipatria | 0.16 | 0.19 | 0.22 | 0.25 | 0.27 | 0.29 |
| El Centro (Seeley) | 0.19 | 0.22 | 0.24 | 0.28 | 0.29 | 0.31 |
| Holtville (Meloland) | 0.17 | 0.21 | 0.23 | 0.27 | 0.29 | 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/.