Imperial County Agricultural Briefs

University of California Agriculture and Natural Resources

UC Cooperative Extension

Features from your Advisors

September 2021 (Volume 24 Issue 8)

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JULY AND AUGUST 2021 CATTLECAL NEWSLETTER UPDATE

Brooke Latack, Livestock Advisor – Imperial, Riverside, and San Bernardino Counties

The July edition of the CattleCal Newsletter covered information on supplementing potassium in feedlot diets, the career and research of UCCE livestock and range advisor Matthew Shapero, and a look at a study supplementing methionine and lysine in the diet of calf-fed Holsteins early in the feedlot.

The August edition of the CattleCal newsletter covered information on shade structures for cattle production, the career and research of UC Davis professor Richard Zinn, and a look at a study supplementing methionine and lysine in the diet of calf-fed Holsteins early in the feedlot.

If you would like to subscribe to the CattleCal newsletter, please visit this site and enter your email address: http://ceimperial.ucanr.edu/news_359/CattleCal_483/

<u>July CattleCal podcast episodes:</u>

- **Career Call**
  In the career call of the month, Brooke Latack and Pedro Carvalho called Matthew Shapero. Matthew is the UCCE Livestock and Range Advisor at Santa Barbara and Ventura counties. He discussed his path from being pre-med during undergrad to developing a passion for agriculture.

- **BONUS EPISODE**
  In this episode, we discuss some research updates on the research we are conducting at our facilities at the Desert Research and Extension Center.

- **Research Call**
  Brooke Latack and Pedro Carvalho call Matthew Shapero again. Matthew shared information about the potential use of using grazing animals to fight against fires in California.

- **Feedlot Research Call**
  In this episode, join Pedro Carvalho and Brooke Latack as they discuss a study looking at supplementation of feedlot diets with methionine and lysine.

- **Quiz Zinn**
  In this episode, we asked Dr. Richard Zinn a question from our listeners related to the addition of potassium in feedlot diets.

August CattleCal podcast episodes:

- **Career Call**
  We had the pleasure to talk with one of the greatest feedlot researchers of our time! A person who inspires and is a mentor to Brooke and Pedro. Dr. Richard Zinn has been working for UC Davis since 1981. Dr. Zinn shared with us amazing stories from his career and personal life!

- **Research Call**
  Pedro Carvalho finishes the initial 6 months of conversation on protein nutrition with Dr. Richard Zinn. They discuss past research and what may be coming in the future.

- **Feedlot Research Cal**l
  In this episode, join Pedro Carvalho and Brooke Latack as they discuss a very recent study looking at supplementation of feedlot diets with methionine and lysine.

- **Quiz Zinn**
  In this episode, we asked Dr. Richard Zinn a question related to the use of shade in Feedlot cattle operations.

The podcast can be found at https://open.spotify.com/show/6PR02gPnmTSHEgsv09ghjY?si=9uxSj3dYQueTEOr3ExTyjw or by searching "CattleCal podcast" in Spotify. It is free to listen!

If you have burning questions about cattle management and would like your questions featured on our Quiz Zinn episodes, please send questions to cattlecalucd@gmail.com or DM your question to our Instagram account @cattlecal.

If you have any questions or comments or would like to subscribe to the newsletter, please contact:

Brooke Latack (UCCE Livestock advisor) – bclatack@ucanr.edu
Pedro Carvalho (CE Feedlot Management Specialist) - pcarvalho@ucdavis.edu
CattleCal: cattlecalucd@gmail.com

Evaluation of Broccoli and Cabbage Cultivars for Production in Imperial County, CA.

Jairo Diaz, Gilberto Magallon, and Juan Buenrostro
Desert Research and Extension Center

September 2021

Introduction

The University of California Desert Research and Extension Center (UC DREC) evaluated broccoli (*Brassica oleracea* var. *italica*) and cabbage (*Brassica oleracea* var. *capitata*) cultivars to assess their performance in the low desert region of California.

Material and Methods

There were 12 broccoli and 10 cabbage cultivars tested for suitability in desert conditions in the 2020-2021 trial. Field studies were performed at the UC DREC located in Holtville, CA. The trial evaluated all broccoli and cabbage cultivars in twin rows on 40-in beds by 20-ft-long plots (Figures 1, 2). The top one-foot soil has a clay textural classification, a pH of 8.03, a cation exchange capacity of 10.9 meq/100 g and soil electrical conductivity of 3.5 dS/m (Table 1).

Figure 1. View of broccoli field trial.

Figure 2. View of cabbage field trial.

Table 1. Soil fertility characterization (0-1 ft) of testing plots at DREC before planting.[z]

pH	NO_3-N (ppm)	PO_4-P (ppm)	K (ppm)	CEC (meq/g)	ECE (dS/m)	Ca (ppm)	Mg (ppm)	Na (ppm)	ESP
8.03	25.8	9.5	388	10.9	3.5	5,408	833	412	3.8

[z]NO_3-N = nitrate nitrogen, PO_4-P = orthophosphate phosphorus (Olsen method), K= potassium, CEC = cation exchange capacity, Ca = calcium, Mg = magnesium, Na = sodium, ESP = exchangeable sodium percentage.

Broccoli and cabbage cultivars were direct seeded on November 5, 2020 and December 3, 2020, respectively. Trial followed similar cultural practices (irrigation, fertilization, weed and pest control) adopted by commercial growers in the region. Broccoli was fertilized with 350 lbs/acre of 11-52-00 (NPK) and 10 gal/acre of 10-34-00 (NPK) at planting. In addition, 100 lbs/acre of urea were applied at 26 days after planting. Cabbage was fertilized with 350 lbs/acre of 11-52-00 (NPK) at planting. Sprinkler irrigation was used for germination and establishment. Furrow irrigation was performed for crop development until harvest. Pest management practices in the broccoli trial included the application of Admire (10 oz/acre) on November 4, 2020 and Asana XL (9.6 oz/acre) on November 23, 2020. Weed and pest control in the cabbage trial was maintained by the application of Dacthal (10 pts/acre) herbicide and Admire (10z/acre) insecticide on December 4, 2020. The plant population at harvest for the broccoli and cabbage trials was equivalent to 26,139 and 28,753 plants per acre, respectively.

Broccoli and cabbage heads were harvested and data were collected from 10 ft within each plot. Each head of broccoli and cabbage was weighed and head diameter of broccoli was recorded. The experimental design of this trial was a randomized complete block design with four replications. Statistical analysis was conducted using the Statistical Analysis Software, SAS.

Results and Discussion

Broccoli

Heads were harvested between 99 and 113 days after planting. Each cultivar was evaluated and selected for harvest based upon adequately size heads (Figure 3). In this study, cultivars ‘BF98-254’, ‘Castle Dome’, and ‘Shining Green’ had the highest yields (Figure 4 and Table 2). Cultivars ‘Green Jade’ and ‘Green Super’ were numerically the lowest-yielding cultivars. Cultivar ‘Avenger’ did not produce heads. Cultivars ‘BF98-254’ and ‘Castle Dome’ had the highest head diameters (Table 3). ‘Green Super’ and ‘Green Jade’ performance was poor. These cultivars had significantly low yields and head diameters.

Cabbage

Heads were harvested between 120 and 128 days after planting (Figure 6). Cultivars with the largest yields included ‘Headstart’ and ‘Gazelle’ (Figure 5 and Table 4). Based on USDA standards for grades of cabbage (81 FR 51297), ‘Headstart’ and ‘Gazelle’ heads were classified as large-sized. Heads of cabbage cultivars ranked from 3 to 11 were classified as medium-sized. ‘Summer Summit” showed the worst performance with only half of the plants yielded heads. Head sizes from this cultivar were classified as small.

Acknowledgments

Thanks to UC DREC staff for supporting field operations and data collection for this project. Dr. Roberto Soto, Universidad Autónoma de Baja California, performed statistical analysis in SAS. Funds were provided by Known-You Seed America Corporation through research agreement No. Y19-4912. For trial/sales inquiry, please contact Jason Boonkokua at 661-855-3192 or jboonkokua@knownyou.com.

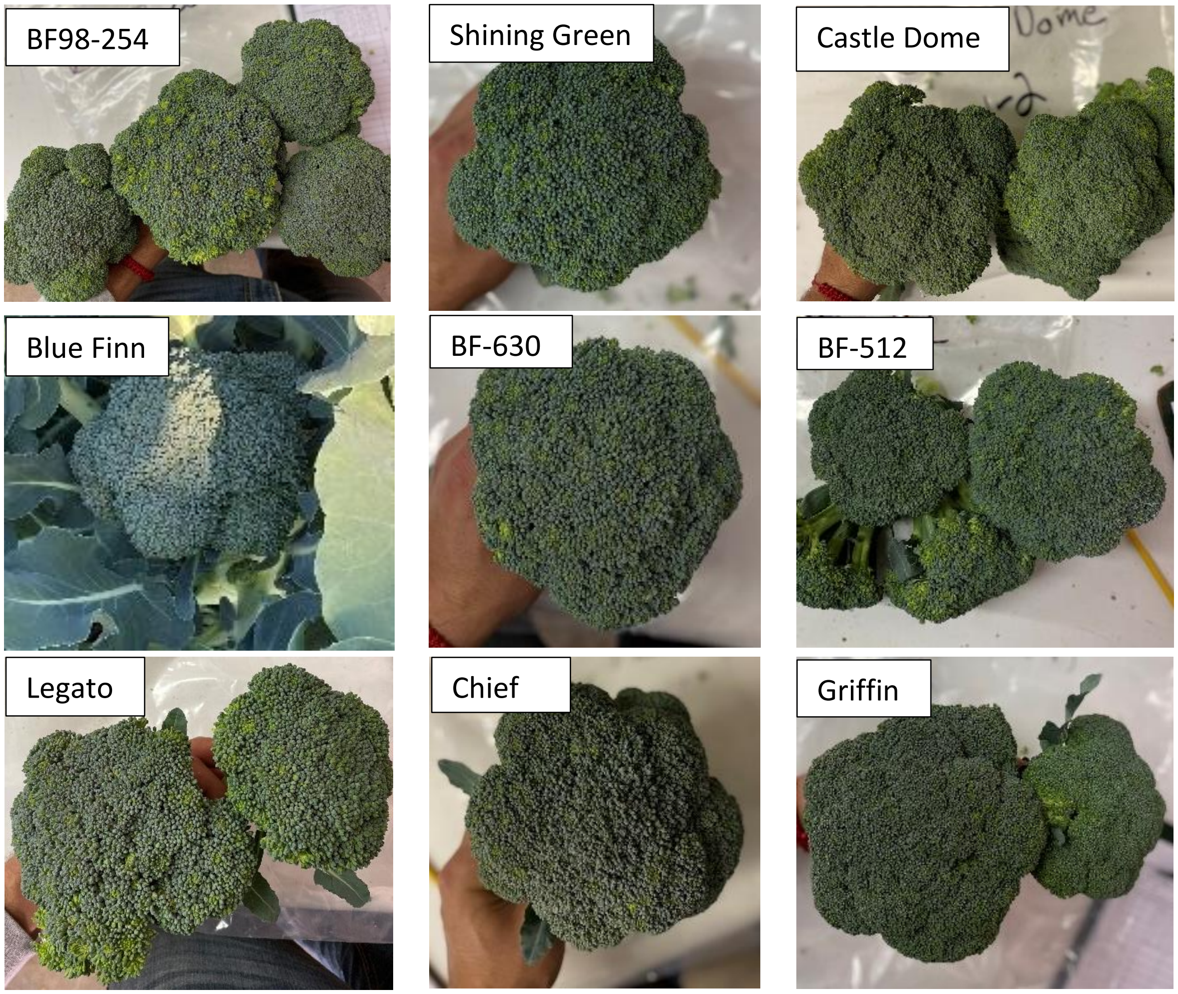


Figure 3. Images of selected broccoli heads at harvest.

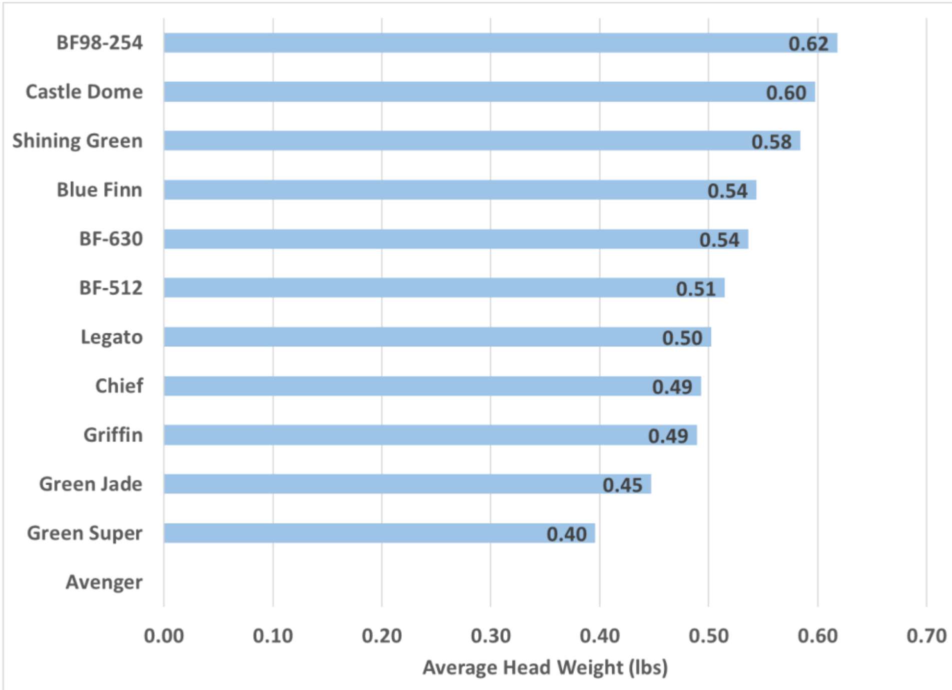


Figure 4. Average weight of heads of 12 broccoli cultivars tested at the UC DREC from November 2020 to February 2021.

Table 2. Broccoli yield potential (ton/ac).[z]

Rank	Cultivar	Total Yield	
1	BF98-254	8.1	A
2	Castle Dome	7.8	A
3	Shining Green	7.6	A
4	Blue Finn	7.1	Ba
5	BF-630	7.0	Ba
6	BF-512	6.7	Bac
7	Legato	6.6	Bac
8	Chief	6.4	Bac
9	Griffin	6.4	Bac
10	Green Jade	5.9	Bc
11	Green Super	5.2	C
12	Avenger	---	---

[z]Means in a column followed by the same letter are not significantly different at P ≤ 0.05 according to the Duncan's multiple range test.

Table 3. Broccoli head diameter (in).[z]

Rank	Cultivar	Head Diameter	
1	BF98-254	5.17	a
2	Castle Dome	5.11	a
3	Griffin	4.74	ba
4	Shining Green	4.73	ba
5	Blue Finn	4.64	ba
6	BF-630	4.58	bac
7	Chief	4.46	bdc
8	BF-512	4.46	bdc
9	Legato	4.29	bdc
10	Green Super	4.00	dc
11	Green Jade	3.94	d
12	Avenger	---	---

[z]Means in a column followed by the same letter are not significantly different at P ≤ 0.05 according to the Duncan's multiple range test.

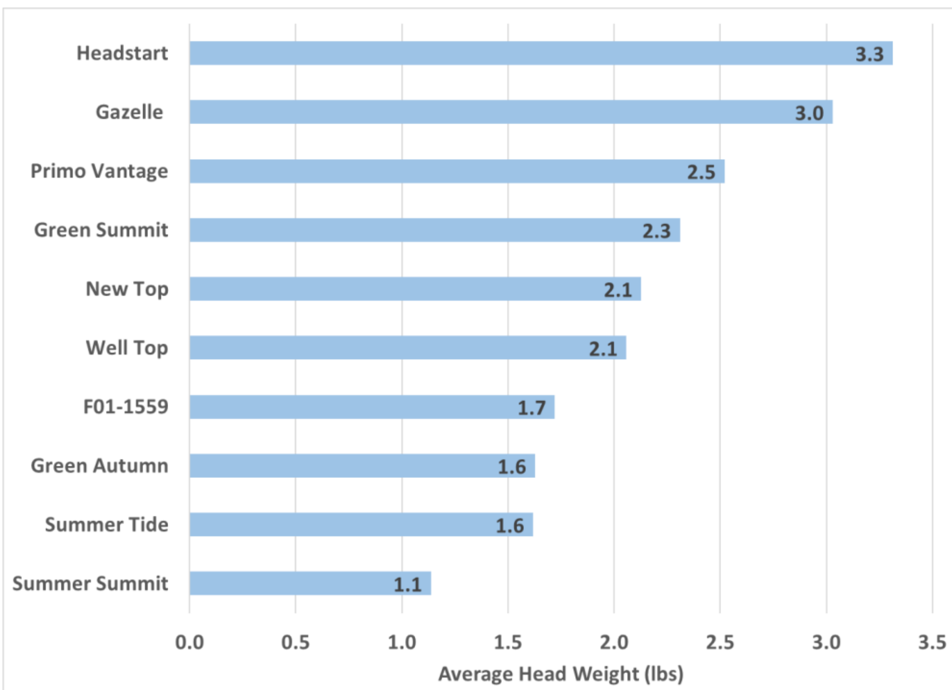


Figure 5. Average weight of heads of 10 cabbage cultivars tested at the UC DREC from December 2020 to April 2021.

Figure 6. Images of cross section of harvested head cabbage cultivars.

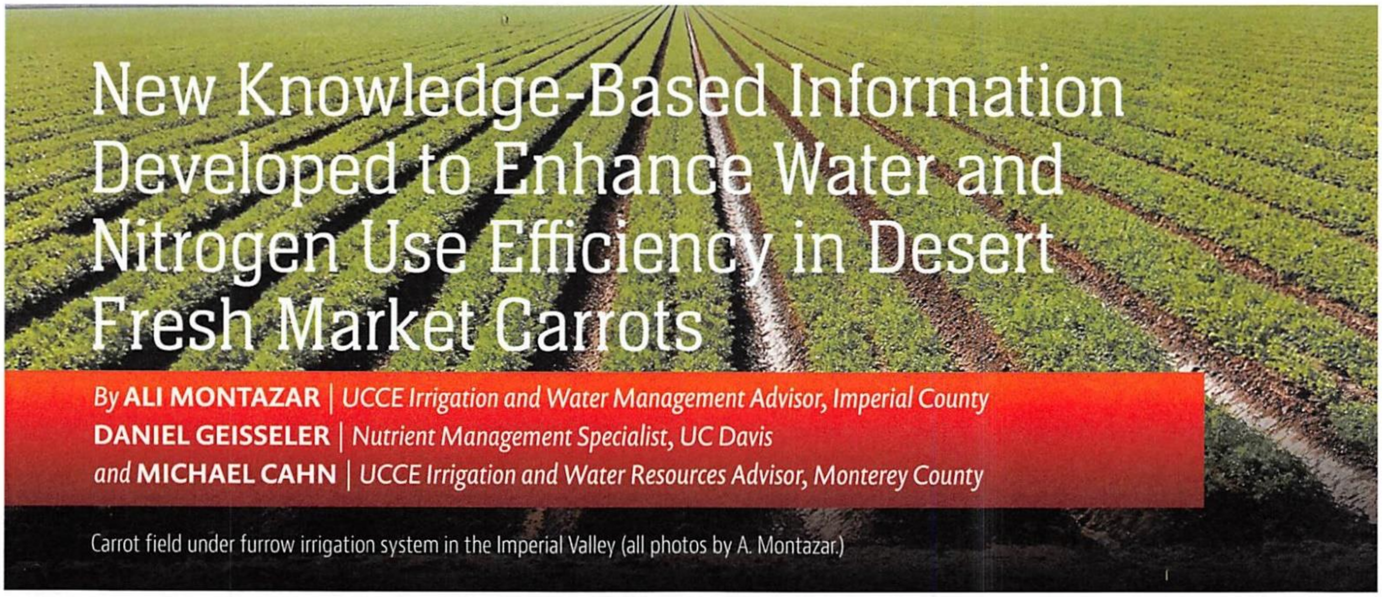
Table 4. Cabbage yield potential (ton/ac).[z]

Rank	Cultivar	Total Yield	
1	Headstart	47.7	a
2	Gazelle	43.6	a
3	Primo Vantage	36.2	b
4	Green Summit	33.2	cb
5	New Top	30.6	cbd
6	Well Top	29.6	cd
7	F01-1559	24.8	ed
8	Green Autumn	23.4	e
9	Summer Tide	23.3	e
10	Summer Summit	8.2	f

[z]Means in a column followed by the same letter are not significantly different at $P \leq 0.05$ according to the Duncan's multiple range test.

New Knowledge-Based Information Developed to Enhance Water and Nitrogen Use Efficiency in Desert Fresh Market Carrots

By **ALI MONTAZAR** | *UCCE Irrigation and Water Management Advisor, Imperial County*
DANIEL GEISSELER | *Nutrient Management Specialist, UC Davis*
and **MICHAEL CAHN** | *UCCE Irrigation and Water Resources Advisor, Monterey County*



Carrot field under furrow irrigation system in the Imperial Valley (all photos by A. Montazar.)

CARROTS ARE ONE OF THE 10 MAJOR commodities in Imperial County, with an average acreage of nearly 16,000 over the past decade. The farm gate value of fresh market and processing carrots was about $66 million in 2019. In the low desert region, fresh market and processing carrots are planted from September to December for harvest from January to May. Most carrots are typically sprinkler irrigated for stand establishment and subsequently furrow irrigated for the remainder of the growing season. However, there are fields that are irrigated by solid set sprinkler systems the entire crop season.

Carrot is a cool-season crop that demands specific growing conditions and effective use of nitrogen (N) and water applications for successful commercial production. N and water management in carrot is crucial for increasing crop productivity and decreasing costs and nitrate leaching losses. The N needs of carrots for optimum storage root yield depends on the climate, soil texture and conditions, residual soil N from the previous season and irrigation management. There is not enough research on N management to free local growers of the worry associated with being short on the amounts applied, which may cause a loss in yield and profitability. The industry needs reliable information on N and consumptive water use of carrots to optimize irrigation and N management, enhance water and nitrogen use efficiency and achieve full economic gains in a sustainable soil and water quality approach.

This study aimed to quantify optimal N and water applications under current management practices and to fill knowledge gaps for N and water management in carrots through conducting experimental trials in the low desert of California. This article presents some of the information developed for desert fresh market carrots.

Field Trials and Measurements

Field trials were conducted on fresh market carrot cultivars at the UC Desert Research and Extension Center (DREC) and four commercial fields in the low desert region during the 2019-20 and 2020-21 seasons (**Table 1, see page 10**). The sites represent various aspects of nitrogen applied (N applications ranged between 176 and 272 lbs ac^{-1}), irrigation water applied (varied from 1.6 to 2.9 ac-feet/ac), irrigation systems (three fields under sprinkler irrigation and two fields under furrow irrigation) and soil types (sandy loam to silty clay loam).

The DREC trials consisted of two irrigation regimes and three nitrogen scenarios (**Fig. 2**). At the commercial sites, due to logistical limitations, the measurements were carried out from five sub-areas selected (50 feet x 50 feet) in an experimental assigned plot (400 feet x 400 feet) with a homogeneous soil type, which was the dominant soil at the site. These areas represented common irrigation and N fertilizer management practices followed by growers.

The actual consumptive water use (actual crop evapotranspiration (ET)) was measured using the residual of the energy balance method with a combination of surface renewal and eddy covariance equipment (fully automated ET tower, **Fig. 3**). As an affordable tool to estimate actual crop ET, Tule Technology sensors were also set up at all experimental sites. The Tule ET data were verified using the ET estimates from the fully automated ET tower. Canopy images were taken on weekly to a 15-day basis utilizing an infrared camera (NDVI digital camera) to quantify crop canopy coverage over the crop season. Actual soil nitrate content (NO_3-N) at the crop root zone (one to five feet) and the total N percentage in tops and roots were determined pre-seeding, post-harvest and monthly over the season. Plant measurements were carried out on 40-plant samples collected randomly per replication of each treatment/sub-area, and deter-

Continued on Page 10

Experimental Site	Seeding (first irrigation) Date	Harvest Date	Irrigation Practices
DREC-1	Oct 11, 2019	Mar 18, 2020	Sprinker
DREC-2	Oct 14, 2020	Mar 21, 2021	Sprinker
C1	Oct 24, 2019	Mar 30, 2020	Sprinker
C2	Oct 2, 2019	Mar 19, 2020	Furrow
C3	Oct 4, 2019	Mar 17, 2020	Furrow
C4	Oct 2, 2020	Apr 12, 2021	Sprinker

Table 1: General information for the experimental sites. Plants were established using sprinkler irrigation at all sites.

Continued from Page 8

minations were made on marketable yield and biomass accumulation. Fresh weight and dry weight of roots and foliage were measured on a regular basis.

Findings and Recommendations

Irrigation Management

The common irrigation practice in carrot stand establishment in the low desert is to irrigate the field every other day using sprinkler systems during the first two weeks after seeding. Carrots germinate slowly, and hence, the beds need to be kept moist to prevent crusting. A comparison between the averages of applied water and actual consumptive water use for a 30-day period after seeding suggested that carrots are typically over-irrigated during plant establishment. An average of 3.8 inches was measured as actual consumptive water use for this period across the experimental sites (**Fig. 4, see page 12**), while the applied water varied from two to three times of this amount.

The results clearly demonstrated that the carrot sites had variable actual consumptive water uses depending upon early/late planting, irrigation practice, length of crop season, soil type and weather conditions. For instance, site C-4 was a sprinkler irrigated field with a dominant soil texture of sandy clay loam where the carrots were harvested very late 193 days after seeding (DAS). The seasonal consumptive water use was 19.2 inches at this site (**Fig. 4, see page 12**). Our results show that the seasonal crop water use of fresh market carrots is nearly 16.0 inches for a typical crop season of 160 days with planting in October. Approximately 50% of crop water needs occurred during the first 100 days after seeding and the other 50% during the last 60 days before harvest. Crop canopy model developed in this study demonstrated that fresh market carrots reach 85% canopy coverage by 100 days after seeding.

The amount of water that needs to be applied in an individual field depends on crop water requirements and the efficiency of the irrigation system. Assuming an average irrigation efficiency of 70%, the approximate gross irrigation water needs of carrot fields in the low desert would be 2.0 ac-feet/ac (pre-irrigation is not included) for a 160-day crop season. Pre-irrigation along with proper irrigation scheduling over the season may effectively maintain crop water needs and salinity in carrots.

Water stress should be avoided throughout the carrot growing cycle. The critical period for irrigation is between fruit set and harvest. Sprinkler irrigation may be considered as a more effective irrigation tool when compared with furrow irrigation. More frequent and light irrigation events are possible by sprinkler irrigation. Over-irrigation of carrot fields increases the incidence of hairy roots, and severe drying and wetting cycles result in significant splitting of roots. Sprinklers also reduce salinity issues which is important since carrots are very sensitive to salt accumulation.

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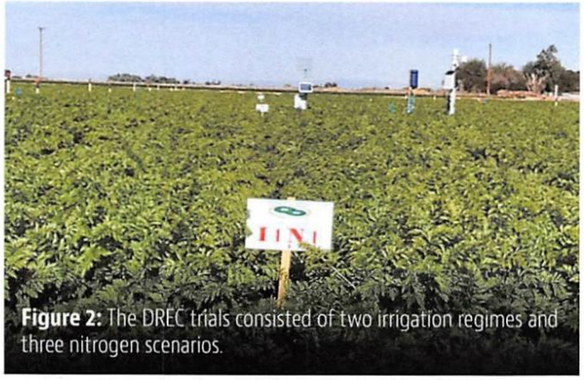

Figure 2: The DREC trials consisted of two irrigation regimes and three nitrogen scenarios.

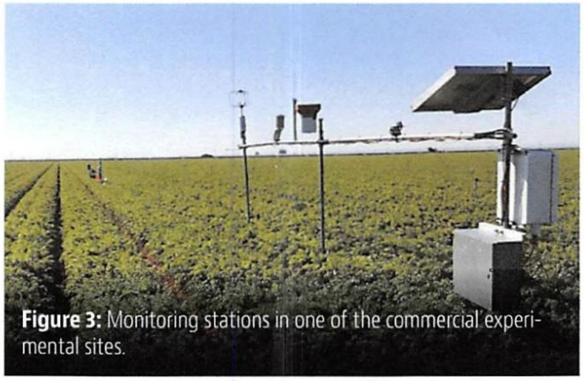

Figure 3: Monitoring stations in one of the commercial experimental sites.

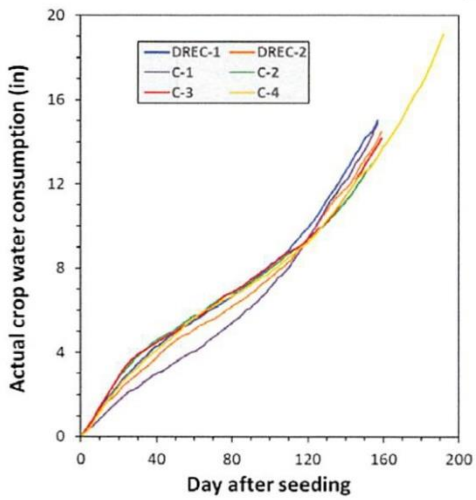

Figure 4: Cumulative actual crop water consumption (actual ET) at each of the experimental sites. Surface renewal actual daily ET is reported here.

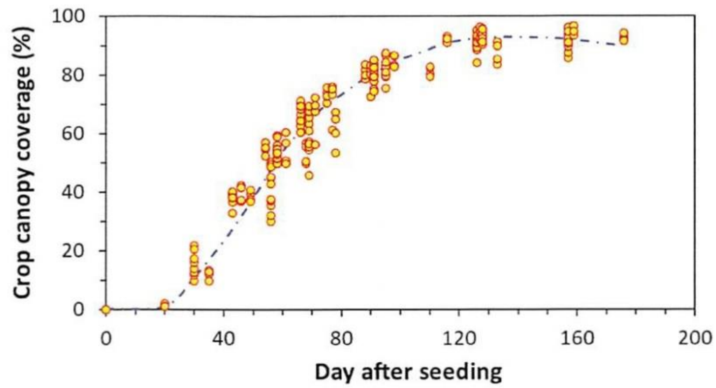

Figure 5: Canopy development curve for the low desert fresh market carrots over the growing season.

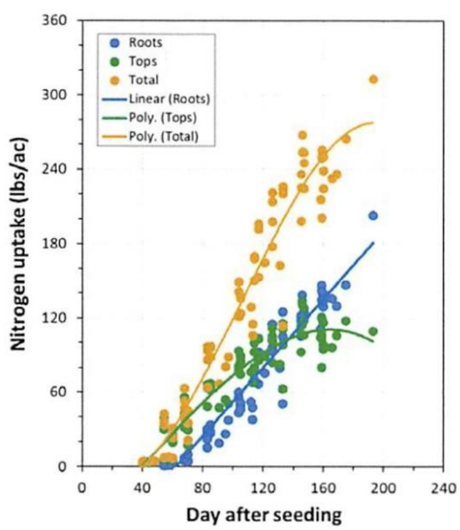

Figure 6: N accumulation trends in storage roots, tops and total (plants) over the growing season at the experimental sites.

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Nitrogen Management

The results demonstrated that a wide range of N accumulated both in roots and tops at harvest (**Fig. 6**). For instance, a total N content of 312.9 lbs ac^{-1} was observed in a fresh market carrot field with a long growing season of 193 days, including 202.9 and 110.0 lbs N ac^{-1} in roots and tops, respectively. The total N accumulated in plants (roots + tops) was less than 265 lbs ac^{-1} in the other sites.

A linear regression model was found for the total N uptake in roots after 60 to 73 DAS without declining near harvest (**Fig. 6**). Small, gradual increases in N contents of roots were observed until about 65 DAS. This suggested that N begins to accumulate at a rapid rate between 65 and 80 DAS; however, the period of rapid increase could vary depending on early (September) or late (November) plantings. N uptake in tops increased gradually following a quadratic regression, and in most sites levelled off or declined slightly late in the season. Although the N accumulated in tops appeared to drop down or level off in most sites beyond 120 to 145 DAS, the N content decline occurred after DAS 155 at site C-4 with a longer growing season.

These findings suggest that a total N accumulation of 260 lbs ac^{-1} occurred by 160 DAS, with 145 lbs ac^{-1} in roots and 115 lbs ac^{-1} in tops. Across all sites, nearly 28% of seasonal N accumulation occurred by 80 DAS (**Fig. 6**) when the canopy cover reached an average of 67% (**Fig. 5**). The large proportion of this N content was taken up during a 30-day period (50 to 80 DAS). The results also suggest that nearly 50% of the total N was taken up during a 50-day period (80 to 130 DAS). This 50-day period appears to be the most critical period for N uptake, particularly in the storage roots, when carrots developed the large canopy and the extensive rooting system. The majority of N is taken up during the months of December to February, and, hence, proper N fertility in the effective crop root zone is essential during this period. For a 160-day crop season, 22% of N uptake could be accomplished over the last 30 days before harvest.

Carrots have a deep rooting system that allows for improved capture of N from deep in the soil profile. The fibrous roots were present at the depth of five feet below the soil surface at site DREC-2 (**Fig. 7**). There is a risk of leaching soil residual N due to heavy pre-irrigation (a common practice for salinity management in the low desert) in late summer prior to land preparation. N is likely accumulated at the deeper depths by the beginning of the growing season, and consequently, there is a potential N contribution from the soil for carrots when the roots are fully developed. Since residual soil N contribution can be considerable in carrots, pre-plant soil nitrate-N assessment down to 60 cm depth could be a tool enabling farmers to improve N management and maximize yield and quality while minimizing economic and environmental costs.

Careful management of N applications in the low desert carrots is crucial because fertilizers are the main source of N, particularly due to low organic matter content of the soils and very low nitrate level of the Colorado River water. Knowing this fact, the soil NO_3-N contents pre-seeding and over the growing season at different sites revealed that none of the sites had N deficiency during the crop season, and consequently, the practice of splitting N applications, as done by the farmers (applying 9% to 15% of total seasonal N as pre-plant and the remainders through irrigation events over the season), was likely effective in most cases. It appears that the practice of 15% to 30% seasonal N applications though irrigation events 45 to 70 DAS has similar effectiveness to sidedress N applications.

Within the range of N application rates examined at the experimental sites, there were no significant relationships between carrot fresh root yield and N application rate, although the results suggested a positive effect of N application on carrot yield. Sufficient N availability in the crop root zone over the growing season and the lack of significant yield response to N applications demonstrate that N optimal rates could be likely less than the applied amounts in most sites. Adequate nitrogen and water applications reduce costs and help prevent leaching, while excess N may lead to excessive N storage in the roots, which may be a concern for processing carrots. Integrated optimal N and water management needs to be approached to accomplish greater N and water efficiency, and consequently keep lower rates beneficial to overall profitability.

Funding for this study was provided by California Department of Food and Agriculture (CDFA) Fertilizer Research and Education Program (FREP) and California Fresh Carrots Advisory Board.

Comments about this article? We want to hear from you. Feel free to email us at article@jcsmarketinginc.com

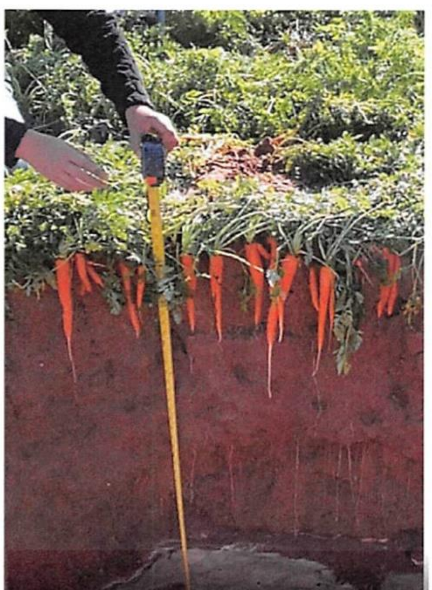

Figure 7: Carrot storage and fibrous roots system at site DREC-2.

USDA United States Department of Agriculture

Agricultural Marketing Service

Creating Opportunities for Farmers and Businesses

USDA to send 2021 Hemp Acreage and Production survey this fall

This October, USDA's National Agricultural Statistics Service will mail its first **Hemp Acreage and Production Survey**. The survey will collect information on the total planted and harvested area, yield, production, and value of hemp in the United States.

The Domestic Hemp Production Program established in the Agriculture Improvement Act of 2018 (2018 Farm Bill) allows for the cultivation of hemp under certain conditions. The Hemp Acreage and Production survey will provide needed data about the hemp industry to assist producers, regulatory agencies, state governments, processors, and other key industry entities.

Producers will be able to complete the survey online or they may complete and return the survey by mail using the return envelope that will be provided.

Learn More

SMALL SCALE COMPORT SPREADER

Are you interested in borrowing a small-scale compost spreader?

Imperial County Cooperative Extension's Climate Smart Agriculture Program has been able to provide free of cost access to a 23-Bushel Loyal Manure spreader for smaller scale growers looking to spread compost material on their land. The capacity of the spreader is about one yard so this equipment is best suited for operations no larger than 2 acres. A small trailer will be needed to tow the spreader to and from the UCCE office that authorizing the release of the spreader. If you are interested in borrowing the spreader, please contact Kristian Salgado at kmsalgado@ucanr.edu.

Equipment Specifications for Loyal Manure Spreader

- Dimensions: 101" x 46.5" x 40"
- Approximate Weight: Weight: 455lbs
- Heaped Capacity: 28.62 Cu. Ft.
- Ground Clearance: 9"
- Tow Capacity Requirement: 10 hp
- https://loyal-roth.com/products/atv-manure-spreaders/pricelist-manure-spreader.php

Equipment Specifications for Square Carry-on Trailer

- Dimensions: 5.5' x 10'
- Max Load Capacity: 2,076 lb.
- Square Tube Top Rail
- https://www.tractorsupply.com/tsc/product/tractor-supply-55-x-10-ft-square-carry-on-trailer-55x10gwhdp

Samples wanted for research on
Lettuce Fusarium wilt

WHAT we are looking for	Samples of lettuce plants affected by Fusarium wilt
WHERE we are looking	Imperial County (including Bard/Winterhaven area) and Huron, other regions of California also welcome
WHY we are doing this	To monitor for emergence of new pathogen races
HOW you can help	If you are a grower or PCA and you have Fusarium wilt in your lettuce crop, contact us and we will survey your field and collect samples

Contact: Alex Putman, UC Riverside (951-522-9556, aiputman@ucr.edu)

Collaborators:
Jim Correll, Univ. of Arkansas
Stephanie Slinski, Yuma Center for Excellence in Desert Agriculture

Funded By:
California Leafy Greens Research Program
2021-2022

IMPATIENS NECROTIC SPOT VIRUS (INSV) IN DESERT LETTUCE

Apurba Barman, Area IPM Advisor, UC Cooperative Extension-Imperial County

The lettuce season in the low desert is quickly approaching and it is in our best interest to have a successful and profitable crop in the region. Like any other crops, a successful crop involves many components of practices starting from land preparation, irrigation, variety selection and overall management of the crop such as pests, diseases and nutrients. One of the recent concerns in lettuce production is the incidence of Impatiens Necrotic Spot Virus (INSV) transmitted by western flower thrips. This viral disease has been consistently prevalent and resulting crop damage in the Salinas Valley for the past several years. However, desert production areas both in California and Arizona did not experience the incidence of INSV until early 2021. Detection of INSV in multiple fields, albeit in very low incidence levels, in the Imperial Valley, has raised concern for this viral disease in desert production region.

Since INSV was reported in the low desert region, it should be our effort to reduce the risk of this disease on in the upcoming season and years to come. While multiple biotic and abiotic factors which could determine the risk of INSV incidence in lettuce crops, there are at least three aspects we can focus on to reduce the risk: 1) management of weed hosts of INSV within and outside the field, 2) management of thrips populations on the crop, and 3) detection and removal of infected plants from field.

Based on the research done in Salinas Valley and limited samples collected from Imperial County, we learned what are the common weed hosts of INSV. Probably many weed species are out there and not tested or may vary from region to region, but some of the commonly available weed species in this area that are found to be a host of INSV through laboratory testing include: little mallow, annual sowthistle, nettleleaf goosefoot, mare's tale, field bindweed, shepherd's purse, common purslane, hairy fleabane, common lambsquarter, prickly lettuce, and curly dock. Managing these weeds in or outside of the lettuce fields should reduce the risk of available reservoir for virus and any subsequent transmission.

Similarly, managing the thrips population should be a priority as the adults can transmit the virus if they were developed on an infected host such as weeds or lettuce plants. Again, weeds or flowering crops serve as favorable hosts for western flower thrips populations and management of these hosts would lead to reduction of available thrips populations in the system in addition to the effective chemical control in the actual crop.

The last but not the least with what we can do to reduce the increased level of INSV incidence in the lettuce crop is to closely monitor, detect the infected plants and destroy them before they become a constant source for the virus. The symptoms of virus infection look similar to chemical burn, where leaves would have chlorosis (yellowing) or necrosis (dead tissue), but they are mostly on the inner leaves at the beginning of the infection. At low infection level, only random plants would have these characteristic symptoms as opposed to a particular pattern occurs in case of chemical burn or drift (Figure 1). If plants are infected with INSV only, there is usually no wilting, crown rot or discoloration. If you are able to confirm these symptoms it is most likely INSV infection, and if you still have any doubts, plant samples can always be tested or sent out for further confirmation. Please contact UC Cooperative Extension Office for any testing needs or other commercial testing facilities.

There is a recent article on INSV in Desert published by the Western FarmPress, which has covered information on current research effort in this area (please see the next three pages).

Figure 1. INSV infected plant in a romaine lettuce field in Imperial County, March 2021.

WESTERN FarmPress®


Todd Fitchette

Arizona lettuce growers have a new disease to concern themselves with. INSV was confirmed last season in the low desert of Imperial County, Calif. and Yuma County, Ariz. It is known to be vectored by the Western flower thrips.

INSV confirmed in desert lettuce

The virus can resemble burn damage caused by chemical applications.

Todd Fitchette I Aug 31, 2021

A bothersome plant virus first discovered in 2006 in the Salinas Valley of California was discovered last season near Tacna, Ariz., a farming community east of Yuma, and in five different fields in California's Imperial Valley.

The disease is like others in lettuce that cause decay and render the crop unmarketable, except that it is not caused by a soil-borne pathogen but vectored by a common insect.

Impatiens necrotic spot virus, or INSV for short, can resemble burn damage caused by chemical applications, according to Steven Koike, a plant pathologist and director of TriCal Diagnostics in

Hollister, Calif. Koike was a farm advisor with the University of California when the disease was first discovered in California.

By itself, INSV in lettuce does not cause wilting, root rot or discoloration, crown rot or vascular discoloration, according to Koike. In combination with other pathogens, a confusing combination of symptoms can arise, necessitating lab tests to determine the cause.

At the end of the day INSV does the same thing to lettuce that other plant viruses do — it renders the crop unmarketable. Symptoms can vary depending on when the plant was infected, the type of lettuce involved, and the environmental conditions, he said.

Transmission

Unlike the soil borne pathogens that lead to Fusarium and other plant diseases in produce crops, INSV is vectored by the Western flower thrips.

The Western flower thrips has long been a pest of concern for lettuce, spinach, and cabbage growers because of the feeding damage it left behind, according to John Palumbo, Extension entomologist with the University of Arizona. That feeding damage also leaves crops unmarketable, particularly for fresh market uses.

According to Palumbo, the feeding damage may be more problematic than the INSV it vectors because of the biology of how that disease is vectored.

Daniel Hasegawa, a research entomologist with USDA-ARS in Salinas, says the Western flower thrips and its ability to vector tospoviruses — INSV and Tomato spotted wilt virus (TSWV) are examples of this — is limited. The virus must be acquired as larvae for the insect to vector the disease. Larvae alone cannot transmit the virus; only adults can transmit the virus. Additionally, the virus is not passed from adult to offspring.

This suggests that good thrips control can break this cycle because only the larvae, feeding on infected plant material, can acquire the pathogen and vector it once the insect reaches adult stage. Palumbo says thrips control can be achieved in part through good weed management. Keeping fields, the edges, and nearby areas free of locations for the pest to migrate is helpful. There are effective insecticides that are also helpful, he said.

Ongoing research

Scientists still do not know how INSV found its way to Arizona. Researchers with the University of Arizona, including Stephanie Slinski, a plant pathologist, and the associate director of the Yuma Center of Excellence for Desert Agriculture, continue to seek answers.

Slinski saw thrips in alfalfa last year and wondered if INSV could exist there and act as a "green bridge" of sorts between the growing seasons. She had similar questions about weeds that serve as a good thrips host. Her surveys turned up no positive INSV cases in the nearby alfalfa fields, but they did turn up common infections in nearby weed banks. Not all weeds showed positive INSV infections, leading to more questions.

Researchers with the University of California are likewise looking at the disease as it was found late in the desert growing season last year.

According to Apurba Barman, Extension integrated pest management advisor in Imperial County, Calif., the detection came at the end of the desert growing season, and "did not seem to be widespread and of significant concern this year."

Managing thrips populations in lettuce will be a priority this season, as will addressing weeds that can host thrips and/or the disease.

Source URL: https://www.farmprogress.com/crop-disease/insv-confirmed-desert-lettuce

INSECTICIDE EFFICACY OF WHITEFLY SPECIES IN LOW DESERT ALFALFA DIFFERS BY WHITEFLY SPECIES

Michael D. Rethwisch, Kassandra Allan, Marissa Kringen and Carla Pryor

The sweetpotato/silver leaf whitefly, *Bemisia tabaci*, is the whitefly species that typically infests low desert crops. The banded-winged whitefly, *Trialeurodes abutilonea*, can also be a pest that occasionally occurs in high numbers.

In 2020 several alfalfa fields in the Palo Verde Valley were infested with high numbers of both species, with these populations producing honeydew and resulting sooty mold. The high populations of mixed species in the same fields also provided opportunity to evaluate multiple insecticide products and document if comparative efficacy differences existed between the two whitefly species.

Plots of alfalfa (28 x 25 ft) in a first-year field of flat-planted alfalfa located west of Ripley, CA, were treated with nine (9) different insecticides on September 14, 2020, with some products also being evaluated at multiple rates and/or in combination with another insecticide.

Each treatment was replicated four (4) times, with a randomized complete block design. Insecticides were applied with a battery powered back-pack sprayer calibrated to deliver 18.1 gallons/acre. Hasten EA was used as the surfactant/ Alfalfa stems averaged approximately 11 inches in height on application date, and the field was already heavily infested with whiteflies.

Plots were sampled using a 15 inch diameter sweep net on Sept. 16, 21 and 27 (2, 6 and 13 days post treatment), with 10 pendulum sweeps utilized per plot. Insects were later counted and recorded after sweep net contents were transferred to containers and then frozen.

Most insecticides were very fast acting against adult banded-winged whiteflies, resulting in many fewer than untreated alfalfa at 2 days post treatment. Most treatments provided greater than 90% reduction of this species (Table 1).

Insecticide efficacy against adult *Bemisia tabaci* whiteflies was much different than that noted for banded-wing whiteflies, with Sefina® treatments (6, 10 and 14 oz./acre rates) resulting in fewest adults of this whitefly species of the evaluated insecticides (Table 1). This was also noted when total adult whitefly numbers were compared (Table 1).

Adult whitefly numbers declined between 2 and 6 days post treatment in untreated and most treated alfalfa plots. Increases total collected adult whiteflies were noted from group 4 insecticides (Sivanto and Transform) and insecticides which contained a pyrethoid active ingredient (Baythroid XL, Endigo ZCX) with these increases associated primarily with *Bemisia tabaci* whiteflies (Table 1).   More adult whiteflies were collected from alfalfa plots treated with Baythroid XL + Danadim Progress than in alfalfa treated with Danadim Progress by itself (Table 1).

The exact reason(s) for these increases is unclear but may be due to reduction of other beneficial insects that feed on whiteflies and/or increased attractiveness of alfalfa in these plots to adult whiteflies. Although numbers of beneficial insects were recorded, data indicated that populations of these insects in from treatments with increasing whitefly numbers at 6 days post treatment were similar to those of other treated alfalfa plots (Tables 2, 3).

Yield data (not shown) noted slightly more hay/acre from certain treatments, although differences may have been much greater if the experiment was initiated earlier in the growing cycle when alfalfa was much shorter. Another factor that contributed to the yields is thought to be the stem strength. Alfalfa treated with Sefina® had much lower percent lignification than untreated or alfalfa treated with other treatments.   This has not been noted in other alfalfa experiments that included Sefina® however, but may perhaps be an interaction of this treatment with alfalfa when whiteflies are present.

Table 1. Mean number of adult whiteflies collected in 10 sweeps of alfalfa following insecticide application on September 14, 2020, Ripley, California.

Treatment and oz./acre	Banded Winged Whiteflies				Sweetpotato/ Silverleaf whiteflies				Total adult whiteflies		
	Sept. 16	Sept. 21	Sept. 27		Sept. 16	Sept. 21	Sept. 27		Sept. 16	Sept. 21	Sept. 27
Baythroid XL 2.8	96.0	50.1	106.4		1,026.5	1,267.6	766.8		1,122.5	1,317.7	873.2
Beleaf 2.8	22.8	5.5	55.8		704.4	510.8	705.7		727.3	516.3	761.5
Beleaf 3.5	38.3	19.9	32.4		602.0	642.6	874.8		640.3	662.5	907.2
Danadim Progress 16	32.6	17.1	81.0		637.9	597.4	586.5		670.5	614.5	667.5
Baythroid XL 2.8 + Danadim Progress 16	62.2	23.4	89.5		776.1	711.1	721.0		838.3	734.5	810.5
*****Endigo ZCX 4.5	28.2	24.0	70.7		797.8	1,160.5	811.8		826.0	1,184.5	882.5
*****PQZ 2.4	247.0	13.2	26.5		341.7	382.0	600.3		588.8	395.2	626.8
Sefina 6	52.8	3.6	25.8		287.2	185.4	561.2		340.0	189.0	587.0
Sefina 10	12.2	7.5	19.6		163.3	189.7	421.0		175.5	197.2	440.6
Sefina 14	11.2	7.6	16.8		168.3	223.9	511.6		179.5	231.5	528.4
Sivanto Prime 12	18.4	47.6	70.7		446.4	797.4	533.1		464.8	845.0	603.8
*****Torac 21	162.3	17.8	87.2		688.7	549.2	654.6		851.0	567.0	741.8
*****Transform 2.25	52.1	55.5	50.1		884.4	1,198.7	605.9		936.5	1,254.2	656.0
Untreated	802.6	23.1	48.7		1,059.9	729.9	441.3		1,862.5	753.0	490.0

**Insecticide active ingredient not registered for usage on low desert California alfalfa hay as of Sept. 9, 2021*

Table 2. Mean number of big-eyed bugs, damsel bugs and minute pirate bugs collected in 10 sweeps of alfalfa following insecticide application on September 14, 2020, Ripley, California.

Treatment and oz./acre	Big-eyed Bugs				Damsel Bugs				Minute Pirate Bugs		
	Sept. 16	Sept. 21	Sept. 27		Sept. 16	Sept. 21	Sept. 27		Sept. 16	Sept. 21	Sept. 27
Baythroid XL 2.8	1.8	6.5	18.0		3.0	3.3	6.3		3.0	2.0	0.8
Beleaf 2.8	2.8	6.5	12.3		1.8	2.3	4.3		1.8	0.0	2.3
Beleaf 3.5	4.8	7.0	17.8		1.8	1.0	3.8		1.8	2.0	0.0
Danadim Progress 16	0.8	7.5	16.5		2.0	1.8	3.3		2.0	2.3	0.8
Baythroid XL 2.8 + Danadim Progress 16	4.3	3.5	15.3		2.0	2.3	6.8		2.0	0.5	0.8
*Endigo ZCX 4.5	3.0	3.8	9.8		1.0	0.0	1.0		1.0	0.5	1.8
*PQZ 2.4	5.0	6.5	21.3		1.3	2.0	5.3		1.3	1.0	1.5
Sefina 6	2.3	7.0	19.0		1.8	1.5	5.8		1.8	0.5	1.0
Sefina 10	2.0	8.0	19.8		3.5	2.8	6.0		3.5	1.3	1.8
Sefina 14	3.3	6.5	22.3		3.0	2.5	4.5		3.0	0.5	0.3
Sivanto Prime 12	4.3	7.0	17.5		1.3	3.0	6.3		1.3	0.5	0.5
*Torac 21	2.5	7.0	16.3		1.5	1.8	5.5		1.5	1.3	2.5
*Transform 2.25	5.0	7.3	9.8		1.3	5.8	7.0		1.3	1.0	1.0
Untreated	4.5	12.8	19.0		2.3	5.5	5.8		2.3	1.3	0.3

**Insecticide active ingredient not registered for usage on low desert California alfalfa hay as of Sept. 9, 2021*

Table 3. Mean number of assassin bug, white-marked fleahoppers, and total beneficial bugs collected in 10 sweeps of alfalfa following insecticide application on September 14, 2020, Ripley, California.

Treatment and oz./acre	Assassin Bugs			Whitemarked Fleahoppers			Total Beneficial Bugs		
	Sept. 16	Sept. 21	Sept. 27	Sept. 16	Sept. 21	Sept. 27	Sept. 16	Sept. 21	Sept. 27
Baythroid XL 2.8	0.0	0.0	0.5	4.3	6.0	3.8	12.5	17.8	29.3
Beleaf 2.8	0.0	0.0	0.5	2.3	1.0	2.5	8.3	9.8	21.8
Beleaf 3.5	0.0	0.5	0.5	3.3	1.5	2.3	12.0	12.0	24.3
Danadim Progress 16	0.0	0.0	0.0	5.0	5.3	4.0	9.3	16.8	24.5
Baythroid XL 2.8 + Danadim Progress 16	0.3	0.0	0.0	7.5	4.8	3.3	15.0	11.0	26.0
*Endigo ZCX 4.5	0.0	0.3	0.3	1.3	3.5	3.8	5.3	8.0	16.5
*PQZ 2.4	0.3	0.0	0.5	4.8	2.3	3.8	13.5	11.8	32.3
Sefina 6	0.0	0.0	0.5	3.3	2.0	2.0	10.8	11.0	28.3
Sefina 10	0.3	0.3	0.0	5.5	1.3	2.0	12.5	13.5	29.5
Sefina 14	0.3	0.0	0.8	3.0	1.3	2.0	11.8	10.8	29.8
Sivanto Prime 12	0.3	0.0	0.3	4.5	1.5	1.3	14.0	12.0	25.8
*Torac 21	0.0	0.8	0.0	2.5	2.8	1.8	9.5	13.5	26.0
*Transform 2.25	0.3	0.0	0.0	1.3	1.8	2.5	9.8	15.8	20.3
Untreated	0.0	0.8	0.0	5.8	4.3	4.3	15.5	24.5	29.3

**Insecticide active ingredient not registered for usage on low desert California alfalfa hay as of Sept. 9, 2021*

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 is 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 including 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 September 1 to November 30 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	September		October		November	
	1-15	16-30	1-15	16-31	1-15	16-30
Calipatria	0.26	0.23	0.21	0.18	0.13	0.11
El Centro (Seeley)	0.26	0.25	0.22	0.18	0.14	0.12
Holtville (Meloland)	0.26	0.24	0.20	0.16	0.13	0.11

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/.