Imperial County Agricultural Briefs

Features from your Advisors

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BEST WATER AND NITROGEN MANAGEMENT PRACTICES IN THE LOW DESERT CARROTS: A PRELIMINARY ASSESSMENT

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Introduction. Carrots are one of the ten major commodities in Imperial County, California with an average acreage of nearly 16,000 over the past decade (2010-2019 Imperial County Agricultural Crop & Livestock Reports). The farm gate value of fresh market and processing carrots was about 66 million dollars in 2019. In the Imperial Valley, most carrots are typically sprinkler irrigated for stand establishment and subsequently furrow irrigated for the remainder of the growing season. However, some fields are irrigated by solid set sprinkler systems the entire crop season (Figure 1).

Figure 1. Carrot fields under solid set sprinkler (left) and furrow (right) irrigation systems in the Imperial Valley.

Nitrogen (N) and irrigation management in carrot production systems is critical for increasing the efficiency of crop production and decreasing costs and nitrate leaching losses. The N needs of carrots for optimum storage root yield depends on the climate, soil, and residual soil N from the previous season. To accomplish greater N and water efficiency, more accurate crop water use information of carrots is required with respect to different soil types, carrot crops, weather, and farming practices. Utilizing more accurate estimates of crop water consumption and N uptake may have a significant impact on water quality issues and on soil water and N availability, potentially increasing the economic sustainability of carrot production. This ongoing study seeks to quantify and fully understand carrot production issues 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 preliminary results of the study.

Field experiment. The field experiments were conducted at the University of California Desert Research and Extension Center (DREC, Figure 2) located in Holtville, California during the 2019-2020 crop season. The trial consisted of two sprinkler irrigation regimes and three nitrogen strategies. In addition, measurements were conducted in five commercial fields in the Imperial Valley with various soil types and under sprinkler and furrow irrigation. Stand establishment was accomplished by sprinklers at the experimental sites.

Figure 2. Monitoring station in treatment I1N1 at the UC DREC trial.

The actual crop water consumption (actual crop ET; ET stands for crop evapotranspiration) was measured using the residual of the energy balance method with a combination of surface renewal and eddy covariance equipment (fully automated ET tower showed in Figure 3). As an affordable tool to estimate actual crop ET, Tule Technology sensors (www.tuletechnologis.com) were also set up at all experimental sites. The Tule ET data were verified using the ET estimates from the fully automated ET station. Soil moisture sensors were installed at multiple depths to monitor soil water potential on a continuous basis (Figure 3). In both the DREC trial and the commercial sites, actual soil nitrate content at the crop rot zone (1-5 feet) and the total N in the plants (tops and roots) were measured several times per crop season.

Figure 3. Fully automated ET tower (right) and a multi depths soil moisture sensor monitoring station equipped along with Tule sensor (left).

Results. The common irrigation practice in carrot stand establishment is to irrigate the field every other day during the first two to three weeks after seeding. Carrots germinate slowly, and hence, the beds need to be kept moist to prevent crusting. A comparison of applied water and crop water consumption indicates that the carrot fields could be over irrigated by three times of crop water requirements during the stand establishment.

A wide range in the length of the crop season (seeding through harvest) was observed, ranging from a 128-day period in a processing carrot through a 177-day period in a fresh-market carrot. The seasonal crop water consumption varied between 12.5-in and 16.6-in at the experimental sites (Figure 4a). The results clearly demonstrate that carrot fields may have variable irrigation water requirements depending upon early/late planting, processing vs. fresh market, irrigation practices, length of crop season, and soil type. A peak daily crop water use of 0.21-in on March 23rd, 151 days after planting, was observed in a fresh market carrot field (Figure 4b).

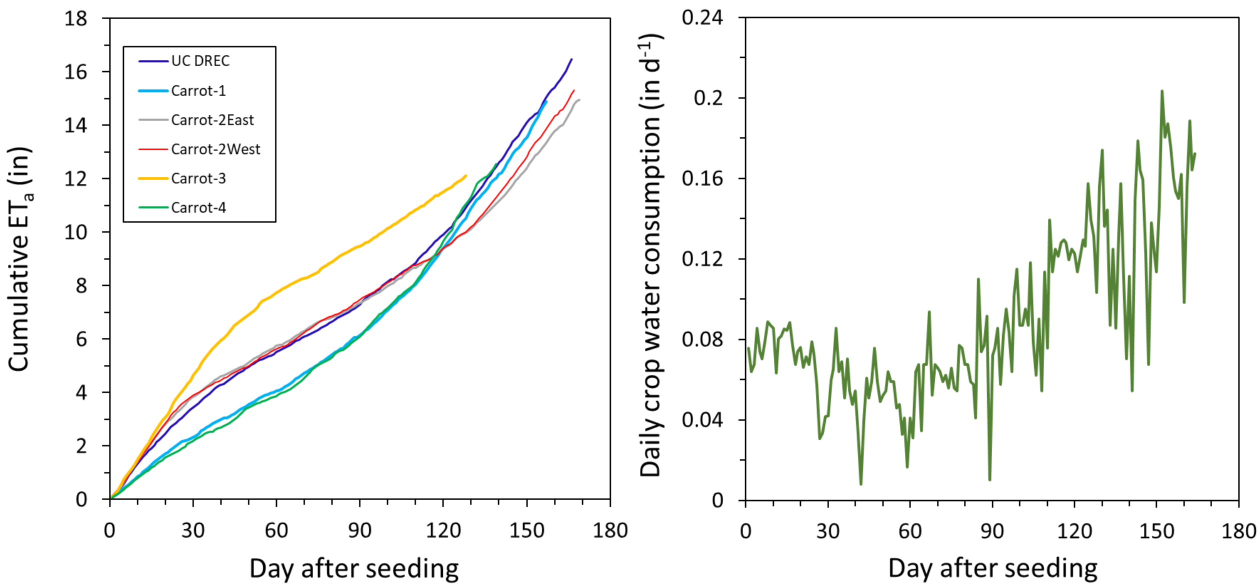


Figure 4. Cumulative actual crop ET in the experimental fields (a), and daily actual crop ET at a fresh market Carrots.

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 reduce salinity issues which is important since carrots are very sensitive to salt accumulation.

The irrigation water that needs to be applied in an individual field depends on crop water requirements and the efficiency of irrigation system. Assuming an average irrigation efficiency of 70%, the approximate gross irrigation water needs of carrot fields in the low desert would be 1.9-2.1 ac-feet/ac (pre-irrigation is not included). Pre-irrigation along with proper irrigation scheduling over the season may effectively maintain crop water needs and salinity in carrots.

The preliminary results of this study demonstrate a notable amount of N uptake both in the roots and tops at harvest time. For instance, a total N content of 286 lbs./acre was observed in a fresh-market carrot field plants grown for a period of 164 days, including a 149 and 137 lbs./acre of N in roots and tops, respectively (Figure 5). In processing carrots, the total N content was 297 lbs./acre (123 lbs./acre in roots and 174 lbs./acre in tops, respectively). Total N uptake trends in the roots and tops was similar with rapid increase beginning 55 days and

45 days after seeding, respectively. The rate of increase in total N content in the roots did not decline near harvest in any of the experimental sites, while it declined in the tops for fresh market carrots beginning 125 days after seeding.

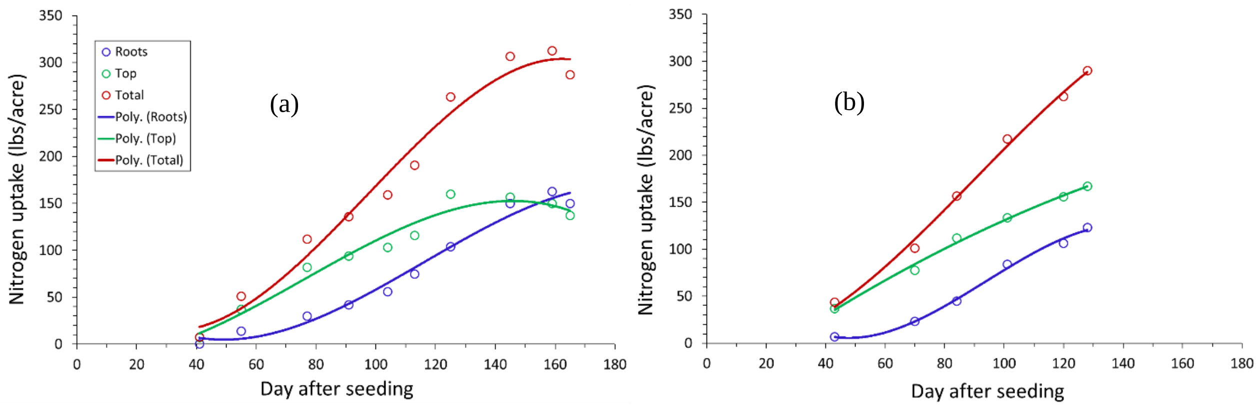


Figure 5. Nitrogen uptake curves developed for a fresh market carrot field (a) and a processing carrot field (b).

The nitrogen uptake amounts were determined using the plant density measured 20-25 days after seeding, the fresh and dry weights of roots and foliage, and the N concentration from lab analysis. The processing carrot field was harvested very early by the cooperative grower (128-day crop season) and the research staff was able to continue measurements by the harvest day.

Nearly 50% of seasonal N accumulated in the tops and the roots occurred at 85-90 days after planting when the canopy is fully developed. An effective nitrogen fertilizer application could be splitting N application into 10-15% at planting, and the remainders through irrigation events over the season. Assuming a 150–170-day period as carrot crop season, it is recommended to apply the total nitrogen fertilizers by 15-20 days before harvest. The results of this study illustrate that a 45-55% of total N accumulated in the carrot plants are left in the fields as residual soil N right after harvest that could contribute as a source of nitrogen for the following season (Figure 6). Further work is needed to quantify which fraction of N provided by the plant residues potentially contribute to the following season, particularly since there is a risk of leaching a portion of residual N due to heavy pre-irrigation in the late summer during land preparation.

Figure 6. A fresh market carrot field in the Imperial Valley after harvest. It demonstrates the carrot tops, plant residues, left in the field.

Note: This project was funded by CDFA-Fertilizer Research and Education Program and California Fresh Carrots Advisory Board. Three UC academics, Daniel Geisseler, Michael Cahn, and Jaspreet Sidhu are collaborating with the project. While this article aims to briefly deliver some preliminary results before the next carrot crop season in the low desert, more details and the findings of two-year experiment will be published soon. If you have any question regarding this project or best irrigation and nitrogen management practices in carrots, please feel free to contact me at (442) 265-7707 or email me at amontazar@ucanr.edu.

MAY 2021 CATTLECAL NEWSLETTER UPDATE

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

This month the CattleCal Newsletter covered information with regards to phase feeding strategies to meet metabolizable amino acid requirements in calf-fed Holstein steers in the feedlot and included an update on our current research at the UC DREC feedlot. We also include transcripts from our podcast episodes featuring Dr. Tara Felix, a extension beef specialist at Penn State University. 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/

The CattleCal podcast released four episodes in April.

- **Week 1: Career Call**

  In this episode we talk to Dr. Tara Felix, an Assistant Professor and Beef Extension Specialist at Penn State University. Dr. Felix shared a lot of nice stories about her career, a time that she spent in Russia during undergrad, at the end, she left us with a lot of great TopTips to think about career and life as well!

- **Week 2: Research Call**

  In this episode, we called Dr. Tara Felix from Penn State University. Dr. Felix discusses her research project that she is currently developing and her perspective on the use of beef semen on dairy cows.

- **Week 3: Feedlot Research Call**

  In this episode, join Pedro Carvalho and Brooke Latack as they discuss a study looking at phase feeding strategies to meet metabolizable amino acid requirements for calf-fed Holstein steers.

- **Week 4: Quiz Zinn**

  This week we ask Dr. Richard Zinn about the use of feed additives in feedlot cattle diets.

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!

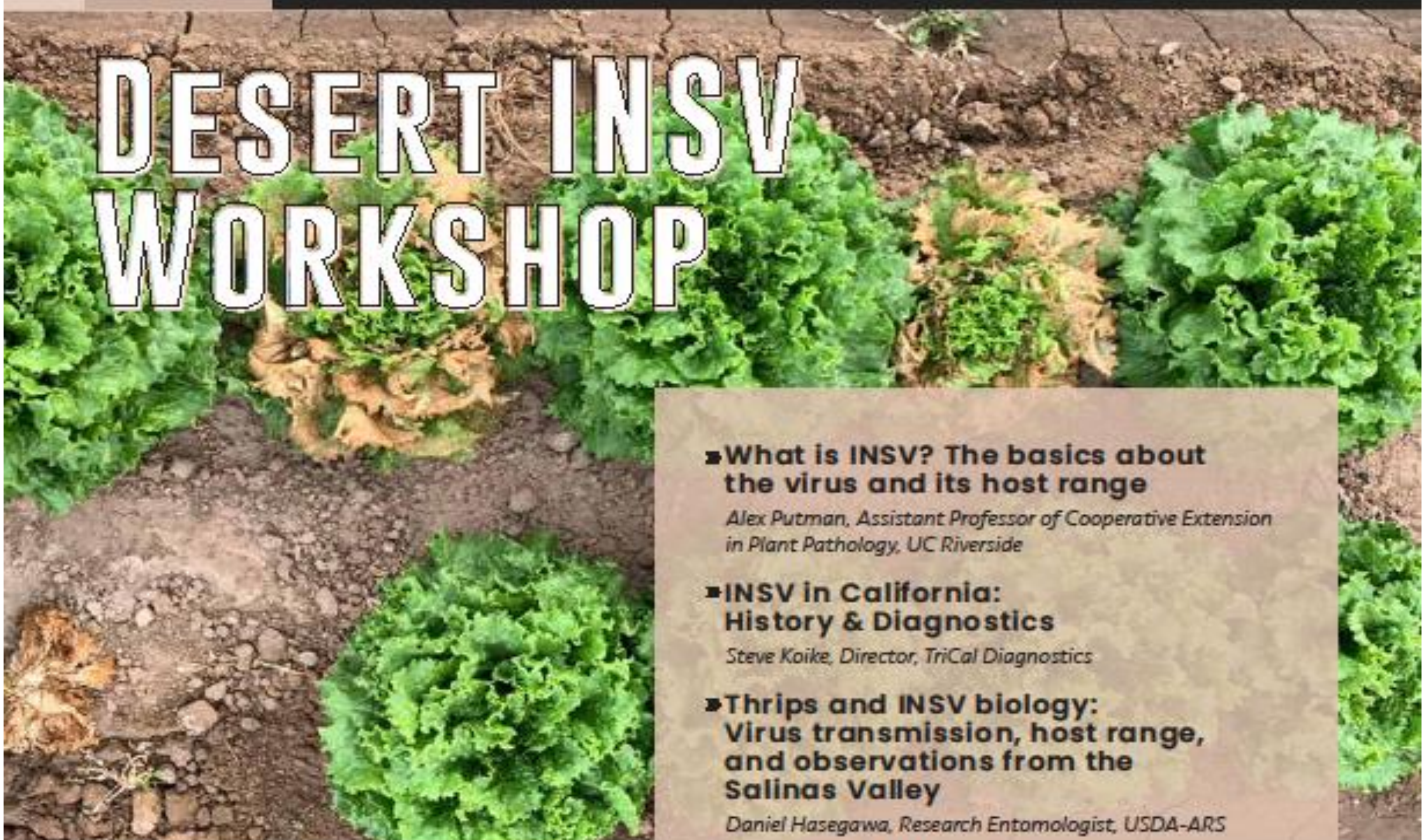
If you have burning questions about cattle management and would like your questions featured on our Quiz Zinn episodes, please send questions to cattlecalucd@gmail.com or DM your question to our Instagram account @cattlecal.

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

The University of Arizona Yuma Center of Excellence for Desert Agriculture | The University of Arizona Cooperative Extension Yuma County | UC RIVERSIDE University of California

DESERT INSV WORKSHOP



SAVE THE DATE

WEDNESDAY AUGUST 11 8-11am

- **What is INSV? The basics about the virus and its host range**
  Alex Putman, Assistant Professor of Cooperative Extension in Plant Pathology, UC Riverside
- **INSV in California: History & Diagnostics**
  Steve Koike, Director, TriCal Diagnostics
- **Thrips and INSV biology: Virus transmission, host range, and observations from the Salinas Valley**
  Daniel Hasegawa, Research Entomologist, USDA-ARS
- **2021 Weed/INSV Survey**
  Stephanie Slinski, Associate Director of Research, YCEDA, UArizona
- **Weed Dynamics in the Desert and the Potential of Weeds to Serve as a Reservoir for INSV**
  Marco Peña, Assistant in Extension, Yuma Ag Center, UArizona
- **Rethinking How We Manage Western Flower Thrips in Desert Lettuce**
  John Palumbo, Research Scientist and Extension Specialist, Department of Entomology, Yuma Ag Center, UArizona

AZ & CA CEUs pending
Registration Opens June 8: https://desertagsolutions.org/events/492-desert-insv-workshop

MANAGING SILVERLEAF WHITEFLY ON MELON CROPS

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

Silverleaf whitefly (*Bemisia tabaci*) is a common insect pest that infests a numerous fruit and vegetable crops. In melons, silverleaf whitefly is a serious concern as high population feeding pressure can significantly reduce the yield and quality of the crop and also vector several viral diseases such as Cucurbit leaf crumple virus (CuLCrV), Squash leaf curl virus (SLCV) and Cucurbit yellow stunting disorder virus (CYSDV). Although these viral diseases are not widespread and consistent, they can result in significant crop loss if no control measures for whiteflies are utilized, especially on fall crops. Therefore, it is important to scout melon fields for presence and relative density of silverleaf whitefly along with the unusual symptoms expressed by the plants.

Adult silverleaf whiteflies are mostly located on the underside of leaves and their density is typically greater on young, terminal leaves. They can infest melon from a very early stage of the crop and are seen usually in clusters. Females can lay up to 300 eggs, which subsequently go through four different immature growth stages prior to becoming adults. The first immature stage of silverleaf whitefly is called a “crawler” as this is the only mobile stage among the four immature stages of the insect. The 2nd, 3rd and 4th immature stages of the insect are translucent, oval shaped and do not move. They constantly feed on phloem sap of the leaf and excrete honey dew. Excess deposition of thus honeydew on leaf or fruit surface can lead to development of sooty mold, with a black layer often noted on those honeydew covered surfaces. This phenomenon can limit photosynthetic activities of the affected leaves and indirectly reduce the plant vigor.

Various cropping systems are at risk of silverleaf whitefly infestation due to the several characteristics of this insect such as high reproductive potential, short generation time and a wide range of host plants that includes numerous crops and weed species. Since whiteflies have multiple host plants, they are constantly present in the cropping system either by infesting other crops or sheltering on weeds. In Imperial Valley, they can be found early in the year, although at low density, on cabbage, broccoli, lettuce, alfalfa etc. Additionally, whiteflies are abundantly found on available weeds such as malva, wild lettuce and sowthistle.

In Imperial Valley, silverleaf whiteflies can complete a generation in less than 20 days and adults can live up to three weeks, thus they can easily complete 12-13 generations in a year. This insect can tolerate dry weather and high temperatures, although extreme heat tends to slow down their rate of reproduction and prolong generation time.

The key to the management of silverleaf whitefly is scouting and making sure that the populations do not get out of control. Yellow sticky cards placed on or near the field can be used as a tool to monitor whitefly activities, but inspection of the underside of the leaves is necessary to get an accurate estimate of the actual pest population (Fig 1).

Fig. 1 Silverleaf whitefly adults on the underside of young terminal leaves of melon crop

Adults tend to be more concentrated on young leaves and are easily visible. Sampling of older leaves can reveal the level of pest pressure based on the number of immature insects. In order to enumerate the immature population, a hand lens with 10-20x magnification is helpful. Natural enemies such as lady beetles, big-eyed bugs and minute pirate bugs are primary predators of whiteflies and have the potential to suppress pest population under low pest densities. However, whitefly populations grow at a fast and at an exponential rate, which is often difficult to maintain by the natural enemies, and insecticide applications become inevitable to bring whitefly populations under control.

Soil application of neonicotinoids (Dinotefuran, Imidacloprid and Thiamethoxam) or cyantraniliprole is helpful in preventing early infestations of whiteflies when a melon crop is at the seedling stage and can protect the crop for 2-3 weeks. Prior to the introduction of bees, foliar applications of insecticides such insect growth regulators, neonicotinoids and diamides are effective in controlling immatures and to some extent adult populations. Since adults can move from outside of the field or within a field, insecticide applications are less effective against them as compared to immature whiteflies.

Spray coverage is critically important for efficient whitefly management as sufficient product must be deposited on the leaf surface to be effective on both adults and immatures, which feed on the underside of the leaves. For available chemical control options for silverleaf whitefly management on melon crops, please visit the resource materials on UCIPM website (http://ipm.ucanr.edu/PMG/r116301211.html).

Other resources:

https://vegetableipmupdates.arizona.edu/entomology-updates-john-c-palumbo

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 May 1st to July 31th for the Imperial Valley stations are presented in Table 1. These values were calculated using the long-term data of each station.

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

Station	June		July		August	
	1-15	16-30	1-15	16-31	1-15	16-31
Calipatria	0.31	0.32	0.32	0.31	0.30	0.28
El Centro (Seeley)	0.34	0.36	0.33	0.31	0.30	0.28
Holtville (Meloland)	0.33	0.34	0.32	0.31	0.30	0.28

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/.