Imperial County *Agricultural Briefs*

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Agriculture and Natural Resources

Features from your Advisors

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IS DRIP-IRRIGATION A VIABLE PRACTICE IN THE LOW DESERT REGION?

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Drip irrigation first appeared in California agriculture in 1969-1970. Enthusiasm rose rapidly because of the newness of the practice and high hopes for substantial water saving. In 1991, when California was experiencing a major drought, 70 percent of farms were irrigated by gravity methods and only 15 percent by "low volume" methods, which include drip and micro-sprinkler irrigation. By 2010, low volume irrigation methods were implemented in 38 percent of farms (California DWR, 2013).

Figure 1. Alfalfa field in buried drip and irrigation control station (Blythe, PV)

Drip irrigation saved substantial amounts of water in some cases and a significant amount in all cases and is particularly important where water is limited and expensive. This irrigation method has the advantage of precisely applying irrigation water in both location and amount, thus offering the potential for increased profit and revenue due to reduced water, fertilizer, cultural costs and increased production and quality. Many farmers and gardeners have discovered that drip irrigation produces healthier plants and better yields. The use of drip irrigation also decreased the incidence of plant disease that can occur with the use of overhead sprinkler irrigation. Furthermore, many water-soluble fertilizers can be applied through drip system, thereby keeping nutrients near the root zone and allowing the plants to get the most value from each fertilizer application.

Figure 2. Sugar beets field in buried drip (Westmorland, IV)

Drip irrigation for precise application of water and fertilizer. Drip irrigation slowly releases low-pressure water near the effective root zone, allowing for the precise application of water and fertilizer to meet crop needs. It provides precise timing and application of fertilizer nutrients, resulting in improved fertilizer application efficiency. Increased efficiency not only saves production costs but also reduces the potential of water pollution due to less/no fertilizer leaching.

More frequent irrigation through drip irrigation practice enhances water distribution uniformity over space and time. It maintains soil moisture content around the root zone near optimal levels. In other words, a well-managed micro-irrigation system should maintain a moisture level above the predetermined threshold.

Over-irrigation should be avoided, because over saturated soils can injure plants by causing inadequate root aeration promoting root rot and/or loss of nutrients. Sandy soils are well known for their inability to hold water. Very little water is stored in the crop root zone. Excessive water applications in sandy soils result in the loss of mobile nutrients such as nitrogen, due to deep percolation. These soil properties require effective irrigation scheduling to avoid unnecessary loss of water and nutrients while providing sufficient amount of water for optimum plant growth and production.

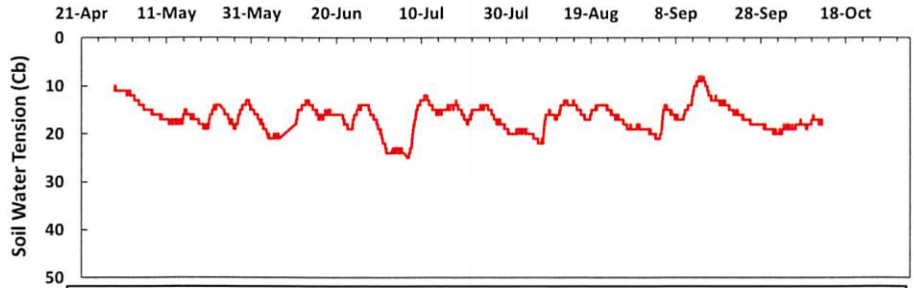


Figure 3. Maintaining soil moisture status at a desirable level over the growing season- alfalfa field in buried drip (Sacramento Valley)

Figure 4. Lettuce field in drip (Salinas Valley)

For soils with poor infiltration rates, irrigation water fails to penetrate to the lower root zone except under drip irrigation. Drip irrigation showed positive impact due to its slow and very frequent water supply and effective water penetration to the lower soil layers.

Figure 5. Date palm orchard in drip (Coachella Valley)

Higher yield production. Effective watering and nutrient supply always result in increased yields. Drip irrigation may reduce total water application, increase crop productivity, and generate significant economic benefits and profitability. For instance, it is quite likely that crop yields may improve under subsurface drip irrigation than flood irrigation in alfalfa. Growers in the long-seasoned environment of Central and Southern California and Arizona have reported increased yields from drip irrigated crops averaging 3 ton/acre over their check-flood fields.

Less water-related disease. With drip irrigation, water is not applied to plant foliage, hence maintain drier aboveground plants and reduce susceptibility to disease outbreak, resulting in reduced need for fungicides. This is one of the most advantages of drip irrigation in organic vegetables. On the other hand, overhead irrigation can spread foliar diseases and increase disease potential while flood irrigation can spread soil borne diseases.

Minimizing salinity issues. Drip irrigation can minimize salinity problems in different ways: (1) by reducing evaporation from wet soil surfaces (which concentrates salt), (2) continually moving soluble salts to the edge of the wetting pattern and pushing them away from crop roots, and (3) high-frequency drip irrigation applications which maintain relatively constant soil water content and soil salinity level over time near the drip lines. Consequently, in-season leaching requirements are minimal for most drip-irrigated vegetable crop operations. The exceptions are: (1) areas of high initial soil salinity, poor water quality (>1,200 PPM soluble salts) or poor soil structure and/or drainage, and (2) areas of high ET and low annual rainfall including the low desert region. Under such circumstances, soil salinity is best handled by leaching the soil profile before planting, as is typically done in sprinkler- or flood-irrigated systems. When in-season leaching is required, a specific leaching fraction can be built into the calculation of the irrigation requirement. Subsurface drip irrigation greatly reduces evaporation from the soil surface, while salt accumulation above buried drip lines is a concern in this region.

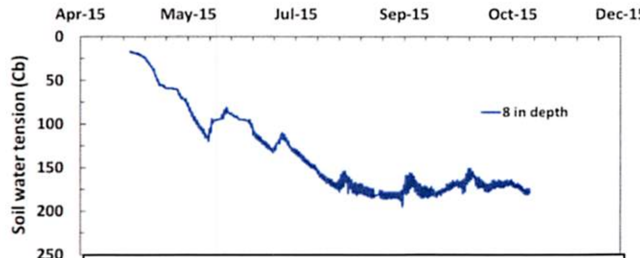


Figure 6. Low soil moisture content in the soil top layer results less soil evaporation (alfalfa field in buried drip- Sacramento Valley)

Applying small amounts of crop fertilizer requirement results in reduced potential for soluble salt injury to crops. This benefit of drip irrigation can improve plant stands and overall crop uniformity and yield. Drip irrigation is particularly important when using water sources that are high in soluble salts.

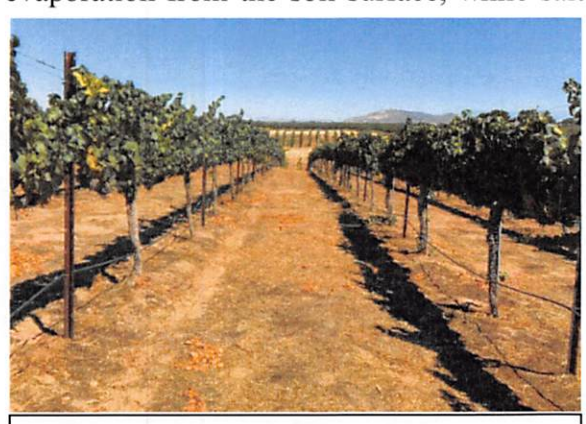


Figure 7. Vineyard in drip (Temecula, CA)

Figure 8. Tape damaged by gophers in alfalfa field

Realizing the full water savings from drip irrigation requires proper management and maintenance. The system may have benefits and challenges. Drip irrigation needs high quality water to prevent emitters from clogging. Rodent or gopher damage is another major challenge faced by drip technology. Drip systems must be carefully designed and installed so that fertilizers and chemicals can be applied safely, legally, and in efficient manner. The system has a high initial cost and should be designed and installed by competent and technologically skilled irrigation industry representative to ensure operable and cost-effective system.

Conclusions. The development of buried drip tape may avoid problems generated by 115°F daytime temperatures in the low desert region and the seemingly perpetual ultraviolet degradation of plastic and other materials exposed to sunlight. The biggest obstacle for the widespread implementation of buried drip irrigation for low value crops is high initial costs of the system. Although growers may be able to compensate their costs in few years (high payback), with favorable yields and market conditions, many growers do not favor high capital investments. Crop rotation and multiple-cropping needs must be considered when designing drip systems. Alfalfa, wheat, and corn may be good candidates as field crops rotation. Watermelon and melon might be other candidates. Shallow depth buried drip in sugar beets and onions is currently practiced in the Imperial Valley. Using micro sprinklers and drip irrigation for date palms, grapes, citrus, and lemons are already practiced successfully in Riverside and Imperial Counties.


Figure 9. Bell pepper field in drip (Coachella Valley)

For many vegetable growers drip irrigation is the most practical solution. Drip irrigation has been positively adopted for cool-season vegetables such as lettuce, cauliflower, celery, broccoli, and artichoke in the coastal valleys of California. Initially, subsurface drip irrigation was used, but now most growers use surface drip irrigation and extract drip tapes after each crop and later use. It worth to give it a try for the key vegetable crops in the low desert region as well, preferably with shallow depth driplines. There are prosperous experiences, using drip irrigation, in vegetable crops in the Coachella Valley. Drip irrigation may minimize food safety risks due to irrigation water, reduce water-related diseases such as downy mildew, improve crop productivity and quality, and water and fertilizer efficiency in vegetable crop production. Labor-intensiveness and higher relative cost are some of the challenges for vegetable production under semi-solid sprinkler systems in the Imperial Valley. Drip irrigation may reduce labor costs than the common irrigation practices.

Since micro irrigation may have promises and pitfalls, like any other irrigation practice, we would need to conduct comprehensive viability evaluation on low-volume irrigation system in the low desert region. Well-designed and properly-managed drip irrigation system is an effective solution for profitable and sustainable agriculture in the low desert region. Well-designed and properly-managed drip irrigation system is an effective solution for profitable and sustainable agriculture in the low desert region. Optimal benefits of drip irrigation highly dependent upon on irrigation scheduling and nutrient management, regular maintenance, effective filtration, and low water pressure variations. It is wise to keep in mind that drip irrigation technology has the potential to address soil and water-related issues in the low desert, if the technology is integrated with effective management practices and tools.

Figure 10. Celery field in drip irrigation (Ventura, CA)

University of California
Agriculture and Natural Resources

1st Annual Desert Agriculture and Natural Resources Symposium
February 28, 2018
UCR Palm Desert Auditorium, Palm Desert, CA

Morning Session
(FREE – no registration required)

8:00 AM – 11:30 AM

Learn about Desert Research and Education activities from UC and Non-UC experts and about services and programs offered by other non-profit desert organizations.

(Lunch available on-site between sessions for a nominal fee)

Afternoon Session: 12:15-5:30pm ($40):

Attend one of the three workshops sponsored by UC ANR & CAPCA specifically, oriented to the desert agriculture industry:

- Crop Production/Irrigation (3.5 DPR, 5 CCA, 2 ISA, 3.5 CCN Pro CEUs approved)
- Landscape/Turf Management (5 DPR, 5 CCA, 4 ISA, 5 CCN Pro CEUs approved)
- Livestock and Feed Quality (No CEUs)

You "Must Register" on the CAPCA website for the afternoon session:
https://capca.com/events/palm-desert-capca-ed-uc-anr-desert-agriculture-

For further information, please contact;

Oli Bachie, Agronomy Advisor, Imperial County, (obachie@ucanr.edu), (442)265-7700;
Etaferahu Takele, Farm Management Economics Advisor, Riverside, ettakele@ucanr.edu), (951) 683-649,
Janet Hartin, Environmental Hort. advisor, San Bernardino, (jshartin@ucanr.edu), (951) 313-2023

INVITATION TO THE UPCOMING CALIFORNIA WEED SCIENCE SOCIETY ANNUAL MEETING

Pratap Devkota, Weed Science Advisor, UCCE Imperial and Riverside Counties

I would like to invite growers, PCA's, CCA's, and other interested individuals & organizations to attend the upcoming California Weed Science Society annual meeting. The meeting will last for two and half days from January 24-26, 2018. It will be held at Fess Parker DoubleTree Resort (633 East Cabrillo Boulevard, Santa Barbara, CA 93103). What you could benefit from the meeting:

1. Get new information on what is happening for weed management in California.
2. Update on weed control topics in various areas, from production agriculture (agronomic and vegetable crops), organic production systems, and tree crops to natural systems, road sides, and laws & regulations from DPR.
3. Information addressing herbicide options and challenges for the California Cannabis industry.
4. A great meeting for DPR license holders to earn 17 DPR hours which includes four laws and regulations hours.

More information's on this meeting (program schedules, presentation titles, and registration forms) can be accessed from this link: http://www.cwss.org/events/. Meeting flyer and announcement is shown on the next page.

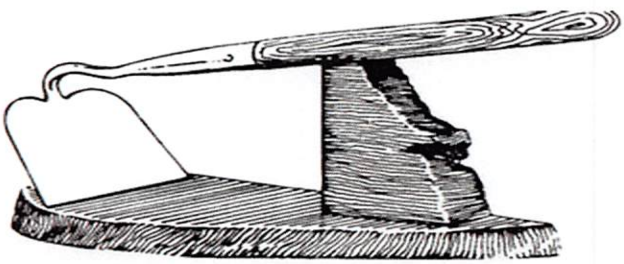
If you need further information about this meeting, please email me: pdevkota@ucanr.edu or phone: 442-265-7708.

Hope to see you in Santa Barbara, CA.

California Weed Science Society

2018 Annual Conference

"California Weed Science: From Restoration to Recreation"



CWSS 1948-2018

January 24-26, 2018

Fess Parker DoubleTree Resort
633 East Cabrillo Boulevard
Santa Barbara, CA 93103

CALIFORNIA WEED SCIENCE SOCIETY
P.O. Box 1961
West Sacramento, California 95691
(831)442-0883 (phone)
(831)442-2351 (fax)
www.cwss.org

17 DPR hours approved, including 4 Laws and Regulations

IRON (Fe) DEFICIENCY CAN CAUSE CHLOROSIS (YELLOWING) OF ALFALFA LEAVES

Oli Bachie, Agronomy Advisor, Imperial, Riverside & San Diego Counties & Director UCCE Imperial County
Pratap Devkota, Weed Science Advisor, UCCE Imperial and Riverside Counties

Around mid-December, we were asked to visit an alfalfa field in Holtville, CA where newly established alfalfa plants were showing chlorosis (yellowing) symptoms on the leaves with green mid-veins (see close shot of the picture, Figure 1). The chlorosis was more prevalent in low-side of the field and spots where irrigation water has been standing (water logged) for some time (Figure 2). There were sporadic chlorotic plants that were predominant in water logged than drained areas (Figure 3). There were more chlorotic plants at the irrigation head than at the central fields. The plants were distinctively stunted in the water-logged areas.

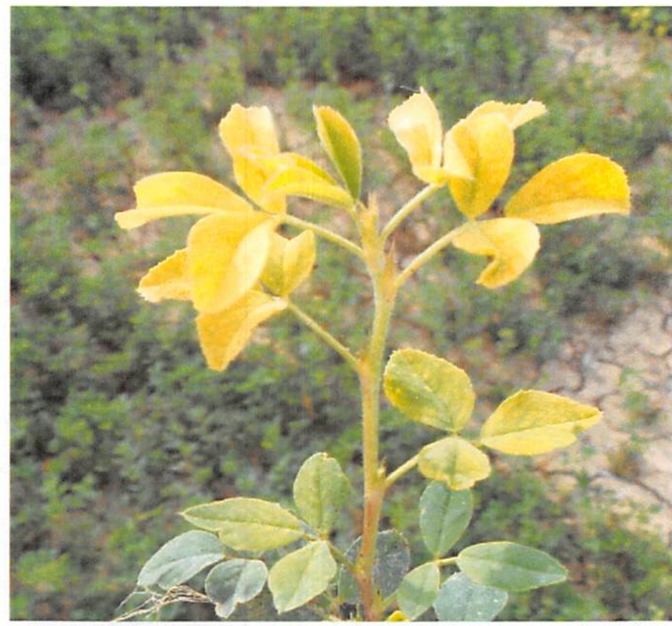


Figure 1: Close view of the chlorotic

We re-visited the field after about 10 days and observed that the field was well drained at this time, alfalfa plants were showing recovery, and leaf chlorosis was subsided., Only some patches near irrigation head (soil was still moist) had some yellow plants.

Figure 2: areas of the field showing more chlorotic symptoms

With the above situations, we tried to investigate what might have caused the alfalfa plant leaves turn into yellow in this field. This article highlights the potential causes of alfalfa leaf yellowing and provides suggestions on what can be done to overcome the problem. We note that several factors contribute to alfalfa leaf chlorosis. Some of these are;

1. Disease, particularly due to alfalfa mosaic virus (AMV)
2. Root Knot Nematodes (RKN)
3. Nitrogen deficiency
4. Micronutrient deficiency (Fe)

Figure 3: Excess moisture areas of the field showed higher intensity of chlorosis than other areas

Alfalfa leaf chlorosis was often localized to water logged areas of the field. The chlorosis was also district from the symptoms exhibited by either alfalfa yellowing virus (AVY) (figure 4) or nitrogen deficiency. We checked for root galling, a characteristic of RKN infection, but detected none. Further realizing that the field was irrigated and there was standing water at some areas of the field, the soil is predominantly heavy clay-loam soil with pH probably above 7.5, and that the symptoms were not widespread across the field, but limited to water logged areas, the possibility of biotic factors and nitrogen deficiency were ruled out from being the factors. Accordingly, the most likely reason seems to be micro-nutrient, most probably Iron (Fe) deficiency or excess moisture factor.

Figure 4: Alfalfa mosaic virus symptoms

Fe Deficiency – There are 18 nutrients essential or beneficial for the growth and productivity of alfalfa. The nutrients can be classified as; 1) structural nutrients – carbon, hydrogen, and oxygen; 2) macronutrients – nitrogen, phosphorus, and potassium; 3) secondary nutrients – calcium, magnesium, and sulfur; and 4) micronutrients – iron, manganese, boron, zinc, copper, molybdenum, chlorine, nickel, and cobalt. Some sources suggested that Imperial Valley soils with irrigation water stands (water logged) often become Fe deficient. Water logging causes lack of oxygen and makes iron and other micronutrients unavailable, leading to iron chlorosis. Saturated soil with high soil pH above 7.5 may exacerbate or worsen Fe deficiency (see Figure 5).

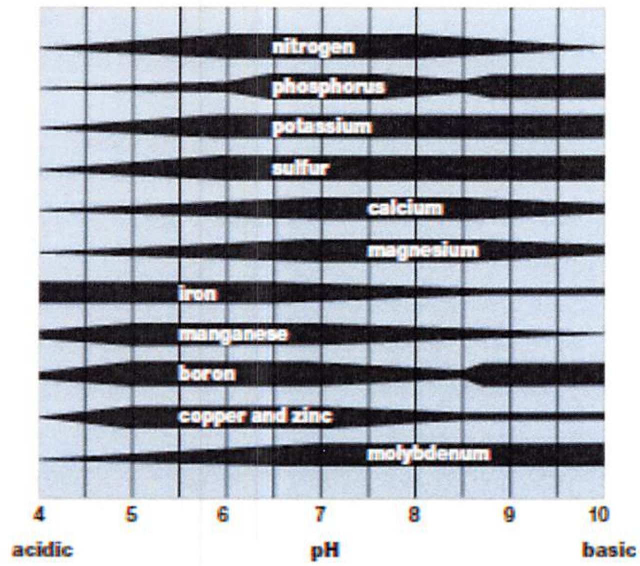


Figure 5: Nutrient availability in relation to pH

It must be noted that Fe is important for seedling vigor, root development, and early season growth of crops. It is the most commonly deficient nutrient for heavy soils with high pH, such as the low desert region, and symptoms is more pronounced after irrigation. Fe deficiency may also occur in fields with high concentration of $CaCO_3$. Fe deficiency may be difficult to diagnose with visual aid as it can be mistaken for effects of excessive water, although plants under Fe deficiency are in general stunted. Under normal field conditions, alfalfa Fe deficiency is a rare phenomenon as the deep roots of alfalfa can extract Fe from deeper sources.

Fe deficiency management options - some sources suggest that nothing is needed, and that the situation will improve on its own. As the soil dries, and aeration improves, the problem may most likely amend itself (true to our observation on a second visit). As alfalfa requires a well-drained soil for optimum production, it is important to improve drainage wherever excess water stands. Poor soil drainage may reduce movement of soil oxygen to roots, causes soil crusting and cause micronutrient toxicity or deficiency. For persistent alfalfa leaf chlorosis, growers may want to send soil and plant samples to a laboratory for accurate diagnosis of the problem. Soil or tissue sampling is also reliable to assess Fe deficiency. If soil – plant tissue confirms Fe deficiency, apply Fe-containing fertilizers at a recommended rate. For alfalfa, the normal is in the 100 ppm. At higher soil pH, Fe deficiency can be controlled by lowering the soil pH using high rates of elemental sulfur. In special situations where Fe deficiencies are suspected and for any other related issues, growers are encouraged to contact local UC Cooperative Extension advisors or their respective PCAs.

For more information, the following **additional references** may help.

1. Meyer R et al., 2007. Irrigated Alfalfa management for Mediterranean & desert Zones. UCANR publication 8292

2. Putnam, D., et al., 2014. Alfalfa and Forage News. http://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=13076, March 10

3. Undersander D. 2011. Alfalfa Management Guide. American Society of Agronomy, Inc.,

IMPERIAL VALLEY CIMIS REPORT AND UC WATER MANAGEMENT RESOURCES

Ali Montazar, Irrigation & Water Mgmt Advisor, UCCE Imperial & 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 January 1st to March 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	January		February		March	
	1-15	16-31	1-15	16-28	1-15	16-31
Calipatria	0.09	0.10	0.12	0.13	0.16	0.19
El Centro (Seeley)	0.10	0.11	0.13	0.15	0.19	0.22
Holtville (Meloland)	0.09	0.10	0.12	0.14	0.17	0.21

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/