Imperial County *Agricultural Briefs*

University of California
UC Cooperative Extension
Agriculture and Natural Resources

Features from your Advisors

October 2017

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University of California Cooperative Extension- Imperial County

Welcomes New Livestock Advisor Brooke Latack

After many years without one, UCCE-Imperial County recently hired a new livestock advisor. Brooke Latack graduated from Michigan State University with a B.S and M.S in Animal Science, focusing on the environmental impacts of livestock production. She worked on projects involving a broad range of management practices and integrated interactions between crop and livestock production to understand the sustainability of animal protein production.

She plans to help producers in Imperial, Riverside, and San Bernardino counties through programs covering livestock nutrition, management techniques, environmental factors affecting producers and the community, and other critical topics. She looks forward to meeting producers and community members to help develop strong relationships and provide meaningful programs. Brooke can be reached at (442) 265-7700.

PARTIAL-SEASON ALFALFA IRRIGATION AS AN EFFECTIVE WATER MANAGEMENT STRATEGY

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

Due to recurring droughts and water shortages in California, improved irrigation management strategies are necessary to sustain forage production under impaired water supply. Deficit irrigation (applying less water than the full potential crop water requirement) has been widely investigated as a valuable and sustainable production strategy over a wide variety of crops to maximize water productivity and to stabilize – rather than maximize – yields. The overall effect of deficit irrigation in terms of water productivity largely depends on the type of crop and the adopted irrigation strategy. Although alfalfa is frequently criticized for its high seasonal water use requirements, it has positive biological features, including greater yield potential than many other legume crops under water stress conditions. Alfalfa has drought tolerance mechanisms that make it biologically suited to deficit irrigation or reduced water supplies. It is a deep-rooted perennial crop with the ability to go into a water-stress induced 'dormancy' during drought. During dormancy, alfalfa limits above ground growth while storing energy for rapid growth from buds when water becomes available. This characteristic gives the irrigation manager flexibility to apply water when available and withhold water when it is in short supply. Alfalfa's deep-rootedness and ability to regrow after long periods of drought without replanting are significant advantages in dealing with drought periods.

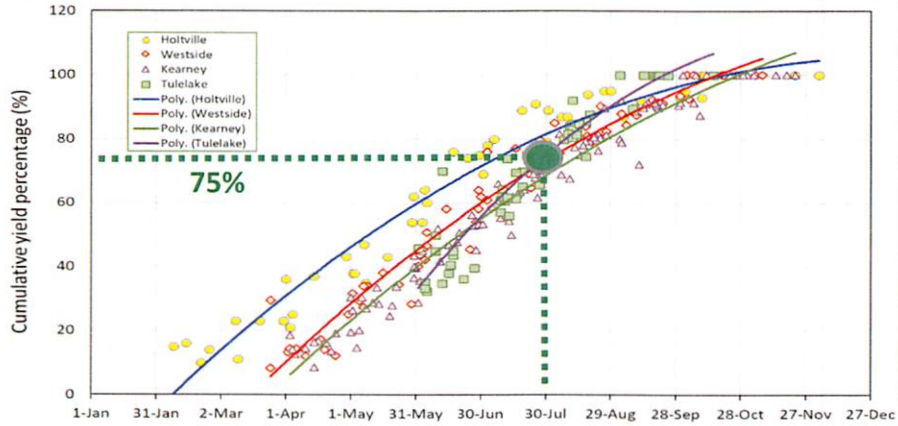
Regulated deficit irrigation can be delivered in several ways, either '*starvation diet*' (incremental reductions in watering over the season) or '*partial-season irrigation*' (sudden cut-off of water during mid-season following full early irrigation).

Since the relationship between crop water consumed and alfalfa hay production is linearly related, yield reduction is expected because of - deficit irrigation practice. Although yield losses due to water deficits can be economically important, the costs of re-establishment of the plant stand are not often a major risk associated with deficit strategies. In areas where water shortage is prevailing, it is important to follow optimal deficit irrigation strategy (less yield penalty and the plant stand losses with a higher amount of water saved) which significantly depends on climate, crop variety, irrigation method and water management practice, and soil salinity. As a general strategy, during times of reduced water supplies it is wise to consider the seasonal production patterns of alfalfa and maximize production during early growth periods, and allow water deficits during periods of relatively low yield and quality, e.g. late summer. Several studies have examined the effect of summer irrigation cut-off, July through September, on alfalfa yield.

Alfalfa plant stand status in the late season after conducting 50% deficit irrigation in (Sacramento Valley, top picture, and Imperial Valley, bottom picture.

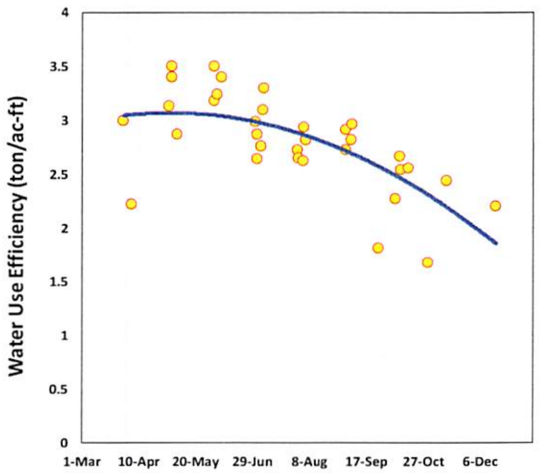
More yield reduction and plant stand losses were observed in the Imperial Valley (Holtville) than the Sacramento Valley (Davis) at 50% deficit irrigation regime (see the picture above). Resuming irrigation in the fall may be recommended in some areas of the state, such as the Low Desert region to avoid stand loss. Alfalfa survivability after deficit irrigation strongly depends on the environment (length of the growing season, soil type and depth, water table depth, and soil salinity), level of deficit irrigation and duration of the drought period, and alfalfa variety.

On average, 75% of the total alfalfa annual production occurs by late-July, while it can be anywhere from 70% to 80% depending on the location and cultural practices (long-term data set of alfalfa varieties in different sites). Alfalfa goes through a summer slump producing significantly lower late-summer yields of poor-quality crop. It's far better to use water early in the season when production and quality are highest, and then dry down those fields until rains return or the water situation improves.



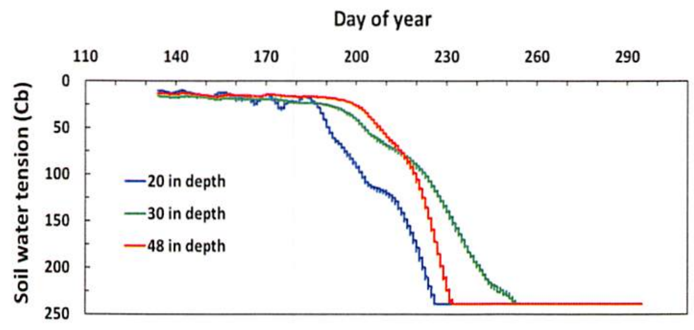
Long-term cumulative multi-variety alfalfa yield percentage over the growing season in California

Alfalfa has higher water use efficiency (WUE) in spring and early summer than the rest of the year. Water use efficiency is the performance by which a crop converts the transpired water into economic dry matter yield. Alfalfa WUE declines significantly over the season, due to late-summer low yields what is called *'summer slump'* (physiological reductions in yields due to daylength and plant physiology), while crop water use remains high. Consequently, the water use efficiency is greater in earlier cuttings than that of mid-summer and fall. A WUE inverse trend over the seasonal cuttings was observed with about 40% decreases in the WUE values between early/mid-season and late season. In this analysis, two-year data set was used from two



Alfalfa WUE values over the different cuttings along the crop season fully irrigated alfalfa fields in the Sacramento Valley (Davis), one under subsurface drip irrigation system and the other one under hand-move sprinkler system. The preliminary results of this experiment demonstrated that deficit irrigation effectively may increase alfalfa WUE up to 50%.

Beginning the growing season with a full soil profile along with *proper irrigation management the entire season* are the key points of producing healthy alfalfa and high yields. This approach can be also effective in partial-season alfalfa irrigation strategy. Soil moisture is clearly impacted by deficit irrigation regime just a few days after water cut-off, while the soil moisture tension reaches eventually a severely dry status (239 centibars).



Soil water tension variations over the season at different depths (irrigation events were stopped in July 8th through late season)

The soil moisture sensing data of for an alfalfa field under subsurface drip irrigation in a silty loam soil showed that severe water shortage after stopping irrigation (July 8th) happens differently at individual soil depths: 50 days at 20-inch depth, 72 days at 30-inch depth, and 59 days at 48-inch depth. The soil water tension values indicated that the crop root zone had adequate available water at the time deficit irrigation was started and the plant could extract water from the residual soil moisture without incurring any water stress during the first 20-25 days after irrigation was stopped. Recommended soil water potential for alfalfa in a silt loam soil should be within the range of 10 to 80 centibars. In other words, some plant growth continues even after severe irrigation cutbacks due to residual soil moisture. As a result, a 20% yield reduction was observed for the 50% mid-season deficit irrigation scenario, mostly from the last three cuttings of the growing season, which were affected by severe water limitations.

There is always the possibility to do unwanted deficit irrigation in alfalfa fields, which may be attributed to constraints and applicability of irrigation scheduling under limited water supply, interference of harvest schedule with irrigation events, and capacity of irrigation systems. This is not what we call "Partial - Season Alfalfa Irrigation" which can be considered as an effective water management strategy and feasible with all irrigation methods. Late-summer dry downs are likely to be better than 'starvation diet' deficit treatments since yields are higher in the early part of the season. On the other hand, avoiding late harvests may save harvesting, pest management and other costs.

The optimal Partial - Season Alfalfa Irrigation significantly depends on climate and soil types. In the Low Desert region, large stand decline can occur with summer dry-downs, likely due to the length of the growing season, heat stress, and lack of sufficient moisture in the crop root zone. Perhaps the optimal partial - season alfalfa irrigation for the desert region could be summer deficit irrigation, July through September, with about half of irrigation events instead of cutting off whole irrigation events. Further studies are required to verify this irrigation strategy. The role of deliberate re-filling of the soil profile after deficit irrigation needs to be considered both in terms of water availability and policy. In a comprehensive economic analysis, other sources of differences between full irrigation and deficit irrigation need to be considered. Some of these sources could be related to the value of water conserved, the cost of harvesting, weed control, and re-planting.

PROBLEMATIC WEEDS FOR LOW DESERT SORGHUM PRODUCTION AND THEIR MANAGEMENT

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

In many parts of the world, grain sorghum (*Sorghum bicolor* L. Moench) is a major crop for arid regions. Sorghum has many uses. It is used as human food in many countries. Likewise, it is used as feed grain for poultry and livestock animals, and even used as forage or silage crops in many parts of the world. At present, grain and forage sorghums are minor crops in California's low desert region and are planted in small acreage. However, Sudangrass, a forage crop from the same family as sorghum, is planted in significant acreage as a summer crop. Like in other crops, pest infestation is one of the primary constraints for optimum harvest in sorghum crop production.

Weeds are a problematic pest for sorghum because they compete with the crop for nutrients, water, sunlight, and other resources essential for plant growth. The competition for resources eventually leads to yield reduction. Likewise, many weed species harbor disease and insect pests, and serve as a bridge for transferring these pests to the next season crop. As we are having a potential threat from the sugarcane aphid in the low desert region, weeds such as johnsongrass or even volunteer Sudangrass can serve as host to this insect pest during a non-crop cycle. Weeds can produce high numbers of seeds and contribute to soil-seed bank where seeds may persist for several years.

Sorghum has relatively slow growth for about 3 to 4 weeks after planting. During the early growth stage, sorghum is very susceptible to weed interference. Grass or broadleaf weed interferences for up to 3 leaf stage can reduce grain sorghum yield >20% and >10%, respectively. The season-long weed competition can reduce yield >50% in grain sorghum production. Therefore, it is very important to maintain sorghum fields free of weeds for about 4 to 6 weeks after crop emergence, and until the crop grows through the head initiation stage in the case of grain sorghum. Weed control up to the head initiation stage is very critical in grain sorghum because number of seeds/plant are set at this stage, and weed interference before this stage can reduce the seed number. Grain sorghum is competitive to weeds after the booting stage and later emerging weeds have less impact on crop yield.

In the California low desert region, the most problematic weeds in sorghum include summer grasses. This is so because majority of grass weeds in Imperial Valley are summer weeds, their life cycle coincides with sorghum crop season. Grass weeds such as johnsongrass (*Sorghum halepense*), volunteer Sudangrass (*Sorghum X drummondii*), barnyardgrass (*Echinochloa crus-galli*), jungle rice (*Echinochloa colona*), prairie cupgrass (*Eriochloa contracta*), and sprangletop spp. (*Leptochloa spp.*) are problematic for sorghum crops. Likewise, broadleaf weeds such as horseweed (*Conyza canadensis*), fleabane (*Conyza bonariensis*), common lambsquarters (*Chenopodium album*), nettleleaf goosefoot (*Chenopodium murale*), and pigweeds (*Amaranthus* spp.) that emerge during late spring or summer are also major weeds for sorghum crops in the low desert region.

Picture: Grain sorghum field infested with grass weeds.

Planting in a clean field is the first strategy for weed control in sorghum. Weeds could be cleaned with burndown herbicides or cultivation prior to planting. Preemergence (PRE) herbicides are the backbone for weed control in sorghum. Since, the crop is susceptible to weed interference early in the season and there are very limited postemergence (POST) herbicides for grass weed control in sorghum, controlling grass weeds with PRE herbicides is very critical. PRE-herbicides are generally applied after planting sorghum and before seedling emergence. Atrazine could be applied PRE and it is effective on multiple weed species with a longer residual activity. The herbicides from the Chloroacetamide family (Group #15) such as *S*-metolachlor or alachlor could be applied PRE for sorghum seed treated with safener (such as Concep or Screen). The combination products of atrazine and Chloroacetamide herbicides could be applied for control of most grass and broadleaf weeds prior to emergence.

POST herbicides could be applied to control broadleaf weeds. Currently, there are very limited options for grass weeds control with POST-applied herbicides in sorghum. Herbicides such as 2,4-D, dicamba, carfentrazone, bromoxynil, and halosulfuron could be applied POST to control broadleaf weeds in sorghum production. Moreover, tank-mixing of multiple herbicide compounds should be considered depending upon weed spectrum in the field. Pendimethalin could be culti-sprayed after grain sorghum establishment, after the crop is 6-inches or taller (after 3 leaf stage). For culti-spraying pendimethalin, the field has to be cultivated prior to spray and grain sorghum root has to be covered by soil layer at least 1-inch or more to ensure that crop roots are not exposed to herbicide. The pendimethalin should be applied as directed-spray at the base of the plant and row middles. Pendimethalin provides residual control for weeds emerging later in the season. When grass weeds infestation is severe and harvesting operation is likely to be hampered then paraquat could be applied in row middles with the hooded applicator in grain sorghum production. Late season paraquat application should be considered only as a rescue treatment because this practice can cause severe injury to sorghum crop.

Various factors to be considered for effective chemical weed control program in sorghum include:

- *Weed identification:* Weeds, especially grass spp., should be identified properly and appropriate herbicide should be applied for effective control.

- *PRE and POST herbicides:* Herbicide programs should consists of PRE- and POST-applied herbicides. For sorghum, PRE herbicides are effective for grass weed control and POST herbicides are effective for broadleaf weed control.

- *Herbicide label:* Herbicide label should be followed for rate and application timing (crop growth stage and weed stage). Herbicides should be applied at an appropriate rate based on the soil types.

- *Spray water factors:* Carrier water factors such as pH, hardness, and turbidity could influence POST herbicides activity. For enhancing herbicide performance, the water quality factors should be amended by using proper adjuvants.

- *Herbicide carryover:* Atrazine and chloroacetamide herbicide have longer residual effect and planting sensitive crop should be avoided after sorghum. Herbicide label should be followed for planting safe crop for the next season.

SOUTHERN BLIGHT CLIFF NOTES - 2017

Cassandra Swett, Asst. Co-Op Ext Specialist, ANR, Dept. of Plant Pathology, UC Davis

Joe Nunez, Farm Advisor, Emertius, Co-Op Ext., ANR, Kern County

This was a big year for southern blight. Out of over forty crown rot samples received in the UC Davis Vegetable and Agronomic Crop Pathology program (Swett lab) in summer 2017, 50% were southern blight, 40% were Fusarium root and crown rot, and 10% were attributed to other causes. This disease was commonly reported to cause over 50% mortality in affected fields.

Southern blight is a very destructive, fast acting crown rot disease that rapidly kills the plant. Over 500 different plants are southern blight hosts. Affected crops in 2017 included pepper, potato, tomato, cucumber, canary bean, chard, and sunflower. Most unusually, this disease caused major losses in many northern counties in the San Joaquin and Sacramento valley, where it is not typically an issue, including Colusa, Yolo, Contra Costa, San Joaquin, and Merced.

Southern blight is not typically considered to be a widespread problem in California--major impacts are usually restricted to the Kern County area. The widespread distribution we saw this year is NOT likely due to pathogen spread to new fields. Southern blight is favored by high temperatures (over 86°F), high soil moisture, dense canopies, and frequent irrigation. It seems most plausible that a combination of late planting dates and record high summer temperatures created unusually favorable conditions for the pathogen in the northern part of the valley.

Although not a new disease to the state, the increased damage from the disease this year may mean that this will be a bigger issue next year if the environment is conducive and the disease is not properly managed. Southern blight is caused by the fungus *Sclerotium rolfsii*. The fungus survives in soil as hardened structures called sclerotia for at least five years. Each infected plant can literally produce tens of thousands of sclerotia and then become more widely distributed in a field with each successive field operation. Although this disease may initially only affect a few plants in the field, southern blight can be serious enough to cause significant yield loss within a season or two. With a host range of over 500 plants, this fungus can easily persist from year to year in infected crop debris.

How to identify southern blight in the field

Southern blight misdiagnosis is likely if it occurs in an area where it has not historically been an issue. Scouting and mapping infested locations in fields during the summer months will greatly help in determining what options can be taken before the sclerotia levels become too numerous and cause severe crop loss. It can be easy to confuse southern blight with other crown rotting diseases, for example Fusarium crown rot. Accurate diagnosis is critical to effective control. You can distinguish southern blight in the field based on the following diagnostic traits, one or more of which is often, but not always present. Part of the trick to diagnosis is not to just look at the plant, but also look at the soil right around the crown.

These small tan to reddish brown sclerotia form at the base of the plant and / or in the soil right around the plant. The sclerotia look like alfalfa seeds when young but turn brown with age (Photo credit: J. Nunez).

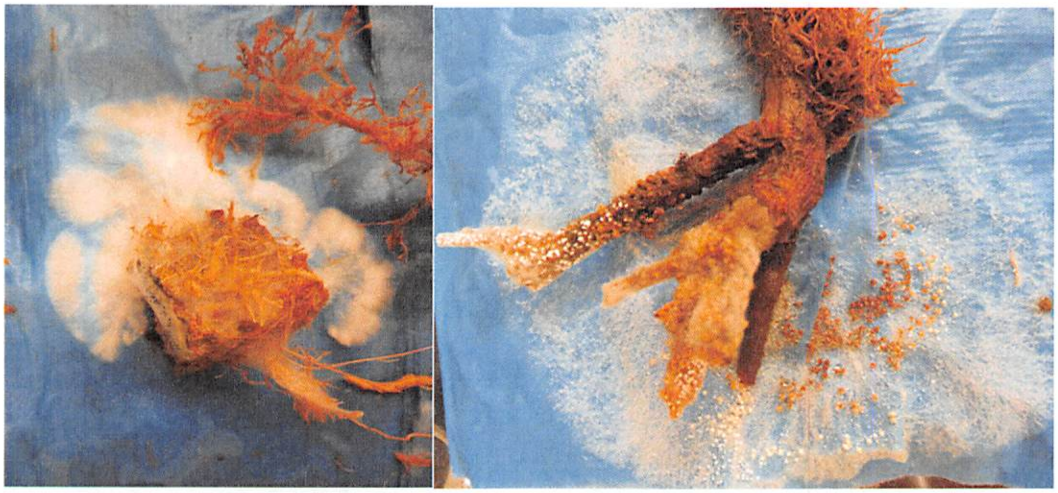
White fungal mycelium (thread-like strands) growing INTO the soil. No other fungus will grow extensively in the soil. Sometimes you also see sclerotia in the soil (R) (Photo credit: R: C. Swett, L: J. Nunez).

White fan like mycelial (thread like) growing on the crown / affected tissues. Severely affected plants can have vascular discoloration, which may be confused with Fusarium wilt (Photo credit: J. Nunez).

Plants go from looking healthy to dead in less than a week—this is much faster than most crown rots (Photo credit: C. Swett).

In affected fields, the disease patches are roughly circular. From a distance, they look like bands of dead plants (Photo credit: L: J. Nunez, R: C. Swett).

If none of these characteristics are present, the best way to diagnose the disease is to put infected tissue in a plastic bag on a moist paper towel and leave at room temperature for one to two weeks. The southern blight fungus will produce distinct fan like growth within about 5-7 days. After about 5-14 days, it will make round white balls that then turn into amber colored sclerotia (R). Both the fan growth and the sclerotia are unique to this fungus (Photo credit: C. Swett).



In-season fungicide applications

Southern blight acts fast, so as soon as you detect the problem, it is critical to get out there to spray. Fungicides work by covering the crown tissue both above and below the soil, killing the fungus around the crown. For vegetable crops, fungicides such as flutolanil, penthiopyrad, and tebuconazole are known to be effective in the management of southern blight. However these products are registered on only a few vegetables so make sure to check crop registration before using these on any vegetable crop. Also, some of these fungicides have severe plant-back restrictions, so crop rotations need to be carefully planned. As always, make sure to read and follow label directions to avoid any problems.

Perhaps the biggest obstacle to fungicide control of southern blight is application timing and method. Because southern blight is basically a summer time disease it rears its ugly head when most crops are near maturity with a full canopy cover. Getting fungicides to the base of the stem and onto the surface of the soil is very difficult especially for fields on drip irrigation systems. Chemigation through sprinklers is a better option especially on crops like garlic and onions which do not have a dense canopy.

If the crop has a dense canopy that the fungicide cannot penetrate, then a fungicide application will not work to control the disease. Fungicide control is most effective in narrow canopy crops, including onions, garlic, beans, sunflower, and potato to a certain extent. In dense canopy such as tomatoes, melons, peppers, and vegetables grown for seed, like lettuce, fungicide applications are only effective early in the season, before the canopy expands.

The question has been raised regarding whether it's possible to apply the fungicide by drip chemigation (through the drip line). If it is buried drip, then no—it would take a lot of water to get to the soil surface, which would be likely to cause other problems; several trials have been conducted in the past in Kern County, and it's never worked. Surface drip would work, but this irrigation method is not common in California.

Managing soil moisture

Manipulating your irrigation to maintain a dry surface may help reduce losses if you detect the fungus in your field. The one advantage of drip irrigation is that the soil surface can more easily be kept dry, which inhibits infection by *Sclerotium rolfsii*. However, alternating wet and dry periods can be a problem--wet periods followed by dry episodes can be particularly conducive to disease development.

Crop rotation

If you have detected southern blight in your field, one of the best things you can do the following year is to plant a narrow canopy crop that you can effectively manage with fungicides. The disease can be effectively controlled in these crops, preventing sclerotia from increasing.

Rotations with non-host crops are limited because of the wide host range of the pathogen. Poor-host crops such as corn and small grains (wheat, millet, oats) can help to significantly reduce sclerotia levels in the field. Most if not all of these crops can become infected by the fungus, but either they are not good hosts and/or the environmental conditions during the growing season are not conducive to pathogen growth. For instance, wheat can be a host, but it's typically too cold for fungal growth during the time that wheat is grown. On the other hand, rotation with highly susceptible crops such as legumes such as beans, peas and hairy vetch can greatly increase soil infestation levels. Mustard cover crops can suppress southern blight, and may be useful for organic producers, where fumigation is not an option.

Soil treatment

Once sclerotia levels become too numerous in a field then fumigation should be considered. Fumigation with metam sodium (Vapam, K-Pam) can be effective, but ideally it needs to be applied through sprinklers so it percolates down into the soil at least 6 inches to kill the fungus in the soil zone where it is active. Because of restrictions in application, sprinkler application is not allowed in many counties, so you have to shank it in. This method of application is not as effective since the fumigant does not penetrate deep enough into the soil. Fields with shanked applications may still suffer major southern blight losses. Also, the requirement of buffer zones for metam applications means the field may become re-infested in short time as sclerotia are moved from the buffer zones into the rest of the field with various tractor operations.

Deep plowing will bury the sclerotia and get it away from attacking plants at the soil line. Sclerotia deeper than 6 inches are usually parasitized by other microbes and are killed over time. Of course, plowing is not an option for fields where buried drip irrigation systems are already installed.

Sclerotia near the surface of the soil can be killed when exposed to high temperatures (105-120°F) for two to four weeks during the summer months. Solarization alone is not generally considered a viable management strategy, but when soils were solarized before addition of a biological control or a fungicide, disease was reduced by 70-100% compared to the same biological or chemical treatment without solarization. Make sure to prepare the soil for planting before solarizing, since cultivation and the incorporation of amendments can bring buried sclerotia back to the upper soil layers.

There are several fungi that appear to have some antagonistic effects on southern blight including RootShield (*Trichoderma harzianum*). There are no field studies that indicate efficacy of bacterial products (eg. Serenade Soil) and, to the authors knowledge, there are no studies to support the use of plant defense-inducing products such as Regalia.

Disease resistance

For most crops, southern blight resistant cultivars are not available. However, for vegetable crops such as tomatoes, there are some rootstocks reported to be resistant to southern blight, which are currently under study in field trials in California. These may be a promising option for small scale and organic producers.

Crystal Gazing--What's going to happen next year?

This was an unusually hot summer and crops went in late due to late spring rains—this combination of factors likely accounts for the widespread occurrence. If crops are planted on time next year, and / or it is not so hot, then the disease might not rear its ugly head. But one thing to keep in mind for folks that had fields with southern blight this year—now, inoculum levels are higher, so it's going to take less to become a problem next year.

Calling all local growers, licensed/private applicators, PCAs, CCAs and other AG industry parties to come join us, UCCE Imperial County for the ***28th Annual Fall Desert Crops Workshop***! The morning event will cover topics such as; irrigation, pest management, cover crops, etc.

More information on location, meeting time, CEU's and registration to follow.

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Presented by:
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IMPERIAL COUNTY CALIFORNIA

IMPERIAL VALLEY CIMIS REPORT AND UC WATER MANAGEMENT RESOURCES

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

The reference evapotranspiration (ET_o) is derived from a well-watered grass field and may be obtained from the nearest CIMIS (California Irrigation Management Information System) station. CIMIS is a program unit in the Water Use and Efficiency Branch, California Department of Water Resources that manages a network of over 145 automated weather stations in California. The network was designed to assist irrigators in managing their water resources more efficiently. CIMIS ET data are a good guideline for planning irrigations as bottom line, while crop ET may be estimated by multiplying ET_o by a crop coefficient (K_c) which is specific for each crop.

There are three CIMIS stations in Imperial County include Calipatria (CIMIS #41), Seeley (CIMIS #68), and Meloland (CIMIS #87). Data from the CIMIS network are available at:
http://www.cim is.water.ca.gov. Estimates of the average daily ET_o for the period of October 1 to December 31 for the Imperial Valley stations are presented in Table 1. These values were calculated using the long-term data of each station.

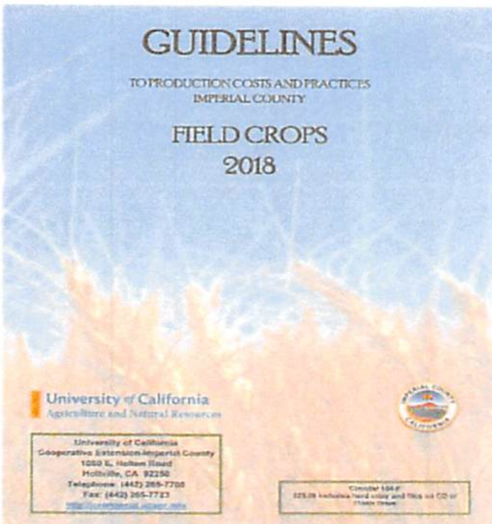
Table 1. Estimates of average daily potential evapotranspiration (ET_o) in inches per day

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

For more information about ET and crop coefficients, feel free to contact the UC Imperial County Cooperative Extension office (442-265-7700). You can also find the latest research-based advice and California water & drought management information/resources through link below:
http://ciwr.ucanr.edu/.

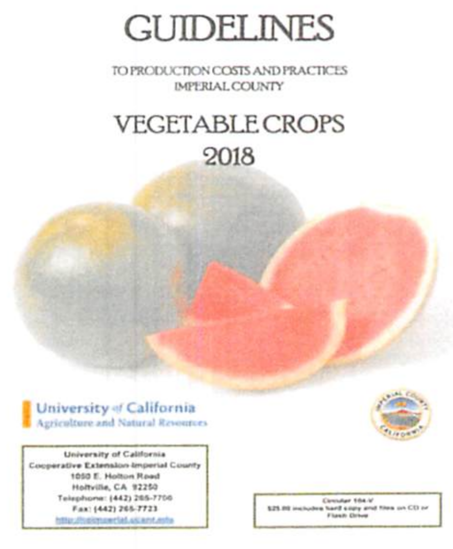
This is to announce that the

2018 Guidelines are ready to be purchased.



2018 Field Crops Guidelines

$25.00/book



2018 Vegetable Crops Guidelines

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