Imperial County Agricultural Briefs

University of California
Agriculture and Natural Resources

Features from your Advisors

May 2017

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SPRAY WATER QUALITY AND HERBICIDE EFFICACY

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

Background information on herbicide spray water quality

Crop growers rely on herbicides as a primary tool for weed management in the conventional agronomic and vegetable crop production system. Water is the primary solvent for herbicide application and comprises about 99% of the herbicide spray solution. However, a critical factor that is routinely ignored is the appropriate spray water quality for herbicide application. Spray water quality factors such as turbidity, pH, and hardness are very important aspects to consider while preparing herbicide spray-mix.

Water turbidity refers to the concentration of suspended particles, such as soil and organic debris, present in water. Water pH refers to the amount of acidity or alkalinity present in water. Whereas, the amount of dissolved minerals cations such as calcium, magnesium, iron, zinc, sodium, potassium constitutes water hardness. These water quality factors could be variable depending upon the geographical location and the season of the year.

Effect of spray water quality on herbicide activity

Various research studies have illustrated that efficacy of Roundup and some other herbicide products are significantly reduced by turbidity, inappropriate pH, and presence of hardness cations in the spray water. Turbidity affects the performance of herbicide which have higher Koc value, i.e. herbicide which binds strongly to the solid particles. Herbicide products which contain active compounds such as paraquat (Grammoxone) and glyphosate (Roundup) are highly affected by water turbidity.

Effect of water pH on herbicide activity is variable depending upon herbicide chemistry. Some herbicide products are most effective at acidic pH, while other products are most effective at neutral or alkaline pH. The

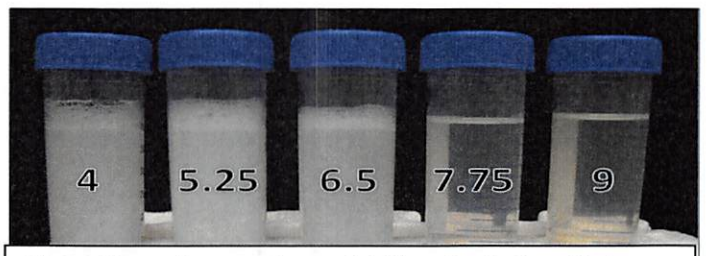

Fig1: Effect of water pH on solubility of saflufenacil. At acidic water herbicide has a solubility issue but at alkaline pH there is no issue. Source: Roskamp et al. (2013)

herbicide product containing weak-acid compound such as glyphosate (Roundup) performs better at acidic water pH; whereas the product containing mesotrione (Callisto) performs better at neutral pH, and products containing saflufenacil (Sharpen) are more effective at alkaline pH. These findings illustrate that depending upon the chemistry and product formulation, the performance of an herbicide is inconsistent when sprayed at unfavorable water pH. Some herbicides have poor solubility in inappropriate spray water pH; whereas, weak-acid herbicides form charged compounds at unfavorable spray water pH.

When considering the effect of water hardness, most of the herbicide products are affected by presence of hard water minerals in the spray water. Moreover, the increase in water hardness reduces efficacy in a linear trend for some of the herbicide products. Hard water minerals bind to the herbicide molecule and form a stable herbicide-mineral complex and cannot get through the leaf barriers into the plant.

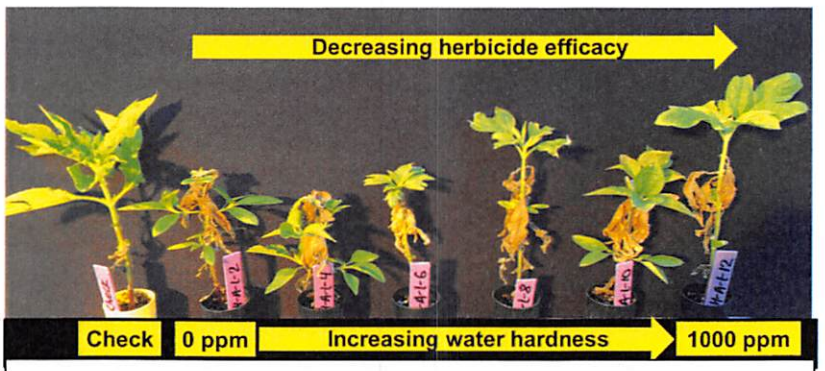

Fig2: Effect of spray water hardness on glufosinate (Rely) herbicide efficacy. As water hardness increases there is reduction in weed control.

Guidelines for optimizing spray water quality for improving herbicide activity

The most important thing is to first know the quality of water used for mixing and spraying herbicides. Simple tests of water with some test strips could provide information on turbidity, pH, and hardness of water. Other important information to know is about the herbicide chemistry such as Koc value; is it a weak-acid herbicide? Is there any information on the product label about preparing the spray solution? After we know the water quality and information on the herbicide, then it is important to adjust water pH to the appropriate level for the herbicide. Water pH could be adjusted to the desired level using commercially available pH adjuster products and buffer solutions. For amending spray solution against hard water cations it is very critical to add water conditioning adjuvants in the spray-mix. The benefit from added water conditioning adjuvant will only be achieved by following the proper mixing procedure. The proper mixing procedure should be as follow: 1) add water in the tank; 2) add water conditioning adjuvants; 3) add herbicide products; 4) add surfactants, defoamer, drift retardants.

SUGARCANE APHID UPDATE

Eric T. Natwick, Entomology Advisor, UCCE Imperial County

I continue to receive calls concerning the sugarcane aphid (SCA) since it first appeared in the Imperial Valley last fall. Most of the calls are concerning sudangrass. My job as the UC ANR Cooperative Extension Advisor specializing in entomology is not to make field specific recommendations to growers concerning crop protection, but my part of job is to educate growers and their licensed pest control advisors (PCA) about new invasive insect pests, such as the sugarcane aphid, *Melanaphis sacchari*. The first goal of integrated pest management (IPM) is to identify the pest. The SCA can be confused with other aphid pests occasionally found on sudangrass of sorghum. The SCA is pale yellow and has black tipped legs, cornicles and antennae. The aphids can take on a grayish appearance when they excrete a thin layer of wax over their body. The corn leaf aphid, *Rhopalosiphum maidis* is a small aphid, bluish green to dark olive in color, with a purplish patch around the base of the cornicles and short antennae. I am still finding corn leaf aphids within the whorls of sudangrass. Another aphid pest of sorghum and sudangrass is the greenbug, *Schizaphis graminum*. Greenbug vary in color from green to yellow-green and have a dark green stripe down the middle of its back.

After identifying SCA in a sorghum or sudangrass crop it is important to know the risk for crop injury and when the crop should be treated. Damage to sorghum and sudangrass from SCA results from a combination of the following factors:

1) loss of plant nutrients
2) increased plant water stress
3) induced leaf chlorosis
4) reduced photosynthesis because of the buildup of sooty mold on the honeydew the aphids excrete
5) hay quality loss due to sooty molds contamination
6) loss of income due to honeydew fouling harvesting equipment.

Biology: Before trying to make management decisions for SCA, it is important to know the biology of the pest. All of the SCA are females, reproducing asexually, and give live birth to their young (nymphs). The nymphs are born pregnant. Females live, on average, 28 days (range 14-37 days) and, when mature, can give birth to 1-5 nymphs per day. The nymphs pass through four nymphal molts and the last molt is to the adult stage with or without wings. Nymphs develop into adults in five days on average during growing season (4.3 to 12.4 days

range). In the absence of predation, the colony from one SCA can grow exponentially. If a mature SCA lived for one week, producing three births per day for one week, a single female SCA could produce 21 offspring. Within a week after birth, each nymph could begin producing three nymphs per day. If each mature females each live for one week producing three nymphs per day, the number of offspring increases to 441 and when they also produce three nymphs per day for one week the number of offspring increases to 9,261 and then 194,481. Fortunately, not all of the aphids reach maturity and not all reach their full reproductive potential. However, the numbers of aphids within a crop of sorghum or sudangrass can increase very rapidly. SCA prefer the underside of lower leaves. When SCA levels are increasing rapidly, they soon spread upward through the crop canopy, from pre-flowering through head development and may move to sorghum head. Feeding with piercing-sucking mouth parts, SCA removes excessive amounts of plant sap that passes through the aphids and is excreted onto leaves as 'honeydew'. When honeydew is detected, look for SCA colonies on the undersides of lower leaves. The shiny and sticky honeydew is often more easily detected than the initial SCA colonies. Start scouting by looking at the bottom half of the crop canopy first. Early detection is critical. Start with weekly scouting. When SCA is detected scout the crop twice per week until an insecticide treatment threshold is reached.

Biological Control: Many natural enemies of aphids will also prey on SCA. Some of these aphid predators were seen feeding this past winter in Imperial County, CA. Aphid predators seen feeding on SCA included lady beetles, lacewing larvae, syrphid fly larvae and others, Figure 2. Several species of parasitoid wasps prey on aphids in Imperial County and some SCA parasitism was observed this past winter, Figure 3. Several ant species, such as the southern fire ant, *Solenopsis xyloni* (Figure 4), milk aphids including SCA for honeydew and discourage predators and paphid parasitoids from preying on aphids. In infested states, aphid predators and parasitoids help to limit colony growth but have not prevented significant,economically important damage from SCA to sorghum crops.

Sudangrass, a sorghum hybrid, is very susceptible to SCA infestation and damage. Sudangrass was highly infested in Central Arizona last August – October even when ambient air temperatures reach nearly 120F. Since November 2016, when SCA was first detected in Imperial County, it was easily detected, surviving the winter on volunteer sudangrass and sudangrass stubble. SCA colonies are now being detected on johnsongrass. Economic treatment thresholds have not been set for sudangrass. Based on conversations with Dr. David Kerns, Texas A&M University, I am suggesting treating when initial SCA colonies are found on 20% of the undersides of leaves of sudangrass.

Sivanto Prime may be used in California for aphid control on sorghum, not including sweet sorghum grown for syrup, but including sugangrass harvested for hay or forage under the crop group 16 when applied at a rate

between 7.0 – 14.0 fl oz/acre with a Pre-Harvest Interval (PHI) of 7 days. Flupyradifurone the active ingredient (a.i.) in Sivanto Prime cannot be applied more than 0.365 lb (28.0 fl oz of Sivanto Prime) per acre per calendar year on cereal grains, regardless of product or formulation. Although Transform 50W has a Section 18 Label for application to Sorghum in 19 states (AL; AR; AZ; CO; GA; IL; KS; KY; LA; MO; MS; NC; NE; NM; OK; SC; TN; TX; VA) it is not labeled for use in California by CA DPR at the time this newsletter article was written.

Sivanto Prime is not an inexpensive insecticide product to purchase and apply. Should California sudangrass growers be granted a Section 18 emergence exemption label for use of Transform 50W for control of aphids on sorghum including sudangrass, it is also not inexpensive to purchase and apply.

Figure 1. Sudangrass from Holtville, CA infested sugarcane aphid, *Melanaphis sacchari*. (digital images by E. T. Natwick)

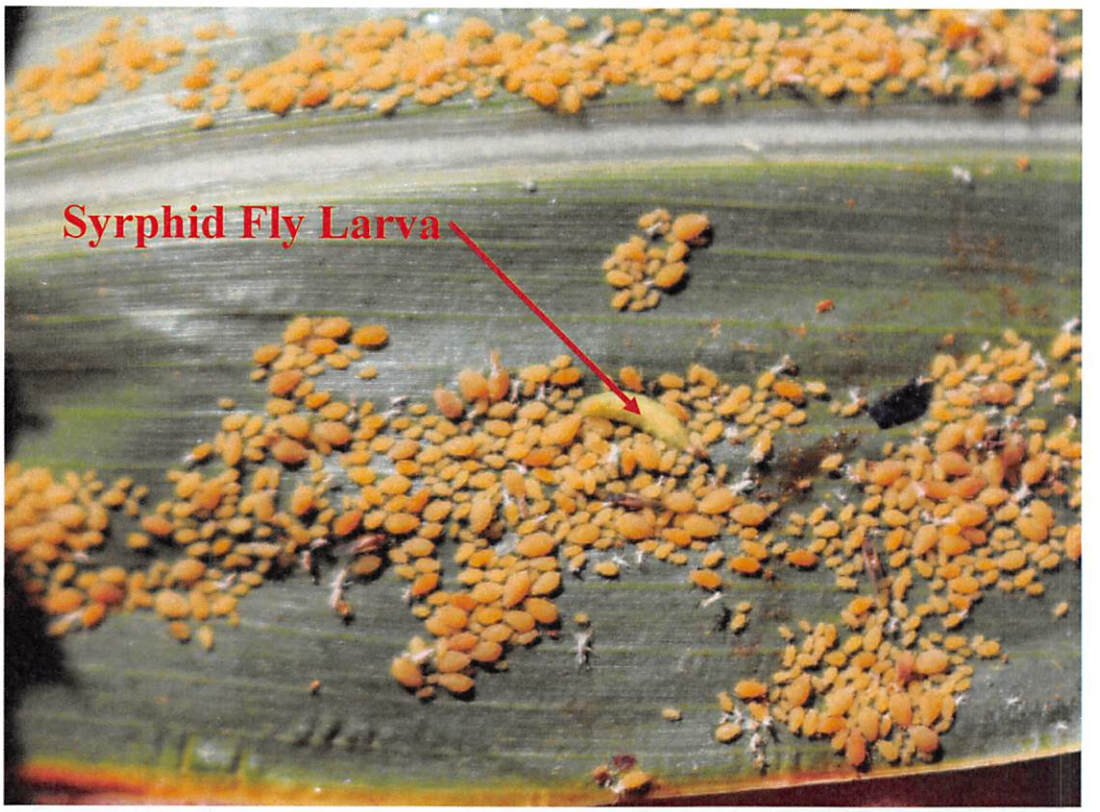

Figure 2. Syrphid fly larva feeding on SCA on Imperial County sorghum in December 2016. (digital images by E. T. Natwick)

Figure 3. Aphid parasitoid wasp (top picture) and aphid mummies with wasp exit holes. (bottom picture. (digital images by E. T. Natwick)

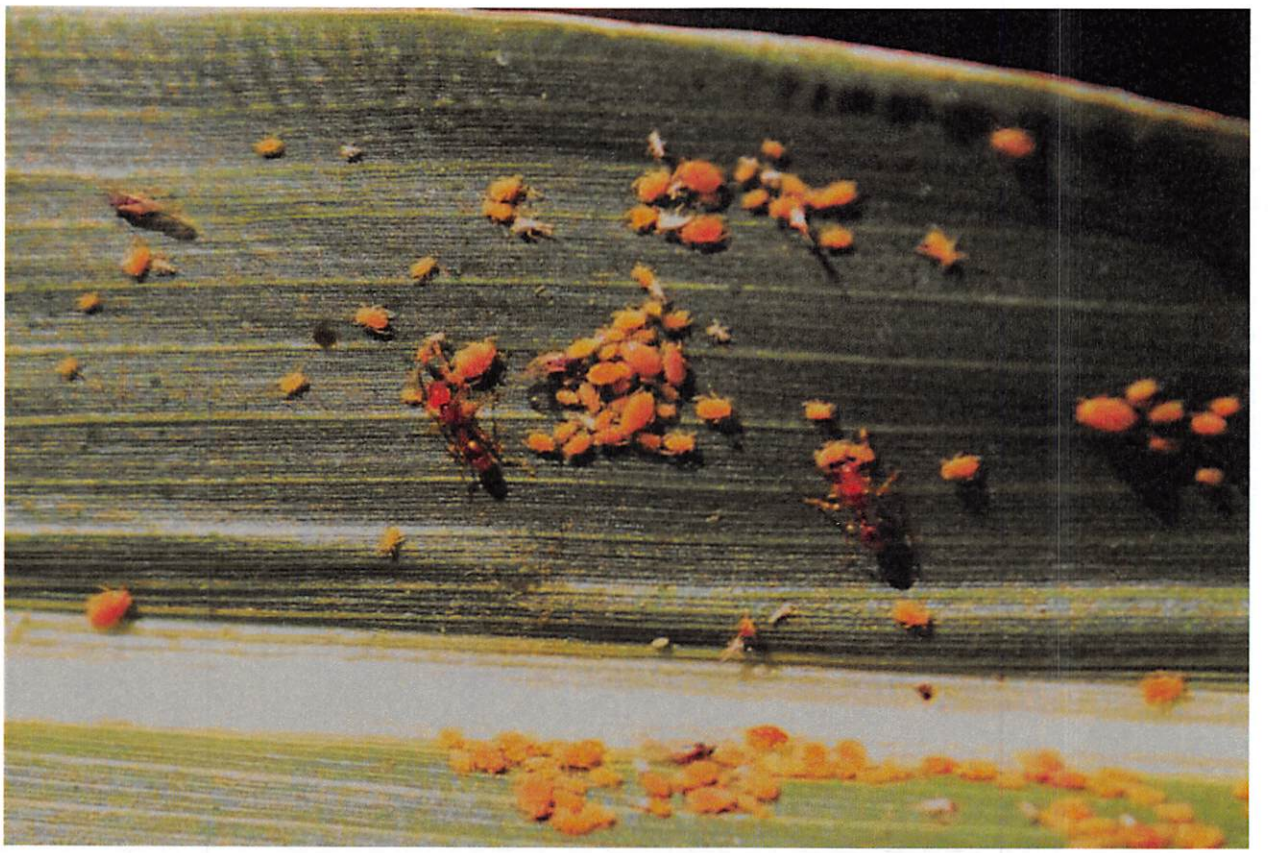

Figure 4. Southern fire ant milking sugarcane aphids for honeydew. (digital images by E. T. Natwick)

NEMATODE PESTS OF LOW DESERT KLEIN GRASS

Oli Bachie, Agronomy Advisor, Director UCCE Imperial County

Klein grass (*Panicum coloratum* L.), belongs to the Poaceae family and is a warm-season perennial bunchgrass native to Africa. It is adaptable to a wide range of soils and dry weather conditions with abundant quantities of good quality forage production. Klein grass is quite variable in its growth habit, sometimes prostrate but mostly erect. It spreads by tillers or short rhizomes, and stem will root at the nodes when it contacts with wet soils.

Klein grass is a relatively new forage crop in the Imperial Valley (IV). It was developed for low desert agriculture by Juan Guerrero in the early 1990s (Blake 2009). The historical trend of Klein grass acreage in the IV is shown in Figure 1 with acreage increase to about 17,500 acres in 2014. The Imperial County Ag. Commissioner reported about 16,000 ac of Klein grass in 2015 (about 4.6% of field crop acreages) generating about $21 million in revenues (Table 1). In the IV, growers may harvest 4 to 5 cuttings of Klein grass annually. If cut correctly, Klein grass protein content averages in the 8 to 9 % range. Klein grass is moderately tolerant to salinity, but is a poor tolerant to cold.

Although there are no known serious pests of Klein grass, flea beetles occasionally cause a problem during stand establishment (*USDA–NRCS).* Weeds do not generally cause serious problems in Klein grass if it is

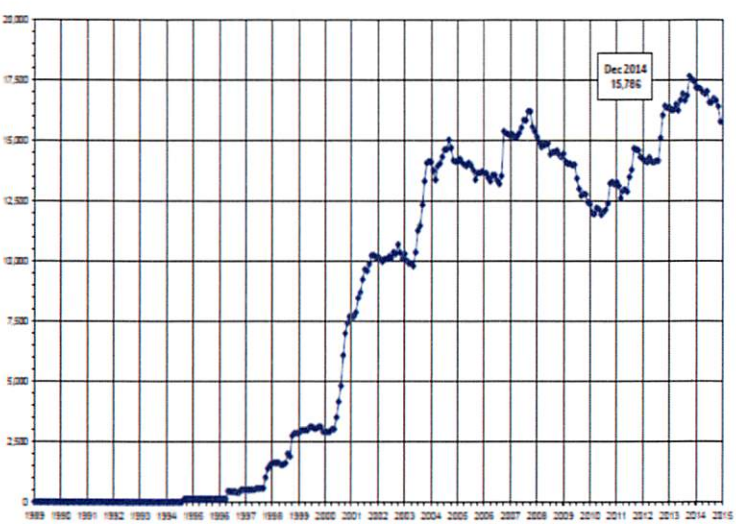

Figure 1: Kleingrass acreage, 1989-2014 (Source: IID crop acreage report, Dec. 2014

Table 1: Imperial County Field Crop Production & values (source: IV County Ag Crop & Livestock report, 2015)

Crop	Year	Harvested Acres	Yield Per Acre	Gross Value
Alfalfa Hay	2015	140,663	7.54	$168,561,000
	2014	122,138	8.15	$219,766,000
Bermuda Grass Hay	2015	51,928	7.61	$64,973,000
	2014	47,641	8.45	$77,448,000
Cotton (Lint)[1]	2015	1,875	3.68	$2,373,000
	2014	2,455	4.66	$4,284,000
Cotton (Seed)	2015			$525,000
	2014			$1,483,000
Klein Grass Hay	2015	16,002	8.28	$21,188,000
	2014	16,771	10.31	$29,078,000
Pastured Crops[2]	2015	49,227		$1,840,000
	2014	46,777		$1,697,000
Straw (Baled)	2015			$5,015,000
	2014			$6,713,000
Sudan Grass Hay	2015	45,151	4.66	$30,231,000
	2014	59,701	5.71	$65,245,000
Sugar Beets	2015	22,485	43.62	$44,764,000
	2014	24,376	43.40	$45,459,000
Wheat	2015	64,447	3.23	$60,883,000
	2014	37,777	3.49	$47,750,000
Misc. Field Crops	2015	7,136		$21,966,000
	2014	11,730		$31,926,000
Total 2015	Acres	349,687		$422,319,000
Total 2014	Acres	322,589		$530,849,000

planted at the appropriate time of the year because the crop grows vigorously (UCCE, 2013). Klein grass may be a host for some nematode species. Recently, we were called to visit a Klein grass field (Figure 2) in the IV suspected of having nematode problems. We collected soil and Klein grass root samples from areas that seem to

Figure 2: : Samples collected (left) and the Klein grass field suspected of nematode infestation

have some stunted growth and sent the samples to the University of California Riverside (UCR) nematology lab of Dr. Antoon Ploeg.

Below are the diagnostic results from the samples, the identified nematode and its nature and some suggested management approaches that may minimize effects of the nematodes. From the soil and plant samples sent to him, Dr. Ploeg's lab identified a nematode that is known as spiral nematode. Spiral nematodes belong to the genus *Helicotylenchus* and are globally distributed and associated with the root system of diverse groups of plants in cultivated and uncultivated areas.

Spiral nematodes are named for their body which tends to curl into a spiral when the nematodes are relaxed or dead (Figure 3). Most of the *Helicotylenchus* species of nematodes are migratory ectoparasitic or semi endo-parasitic and may occur in very high numbers feeding on the roots various susceptible plants (Subbotin et al., 2010). Some species live half-buried in the root tissue. Reproduction is highly variable among species of *Helicotylenchus*. Some species reproduce sexually, some species are hermaphrodites that self-fertilize their own eggs without mating, and other species reproduce asexually by parthenogenesis, i.e. they do not mate and have only females. Females lay eggs on, around, or inside the roots, and within two or three days the juveniles emerge and start to feed. The nematode inserts its mouth-spear (stylet) into the epidermis and cortical cells and ingests the cellular content. The

Figure 3: The body of spiral nematodes curve into a spiral when the nematode is dead or relaxed (source: Crow. U of Florida)

nematodes generally stay in one location feeding on a single food cell, but can also move to a different location on the same or different plant root.

Significant injury from the spiral nematodes may not occur unless the population is high. Symptoms of injury may include wilting, decline in growth, and slow response to water and fertilizer. In turf, decline will occur in patches (Figure 4) and is often accompanied by a proliferation of weeds in the affected areas. Small light to dark brown lesions may also occur on infected plants. These symptoms may not be unique to spiral nematodes, because other pathogenic agents and cultural and environmental problems can cause similar symptoms. Therefore, to determine if spiral nematodes are contributing to a decline in crop health, soil or root assay has to be conducted. For the assay, select a nematology lab that has experience with nematode diagnosis. It is a good idea to call the lab before sending the sample and know how the samples should be collected and shipped. When sampling, it is important to know that nematodes are not evenly distributed, hence samples need to be collected from various locations and consistent depth. Take 4-inch-deep soil cores, tearing the top 0.5 inch from the cores, mix and take composite sample of the mix. It is best to sieve the soil samples to prevent clumps and debris. If samples are collected when too hot, it is important to water the soil samples slightly.

Figure 4: Infestation by H. pseudoobustus- see visible patches of turf (source: Crow. U of Florida)

Suggested management strategies

Healthy grass can better withstand nematode infestations. Therefore, appropriate crop production practices and maintenance is considered to suppress potential damage of the nematode pest. Other approaches of nematode suppression are;

- Cultural Control – could be the use of resistant varieties, if any and should be used where nematodes are present. Rotation with resistant varieties and non-host crops may be as effective as fumigation. Some of the host plants of spiral nematodes include *Allium cepa* (onion), *Allium sativum* (garlic), *Avena sativa* (oats), *Cucumis melo* (melon), *Daucus carota* (carrot), *Gossypium* (cotton), *Helianthus annuus* (sunflower), *Hordeum vulgare* (barley), *Lactuca sativa* (lettuce), *Solanum lycopersicum* (tomato), *Solanum tuberosum* (potato), *Sorghum bicolor* (sorghum), *Zea mays* (maize), *Triticum* (wheat), etc. The extensive host range of spiral nematode makes management by crop rotation or cover crops very difficult.

- Soil solarization can provide control of many soil-borne diseases, nematodes, & weeds.
- Monitoring and Treatment Decisions - confirm that aboveground symptoms are caused by nematode injury and not by other stress.

Further study is necessary to make more specific recommendations on control strategy. If you suspect you're having nematode problems, consult with your PCA or contact the UCCE office.

References (for further information, please read the following);

- Subbotin et al. 2010. Biodiversity and phylogenetic relationships within the spiral nematodes of *Helicotylenchus* Steiner, 1945
- Blake C. 2009. Klein grass gains ground in desert ag. _http://www.westernfarmpress.com/alfalfa/Klein grass-gains-ground-desert-ag. 2009.
- Ploeg A. *UC IPM Pest Management Guidelines:* UC ANR Publication 3470
- Crow. Nematode Management for Golf Courses in Florida
- *USDA–NRCS James E. "Bud" Smith Plant Materials Center, Knox City, Texas.*
- UC Cooperative Extension-Imperial County Field Crops Guidelines 2013.

CIMIS REPORT AND UC DROUGHT RESOURCES

Khaled M. Bali, Irrigation Water Mgmt Specialist, Kearney Ag Research & Extension
Sharon Sparks, Imperial Irrigation District*

California Irrigation Management Information System (CIMIS) is a statewide network operated by California Department of Water Resources. Estimates of the daily reference evapotranspiration (ET_o) for the period of May 1 to July 31 for three locations in Imperial County are presented in Table 1. ET of a particular crop can be estimated by multiplying ET_o by crop coefficients. For more information about ET and crop coefficients, contact the UC Imperial County Cooperative Extension Office (352-9474) or the IID, Ag Water Science Unit (339-9082). Please feel free to call us if you need additional weather information, or check the latest weather data on the worldwide web (Google CIMIS for the current link to CIMIS site).

Table 1. Estimates of daily Evapotranspiration (ET_o) in inches per day

Station	May		June		July	
	1-15	16-31	1-15	16-30	1-15	16-31
Calipatria	0.32	0.36	0.39	0.40	0.39	0.38
El Centro (Seeley)	0.31	0.34	0.36	0.38	0.38	0.37
Holtville (Meloland)	0.32	0.35	0.38	0.39	0.39	0.38

* Ag. Water Science Unit, Imperial Irrigation District.

Water and Drought Online Seminar Series

The latest research-based advice on weathering a drought is now available free online. The UC Division of Agriculture and Natural Resources is working to help farmers cope with the unwelcome outcome of historically low rainfall the last three years. UC scientists, with support from the California Department of Water Resources, have recorded video presentations on high-priority drought webpages.

Each presentation is about one half hour in length and is available at the link below:

http://ciwr.ucanr.edu/

Then click on the drought resources link.

COACHELLA VALLEY FARMERS EDUCATIONAL MEETING SCHEDULE

2017

Month	Date	Topic and Speaker
August	16	Grape Production/Disease Update: Carmen Gispert, Farm Advisor, UCCE Riverside County 760-342-2446 cgispert@ucanr.edu
September	13	Pitahaya Mini Festival: Ramiro Lobo, Farm Advisor, UCCE San Diego County ((858) 243-4608) rlobo@ucdavis.edu
October	11	Laws and Regulations Update: Ruben Arroyo, Riverside County Agricultural Commissioner (951-955-3000) agdept@co.riverside.ca.us

2018

Month	Date	Topic and Speaker
February	14	Update on Pink Hibiscus Mealybug: Tom Perring Professor of Entomology: UCR ((951) 827-4562) thomas.perring@ucr.edu
March	14	Invasive Species: Cheryl Wilen, Area Integrated Pest Management Advisor, (858) 822-7795 cawilen@ucanr.edu
April	11	Invasive weed control: Travis Bean, Assistant Weed Science Specialist, Cooperative Extension UCR 951-8275130 travis.bean@ucr.edu

Planning committee:

Olde Avalos, Rod Chamberlain: Coachella Valley Mosquito Vector Control District

Ruben Arias, California Department of Food and Agriculture

Angela Fasano, Coachella Valley Water District

Jose Luis Aguiar, UCCE Riverside County

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