Features

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PHOSPHOROUS AND WATER QUALITY

Khaled M. Bali & Nicole Rothfleisch*

California Regional Water Quality Control Boards (CRWQCBs) are in the process of developing total maximum daily loads (TMDLs) that define how much of a "pollutant" a water body can tolerate on a daily basis. Regional Boards are also expected to set limits for these pollutants such that these water bodies attain their "beneficial" uses. The list of water bodies in this region that are considered "impaired" by the state includes the Alamo River, New River, Imperial Valley agricultural drains, Salton Sea, and Coachella Valley storm water channel. According to the list, major "pollutants" impairing these waters are silt, pesticides, salts, nutrients (mainly phosphorous), and other pollutants. Currently the two TMDLs of concern to us are the Salton Sea Nutrient TMDL and the silt/sediments TMDLs for drains and rivers in this region.

Why Phosphorous?

Agricultural discharges from the Imperial Valley account for almost 85% of the total annual flow of fresh water to the Sea. The Salton Sea provides significant habitat for fish and wildlife. Rising salinity, sediments, and nutrients may threaten these habitats. The load of nutrients (mainly phosphorous and nitrogen) and sediments in Imperial Valley drains and rivers have resulted in degraded conditions that impair the state-designated beneficial uses of the Salton Sea. The CRWQCB- Region 7, the Salton Sea Nutrient TMDL Technical Advisory Committee (TAC) and other agencies have identified phosphorous (P) as the primary nutrient creating eutrophic conditions in the Salton Sea. The two main external sources of P are agricultural drains and the New River load from Mexicali.

What can be done to achieve the TMDL objectives?

A significant reduction in P loading rate to the Salton Sea must be achieved to decrease the probability of eutrophic conditions in the Salton Sea. This reduction can be achieved by either reducing the concentration of P and sediments in surface runoff water and New River water and/or by the removal of P from drainage and river waters.

Can we do it?

Agricultural P management techniques may be implemented to reduce the concentration of P in drainage waters. In addition, the P load from Mexicali in the New River must be substantially reduced to improve the quality of water that is being discharged into the Salton Sea. The combined effect of these two measures may reduce the P concentration in drainage/river waters by as much as 40-50% of current levels. Complying with the current silt/sediments TMDL should reduce P load in drainage water. This reduction in P load will definitely improve the quality of discharged water into the Sea but may not be sufficient to eliminate eutrophication in the Sea. Additional measures to remove soluble P from drainage water may be needed. There are concerns that it may take years or decades for such measures to be effective in reducing eutrophic conditions in the Salton Sea due to the current internal load of P in the Salton Sea (the release of P from sediments in the Salton Sea).

What do I need to do?

Growers in the Imperial County are encouraged to sing up for the Imperial County Farm Bureau TMDL/water quality compliance program. Contact Nicole Rothfleisch at the address below or you may sign up online at http://www.ivtmdl.com.

For additional information about water quality in the Imperial Valley, visit our new water quality website (http://tmdl.ucdavis.edu), the Imperial County Farm Bureau TMDL website (http://www.ivtmdl.com), or contact Nicole Rothfleisch at the address below.

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WIND WHIP DAMAGE

Keith S. Mayberry

Springtime often brings strong west winds to the low desert valleys of Imperial and Riverside Counties. Although the winds bring a cooling trend to the desert, they also create havoc with some crops.

Wind whip damage increases dramatically during this time of the year. Plants such as melons are tossed back and forth on beds, twisting and breaking stem tissue. Often the damage goes unnoticed for a period of as much as a couple of weeks. The weather is often cool, minimizing the need for plants to draw up much water to satisfy evapotranspiration needs. The damaged plant develops a greater mass of foliage in a few days and the temperature once again rises in the desert. The result of the injury is wilting, perhaps yellowing of the leaves and scorching of the leaf margins. Many plants die.

The main keys to identifying wind whip injury are to look for signs of damage in the stem section right near the soil. If some affected plants are dug and the root/stem area is sliced in half longitudinally, there may be signs of constriction. The area may be fatter than normal by callus tissue formation and hard to cut with a knife. The roots are often small, but normal in shape and appearance, and usually white (not shades of brown). If wind whip is the cause, then there is an absence of any form of normal plant root rot, no nematode galls, and no sign of fertilizer damage.

Wind damage not only affects melons, but many other crops can suffer a similar fate including peppers and tomatoes. Fruits of the plants may also be scarred to the point of reducing market value. This is especially true in watermelons. The scarring may be the result of abrasion by the vine or foliage or by sandblast from airborne particles.

With taller crops, wind may topple the foliage. This can occur with sweet corn, artichoke, and wheat. These crops may not be commercially harvested under the worse case scenario. Artichoke plants, for example, often snap at the base leaving the maturing buds to wither and die.

Alfalfa hay or bermudagrass hay windrows are scattered by the wind. There is greater expense in re-raking the fields. There also is loss of economic value as raking may cause the leaves to fall off in alfalfa. Dirt and debris may be rolled back into the windrows with alfalfa and bermudagrass.

Cooler temperature from the wind also slows down plant growth. Many crops are delayed in maturity including melons, onions, corn, tomatoes, etc. Delays at harvest are often felt in reduced farm gate prices as other competing areas not affected by cool temperature come into harvest.

Crop pollination may be enhanced with wind-pollinated crops such as corn or tomatoes if the winds are not too strong. However, bee pollinated crops are severely affected as bees do not work efficiently when bucking a head wind to return to the hives. Melon fruit tend to be smaller and more fruit abortion occurs during windy periods.

INSECTICIDE EFFICACY AGAINST SILVERLEAF WHITEFLY IN A 2002 COTTON TRIAL

Eric T. Natwick

A whitefly insecticide efficacy research trial was conducted at the beginning of the 2002 cotton growing seasons at the University of California Desert Research and Extension Center in Imperial Valley, CA. A stand of cotton, variety DPL 5415, was established on March 20, 2002. The insecticide treatments and untreated controls were replicated four times in randomized complete design. Insecticide treatments, by trade name, and treatment rates are listed in Table 1. All insecticide treatments were applied with a Lee Spider Spray Trac Tractor 4-row sprayer with three nozzles per row on June 25, July 9, 16, and 23, 2002

Ten leaves at the 5th node position down from the terminus in each plot were used for silverleaf whitefly sampling. Adult numbers were recorded per leaf and nymphs were counted on a 1.65 cm^2 leaf disk from the lower left quadrant. Adults and nymphs were counted on June 24, 26, July 1, 8, 15, 22, 29, and August 5, 2002. Data were analyzed using analysis of variance for randomized complete block design and Least Significant Difference (LSD) was employed for means separations.

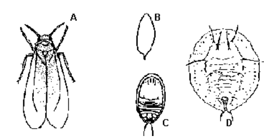
The adult whitefly post treatment mean for the untreated control was significantly greater (*P* # 0.05) than the adult mean for the Danitol 2.4 EC plus Orthene 97 treatment, Table 1. Danitol 2.4 EC plus Orthene 97 had a whitefly adult mean that was significantly lower than all other treatments except Assail 70 WP and Calypso 4 SC. The adult mean for (-cyhalothrin was significantly greater than the mean for the untreated control.

The whitefly egg post treatment mean for the untreated control was significantly greater (*P* # 0.05) than the egg means for the Assail 70 WP and Calypso 4 SC treatments, Table 1. Assail 70 WP had a whitefly egg mean that was significantly lower than all other treatments except Danitol 2.4 EC plus Orthene 97 and Calypso 4 SC. The egg mean for (-cyhalothrin was significantly greater than the mean for the untreated control.

The whitefly nymph post treatment mean for the untreated control was significantly greater (*P* # 0.05) than the nymph means for all insecticide treatments with the exception of the Warrior and (-cyhalothrin treatments, Table 1. Assail 70 WP had a whitefly nymph mean that was significantly lower than all other treatments except the nymph mean for Calypso 4 SC.

There were no significant differences among the treatment for pounds of seed cotton per acre, Table 1. However, the three treatments with the lowest means for whitefly adults, eggs and nymphs, Assail 70 WP and Calypso 4 SC and Danitol 2.4 EC plus Orthene 97, also had the greatest seed cotton yields.

Mention of trade name, proprietary product, or specific equipment does not constitute a guarantee or warranty by the University of California nor does it imply approval to the exclusion of other products that may be suitable. Some products mentioned in this report are not currently available for use on cotton. Obtain a current label and necessary permits for insecticides prior to application. Read and follow all label directions.



A. Adult B. Egg C. Crawler D. Nymph

Table 1. Post Treatment Means for Whitefly Adults, Eggs, and Nymphs and Seed Cotton Yield Following Insecticide Treatments to Cotton, Holtville, CA, 2002[x].

Treatment	Lb AI/acre	Adults/leaf[yz]	Eggs/cm^{2z}	Nymphs/cm^{2z}	Seed Cotton/acre
Non-Treated	**--------**	**2.4 cde**	**0.31 cd**	**0.91 a**	**4052**
Warrior	**0.025**	**4.1 ab**	**0.55 ab**	**0.84 ab**	**3974**
Warrior	**0.03**	**2.8 cd**	**0.41 bc**	**0.66 abc**	**3569**
***(-cyhalothrin**	**0.0125**	**4.3 a**	**0.73 a**	**0.85 a**	**3839**
Applaud 70 WP	**0.378**	**2.8 bcd**	**0.32 cd**	**0.44 cd**	**4059**
***Oberon 2 SC**	**0.133**	**2.9 bcd**	**0.27 cdef**	**0.44 cd**	**3946**
Assail 70 WP	**0.10**	**1.6 ef**	**0.16 f**	**0.20 e**	**4274**
***Calypso 4 SC**	**0.0939**	**1.9 def**	**0.18 ef**	**0.27 de**	**4200**
***Diamond 0.83EC**	**0.013**	**2.2 cde**	**0.31 cd**	**0.60 abc**	**3816**
***Diamond 0.83EC**	**0.026**	**3.0 abc**	**0.28 cde**	**0.79 ab**	**3904**
Danitol 2.4 EC + Orthene 97	**0.2 + 0.5**	**1.2 f**	**0.25 def**	**0.54 bc**	**4312**

*** Not registered for this use at time of publication.**
[y] Mean separations within columns by $LSD_{0.05}$.
[z] Log transformed data used for analysis; reverse transformed means in table.

BOTRYTIS FRUIT ROT OF TOMATO

Thomas A. Turini

Botrytis cinerea is the fungal species that causes gray mold of tomato. This fungus survives on dead tissue, causes disease on many crops and its airborne spores are widespread.

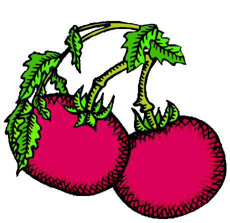
On tomatoes, it can cause severe losses under some conditions. *Botrytis cinerea* can grow on all aboveground tomato tissues including leaves and stems, but the greatest economic damage it causes is a fruit rot. The fruit may rot either in the field or in storage.

This disease can be identified by the fuzzy gray-brown appearance of this fungus associated with soft rot. Light tan-to-gray spots characterize the symptoms on expanding leaves. At advanced stages of disease development the leaves whiter and the characteristic fungal growth is apparent.

The range of temperatures for optimum growth of this fungus is from 64° to 73°F. Although average temperatures in Imperial Valley range 67° to 97°F, tomatoes are stored commercially from 62° to 68°F. This is the likely reason that it is a post harvest problem in this area.

Currently, no fungicide for post-harvest treatment is registered and no information regarding the affect of pre-harvest treatment was available at the time of the last report of a severe problem in Imperial County. Therefore, the possibility of a pre-harvest treatment providing some protection after harvest was investigated. A field trial was conducted in a field of cv. "Shady Lady" tomatoes in Imperial County. However, no materials tested that currently have registration on tomatoes (Bravo, Quadris) reduced disease incidence in storage when applied 4 days before harvest.

In some studies, an increase of the calcium-to-phosphorus ratio in the plant can result in a decrease in disease incidence.



SUMMER 2003

Juan N. Guerrero

The winter of 2002/03 was rather mild, with a mild "El Niño" weather pattern over the Pacific Ocean. Following an El Niño event, the monsoon season over the Desert Southwest is usually quite active; it takes time for the ocean to cool back down. Warm Pacific waters mean high amounts of water vapor in the air. An active monsoon season means that this summer besides being hot (normal) will also be more humid than usual.

It is imperative that livestock be protected from the effects of summer heat as much as possible. During summer heat stress horses (and humans) sweat, dogs and cattle pant to relieve heat stress. In cattle, when rectal temperatures exceed 104°F (100 to 103°F is normal), the animals start to pant to cool down. Normal respirations for cattle are 15 to 30 respirations/min, greater than this means the animal is panting and heat stressed. Heat stressed cattle often have their tongues protrude, like a dog. Heat stressed cattle have recorded rectal temperatures >107°F, at these body temperatures cattle are close to death. During the summer it is imperative not to work or exercise animals during the hot part of the day. By 6AM during the summer, all work with livestock should cease.

The digestive process (fermentation) in cattle releases heat, so when cattle are heat stressed, they eat less to keep themselves cool. If you are trying to fatten cattle during the summer, it would be a good idea to not start feeding until about 6PM, so cattle are digesting their food during the cooler nights. All livestock and pets kept outside during summer need three basic requirements to endure the Sonoran Desert summer.

1. Shade – Shade is an absolute must in the irrigated Sonoran Desert for livestock. Often during the passing of the day, part of the animal's pen is not covered by shade, a grave mistake. Shades should be oriented North/South so the shade covers some part of the pen during the day. If a permanent shade can not be constructed, plastic shade cloth (available at hardware stores) is a good alternative.

2. Cool water – During the summer, warm water in animal drinkers soon becomes algae contaminated in our climate. Changing the water several times per day, or having a continuous trickle of water to the drinker will alleviate much heat stress.

3. Air movement – Air movement, wind, helps cool down heat-stressed animals. Livestock pens should be made of metal cable, pipe, or wire to not impede wind flow. Wooden boards or pallets are the absolute worst kind of fencing for the desert summer.

For horses and pets kept outside during the summer, an outside mister works wonders in relieving heat stress. Just as in Northern climates there is a "wind chill" factor, in warm climates there is a "heat stress" factor as well. Higher relative humidity makes the apparent temperature feel even hotter. At higher temperatures at the same relative humidity, there is a greater amount of water vapor in the air. The heat stress factors are shown in Table 1. For example, at 27% relative humidity; 100°, 110°, and 115°F "feel' like 101°, 119° and 130°F, respectively. These kinds of temperatures and humidities are common during our summer.

Table 1.

	Apparent Heat °F Thermometer temperatures °F									
Relative Humidity %	**70**	**75**	**80**	**85**	**90**	**95**	**100**	**105**	**110**	**115**
0	70	75	80	85	90	95	100	105	110	115
6	70	74	78	82	86	90	94	98	103	107
9	71	74	78	82	86	90	95	99	104	109
12	72	75	78	82	86	90	95	100	106	112
15	73	75	78	82	86	91	96	102	108	115
18	74	76	78	82	86	91	97	103	110	118
21	74	76	79	82	86	92	98	105	113	122
24	75	76	79	82	87	92	99	107	116	126
27	76	77	79	83	87	93	101	109	119	130
30	76	77	79	83	88	94	102	112	122	134
33	76	77	79	83	89	96	104	114	126	139
36	77	77	80	84	89	97	106	117	130	144
39	77	77	80	84	90	98	108	120	134	150
42	77	78	80	85	91	100	111	124	139	156
45	77	78	80	85	92	102	114	127	143	162
48	77	78	81	86	94	104	116	131	148	168
51	77	78	81	87	95	106	119	135	154	175
54	77	78	81	87	96	108	123	140	159	182
57	76	77	81	88	98	111	126	144	165	189
60	76	77	82	89	100	113	129	149	171	197
63	75	77	82	90	101	116	133	154	178	204
66	75	77	82	91	103	119	137	159	184	213
69	74	77	83	92	105	122	141	165	191	221
71	74	77	83	93	107	124	144	168	196	227
73	73	76	83	94	108	126	147	172	201	233
75	72	76	84	95	109	128	150	176	206	239
77	72	76	84	95	111	130	153	180	211	245
79	71	76	84	96	113	133	157	184	216	252
81	70	75	84	97	114	135	160	189	221	258

EVALUATION OF PLANT MONITORING TECHNIQUES FOR DETERMINING TIMING OF PIX APPLICATIONS TO COTTON FOR GROWTH SUPPRESSION

Herman Meister

Introduction and Objective

Cotton growers in the Valley are growing cotton more aggressively than in the past. New genetically modified varieties of cotton are being grown on better quality ground with more water and fertilizer.

Cotton growers were concerned that Pix applications were not providing adequate suppression of growth when used according to label guidelines. They felt that the criteria used to evaluate "when" to apply Pix were not appropriate for this area and their growing technique.

A trial was established in the spring of 2002 to evaluate the timing of Pix applications based on two techniques for determining "when" to apply Pix. The "Height to Node" ratio (H:N) method and the Maximum Internode Distance (MID) technique were evaluated to determine their appropriateness for timing of Pix applications. A multiple application treatment (label recommendation) was included as a standard along with an untreated check.

As the season progressed, I consulted with members of the Cotton Pest Abatement District (CPAD) board regarding thresholds to use to activate Pix based on the data collected. A decision was made to use a H:N of 1.2 rather than the label recommendation of 1.5. Regarding the MID, the decision was made to activate at 5.0 cm rather than at 6.0 cm. The intentional lowering of the thresholds was to activate Pix applications earlier in the cycle of the growth pattern to achieve greater growth suppression.

Methods and Procedure

The cotton variety DP 5415 was irrigated to stand on March 19, 2002. It was thinned to a final plant population of 31,300 plants per acre. It was sidedressed with 150 lbs urea/ac on May 13 with a second sidedress of the same amount on June 10. Seven more irrigations were applied to alternate furrows on the following dates: May 16, June 11, June 20, June 28, July 5, July 11, and July 18.

Petiole samples were collected four times during the season: match head square (16, 740 ppm on May 16th), first bloom (17,310 ppm on June 7th), peak bloom (15, 600 ppm on June 19th), and first open boll (9, 060 ppm on July 12th).

Plots were monitored weekly after emergence for mites, beet armyworm, lygus bugs, silver leaf whitefly (SLW), and pink bollworm (PBW). Appropriate insecticidal treatments were applied when pests reached economic thresholds.

PIX TREATMENTS		
1.	Multiple applications of Pix	
	a) 4 oz/ac at match head square	(May 16)
	b) 8 oz/ac.at first bloom	(June 7)
	c) 16 oz/ac at peak bloom	(June 20)
2.	Pix at 16 oz/ac applied at the H:N of 1.2	(June 7)
3.	Pix at 16 oz/ac applied at a MID of 5.00 centimeters.	(June 20)
4.	No Pix applications	

Treatments were randomized and replicated four times. Plots were 100 feet long and 4-40 inch beds wide with two non-planted beds as buffer areas in between plots. Pix treatments were applied with a CO_2 hand-held boom equipped with two 8002 FF nozzles, one located over the center of each row. Pix was applied at 25 gpa using 40 psi. Rates were calculated at 50% field coverage. All four treatments were evaluated using both methods of plant monitoring for timing of Pix applications.

The crop was defoliated with Ginstar on August 13th. Two one-thousandth acre samples were handpicked from the center of each plot approximately 10 days later to determine yields. Samples were hand ginned to determine turnout.

Results

The H:N method measures the growth of the plant the entire season resulting in an average figure for the growth pattern. In this test, the H:N method did not detect any differences in growth due to Pix applications. The MID method measures the distance between the 4th and 5th node, which gives a more recent estimate of the growth condition of the plant. The MID method did show differences in plant growth suppression due to Pix applications.

Fruit retention was not affected by Pix applications in this study. A slightly earlier advancement into cutout due to Pix applications was detected. No effect on yield was noted due to Pix applications.

FERTILIZERS AND FORMULATIONS

NAME	L or D	WEIGHT/ GAL	% N	% P_2O_5	% NH_4	LBS N/GAL	% NO_3	LBS P_2O_5/GAL	BURN POTENTIAL *
NH_3 (Anhydrous Ammonia)	Gas	5.15 lbs @ 60º	82		100	4.24	0		10
Aqua Ammonia 20-0-0	L	7.60 lbs.	20		100	1.55	0		9
AN20 20-0-0	L	10.60 lbs.	20		50	2.12	50		2
AN33 (Ammonium Nitrate)	D	Dry	33		50		50		2
UAN32 (Tri N32 or UN32)	L	11.10 lbs	32		75	3.55	25		7
Urea 46-0-0	D	Dry	46		100		0		5
Calcium Nitrate 15.5-0-0	D	Dry	15.5		0		100		1
CAN 17	L	12.64 lbs	17		25	2.15	75		1
Treble Super Phosphate (Triple Super Phosphate) 0-45-0	D	Dry	0	45	0		0		1
11-52-0	D	Dry	11	52	100		0		6
Phosphoric Acid 0-52-0		13.15 lbs	0	52	0		0	6.84	2
10-34-0 (Ten Thirty Four)	L	11.40 lbs	10	34	100	1.14	0	3.88	5

* 10 = Most likely to injure plants
L = Liquid
D = Dry

CIMIS REPORT

Khaled Bali and Steve Burch*

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 the 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, Irrigation Management Unit (339-9082).

The Irrigation Management Unit (IID) provides farmers with a weekly CIMIS update. Farmers interested in receiving the updated CIMIS report on a weekly basis can call the IID at the above number. Please feel free to call us if you need additional weather information, or check the latest weather data on the worldwide web (visit http://tmdl.ucdavis.edu and click on the CIMIS link).

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

Station	May		June		July	
	1-15	16-31	1-15	15-30	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

* Irrigation Management Unit, Imperial Irrigation District.

Eric T. Natwick
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