Imperial County Agricultural Briefs

Features

From your Farm Advisors

February, 2009

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Evaluation Insecticides for Aphid Control in Alfalfa

Eric T. Natwick

A field study was conducted during the spring of 2008 at the UC Desert Research and Extension Center. A stand of alfalfa, VAR. CUF 101, was used for the experiment. Plots were arranged in a randomized complete block design with five replications. Four insecticide treatments were included along with an untreated control. NAI-2302 is Tolfenpyrad is an experimental insecticide product under development by Nichino America Inc. and is not yet registered for use on alfalfa. Insecticide treatments and rates are listed in Table 1. Plots measured 13.3 ft. by 50 ft. and insecticide treatments were applied on March 10, 2008, using a broadcast application with a tractor mounted boom. Aphid populations {blue alfalfa aphid (BAA) pea aphid (PA) and spotted alfalfa aphid (SAA)} were measured in each plot with a standard 15-inch diameter insect net consisting of ten, 180^o sweeps. Plots were sampled on 7, 13, 17, 24 & 31 March; 3-day pre-treatment (DPT), 3-days after treatment (DAT), 7-DAT, 14-DAT and 21-DAT.

There were no significant differences among the insecticide treatments and the untreated control for BAA, PA or SAA in the pre-treatment sampled ($P = 0.05$), Tables 1, 2 and 3. All of the insecticide had significantly fewer PA compared to the untreated check 3-DAT and 7-DAT but none of the insecticide treatments were different from the check 14-DAT and 21-DAT. This was probably due to the overall decline in the PA population due to heavy parasitism by *Diaeretiella* spp. (Table 1). All of the insecticide had BAA means that were significantly lower than the untreated check 3-DAT, 7-DAT and 14-DAT (Table 2). All of the insecticide had significantly fewer SAA compared to the untreated check 3-DAT and 7-DAT but none of the insecticide treatments were different from the check 14-DAT and 21-DAT. This was probably due to the overall decline in the PA population due to heavy parasitism by *Diaeretiella* spp. (Table 3).

Table 1. Pea Aphids per Sweep, Holtville, CA, 2008.

Treatment	oz/acre	PT[w]	3 DAT[x]	7 DAT	14 DAT	21 DAT
Untreated check	--------	15.96	6.48 a	0.56 a	0.02	0.34
NAI-2302 15EC	27.0	10.42	1.42 b	0.10 b	0.14	0.24
NAI-2302 15EC	21.0	14.68	1.94 b	0.04 b	0.00	0.08
Dimethoate 267E	16.0	14.30	1.34 b	0.00 b	0.00	0.10
Furadan 4F	16.0	12.32	1.56 b	0.02 b	0.02	0.24

Means within columns followed by the same letter are not significantly different by $LSD_{0.05}$.
[w] Pre-treatment.
[x] Days after treatment.

Table 2. Blue Alfalfa Aphids per Sweep, Holtville, CA, 2008.

Treatment	oz/acre	PT[w]	3 DAT[x]	7 DAT	14 DAT	21 DAT
Untreated	--------	235.14	2.21 a	1.01 a	2.72 a	1.58
NAI-2302 15EC	27.0	220.82	1.54 b	0.44 b	0.90 b	0.90
NAI-2302 15EC	21.0	317.22	1.58 b	0.44 b	0.60 b	0.80
Dimethoate 267E	16.0	205.36	1.18 c	0.18 c	0.78 b	1.16
Furadan 4F	16.0	219.32	0.84 d	0.24 bc	0.62 b	0.86

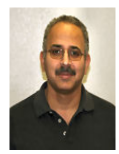
Means within columns followed by the same letter are not significantly different by $LSD_{0.05}$.
[w] Pre-treatment.
[x] Days after treatment.

Table 3. Spotted Alfalfa Aphids per Sweep, Holtville, CA, 2008

Treatment	oz/acre	PT[w]	3 DAT[x]	7 DAT	14 DAT	21 DAT
Untreated	--------	10.26	3.50 a	0.62 a	0.22	0.04
NAI-2302 15EC	27.0	10.26	0.86 b	0.22 b	0.04	0.04
NAI-2302 15EC	21.0	9.72	0.68 b	0.20 b	0.04	0.02
Dimethoate 267E	16.0	9.78	0.44 b	0.00 b	0.12	0.00
Furadan 4F	16.0	7.92	0.32 b	0.00 b	0.00	0.02

Means within columns followed by the same letter are not significantly different by $LSD_{0.05}$.
[w] Pre-treatment.
[x] Days after treatment.

Estimating Average Application Depth of Water Application – Drip Irrigation Systems



Khaled M. Bali

How much water are you applying with a drip irrigation system? To estimate the average depth of application, you need to figure out the amount of water applied from a flow meter, irrigation time and the area irrigated. Flow units are usually expressed in gallons per minute (gpm). To estimate the average depth of applied water, you need to take the average flow rate during the irrigation. The average depth of application can be determined from:

D= (Q*T)/(A* 449)

Where D is the average depth of applied water in inches, Q is the flow rate in gpm, and 449 is a conversion factor

Example: How much water was applied to a 40 acre field using an average flow rate of 2500 gallons per minute and the field was irrigated for 12 hours?

D= (2500*12)/(40*449)= 1.67 inches

If the flow rate reading is in units other than gpm, the average depth of application can be determine using the same principle but a different conversion factor.

Conversion factors:
1 acre = 43560 ft^2
1 ft^3 = 7.48 gallons
1 gallon = 3.785 liters
1 cfs = 449 gpm
24 Hour-Run: 1 cfs ::: 2 Ac-ft per 24 hr.
12 Hour-Run: 1 cfs ::: 1 Ac-ft per 12 hr.

Survival and Multiplication of Pathogens on Raw Produce

Mark A. Trent

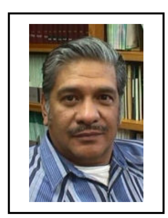
The preferred environment for many food-borne human pathogens is typically the intestines of a warm-blooded animal. An exception is *Salmonella* which is commonly found in many bird species, can also be found in the intestines of some reptiles. Once a pathogen leaves the security of its host's environment then its primary function is to survive until it again comes into contact with its preferred surroundings. The survival and/or multiplication of human pathogens on fresh produce is influenced by the organism, type of product, and environmental conditions in the field, at harvest, and postharvest, including storage conditions. In general, pathogens will survive but not grow on the uninjured outer surface of fresh fruits or vegetables, due in part to the protective character of the plant's natural barriers (for example, cell walls and wax layers). In some cases pathogen levels will decline on the outer surface.

Fortunately, in the physical environment of the field, leaf surfaces are considered to be inhospitable for the growth and survival of bacteria (for example, lack of nutrients and free moisture, temperature and humidity fluctuations, and ultraviolet light). Certain conditions, such as sunlight, particularly the shorter ultraviolet wavelengths, can damage bacterial cells. Consequently, nature may select for bacteria with adaptations to these stressful conditions. One method many human pathogens use to infect their host is to form a biofilm in order to adhere to the surface of the animal gut. A biofilm is the encapsulation within a self-developed polymeric matrix and adherent to a living or inert surface. Research has shown that some human pathogens can adhere to leaf surfaces through the formation of a biofilm. It may also be possible for some pathogens to take up residence within a biofilm formed by a different organism; similar to the way a hermit crab utilizes the shell of a less fortunate sea creature. Protected within the shelter of a biofilm, the pathogen may be able to resist the lack of free moisture, climatic fluctuations, and ultraviolet light as well as vigorous washing and even sanitizing agents.

An even more effective strategy for survival would be for the pathogen to find an environment that provides nutrients along with moisture, protection from ultraviolet light and climate fluctuations. This environment exists within the plant's tissues. Fortunately, bacteria cannot penetrate the surface of an uninjured plant on its own. Plant pathogenic bacteria enter the plant though passive means such as entrance through wounds or abrasions. Survival of foodborne pathogens on produce is significantly enhanced once the protective epidermal barrier has been broken either by physical damage, such as punctures or bruising, or by degradation by plant pathogens (bacteria or fungi). Because these conditions provide moisture and nutrients, the environment can now promote the multiplication of pathogens, especially at non-refrigerated temperatures. Various enteric pathogens have been shown to multiply on the surface of cut melons, on shredded lettuce, and on chopped parsley and under acidic conditions, such as chopped tomatoes and wounded apple tissue.

Wash-water contaminated with microorganisms, including pathogens, can infiltrate the intercellular spaces through pores when conditions are right. Plant pathologists who want to study the effects of plant pathogenic bacteria may infect healthy plants by a method called infiltration. In this method the plants are held at 100% humidity for a period before they are spray inoculated with suspension of bacteria using an artist's airbrush. Under high humidity the natural pores in the plant leaves open and water along with microorganisms can be forced in to the plants intercellular spaces. Adding surfactants (detergents) to the water appears to enhance infiltration, likely due to reduced surface tension. Under some circumstances, wash water may enter an intact fruit through the stem scar or other opening, such as the blossom or stem end of an apple. Conditions that reduce infiltration of plant pathogens should also prevent infiltration of human pathogens. Infiltration of wash-water into intact fruit has been demonstrated with several fruits and vegetables, and is thought to have contributed to an outbreak of salmonellosis.

Outbreaks of human infections associated with consumption of raw fruits and vegetables have occurred with increased frequency during the past decade. Factors contributing to this increase may include changes in agronomic and processing practices, an increase in per capita consumption of raw or minimally processed fruits and vegetables, increased international trade and distribution, and an increase in the number of immuno-compromised consumers. A general lack of efficacy of sanitizers in removing or killing pathogens on raw fruits and vegetables has been attributed, in part, to their inaccessibility to locations within structures and tissues that may harbor pathogens. Understanding the ecology of pathogens and naturally occurring microorganisms is essential to the development of new interventions for elimination or control of growth of food-borne pathogens.



Pricing Silage

Juan N. Guerrero

Making hay during the winter is difficult because the drying period may become excessive. If during the drying period it rains, the entire cutting might be lost. Rather than taking the risk of hay-making during the winter, some growers pasture alfalfa fields with sheep during the winter. There is another option, silage. Alfalfa silage is prized by dairy producers because cows relish silage. On a dry matter basis, cows usually eat more silage than a comparable amount of hay. One of the golden rules in livestock production is: the more an animal eats, the more it produces. Over time stored hay decreases in feeding value. However, silage nutritive value may be conserved over a much longer period (years). There are several market production problems with alfalfa silage production. Since silage is about 65% water, transporting water by truck is expensive. The ensiling process has innate inefficiencies. Silage dry matter losses may range from 20-30% in bunker silos to 10-20% in silage bags. Another problem for a producer is properly pricing the alfalfa silage; how do you sell standing water?

I propose the following procedure for a producer to price alfalfa silage. Assume the following for next February: Hay price – $210/ton for Premium hay, baled hay has 16% moisture, a hay yield of 1 ton/acre, baling losses of 15% of potential dry matter yield, lush and green alfalfa in the field is about 80% water; $35/ton for baling, raking and stacking; a 12% silage loss from silage bags; and costs for plastic bags for silage and freight are borne by dairyman

Calculations:

✓ 2000 lb/acre (hay yield) * 0.84 dry matter (bale dry matter) = 1680 lb/acre dry matter yield

✓ 1680 lb/acre ÷ 0.85 (baling loss adjustment) = 1976 lb/acre of potentially available dry matter harvested by the silage process (when you make silage you harvest *all* potentially produced dry matter rather than the *normal* loss of 15% during baling, that is why you divide)

✓ 1976 lb/acre ÷ 0.35 (dry matter in silage) = 5646 lb/acre of potential silage yield

✓ 5646 lb/acre ÷ 2000 lb/ton = 2.8 ton/acre potential silage yield

✓ 2.8 t/a * 0.88 (silage loss) = 2.5 t/a net silage production

✓ $210/ton (hay price) - $35/acre (baling costs) = $175/ton (net price per ton of hay without baling costs)

✓ 1 ton/acre hay yield * $175/ton = $175/acre gross returns

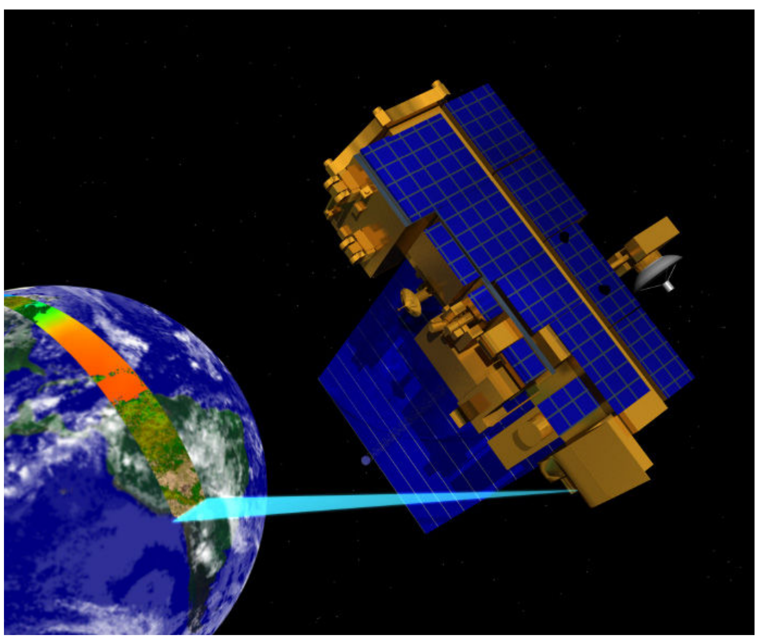
✓ $175/acre (gross returns) ÷ 2.5 ton/acre (silage production) = $70/ton breakeven silage price

Under these conditions the grower must receive $70/ton of silage to make silage-making comparable to hay production. If any part of the transaction, such as the cost of the plastic bags or freight charges change, then silage production will not be comparable to hay production. While alfalfa silage is highly prized by the dairyman, for the alfalfa producer silage production is just another marketing medium with its own particular positives and negatives.

Remotely Sensed Crop Evapotranspiration

Ayman A. Suleiman

Crop Evapotranspiration (ET_c, the sum of soil water evaporation and crop transpiration) is a major component of the energy and water balances over areas. Many studies of long-term averages have shown that more than half of the net solar energy and two thirds of precipitation go to ET_c over areas. In addition to agriculture, estimates of ET_c are needed for many applications in diverse disciplines such as hydrology and meteorology. Ground-based measurement techniques of ET_c and variables controlling it, such as canopy density, soil water availability, and surface temperature are inadequate over large or heterogeneous areas. Remote sensing can be a handy source for such variables at a reasonable resolution. Soil moisture availability is a key variable, as it exerts control over the ratio between actual and potential evapotranspiration. Although soil moisture sensing is progressing rapidly, remotely sensed soil moisture content data are not always available or accurate, especially for dense vegetation. Moreover, remotely sensed soil moisture does not represent the entire soil water profile (root zone) that controls ET_c; it merely represents the top 2 inches of the soil surface. ET_c is usually estimated from remotely sensed data in two methods. First, the Land-Atmospheric Radiometer Model can be used to compute ET_c directly using remotely sensed data and air temperature, wind speed, and solar radiation that are readily available from ground-based weather stations. Second, remotely sensed data can be used to determine crop coefficients. The availability of more than 100 weather stations across the state as part of the California Irrigation Management Information System (CIMIS) makes it possible to obtain the required weather data. Currently, CIMIS collects reliable weather information for agricultural and environmental applications, including irrigation and water management. The CIMIS is a network of automated weather stations operated by California Department of Water Resources to collect detailed weather variables at remote locations across the state.



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 December 1 to February 28 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). 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	December		January		February	
	1-15	16-31	1-15	15-31	1-15	16-28
Calipatria	0.07	0.07	0.08	0.09	0.12	0.14
El Centro (Seeley)	0.06	0.06	0.08	0.09	0.12	0.14
Holtville (Meloland)	0.06	0.06	0.08	0.09	0.12	0.14

* Irrigation Management Unit, Imperial Irrigation District.