Imperial County Agricultural Briefs

Features

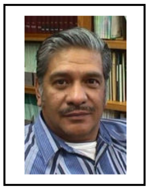
From your Farm Advisors

June, 2009

Page

Farewell

Juan N. Guerrero



June 30, 2009 will be my last day with the University of California Cooperative Extension; I'll be retiring. I started working with Cooperative Extension on July 17, 1984 as the area livestock advisor for Riverside and Imperial Counties. Since the late 80's, I have also been responsible for the forage extension program. One of the greatest satisfactions of my life has been to provide research based information to the livestock and forage producers of the irrigated Sonoran Desert. All the clientele have been very kind and cooperative; only once was I asked to leave a farm. Over these many years I have witnessed various changes in local agriculture, and more changes will be inevitable; it's the nature of the beast. Local producers must keep ahead of the technological curve or risk going out of business; i.e. adapt or get out.

One of the joys of my life has been providing extension information to all of you; Thank You!

Using Mode of Action Classifications

Mark A. Trent

Using Mode of Action Classifications in a Integrated Resistance Management Program – Insecticide Resistance

Frequent and/or indiscriminant use of chemical pesticides typically leads to the development of resistance. However, wise use of pesticides can delay (or maybe even prevent) the advance of resistant genotypes. Listed below are three strategies that can be used to "manage" the development of resistance:

1. **Management by Saturation** involves excessive, heavy, or frequent use of a pesticide that is designed to leave absolutely no survivors. This strategy overwhelms a population's resistance, suppresses any detoxification mechanism, and precludes reproduction by survivors. It is most effective when the resistant gene is dominant and the target population is small, isolated, or living in a limited habitat (*e.g.* greenhouse). If this strategy cannot be fully carried out it can be a recipe for disaster.
2. **Management by Moderation** uses only the minimum control necessary to reduce a population below its economic threshold. Growers use low rates, short-residual compounds, infrequent applications, and/or incomplete coverage to ensure that significant numbers of susceptible individuals survive and reproduce. This strategy tries to ensure that susceptible genes are never eliminated from the population. It works best when the susceptible trait is dominant over the resistant trait.
3. **Management by Multiple Attack** involves the use of several control tactics that work in different ways. By rotating insecticides with different mode of action (MoA) or by alternating chemical with non-chemical control tactics, a pest population is exposed to selective pressures that change from generation to generation. The development of a resistant genotype is less likely to occur when selective pressures are highly variable.

Perhaps the most widely used and accepted method for pesticide resistance management is known as "management by multiple attack". To assist in this approach three international Specialist Technical Groups representing insecticides, fungicides, and herbicides have been formed. Their general purpose is the support of a cooperative approach to the management of pesticide resistance. The Insecticide Resistance Action Committee (IRAC), the Fungicide Resistance Action Committee (FRAC) and the Herbicide Resistance Action Committee (HRAC) have developed MoA classifications for their respective pesticides. This article is the first of a three part series and will examine a resistance management program for insecticides. IRAC defines resistance to insecticides as "*a heritable change in the sensitivity of a pest population that is reflected in the repeated failure of a product to achieve the expected level of control when used according to the label recommendation for that pest species*".

Insecticide Mode of Action Classification

IRAC's MoA classifications include insecticides and acaricides (miticides). These pesticides are classified into 28 MoA group numbers (with 3 group numbers "vacant") and a number of sub-groups. The main idea behind "management by multiple attack" is to practice alternation, sequences or rotations of compounds from different MoA groups to ensure that successive generation of the pest are not treated with compounds from the same pesticide classification. Within some MoA groups are sub-groups. These sub-groups represent distinct structural classes believed to have the same mode of action. In general, the risk of metabolic cross-resistance is lower between subgroups than for close chemical analogs. However, cross-resistance among sub-groups of the same MoA is known. Therefore, in the absence of other alternatives, it may be possible to rotate compounds between sub-groups only if it is clear that cross resistance mechanisms do not exist in target populations. By definition, sub-groups are established to represent distinct chemical classes within a common MoA. Whether they should be rotated or not will depend on knowledge and experience of cross-resistance patterns, resistance mechanisms, and on the pest, crop, and region. For more information on insecticide resistance go to: http://www.irac-online.org

A Potential Threat to the Imperial Valley Tomato Growers: Tomato Yellow Leaf Curl Virus

Donna R. Henderson

Tomato Yellow Leaf Curl Virus (TYLCV) is considered one of the most devastating diseases of tomatoes worldwide, especially in Mediterranean climates similar to that of southern California. Thus, TYLCV may be considered a serious threat to tomato production in California should it become established. In the 1990's TYLCV was found in the Dominican Republic, and has since become established in Florida and found in Georgia, Louisiana, and North Carolina (UC-IPM). In 2006-2007, there was a severe outbreak of TYLCV in the northern States of Mexico (states of Sinaloa and Tamaulipas) (Rojas et al., 2007). In fall 2006, TYLCV was found in Texas and Arizona (UC-IPM). TYLCV was first detected in greenhouse tomato transplants in March of 2007 in Brawley, CA (Rojas et al., 2007). The virus was found to be 99.7% similar (total nucleotide sequence) to the virus isolate from Northern Mexico (Rojas et al., 2007). Additionally, the greenhouse tomatoes were seed-grown and only developed the viral symptoms later in the season, indicating that the infection was introduced from Mexico through viruliferous whiteflies, and not through transplanted tomatoes (Rojas et al., 2007). Since that initial positive virus detection, tomatoes have been closely monitored for TYLCV symptoms so that the virus will not become a regular disease in tomatoes grown in the Imperial Valley. However, this year two tomato plants have already tested positive for TYLCV. Nonetheless, TYLCV has not become established in the Imperial Valley. In order to slow down the establishment of the virus in tomatoes of the Imperial Valley, it is important for tomato growers, homeowners (includes store bought tomatoes), and PCA's to know what symptoms to look for in their tomato plants.

TYLCV (genus Begomovirus, family Geminiviridae) is transmitted by the sweet potato whitefly, *Bemisia tabaci* biotype B (silverleaf whitefly), *B. argentifolii* and some other whitefly species (UC-IPM). In order for the whiteflies to acquire TYLCV from an infected plant, the whitefly must feed for 5-10 minutes. After initial infection, it takes about 10 hours before the whitefly can then transmit the virus to a new host by again feeding for 5-10 minutes (UC-IPM). Whiteflies can travel up to 5-7 miles, but longer distance movements may occur with the aid of wind or human transport of the whiteflies in plant material. The virus is not mechanically transmitted (by hand) and is not spread through seed. This virus has numerous plant hosts including solanaceous crops (peppers, tomatoes, and some tobacco species), common bean, and various weed species (e.g., nightshade and jimsonweed) (UC-IPM). There are other weeds that are asymptomatic hosts (they do not show symptoms). However, it is not known how well whiteflies are able to acquire TYLCV from asymptomatic weed hosts (UC-IPM).

Most of these hosts do not have the characteristic TYLCV symptoms quite like the tomato. Symptoms of TYLCV on tomato are stunted growth, abnormally upright stem and leaf growth (instead of fanning out- the leaves grow straight up), have shortened internodes (length of stem separating nodes) making the tomato short and bushy (Figure 1). The leaves of the new plant growth will be smaller, crumpled and show yellowing at the margins and between veins- the veins remain a vibrant green color. Flowers of infected plants may fall off prior to fruit set, dramatically reducing the fruit production potential (UC-IPM). If your tomato plants show symptoms of TYLCV it is best to have the plant tested for the virus.

Prevention is the cure in the Imperial Valley, strategies for disease management include select TYLCV-resistant varieties, and only use virus-free and whitefly-free tomato transplants. And most importantly, try to avoid importing tomato transplants from areas known to have TYLCV (Arizona, Florida, Georgia, Texas, North Carolina, Northern Mexico).

If the virus were to become established in the Imperial Valley, there are management strategies that have been successful in other TYLCV infected areas. These include using a TYLCV resistant tomato variety, having a ‘tomato free’ period, and restricting movement of tomato transplants from TYLCV infected areas to areas where the virus has not become established (UC-IPM). Additionally, research is underway to identify weed hosts of TYLCV that may play a part in creating a ‘green bridge’ allowing TYLCV to survive from one growing season to the next.

Figure 1. Tomato plants with symptoms of Tomato Yellow Leaf Curl Virus. Symptoms include crumpled leaves, interveinal and marginal yellowing on leaves, shortened internodes, and upturned leaves.

EMOPASCA LEAFHOPPER MANAGEMENT IN ALFALFA

Eric T. Natwick

Imperial County alfalfa growers occasionally suffer losses to summer hay cuttings due to leafhopper infestations. Many species of leafhoppers may be found in alfalfa, but species in the genus *Empoasca* are primarily responsible for injury and yield reductions. Three species have been found damaging alfalfa in California: the potato leafhopper, *Empoasca fabae*, and two southern garden leafhoppers, *E. solona*, and *E. mexara*. All three species cause identical injury. The prevalent species in the Imperial Valley are *E. solana* and *E. mexara*.

Other leafhoppers associated with alfalfa are distinguished from *Empoasca sp.* by their brown or grey color. Adult *Empoasca sp.* leafhoppers are small (1/8 inch long), bright green, wedge-shaped insects that have piercing and sucking mouthparts and jump and fly readily when disturbed. Nymphs are also green, wedge-shaped and run rapidly sideways or backward when disturbed. The unusual rapid movements by the leafhopper and their shape easily distinguished them from lygus bug nymphs or slow moving aphids.

Empoasca sp. leafhoppers damage alfalfa through the removal of sap, but the main concern for hay producers is a type of injury referred to as "hopper burn". Hopper burn symptoms result from the injection of salivary toxins into the plant during leafhopper feeding. An early symptom of hopper burn is a characteristic V-shaped yellow area on the leaf tip. This symptom should not be confused with nutrient deficiencies or diseases, in which yellowing of foliage typically begins at leaf margins. As damage increases, the yellow area spreads over the entire leaf and the field takes on a yellow color. Alfalfa regrowth can be severely stunted, resulting in yield losses. Hay quality can be affected by severe leafhopper injury due to reduction in both the protein and vitamin A. Yellowing and stunting symptoms following a heavy *Empoasca sp.* leafhopper infestation may carry over into one or two subsequent cuttings, even through the leafhoppers are no longer in the field.

Empoasca sp. leafhoppers attack several other crops and adult leafhoppers can migrate to alfalfa fields from neighboring crops, such as sugarbeets.

Look for leafhoppers during weekly field monitoring with a standard 15 inch insect sweep net. When symptoms first appear, sample a minimum of four to six areas over the entire field by taking ten sweeps in each area and counting the number of adults and nymphs. Leafhopper infestations usually begin on the field margin so be sure to include field edges in your samples.

An insecticide treatment should be applied for leafhopper control if the alfalfa crop is two or more weeks away from harvest and if counts reach five leafhoppers per sweep. Treat alfalfa scheduled to be harvested in ten days to two weeks if counts reach ten *Empoasca sp.* leafhoppers per sweep. It is not unusual for leafhopper infestation of treatable magnitude to be confined to the first 50 to 100 feet of the field margin, in which case only the field margin should be treated.

Common sense should be utilized when applying treatment thresholds. Heavy leafhopper infestations on young regrowth immediately after harvest are more damaging than similar infestations later in the growth cycle. Alfalfa under stress from other insects, diseases, or lack of water is more susceptible to injury than stress-free alfalfa. Alfalfa within a week of harvest may be able to tolerate very heavy leafhopper populations without yield loss, but regrowth should be monitored closely.

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 June 1 to August 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). 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	June		July		August	
	1-15	16-30	1-15	15-31	1-15	16-31
Calipatria	0.39	0.40	0.39	0.38	0.35	0.32
El Centro (Seeley)	0.36	0.38	0.38	0.37	0.32	0.29
Holtville (Meloland)	0.38	0.39	0.39	0.38	0.34	0.31

* Irrigation Management Unit, Imperial Irrigation District.