University of California Cooperative Extension • Tulare County

Citrus Notes

Volume 4, Issue 1 *February 2007*

Spring Citrus Meeting

Thursday, March 29
9:00 - 11:30 A.M.

Agriculture Building, 4437 South Laspina ,Tulare

9:00 A.M.	**New Methods for Freeze Damage Detection** Dr. Jim Thompson, University of California, Davis
9:30	**Post-Freeze Pest Management** Dr. Beth-Grafton Cardwell, Kearney Research and Extension Center, Parlier
10:00	**Break**
10:15	**Status of Greening, Citrus Psyllid and Citrus Canker** Dr. MaryLou Polek, Director Central California Tristeza Eradication Agency, Tulare
10:45	**Detection of Citrus Stubborn Disease** Dr. Raymond Yokomi, USDA/ARS, Parlier

Spring Cultural Considerations:

An efficient nitrogen management program should involve review of leaf analysis, production, fruit quality as well as fertilization records including material, rate, timing and method of application. To assist in management decisions regarding nitrogen use results from recent research in navel oranges in Tulare County, by Drs. Lund and Arpaia are included. In the study nitrogen was applied in increasing amounts and at various times by foliar application, introduced into the irrigation system or in a combination of foliar and fertigation applications. Foliar treatments were as follows: one time only in late May; two applications, one late winter and one late May; four times-late winter, prebloom, late May and 30 days following the late May application. Soil treatments (injected into the low volume irrigation system) were: one application in late winter; two applications - late winter and early summer; continuous application - applied in every irrigation from late winter through summer. Samples were taken of soil solution moving below the root zone. Fruit yield, size and quality were evaluated. Results of the trial demonstrated an increase in yield with increasing amounts of applied nitrogen up to 1 to 1 ½ lbs. of actual nitrogen per tree per year. This effect was demonstrated regardless of the method of application. The rates of actual nitrogen applied varied with the various treatments from 0-2.25 lbs. Soil applications (fertigation) resulted in the highest nitrate nitrogen leaving the rootzone in the soil solution with foliar applications resulting in the least and combination treatments of foliar and soil resulting in intermediate levels of nitrate in the leachate.

When nitrogen was applied in a single irrigation versus application in split or applied in each irrigation, the single application always resulted in the highest nitrate in the soil solution leaving the rootzone. Among the various rates in the fertigation treatment, the higher the rate the higher the nitrate leaving the rootzone.

Additional considerations in a nutrient management program are: additions of potassium may induce or aggravate symptoms of magnesium deficiency in the foliage. Many instances of magnesium deficiency symptoms can be attributed to potassium additions either as manure or commercial fertilizer. Additions of phosphorous have been observed to induce or aggravate zinc and copper deficiencies; both are readily corrected by sprays of zinc or copper.

Production of citrus fruits requires fulfilling the nutritional needs of the citrus tree. In some instances, adequate supplies are available from soil supplies. Failure to supply sufficient quantities of essential elements results in deficiencies that can cause reduced yields and lowered fruit quality. Of the elements (nitrogen, potassium, phosphorous, nitrogen is most often in short supply. A number of elements are required in trace amounts; trace elements are referred to as micronutrients. Citrus has been found to need the following micronutrients: iron, manganese, zinc, copper, boron and molybdenum. A shortage of one or more of these micronutrients usually affects the appearance of the tree; severity of symptom is related to severity of the deficiency. Zinc and manganese are the micronutrients most frequently deficient. Iron deficiency or chlorosis is widespread throughout the citrus growing areas. Overirrigation and calcareoud soils are conditions often associated with the deficiency. Insecticides and micronutrients are often combined in a single application. The compatibility of the materials should be determined in advance, since toxic compounds may form in the spray solution, or the insecticide may lose its effectiveness for pest control.

Leaf analysis is based on the idea that the plant is the best nutrition indicator for the complex production system of climate, soil and plant. Results from last fall's leaf analysis can be compared to standards established for elements that are important in the nutrition of the tree. Leaf analysis provides the information for planning, evaluating and controlling the nutritional program, with the highest yields of good quality fruit the goal with maximum returns at reasonable cost.

Occasionally in young trees nitrogen hunger patterns are observed caused by insufficient allowance for vigorous growth. Vigorous young trees utilize nitrogen for growth. The nitrogen in leaves of trees in an active vegetative state should be maintained at levels high enough to ensure maximum development of the tree structure as quickly as possible.

Interpret leaf analysis results from last fall by comparing to optimum levels established for each of the essential elements. Review fertilizer amount, timing and analysis applied last year. Was it enough, too little or excessive? Review production and fruit quality from packout records. This review will suggest if the current program is adequate or if adjustments upwards or downward are called for.

Canopy Management:

A basic consideration for an orchard pruning program would be the impact of pruning on yield and fruit size. Recent research by Craig Kallsen, Cooperative Extension Kern County, addressed the impact of topping and interior pruning treatments on yield and fruit size. Thirty-five-year-old Frost Nucellar navel trees 20 feet in height, planted on a 20x22 spacing; received one of three topping treatments-no topping, topped to 16 feet and topped to 14 feet. Three levels of interior pruning were also evaluated: no interior pruning (2000-2002), deadbrush removal only (2000-2002) and severe interior pruning where major scaffold branches were removed (2000), followed by deadbrush removal only (2001-2002). The study begun in March 2000, and the last harvest was January 2004. The overall objective of the study was to evaluate the effect of topping and interior pruning on yield, fruit size and fruit grade. The results demonstrated no difference in yield (lbs. of fruit per tree) among the three topping treatments, either annually or cumulatively.

There was no difference in number of fruit per tree in sizes 72-48 among the three topping treatments. There was a significant difference in yield and fruit size from the interior pruning treatments. Severe interior pruning resulted in a significant reduction in yield (number of fruit per tree) and significant reduction in number of fruit sized 72-48. Regardless of pruning intensity or weather, a constant linear relationship seemed to exist between numbers of fruit and number of large fruit. Conditions that promote numbers of fruit allow for production of larger fruit. Large fruit may result from severe interior pruning, but there are too few of them. The trees that received no interior pruning produced equal or greater yields, fruit of equal or greater size and grade.

Evaluation Of Insecticides For Citrus Thrips Control, Using Blueberries As A Crop Surrogate

David R. Haviland, University of California Cooperative Extension, Kern County
Joseph G. Morse, Department of Entomology, University of California, Riverside

During the past few years citrus thrips have become the most significant insect pest of blueberries in the San Joaquin Valley. Citrus thrips are found at high levels throughout the growing season from June through October, and cause significant damage by feeding on the new flush throughout this period. Since population levels in blueberries are consistently very high (much higher than are typically found in citrus), and the crop is harvested by mid-June, blueberries present an excellent opportunity to conduct insecticide efficacy trials for this pest without having to deal with crop destruct issues for unregistered products.

An insecticide trial was conducted in southern Tulare County during the summer of 2006 to evaluate the effects of 13 insecticides and an untreated control on the density of citrus thrips in blueberries. Data from these trials should parallel the results that would be seen if these products were used on non-bearing citrus, and give some insights into the relative effectiveness of these products on bearing citrus. Plot size in the trial was 44 ft. (4 rows) by 88 feet long, replicated 5 times, and treatments were applied on July 31, 2006 with a commercial over-the-top sprayer with wrap-around arms to cover two rows at a time. Initial thrips populations at the time of spraying were just over 30 thrips per beat sample (one tap of the terminal 6 inches of growth onto a 12 x 12 piece of black acrylic).

Table 1 shows the results of the trial, with the best products starting from the top. Carzol, which had previously never been used at this site, provided the best control. This product is registered for use in citrus, though documented resistance and its propensity to flare other pests, such as mites, has led to reduced Carzol use. The next best treatments were Radiant, Success, and Assail. Radiant is a new macrocyclic lactone (same class of chemistry as Success and Agri-Mek) from Dow Agrosciences (that will be registered on citrus under the name Delegate). In multiple trials on several crops, it has longer residual persistence than Success, and does so with only half the amount of active ingredient. Assail is a neonicotinoid that proved effective against thrips in this trial, and is registered on citrus. It has value in a resistance management program as a rotational product for Success. However, those that use this product should watch their red scale populations, as Assail appears to flare red scale. The next most effective product was Agri-Mek, which also has some value as a rotational product with Success in citrus, although preliminary data has suggested there may be cross resistance between these two materials - thus, Carzol and Assail are better rotation choices.

Insecticides with moderate effectiveness against thrips included Novaluron, Lannate, and Danitol. Novaluron (not registered) is a slow-acting insect growth regulator that produced results similar to that of Assail from 14 to 28 days after treatment. Lannate (a carbamate) and Danitol (a pyrethroid) both reduced thrips populations by about 50 percent for a couple of weeks.

Other insecticides currently registered for citrus, but that were not evaluated in this trial are Veratran D (sabadilla) and Baythroid (cyfluthrin). Each can be used in citrus as a rotation for Success. Veratran D is a botanical stomach poison that works best when mixed with molasses or sugar to encourage feeding (formulated Veratran D is 80 percent sugar to begin with). Baythroid is a pyrethroid that can be effective against citrus thrips, but that is also known for its broad-spectrum effects on insects, regardless of whether they are beneficial or not. This is also true of Danitol but this pyrethroid has somewhat greater activity against many mite species.

Table 1.

Treatment/ Formulation	Rate Formulated Product Per Acre	Mean number of citrus thrips per beat sample															
		Pre		DAT 4		DAT 8		DAT 11		DAT 14		DAT 18		DAT 21		DAT 25	
Carzol 90SP	1 lb	30.0	a	1.5	a	1.2	a	1.2	a	1.1	a	0.8	a	1.8	a	2.6	a
Radiant SC	6 fl oz	33.0	a	9.2	bc	0.8	a	0.9	a	3.5	ab	5.2	b	8.2	b	8.4	b
Success 2SC	6 fl oz	31.3	a	9.3	bc	0.7	a	2.3	ab	8.2	bc	10.4	bc	10.2	bc	16.4	cd
Assail 30SG	6 oz	31.1	a	5.0	ab	3.1	ab	5.3	bc	5.8	bc	8.4	b	10.6	bcd	12.8	bc
Agri-Mek 0.15EC	15 fl oz+1%v/v oil	31.3	a	4.5	ab	5.2	b	8.7	cde	9.1	c	17.2	def	14.6	cde	23.2	de
Novaluron 0.83EC	12 fl oz	34.1	a	30.5	def	20.4	cd	8.4	cd	7.8	bc	10.5	bcd	7.6	b	12.5	bc
Lannate 90SP	1 lb	35.4	a	10.4	bc	14.2	c	14.4	ef	22.9	de	22.6	efg	20.4	ef	24.8	ef
Danitol 2.4EC	16 fl oz	36.8	a	17.5	cd	16.5	cd	13.5	def	20.2	d	16.3	cde	17.2	de	21.6	de
Actara 25WG	4 oz	23.8	a	21.4	de	23.2	d	23.8	gh	31.1	efg	36.0	h	28.1	fg	33.5	fg
Venom 70SG	3 oz	32.4	a	22.3	de	18.5	cd	19.0	fg	27.0	def	30.0	gh	39.0	g	28.6	efg
Diazinon 50WP	2 lb	34.8	a	32.6	efg	38.9	e	27.1	hi	35.3	fg	35.1	h	29.3	fg	36.3	g
Surround WP	25 lb	34.8	a	25.4	de	21.0	cd	28.3	hi	34.8	fg	26.6	fgh	37.1	g	26.5	efg
DPX-E2Y45	4 oz	29.7	a	49.6	g	41.4	e	36.0	i	41.0	g	37.7	h	31.9	g	33.2	fg
Untreated		31.3	a	46.9	fg	42.5	e	32.9	i	32.1	efg	27.6	gh	38.1	g	26.1	ef
F		0.53		13.16		30.58		33.18		23.84		16.90		21.08		14.59	
P		0.89		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001	

Means in a column followed by the same letter are not significantly different ($P > 0.5$, Fisher's protected LSD) after square root (x + 0.5) transformation of the data. Untransformed means are shown.

University of California
Cooperative Extension
Tulare County
4437B S Laspina St
Tulare, CA 93274-9537

Nonprofit Org
US Postage Paid
Visalia, CA 93277
Permit No. 240

Citrus Notes

Spring Citrus Meeting

Thursday, March 29, 2007

Neil O'Connell
Farm Advisor