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April 2010

KERN SPRING CITRUS MEETING

Tuesday, April 20, 2010 – 1:00 p.m. to 4:30 p.m.
University of California Cooperative Extension Office
Large Conference Room, 1031 S. Mt. Vernon Ave.
Bakersfield, CA 93307

1:00 – 1:10 **Registration**

1:15 – 1:45 **"Citrus Yield, Fruit Size and Pruning"**
Craig Kallsen,
U.C.C.E. Citrus and Pistachio Farm Advisor/Kern County

1:45 – 2:15 **"Update on Citrus Pests"**
Beth Grafton-Cardwell, Director, Lindcove Research and Extension Center and Extension Specialist & Entomologist, Kearney Agricultural Research and Extension Center

2:15 – 2:45 **"New Rootstocks and Varieties for the Citrus Industry"**
Dr. Mikeal Roose, Professor of Genetics
University of California/Riverside

2:45 – 2:55 **Break**

2:55 – 3:25 **"Major Fungal Root Rots in Citrus and Their Control"**
Akif Eskalen,
U.C. Cooperative Extension Specialist, Plant Pathologist

3:25 – 3:45 **"Factors Associated with Early Fruit Maturity in Citrus"**
Craig Kallsen,
U.C.C.E. Citrus and Pistachio Farm Advisor/Kern County

3:50 **Adjourn**

1 Hour of PCA/Private Grower Credit Applied For

Asian Citrus Psyllid Training

Focusing on how you can help with the effort to detect the psyllid in your citrus orchards

Dr. Beth Grafton-Cardwell
Dept. of Entomology, UC Riverside
Director of Lindcove Research and Extension Center

Thursday, April 22, 2010
9:00 a.m. – 11:30 a.m.

U.C. Cooperative Extension Office
Large Conference Room

1031 S. Mt. Vernon Ave., Bakersfield, CA
(Call (661) 868-6200 for directions to the office)

9:00 am	**Registration**
9:15 am	**Beth Grafton-Cardwell (UC Riverside Entomology).** Background on the biology and management of Asian citrus psyllid and the bacterial disease Huanglongbing. An update on the spread of the psyllid in California and the spread of the disease outside of California will be provided.
10:00 am	**Brian Taylor (Citrus Research Board):** The Citrus Research Board trapping program for commercial citrus in California. How the traps are set up and collected.
10:20 am	**Dennis Haines (Tulare County Ag Commissioners Office):** Ag Commissioners office trapping program in the urban areas. How to recognize the Asian citrus psyllid on a trap card.
10:35 am	**Michelle Redstone** (Kern County Ag Commissioners Office): Update of Kern County trapping program. Discussion of what to do if you think you have found the psyllid or the disease.
10: 50 am	**Break**
11:00 am	Identification practice. Specimens of psyllids on trap cards will be used for training in psyllid recognition.
11:30 am	**Meeting Ends**

Continuing education credits have been requested for this meeting.
No RSVP necessary – but please do bring your hand lens.

The Relationship Between Spotted Wing Drosophila and Citrus

David Haviland, Entomology Farm Advisor, Kern County

Spotted wing drosophila (SWD) is a new invasive pest of fleshy fruit in California. It was first collected on the Central Coast in late 2008 and was officially identified and recognized as being established as a pest in California during 2009. In 2009 it also spread to and became established throughout much of California, Oregon, Washington, British Colombia and a few other locations.

SWD is a newly-introduced species of Drosophila fruit flies, also known as vinegar flies, which are nothing new to citrus producers worldwide. Drosophilas are the common, small fruit flies that can be found hovering around rotting fruit underneath citrus trees. Spotted wing drosophila is similar to these common vinegar flies, except that it can also attack fleshy fruit prior to harvest. Some of the favorite hosts are cherries, blueberries, blackberries, raspberries and strawberries. Intact citrus fruit are not a host. However, rotting citrus fruit on the ground are excellent hosts, especially in the shade where leaf litter and microsprinklers provide a moderate, humid environment.

What this means is that citrus itself is at absolutely no risk due to SWD. However, citrus growers should be aware that neighbors that grow cherries, blueberries or caneberries are extremely concerned about SWD and in 2009 will be putting in place aggressive programs to keep this pest out of their fruit. These neighbors will be very concerned about the role of rotting citrus fruit as an ideal host for the early-season buildup of SWD populations that could migrate to their crops. As good participants of the agricultural community, citrus growers should be aware of this concern until more information either discredits or validates the role of citrus within the landscape-scale biology of this new exotic pest.

Citrus Irrigation

Craig Kallsen, Subtropical and Pistachio Farm Advisor, Kern Co.

Seasonal water-use by citrus is moderate compared to that of other perennial fruit and tree crops in the San Joaquin Valley. A reasonable estimate for crop evapotranspiration for citrus (ET_c) for the current year may be obtained by multiplying a crop coefficient (K_c) of approximately 0.65 (for citrus) by reference evapotranspiration (ET_o).

Normal year weekly ET_c for mature citrus in the southern San Joaquin Valley is presented in Table 1. Since no irrigation system delivers water to the field with perfect uniformity, ET_c values must be adjusted upward to account for nonuniformity. To schedule irrigation more accurately, the distribution uniformity of an irrigation system should be known. Some irrigation districts will determine the distribution uniformity of an irrigation system at no cost. To determine how much additional water is required to correct for nonuniformity of application, ET_c is divided by the numerical value for uniformity expressed as a decimal fraction of 1, with 1 being perfect uniformity. As an example, the amount of water in gallons required per acre per day for an orchard with an irrigation system providing 85% (0.85) distribution uniformity is presented in Table 1.

Generally, within the typical range of planting densities and tree height used in citriculture, mature citrus ET_c on a per acre basis is relatively constant and values in Table 1 will apply to a wide range of citrus plantings. Closely spaced trees will mutually shade each other reducing water use on a per tree basis, but since there are more trees per acre, water use per acre will be similar to that for more widely spaced trees. Mutual shading does not begin to become an important factor until trees are six years old or older and then only for close spacing. Estimates of ET_c requirements for young trees as a percentage of that used by mature citrus are presented in Table 2 for a wide versus a close spacing. Since the evaporation component accounts for a much larger percentage of ET_c in young orchards, differences in wetted surface area and frequency of irrigation have relatively large effects on ET_c. The soil-water status of young trees should be checked frequently because over-irrigation is one of the major causes of reduced growth and disease in new and immature citrus plantings.

In addition to distribution uniformity and tree age, the actual water that must be applied to citrus is a function of many variables, such as weather, tree canopy health, tree height, rooting depth, salinity, heat advection from neighboring property, and other factors. The values presented in these tables are meant to be estimates only. Some method of measuring soil-water availability, such as tensiometers or other devices or methods, should be in-place in the field to check that water application estimates have a firm basis in reality. Water-use much greater or less than that estimated in these tables may suggest a problem with the scheduling method or irrigation system currently in use. Under- or over-irrigation may result in loss of yield and reduced tree health. Over-irrigation has also been shown to leach nitrogen and other fertilizers and pesticides into ground water.

Table 1. Normal year weekly evapotranspiration and water requirement for mature citrus in the southern San Joaquin Valley *(Adapted from "Crop Water Use - A Guide to Scheduling Irrigations in the Southern San Joaquin Valley, 1977-1991" Department of Water Resources, Published March 1993.)*

Week Ending		Weekly ET_c [1] (inches/week)	Daily ET_c (gallons/acre/day) [2]	Water requirement for system with 85% distribution uniformity (gallons/acre/day)
Jan	7	0.14	540	635
	14	0.16	620	730
	21	0.18	700	825
	28	0.22	855	1005
Feb	4	0.25	970	1140
	11	0.28	1085	1275
	18	0.33	1280	1505
	25	0.37	1435	1690
Mar	4	0.42	1630	1920
	11	0.47	1825	2145
	18	0.51	1980	2330
	25	0.57	2210	2600
Apr	1	0.63	2445	2875
	8	0.68	2640	3105
	15	0.74	2870	3375
	22	0.81	3140	3695
	29	0.87	3375	3970
May	6	0.94	3880	4565
	20	1.06	4110	4835
	27	1.10	4265	5020
June	3	1.13	4385	5160
	10	1.16	4500	5294
	17	1.17	4540	5341
	24	1.20	4655	5475
July	1	1.21	4695	5525
	8	1.21	4695	5525
	15	1.20	4655	5475
	22	1.17	4540	5340
	29	1.14	4420	5200
Aug	5	1.10	4265	5020
	12	1.05	4075	4795
	19	1.00	3880	4565
	26	0.95	3685	4335
Sept	2	0.90	3490	4105
	9	0.85	3300	3880
	16	0.80	3100	3640
	23	0.73	2830	3330
Oct	7	0.64	2480	2920
	14	0.59	2290	2695
	21	0.52	2015	2370
	28	0.46	1785	2100
Nov	4	0.40	1550	1825
	11	0.34	1320	1555
	18	0.28	1085	1275
	25	0.23	890	1045
Dec	2	0.18	700	825
	16	0.12	465	545
	23	0.11	425	500
	31	0.13	505	595
TOTAL		**34.5 inches/year**	**2.9 acre feet/year**	**3.4 acre feet/year**

[1] Crop coefficient K_c times ET_o for grass reference crop, $ET_c = (K_c)(Et_o)$.
[2] 1 acre inch = 27,150 gallons or 3630 cubic feet.

Table 2. Evapotranspiration of immature citrus trees expressed as a percentage of mature citrus tree ET_c, for wide and close planting density in the Southern San Joaquin Valley.

Tree age (years)	**ET_c requirement of immature citrus as a percentage of that of mature citrus[1]** wide spacing (22'x 22')	narrow spacing (11' x 22')
0-1	5	10
2	**1325**	
3	20	40
4	30	50
5	40	65
6	50	70
7-8	**6080**	
9-10	70	95
11-12	90	100
13	100	100

[1] These values are meant to be used as an estimate only. Irrigation and soil-moisture status should always be physically checked in the field.

Navel Orange Regulated Deficit Irrigation – Who says that there is No Such Thing as a Free Lunch?

The technique of improving or maintaining crop yields and quality by reducing or regulating irrigation during distinct crop developmental growth stages or periods is referred to as 'regulated deficit irrigation' or simply 'RDI'. Matching the right regulated deficit irrigation strategy to a navel orange variety can improve fruit quality and reduce irrigation. So says Dr. David Goldhamer, University of California Irrigation Specialist at the UC Kearney Agriculture Center. Dr. Goldhamer has spent the past quarter of a century measuring evapotranspiration requirements of many key perennial fruit and nut crops in the San Joaquin Valley of California.

Some evidence suggests that maturing navel orange fruit subjected to rapid fluctuations of temperature in May and June, may be more susceptible to 'puff and crease' which is a malady of the rind and which can severely reduce fruit quality. If, so oranges maturing in the San Joaquin Valley of California this season should demonstrate more puff and crease at harvest in response to the large and rapid temperature fluctuations experienced by the crop early this season. Some varieties of navel orange, such as Frost Nucellar, are more susceptible to puff and crease than other varieties. Dr. Goldhamer found over a three period (from 1998-2000) that irrigating Frost Nucellar navel orange trees at 50% of full citrus evapotranspiration (ET) during the period from May 15 to July 15 decreased the number of fruit with puff and crease from 30% in the fully irrigated trees to 10 % in the RDI trees. This difference increased the percentage of fancy fruit from 22% to 35% of the pack out. Yield, fruit number and fruit size were not affected by RDI and approximately eight inches of water was saved on average every year over the three years of the trial. For RDI to be conducted effectively, growers must have the ability and tools to estimate citrus ET, water application rates, soil-water holding capacity, irrigation application rates and crop water stress accurately. For those familiar with an instrument called the 'pressure bomb', Dr. Goldhamer suggests irrigating at 50% ET beginning in mid-May until a mid-day shaded leaf-water potential of -20 bars is attained in the trees, at which point the trees can be returned to full irrigation.

Late-maturing navel orange quality has also been improved by RDI. In an experiment conducted by Dr. Goldhamer from 2004-2006, in an orchard of Lane Late navels, the targeted RDI for the water stressed trees was 50% of full citrus ET and the stress was applied evenly throughout the season. During the season from June through October, mid-day shaded leaf-water potentials of lower than -30 bars were recorded regularly with the pressure bomb. At harvest, RDI oranges peaked on the desirable sizes 56 and 72 compared to the overly large sizes 24 to 40 in the oranges irrigated at full citrus ET. The RDI treatment did not result in a reduction in yield. The RDI trees grossed an average of $6220 versus $3610 an acre as a result of reduced fruit granulation and the improved size distribution. Substantial water savings also accrued. On average for the three-year experiment, the RDI trees were irrigated annually with an average of 17 inches of water compared to the normal 37 inches.

In another year where water delivery may not be up to 100%, there is probably no better news than hearing that not only will a water-shortage not hurt you but, for those with the right navel orange variety and the knowledge to regulate deficit irrigation, might actually improve profitability.

Cover Crops: Some Plants Are Not Good Neighbors

Little is currently known about the possible advantages of disadvantages of individual plant species composing a cover crop. However, we do know that some plants can be hazardous to citrus health. The mustards, unfortunately common volunteer weeds (or native cover crop components) in the southern San Joaquin Valley, have been shown to excellent hosts to the spiroplasm that causes citrus stubborn disease, and to the insect vector of this disease pathogen, the beet leafhopper. Citrus, generally, does not host the spiroplasm in sufficient quantities to be a source of infection for the beet leafhopper. The beet leafhopper, apparently, has difficulty moving the stubborn spiroplasm from one citrus tree to another. The beet leafhopper, however, once infected through feeding on the mustards for example, can spread the disease to citrus. Large stands of mustards are common on land adjacent to citrus, in northern Kern County for example, and having additional habitat for beet leafhoppers and the spiroplasm within the orchard itself will likely increase the chance of stubborn infection in that orchard. Other weeds can also harbor the spiroplasm and the beet leafhopper.

Stubborn disease aside, the benefits of having a crop cover should be weighed against the potential costs. Research work conducted in an experiment conducted over 3 years in northern Kern County by myself, U.C. Farm Advisors Neil O'Connell, Mark Freeman, Blake Sanden and a hard-working group of private PCAs, found little positive affect of partial ground-covering stands of planted legumes, other dicots and grasses on pest or beneficial insect populations in the neighboring Valencia tree canopy. However, the cover crop did appear to improve water infiltration. Cover crops can reduce heat storage during the day and reradiation of heat back to the crop at night during those all-important winter-freeze events. The danger of frost however, is less in hilly areas where cold drainage is usually good. In hilly areas, the reduced soil erosion that occurs with cover crops will probably outweigh the potential increased-hazard associated with freezing. Planting a cover crop in the fall, which can be difficult in Kern County due to undependable rainfall, and allowing it to dry out by June as summer begins will largely eliminate the increased frost hazard associated with cover crops even on flatter ground, while preserving some of the water-infiltration improvements.

Top-working Older Citrus: Start With a Good Foundation

Top-working (i.e. grafting) an older block of citrus to a different variety can be a challenging endeavor. If the existing citrus trees are older than forty years, the negatives of top-working probably outweigh the benefits. Factors present in the field can assist the grower in making the decision to bud or not to bud older trees. In Kern County, late stage incompatibility is often obvious in blocks of citrus planted in the late 1960's and early 1970's on trifoliate or trifoliate hybrid rootstocks (such as Troyer). A significant fraction of trees in orchards of this age show the 'pinching' of vascular tissue at the graft union as the rootstock overgrows the scion. Trees so affected have a thin leaf canopy, a lot of leafless twigs, poor leaf color and yields. Older blocks of lemons, trees old enough to survive several severe freeze events, often have considerable dry rot, caused by *Fusarium* species, and are not good candidates for grafting. Stubborn disease is common in many older blocks of citrus, and affected trees often produce fair yields of fruit on unaffected limbs. However, new branches of top-worked stubborn-infested trees often grow very poorly. The new limbs remain short, and the new branches appear to have micronutrient deficiencies. Additional problems that I have witnessed of newly top-worked older blocks of citrus include: off-type budwood; poor initial bud take, severe sun burning of bark, especially at the foot of the tree; burning of new buds with foliar fertilizers, excessive preemergent herbicide use or by other unknown chemicals; overwatering inducing root and trunk rots of various types; heavy insect feeding on new growth; failure of growers to follow up the top working by suckering, pruning and supporting new growth to reduce wind and other mechanical damage.

Removing an old orchard can give a grower a chance to correct some existing problems such as layered soils, nematodes or *Phytophthora* infestations, which can be addressed more effectively when trees are absent. Planting new trees also gives the grower to select a more appropriate rootstock for the environmental conditions present.

Craig Kallsen, Citrus, Subtropical Horticulture, Pistachios Advisor