University of California Cooperative Extension • Tulare County

Citrus Notes

Volume 5, Issue 1 **March 2008**

Spring Citrus Meeting

Thursday, April 17, 2008

8:30 to 11:15 A.M.

Tulare County Agricultural Building
4437 South Laspina Street, Tulare

8:30 A.M. **Pest Update and Spring Pest Management Decisions**
Dr. Beth Grafton-Cardwell, Pest Management Specialist,
Kearney Agricultural Research & Extension Center

9:00 **Volatile Organic Compounds and Ozone Production**
Dr. Peter Green, Civil Environmental Engineering Dept., UC Davis

9:30 **Plant Growth Regulators, Clementines and W. Murcotts**
Dr. Carol Lovatt, Botany and Plant Sciences Department, UC Riverside

10:00 **Break**

10:15 **Citrus Tristeza and Lindcove Research and Extension Center**
Dr. Beth Grafton-Cardwell, Director, Lindcove Research and Extension Center

10:45 **Citrus Thrips Management**
Dr. Joseph Morse, Entomology Department, UC Riverside

Continuing education credit has been requested

4437B Laspina St, Tulare, CA 93274 • Phone: 559/685-3303 • Fax: 559/685-3319 • Web Site: cetulare.ucdavis.edu
US Department of Agriculture, University of California, and Tulare County Cooperating

Winter Tree Color

Winter temperatures frequently result in tree canopies taking on a yellow color often referred to as winter chlorosis. Low soil temperatures during the winter months result in reduced root activity. This may result in a reduced assimilation of iron. A reduction in the iron level affects the production of chlorophyll. Iron is a building block of chlorophyll, the pigment which gives the green color to the tissue. With warming soil temperature in the spring, uptake of iron increases and the normal green color generally returns to the canopy. A continuing yellow cast to the foliage may be the result of a saturated soil condition which has persisted, beyond just a brief condition following an irrigation. In this case, oxygen concentration in the soil is low, which reduces iron uptake by the roots. Some soils in which citrus orchards have been established over the years have lime present in surface and subsoil. Some rootstocks are less efficient in extracting iron in the presence of lime in the soil, resulting in a condition referred to as lime-induced chlorosis.

Among the commercial rootstocks, trifoliate rootstock is the most notable in this regard, followed by Troyer and Carrizo, which are related to trifoliate. If the tree roots contact this lime at some point, iron assimilation by the tree may be affected. The presence of the lime raises the ph of the soil, which decreases the solubility of the iron, making the iron less available for assimilation by the roots. Carbon dioxide produced by roots during respiration reduces the ph, making the zone between root and soil particle more acid and increasing the solubility of iron present and more available for assimilation. The amount and location of lime present varies with the soil. Correction of iron chlorosis in citrus has been studied for many years. Addition of iron in various forms to the soil has been studied, as well as direct injection into the tree, all with limited success. Chelated forms of iron applied to the soil have been more successful; however, they are often more expensive. Application of acidifying materials which react with the lime can be helpful. This would include materials such as soil sulfur or acids such as sulfuric. Sulfur applications are slow in influencing the lime condition because of the soil mass involved in the rootzone. Acid treatments may react more rapidly with the lime but generally require additional safety precautions and equipment during application. Application of various formulations of iron to the tree has also been studied extensively, again with limited success. Some materials are taken in by the leaf tissue but are not then translocated throughout the tree.

Nitrogen Demand

During the bloom and fruit setting period, there is a strong demand for nitrogen by the tree; therefore, an adequate level of nitrogen must be readily available at this time. The time that it takes for soil applications of nitrogen fertilizer to be available in the tree depends upon what the form of nitrogen is in the fertilizer. The nitrate form in a fertilizer will move with the water and be available for immediate assimilation by the roots. This is desirable where the nitrogen level in the tree may be deficient. The urea form moves with the water and then is rapidly changed to the ammonium form; this form adsorbs to the soil particles and is then converted to the nitrate form. The ammonium form in a fertilizer is fixed to the soil particles at the soil surface and then is converted to the nitrate form before it can be taken up by the roots. The conversion to the nitrate form of urea and the ammonium forms requires time which is largely dependent upon soil temperature. Foliar application of lo-biuret urea is taken up by spring flush growth very rapidly (some studies suggest within hours). Although large quantities of nitrogen cannot be applied in this manner in a single spray, it is a method of quickly providing a source of nitrogen to the tree, as in cases where fall leaf analysis has suggested a below optimum level of nitrogen. Fertigation (injecting the fertilizer into the irrigation system) provides the opportunity to place the fertilizer in the root zone, and that part in the nitrate form would be available for immediate assimilation by the root system. The fertigation should be managed to avoid leaching the fertilizer below the root zone. The amount of nitrogen applied should be based upon the nitrogen requirement of the trees. This amount should be based upon leaf analysis, the history of fertilizer applications to the orchard, and the yield and fruit quality response by the trees to these applications. Excessive fertilizer application is costly, may result in a loss in fruit quality, and may negatively affect groundwater quality.

Spring Cultural Considerations

An efficient nitrogen management program should involve review of leaf analysis, and 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); and 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) and 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, and 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 began 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 the 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 numbers 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.

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

Citrus Notes

SPRING CITRUS MEETING
Thursday, April 17, 2008

Neil O'Connell
Farm Advisor