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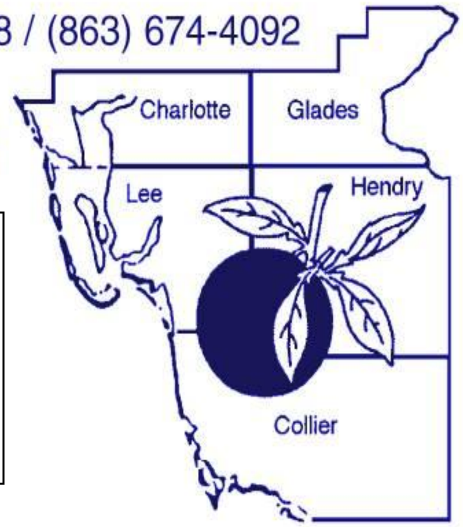

Vol. 10, No. 6 **June 2007**

Dr. Mongi Zekri
Multi-County Citrus Agent, SW Florida

UPCOMING EVENTS

CITRUS EXPO
IN FORT MYERS

Wednesday, August 22 &
Thursday, August 23, 2007

CITRUS EXPO

Not like it was mentioned in the previous issue, Enable can now be used on all citrus for the control of greasy spot.

If you want to print a color copy of the **Flatwoods Citrus** Newsletter, get to the Florida Citrus Resources Site at http://flcitrus.ifas.ufl.edu/
You can also find all you need and all links to the University of Florida Citrus Extension and the Florida Citrus Industry

Mark Your Calendars

Forty-Sixth Annual Citrus Packinghouse Day	Indian River Postharvest Workshop
Thursday, September 6, 2007 Citrus Research and Education Center 700 Experiment Station Road, Lake Alfred, FL 33850 Lunch Sponsor: DECCO Includes exhibits by more than 20 companies Great door prizes!	**Thursday, September 13, 2007** Indian River Research and Education Center 2199 S. Rock Rd. Ft. Pierce, FL 34945 Lunch Sponsor: FMC FoodTech

Mark your calendars for Citrus Packinghouse Day on September 6th, and the Indian River Postharvest Workshop on September 13th. Both programs begin at 9:30 AM.

This year both programs will again focus on presentations, discussions, and workshops of how to successfully ship fresh citrus under changing citrus canker regulations.

Presentations include:

- Changing regulations for the new season
- The latest research results from leading pathologists
- Update on work to improve electronic grading of canker
- Argentine trip report on canker-related pre- and postharvest practices

Training sessions, with certificates of completions, will also be available covering:

- Canker identification on fresh fruit
- Good worker health and hygiene practices

For more information contact Dr. Mark Ritenour at (772) 468-3922, ext. 167 (mritenour@ifas.ufl.edu), or visit the University of Florida Postharvest Resources Website (http://postharvest.ifas.ufl.edu).

Special Thanks to all the sponsors of the Flatwoods Citrus newsletter for their generous contribution and support. If you would like to be among them, please contact me at 863 674 4092.

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For more information, call Mongi at 863 674 4092 or send an e-mail to maz@ifas.ufl.edu

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Drink Your Citrus Juice
Citrus is Top Juice in Nutrition

Orange juice and grapefruit juice pack more nutritional punch per calorie than other commonly consumed fruit juices, according to a new study co-funded by the University of Florida and the state Department of Citrus.
The nutrient-density study, in the May issue of the Journal of Food Science, gives the Florida citrus industry another marketing tool in the agency's effort to reverse a slide in consumption of citrus juices.
Orange juice and pink-grapefruit juice topped other 100% juices such as apple, grape, pineapple and prune in most categories for vitamin C, potassium and folate, and matched or exceeded levels of vitamin A, thiamin and phosphorus, the study found.
UF-IFAS researcher and lead author Gail Rampersaud used six different methodologies to rank commonly consumed fruit juices.

The nutrient-density rankings differed slightly based on methods used, but pink-grapefruit juice, such as from the Ruby Red variety, came in first in most scoring methods, followed by orange juice, white grapefruit, pineapple, prune, grape and apple.

Pink Grapefruit Juice Most Nutritious

Pink grapefruit juice provides more nutrients per calorie than any other 100 percent fruit juice, according to a new study that analyzed several juices commonly found in major U.S. markets.
The pucker-inducing pink drink just edged out orange juice, which also ranked high, but soundly beat white grapefruit, pineapple, prune, grape and apple juices, which rated in that order, with non-citrus juices like apple falling behind high vitamin C content varieties.
Author Gail Rampersaud, a researcher at the Institute of Food and Agricultural Sciences at the University of Florida, told Discovery News that pink grapefruit juice "is an excellent source of vitamin C," providing an entire day’s recommended amount in a single 8-ounce glass.
"It also provides potassium, folate, thiamin and magnesium, as well as certain carotenoids that can be converted into vitamin A in the body," she added.
"Pigmented grapefruit juices, such as pink or ruby, also contain lycopene, a carotenoid that gives pigmented grapefruit its rich color."
Carotenoids are color-giving substances found in orange and yellow fruits and vegetables. They are also present in dark green leafy veggies. Prior studies suggest these compounds may help to prevent cancer and other diseases.

SouthEast Climate Consortium Summer Climate Outlook

Date updated: May 8, 2007

Drought worsening in the Southeast - In spite of an El Niño of moderate strength forming in the Pacific Ocean last fall, it failed to bring the predicted excess rainfall and cooler temperatures to Florida, south Alabama, and south Georgia this winter. North Florida was the only area to receive near-normal rainfall this winter, while Alabama, northwest Georgia, and South Florida only saw 50% to 75% of normal winter precipitation. The entire area also saw winter temperatures ranging from 1 to 3 degrees F above normal.

Winter rainfall is important for surface and groundwater recharge in Georgia and Alabama, as well as establishing sufficient soil moisture for the spring planting season. The failure of ample rains during the winter mean that soil moisture and groundwater levels are below normal for late March and falling. The U.S. Drought Monitor has the entire area rated from "moderate drought" to "extreme" in northwest Alabama, southeast Georgia, and south Florida. Water restrictions are currently in place in Georgia and south Florida. In South Florida, a very dry 2006 (3rd driest on record for the state as a whole) and dry beginning to 2007 have Lake Okeechobee levels over 4 feet below normal and approaching a new all-time record.

The prevailing dry conditions have been compounded in recent weeks by an unusually warm and dry weather pattern. Unusually large wildfires have recently burned more than 100,000 acres in southeast Georgia. Florida is also experiencing its most active season in a number of years, with nearly 200,000 acres burned thus far in 2007.

MICROIRRIGATION AND FERTIGATION

Microirrigation is an important component of citrus production systems in Florida. Microirrigation is more desirable than other irrigation methods for several reasons. Three important advantages are (1) water conservation, (2) the potential for significantly improving fertilizer management and (3) for cold protection. Research has shown that when properly managed (no overirrigation), water savings with microirrigation systems can amount to as much as 80% compared with subirrigation and 50% compared with overhead sprinkler irrigation.

Microirrigation provides for precise timing and application of fertilizer nutrients in citrus production. Fertilizer can be prescription-applied during the season in amounts that the tree needs and at particular times when those nutrients are needed. This capability helps growers increase the efficiency of fertilizer application and should result in reduced fertilizer applications for citrus production. Research has also shown the important advantage of microsprinklers for freeze protection of citrus.

Fertigation is the timely application of small amounts of fertilizer through irrigation systems directly to the root zone. Compared to conventional ground application, fertigation improves fertilizer efficiency. Subsequently, comparable or better yields and quality can be produced with less fertilizer. To effectively fertigate crops, growers must properly maintain microirrigation systems to apply water and fertilizer uniformly. In addition, growers must determine (1) which fertilizer formulations are most suitable for injection, (2) the most appropriate fertilizer analysis for different age trees and specific stages of growth, (3) the amount to apply during a given fertigation event, and (4) the timing and frequency of applications.

Properly managed applications of plant nutrients through irrigation systems significantly enhance fertilizer efficiency while maintaining or increasing yield. On the other hand, poorly managed fertigation may result in substantial yield losses. Fertilizers are available in different forms and concentrations. Formulations usually contain two or more nutrients and the solubility of various formulations vary significantly. Fertigation involves deciding which and how much nutrients to apply, selecting the most effective formulations, properly preparing solutions for injection, and scheduling injections to ensure that essential nutrients are available as needed.

Many sources of nitrogen and potassium are suitable for injection through microirrigation systems. They include ammonium nitrate, ammonium sulfate, urea-ammonium nitrate, urea, calcium nitrate, potassium chloride, and potassium nitrate. When using phosphorus (P), magnesium (Mg) cannot be used because Mg-P compounds will precipitate. The use of P can also be a problem when high levels of calcium (Ca), Mg, or iron (Fe) are in the irrigation water.

<u>Solubility of Fertilizer Formulations</u>

Solubility indicates the relative degree to which a substance dissolves in water. Solubility of fertilizer is a critical factor when preparing stock solutions for fertigation, especially when preparing fertilizer solutions from dry fertilizers.

Fertilizer Formulation	Solubility (lb/gal)
Ammonium nitrate	**9.8**
Calcium nitrate	**8.5**
Potassium chloride	**2.3**
Potassium nitrate	**1.1**

Hot water increases solubility and makes dissolving fertilizer easier and quicker. Hot water may be especially helpful when dissolving a fertilizer such as potassium nitrate, which actually cools the solution as it dissolves. Because solubility is reduced when water cools, it is not a good practice to heat water in order to dissolve "extra" fertilizer (more than is soluble at normal temperatures). As the solution cools, this extra fertilizer will come out of solution (precipitate or "salt out") and possibly clog emitters.

A solution of 50 percent urea by weight results in 23-0-0 and has a salting-out temperature of 60 degrees F. In order to store and handle liquid urea during cooler temperatures, the nitrogen concentration must be lowered to reduce salting problems.

Crystallization (salt out) temperatures for liquid urea	
	60^0F @ 23%N
	43^0F @ 20%N
	32^0F @ 18%N
	19^0F @ 16%N

Liquid Fertilizer Formulations

Preparation of nutrient stock solutions from dry fertilizers may require considerable time and effort and can generate sediments. Therefore, commercially prepared liquid fertilizer solutions (true solutions, not suspensions) that are completely water-soluble should be used. Liquid fertilizers are available in a variety of formulations (8-0-8, 8-2-8, etc.). Liquid formulations are very convenient, because they can be injected directly (without mixing in water) with a variable rate injection pump. Although transportation costs make liquid formulations a little more expensive, they save time and labor and help prevent problems associated with poorly made "home mixes." Also, they eliminate the problems caused by insoluble materials found in some dry fertilizers. Even with liquid formulations, again, be careful when injecting fertilizers containing phosphorus or sulfur (S) into microirrigation systems. Phosphorus and S may react with calcium and/or magnesium in the irrigation water to form mineral precipitates that could clog emitters.

Injection Duration

A minimum injection time of 45 to 60 minutes is recommended. This time is sufficient for uniform distribution of nutrients throughout the fertigation zone. Limit injection time to prevent the application of too much water, because excessive water leaches plant nutrients below the root zone. In addition, too much water saturates the soil, causing damage to roots. The maximum injection time depends on soil type, nutrients, and water requirements of the crop. However, as a general rule, a "reasonable" maximum duration of injection should not exceed two hours per zone.

CITRUS NUTRITION IN RELATION TO SOIL ALKALINITY

Soils are not homogenous and the pH can vary considerably from one location in the field to another. It also varies with depth. Soils in different geographic regions may have different pHs because of several factors including the parent material and the climate. The optimum soil pH range for citrus trees is 6.0 to 7.0. Trifoliate hybrid rootstocks such as citrumelos and citranges do better at the low end of this pH range. Soil pH must be monitored every year through soil testing before liming. Do not assume that lime is needed. Certain soils may already contain excess lime. Such soils will typically have a pH between 7 and 8. When soil pH is high because of naturally occurring lime such as limestone, marl, or seashells, there is no practical, economical way of lowering the soil pH. Under these conditions, tolerant rootstocks to high pH soils should be selected to reduce nutritional disorders and deficiency problems. Sulfur added to soil can reduce the soil pH through bacterial action that transforms elemental sulfur to sulfuric acid. (Only the elemental form of sulfur is acidifying, not sulfate (SO_4^{2-}). However, the soil pH can return to its original value as soon as sulfuric acid is used up.

Problems in alkaline (high pH) soils

*Iron deficiency
*Manganese deficiency
*Zinc deficiency
*Phosphorus tied up by calcium and magnesium

Overliming

While a correct liming program is beneficial for plant growth, excessive liming can be detrimental because deficiencies and imbalances of certain plant nutrients may result. The practice of estimating lime requirement without a soil test is risky because it can lead to overliming.

Overliming causes the soil pH to increase beyond the range of optimum plant performance. Reduced plant growth is usually associated with deficiencies of micronutrients, which become less available as soil pH increases. Overliming is costly -- it costs to buy and apply the lime, and it costs in terms of reduced plant performance.

The principal factors contributing to overliming are: (1) application of lime to soil without testing if lime is needed, (2) liming to soil pH values much higher than those necessary to achieve the desired plant response, (3) liming to supply calcium (Ca) and/or magnesium (Mg) as nutrient elements without sufficient regard to the effect of lime on raising the soil pH.

If there is a need for Ca or Mg as nutrients and an increase in soil pH is not desired, another source of Ca or Mg should be used. Gypsum (calcium sulfate) and magnesium sulfate or oxide can supply Ca and Mg without affecting soil pH.

Sulfur products used as soil amendments

Soil acidulents can improve nutrient availability in calcareous soils by decreasing the soil pH. Soils with visible lime rock or shell in the root zone would require repeated applications of a high rate of acidulent. Examples of S-containing acidulents include elemental sulfur (S) and sulfuric acid (H_2SO_4). These compounds act to neutralize $CaCO_3$ with acid. Ammonium sulfate [$(NH_4)_2SO_4$] acidifies the soil by converting NH_4^+ to NO_3^- during nitrification. The sulfate ion (SO_4^{2-}) alone possesses no acidifying power.

Elemental S is the most effective soil acidulent. Although not an acidic material itself, finely ground elemental S is converted quickly to sulfuric acid in the soil through microbial action. Sulfuric acid reacts more quickly than any other material, but it is hazardous to work with and can damage plants if too much is applied at one time. Dilute concentrations of sulfuric acid can be applied safely with irrigation water and used to prevent Ca and Mg precipitates from forming in microirrigation lines. Repeated applications of sulfuric acid with irrigation water will tend to lower soil pH within the wetted pattern of the emitter. The soil within the wetted pattern of a microirrigation emitter often becomes alkaline when the water contains bicarbonate, while the surrounding soil may be neutral or acidic. To lower the soil pH in this situation, acid or acidifying fertilizer must be applied to the wetted pattern only.

$CaCO_3$ Neutralizing Power of Several S Sources

Sulfur Source	**Amount Needed to Neutralize 1,000 lbs $CaCO_3$**
Elemental Sulfur	320 lbs
Concentrated sulfuric acid (66° Baume)	68 gallons
Ammonium sulfate 21-0-0-24S	900 lbs

Citrus nutrition on calcareous soils

1. Calcareous soils are alkaline because they contain free $CaCO_3$.

2. The availability of N, P, K, Mg, Mn, Zn, and Fe to fruit trees including citrus decreases when soil $CaCO_3$ concentration increases to more than 3% by weight. These soils generally have a pH value in the range of 7.6 to 8.3.

3. To avoid ammonia volatilization, fertilizers containing ammonium-N or urea should be moved into the root zone with rainfall or irrigation, or be incorporated into the soil.

4. Phosphorus fertilizer applied to calcareous soils becomes fixed over time. Plant P status can be evaluated using a leaf tissue test. If citrus leaf P is less than 0.12% indicating reduced soil P availability, then P fertilizer should be applied.

5. Trees planted on calcareous soils require above normal rates of K or Mg fertilizer for satisfactory nutrition. Foliar sprays of potassium and magnesium nitrates are effective where soil applications are not.

6. The least expensive and most effective way to correct Zn and Mn deficiencies of fruit trees is through foliar application of inorganic or organic chelated forms.

7. The easiest way to avoid lime-induced Fe chlorosis is to plant trees budded on tolerant rootstocks.

8. The most effective remedy for lime-induced Fe chlorosis on nontolerant rootstocks involves the use of chelated Fe.

9. Sulfur products that act as soil acidulents can potentially improve nutrient availability in calcareous soils.

From The Florida Citrus Pest Management Guide

WEED CONTROL IN CITRUS GROVES

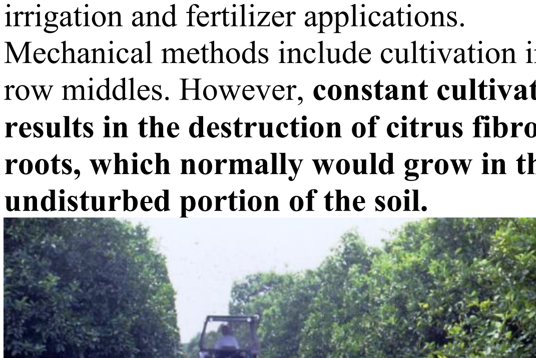
Weeds can reduce the growth, health and survival of young trees, or the time to come into bearing and ultimately fruit production. The more competitive the weeds, the more adversely they alter tree physiology, growth, fruit yield and quality. The attainment of early crop production requires controlling the growth of weeds. Weeds alter economic status by competing with trees, particularly young trees, for water, nutrients and even light in the case of climbing vines, which can easily cover trees if left uncontrolled.

Weeds also have various effects on tree performance including reduced efficacy of low volume irrigation systems, and interception of soil-applied pesticides.

Management Methods

Cultural & mechanical

Cultural methods include off-target irrigation and fertilizer applications. Mechanical methods include cultivation in row middles. However, **constant cultivation results in the destruction of citrus fibrous roots, which normally would grow in the undisturbed portion of the soil.**



Mowing is practiced between the tree rows and away from the trees in combination with herbicide applications in the tree row over the major root zone of trees. It is appropriate where a cover crop is desired in bedded groves to prevent soil erosion. Weeds can also be spread by seed and vegetatively during mowing operations, reinfesting tree rows where herbicides have been applied. **Mowing before seedhead formation is necessary to reduce seed dissemination and reinfestation.**

Chemical mowing

Chemical mowing, utilizing Low Rate Technology (LRT) postemergence herbicide spray applications and wiping in combination with mechanical mowing, is used for the suppression of vegetation in row middles. With the high frequency and cost of mechanical mowing required to maintain vegetation control in row middles, chemical mowing and wiping with low rates of glyphosate has increased. Middles management chemical applications result in the elimination of tall growing species and establishment of more manageable sod type species such as bermuda and bahia grasses.

Chemical

Generally speaking, all weed species listed as susceptible on the herbicide product label will be controlled by that herbicide at the appropriate rate, time of application and stage of growth. Environmental and plant conditions before, during and following the application are also important including moisture in the form of rainfall and/or irrigation.

Poor control can sometimes be expected from postemergence applications to weeds under stress conditions due to poor uptake and translocation of applied herbicides. Assuming that the appropriate herbicide or herbicide mixtures are selected for the weed species present, failures in the program will usually be due to one of the above factors or to the actual application including calibration and/or equipment design and operation.

Herbicides may be classified as foliar or soil-applied. Foliar applied materials may have systemic or contact activity. Soil applied preemergence herbicides are absorbed through weed root systems, being most effective during germination and early seedling growth stages. Systemic herbicides are those that are absorbed by either roots or above-ground plant parts and are translocated throughout the plant. Contact herbicides act as desiccants, damaging or killing all plant parts actually sprayed with little if any translocation.

For the control of well-established perennial weeds, a postemergence herbicide with systemic metabolic activity should be used with preemergence soil residual products.

Timing and frequency of application are the keys to good vegetation management. **Increased application frequency of lower rates of soil residual herbicides is more effective in young groves where vegetation presence is greater due to more exposure of the grove floor to sunlight and where a greater herbicide safety factor is required**.

Application Technology

Rapid advances in herbicide application technology have resulted in the development of sophisticated equipment. Application equipment is now capable of selective delivery of multiple herbicide products, each directly injected into booms. In a single application, tree rows and row middles may be treated with soil residual and postemergence products with selectivity for tree age, soil type and vegetation species.

Well-maintained, accurately calibrated equipment with good filtration and agitation systems capable of uniform distribution of prescribed spray volumes and droplet size is essential for efficiency, cost-effective vegetation management. Worn nozzle tips result in increased spray delivery rates and distortion of distribution patterns and should be checked regularly. Improved herbicide boom design to reduce tree skirt contact, spray drift and interference of heavy weed cover with nozzle output will reduce tree damage and fruit drop while improving control of target vegetation. Tree skirt pruning and timing of postemergence applications will also reduce boom and spray contact with low hanging limbs and fruit.

Environmental Considerations

In determining management options, herbicide selection should be based not only on species and stage of vegetation development, but product solubility and leaching potential, soil type and rainfall distribution. Objectives are to reduce weed competition and interference through measured vegetation control/suppression with inputs having reduced potential for leaching through over-irrigation, runoff and erosion, chemical drift, or other off-target impacts. <u>CAUTION:</u> Herbicides may move through the soil to groundwater. Several factors influence the rate of this movement. Lower rates applied more frequently combined with sound irrigation management practices will reduce herbicide movement.

The use of bromacil-containing herbicides is prohibited on deep, sandy Ridge-type soils.

Here is a list of several herbicides that are registered for citrus.

<u>Preemergence soil residual herbicides</u>: Karmex, Krovar, Princep, Simazine, Solicam,

<u>Non-selective postemergence systemic herbicides</u>: Roudup, Touchdown

<u>Non-selective postemergence contact herbicides</u>: Gramoxone

For more details, go to:

2006 Florida Citrus Pest Management Guide: Weeds at ***http://edis.ifas.ufl.edu/CG013***

IRON, ZINC, AND MANGANESE NUTRITION

Iron (Fe): One of the functions of Fe is to act as a catalyst in the production of chlorophyll. Iron deficiency has been of importance on calcareous soils in certain areas of Florida where the soil contains high amount of calcium carbonate and has a pH of 8.0. Iron deficiency is attributed to low Fe content in white sandy areas near lakes and places known locally as “sand soaked areas”. Iron deficiency can be induced by high levels of P and accumulations of heavy metals, primarily Cu, in the soil. In Florida, Fe deficiency is commonly associated with Zn and Mn deficiencies.

The symptoms of Fe deficiency are also known as “iron chlorosis”. They occur on new growing leaves which are very light in color and sometimes almost white but with the veins greener than the remainder of the leaf. In acute cases, the leaves are reduced in size, very thin, and shed early. The trees die back severely on the periphery and especially in the top. Fruit set, yield, and fruit size will be reduced.

Iron deficiency is usually associated with high soil alkalinity, but it is also associated with over irrigation, prolonged spells of wet soil conditions or poor drainage and low soil temperature. Several areas affected with Fe chlorosis in south Florida have been materially helped or completely cured by careful control of irrigation and drainage. Iron deficiency sometimes occurs where excess salts are present in the soil.

Iron deficiency has been found to be one of the most difficult deficiencies to correct especially on calcareous soils. Foliar applications of Fe are not recommended because of their lack of effectiveness and risk of leaf and fruit burn. At their best, foliar sprays of Fe produce a spotted greening of the leaves rather than an overall greening. The most reliable means of correcting Fe chlorosis in citrus is by soil application of iron chelates. Iron sulfate has not given satisfactory control on either acid or alkaline soils. Citrus rootstocks vary in their ability to absorb Fe. Trifoliate orange and its hybrids (Swingle citrumelo and Carrizo citrange) are the least able to do so.

Zinc (Zn): Zinc is essential for the formation of chlorophyll and function of normal photosynthesis. Zinc is also needed for the formation of auxins which are growth-promoting substances in plants.

Zinc deficiency symptoms are characterized by irregular green bands along the midrib and main veins on a background of light yellow to almost white. The relative amounts of green and yellow tissue vary from a condition of mild Zn deficiency in which there are only small yellow splotches between the larger lateral veins to a condition in which only a basal portion of the midrib is green and the remainder of the leaf is light yellow.

In less acute stages, the leaves are almost normal in size, while in very acute cases the leaves are pointed, abnormally narrow with the tendency to stand upright, and extremely reduced in size. In mild cases, Zn deficiency symptoms appear on occasional weak twigs. Fruit formed on these weak twigs are drastically reduced in size and have

an unusually smooth light-colored thin skin and very low juice content.
Zinc deficiency symptoms can be so severe that they may mask or noticeably alter the symptoms of other deficiencies or disorders. Deficiency in Zn can develop due to soil depletion or formation of insoluble compounds. Excessive P or N has also been found to induce or aggravate Zn deficiency.

A single spray of a solution containing 2 to 4 lbs of elemental Zn per acre from Zn sulfate, oxide, or nitrate can correct Zn deficiency. Under severe deficiency conditions however, application of Zn sprays may be necessary on each major flush of growth to keep the trees free of deficiency symptoms because Zn does not translocate readily to successive growth flushes. Foliage injury can be reduced by adding 2 to 3 lbs of hydrated lime to the spray. Maximum benefit is obtained if spray is applied to the young growth when it is two-thirds to nearly fully expanded and before it hardens off. Treatment on the spring flush is preferable. Soil application of Zn in the fertilizer is neither an economical nor an effective way to correct Zn deficiency. One of the early diagnostic symptoms of a disorder known as young tree decline or "blight" is a Zn deficiency pattern in the leaves. Correction of the symptoms will not alleviate the disorder, and trees will never recover form the disease.

Manganese (Mn): Manganese is involved in the production of amino acids and proteins. It plays a role in photosynthesis and in the formation of chlorophyll.

Manganese deficiency occurs commonly in Florida. It is particularly evident in the spring after a cold winter. Manganese deficiency leads to a chlorosis in the interveinal tissue of leaves but the veins remain dark green. Young leaves commonly show a fine pattern or network of green veins on a lighter green background but the pattern is not so distinct as in Zn or Fe deficiencies because the leaf is greener. By the time the leaves reach full size, the pattern becomes more distinct as a band of green along the midrib and principal lateral veins with light green areas between the veins.

In more severe cases, the color of the leaf becomes dull-green. Interveinal leaf areas may develop many whitish opaque spots which give the leaf a whitish or gray appearance. The leaves are not reduced in size or changed in shape by Mn deficiency, but affected leaves prematurely fall from the tree. No particular twig symptoms have been related to Mn deficiency. In cases of acute Mn deficiency, the growth is reduced giving the tree a weak appearance.

Manganese deficiency may greatly reduce the crop and the color of the fruit. Manganese deficiency is frequently associated with Zn deficiency. This combination of the two deficiency symptoms on leaves is characterized by dark green veins with dull whitish green areas between the veins. In such combinations, the Mn deficiency is acute and the Zn deficiency is relatively mild.

In Florida, Mn deficiency occurs on both acid and alkaline soils. It is probably due to leaching in the acid soils and to insolubility in the alkaline soils. For deficient trees on alkaline soils, treatments by sprays of Mn compounds are recommended. On acid soils, Mn can be included in the fertilizer. Foliar spray application quickly clears up the pattern on young leaves but older leaves respond less rapidly and less completely. When Mn sprays are given to Mn-deficient orange trees, fruit yield, total soluble solids in the juice and pounds solids per box of fruit increase. Foliar spray of a solution containing 2 to 3 lbs of elemental Mn on two-third to fully expanded spring or summer flush leaves is recommended. If N is needed, adding 7 to 10 lbs of low biuret urea will increase Mn uptake.

Flatwoods Citrus

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LaBelle, FL 33975

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__American Indian or native Alaskan
__Asian American
__Hispanic
__White, non-Hispanic
__Black, non-Hispanic

Gender

__Female __Male