UNIVERSITY OF FLORIDA | EXTENSION
Institute of Food and Agricultural Sciences

Hendry County Extension • P.O. Box 68 • LaBelle, Florida 33975-0068 • (941) 674-4092

Flatwoods Citrus

Vol. 6, No. 1 January 2003

Dr. Mongi Zekri, Multi-County Citrus Agent | **Email: maz@mail.ifas.ufl.edu**

Happy Holiday Season and Joyous and Productive New Year!

UPCOMING EVENTS

Seminars & workshops at the Hendry County Extension Office, LaBelle

Tuesday, January 14, 2003, 9:00 AM – 4:30 PM
Workshop on scouting for pests and diseases
Speakers: John Taylor, and Drs. Pam Roberts, Stephen Rogers and Phil Stansly
6 CEUs for Pesticide License Renewal, 6 CEUs for Certified Crop Advisors
Sponsor: Robert Gregg, Syngenta
Preregistration is required. Registration form was enclosed in the previous issue.

Tuesday, January 21, 2003, 10:00 AM – 12:00 Noon
Citrus scab, alternaria, melanose, and fungicide update
Speakers: Dr. Pete Timmer and Pam Roberts
2 CEUs for Pesticide License Renewal
2 CEUs for Certified Crop Advisors
Sponsor: Shelby Hinrichs, Nufarm Agriculture USA
Following the seminar, we are planning a free lunch (Compliments of Nufarm Agriculture USA) for only who call 863 674 4092 no later than Friday, 17 January.

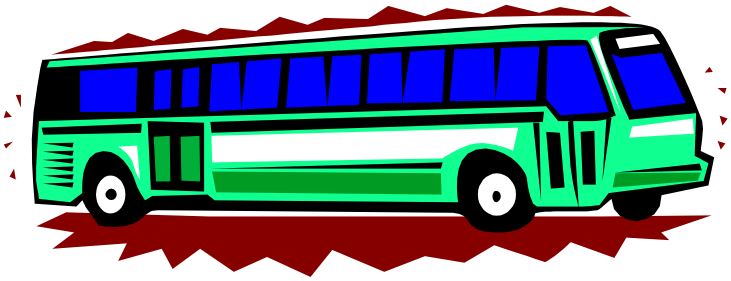
If you want to print a color copy of the Flatwoods Citrus Newsletter, get to the Florida Citrus Resources Site at http://flcitrus.ifas.ufl.edu/
You can also find all you need and all links to the University of Florida Citrus Extension and the Florida Citrus Industry

Tuesday, February 4, 2003, 10:00 AM – 12:00 Noon
Strategies for efficient application of pesticides
Speaker: Dr. Masoud Salyani
2 CEUs for Pesticide License Renewal
2 CEUs for Certified Crop Advisors
Sponsor: Michael Harowitz, FarmSaver.com
Following the seminar, we are planning a free lunch (Compliments of FarmSaver.com) for only who call 863 674 4092 no later than Friday, 31 January.

Tuesday, February 18, 2003, 10:00 AM – 12:00 Noon
Update on herbicide program options
Speakers: Dwight Meeker, Mike Prescott and Dr. Steve Futch
2 CEUs for Pesticide License Renewal
2 CEUs for Certified Crop Advisors
Sponsor: Donna Muir-Strickland, Monsanto

Tuesday, March 18, 2003, 10:00 AM – 12:00 Noon
Irrigation scheduling, maintenance, plugging problems and solutions
Speakers: Drs. Larry Parsons, Brian Boman, Tom Obreza and Sanjay Shukla
Sponsor: John Coley, Citrus Maintenance & Service, Inc.

COLLIER COUNTY EXTENSION AG TOURS



Dates: Wednesday 19 March and Friday 21 March 2003
For more information, call the Collier County Extension Office at 239 353 4244.

Indian River Citrus Seminar at Ft. Pierce

Tuesday March 4 & Wednesday March 5, 2003
For more information call 561 468 3922 or 561 462 1660

Florida Agricultural Conference & Trade Show (FACTS)

Date: April 29-30, 2003, Location: Lakeland Center, Lakeland

Citrus Expo in Fort Myers

Wednesday, August 27 & Thursday, August 28, 2003

Special Thanks to the following 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.

Bart Hoopingarner
Cerexagri, Inc.
11933 3rd Street East
Parrish, FL 34219
Phone: 941 737 7444
Fax: 941 776 8127

Shelby Hinrichs
Nufarm Agriculture USA
6943 Scarboro Drive
Fort Myers, FL 33919
Phone: 239 437 9970
Fax: 239 437 2646

Larry McCauley
Griffin LLC
5843 Deer Flag Drive
Lakeland, FL 33811
Mobile: 863 712 6487
Fax: 863 607 9403

Jerry Southwell
Hydro Agri
574 Green Ash Lane
Wauchula, FL 33873
Phone: 863 773 0154
Fax: 863 773 5088

Robert Murray
Florida Favorite Fertilizer
787 Overiver Drive
North Fort Myers, FL 33903
Phone: 800 457 0807
Fax: 239 995 0691

Robert M. Bancroft
Citrus Hedging, Inc.
P.O. Box 1366
LaBelle, FL 33975
Phone: 863 675 2190
Fax: 863 675 2104

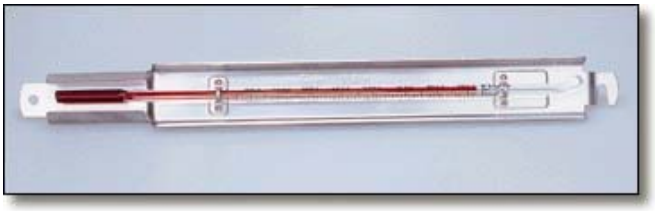
FARM CREDIT
SOUTHWEST FLORIDA
330 N. Brevard Ave.
Arcadia, FL 34266
Phone: 800 307 5677
Fax: 941 494 6460

Rachel M. Walters
***BAYER* CropScience**
Phone & Fax: 239 542 8831
Mobile: 239 707 1198
E-mail:
rachel.walters@bayercropscience.com

Bobbitt Jenkins
BASF Corporation
11100 Lakeland Circle
Fort Myers, FL 33913
Phone: 239 561 2812
Fax: 239 561 6985
Mobile: 239 707 1603 AGNET #6652

COLD HARDINESS AND COLD PROTECTION

Both citrus fruit and foliage can be damaged if temperature falls below freezing for a prolonged period. However, weather conditions prior to cold temperature, duration of cold, position of the tree in the grove or yard, maturity of the fruit, health and age of the tree can affect tree and fruit hardiness. Citrons, Tahiti and Mexican limes are the most sensitive. True lemons are slightly more cold hardy, followed by grapefruit, tangelo, limequat, sweet orange, most mandarins, and kumquat. Leaves of kumquats are hardy to 20F. The majority of sweet oranges are hardy to 26-27F. Thin-skinned, small-sized fruit or fruit held toward the outside of the canopy are usually more sensitive to cold. Fruit that is mature or close to maturity and has high sugar content can withstand more cold than immature fruit. Trees are more cold hardy when exposed to cooler temperature over several weeks prior to freezes. Sudden cold snaps can be particularly damaging to citrus. Cold tolerance develops most readily when trees are not flushing. Warm temperatures at any time during the winter may cause citrus trees to resume growth and reduce their cold tolerance. Ice formation in citrus tissues - not low temperature- kills or damages citrus trees and fruit. One hour below 28F may kill tender growth and citrus flowers. New flush growth and bloom buds will experience minimal damage at 28F when exposed for 30 minutes, but will be killed at 26F for the same period of time. Fruit damage occurs when the temperature falls below 28F for at least 4 hours. Frozen fruit can be salvaged for juice. Mature citrus leaves can generally withstand 4 hours of 23-24F with minimal damage. Four hours at 20F can kill 3/8-inch or smaller wood and temperatures below 28F for 12 continuous hours may kill larger limbs and possibly the entire tree. A clean, hard-packed surface intercepts and stores more solar radiation during the day and releases more heat at night than a surface covered with vegetation or a newly tilled area. Addition of water to the cleanly cultivated area prior to a freeze further improves heat accumulation during the day. Therefore, keep the area around the trees free of weeds and apply water to the soil prior to cold weather. Water should also be pumped high in the ditches the day before and during the time of freezing weather. But water has to be removed within 2-3 days after the freeze to avoid root damage. As the water cools, it releases heat, increasing air temperature around the trees. Young trees are more vulnerable to cold damage. It is more of a problem in open, solid-set plantings than resets in mature groves. Minimum-reading thermometers should be installed in the coldest locations of the groves. They should be placed at a height of 42 inches (4.5 ft) on a stand sheltered at the top and facing north.



Use of microsprinkler for cold protection is very important. Turn on the water early when the air temperature reaches 36F. Remember that in cold pockets, the ground surface can be below 32F when it is 36F at the thermometer location. You have to keep running the system all night. The irrigation system can be turned off in the morning when the air temperature rises to 40F.

Special Thanks to the following 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.

Susan S. Thayer
Maxijet, Inc.
8400 Lake Trask Rd.
P.O. Box 1849, Dundee, FL 33838
Phone: 800 881 6994
Fax: 800 441 6294

Jay L. Hallaron
UNIROYAL CHEMICAL/ CROMPTON CORPORATION
4953 Hidden Springs Blvd
Orlando, FL 32819
Phone: 907 256 4667

MONSANTO
Donna Muir Strickland
Phone: 863 675 4250
Nextel Agnet: 6808
Thad G. Boatwright
Phone: 561 478 4970
Nextel Agnet: 10556

John W. Coley
Irrigation maintenance,
Spot herbiciding,
Young tree care,
& Tree planting services
Phone: 863 673 2222

Wayne Simmons
SIMMONS CITRUS NURSERY
1600 Hwy 29 South
LaBelle, FL 33935
Phone: 863 675 4319
Fax: 863 675 6963

Ed Early
DU PONT Ag. Products
5100 S. Cleveland Ave., Suite 318-368
Fort Myers, FL 33907
Phone: 239 332 1467
Fax: 239 332 1707

Robert F. Gregg
SYNGENTA
11051 Championship Drive
Fort Myers, FL 33913
Phone: 239 561 8568
Fax: 239 561 8569

FIRST BANK
P.O. Box 697
LaBelle, FL 33975
Phone: 863 675 4242
Fax: 863 675 1099
Moore Haven: 863 946 1515

AIRWORK
Aerial Spraying
Fixed Wing & Helicopter
P.O. Box 5100
Immokalee, FL 34143
Phone: 239 657 3217
Serving SW Fla. Since 1979

TIPS ON FOLIAR FEEDING

The value of foliar feeding was proven many years ago. In fact, the tests showed that it was over 5 times more effective to foliar feed a plant as far as the amount of nutrients required and the speed with which those nutrients were utilized. Foliar feeding is a good approach to insure maximum growth, yields, and quality by overcoming limitations of the soil and its ability to transfer nutrients into the plants.

The best time to foliar feed is early in the morning or late in the afternoon. These are the periods when the stomata (small openings at the lower side of the leaves) are open. However, if the temperature is above 80°F, the spray will be less effective and may cause leaf burn and/or drop. The optimum temperature for foliar application of nutrients is in the low 70s.

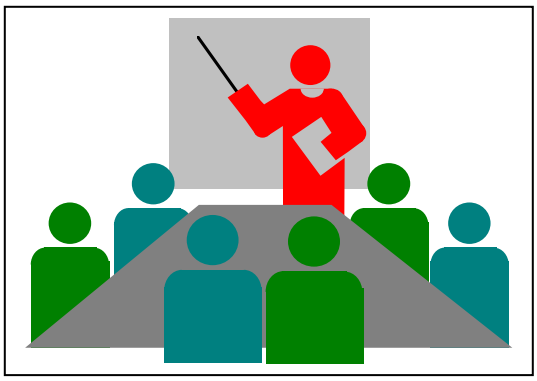
While foliar feeding has many advantages, it can burn plants at certain rates under certain environmental conditions. It is important, therefore, to foliar feed within the established guidelines. There are a number of conditions that can increase the chances of causing foliar burn. A plant under stress is more susceptible to damage. Stressful conditions include drying winds, disease infestations, and poor soil conditions. The environmental conditions at the time of application are also important factors. Applications should be avoided when the weather is hot (above 80°F) with bright sun. Furthermore, applications should not be at less than two-week intervals to give the plant sufficient time to metabolize the nutrients and adjust to the added osmotic stress. The "law of little bits" applies in foliar feeding. It is better to spray smaller amounts of material often rather than to apply one large dose. Whenever possible, the pH of a foliar spray should be between 6 and 7.

Foliar feeding is not intended to completely replace soil-applied fertilization of the macronutrients (nitrogen, potassium, and phosphorous). However, foliar applications of macronutrients in sufficient quantities can be expected to positively influence both yield and quality. Some crops, such as citrus, can have a large part of the annual nitrogen requirements met through foliar applications.

WORKSHOP

Understanding and Dealing with "Problem Areas" on Florida's Sandy Soils: a Workshop Geared toward Sugarcane, Citrus, and Vegetables

Organized by Rosa M. Muchovej (Forages and Sugarcane Agronomist, University of Florida, IFAS, Southwest Florida REC) in collaboration with Gene McAvoy (Vegetable and Ornamental Horticulturist, Hendry County Extension Office) and Mongi Zekri (Multi-County Citrus Extension Agent, SW Florida).



Date: **Wednesday, January 22, 2003**

Site: **Dallas Townsend Auditorium**
--Hendry County Extension Office, LaBelle --

Preliminary Program

8:30 – 9:00 Registration

9:00 – 9:10 Introduction and Welcome – Ed Hanlon

9:10 – 9:35 Soil Genesis and Classification in South Florida – Howard Yamataki

9:35–10:00 Importance of an Efficient Finely-tuned Irrigation System for Vegetables – Sanjay Shukla, Tony Polizos, Dan Rutledge, Gene McAvoy

10:00–10:15 Break

10:15–10:35 Citrus Rootstock Behavior Depends on Soil Characteristics – Tom Obreza

10:35–11:00 Nutritional Problems Associated with Bad Spots on Sugarcane Soils – Rosa Muchovej

11:00–11:20 Economical Aspects Considered when Dealing with Agricultural Crop Production on Problem Soils – Fritz Roka

11:20–12:00 Grower Pannel/Discussion

12:00–1:00 Free Lunch. ***Call 863 674 4092 to register and reserve lunch.***

- A WORKSHOP FOR CITRUS GROWERS -

ACCESSING UF/IFAS SOLUTIONS FROM YOUR PERSONAL COMPUTER

Jan. 22, 2003 - 9:30 am - 1:30 pm
Location: University of Florida/IFAS Citrus Research and Education Center (CREC)
700 Experiment Station Rd., Lake Alfred, FL, 33850
Contact: Dr. Richard Buker, Tel. (863) 956-1151 or e-mail: rsb@lal.ufl.edu
Registration: send your name, address, e-mail address and a check for $7 (made payable to the Citrus Research and Education Foundation) to the:
Citrus Research and Education Center, Extension Office, 700 Experiment Station Road, Lake Alfred, FL 33850.

Want an easier way to find solutions to problems? Want to spend less time looking for information on the Internet? Dr. Richard Buker, University of Florida/IFAS (UF/IFAS) Citrus Extension Specialist is conducting an Internet workshop at the Citrus Research and Education Center (CREC) in Lake Alfred on Jan. 22, 2003. Buker and Tom Hintz, Associate Director of UF/IFAS Information Technologies, will offer instruction on using Internet resources for citrus growers, an in-depth look at websites for citrus, weather and other agricultural information. Computers will be provided for this hands-on training session. According to Buker, the first session of the day will include material for beginning computer users, and the mid-morning and afternoon sessions will offer information for more experienced Internet users. Participants may choose to attend sessions pertinent to their areas of interest. As an added bonus, a CD with citrus resources from the UF/IFAS EDIS website (http://edis.ifas.ufl.edu/) will be given to all participants.

Program:

9:30-10:30: Introductory computer information; e-mail (including sending e-mail images of pests and diseases to appropriate UF/IFAS authorities for identification).

10:30-10:45: Break/time for additional questions.

10:45-12:00: Navigating the Internet; tips on getting the most out of search engines.

12:00-12:45: Lunch provided on-site.

12:45-1:30: Unlocking the full potential of the Internet to find citrus resources; how to use the CREC website to find citrus resources (http://www.lal.ufl.edu/), the FAWN website for weather information (http://fawn.ifas.ufl.edu/) and the EDIS website (http://edis.ifas.ufl.edu/) for UF/IFAS information on citrus and agricultural topics.

FLOWER BUD INDUCTION AND SPRAY TIMING ADVISORY

By Dr. Gene Albrigo, Horticulturist, University of Florida, IFAS, Citrus Research & Education Center, Lake Alfred

For an update, get to Lake Alfred CREC website at **http://www.lal.ufl.edu/**

Click on Extension Programs. Then, click on Flowering or get directly to this website: **http://www.lal.ufl.edu/Extension/extensionframe.htm**

FLOWER BUD INDUCTION AND SPRAY TIMING ADVISORY #6- 12/16/02

First the bad news - So much for my hoping you could develop some water stress by withholding irrigation. If anything, some of you may have been experiencing flooding conditions with all the rain. Now the good news - Temperatures were not as warm as predicted even in the southern half of the citrus zone. It appears, from our model, that initiating temperatures did not occur. The next 8 days should be satisfactory for continuation of inductive temperature accumulating, without sufficient warm weather to cause the beginning of bud break. The southern part of the industry should experience not more than 2 or 3 days near 80 and then it should become slightly cooler by next weekend. To date we have accumulated about 600 hours of inductive temperatures in the southern zones and over 750 in the northern-most zones. With the predicted temperatures for the coming week, we should reach inductive temperature accumulations of 650 to 700 hours in southern areas and 800 to 850 in northern area by the end of the coming week. If the following week (Christmas) remains cool, northern areas should exceed 900 hours while southern areas should reach 800 accumulated hours below 68 degrees F. If a significant warm spell does not occur by New Year's day, trees should be in excellent condition to push into flowering at the first warm spell after that.

At that time, growers of processed oranges should consider whether to push their trees or try to hold them back for another 2 to 3 weeks. If additional rainfall does not prevent the ability to develop some water stress, growers should test the effect of withholding irrigation in order to get by an early January warm spell and then push their trees with irrigation at the time of the next warm spell. Growers should be prepared to apply urea or PO3 just before the start of the first significant warm spell if soil moisture continues to be plentiful and there is no possibility of preventing bud break by developing some water stress. Previous experience indicates that flowering enhancement and increased yields can be obtained by applying either product after 850 to 900 hours of cool temperatures have accumulated.

FLOWER BUD INDUCTION AND SPRAY TIMING ADVISORY #5- 12/9/02

Warning - The next 5 days will be relatively warm (low 80s) particularly across the southern half of the citrus zone. Although it may not be warm enough to initiate flower bud induction, the predictions are too close to initiating temperatures to take chances. It would be advisable to stop irrigating, if you haven't already, and allow some water stress to develop so that no growth is initiated at this time. The daily highs in the northern areas are predicted to be in the mid 70s. It appears that temperatures will get cooler again at the end of the week. If temperatures do cool off for a sustained period, look at 8 day forecast, then moderate irrigation can be resumed at the end of the week. To date we have accumulated about 550 hours of inductive temperatures in the southern zones and over 600 in the northern-most zones. With the relatively warm week predicted, we will only accumulate another 100 hours this coming week. It would be desirable to accumulate another 200 to 300 hours after that before

allowing the trees to initiate flower bud development. That should be accomplished by Christmas or New Years. Until then, keep your eyes on the weather for warm spells and now also for freezes. Hopefully, we will not see one of those.

FLOWER BUD INDUCTION ADVISORY #4 - 12/02/02

Florida weather conditions continue to favorable this year for good citrus flower bud induction. Southern areas will have accumulated about 500 hours below 68 degrees F by next Monday. Northern areas should have exceeded 600 hours by next Monday. Remember that the goal is to get to Christmas and/or above 900 hours below 68 degrees F before allowing initiation of flower bud differentiation.

Irrigation should be used sparingly until Christmas so that drought can be initiated by stopping irrigation if a warm spell occurs before then. Although 2 warm days are expected, Tuesday and Wednesday, this coming week should have generally cool temperatures, and therefore no potential for bud growth should occur this week. Growers should follow the NOAA 8 day forecast (http://www.lal.ufl.edu/CRECHOME/crecweather.HTM) later in the week to see if a warm spell is predicted for next week. If so, sufficient cool temperatures will have accumulated that a low to low-moderate initiation of flowering could start with the first significant warm spell. I would expect the first 2 or 3 buds from the shoot apex would start to differentiate if sufficient soil moisture is present during any warm spell that might occur from now until Christmas.

Growers on deep sands should allow trees to reach mid-day wilt before irrigating, using perhaps 2 irrigations per week of about one hour duration. Trees in bedded groves should show wilt symptoms more quickly than those on deep sands and be irrigated accordingly, but sparingly.

Our goal, until Christmas, is to stop irrigation before a warm spell occurs (7 to 10 days with highs above 80 degrees F and lows near 70 degrees). Stopping irrigation soon enough before the warm spell should allow water stress to develop before the warm spell, which will minimize any early bud development. In addition to stopping bud development, drought stress may also conserve freeze hardiness that the trees have gained during the current flower bud induction period. Another advantage of avoiding the initiation of early flower bud differentiation (the start of a bloom event) is that this will delay bloom date.

For processed oranges this later bloom date should result in higher acidity levels in the fall so that normal harvest dates can be reached with good Brix/acid ratios. If a warm spell occurs around Christmas or when about 900 hours below 68 degrees F have accumulated, flower bud enhancing sprays such as urea or PO3 are appropriate to apply followed by increasing irrigation rates to stimulate growth. **Minimum rates for urea should be 25 lbs N per acre (28 lbs is preferred, 63 lbs urea). PO_3 materials may be applied at 2.5 qts/acre of a 26-28 % product.** Such sprays, especially urea, will usually advance bloom date about one week. **The best timing should be just before the predicted warm spell and not later than a couple of days into the warm spell.** These sprays can be applied with good aerial application or by ground in 30 to 125 gal/acre. If the bloom intensity potential is high when a warm spell causes initiation of flower bud differentiation, then a gibberellin spray (20 oz per acre of 4 % GA) may be appropriate to minimize the flowers per inflorescence in order to get a leafy bloom with stronger ovaries. This is primarily important for seedless cultivars in any year and mandarin hybrid types that are coming into the on-year of an alternate bearing cycle. GA should be applied at the end of the warm spell rather than before as recommended for urea. An early winter GA spray could stimulate shoot growth of the swelling buds if another warm spell comes soon. These buds or young shoots would then be much more susceptible to a freeze. If we can get to Christmas without a warm spell, then this hazard is not an issue. GA should be applied in 100 to 200 gal/acre total spray volume.

UREA

Urea is a white crystalline substance with the chemical formula $CO(NH_2)_2$; it is highly water-soluble and contains 46% nitrogen (N). Urea is considered an organic compound because it contains carbon. It was the first organic compound synthesized by chemists; this was accomplished in the early 1800s by German chemists.

Urea manufacture

Urea is made by reacting carbon dioxide (CO_2) with anhydrous ammonia (NH_3) under 204-atmosphere pressure and at 177° C (350° F).

$$CO_2 + 2NH_3 \rightarrow CO(NH_2)_2 + H_2O$$

The removal of water that occurs during the reaction is referred to as "dehydration." The resulting molten mixture is further processed into either prills or granules.

Amounts of N in urea

Urea supplies more nitrogen per ton of product than any other dry fertilizer. It contains 46% nitrogen; this means that each ton (2000 lbs) of urea supplies 920 lbs of nitrogen. For comparison, a ton of ammonium sulfate supplies only 420 lbs of nitrogen and a ton of ammonium nitrate supplies 670 lbs of nitrogen. The higher nitrogen content means lower transportation and application costs per pound of nitrogen.

Advantages of Urea

--Urea can be applied to soil, as a solid or solution, or to certain crops as a foliar spray.
--Urea usage involves little or no fire or explosion hazard.
--Urea's high analysis, 46% N, helps reduce handling, storage and transportation costs over other dry N forms.
--Urea manufacture releases few pollutants to the environment.
--Urea, when properly applied, results in crop yield increases equal to other forms of nitrogen.

Incorporate Urea for Best Use

Nitrogen from urea can be lost to the atmosphere if urea remains on the soil surface for an extended period of time during warm weather. The key to the most efficient use of urea is to incorporate it into the soil. It may also be blended into the soil with irrigation water. A rainfall as little as 0.2 inch is sufficient to blend urea into the soil to a depth at which ammonia losses will be minimized.

Urea Losses to the Air

Urea breakdown begins as soon as it is applied to the soil. However, if the soil is totally dry, no reaction happens. But with the enzyme urease, plus any small amount of soil moisture, urea normally hydrolyzes and converts to ammonium and carbon dioxide. This can occur in 2 to 4 days and happens quicker on high pH soils. Unless it rains, urea must be incorporated during this time to avoid ammonia loss. Losses might be quite low in the winter if the soil temperature is cold. The volatility of urea depends to a great extent on soil temperature and soil pH.

Soil Application and Placement of Urea

If properly applied, urea and fertilizers containing urea are excellent sources of

nitrogen for crop production. After application to the soil, urea undergoes chemical changes and ammonium (NH_4^+) ions form. Soil moisture determines how rapidly this conversion takes place. When a urea particle dissolves, the area around it becomes a zone of high pH and ammonia concentration. This zone can be quite toxic for a few hours. The free ammonia that has formed can kill seeds and seedling roots within that zone. Fortunately, this toxic zone becomes neutralized in most soils as the ammonia converts to ammonium. Usually it's just a few days before plants can effectively use the nitrogen. Although urea imparts an alkaline reaction when first applied to the soil, the net effect is to produce an acid reaction. Urea or materials containing urea should, in general, be broadcast and immediately incorporated into the soil. Urea can be bulk-spread, either alone or blended with most other fertilizers. However, urea often has a lower density than other fertilizers with which it is blended. This lack of "weight" produces a shorter "distance-of-throw" when the fertilizer is applied with spinner-type equipment. In extreme cases this will result in uneven fertilizer distribution.

Advantage of urea for foliar application of N

Use of urea compared to other nitrogen fertilizers offers several advantages. First, urea is taken up rapidly by plants. Research has shown that up to 50% of the urea can be taken up within 30 minutes. Second, there is reduced foliar burn due to salt injury because the nitrogen is organic rather than a fertilizer salt.

Guidelines for foliar applications of urea

Urea uptake is increased under mildly acidic conditions so the pH of the solution should be buffered to about 5.5 to 6.5 for maximum uptake. When the pH of the solution exceeds 7, the possibility of free ammonia exists, and the potential for leaf burn increases dramatically. Low-biuret urea solution specifically manufactured for foliar application can be buffered to eliminate free ammonia and a special dye can be added to act as a visual indicator of the solution pH. For citrus, the quantity of nitrogen applied at one time should not exceed 28 lbs (60 lbs of urea) per acre.

Biuret

Biuret is formed during the manufacturing of urea. It is two urea molecules joined together accompanied by the removal of an ammonia molecule. Biuret is of little concern for soil-applied nitrogen fertilizers, but it can be toxic when nitrogen fertilizers containing biuret are foliar-applied to sensitive crops such as citrus. Research data indicate that urea should contain no more than 0.25% biuret for use in foliar sprays.

Aerial applications of N

Urea is the best source of nitrogen for aerial application. Because urea has the highest analysis (46% nitrogen), it has the lowest application cost per pound of nitrogen. The uniform area granules mean that applications can be accurately calibrated and evenly spread. Urea is practically dust-free and, under most conditions, it does not absorb moisture and cake up.

COLD PROTECTION WITH WATER

As a means of cold protection, overhead, high-volume sprinklers have been used successfully in citrus nurseries and low-volume microsprinklers have been used to protect young trees in groves. However, success can vary with the type of system, application rates, type of freeze (advective vs. radiative), and severity of the freeze. An advective or windy freeze occurs when a cold air mass moves into an area bringing freezing temperatures. A radiation frost occurs when a clear sky and calm conditions allow an inversion to develop and temperatures near the surface drop below freezing. Inversion occurs on a clear night during which heat continues to radiate out into the space. The temperature drops significantly and cool air collects at the surface. The temperature increases with altitude (height), which is the inverse of normal conditions.

Water protects young trees by transferring heat to the tree and the environment. The heat is provided from two sources, sensible heat and the latent heat of fusion. Most irrigation water comes out of the ground at 68° to 72°F, depending on the depth of the well. In fact, some artesian wells may provide water of 80°F or more. As the water is sprayed into the air, it releases this stored (sensible) heat. However, by the time the water reaches the tree it has lost most of its energy, particularly for low volume microsprinkler systems. Consequently, the major source of heat from irrigation is provided when the water changes to ice (latent heat of fusion). As long as water is constantly changing to ice the temperature of the ice-water mixture will remain at 32°F. The higher the rate of water application to a given area, the greater is the amount of heat energy that is applied.

The major problems in the use of irrigation for cold protection occur when inadequate amounts of water are applied or under windy (advective) conditions. Evaporative cooling, which removes 7.5 times the energy added by heat of fusion, may cause severe reductions in temperature under windy conditions, particularly when inadequate amounts of water are used. It should be kept in mind that most irrigation systems will not protect the upper portion of tree canopies. Because water can provide protection in one situation and cause damage in another, it is important to know what principles are involved and understand the dew point and what can happen when using water during a freeze.

What's the "Dew Point?" It is the temperature at which dew begins to form or the temperature at which water vapor condenses to liquid water. It is also the temperature at which air reaches water vapor saturation. A common example of condensation is the water that forms on the outside of a glass of ice water. This happens because the temperature of the glass surface is lower than the dew point temperature of the ambient air in the room. Hence, some of the water vapor in the surrounding air condenses on the outside of the cold glass. When referring to cold protection, the dew point is one of the better ways to describe the humidity or amount of water vapor in the air. When the dew point is below 32°F, it is often

called the frost point because frost can form when the temperature is below freezing. The dew point is important on freeze nights because water vapor in the air can slow the rate of temperature fall. With a relatively high dew point on a cool night, radiant heat losses from a grove are reduced, and the temperature may be expected to fall slowly. But if the dew point is quite low, the temperature may be expected to fall rapidly. Water vapor absorbs infrared radiation. Water droplets or fog are an even more effective radiation absorber than water vapor. Hence, fog can reduce the rate of temperature drop on a frost night. Dew point temperatures are commonly higher on the coasts than they are inland. In addition to affecting the rate of radiation loss, the dew point is often a "basement" temperature, and the air temperature will not go much below it unless drier air moves in. The reason for this is that when dew condenses or ice forms, heat is given off.

A sling psychrometer is a convenient portable gauge for measuring relative humidity and dew point. It is an important tool to determine when to stop irrigating during freezing conditions. This instrument compares the temperatures of a dry bulb thermometer and a wet bulb thermometer. The psychrometer is spun around rapidly for a few minutes and readings are taken for the dry and wet bulb temperatures. The scale on the back of the unit and the chart that comes with the unit allow deriving the dew point and relative humidity. In the morning, when the temperature warms up, it is not necessary to wait until the ice has melted before turning off the system. When the wet bulb temperature is above 33° or when the air temperature is 40°, the system can be turned off safely.

It is generally advisable to place the emitter northwest of the tree, approximately 1 to 2 feet away from the trunk. Emitters should be attached to risers for greatest tree trunk protection. Improper placement or inadequate spray coverage will greatly lessen the effectiveness of the irrigation. A 90° to 180° spray pattern, which concentrates the water on the trunk and lower limbs, gives cold protection superior to a 360° pattern. Inverted cone sprinklers positioned above the wrap in the tree also give adequate protection. The volume of water applied depends on the amount of cold protection required. Generally, 10 gallons per hour (gph) applied directly to the trunk in a 90° pattern will provide adequate cold protection during most freezes.

It is very important to know the critical temperature at which freezes can damage the grown crop. Minimum-temperature-indicating thermometers are not expensive and are a wise investment for any grower concerned with freeze/frost protection. Several thermometers should be placed in several blocks. Placement and number of thermometers should depend on the area and grower's interest. Some factors to be considered include elevation, scion/rootstock cultivars, tree size, and irrigation systems. Some growers place one thermometer in the coldest spot and organize their protection strategy around the worst possible case. This is acceptable, but most of the area will receive more protection than it needs which will waste water and fuel and cost the grower money.

FLATWOODS CITRUS NEWSLETTER

☐ If you did not receive the ***Flatwoods Citrus*** newsletter and would like to be on our mailing list, please check this box and complete the information requested below.

☐ If you wish to be removed from our mailing list, please check this box and complete the information requested below.

Please send: Dr. Mongi Zekri
Multi-County Citrus Agent
Hendry County Extension Office
P.O. Box 68
LaBelle, FL 33975

Subscriber's Name:_____

Company:_____

Address:_____

City:_____State:_____Zip:_____

Phone:_____

Fax:_____

E-mail:_____

Racial-Ethnic Background

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

Gender

__Female __Male