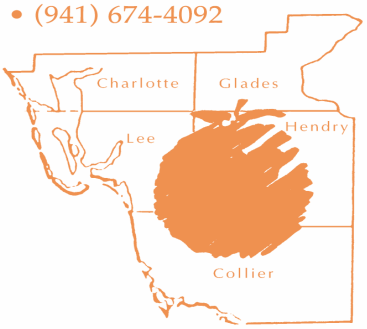
UNIVERSITY OF FLORIDA
EXTENSION
Institute of Food and Agricultural Sciences

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

Flatwoods Citrus



Vol. 5, No. 1 January 2002

Dr. Mongi Zekri, Multi-County Citrus Agent

Happy Holiday Season and Joyous and Productive New Year!

UPCOMING EVENTS

All seminars and workshops are held at the Immokalee IFAS Center.

Tuesday, January 15, 2002, 10:00 AM – 12:00 Noon

Thrips, citrus psyllid, and citrus greening

Speakers: Drs. Carl Childers and Pam Roberts
Sponsor: Sim Nifong, Dow AgroSciences
2 CEUs for Pesticide License Renewal
2 CEUs for Certified Crop Advisors
Following the seminar, we are planning a free lunch (Compliments of Dow Agro-Sciences) for only who call Sheila at 863 674 4092 no later than Friday, 11 January.

Tuesday, February 5, 2002, 8:30 AM – 4:00 PM

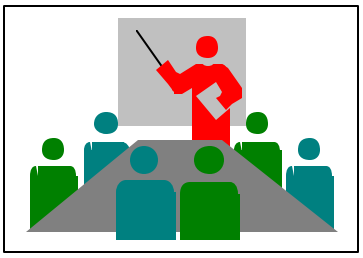
Workshop on scouting for pests and diseases

Speakers: John Taylor and Drs. Pam Roberts, Steve Rogers, and Jeff Brushwein
Sponsor: Robert Gregg, Syngenta
6 CEUs for Pesticide License Renewal
6 CEUs for Certified Crop Advisors
Preregistration is required.
Registration fee is $10.00 (includes refreshments, lunch, and handouts). To ensure lunch, registration is required no later than February 1.

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

Friday, February 1 & 8, 2002, 9:30 AM – 11:30 AM
Master Gardener Training in Charlotte County
Speaker: Mongi Zekri
Coordinators: Ralph Mitchell & Holly Shackelford, Charlotte County Extension Office

Tuesday, February 19, 2002, 10:00 AM – 12:00 Noon
Water management and issues related to water regulations
Speakers: Mary N. Gosa and Drs. Larry Parsons and Sanjay Shukla
Sponsor: Donna Muir Strickland, Monsanto
2 CEUs for Certified Crop Advisors



Tuesday, March 19, 2002, 10:00 AM – 12:00 Noon
Precision Ag and application technology
Speakers: Neal Horrom, Mike Roberts and others
Sponsor: Keith Hollingsworth, Chemical Containers
2 CEUs for Pesticide License Renewal
2 CEUs for Certified Crop Advisors

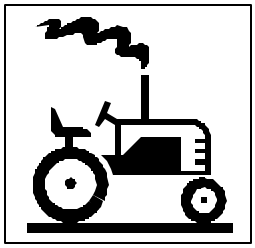
Wednesday March 20 & Friday, March 22, 2002
Collier County Annual Agricultural Bus Tours
For more information, call the Collier County Extension Office at 941 353 4244.

Tuesday, April 16, 2002, 10:00 AM – 12:00 Noon
Grove replanting and resetting strategies and Diaprepes and canker update
Speaker: Jack Neitzke and Drs. Fritz Roka and Clay McCoy
Sponsor: Shelby Hinrichs, New Farm Americas, Inc.
2 CEUs for Pesticide License Renewal
2 CEUs for Certified Crop Advisors

Monday, April 22, 2002
Master Gardener Training in Lee County
Speaker: Mongi Zekri
Coordinator: Stephen Brown, Lee County Extension Office

Tuesday, May 21, 2002, 8:30 AM –12:00 Noon
Greasy spot and other fungal diseases
Speaker: Drs. Pete Timmer and Pam Roberts
Sponsor: Mike Raines, Griffin LLC
2 CEUs for Pesticide License Renewal and 2 CEUs for Certified Crop Advisors

Saturday, June 1, 2002, 7:45 AM – 2:45 PM
Farm Safety Day
Coordinator: Dr. Mongi Zekri
2 CEUs for Pesticide License Renewal



CITRIBLEN™, AN ENVIRONMENTAL/OR A PROFITABLE APPROACH TO CITRUS FERTILIZATION

Ctiriblen™, a new controlled release fertilizer specially formulated for citrus is now on the market. Citriblen contains two Scotts patented fertilizer technologies. Developed from 5 years of research grants with IFAS, Citriblen has shown impressive yield increases and economic returns when compared to standard grower practice.

Research Findings

Citriblen was developed from a 5 yr study conducted by Drs Robert Rouse and Tom Obreza of the University of Florida, in Immokalee. Citriblen, controlled release fertilizer, was applied at 90 lb N/A on 3 yr-old Hamlin orange trees, once per growing season. The standard fertilizer, formulated from conventional fertilizers, was applied 3 times for a total of 180 lb N/A. Over a 5 yr average, Citriblen produced an 8% pounds solids increase per acre compared to standard practice.

Grower Economics

Economic analyses show the use of Citriblen to provide an incremental value/A/yr of $32 or a 35% return on investment assuming a market value of $0.70/lb solids. Stated differently: a $100 investment in Citriblen will put an additional $35 in the grower's pocket (according to 5 year IFAS results and a market value of $0.70/lb solids). These economics compare the 5 yr average yield of Citriblen (applied at 90 lbs N per acre; once per year) to the standard practice (180 lb N/acre applied 3 times per year) and assume a standard fertilizer cost of $130/A applied. As the market price of solid increases, so do the incremental profits. Return on investment (ROI) using Citriblen at different market values shows a potential ROI of 93% at $1/lb solids when compared to the standard.

Value Discovery

- Higher pounds solids per acre
- Greater grower profit (ROI)
- Single application (simpler management)
- Lower N rate
- Environmentally friendly (reduced environmental losses)

Product Information

ProSource One is the official Citriblen distributor. Please call the ProSource One Sales Manager in your region for further details.
Their main phone number is **1-813-752-1177**.

Special Thanks to these sponsors of the Flatwoods Citrus Newsletter for their generous contribution and support. If you would like to be among them, please contact me at Phone: 863 674 4092, Fax: 863 674 4636 or E-mail: maz@gnv.ifas.ufl.edu

Citrus tree pruning
(summary)

A pruning program should begin before any heavy cutting is necessary and should be conducted every year so that desired tree size and shape can be maintained at low cost and with minimum loss of canopy and maximum consistency in fruit production.

- Severe pruning and training of young, nonbearing trees, tends to delay fruit production and should be avoided.
- Mature trees should be pruned when approaching containment size and before crowding becomes a problem so that only small branches are cut and yield reduction is minimized.
- Crowding results in inadequate light conditions, dieback of small branches in the interior and base of the canopy, loss of foliage and fruit production particularly in the lower portion of the tree.
- Middles between tree rows should have a width of 7 to 8 feet to accommodate grove equipment and provide adequate light to the trees.
- **Hedging** consists of cutting back the sides of trees to prevent crowding.
- Hedging should be done at 10 to 15 degrees from vertical. Hedging at wider angle is better for spray coverage, but may result in severe yield reduction.
- **Topping** should be done before trees have become excessively tall.
- Yield reduction due to light topping is usually not significant if trees still have their lower skirt areas.
- Topping increases light penetration into the trees, stimulates vegetative growth and results in thicker canopies.
- Topping can increase fruit size and packout.
- Retopping should be done just above the old cut.
- Moderate, consistently timed hedging and topping does not reduce yield, but may improve fruit quality.
- The best time to top and hedge early maturing cultivars is after removal of the crop. For Valencia, it is recommended that the first cut is done after harvest and then annually during the winter.
- **Skirting**, which is the pruning to raise tree skirts, has become a more widely accepted practice.
- Skirting facilitates the movement of herbicide booms and other equipment, improves weed control, fertilizer distribution and air circulation under the tree canopy, reduces brown rot and Phytophthora problems, and makes less difficult the inspection of irrigation systems.

More detailed information on pruning follows

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RECOMMENDATIONS TO REDUCE THE SPREAD OF CITRUS CANKER

Groves and Nurseries

1. Whenever possible lock the gates of the property and restrict access at all times.

2. Before entering and upon leaving groves or nurseries, equipment should be first cleaned of all plant material, debris and soil and then disinfected with approved decontamination products.

3. Prior to entering and leaving groves and nurseries, all workers should disinfect hands and shoes with antimicrobial soap or other approved disinfectants.

4. All workers including fruit picking personnel should wear freshly laundered clothes each day.

5. All grove and nursery traffic including personal vehicles, equipment and visitors should be limited as much as possible.

6. Exchange of personnel, vehicles and equipment between groves and nurseries should be limited as much as possible.

7. It is required that grove service contractors practice stringent decontamination and sanitation procedures.

8. Restrict access of all personnel, vehicles, and equipment and movement in groves or nurseries when foliage is wet with rain or dew. Do not harvest fruit before the trees dry.

9. Restrict irrigation to nighttime hours to reduce worker exposure to wet foliage.

10. Before entering and upon leaving a grove, all harvesting equipment including trucks, trailers, tractors, “goats”, ladders, tubs, boxes, picking bags and gloves must be decontaminated.

11. Do not collect canker specimens. Flag adjacent trees, map the location and immediately contact the Division of Plant Industry at 1 800 850 3781.

Packinghouses and Processing Plants

Clean all debris including leaves, twigs and fruit from all fruit hauling equipment and containers. All debris should be burned or disposed of at the present location in a manner that will not pose any risk.

Avoid dumping culled fruit and debris in unauthorized areas especially near groves and nurseries.

Tarping for all fruit transport trucks and trailers is recommended to eliminate escape of debris.

PRUNING CITRUS TREES

Pruning healthy, mature citrus trees usually reduces yield in proportion to the amount of foliage removed and can delay fruiting of young, nonbearing trees. Proper control of vegetative growth is essential for the maintenance of healthy, productive citrus groves. Most groves in Florida must be pruned at some time during their development to avoid problems associated with overcrowded, excessively tall trees.

When pruning should begin will depend to a large degree on the initial tree planting density. Crowded conditions result in poor light accessibility, loss of lower foliage and bearing wood, relocation of fruiting to the upper tree canopy areas and reduction in fruit yield, size, and external quality. Therefore, good management dictates the need to prune before the occurrence of these undesirable effects.

The response to pruning depends on several factors including variety, tree age and vigor, growing conditions, and production practices. As no one system or set of rules is adequate for the numerous situations encountered in the field, growers are encouraged to gain a clear understanding of the principles involved in pruning and to take advantage of research results and knowledgeable colleague and custom operators' observations.

Too much nitrogen after severe pruning will produce vigorous vegetative growth at the expense of fruit production. Therefore, nitrogen applications should be adjusted to the severity of pruning. Reducing nitrogen applications avoids an imbalance when heavy pruning is done. Omitting a nitrogen application before heavy pruning and possibly after will reduce both costs and excessive vegetative growth. However, light maintenance pruning should not affect fertilizer requirements.

A heavy crop of fruit tends to deplete carbohydrates and results in a small crop and increased vegetative growth the following year. Pruning after a heavy crop additionally stimulates vegetative growth and reduces fruit yield the following year. Pruning after a light crop and before an expected heavy crop is recommended because it can help reduce alternate bearing.

Severe pruning stimulates vigorous new vegetative growth, especially when done before a major growth flush. This happens because an undisturbed root system is providing water and nutrients to a reduced leaf area. The larger the wood that is cut, the larger is the subsequent shoot growth. Severe pruning reduces fruiting and increases fruit size. Severe pruning of a very crowded grove typically results in a crop reduction the first year, recovery of the previous yield the second or third year, and higher yields

thereafter, although this can vary with tree vigor, grove conditions, and size of the previous crop.

RECOMMENDATIONS

Severe pruning and training of young, nonbearing trees tends to delay fruit production and should be avoided. Most trees usually need no pruning for the first few years in the grove except for removal of sprouts on the trunk or vigorous suckers on weak trees. When the tree is 3 or 4 years old, depending on its growth, branches that are too closely spaced or are crossed and entangled may be removed. This pruning should be light, just sufficient to establish a desirable framework without stimulating excessive vegetative growth. Mature Trees require pruning when they approach containment size because crowding results in inadequate light conditions, loss of foliage and loss of fruit production in the lower portion of the tree.

Hedging, which consists of cutting back the sides of trees to prevent or alleviate crowding, has become a common practice. Hedging causes numerous cut wood surfaces along the side of the tree canopy from which new sprouts arise eventually developing into a wall of new foliage. Middles between tree rows should be sufficiently wide to accommodate grove equipment and provide adequate light access to the sides of the trees. Middles are usually hedged to a width of 7 to 8 ft.

Hedging should be started before crowding becomes a problem so that only cutting of small branches is necessary and minimal crop reduction results. The closer the spacing and the more vigorous the trees, the sooner hedging is required and the more frequently it needs to be done. Removal of a large portion of the tree will result in excessive vegetative growth and a drastic reduction in subsequent yield. Hedging of severely crowded groves aids in the eventual restoration of the tree skirts and opens them up for passage of grove equipment. However, heavy cutting is expensive, reduces the crop, and increases problems and cost of brush disposal.

Hedging is usually done at an angle, with the boom tilted toward the tree tops so that the middles are wider at the top than at the bottom, allowing more light to reach the skirts of the tree. Hedging angles being used vary from 0 to 25 degrees from vertical, with 10 to 15 degrees being more commonly used and more satisfactory. With wide angles, topping can sometimes be done with one pass of the boom instead of two or can be eliminated entirely if the trees come to a peak at a suitable height. Another advantage of hedging at wider angles may be better spray coverage, particularly aerial.

Topping should be done before trees have become excessively tall and should be an integral part of a maintenance program. Long intervals between topping will increase costs of the operation due to heavy cutting and more brush disposal. Excessively tall trees are more difficult and expensive to harvest and spray. Topping trees will increase light penetration into the tree canopy thereby stimulating intense vegetative growth. Topping will also reduce harvesting costs and enhance pest and disease control due to better spray coverage, and increase fruit quality and size. Yield reduction due to

light topping is usually not great if trees still have their lower skirt areas. However, if the trees have lost their lower canopy bearing wood, a large reduction in yield will occur in the first year since much of the fruit-producing wood and foliage would be removed. Topping these trees would still be beneficial in the long run since it may help them regain their skirt areas and bring them to a more manageable height. Since topping usually increases fruit size (by reducing crop load), fresh-market fruit from topped trees may have a higher packout.

Some trees are flat-topped, especially if they are small or narrow or have been hedged at a wide angle. Closely-spaced rows and those with a sufficient hedging angle can be flat-topped with a single pass of the boom. However, trees can be topped at angles ranging from 15 to 30 degrees from horizontal, resulting in a peak which is 2 or more ft higher than the shoulders. Angles between these extremes are commonly used. The slope aids machines in sweeping brush from the tops.

Optimum tree height depends on the distance between trees, the hedging angle and tree width. Topping height may vary from about 10 to 20 ft, but is usually about halfway between. Some common topping heights are 12 to 14 ft at the shoulder and 15 to 16 ft at the peak. Lower heights are mostly used for training trees, increasing

fruit size or rejuvenating declining trees. Topping should be started before heavy cutting is required. If heavy cutting is required in older groves, the initial cuts should be low enough to avoid cutting heavy wood in subsequent topping operations. Retopping is generally done just above the old cut.

Skirting, which is pruning to raise tree skirts has become a more widely accepted practice. With low tree skirts the movement of herbicide booms and other equipment is impeded, and the inspection of irrigation systems is more difficult. Fruit and limbs near the ground are often damaged by the passage of such equipment by herbicide spray and fertilizer contact. Low tree skirts may also increase the incidence of Phytophthora foot rot, because of poor air circulation under the tree canopy. Lower canopy fruit is also more susceptible to Phytophthora brown rot. Skirting has the advantage

in reducing problems with vines and facilitating mechanical harvesting.

PRUNING PROGRAMS

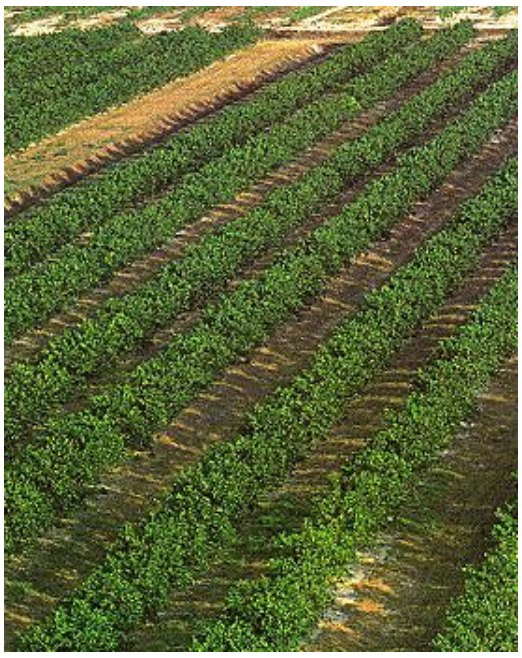
Hedging programs can vary considerably with variety, tree vigor, and spacing. The grower can hedge every middle every year; hedge alternate middles every year; or hedge every middle every other year. Groves on a 2-year program are hedged in one middle one year and the other middle the next. A 3-year program might consist of hedging one middle the first year, the other the second and topping in the third year. The possibilities for hedging and topping schedules are numerous and should be decided on an individual basis.

The best time of year to hedge depends on variety, location, severity of pruning, and availability of equipment. Since hedging is usually done after removal of the crop, early maturing varieties are generally hedged before those which mature later in the season. Many prefer to hedge early before bloom, but they may also get more regrowth which may or may not be desirable. Hedging could begin as early as November in warmer areas. Moderate hedging can be done until July with little or no crop loss and perhaps less regrowth. Light maintenance pruning can be done throughout the summer and until early fall with little or no loss in fruit production. Hedging should not continue into the fall in freeze-prone areas as trees with tender regrowth are more susceptible to cold injury.

Hedging `Valencia' orange or late harvested grapefruit presents a special problem because of overlapping crops. Hedging has usually been done in late spring after the old crop is harvested and the new crop is set. Fruit harvest should be scheduled early in the season for `Valencia' groves that are to be hedged. Good results have been obtained when annual hedging has been done in late winter with the old crop still on the tree and before bloom. The first cut is usually done after harvest and then the grove is rehedged annually in January or February. When this is done annually at the same width, the wood and foliage removed contains few fruit and there is little or no reduction in yield. The key to this program is consistency.

Fresh fruit

Fruit size is very important in fresh fruit operations, with small sizes often resulting in a reduced pack-out and lower prices. In some cases, large fruit are spot-picked and the rest of the crop is never harvested. Hedging and/or topping after a light crop and before an expected heavy crop can reduce the number of fruit with a corresponding increase in fruit size and also alleviation in alternate bearing. The grower may wait until the fruit-set so that the amount of fruit-set can be more accurately determined. However, it is extremely important that pruning is done before the fruit has attained appreciable size since later fruit removal could result in a crop reduction without a compensating fruit size increase.



MECHANICAL HARVESTING VS. HAND PICKING

To be competitive in an increasingly global marketplace, Florida citrus growers must reduce production and harvesting costs. Immigration reforms and the Immigrant Responsibility Act caused a continual decrease in the traditional labor supply and a shortage in the labor required to harvest citrus. These facts have pushed the Florida Department of Citrus (FDOC) to re-examine the feasibility of mechanical harvesting for citrus crops. For the last few years, the FDOC has been supporting, testing, and evaluating several mechanical harvesting devices. About 10,000 acres were mechanically harvested last season. It is expected that 15,000 acres will be harvested this season and that most processed fruit will be harvested mechanically 10 years from now. Crop removal by mechanical harvesting ranges from 90 to 95%. Mechanical harvesting was demonstrated to be more cost effective (15-75% potential cost savings) than hand labor, but groves need to be prepared for mechanical harvesting. For example, trunk shakers can only operate where the trees have clear, tall trunks and
the canopy has been skirted (lower branches removed). Not all citrus crops can be mechanically harvested. Current mechanical harvesting devices are not well adapted to 'Valencia' because of the presence of 2 crops (one mature and another that will be mature next season) on the tree. Furthermore, at the present time for the fresh market, citrus fruit must be hand-harvested.

MORE ON MECHANICAL HARVESTING VS. HAND PICKING

The current Florida Department of Citrus (FDOC) Harvesting Program was restarted in January 1995. The University of Florida, the FDOC, and the USDA's Agricultural Research Service conducted a prior cooperative research and development program for about 25 years (1959 - 1984) at the Lake Alfred Citrus Research Center. Inventors, growers, and equipment manufacturers also participated in this program.

The Canopy Area Shake and Catch System is potentially very versatile and should be capable of mechanically harvesting 80 to 95% of the fruit from any citrus grove in Florida. When a hand gleaning crew follows the harvester, the 5 to 20% of the crop that remains on the tree or ground can be recovered, so none of the crop needs to be abandoned. The hydraulically powered shaker head has plastic probes that are pushed into the fruiting canopy to a depth of about 30 to 36 in. A 5 second shake will remove about 95% of the fruit. The shaker head is positioned into successive areas of each tree or hedgerow of trees.

An effective fruit catching and handling machine is also a necessity if this harvesting system is to be economically successful. The trees must be skirted to 24 in., but special hedging and topping are not required. ***The Canopy Penetrate Pull and Catch Harvester*** does not shake, beat, or twist the tree to get the fruit off. It simply pulls each fruit away from the stem. To do this on the present harvester, 900 hollow metal arms (each 8 ft long) mounted on a 10 ft long by 15 ft high panel are pushed into the fruiting canopy to a depth of 8 to 9 ft (the trunk line) then withdrawn. Spaced along each vertical side of the arms are three spring-loaded plastic fingers that hook the fruit stems and pull the fruit off as the arms are withdrawn from the canopy. This harvester will require the trees to be topped at a fixed height

(probably 17 ft), to be skirted at about 2 ft to accommodate the fruit collection system, and to be hedged at a maximum canopy depth of 8 ft from the trunk centerline. Close-planted, hedged, topped, and skirted trees will allow this harvester to operate with its best productivity. Worker productivity would be about 4 times that of hand harvesters. If 2 gleaners could keep up with the machine and recover the remaining 10% of the crop, worker productivity would be reduced to 3 times that of hand harvesters.

The Trunk Shake and Catch Harvesting Systems offer complete trunk shake and catch harvesting systems that are compatible with the grove conditions in the Florida citrus industry. These harvest systems require that the groves be prepared for mechanical harvesting. This generally amounts to selecting only those groves in which the clear trunk height to the first branches is 15 in. or more, the average trunk diameter is 9 in. or less, the spacing between trees down the row is uniform at 11 to 15 ft, tree age is similar (not a rehabilitated grove having a mixture of survivor and

replacement trees), headlands are adequate for quick machine turn-around, swales are graded uniform from the trunk line, and that the yield/acre is good.

The Continuous Travel Canopy Shake and Catch Harvest Systems appear to be capable of cutting harvesting cost by up to 75% and increasing labor productivity by 12 to 25 times. The trunk shake and catch harvest systems are capable of cutting harvesting cost by up to 50% and increasing labor productivity by 5 to 8 times. The Canopy Area Shake and Catch system appears to be capable of cutting harvesting cost by up to 30% and increasing labor productivity by 2 to 3 times.

Hedging, topping, and skirting for mechanical harvesting

Hedging to maintain an 8 ft wide equipment alley, or row middle, between rows is a standard industry practice no matter how wide or narrow the spacing between rows may be. Topping at 14 to 18 ft was a rule-of-thumb, until the 1998-99 season when some harvesters (pickers) refused to pick groves that were over 14 ft tall. Skirting to remove the low canopy foliage between the ground and 12 or 18 in. above the ground seems to be on the increase, versus letting the low foliage touch the ground. Most nurseries only offer trees that begin branching at 12 to 15 in. above the ground. The efficient mechanical harvesting systems require 24 to 30 in. of clear trunk height. Data from many commercial groves shows that total yield/acre is not decreased permanently when groves are skirted for mechanical harvesting. A 5 to 15% yield loss will occur the first year, but yield returns to normal in 2 years.

SCOUTING FOR PESTS AND DISEASES

Florida citrus industry uses sustainable production practices. Florida citrus growers help preserve environmental quality by using many sound cultural practices including integrated pest management (IPM) strategies. IPM depends on grove scouting and close observations to determine the need and timing for pesticide applications as well as modification of cultural practices to minimize damage.
Scouting for early warnings of pests and diseases is becoming very important in citrus operation. Scouting not only helps growers control pests more efficiently, but also lowers the use of pesticides and the chances of pesticide resistance.
In most cases, there is no way to predict on a seasonal basis the incidence and severity of pests. However, based on grove history and frequent observations, many situations can be reasonably assessed. With most citrus pests, the pressure must be high before economic damage levels on the processing fruit crop are experienced.

Pest populations should be suppressed only when high levels of infestation threaten tree vigor and productivity. There are several techniques and procedures for scouting and there are many things to know before scouting. To learn more, you need to attend the workshop on scouting for citrus pests and diseases scheduled on 5 February 2002.

A service for Citrus Growers

For the Florida citrus growers, Global Ag Exchange, Inc. provides a number of free resources and some fee based services to help the struggling grower have a better chance of making a profit. Check their site at www.fruit2juice.com Meet them and find out who they are by clicking on "About US' at the top of the home page. For any question, call David Stephens at 863 676 5678 or e-mail at dstephens@globalagex.com

EPA PROGRAM BASED ON FALSE INFORMATION

Friday, November 9, 2001

By Steven Milloy ***FOX NEWS***

http://www.foxnews.com/story/0,2933,38366,00.html

Via AgBioView www.agbioworld.org

A scientific study that spawned a federal law requiring the testing of chemicals for their potential to interfere with hormonal processes has been found to be the product of scientific misconduct.

The federal Office of Research Integrity just ruled that Steven F. Arnold, a former researcher at the Tulane University Center for Bioenvironmental Research, "committed scientific misconduct by intentionally falsifying the research results published in the journal Science and by providing falsified and fabricated materials to investigating officials." Arnold lied and then covered up.

The ORI also found that, "there is no original data or other corroborating evidence to support the research results and conclusions reported in the Science paper as a whole."

The disturbing tale began in 1996 with the publication of the book Our Stolen Future: Are We Threatening Our Fertility, Intelligence and Survival? -A Scientific Detective Story. The book was a compendium of loosely told anecdotes that attempted to implicate chemicals in the environment and our food - such as PCBs, pesticides and plastics - as the cause of diseases ranging from cancer to infertility to attention deficit disorder.

The authors of Our Stolen Future speculated that these chemicals - so-called "environmental estrogens" or "endocrine disrupters" - disrupted normal hormonal processes, even at low exposure levels generally accepted as safe.

Although Our Stolen Future initially received a great deal of media attention, it soon died out amid much criticism from many respected scientists. But just when the fury faded, Arnold and his Tulane gang published their study in June 1996, claiming that combinations of pesticides and PCBs were up to 1,000 times more potent as endocrine disrupters than the individual chemicals alone.

"The new study is the strongest evidence to date that combinations of estrogenic chemicals may be potent enough to significantly increase the risk of breast cancer, prostate cancer, birth defects and other major health concerns," said then-EPA chief Carol Browner.

"I was astounded by the findings," said then-EPA pesticide chief Lynn Goldman. "I just can't remember a time where I've seen data so persuasive… The results are very clean looking."

The study received a great deal of publicity that stampeded Congress into passing a bill in July 1996, signed into law by President Clinton, requiring the EPA to develop a program for screening thousands of chemicals for their ability to act as endocrine disrupters.

The EPA's Endocrine Disrupter Screening Program now underway only costs about $10 million per year. But the cost to industry and consumers will likely stretch into the billions of dollars. Testing of a single chemical can easily reach into the millions of dollars.

The Arnold study began to unravel a mere six months after publication. Scientists from around the world began to report that they could not reproduce Arnold's results - such replication of results being a requirement for findings to be considered as "scientific."

By August 1997, Arnold was forced to retract his study from publication. His retraction stated, "We have not been able to reproduce the results we reported." He later added, "I can't really explain the original findings."

Now we know why - he cheated. The penalty imposed on Arnold was a five-year ban from federal grants.

Although a lifetime ban and perhaps even criminal prosecution would have been more appropriate - after all, he was found guilty of "intentionally falsifying" taxpayer-funded research - the light penalty is not the most disturbing part of this story.

Arnold's study has been thoroughly trashed, but the federal law remains and the mandated EPA testing program is in full bloom.

In August 1999, an expert committee of the National Academy of Sciences' National Research Council - a panel that included scientist representatives from the environmental activist community - reported there was no evidence that chemicals in the environment were disrupting hormonal processes in humans and wildlife.

That scientific report was inexplicably insufficient to kill the endocrine disrupter scare. But now, if proven fraud isn't enough, what is?

Thanks to Dr. Ed Hanlon for e-mailing me the article!

PHOSPHORUS NOTES

By **Dr. Ed. A. Hanlon**
14 Nov 2001
University of Florida, IFAS, Southwest Florida Research & Education Center

1. Phosphorus (P) in the Everglades can be measured in selected spots at approximately 10 parts per billion (ppb) in the water column.
2. Evidence suggests that a P gradient exists from Lake Okeechobee (high P) to selected spots in the Everglades (low P).
3. This P gradient was created through many complex (and partially documented) processes.
4. Human interventions have affected the natural gradient.
5. Better management practices have led to a reduction of P in the system.
6. Management of water treatment areas and continued study of the processes affecting P in the water column have produced water containing approximately 20-30 ppb P.
    a) In Cell 4 inflow concentrations are approximately 80 ppb P and outflow is approximately 20-30 ppb P.
    b)The major portion of entering P is in the organic P fraction.
        i) This fraction contains particulate organic components including dead and living organisms (diatoms are observed in considerable numbers, for example).
        ii) P reduction within Cell 4 involves several complex physical, chemical, and biological processes including: uptake by plants and periphyton, settling, coprecipitation with calcium carbonate, or aggregation removing organic P from the water column.
    c) A smaller portion of entering P is in the soluble reactive form (SRP).
        i) This fraction is reduced within Cell 4, but the process is likely different than that for organic P.
        ii) Since SRP is already low (5 ppb P, for example) in the inflow, a typical reduction to approximately 2 ppb P in outflow suggests little actual concentration change (and big percentage change, for example).
7. Problematic issues:
    a) P reductions resulting from current BMPs in the Everglades Agricultural Area will increase the longevity of the water treatment areas. The processes should be better understood so that appropriate management strategies can be developed and tested.
    b) The P gradient is a fact. How humans should manage the current system to achieve meaningful outcomes must still be a subject of research.