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E X T E N S I O N

Institute of Food and Agricultural Sciences

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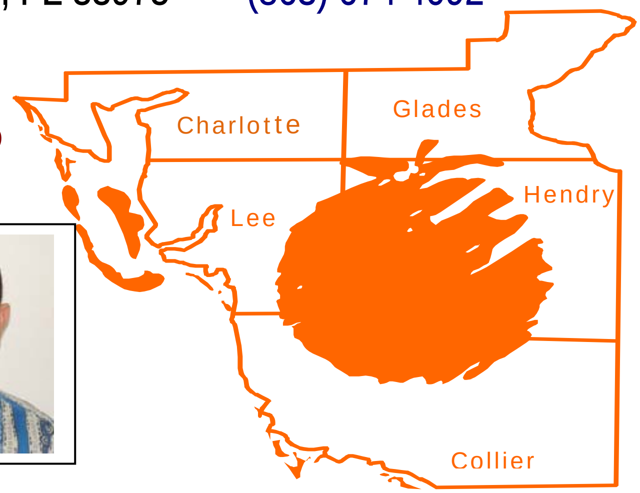
Flatwoods Citrus



Vol. 17, No. 7 **July 2014**

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

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Previous issues of the Flatwoods Citrus newsletter can be found at:
http://citrusagents.ifas.ufl.edu/agents/zekri/index.htm
http://irrec.ifas.ufl.edu/flcitrus/

I M P O R T A N T   E V E N T S

AGRICULTURAL TREE CROP PESTICIDE LICENSE TRAINING- Mongi Zekri, UF-IFAS

Date & Time: Thursday morning, July 17, 2014 at 8:00 AM, **11:00 AM Exam**
Location: Dallas B. Townsend Agricultural Center (UF-IFAS Hendry County Extension Office) in LaBelle
A Registration Fee of $10.00 per person will be charged to all participants.
Please RSVP to Debra at 863-674-4092 or dcabrera@ufl.edu

Seminar – Foliar Nutrition in the Age of Greening

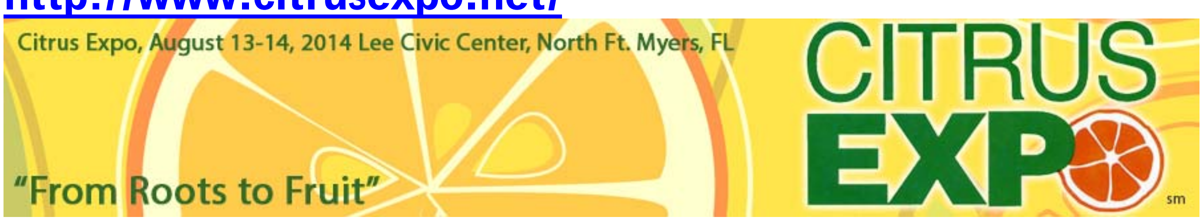
Date & time: Thursday, August 28, 2014, **10:00 AM – 12:00 Noon**
Location: UF-IFAS Southwest Florida Research and Education Center
Program Coordinators: Mongi Zekri and Heath Prescott
-DR. HAMED DOOSTDAR
HLB Infection and its Effect on Tree Health and Production
* Effects Nutrition on Mitigating HLB symptoms
* Spray Timing and Tank Mixes
* Common myths and misconceptions

-HEATH PRESCOTT
*PFD overview
* Product improvements
* New Product developments (Roots/Motivate)

1.5 CEUs for Certified Crop Advisors (CCAs)
1.5 CEUs for Pesticide License Renewal
Pre-registration is required. No registration fee and lunch is free Thanks to Heath Prescott with KeyPlex. To reserve a seat, call 863 674 4092, or send an e-mail to Dr. Mongi Zekri at: maz@ufl.edu **No RSVP = No lunch**

CITRUS EXPO IN FORT MYERS

Wednesday, August 13 & Thursday, August 14, 2014
http://www.citrusexpo.net/



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BROWN ROT MANAGEMENT

Management of brown rot, caused by *Phytophthora nicotianae* or *P. palmivora*, is needed on both processing and fresh market fruit. While the disease can affect all citrus types, it is usually most severe on Hamlin and other early maturing sweet orange cultivars.

Phytophthora brown rot is a localized problem usually associated with restricted air and/or water drainage. It commonly appears from mid-August through October following periods of extended high rainfall. It can be confused with fruit drop due to other causes at that time of the year. If caused by *P. nicotianae*, brown rot is limited to the lower third of the canopy because the fungus is splashed onto fruit from the soil. *P. palmivora* produces airborne sporangia and can affect fruit throughout the canopy.

Early season inoculum production and spread of *Phytophthora* spp. are minimized with key modifications in cultural practices. Skirting of the trees reduces the opportunity for soil-borne inoculum to contact fruit in the canopy. The edge of the herbicide strip should be maintained just inside of the dripline of the tree to minimize the exposure of bare soil to direct impact by rain. This will limit rain splash of soil onto the lower canopy. Boom application of herbicides and other operations dislodge low-hanging fruit. Fruit on the ground becomes infected and produces inoculum of *P. palmivora* that can result in brown rot infection in the canopy as early as July while fruit are still green. The beginning stages of the epidemic are very difficult to detect before the fruit are colored and showing typical symptoms. Application of residual herbicides earlier in the summer may reduce the need for post-emergence materials later and minimize fruit drop throughout this early stage of inoculum production from fallen fruit.

Usually a single application of Aliette, Phostrol or ProPhyt before the first signs of brown rot appear in late July is sufficient to protect fruit through most of the normal infection period. No more than 20 lb/acre/year of Aliette should be applied for the control of all Phytophthora diseases. Aliette, Phostrol and ProPhyt are systemic fungicides that protect against postharvest infection and provide 60-90 days control. Copper fungicides are primarily protective but are capable of killing sporangia on the fruit surface and thus reducing inoculum. They may be applied in August before or after brown rot appearance and provide protection for 45-60 days. If the rainy season is prolonged into the fall, a follow-up application of either systemic fungicides at one-half of the label rate, or copper in October may be warranted. With average quality copper products, usually 2-4 lb of metallic copper per acre are needed for control.

Precautions should be taken during harvesting not to include brown rot-affected fruit in the field containers as this could result in rejection at the processing or packing facility.

Recommended Chemical Controls for Brown Rot of Fruit

Pesticide	**FRAC MOA**[2]	**Mature Trees Rate/Acre**[1]
Aliette WDG	33	5 lb
Phostrol	33	4.5 pints
ProPhyt	33	4 pints
copper fungicide	M1	Use label rate.

[1]Lower rates may be used on smaller trees. Do not use less than minimum label rate.
[2]Mode of action class for citrus pesticides from the Fungicide Resistance Action Committee (FRAC) 2013. Refer to ENY624, Pesticide Resistance and Resistance Management, in the 2014 Florida Citrus Pest Management Guide for more details.

Rates for pesticides are given as the maximum amount required to treat mature citrus trees unless otherwise noted. To treat smaller trees with commercial application equipment including handguns, mix the per acre rate for mature trees in 250 gallons of water. Calibrate and arrange nozzles to deliver thorough distribution and treat as many acres as this volume of spray allows.

For more information, go to: **Florida Citrus Pest Management Guide: Brown Rot of Fruit at:** ***http://edis.ifas.ufl.edu/pdffiles/CG/CG02200.pdf***

FLOODING INJURY

Almost all citrus trees grown in southwest Florida are located on high water table, poorly drained soils. Water management on poorly drained soils is difficult and expensive because during heavy rains in the summer, excess water must be removed from the rootzone and in periods of limited rainfall, irrigation is needed. On these soils, drainage is as important as irrigation. The concept of total water management must be practiced. If either system—irrigation or drainage—is not designed, operated, and maintained properly, then the maximum profit potential of a grove cannot be achieved. Both surface and subsoil drainage is necessary to obtain adequate root systems for the trees.

Roots, like the rest of the tree, require oxygen for respiration and growth. Soils in Florida typically contain 20-21 % oxygen. When flooding occurs, the soil oxygen is replaced by water. This condition causes tremendous changes in the types of organisms present in the soil and in the soil chemistry.

Flooding injury would be expected if the root zone were saturated for 3 days or more during extended summer rains at relatively high soil temperatures (86-95° F). Flooding during the cooler December-March period can be tolerated for several weeks at low soil temperatures (< 60° F). The rate of oxygen loss from the soil is much greater at high than at low temperatures. The potential for damage to roots is less obvious but equally serious when the water table is just below the surface. Flooding stress is much less when water is moving than when water is stagnant. The use of observation wells is a very reliable method for evaluating water-saturated zones in sites subject to chronic flooding injury.

Short-term estimates of flooding stress can be obtained by digging into the soil and smelling soil and root samples. Sour odors indicate an oxygen deficient environment. The presence of hydrogen sulfide (a disagreeable rotten egg odor) and sloughing roots indicate that feeder roots are dying. Under flooded conditions, root death is not exclusively associated with oxygen deficiency. Anaerobic bacteria (the kind that can grow only in the absence of oxygen) develop rapidly in flooded soils and contribute to the destruction of citrus roots. Toxic sulfides and nitrites formed by anaerobic sulfate- and nitrate-reducing bacteria are found in poorly drained groves. Sulfate-reducing bacteria require both energy and sulfates in order to change sulfates to sulfides. The best sources of energy have been found to be certain organic acids contained in citrus roots, grass roots, and buried pieces of palmetto. Thus, citrus roots can contribute to their own destruction by being an energy source for these bacteria.

Symptoms of flooding injury may occur within a few days or weeks, but usually show up after the water table has dropped and the roots become stranded in dry soils. Leaf wilting, leaf drop, dieback, and chlorosis patterns may develop and tree death may occur. Trees subjected to chronic flooding damage are stunted with sparse canopies, dull colored, small leaves and produce low yields of small fruit. New flushes of growth will have small, pale leaves due to poor nitrogen uptake by restricted root systems. Usually, the entire grove is not affected, but most likely smaller more defined areas will exhibit the symptoms. Striking differences in tree condition can appear within short distances associated with only slight changes in rooting depths. Water damage may also be recognized by a marked absence of feeder roots and root bark, which is soft and easily sloughed.

With acute water damage, foliage wilts suddenly followed by heavy leaf drop. Trees may totally defoliate and actually die, but more frequently partial defoliation is followed by some recovery. However, such trees remain in a state of decline and are very susceptible to drought when the dry season arrives because of the shallow, restricted, root systems. Moreover, waterlogged soil conditions, besides debilitating the tree, are conducive to the proliferation of soil-borne fungi such as Phytophthora root and foot rot. These organisms cause extensive tree death especially in poorly drained soils.

Water damage may usually be distinguished from other types of decline by a study of the history of soil water conditions in the affected areas. Areas showing water damage are usually localized and do not increase in size progressively as do areas of spreading decline. Foot or root rot symptoms include a pronounced chlorosis of the leaf veins caused by root damage and girdling of the trunk. Lesions also appear on the trunk usually near the soil level (foot rot) or roots die and slough-off (root rot). Flood damage does not produce lesions. Trees with blight or CTV are usually randomly distributed within the grove and diagnostic tests are available to distinguish them from water-damaged trees.

Citrus trees respond physiologically to flooding long before morphological symptoms or yield reductions appear. Photosynthesis and transpiration decrease within 24 hours of flooding and remain low as flooding persists. Water uptake is also reduced which eventually translates to decreased shoot growth and yields.

It is both difficult and costly to improve drainage in existing groves, so drainage problems should be eliminated when the grove area is prepared for planting by including a system of ditches, beds and/or tiling. Growers should not depend on the slight and often unpredictable differences in rootstock tolerance to waterlogging to enable trees to perform satisfactorily under such conditions. Trees, irrespective of scion and rootstock cultivars, should be planted under the best drainage conditions possible. Drainage ditches should be kept free of obstruction through a good maintenance program including chemical weed control. Tree recovery from temporary flooding is more likely to occur under good drainage structure maintenance conditions.

Do not disk a grove if trees were injured by flooding. Irrigation amounts should be reduced, but frequencies should be increased to adequately provide water to the depleted, shallow root systems. Soil and root conditions should be evaluated after the flooding has subsided. Potential for fungal invasion should be determined through soil sampling and propagule counts. If there is a Phytophthora problem, the use of certain fungicides can improve the situation.

WATER TABLE MEASUREMENT AND MONITORING

Most flatwoods citrus soils have a restrictive layer that can perch the water table and significantly affect tree water relations. To optimize production and tree health, the level of this water table should be monitored and maintained within an optimal zone. Simple and practical observation wells can normally produce adequate information.

Water Table Behavior. The water table under flatwoods citrus may rise rapidly in response to either rainfall or irrigation because sandy soils are highly conductive to water flow. A general rule of thumb is that 1 inch of rain will cause the water table to rise about 10 inches in fine textured soils, 6 inches in most of the flatwoods sandy soils, and 4 inches in coarse sands. It may take 4 to 6 days for the water table to return to its desired levels following rains of 1 inch or more.

Observation Wells. A water table observation well is made with a porous casing buried vertically in the ground. It permits the groundwater level to rise and fall inside it as the water level in the adjacent soils. Observation wells with a simple float indicator can provide rapid evaluation of shallow water table depths. The float and indicator level move with the water table, allowing an above-ground indication of the water level. Water table observation wells installed in flatwoods soils usually penetrate only to the depth of the restrictive (argillic or spodic) layer. Typically this layer is within 30 to 48 inches of the soil surface.

Well Construction. The basic components of the well itself include a short section of 3-inch perforated PVC pipe (3-5 ft long), 3-inch PVC cap, screening material, a float, indicator rod, and small stopper.

The indicator rod can be a dowel, ½ -inch PVC pipe (thin wall) or microsprinkler extension stake. Dowels are a poor choice since they require painting and will rot out near the float within a few years. The float is typically a 2½- inch fishing net float or a 500 ml (approximately 2½ in. diameter x 6 in. high) polyethylene bottle with a 28-mm (1.1 in.) screw cap size. The float assembly can be constructed by inserting the microsprinkler extension stake into the fishing float or ½-inch pipe into the polyethylene bottle.

The bottle neck provides a snug fit for the stake and no sealant is required. The hole in the cap should be drilled slightly larger than the indicator stake to serve as a guide for the float assembly. Fittings should not be glued so that components can be easily disassembled for cleaning or replacement. Observation well casings are constructed from 3-in. diameter PVC pipe (Class 160). A circular saw or drill can be used to perforate the pipe prior to installation. Perforations should be staggered in rows around the pipe to allow flow into the well from the sides in addition to the bottom. Perforations totaling about 5% of the well's surface area are adequate for sandy soils encountered in the flatwoods. No perforations should be made within 12 inches of the surface in order to minimize the chances of ponded water from high intensity storms creating flow channels into perforations near the soil surface.

The pipe should be wrapped (sides and bottom) with a screening material to prevent soil particles from moving into the well. Materials such as cheesecloth, polyester drain fabric, and fiberglass screen have been used successfully as filters. The filter material should be taped in place with duct tape. A 3-inch soil auger can be used to bore holes for the wells. When possible, the observation wells should be installed when no water table is present in order to minimize chances of the well sides sloughing into the bore as it is dug.

When a water table is present, it is easiest to install the well by starting off with a larger diameter pipe. For a 3-inch observation well, a 4-inch installation pipe (Sch 40 preferred) will be needed. The installation pipe should be cut at least 6 inches longer than the intended depth of well. Holes (½-inch diameter) should be drilled in the sides of the pipe opposite each other about 1½ inches from the top of the pipe. These will be used to aid in removing the pipe from the soil after the observation well is installed. Auger a hole in the soil until it begins to slough in (when the water table is reached). The 4-inch pipe should then be forced into the hole. A 3-inch auger can then be used to remove soil from within the 4-inch casing. As soil is removed, the casing needs to be forced downward to keep the hole from sloughing. Continue to remove soil from inside the casing until the appropriate depth is achieved (typically when hardpan material begins to be excavated).

The well casing pipe should be cut to length and installed in the hole so that it extends 2 to 6 inches above the soil surface. Care should be taken to ensure that the casing is installed plumb to minimize binding of the float assembly. If a 4-inch installation pipe was used to excavate the hole, it needs to be removed. A ½-inch rod can be inserted through the holes that were drilled in the top of the 4-inch pipe. If the pipe cannot be removed easily by hand, a chain can be attached to the rod and attached to a high-lift jack. Usually, after jacking the installation pipe up about a foot, the pipe can be easily removed by hand. The soil should be backfilled around the observation well casing and tamped to compact the soil and get a tight fit between the soil and the sides of the pipe.

A measurement should be taken of the distance from the bottom of the well to the soil surface. The float assembly can then be lowered into the well. Make sure that the indicator rod and float do not bind against the sides of the observation well. The well is now ready for calibration.

Calibration. A mark on the indicator stake or rod should be made at the top of the well when the float is at the bottom of the well. This level is the reference mark for the well depth. The indicator stake or rod can then be marked with major divisions (feet) and minor divisions (inches) for easy reading of the water table depth. These rings can be painted at appropriate intervals using different colors for major and minor divisions. Marks painted at 2-inch increments provide enough accuracy for most users.

The mark at the upper level is dependent on the depth of the water furrow and root depth. The upper depth should be selected so that water does not pond in water furrows and it should be at least 6 inches below the bottom of the root zone to prevent root pruning. Observations over time will help to determine the water table level depth that will prevent root damage or excessive wetness in the root zone.

DRAINAGE FOR FLATWOODS CITRUS

Drainage of water is especially important in the wet season since citrus root damage may occur under relatively prolonged conditions of high water table. Both surface and subsurface drainage are generally required for citrus grown in Flatwoods areas. Drainage systems in Flatwoods groves consist of systems of canals, retention/detention areas, open ditches, subsurface drains, beds, water furrows, swales, and the pumps required to move the drainage water. These systems require continued good maintenance in order to minimize the chances of root damage from prolonged exposure to waterlogged soils following high intensity rains. Drainage systems should generally be designed to allow water table drawdown of 4 to 6 inches per day, which should be adequate to prevent root damage.

Soil Water Dynamics

Research has shown that there is potential for water damage to citrus trees if roots are submerged in water for 4 days or more during frequent extended summer rains. During the cooler months of December through February, citrus trees can tolerate flooded conditions for longer periods than during the hot summer months.

Observation wells are good tools for observing soil-water dynamics. They are the only reliable method for evaluating water-saturated zones in sites subject to chronic flooding injury. These wells can also be used to measure the rate of water table drawdown, which is the real key to how long roots can tolerate flooding. Observation wells constructed with float indicators allow water tables to be visually observed while driving by the well site. Local offices of the Natural Resources Conservation Service (NRCS) can assist with water table observation, well construction, and monitoring.

Water Damage to Trees

It can be detected by digging into the soil and smelling soil and root samples. Sour odors indicate an oxygen deficient environment. The presence of hydrogen sulfide (a rotten egg odor) is an indication that feeder roots are dying.

Anaerobic bacteria (which grow only in the absence of oxygen) will develop rapidly in flooded soils and contribute to the destruction of citrus roots. In a field survey of poorly drained groves, toxic sulfides were formed by anaerobic sulfate-reducing bacteria at more than half the locations. Nitrites, formed by nitrate-reducing bacteria, and other organic acids that are toxic to roots were also found in these flooded soils.

Improper bed construction has been linked to areas with chronic root damage in several groves. Severe sulfide problems have often been found in grove areas that were developed over old swamps which were filled in before planting. Palmetto, cabbage palms, and other decomposable organic debris were frequently buried in these areas where land was leveled during preparation. It can take many years for Palmetto roots and stems to decompose in this environment. Certain organic acids in Palmetto, grass, and citrus roots provide a good source of energy for reducing bacteria which require both energy and sulfates in order to reduce sulfates to sulfides. Thus, it is possible for citrus roots to contribute to their own destruction by acting as an energy source for these bacteria. Only small amounts of sulfur (3 ppm) are required for the bacteria to function at peak capacity. The forms of sulfur used by the bacteria can be elemental sulfur, thiosulfate, sufites, or sulfates which are usually present in all Florida soils.

Using topography alone as a diagnostic factor to assess potential for flood damage may be misleading. Flooding injury can occur in obvious spots such as poorly drained depressions, but it may also be present where least expected. Flood injury has been observed on hillsides, on relatively high ground, on isolated areas of flat land, and even on raised beds. Hillsides may have pockets of clay. In flat areas, the problem may be impervious clay, marl, or organic-layered pockets that hold the water and prevent movement. Even beds in apparently uniform sandy areas can have buried palmetto roots and organic materials. These areas are subject to root damage since the soils are able to support bacteria which can quickly generate toxic hydrogen sulfide if flooded. Old pond sites are prone to severe flooding injury. Trees on the periphery of old pond sites are often damaged as much as those in the middle.

Good drainage allows air to move into the soil and prevents oxygen-deprived conditions. Flooding stress is usually less when water is moving than when water is stagnant, for anaerobic bacteria cannot multiply if oxygen is present. Also, a higher subsoil pH may help to delay, for a few days at least, the death of citrus roots under flooded conditions.

With experience, flooding injury can be diagnosed during periods when groundwater levels are high. Even before there are visible tree symptoms, auguring and digging in the root zone may give an estimate of future tree condition. Indications of problems include high water tables with saturated soils in the root zones, sloughing roots, and sour odors in the soil. When the water table recedes, visible damage to the trees may become more obvious.

Symptom expression of damage may occur over a period of time depending on the severity of root damage. Symptoms usually start to show up after the water table drops and the soil dries out. Root damage symptoms include leaf yellowing, chlorosis, wilting, fruit drop, leaf drop, and dieback. Often root damage is so severe that trees may go into a wilt even though water furrows are still wet. Because the root system was pruned by the flooding, the full extent of damage may not be known for several months or until drought conditions occur.

Young trees are often more sensitive to flooding and may develop symptoms resembling winter chlorosis. More subtle symptoms include reduced growth and thinner foliage. This can occur at locations only a few inches lower in elevation than the surrounding area.

Hot, dry conditions following flooding will hasten the onset of stress and symptom expression. The reduced root system resulting from summer flooding is incapable of supporting the existing tree canopy. When this occurs, irrigation management becomes critical. Excessive water could compound existing problems. If root system damage is extensive and tree canopy condition continues to deteriorate with permanent wilt and foliage dieback, some degree of canopy pruning may be necessary to reestablish a satisfactory shoot/root balance.

Light frequent irrigations will be required until the root zone has been reestablished. If irrigation water is high in salts, frequent irrigations are essential to prevent salt buildup, which will compound the flooding problem. Fertilization rates and schedules may need to be adjusted for flood-damaged trees. Light ground applied or foliar fertilizer applications on a more frequent schedule are preferred until the root system becomes re-established.

DRAINAGE SYSTEM

Beds and Water Furrows
Rows are typically oriented north-south and consist of beds constructed with vee-ploughs and/or motor graders between water furrows that are generally 48 ft to 55 ft apart. Water furrows are cut 2 to 3 ft deep and the soil is mounded between them to provide a 2.5-3.5 ft bed height from the bottom of the water furrow to the crown of the bed. Beds of these dimensions are the most common and they accommodate two rows of trees 22 ft to 26 ft apart.

Lateral Ditches
Lateral drainage ditches should be cut at right angles to the beds and water furrows and spaced no further apart than 1320 ft center to center. Topsoil spoil from the ditches can be used to provide fill for low areas in the adjoining fields. Subsoil spoil can provide a grove road base on either side of the lateral ditch. Swales drain into the ditches via 6-8 inch flexible polyethylene or rigid pipe that can be installed either before or after swale construction. A laser level is sometimes employed in this operation, but is not essential. The pipe is installed in the bottom of the water furrow and sloped to discharge approximately 1 ft above the bottom of the ditch. Ditch size will vary depending upon the area served and water management district criteria. In general, lateral ditches should have a minimum of 14-15 ft top width, 4 ft bottom width, 2:1 side slopes, and a depth of at least 5 ft.

Collector Ditches
Drainage water from several lateral ditches runs into collector ditches and is conveyed off-site. Gravity drainage is preferred if topographic relief allows. However, discharge pumps are required where there is insufficient relief. Size of the collector ditches and any related pumping facilities is dependent on several factors, such as size of the area being served, soils, bed and water furrow design, and slope of ditches. The surface water drainage system should be designed to remove at least 4 inches per day from the grove.

Off-Site Discharges
The main grove runoff concerns center around effects on wetlands and water quality. In addition changes to surface water discharge rates must be addressed to meet criteria adopted by the Water Management Districts. A surface water management system for citrus production in the Flatwoods should be designed to remove at least 4 inches in 24 hours. Properly designed surface water management systems can minimize storm water runoff rates. Runoff rates are reduced by designing surface water detention areas that are interspersed between the grove area and the ultimate off-site discharge points. Typically these are diked off areas that receive inflow from the grove area either via gravity or pumped discharge. Outflow from the detention areas (often called reservoirs) passes through discharge structures that are designed to restrict the flow rate to pre-development peak rates. Water levels thus build up in detention areas for a short period of time following major rainfall events.

Perimeter Ditch and Off-Site Discharge
In order to intercept and control the off-site water table and off-site surface flows, it is necessary to construct a perimeter ditch and dike. The dike is located

external to the ditch. Frequently the ditches can serve as collector ditches. The actual size of the ditches depends on anticipated flow rates. High water tables or natural drainage from adjacent undeveloped properties may result in subsurface flow towards a grove. Pumps may be required in the perimeter ditches to intercept this seepage water in order to maintain satisfactory water table depths in the developed grove.

Discharges are normally controlled with some type of water control structure where the water depth and discharge rate can be regulated. In areas prone to erosion or at changes in ditch direction, structures may be required to prevent scouring of banks.

Tile Drainage-Design Considerations

Drain tiles may be installed for additional control of the water table. Perforated 4 inch diameter, flexible polyethylene pipe covered with a nylon fabric sock installed down the center of every other bed normally provides effective control. The pipe should be installed on a slope corresponding to the flow of the swales at depths averaging 3 ft to 4 ft depending upon the location of spodic or clay horizons. Drain tile should not be installed below the depth of the hard pan horizons.

Drain Capacity

The drainage coefficient should be at least 0.5 to 0.75 inches per day, which should provide a water table drawdown of 4 to 6 inches per day. This rate should be adequate to prevent root damage in most cases. If surface water must also be removed, the drainage coefficient should be doubled to accommodate the extra water which needs to pass through the drains. Approximately one inch of rainfall entering the soil can raise the water table as much as one foot.

Grade

The grade (slope) at which the drain is installed should be based on site conditions, size of drain, and quality of installation. Minimum grades are: 4-inch = 0.10% (1.2 inches per 100 ft), 5-inch = 0.07% (0.8 inches per 100 ft) and 6-inch = 0.05% (0.6 inches per 100 ft).

Outlet

Outfall from the grove site is a first priority. Sufficient engineering surveys must be conducted to determine the existence of a natural water outlet from the grove site before considering a drainage system. Permits might be required by Water Management Districts or other agencies before large quantities of water can be removed rapidly from poorly drained wetlands. Drainage outlets that discharge into state waters are considered point source discharges by local and state pollution control authorities, and approval to discharge into such waters should be obtained during the planning stage of a drainage or water management system. A sump-and-lift-pump type outlet may be necessary for subsurface drainage, but it may significantly increase drainage system construction costs. Sumps should be located at low ends of collector ditches. Float-controlled pumps that allow automatic operation are preferred. The pump should be sized to remove the design capacity for the drained area. Drain outlets should be 6 inches above the normal water level in the ditch. In addition to sunlight weakening the plastic drainage tubing, it can be destroyed by fire or damaged by rodents or ditch maintenance procedures. Therefore, the discharge end should be rigid PVC. At least 2/3 of the PVC pipe should be embedded in the ditch bank. The rigid outlet pipe may need an animal guard to keep rodents from entering and plugging the tubing.

FREQUENTLY ASKED QUESTIONS ABOUT BIOSOLIDS

1) What are Biosolids?

Biosolids are the nutrient-rich solid organic matter recovered from the treatment of domestic sewage in a wastewater treatment facility. Biosolids are a beneficial resource, containing essential plant nutrient and organic matter and are recycled as a fertilizer and soil amendment. When treated and processed, these residuals can be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth.

2) What is the difference between biosolids and sewage sludge?

Sludge is generally used before applicable beneficial recycling criteria have been achieved which normally occurs at the outlet of the stabilization process. It should be used in tandem with a specific process descriptor (e.g., *primary sludge*, *waste activated sludge*, *secondary sludge*, etc.)

Biosolids is generally used after applicable beneficial recycling criteria have been achieved, i.e., at the outlet of the stabilization process. Common stabilization processes include the following: aerobic digestion, autothermal thermophilic aerobic digestion (ATAD), anaerobic digestion, composting, alkaline stabilization, thermal drying, including flash, rotary, fluid bed, paddle, hollow-flight, disc, and infrared dryers, thermophilic pozzolanic fixation, acid oxidation/disinfection, and heat treatment/acid digestion.

3) Why do we have biosolids?

We have biosolids as a result of treating sewage sludge (i.e., the solids generated during the treatment of domestic sewage in a treatment plant) to meet the land application regulatory requirements). Wastewater treatment technology has made our water safer for recreation and seafood harvesting. Thirty years ago, thousands of American cities dumped their raw sewage directly into the nation's rivers, lakes, and bays. Through regulation of this dumping, local governments now required to treat domestic sewage and to make the decision whether to recycle the solids generated as fertilizer, incinerate them or bury them in a landfill. If the solids meet the regulatory requirements for land application and are recycled, they are biosolids.

4) How are biosolids generated and processed?

Biosolids are generated when solids generated during the treatment of domestic sewage are treated further to meet regulatory requirements. The wastewater treatment can actually begin before the wastewater reaches the treatment plant. In many larger wastewater treatment systems, pre-treatment regulations require that industrial facilities pre-treat their wastewater to remove many hazardous contaminants before it is sent to a wastewater treatment plant. Wastewater treatment facilities monitor incoming wastewater streams to ensure their recyclability and compatibility with the treatment plant process.

Sewage sludge is not generated until domestic sewage is treated in a treatment works, and biosolids are not produced until the sewage sludge meets the land application Part 503 requirements. For these reasons, the treatment of biosolids cannot occur before the domestic sewage reaches the wastewater treatment plant. Once the wastewater reaches the plant domestic sewage goes through physical, chemical and biological processes that clean the domestic sewage and remove the solids. If necessary, some of the solids are then treated with lime to raise the pH level to eliminate objectionable odors. Pathogen reduction (disease-causing organisms, such as bacteria, viruses and parasites) and other organisms capable of transporting disease for the solids usually occur in a different process (e.g., a digester).

5) How are biosolids used?

After treatment and processing, biosolids can be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth. The controlled land application of biosolids completes a natural cycle in the environment. By treating sewage sludge, it becomes biosolids that can be used as valuable fertilizer, instead of taking up space in a landfill or other disposal facility.

6) Are biosolids safe?

Decades of studies have demonstrated that biosolids can be safely used on food crops. The National Academy of Sciences has reviewed current practices, public health concerns and regulator standards, and has concluded that "the use of these materials in the production of crops for human consumption when practiced in accordance with existing federal guidelines and regulations, presents negligible risk to the consumer, to crop production and to the environment." In addition, an epidemiological study of the health of farm families using biosolids showed that the use of biosolids was safe.

7) Do biosolids smell?

Biosolids may have their own distinctive odor depending on the type of treatment it has been through. Some biosolids may have only a slight musty, ammonia odor. Others have a stronger odor that may be offensive to some people. Compounds that contain sulfur and ammonia, which are both plant nutrients, cause most odors.

8) Are there regulations for the land application of biosolids?

The federal biosolids rule is contained in 40 CFR Part 503. Biosolids that are to be land applied must meet these strict regulations and quality standards. The Part 503 rule governing the use and disposal of biosolids contains general requirements, numerical limits for metals in biosolids, pathogen and vector attraction reduction standards, management practices and frequency of monitoring, record keeping and reporting requirements for land applied biosolids as well as similar requirements for sewage sludge that is surface disposed or incinerated. Most recently, Part 503 requirements have been proposed to limit the concentration of dioxin and dioxin like compounds in biosolids to ensure safe land application. Biosolids are one of the most studied materials that have ever been regulated by EPA.

9) Where can I find out more about the regulations?

The biosolids rule is described in the EPA publication, A Plan English Guide to the EPA Part 503 Biosolids Rule. This guide states and interprets the Part 503 rule for the general reader. This guide is also available in hard copy. In addition to the Plain English Guide, EPA has prepare A Guide to the Biosolids Risk Assessments for the EPA Part 503 Rule which shows the many steps followed to develop the scientifically defensible, safe set of rules (also available from EPA in hard copy.) The cited references provide valuable information about the Part 503 land application requirements. However, if the information in the references is different form the requirements in the Part 503 rule, the Part 503 rule requirements apply. A number of relevant biosolids publications are located on the National Biosolids Partnership's web page at: http://www.biosolids.org.

10) How are biosolids used for agriculture?

Biosolids are used to fertilize fields on which crops are grown. Agricultural uses of biosolids that meet strict quality criteria and application rates have been shown to produce significant improvements in crop growth and yield. Nutrients found in biosolids, such as nitrogen, phosphorus and potassium and trace elements such as calcium, copper, iron, magnesium, manganese, sulfur and zinc, are necessary for crop production and growth. The use of biosolids reduces the farmer's production costs and replenishes the organic matter that has been depleted over time. The organic matter improves soil structure by increasing the soil's ability to absorb and store moisture.

Crops use the organic nitrogen and phosphorous found in biosolids very efficiently because these plant nutrients are released slowly throughout the growing season. This enables the crop to absorb these nutrients as the crop grows. This efficiency lessens the likelihood of groundwater pollution of nitrogen and phosphorous.

11) Can biosolids be used for composting?

Yes, biosolids may be composted and sold or distributed for use on lawns and home gardens. Biosolids composted with sawdust, wood chips, yard clippings, or crop residues make excellent mulches and topsoils for horticultural and landscaping purposes. Even after composting, the sewage sludge has to meet the appropriate Part 503 requirements for it to become biosolids that can be applied to lawns and home gardens. Many professional landscapers use composted biosolids for landscaping new homes and businesses. Home gardeners also find composted biosolids to be an excellent addition to planting beds and gardens. Most biosolids compost, are highly desirable products that are easy to store, transport and use.

12) Are there rules about where biosolids can be applied?

To determine whether biosolids can be applied to a particular farm site, a good management practice includes an evaluation of the site's suitability and is generally performed by the land applier. The evaluation examines water supplies, soil characteristics, slopes, vegetation, crop needs and the distances to surface and groundwater.

There are different rules for different classes of biosolids. Class A biosolids contain no detectible levels of pathogens and must meet strict vector attraction reduction requirements and low levels metals contents. The biosolids preparer usually applies for a permit and only have to apply for permits to ensure that these very tough standards have been met. However, the Part 503 requirements have to be met even if there is no permit. Class B biosolids are treated but still contain detectible levels of pathogens. There are buffer requirements, public access, and crop harvesting restrictions for Class B biosolids. (The land application site restrictions have to be met in all cases where Class B biosolids are land-applied.) Nutrient management planning ensures that the appropriate quantity of biosolids is land-applied. The biosolids application is specifically calculated to match the nutrient uptake requirements of the particular crop. Nutrient management technicians work with the farm community to assure proper land application and nutrient control.

13) Is EPA pushing the use of biosolids as a fertilizer? Is the federal policy for biosolids driven by economics of disposal?

As a result of its decade-long assessment of biosolids, EPA concluded that recycling biosolids to land was an environmentally responsible solution, when used in accordance with the Part 503 rule. The Federal policies supporting and promoting the beneficial recycling of biosolids are based upon sound science that has demonstrated the benefits of such recycling. These policies are not driven by economics, and the choice of to recycle biosolids remains a local decision.

14) How do the risks associated with biosolids compare with other soil amendments used in agriculture?

A Water Environment Research Foundation (WERF) study completed in 2002 finds that the risks associated with biosolids are no greater than risks associated with other soil amendments used in agriculture. The project, "Evaluate Risks and Benefits of Soil Amendments Used in Agriculture" (project no. 99-PUM-1), examined the risks and benefits, advantages and potential disadvantages associated with the use of a variety of soil amendments in comparison to chemical fertilizers. Project results indicate that the relative risk to the environment from amendments and fertilizers varies by parameter and shows that known risks from each of the materials studied can be managed. Moreover, these manageable risks must be carefully weighed against the considerable benefits provided by the land application of amendments and fertilizers.

15) Is recycling much cheaper than disposal?

In areas where disposal costs have increased due to shrinking landfill space and increased costs to maintain and monitor landfills, some cities and towns find that recycling biosolids is less expensive than land filling. However, in most cases, land filling is competitive or less expensive than land application. In such cases, many U.S. communities have made a positive environmental decision to commit to recycling biosolids despite the additional cost. This is especially true where communities have committed to the additional costs of composting or heat drying and pathogen reduction processes for biosolids prior to utilization.

16) Are Biosolids good for the environment?

Recycling biosolids is good for the environment. Organic matter has been recycled for centuries to improve soil fertility and productivity. When properly applied and managed, biosolids can: provide essential plant nutrients; improve soil structure and tilth; add organic matter; enhance moisture retention; and reduce soil erosion.

Biosolids recycling is regulated and encouraged by the United States Environmental Protection Agency and state and local authorities. Research and years of recycling experience have demonstrated that properly managed land application of biosolids is environmentally safe.

FOLIAR NUTRITION

Foliar feeding, a term referring to application of essential plant nutrients to the tree canopy, has been documented over a century ago. More recently, foliar feeding has been widely used and accepted as an essential part of crop production, especially on citrus trees. The benefits of foliar feeding have been well documented and increasing efforts have been made to achieve consistent responses. The purpose of foliar feeding is not to replace soil fertilization. Supplying a plant's macronutrients needs (nitrogen, phosphorus, and potassium) is most effective and economical via soil application. However, foliar application has proven to be an excellent method of supplying plant requirements for calcium, magnesium, sulfur and micronutrients (zinc, manganese, copper, boron, and molybdenum), while supplementing N-P-K needs for short and/or critical growth stage periods. Foliar feeding can be an effective management tool to favorably influence bloom, fruit set, fruit size, and fruit yield by compensating for environmentally induced stresses of adverse growing conditions and/or poor nutrient availability. Foliar applications of nutrients have become an important practice in citrus crop production particularly after the introduction of HLB (citrus greening).

The advantages of foliar feeding in accomplishing the desired crop responses are two-fold:

1. It is a highly efficient and timely method of applying needed and/or critical plant nutrients.
2. It is a means of compensating for soil or environmentally induced nutrient deficiencies.

In order to achieve the benefits of foliar feeding, combining proper methods of application and the best suited nutrient materials related to specific goals is essential.

I. Proper Timing of Foliar Applications

a. Proper Growth Stage: This is one of the most critical aspects of a foliar feeding program. Foliar applications should be timed to provide needed nutrients during the time frame of growth, which will in turn favorably influence the post reproductive development stages. Multiple, low rate applications may show the most favorable responses within these time frames. A comprehensive plant tissue analysis following IFAS guidelines is also essential to establish a good nutritional program providing the proper amounts and balance of nutrients.

b. Proper Crop Condition: Generally speaking, crops that are nutritionally sound will be most likely to respond to foliar feeding. This is due to better tissue quality (allowing for maximum absorption of nutrients into leaf and stem) and better growth vigor (allowing nutrients to be rapidly moved to the rest of the tree). Stressed trees show less response to foliar applications due to lower leaf and stem absorption rates and poor vigor. However, foliar feeding does benefit crop performance and yield if an application was made prior to water stress. Recovery from freeze or herbicide damage can be hastened with proper foliar applications.

c. Proper Meteorological Conditions: Time of day, temperature, relative humidity and wind speed influence the physical and biological aspects of foliar applications. Plant tissue permeability is an important factor in absorption of nutrients into the plant. Warm, humid and calm conditions favor highest tissue permeability, conditions found most often in the late evening hours, and in the early morning hours. Rainfall within 24 to 48 hours after a foliar application may reduce the application effectiveness, as not all nutrient materials are immediately absorbed into the plant tissue.

II. Types of Fertilizer Materials: Not all fertilizers are suitable for use as a foliar spray. The primary objective of a foliar application is to allow for maximum absorption of nutrients into the plant tissue. Foliar fertilizer formulations should meet certain standards in order to minimize foliage damage. Qualifications for fertilizer materials follow:

a. Low salt index: Damage to plant cells from high salt concentrations can be considerable, especially from nitrates (NO_3^-) and chlorides (Cl^-).

b. High solubility: Needed to reduce the volume of solution needed for application.

c. High purity: Needed to eliminate adverse effects on foliage.

Nitrogen Materials: Urea may be the most suitable nitrogen source for foliar applications, due to its low salt index and high solubility in comparison with other nitrogen sources. Urea has been shown to stimulate absorption of other nutrients by increasing the permeability of leaf tissue. However, the urea utilized in foliar sprays should be low in biuret content (0.2% or less) to avoid leaf burn. Other sources of nitrogen can be obtained from ammonium polyphosphates, ammoniated ortho-phosphates (liquid), potassium nitrate, calcium nitrate, ammonium thiosulfate. These sources, when utilized at low foliar rates, are excellent supplemental nitrogen carriers with no minimal foliage burn side-effects. Triazone nitrogen has been shown to significantly reduce leaf burn and enhance foliar absorbed nitrogen compared with urea, nitrate, and ammonium nitrogen sources.

Phosphorus Materials: A combination of poly and ortho-phosphates has been shown to lessen leaf burn and aid in leaf phosphate absorption. Furthermore, the polyphosphate advantage may also be due to supplying both ortho and polyphosphate forms simultaneously.

Potassium Materials: Depending on availability, potassium polyphosphates are an excellent source of low salt index, highly soluble potassium. Potassium sulfate is suitable also, having a low salt index, but with low solubility. Potassium hydroxide, potassium nitrate and potassium thiosulfate sources combine both low salt index and high solubility characteristics.

Calcium, Magnesium, Sulfur and Micronutrient Materials: Foliar application of these nutrients (calcium, magnesium, sulfur, zinc, manganese, copper, boron and molybdenum) can be highly effective, but because of difficulties associated with leaf tissue absorption and translocation of some of these nutrients (such as calcium magnesium, boron and molybdenum), choosing the correct fertilizer sources for these nutrients becomes very critical. Chelate sources, while valuable for soil application, have been shown to be generally unfavorable for foliar application because most chelating agents have a molecular size too large to be effectively absorbed by leaf tissue. Chelated zinc is no better than inorganic sources, and not as effective as $ZnSO_4$. The relative ineffectiveness of iron foliar sprays has not been improved by using chelated sources. Copper chelate sprays were not found as effective as Bordeaux (copper sulfate + calcium hydroxide), and chelated Mg was inferior to magnesium nitrate. However, organic chelating agents (including citric and malic acids, amino acids, phenolic acids, lucoheptonate and glucosylgycine) have been shown to enhance micronutrient foliar absorption. Good sources for supplying many of the micronutrient elements are the sulfate sources. The overall effectiveness of micronutrient foliar applications, depends on multiple (2-4) applications of low rate spray solutions containing nitrogen (3-8%N).

Base Fertilizer Formulations: In order to enhance the effectiveness of any foliar application, nitrogen should always be present in any base solution. Micronutrients should be applied according to need and should always be applied along with nitrogen in the solution. Combinations of certain nutrients may pose solution solubility problems, especially where nutrient solutions are combined with fungicides and pesticides. Generally speaking, unless compatibility with fungicides and pesticides is known, nutrient sprays should be applied separately. Urea is compatible with most pesticides, exceptions being lime, sulfur, and Sevin. Magnesium sulfate is not compatible with copper sprays. Zinc sprays are not compatible with oil. Manganese solutions should not be mixed with phosphate.

Additives: Agents added to the foliar fertilizer solution which buffer the pH of the solution (preferably between pH of 5.0 and 6.0) and provide for quick and uniform coverage of the spray droplets are highly recommended. Foliage burn is caused by a high concentration of fertilizer salts (i.e., nitrate and chloride) rather than low pH in the fertilizer solution. Low pH fertilizer foliar solutions have been shown to increase the absorption rate of fertilizer materials. Leaf and stem tissues can inhibit initial nutrient absorption by means of waxy substances in the cuticle (outer layer of plant cells). To achieve maximum nutrient absorption via foliar applications, a fine mist application with spreading and wetting agents is desired. These agents provide quick wetting of plant tissue and more uniform coverage with increased spray retention by reducing the surface tension of the spray droplets. Effective foliar applications depend on maximum absorption of soluble nutrients, avoiding losses due to evaporation and/or runoff as much as possible.

Compatibility Agents. Pesticides can sometimes be combined with liquid fertilizers for application, saving a trip through the field. But an applicator must guard against unequal distribution of the pesticide and the pesticide formulation breaking under the influence of the strong salt solutions in liquid fertilizers.

Try small-scale tests in small jars to determine stability before mixing in a spray tank unless the pesticide concentration formulation specifically states that it is compatible with liquid fertilizers.

Water: Water is taken for granted in formulating fertilizer solutions, but the quality as well as the amount of water used must be considered. Water quality, especially pH, hardness, and possible excess in sulfates, nitrates, carbonates and iron, should be determined before a water source is used for foliar fertilizer formulations. For mature trees, with ground sprayers, rates of 50 to 100 gallons of water per acre are required.

Advantages of Foliar Applications

Several factors have contributed to the current widespread interest and potentialities in foliar feeding. With fruit trees, disorders and nutritional deficiencies are becoming more frequent and foliar sprays are often the most effective and the most practical means of correction and control. Soil imposed problems of dilution, penetration, and fixation are circumvented. Thus a greater response per unit of applied nutrient is realized. A plant's entire requirement for many trace elements may often be supplied by one or two foliar applications. Quantities needed are small, and tolerances for the applied materials, and rates of uptake are adequate. For the macronutrients used in large quantities, however, only a part of the nutrient needs are satisfied, but the contribution can still be significant.

Favorable results from foliar feeding are most likely to occur when the total leaf area is large. Foliar feeding is often effective when roots are unable to absorb sufficient nutrients from the soil. Such a condition could arise from an infertile soil, a high degree of soil fixation, losses from leaching, cold soil temperatures, a lack of soil moisture, or a restricted, injured, or diseased root system.

Crop response to nutrient sprays is more rapid but also more temporary than from soil treatments. This offers a quick recovery from deficiencies and more precise control over the equilibrium between vegetative growth and fruit production. As a supplement to the soil fertilizer treatments, favorable responses from foliar fertilization have been observed during periods of slow growth and during flowering. After flowering, having achieved their maximum leaf surface, fruit trees show a marked depression in general overall metabolic activity, including nutrient uptake by the roots. Foliar applications of nutrients should be especially beneficial under such conditions.

Color transitions and greening of the foliage can occur within hours. Even though these color differences cannot always be translated immediately into yields, the improved appearance of the foliage is justification enough for many growers to continue with the practice.

Conclusions

From a small beginning of over 100 years ago where iron sprays were used to correct leaf chlorosis on crops grown in alkaline soils, foliar feeding today plays an important role in crop production. Some crops are fed almost exclusively through the leaves. With almost all crops, foliar feeding plays some role in their nutrition at one time or another in their development. Leaf feeding is rapidly being standardized as an insurance against specific deficiencies, disorders and the hazards of unpredictable weather. The concept that foliar sprays should be applied only after the appearance of a deficiency disorder is unsound, since depressions in yield and quality usually precede the appearance of visual symptoms. Nutrient sprays like fertilizers applied to the soil should be used with the objective of maintaining crops at an optimal rather than at a suboptimal or marginal productivity status.

Gulf Citrus Growers Association Scholarship Foundation, Inc.

11741 Palm Beach Blvd., #202, Fort Myers, FL 33905
Phone: (239) 690-0281 / Fax: (239) 690-0857 / Email: gulfcitrus@embarqmail.com

About the Gulf Citrus Growers Association

The citrus growers of southwest Florida are committed to supporting education as a long-term investment in the future of our industry. The first Gulf Citrus scholarship was awarded in 1992 through the Gulf Citrus Growers Association, a trade organization representing growers in Charlotte, Collier, Glades, Hendry and Lee Counties.

The Gulf Citrus Growers Association Scholarship Foundation was established in 2000 as a non-profit entity to oversee the distribution of these awards. Scholarship applications are accepted throughout the year and are reviewed semi-annually by a Scholarship Selection Committee comprised of academic and industry members. The number and amount of awards vary depending upon the number of applications received and available funds.

Applicants who are not selected may submit a new application for consideration in the next selection cycle. Previous award winners may also reapply.

Scholarship Criteria

Preferred requirements for scholarships are as follows:

AA, BS, MS and **PhD Degrees:**

- Completion of all placement testing and a **declared major** in agriculture or related major.
- Completion of **12 credit hours** towards agriculture or related degree.
- Minimum overall grade point average of **2.5** for AA and BS degrees; **3.0** for MS and PhD degrees.
- A demonstrated **commitment** to complete the degree at a state college, community college or university.

Applicants must send their transcripts including grades for the courses taken the previous semester and complete the attached application, which includes a statement of release giving the selection committee permission to verify information submitted.

APPLICATION DEADLINES ARE JULY 31 AND DECEMBER 31

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Phone: (239) 690-0281 / Fax: (239) 690-0857 / Email: gulfcitrus@embarqmail.com

Scholarship Application

Personal Data

Name: ____Date of Birth:___________________________

Home Address: ____

City/State: ___________________________ Zip: ____________________ Phone: _______________

Mailing Address: ____

City/State: ___________________________ Zip: ____________________ Phone: _______________

E-mail: ____

Employer: ____

Address: ____

City/State: ___________________________ Zip: ____________________ Phone: _______________

Does your employer reimburse you for tuition or other expenses incurred toward your degree? Yes ____ No _____

Educational Information

College or University in which you are enrolled: ____

Department / Degree Program: ____

I am working toward the following: AA ____ BS _____ MS _____ PhD _____ Other ______

Courses Taken in Major *(completed)*:

____

____

____

____

Courses (*in which you are currently enrolled*):

____

____

Total Credit Hours Toward Degree: _______ Cumulative Grade Point Average (GPA): ____________

Expected Date of Graduation: ___________________________________

Please answer the following questions in complete sentences with as much detail as possible.

What are your career goals? ____

____

____

____

____

What is the potential value of your education to the citrus industry *in southwest Florida*?

____

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____

____

____

I authorize the release of this application and any relevant supporting information to persons involved in the selection of recipients for Gulf Citrus Growers Association scholarships.

______________________________ ______________________________

Applicant's Signature Date

*****APPLICATION DEADLINES ARE DECEMBER 31 AND JULY 31*****

Please return this application with your official transcripts to:

Gulf Citrus Growers Association Scholarship Foundation, Inc.
Dr. Mongi Zekri, Application Coordinator
Hendry County Extension Office
P. O. Box 68
LaBelle, FL 33975
Phone: (863) 674-4092 / Fax: (863) 674-4636
E-mail: maz@ufl.edu

Flatwoods Citrus

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☐ 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