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Flatwoods Citrus



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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/>

IMPORTANT EVENTS

-- [Workshop](#) on CITRUS BLACK SPOT

Speakers: Megan Dewdney, Paul Mears, Ricke Kress, Jim Snively, Paul Meador

Date: Tuesday, March 13, 2012, Time: **9:30 AM** – 12:00 Noon

Location: Southwest Florida REC (Immokalee).

No registration fee and lunch is free, but **pre-registration is required.**

To reserve your seat, call 863 674 4092 or send an e-mail to: maz@ufl.edu

3 CEUs for Pesticide License Renewal; 3 CEUs for Certified Crop Advisors (CCAs)

Lunch Sponsor: Stacey Howell with Bayer CropScience

Workshop on peaches

Date: Friday, March 23, 2012, Time: 10:00 AM – 12:05 PM

Location: UF-IFAS Southwest Florida REC (Immokalee)

Varieties of peaches and plums, Cultural practices (pruning, thinning, and fertilization) for peach trees, Weed control/management for peach trees, Insect pests of peach trees, and Overview of Dundee Citrus Growers Association cultural practices and marketing services for peach growers

Speakers: Dr. Jose Chaparro, Dr. Mercy Olmstead, Dr. Peter Dittmar, Dr. Phil Stansly, and Adam Pate & Steven Callaham

No registration fee and lunch is free, but **pre-registration is required.**

To reserve your seat, call 863 674 4092 or send an e-mail to: maz@ufl.edu

1CEU for Pesticide License Renewal; 2 CEUs for Certified Crop Advisors (CCAs)

Lunch Sponsor: Cody Hoffman with Syngenta

International Symposium on Mechanical Harvesting & Handling Systems of Fruits & Nuts

April, 2-4, 2012, Lake Alfred CREC

For more details and registration, go to:

<http://conference.ifas.ufl.edu/harvest/>

ANNUAL FLORIDA CITRUS GROWERS' INSTITUTE

Date & Time: Tuesday, 10 April 2012, 8:00 AM – 3:30 PM

Location: Avon Park Campus of South Florida Community College



FARM SAFETY DAY

Saturday, May 19, 2012, Immokalee IFAS Center

IMPORTANT WEBSITES

Citrus Extension: <http://www.crec.ifas.ufl.edu/extension/>

Citrus Health Management Areas (CHMAs):

http://www.crec.ifas.ufl.edu/extension/chmas/chma_overview.shtml

Florida Citrus Extension Agents:

http://citrusagents.ifas.ufl.edu/Citrus_Agents_Home_Page/Citrus_Agents_Home.html

Southwest Florida Research and Education Center (SWFREC):

<http://swfrec.ifas.ufl.edu/>

Citrus Research & Education Center:

<http://www.crec.ifas.ufl.edu/>

Florida Citrus Resources: <http://irrec.ifas.ufl.edu/flcitrus/>

Florida Citrus Pest Management Guide:

http://edis.ifas.ufl.edu/topic_book_florida_citrus_pest_management_guide

Extension: Citrus Greening Database

<http://swfrec.ifas.ufl.edu/entomology/extension/hlb/>

Citrus Greening (Huanglongbing)

<http://www.crec.ifas.ufl.edu/extension/greening/index.shtml>

[History](#) | [Regulations](#) | [Transmission](#) | [Pathogen](#) | [Alternate Hosts](#) | [Symptoms](#) | [Nutrient Deficiencies Compared to Citrus Greening](#) | [Diagnostics](#) | [Management](#) | [Photo Gallery](#) | [Links](#) | [Contacts](#)

Citrus Canker

<http://www.crec.ifas.ufl.edu/extension/canker/index.shtml>

[History](#) | [Eradication](#) | [Decontamination](#) | [Pathogen Symptoms & Susceptibility](#) | [Diseases Commonly Mistaken for Citrus Canker](#) | [Spread](#) | [Management](#) | [Links](#) | [Contacts](#)

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

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DROUGHT

Water stress is the physiological condition to which a plant is subjected whenever the rate of water loss from the leaves by transpiration exceeds the rate at which water is absorbed by the root system. Water stress can be the result of excessive transpiration or slow absorption from a dry soil or a combination of these two factors. Any degree of water imbalance can produce a deleterious change in physiological activity of growth and reproduction. Short-term drought often reduces production and prolonged drought can cause total crop failure. Severe drought between March and July can reduce fruit set, fruit development and fruit growth. The number of fruit, fruit size, and tree canopy are reduced with water stress. Extension growth in shoots and roots, and leaf expansion are all negatively correlated with water status. Trees subjected to water stress are generally reduced in size. Vegetative growth is particularly sensitive to water deficit. Growth is closely related to turgor and the loss of turgidity reduces photosynthesis, leaf and fruit enlargement, juice content and yield, and increases wilting and leaf and premature fruit drop. Growers cannot afford water stress or water restrictions during this critical period. Irrigation is of particular importance during the springtime, which coincides with the important stages of leaf expansion, bloom, fruit set, and fruit enlargement.



PLANT GROWTH REGULATORS (PGRs)

Plant growth regulator sprays can provide significant economic advantages to citrus growers when used in appropriate situations. Many citrus growers routinely use PGRs to enhance crop profitability. Depending on variety and timing, PGRs may improve fruit set, increase fruit size by reducing cropload, extend the harvest season by delaying rind aging, and reduce preharvest fruit drop. Excessive rates, improper timings, untested surfactants or tank mixes, and inappropriate environmental conditions can result in phytotoxicity, erratic results, and/or greatly reduced cropping. Growers are urged to become familiar with PGRs through application to small plots before treating significant acreage. To avoid drift onto susceptible crops in surrounding areas, products containing 2,4-D (2,4-Dichlorophenoxyacetic acid) have stringent requirements for application conditions. **READ THE LABEL.** Consult with your County Extension Office.



Since PGRs function by directly influencing plant metabolism, plant response can vary considerably with concentration, making sprayer calibration and accurate material measurement especially important. Studies show that variability in spray deposition increases as spray volume is reduced below 250

gallons/acre in mature citrus groves. At lower water rates, canopy closest to the sprayer manifold tends to retain much more material than other plant surfaces. Because material concentration is especially important in PGR use, water volumes below 125 gallons/acre are not generally recommended.

Unlike most agrichemicals applied to crop, efficacy of PGRs depends on entry of materials into plant tissues. Uptake is influenced by a number of factors: amount of PGR applied, concentration of PGR, presence of surfactants, solution pH, environmental conditions during and after application, foliage condition, and plant stress level. Application of PGRs is recommended only on healthy citrus blocks. Even when properly applied, some PGRs may cause leaf curling, especially when sprayed on young leaves.

GIBBERELLIC ACID (GA₃) is recommended to be used on citrus hybrids that are weakly parthenocarpic and without sufficient cross-pollination to improve fruit set. Applied from full bloom to two-third petal fall, GA can effectively set and produce an excellent crop of seedless Robinson, Nova, Orlando, Minneola, or other self incompatible mandarin hybrids. Use Gibberellic acid (GA₃, 4.0% liquid concentrate) at the rate of 10-20 oz/acre. Products marketed include: Pro-Gibb, GibGro, and Gibbex. Because material concentration is important in plant growth regulators, water volumes below 125 gallons/acre are not recommended. Do not use in water above pH 7.5 because uptake will be reduced. Care should also be exercised in not exceeding the recommended GA dosage or concentration because it can cause severe leaf drop.

READ THE LABEL

Chemical thinning of tangerines with NAA to increase fruit size and reduce branch breakage and alternate bearing

NAA (naphthalene acetic acid) encourages greater physiological-drop (usually in May for Florida citrus). Sunburst and Murcott are especially likely to benefit from judicious use of NAA. **READ THE LABEL**

NAA rate

Since concentration is so important, growth regulator treatments are usually expressed on a concentration basis (part per million or ppm) rather than ounces per acre. Rates of 250-500 ppm NAA have been most effective in thinning citrus varieties. For mature groves of large trees, 125-150 gallons per acre is probably adequate and lower volumes should be used for smaller trees by turning off some sprayer nozzles. Growers uncomfortable with calculations on a ppm basis can use the ounces of NAA/125 gallons, at appropriate ppm, as a rate per acre when applying at 125 gallons/acre. All NAA applications should include a surfactant at 0.05% and should not be tank mixed with other materials, unless you confirm that it is compatible with NAA.

For most healthy, unstressed groves, NAA should be applied at 120 ounces Fruit Fix 200 (or similar product, NOT Citrus Fix, which is 2,4-D rather than NAA plus 6.5 ounces of surfactant per 100 gallons, at 125 gallons per acre. Murcott should receive a lower rate 60-96 oz NAA/100 gallons.

READ THE LABEL

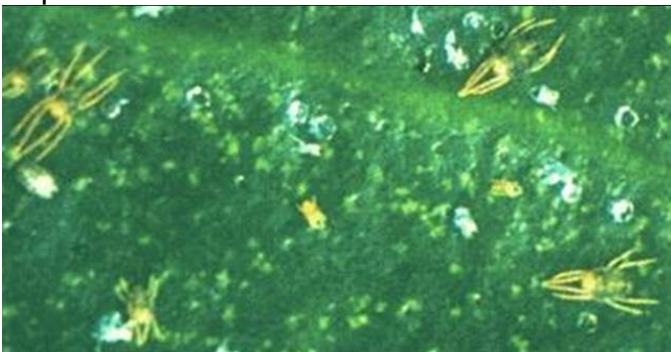
Timing

NAA should be applied near the beginning of physiological drop, when most fruitlets are about 1/2 inch in diameter, which typically occurs 6 to 8 weeks postbloom. Rain within six hours of treatment, drought stress, or very hot or cool conditions may affect response.

Environmental conditions can greatly influence uptake and activity of NAA. Higher temperatures and delayed drying of spray solution both contribute to greater thinning action. Best results are likely to occur when applied between 75° and 85° F. Higher temperatures may cause excessive thinning. Since uptake continues for several hours after the spray dries, heavy rain within six hours of application may significantly reduce NAA action.

Spider Mites

The Texas citrus mite is the predominant species in most citrus groves throughout the state. The citrus red mite is usually second in abundance, but in some nursery operations it is the predominant species. The Texas citrus and citrus red mites occur on citrus throughout the year and usually are most abundant in groves during the dry season. They are found most commonly on the upper leaf surface of recently mature flush, and all stages of the mites orient along the mid-vein. As populations increase, they move to leaf margins and fruit. Spider mites feed primarily on mature leaves and differ from rust mites by feeding beneath the epidermal layer of cells. They are capable of removing cellular contents, causing cell destruction and reducing photosynthesis. Mesophyll collapse and leaf drop can result when trees are stressed by high spider mite infestations in combination with sustained dry, windy conditions that may occur in the late fall, winter or early spring months. When populations of Texas citrus mite or citrus red mites are high, they will also feed on developing fruit. Spider mites prefer dry weather and low relative humidities in the range of 30 to 60% and generally do not pose a sustained problem in the higher humidity conditions that occur between June and September.



Populations of Texas citrus and citrus red mites aggregate among leaves within and between citrus trees.

Spider mites are suppressed to low densities by several species of predacious mites, insects, and entomopathogens in some groves.

However, when populations averaging 5 to 10 motile spider mites per leaf develop between September and May, it would be reasonable to apply a miticide, especially if the trees are stressed. However, infestations comprised predominantly of adults, particularly males, are in decline and would not require control. Adult mites are recognized by their large size relative to immatures and females distinguished by their round shape and shorter legs compared to males.

Need for controlling spider mites is based on temperature and humidity conditions, spider mite population levels, tree vigor, and time of the year. Petroleum oil provides some ovicidal activity against spider mite eggs. None of the other miticides provide ovicidal activity, and their residual activity must be sufficiently long-lasting to kill subsequently emerging larvae.

Application of Miticides

Selection of a miticide should be based on the target pests to be controlled, avoiding risks of phytotoxicity, products that will be tank mixed, the time of year, treatment to harvest interval, and prior use of a product. All miticides except petroleum oil should be used only once a year to minimize resistance development. For example, dicofol can be effectively used for spider mite or rust mite control during the supplemental early spring or postbloom intervals. The product is most effective when applied at ONE of these times. Conversely, Comite would be recommended in the fall or supplemental late fall intervals. Vendex is effective in one of the following four periods: supplemental spring, postbloom, fall, or supplemental fall periods. Petroleum oil spray applications can be effectively applied during the postbloom, summer, or fall intervals. Sulfur is included since it has a short treatment to harvest interval and provides a highly effective means of cleaning up rust mite infestations prior to harvest when needed. Use of sulfur should be minimized given its toxic effects on several beneficial arthropods.

Recommended Chemical Controls

READ THE LABEL.

TO MINIMIZE RISK OF RESISTANCE, DO NOT APPLY A SPECIFIC MITICIDE MORE THAN ONCE PER ACRE PER SEASON OTHER THAN PETROLEUM OIL.

Control Thresholds and Appropriate Sample Sizes for 10 Acres

If the control threshold is:	Sample size (Sample trees should be uniformly scattered across a 10-acre block. Do not sample adjacent trees.)
5 mites/leaf	Examine 4 leaves/tree from 6 trees/area from 4 areas/10 acres = 96 leaves on 24 trees/10 acres
8 mites/leaf	Examine 4 leaves/tree from 6 trees/area from 3 areas/10 acres = 72 leaves on 18 trees/10 acres
10 mites/leaf	Examine 4 leaves/tree from 5 trees/area from 2 areas/10 acres = 40 leaves on 10 trees/10 acres

Citrus Miticide Selection¹

Supplemental (early Spring)	Post Bloom	Summer	Fall	Supplemental Fall
--	--	Agri-mek + oil	--	--
--	--	--	Comite	Comite
Dicofol	Dicofol	--	--	--
Envidor	Envidor	Envidor	Envidor	Envidor
--	Petroleum oil	Petroleum oil	Petroleum oil	--
--	--	--	Sulfur	Sulfur
--	--	Micromite	Micromite	--
--	--	--	Nexter	Nexter
Temik	--	--	--	--
Vendex	Vendex	--	Vendex	Vendex

¹Except for petroleum oil, do not use the same miticide chemistry more than once a year.

For more information and details, go to:

Florida Citrus Pest Management Guide: Rust Mites, Spider Mites, and Other Phytophagous Mites at <http://edis.ifas.ufl.edu/cg002>

Management of Citrus Black Spot

Citrus black spot is a fungal disease that causes fruit blemishes and significant yield losses, especially on sweet oranges. Black spot can affect all commercial citrus species and cultivars commonly grown in Florida. **Lemons are the most susceptible, but sweet oranges—especially mid-late maturing types such as 'Valencia'—are also highly susceptible to this disease.** 'Hamlin' sweet oranges, grapefruit, and tangerine/mandarin types are moderately susceptible.



Hard spot is the most diagnostic symptom of black spot. The 3–10 mm diameter lesions are depressed and nearly circular, with gray necrotic tissue at the middle that has a brick-red to black margin that can be cracked around the edges. Structures that produce the asexual spores (pycnidia) are often present in the center of lesions and resemble slightly elevated black dots. Hard spot appears as the fruit begins to color before harvest. Lesions first occur on the side of the fruit with the greatest light exposure. False melanose symptoms appear on green fruit early in the season and do not contain pycnidia. The slightly raised lesions are 1–3 mm in diameter and can vary in color from tan to chocolate brown. Under favorable infection conditions, false melanose can resemble the mudcake symptoms of authentic melanose, but are very dark brown rather than rust red. False melanose symptoms can develop into hard spot as the season progresses. Cracked spot is a symptom that has only been observed in the Americas and is reported to be an interaction between rust mites and *G. citricarpa*. Cracked spots are large, diffuse, smooth lesions that form raised cracks around the

center. Hard spots can form in the center of these lesions. The most concerning black spot symptom is virulent spot. Early virulent spot (freckle spot) lesions start as irregularly shaped, sunken lesions with a reddish color. Early virulent spot can either coalesce to cover a large portion of the fruit surface or become hard spot. When spots coalesce, they turn from brown to black, and the older lesion surface becomes leathery. Many pycnidia can be found in early and expanded lesions. Virulent spot occurs on mature, severely infected fruit at the end of the season. Virulent spot symptoms can appear in post-harvest on apparently symptomless fruit, sometimes in transit to markets. Despite the unsightliness of black spot lesions, they rarely cause internal fruit rot so those fruit that have not fallen off the tree are still suitable for processing. Significant fruit drop is a common symptom in heavily infected groves.

Airborne ascospores produced in decomposing leaf litter on the grove floor and blown into the canopy by the wind are the primary inoculum for black spot. These spores germinate and directly infect the leaves and fruit. There is a long latent period for this disease, which means that most symptoms do not appear for several months, usually not until the fruit begins to ripen. The fungus requires a long wetting period of 24–48 hours to infect, and the disease is favored by warm, humid weather such as occurs during the summer months. **Major ascospore release usually occurs from April to early September**, with favorable infection conditions from May through September. Fruit remains susceptible most of the growing season. It is unknown how long leaves may remain susceptible. The asexual spores (conidia) are formed in fruit lesions, and to a lesser extent in leaf litter and twigs. Conidia spread by rain splash and can infect fruit and leaves. Monthly fungicide applications of copper and/or strobilurins (Abound, Gem, or Headline) will be needed from early May to mid-September to control black spot. **Fungicide applications in April are advised if there is substantial rainfall that month.** Our fungicide recommendations are based on efficacy data from trials in other countries with black spot and products registered for use on citrus in Florida. Since only four strobilurin fungicide applications can be used in a season for any purpose, it is recommended to reserve strobilurin fungicides for times when phytotoxicity from copper applications is a concern (temperatures >94°F). This is especially important for fresh fruit. It is recommended that strobilurin fungicides not be

applied in two consecutive sprays to manage pathogen resistance. Currently, there are no other rotational fungicides for resistance management. **In addition to chemical control measures, practices to accelerate leaf litter decomposition beneath the trees to reduce the ascospore inoculum may be beneficial.** Enhancing leaf litter degradation should commence in mid-March. There are three methods that have reduced the ascospore inoculum of *Mycosphaerella citri*, the fungus that causes greasy spot. The first is to increase microsprinkler irrigation to at least 5 times a week for approximately a ½ hour per irrigation period for 1.5 months. The leaf litter decomposition will be greater compared to that with the traditional irrigation frequency. One drawback is that leaf litter reduction will be confined to the areas where the microsprinklers reach. A second method is to apply urea (187 lb/treated acre) or ammonium sulfate (561 lb/acre) to the leaf litter. Nitrate-based fertilizers are ineffective. The final method is to apply dolomitic lime or calcium carbonate (2,226 lb/treated acre) to the leaf litter.

There are several cultural practices that will aid control and help restrict further spread of black spot. It is essential to minimize plant trash movement among groves and even among blocks within groves. While there are generally few symptoms on leaves, the ascospores, which are the main inoculum, are formed within the leaves. As leaf litter decomposes, the spores form and are forcibly ejected. This is the basis of the tarping requirement from quarantine areas, but any grove equipment or vehicle can move leaf litter or trash from one location to another.

Where possible, open the tree canopy by skirting to reduce the leaf wetness periods. The fungus requires between 24-48 hours of leaf wetness to infect. It is also important to minimize dead wood in the canopy. **Like the melanose pathogen, black spot fungus can colonize and reproduce in dead twigs. Canopies with significant numbers of dead twigs will have more problems with black spot than those without.**

Recommended Chemical Controls

READ THE LABEL.

Recommended Chemical Controls for Citrus Black Spot

Pesticide	FRAC MOA ²	Mature Trees Rate/Acre ¹
copper fungicide	M1	Use label rate.
Abound 2.08F ³	11	12.4-15.4 fl oz. Do not apply more than 92.3 fl oz/acre/season for all uses. Best applied with petroleum oil.
Gem 25WG ³	11	4.0-8.0 oz. Do not apply more than 32 oz/acre/season for all uses.
Gem 500 SC ³	11	1.9-3.8 fl oz. Do not apply more than 15.2 fl oz/acre/season for all uses. Best applied with petroleum oil.
Headline ³	11	9-12 fl oz. Do not apply more than 54 fl oz/acre/season for all uses. Best applied with petroleum oil.

¹Lower rates can be used on smaller trees. Do not use less than minimum label rate.

²Mode of action class for citrus pesticides from the Fungicide Resistance Action Committee (FRAC) 2011¹. Refer to ENY-624, "Pesticide Resistance and Resistance Management," in the *2012 Florida Citrus Pest Management Guide* for more details.

³Do not use more than 4 applications of strobilurin fungicides/season. Do not make more than 2 sequential applications of strobilurin fungicides.

For more information and more details go to: Florida Citrus Pest Management Guide: Citrus Black Spot at: <http://edis.ifas.ufl.edu/cg088>

Citrus Fruits May Lower Women's Stroke Risk

Compound in Oranges, Grapefruit Appears Protective

By Salyann Boyles

Reviewed by Laura J. Martin, MD



Researchers have identified a compound found in oranges, grapefruits, and other citrus fruits that may lower a woman's [stroke](#) risk.

Previous studies suggest that eating [fruits and vegetables](#) helps protect against strokes, and many believe that antioxidant compounds known as flavonoids may explain why, because they have been shown to improve [blood](#) vessel function and they have anti-inflammatory effects.

Among other things, flavonoids give fruits and veggies their vibrant colors. They are also found in chocolate and red wine. By some estimates there are more than 5,000 of them. In the newly published study, flavonoids abundant in citrus fruits known as flavanones appeared to give the most protection against stroke.

Women whose [diets](#) included the highest amount of flavanones had a 19% lower risk of suffering a blood-clot-related stroke than women with the lowest intake of the compound.

"Our study supports the conclusion that flavanones are associated with a modest reduction in stroke risk," says researcher Kathryn M. Rexrode, MD, MPH, of Boston's Harvard Medical School and Brigham and Women's Hospital.

Citrus Fruits and Stroke

Along with researchers from Norwich Medical School in the United Kingdom, Rexrode and Harvard colleagues attempted to better

understand the impact of six specific subtypes of flavonoids on stroke risk.

They did this by analyzing 14 years of follow-up data on nearly 70,000 female nurses participating in a nationwide women's health study.

At enrollment and every four years thereafter, the women were asked to fill out questionnaires detailing the foods they ate. Among the different subtypes of flavonoids, higher flavanone intake mainly from citrus fruits was specifically associated with a lower risk. Women whose diets included the most oranges, and orange and grapefruit juices, had the lowest stroke risk.

The study appears in the April issue of the American Heart Association journal *Stroke*.

Public Health Message Not Simple

Rexrode says more research is needed to confirm the findings.

"I would certainly not recommend that anyone take flavanone [supplements](#) based on this research," she says.

The public health message is further complicated by the fact that grapefruit juice and fresh grapefruit can sometimes cause dangerous interactions with [medications](#) commonly prescribed to lower [heart attack](#) and stroke risk.

For example, drinking grapefruit juice can increase the risk for liver problems associated with the use of [cholesterol](#)-lowering statin drugs.

Grapefruit juice can also increase concentrations of certain [blood pressure](#) drugs, raising the risk for side effects.

Pennsylvania State University professor of nutrition and American Heart Association spokesperson Penny Kris-Etherton, PhD, says the study reinforces the public health message that eating a diet rich in a variety of fruits and vegetables protects against heart and blood vessel disease.

She recommends getting the benefits of citrus from the whole fruits instead of juices to limit sugar and calories.

"This is very provocative research which suggests that including citrus fruits in your diet could lower stroke risk," she says.

How eating oranges and grapefruit can cut the risk of a stroke by their anti-inflammatory properties?

Eating oranges and grapefruit could cut your risk of stroke, claim researchers.

Both the whole fruit and breakfast juices appear to protect against having a 'brain attack', probably due to their high content of a certain type of antioxidant.

A new study looked at citrus fruit for the first time, rather than a range of fruit and vegetables which have been linked to stroke protection.

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The study involved thousands of women taking part in the ongoing Nurses' Health Study in the US, but experts believe the benefits may also apply to men.

Every year in the UK, approximately 120,000 people have a stroke and 20-30 per cent die within a month, while 300,000 people are living with disabilities as a result.

A research team based at Norwich Medical School in the University of East Anglia investigated the strength of protection from flavonoids, a class of antioxidant compounds present in fruits, vegetables, dark chocolate and red wine.

Women who ate high amounts of flavanones in citrus had a 19 per cent lower risk of blood clot-related (ischemic) stroke than women who consumed the least amounts.

The highest level of flavanones was around 45mg a day compared with 20mg a day. A glass of commercial orange juice can provide 20-50mg depending on processing and storage conditions.

In the study, reported in the medical journal Stroke (must credit) flavanones came primarily from oranges and orange juice (82 per cent) and grapefruit and grapefruit juice (14 per cent).

However, researchers recommended that consumers wanting to increase their citrus fruit

intake should eat more whole fruit rather than juice, due to the high sugar content of commercial fruit juices.

Lead researcher Aedin Cassidy, professor of nutrition, said 'Studies have shown higher fruit, vegetable and specifically vitamin C intake is associated with reduced stroke risk.

'Flavonoids are thought to provide some of that protection through several mechanisms, including improved blood vessel function and an anti-inflammatory effect.'

A previous study found that citrus fruit and juice intake, but not intake of other fruits, protected against risk of ischemic stroke and intracerebral hemorrhage.

Another study found no association between yellow and orange fruits and stroke risk, but did link increased consumption of white fruits like apples and pears with lower stroke risk.

An additional study found that Swedish women who ate the highest levels of antioxidants - about 50 percent from fruits and vegetables - had fewer strokes than those with lower antioxidant levels.

More studies are needed to confirm the association between flavanone consumption and stroke risk, and to gain a better understanding about why the association occurs, said Prof Cassidy.

Dr Sharlin Ahmed, Research Liaison Officer at The Stroke Association said 'We all know that eating plenty of fresh fruit and veg is good for our health. This study suggests that eating citrus fruits in particular, such as oranges and grapefruits, which are high in vitamin C could help to lower your stroke risk.

'However, this should not deter people from eating other types of fruit and vegetables as they all have health benefits and remain an important part of a staple diet.

'More research is needed in this area to help us understand the possible reasons why citrus fruits could help to keep your stroke risk down. 'Everyone can reduce their risk of stroke by eating a healthy balanced diet that is low in saturated fat and salt, exercising regularly and ensuring that your blood pressure is checked and kept under control.'

IRRIGATION



Florida citrus growers and production managers know that they can't grow citrus successfully and competitively without supplemental irrigation. In Florida, through research and field experience, we know that irrigation is necessary because of the non-uniform distribution of the rainfall and the very limited water holding capacity of our sandy soils.

Irrigation is of particular importance during the dry period (February-May), which coincides with the critical stages of leaf expansion, bloom, fruit set, and fruit enlargement.

Proper irrigation scheduling is defined as the application of water when needed and in the amounts needed. Citrus production managers should accurately determine when and for how long to irrigate. With proper irrigation scheduling, tree growth and fruit yield will not be limited by water stress or water excess. Over-watering will waste water and pumping energy, will leach nutrients and other chemicals below the rootzone, and will contribute to contamination of the groundwater.

Because of the high water table in southwest Florida, citrus trees have over 90% of their feeder roots within the top foot of soil. For this situation, irrigating for long

duration can lead to loss of water below the rootzone. Therefore, it is recommended to increase the frequency and reduce the length or duration of irrigation. Irrigating every other day is better than irrigating once or twice a week.

Good water management practices should include precise irrigation scheduling and well-designed, uniform irrigation systems to minimize waste. Non-uniform irrigation will cause excess water to be applied in some areas while other areas will not get enough. Production managers should not only be aware of the losses resulting from irrigation systems that apply water and chemicals non-uniformly, but should adopt the recommended ways to minimize these losses.

BASIC IRRIGATION SCHEDULING

Proper irrigation scheduling is the application of water to crops only when needed and only in the amounts needed; that is, determining when to irrigate and how much water to apply. With proper irrigation scheduling, crop yields will not be limited by water stress from droughts, and the waste of water and energy used in pumping will be minimized. Other benefits include reduced loss of nutrients from leaching as a result of excess water applications, and reduced pollution of groundwater or surface waters from the leaching of nutrients.



Determining when to irrigate

One indicator of plant water stress is the visual appearance of the plant. However, yield reduction has already occurred by the time crops show wilt symptoms. Growth ceases in many crops before visual wilting occurs, and yield reduction may have occurred for some time before wilting is seen.

When to irrigate can also be determined by calendar methods (for example every 3 days), by crop growth stage (for example, every 4 days during early vegetative growth stage, and every other day during peak growth stage), or by similar methods based on long-term average irrigation requirements. However, these methods fail to consider the effects of climatic variability on daily crop water use. Therefore, the use of long-term average values may not be adequate during periods of hot, dry days, while over-irrigation may occur during periods of cool, overcast days, especially if rainfall is not considered. Day-to-day climatic conditions are highly variable during much of the year because of cloud cover and the random nature of rainfall.



Irrigations are most often scheduled based on the soil water status. Three procedures may be used: 1) a water balance procedure based on the estimated crop water use rate and soil water storage, 2) a direct

measurement procedure based on instrumentation to measure the soil water status, and 3) a combination of the above two methods in which soil water status instrumentation is used with a water balance procedure. These procedures require knowledge of the crop water requirements, effective root-zone, soil water-holding capacity, and irrigation system capabilities in order to schedule irrigations effectively.

Once available water content (AWC) is known, the total depth of water available (AW), and thus the capacity of the soil-water reservoir, can be obtained by multiplying AWC by the crop effective root zone depth. For layered soils, AW is calculated by adding the multiples of AWC and depths of all soil layers contained in the crop root zone.

Soil-moisture indicators for irrigation scheduling

Devices for monitoring soil moisture have been available for many years. Among them, are tensiometers and capacitance probes. When placed in the plant root zone, they indicate the soil water status that the plants are experiencing. Disadvantages of soil moisture sensors include their cost, labor requirements for reading and servicing, and the need for periodic calibration. They also measure soil water status at a point rather than for the whole field, thus many instruments or sensors may need to be installed to accurately represent a given field.

For a free evaluation of your irrigation system, call the Mobile Irrigation Lab in your area.

In SW Florida, call **239 455 4100**.

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