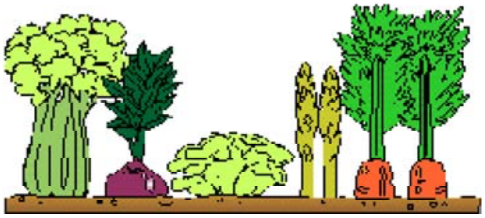

VEGETARIAN NEWSLETTER

A Vegetable Crops Extension Publication
Vegetarian 02-11
November 2002

University of Florida
Institute of Food and Agricultural Sciences
Cooperative Extension Service

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COMMERCIAL VEGETABLES

List of Extension Vegetable Crops Specialists

* * * * * * * UPCOMING EVENTS CALENDAR * * * * * * *

Florida Drip Irrigation School. GCREC-Dover. November 13, 10:00-4:00. Contact Christine at 813-744-6630. Programs are offered free of charge but require pre-registration.

Florida Drip Irrigation School. NFREC-Live Oak. December 4, 9:00-4:00. Contact Laurie at 386-362-1725. Programs are offered free of charge but require pre-registration.

Cucurbitaceae 2002. Naples Beach Hotel and Golf Club; Naples, Fla. December 8-12. Contact Don Maynard at 941-751-7636 x239 or dnma@mail.ifas.ufl.edu

Florida Postharvest Horticulture Industry Tour. Statewide. March 10-13, 2003. Contact Steve Sargent at 352-392-1928 or sasa@mail.ifas.ufl.edu OR Mark Ritenour at 561-201-5548 or mrit@mail.ifas.ufl.edu

Florida Postharvest Horticulture Institute at FACTS (Florida Agricultural Conference & Trade Show). Lakeland. April 29-30, 2003. Contact Steve Sargent at 352-392-1928 or sasa@mail.ifas.ufl.edu

Vegetable Field Day. GCREC-Bradenton. May 15, 2003. Contact Don Maynard at 941-751-7636 x239 or dnma@mail.ifas.ufl.edu

116th Florida State Horticultural Society. Sheraton World Resort Hotel International Drive - Orlando, June 8-10, 2003.

UNDERSTANDING CHILLING INJURY AND RECOGNIZING ITS SYMPTOMS

Plants evolved around the world within relatively narrow temperature ranges and, although the cultivated descendents of wild plants may nowadays be grown worldwide, they still “remember” their origins. Thus, many cultivated fruits and vegetables that originated in the tropics and subtropics cannot tolerate low, but nonfreezing temperatures in the range of 32 to 55 °F (0 to 12.8 °C). The resulting adverse effects on their growth, development, maturation, or ripening when they are exposed to temperatures in this range are collectively referred to as “chilling injury.” For the postharvest handler, this is an ironic situation because, as we know, low temperature is our best tool for maintaining the quality of fresh fruits and vegetables.

An important yet simple concept to understand with regard to chilling injury is the “threshold temperature.” For each crop species, there is a unique temperature at or above which chilling injury will not occur. These threshold or lowest safe temperatures are the basis for the widely circulated “recommended” or “optimum” storage and handling temperatures for various chilling sensitive crops. The lower the temperature below the threshold temperature and the longer the exposure, the worse the chilling injury will be. Threshold temperatures for an individual crop can vary substantially among varieties and with differences in maturity – less mature or less ripe individuals are more sensitive to chilling. Chilling injury is also usually cumulative. This means that a number of even brief exposures to chilling temperatures, including those occurring in the field before harvest, may result in development of injury symptoms.

Examples of crops that are sensitive to chilling injury obviously include the tropical fruits such as bananas, mangoes, papayas, and pineapples. Less appreciated is the fact that almost all of the vegetables crops that are grown in the northern hemisphere as “warm season” vegetables are of tropical or subtropical origin and thus subject to chilling injury. These include beans, cucumbers, eggplants (Fig. 1), most of the melons (cantaloupes are only slightly sensitive), peppers (Fig. 2), all of the squashes (summer and winter types), sweetpotatoes, and tomatoes. Asparagus and potatoes are cool season vegetables that are also chilling sensitive.

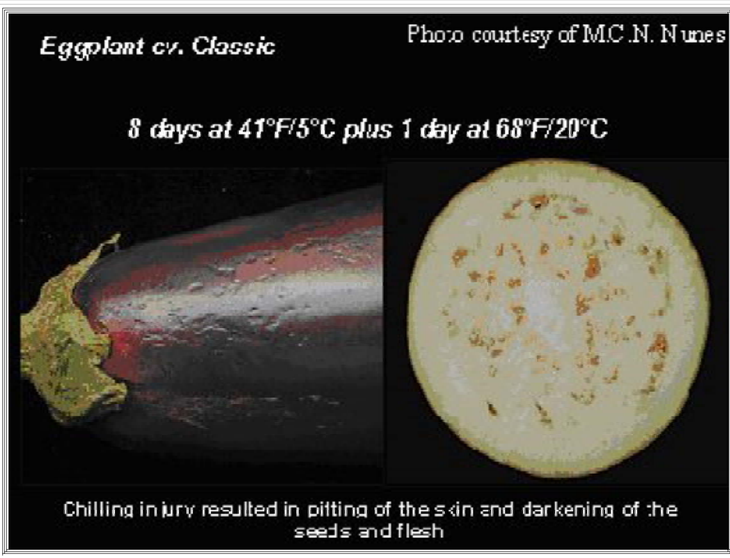

Figure 1. Eggplant chilling injury symptoms.

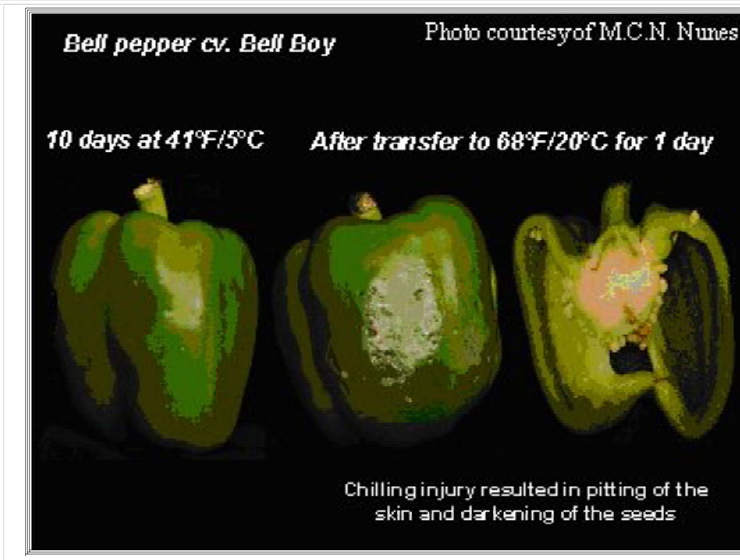

Figure 2. Bell pepper chilling injury symptoms.

The visible symptoms of chilling injury vary widely among these sensitive crops (Table 1), but typically include surface pitting, watersoaked and discolored flesh, failure to ripen normally, and increased susceptibility to decay.

An extremely important (and insidious) consequence of chilling injury is flavor loss due to inhibition of aroma volatile production. This is often the first symptom of chilling injury and, in cases of mild chilling exposure, it may be the only symptom. The infamous “tasteless winter tomatoes” are almost certainly a result of shipping and storage at below the lowest safe temperature! Another ironic aspect of chilling injury is that chilling symptoms are usually most clearly expressed after the commodity is transferred to a warm, non-chilling environment. This means that handlers who carelessly expose sensitive vegetables to chilling temperatures may very well never see the injury that they have caused – that will fall to a subsequent handler, perhaps the ultimate consumer, baffled as to why seemingly high quality vegetables quickly spoiled at home. It also means that vegetables that were chilled in the field due to inclement weather may develop chilling injury even when they are handled at recommended temperatures!

Table 1. Lowest safe ("threshold") temperatures and chilling injury symptoms for sensitive vegetables.

Vegetable	Threshold temperature		Visible chilling injury symptoms
	(°F)	(°C)	
Asparagus	35	2	Dull, gray-green and limp tips
Bean (lima)	37 – 41	3 – 5	Rusty-brown specks or spots
Bean (snap)	40 – 45	4 – 7	Pitting and russetting (rusty-brown streaks)
Cucumber	50	10	Pitting, watersoaked spots, decay
Eggplant	46	8	Surface scald, *Alternaria* rot, seed darkening
Melons			
Cantaloupe			
(¾-slip)	36 – 41	2 – 5	Pitting, surface decay
(full-slip)	32 – 36	0 – 2	Pitting, surface decay
Honey Dew	45 – 50	7 – 10	Reddish-tan discoloration, pitting, surface decay, failure to ripen
Casaba	45 – 50	7 – 10	Pitting, surface decay, failure to ripen
Crenshaw	45 – 50	7 – 10	Pitting, surface decay, failure to ripen
Watermelon	50	10	Pitting, darkening or watersoaking of flesh
Okra	45	7	Discoloration, watersoaked areas, pitting
Pepper	45	7	Sheet pitting, *Alternaria* rot, seed darkening
Potato	40	4	Mahogany browning, sweetening
Squash			
(summer)	41	5	Pitting, watersoaked spots, decay
(winter)	50	10	Decay, especially *Alternaria* rot
Sweetpotato	55	13	Decay, pitting, internal discoloration, hard- core when cooked
Tomato			
(mature-green)	55	13	Slowed ripening, pitting, poor color, *Alternaria* rot
(ripe)	45 – 50	7 – 10	Watersoaking, softening, decay
Yam	61	16	Tissue discoloration and watersoaking, decay
Adapted from USDA Agriculture Handbook Number 66			

Chilling injury is a complicated phenomenon, however it behooves us as postharvest handlers to understand this disorder and be able to recognize it symptoms. In ongoing research in which we are collaborating with colleagues at University Laval in Quebec, quality curves are being established for about two dozen fresh fruits and vegetables, including a number that are chilling sensitive. This is being done by evaluating all measurable quality changes in each commodity every day or every other day (depending on relative shelf life) at 32, 41, 50, 59, 68, and 77 °F (0, 5, 10, 15, 20 and 25 °C). From these experiments, we are determining both the shelf life and the quality factor(s) that limit(s) the shelf life at each temperature. In the meantime, we recommend that in the absence of specific experience with a particular chilling sensitive crop or variety, it is best to take a conservative approach and strictly avoid any exposure to temperatures below the thresholds listed in Table 1.

(Brecht, Ritenour, and Sargent- Vegetarian 02-11)

MANAGEMENT OF CUCURBIT DISEASES

With the South Florida vegetable production season in full swing, and the North Florida Spring season on its way, a review of diseases for watermelon and other cucurbits is in order. Plant diseases significantly impact yields and quality of cucurbits. Disease pressure is determined primarily by four factors: abundance of inoculum in surrounding fields, presence of inoculum on seeds and transplants, climatic conditions, cultural practices during the cropping season, and the choice of variety to plant. Close attention should be paid to all of these conditions to minimize damage done during the season.

Fungal pathogens such as Gummy Stem Blight (Fig. 1), Powdery Mildew (Fig. 2), and Downy Mildew (Fig. 3) defoliate vines, and ultimately reduce yields of marketable fruit. With the exception of powdery mildew, these diseases are favored by humid, rainy, and hot conditions. For effective management, choose a field where cucurbits haven't been grown for at least 4-5 years (practice crop rotation), choose well-drained fields with good air circulation around them, use pathogen-free transplants or seeds, and eliminate wild (citrons) and volunteer cucurbits in and around production fields. If possible, use drip irrigation and deep plow plant debris after harvest. Deep plowing promotes decay of infected debris, reducing survival and sporulation of pathogens. Finally, it is important to follow a protective fungicide program, i.e. begin applications of chlorothalonil, mancozeb, maneb, or other materials before disease symptoms are present. Quadris (strobilurin) is both a protective and curative material and may be applied at 15.4 fl oz/trtd Acre, and must be alternated with other fungicides with different modes of action, with a maximum of 4 applications strobilurin/crop/acre/year.

Figure 1. Symptoms of Gummy Stem Blight

Figure 2. Symptoms of Powdery Mildew

Figure 3. Symptoms of Downy Mildew

Figure 4. Symptoms of ZYMV

Unlike fungal pathogens, viral diseases require insect vectors (primarily aphids and whiteflies) for transmission, although mechanical transfer of plant sap may also result in disease spread. Zucchini Yellow Mosaic Virus (ZYMV) (Fig. 4), Watermelon Mosaic Virus 2 (WMV-2), Papaya Ring Spot Virus-W (PRSV-W), and Cucumber Mosaic Virus (CMV) all have been reported in North Florida. Viral symptoms include plant and leaf deformation, stunting of growth, and fruit damage. Planting virus-resistant varieties is the best defense against infections, but other cultural practices, such as destroying weed hosts and volunteer cucurbits in and bordering fields, early season planting of healthy plant material, oil sprays ('JMS Stylet oil'), and reducing insect populations all will prove to be "preventative measures" for growers. Growers should also beware of "bridge" weeds left in fields between seasons that may serve as ways for viruses to be carried over to the next crop.

To be successful at combating pathogens on cucurbits, producers must integrate crop rotations, destruction of weed hosts, use of drip irrigation and disease-free plant material, proper field monitoring and diagnostics, and a fungicide/insecticide program that is both protective and curative. Regular scouting and close attention paid to growing crops will keep producers well abreast of disease developments in fields, thus aiding them in making wise management decisions.

(Josh Mayfield, ext. agt., Gadsden County and Tim Momol, asst. prof., NFREC-Quincy - Vegetarian 02-11)

EFFECTS OF PLANT ESSENTIAL OILS ON BACTERIAL WILT INCIDENCE IN TOMATO

Bacterial wilt (BW) caused by *Ralstonia solanacearum* (Rs) is a serious soil-borne disease of many economically important crops, such as tomato (Fig. 1), potato, tobacco, banana, eggplant and some ornamental plants. This bacterium causes wilt by infecting plants through roots and colonizing stem vascular tissue. Although diseased plants can be found scattered in the field, bacterial wilt usually occurs in foci associated with water accumulation in lower areas. Under natural conditions, the initial symptom in mature plants is wilting of upper leaves in hot days followed by recovery throughout the evening and early hours of the morning. The wilted leaves maintain their green color as disease progresses. Under hot humid conditions favorable for disease, complete wilting occurs and the plant will die. The vascular tissues in the lower stem of the wilted plants usually show a brown discoloration.

Figure 1. Affects of bacterial wilt on tomato.

Due to the limited efficacy of the current integrated management strategies, BW continues to be economically important for field grown fresh market tomato production in the southeastern United States and many subtropical and tropical areas of the world. Cultural practices, crop rotation and host resistance could provide a limited success.

Greenhouse experiments were conducted to determine the effectiveness of plant essential oils as soil fumigants to manage BW in tomato. Potting mixture infested with Rs was treated with the essential oils at 400 mg or µl and 700 mg or µl per L soil in greenhouse experiments. Rs population densities were determined just before and 7 days after treatment. Populations declined to undetectable levels in thymol, palmarosa oil and lemongrass oil treatments at both concentrations, whereas tea tree oil had no effect. Tomato seedlings transplanted in soil treated with 700 mg/L thymol, 700 ml/L palmarosa oil and 700 ml/L lemongrass oil were free from bacterial wilt and 100% of the plants in thymol treatments were free of Rs. Soil amendment with fresh leaves of essential oil producing plants did not reduce bacterial wilt incidence compare to untreated inoculated control. Some thyme oil producing plants such as thyme cv. German winter, Creeping thyme, and Greek oregano were systemically infected by Rs in their roots and therefore identified as hosts of Rs.

(M. T. Momol, asst. professor, Quincy-REC, Olson, P. M. Pradhanang, Plant Pathology Dept, Vegetarian 02-11)

MATRIX (RIMSULFURON) HERBICIDE LABELED ON FLORIDA TOMATO

Dupont has issued a supplemental label for the rise of Matrix on field grown tomatoes. Matrix (rimsulfuron) will control a number of grasses and many broadleaf weeds applied preemergence and postemergence to the weeds. The label states (at the present time) that Matrix can be applied preemergence to the seeded crop only.

Matrix may be applied postemergence or posttransplant to the tomatoes at 1-2 oz. product (0.25-0.5 oz. ai). Sequential applications are labeled. A maximum of 4.0 oz. Product per acre per year can be used. Use a nonionic surfactant of 80% ai or higher with all applications. Use a surfactant at a rate of 0.25% v/v (2 pts/100 gallons of water). The use of a crop oil concentrate, methylated seed oils, nitrogen fertilizer solution or nonionic surfactants applied at rates above 0.25% v/v may result in temporary crop chlorosis. Symptoms usually disappear within 5-15 days.

Matrix must be activated in the soil with sprinkler irrigation or rainfall. Preemergence (weed) use without soil activation do not provide adequate weed control.

Check the rotational crop guidelines on the label.

(Stall - Vegetarian 02-11)

Extension Vegetable Crops Specialists

Daniel J. Cantliffe Professor and Chairman	**Ronald W. Rice** Assistant Professor, nutrition
John Duval Assistant Professor, strawberry	**Steven A. Sargent** Professor, postharvest
Chad Hutchinson Assistant Professor, vegetable production	**Eric Simonne** Assistant Professor ***and editor,*** vegetable nutrition
Elizabeth M. Lamb Assistant Professor, production	**William M. Stall** Professor, weed control
Yuncong Li Assistant Professor, soils	**James M. Stephens** (retired) Professor, vegetable gardening
Donald N. Maynard Professor, varieties	**Charles S. Vavrina** Professor, transplants
Stephen M. Olson Professor, small farms	**James M. White** Associate Professor, organic farming
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This page is maintained by Susie Futch.... if you have any questions or comments, contact me at zsf@mail.ifas.ufl.edu