Vegetarian Newsletter

A Vegetable Crops Extension Publication

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

Vegetarian 00-01

January 2000

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VEGETABLE GARDENING

- *Top Ten Vegetables of the 20th Century*

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Vegetable Crops Calendar

Australian Vegetable Tour. January 7-10, 2000. Contact: Dr. Doug Sanders, NC State University (919) 515-1222, E-mail: Doug_Sanders@NCSU.edu

Suwannee Valley Field and Greenhouse Shortcourse and Trade Show. January 8, 2000. Suwannee County Coliseum, Live Oak, FL. Contact: Bob Hochmuth (904) 362-1725.

Watermelon Production Meeting. Thursday, January 27, 2000, Marianna and Bonifay. Contact: Charles Brasher, 850-482-9620, clb@gnv.ifas.ufl.edu **(Click for AGENDA)**

2000 Florida Postharvest Horticulture Institute and Industry Tour.
Institute - March 6th, University of Florida, Gainesville, with video-links to several sites in Florida.
Industry Tour - March 7-10th Statewide
For more information contact: Steve Sargent, (352) 392-1928 ext. 215, e-mail or Abbie Fox (352) 392-1928 ext.235, fax (352) 392-5653, e-mail

Commercial Vegetable Production

Ongoing Research at the GCREC-Dover

The center is located 15 miles east of Tampa, in the heart of Florida's strawberry production area. While researchers at Dover have state wide responsibility, 90% of the state's 6,000+ acres of strawberries are located within 20 miles of the center. The Strawberry Investigation Laboratory was opened in 1925 and moved to its current location in 1963. The Lab's focus is to develop and expand knowledge and technology of strawberry production which will enable Florida growers to remain competitive with other production areas in the U.S. and abroad. Currently, there are 3 faculty members working to accomplish these goals.

Dr. J.R. Duval is currently working to improve cultural practices and understanding of strawberry physiology. Transplant type, transplant date, and varietal influences on yielding pattern are being examined. It is hoped that this research will equip growers to accurately plan their planting schedules to maximize financial returns. Root geometry and mass are being looked at to determine their effects on plant establishment and subsequent yields. Plant growth regulators are being studied to determine the benefit of increased or decreased vegetative growth. Manganese nutrition is being analyzed to determine its role in the development of plant disease. Dr. Duval is also working in conjunction with Eric Waldo of the Hillsborough County Extension office on hydroponic field production of strawberries in perlite bags. In the future, experimentation on methyl bromide alternatives, carbohydrate partitioning, photosynthesis, transplant production, irrigation efficiency and nutrient management are planned.

Strawberry breeding and genetics are the main focus of Dr. Craig Chandler's research effort. To date, he has released two varieties 'Rosa Linda' and 'Sweet Charlie'. 'Sweet Charlie' accounts for approximately 40% of all strawberries grown in Florida. It is an anthracnose-resistant variety which produces early, sweet flavorful fruit which are popular with comsumers. Currently, Dr. Chandler has two varieties ready for release which are tentatively named 'Earlibrite' and 'Strawberry Festival'. These varieties will provide Florida strawberry producers better options than varieties developed elsewhere around the world.

Dr. Daniel Legard, a plant pathologist, is currently probing chemical and cultural methods to reduce pesticides sprayed on strawberries (Florida strawberries receive more applications of pesticides than any other food crop grown in the U.S.). Particular interest is being paid to determine optimal control strategies for botrytis fruit rot, anthracnose, powdery mildew, and gray mold of strawberry.

In addition to Drs. Duval, Chandler and Legard, graduate students, post-docs, visiting scientists and faculty members from other centers conduct research at the station. In particular, Dr. James Price has implemented a research program studying two-spot spider mites and Dr. Joe Noling is examining methods to cope with the loss of methyl bromide. Collaborative efforts with foreign institutions are being conducted at Dover as well.

(Duval, Vegetarian 00-01)

South Florida Extension Leadership in Vegetables

Because of the unique nature of vegetable production in South Florida, an Extension Working Group was organized as a branch of State Major Program, FL107 in June 1999 to help fill perceived needs for information by South Florida growers. The South Florida Extension Leadership in Vegetables (LIV) working group is spearheaded by Dr. Charles Vavrina with faculty participation from the four Research and Education Centers in South Florida (EREC, IRREC, SWFREC, and TREC) and Dade, Hendry, Hillsborough, Manatee and Palm Beach counties. A small group of growers are involved to provide a producer point of view. County Advisory Committees formulated 'Priority' lists which were used to identify the topics most commonly cited as requiring information and these issues are being addressed by four subcommittees; Communication, Cultural Practices, Integrated Pest Management, and Production Economics. Each subcommittee has developed an Action Plan of the methods that they will use to address the information gaps, with appropriate deadlines and deliverables indicated. One of the first products of LIV was the website developed by Dr. Vavrina. Action plans and current updates on the work of the LIV can be found at www.imok.ufl.edu/veghort/liv.

On November 30, 1999, the working group met to discuss the accomplishments of each subcommittee and to reassess priorities and methods.

The Communication Subcommittee has as its focus the improvement of communication among the personnel currently working in vegetable extension in South Florida and the compilation of existing information relevant to South Florida vegetable production. One or more e-mail list-serves will be developed to facilitate the exchange of information among extension personnel in South Florida. Additional links will be added to the LIV website to create a 'one-stop shopping' method of accessing a range of newsletters and information sources.

Focus areas of the Cultural Practices Subcommittee include 1) determining the cost of compliance with environmental regulations, 2) assessing crop pesticide choices, 3) evaluating methyl bromide alternatives, in particular composting and cover crops, 4) assessing vegetable irrigation scheduling and 5) evaluating fertilizer application methods.

The focus of the Integrated Pest Management Subcommittee is information relevant to the utilization and evaluation of biocontrol agents. The committee has developed an annotated list of IFAS personnel with expertise in biological and biorational control of insects and mites in vegetable crops as well as identifying sources of information on the use of biological agents for the control of plant diseases.

The Production Economics Subcommittee is working in the areas of enterprise budgets and labor demographics. The list of crops for which enterprise budgets will be developed is based on agent requests. This committee has also compiled a web-based listing of available budget information from throughout the US on over 40 crops including specialty vegetables, herbs and organically produced vegetables, which is available on the LIV website.

It is the intent of the LIV working group that as one priority issue is addressed a new one will take its place. Through the efforts of the LIV working group, the links between the County Advisory Committees, county faculty, extension specialists, researchers and research centers in south Florida will be strengthened and the imperatives and initiatives of Florida FIRST will be met.

(Lamb, Vegetarian 00-01)

Cantaloupe Variety Trial Results Spring 1999, NFREC, Quincy, FL

Cantaloupes are a minor crop in Florida with much of the production sold through roadside stands and local markets. The biggest problem with cantaloupe production in Florida is the ability to produce a high quality fruit that has sufficient keeping ability so that it can pass through the market chain. Most of the varieties used at this time are eastern types with prominent sutures, medium netting but do not have a long shelf life. Western types which are usually round, smaller, nearly sutureless, and have a longer shelf life but have not been grown much in Florida due to lower yields and lack of disease resistance.

This trial was part of a statewide trial to evaluate varieties at multiple locations. The purpose of this trial was to evaluate varieties for adaptability to the panhandle area of the state. Included in the trial were 5 eastern types and 9 western types.

Soil type was an Orangeburg loamy fine sand. Soil pH prior to planting was 6.6. Total fertilizer applied was 165-50-165 lb/a of N-P_2O_5-K_2O. Beds were fumigated with 350 lb/a of methyl bromide:chloropicrin (67:33) prior to application of black polyethylene mulch. Irrigation was with a single drip tube (Chapin Twin Wall IV, 0.5 gpm/100ft at 10 psi) buried 1-inch deep, 6 inches off center. Between-row spacing was 6 feet and in-row spacing was 20 inches (4356 plants/a). Plot length was 34 feet. First and last plants in plot were honey dews to help separate plots.

Fourteen entries were seeded on 18 Feb, 1999, into flats with cell size 1.5 in. X 1.5 in. X 2.5 in. Plots were planted on 22 March, 1999. Four replications were used. Between-row weed control was accomplished with Curbit pretransplant and post-directed applications of Gramoxone. Pesticides were applied as needed to control pests.

Seven harvests were made from 1 June to 21 June 1999. Marketable fruit were weighed and counted at each harvest. Soluble solid determinations were made with a digital refractometer on two fruit on the 7 June harvest. Ratings of 1 to 5 were also made on flesh color with 5 being intense orange color and 1 being pale orange. The resulting data were subjected to analysis of variance and means were separated by Duncan's Multiple Range Test, 5% level. Temperatures during production period were near normal but very dry. Spider mites came in later and were very difficult to control.

Total yields ranged from a high of 726 cwt/a for 'Zodiac' (western type) to a low of 477 cwt/a for 'SME 7122' (western type). There were 6 entries with yields similar to 'Zodiac'. Average fruit size ranged from a low of 2.9 lbs for 'Allstar' to a high of 5.1 lbs for 'Vienna'. Only 'SMX 7119' produced fruit as large as 'Vienna'. Soluble solids ranged from 13.9% for 'SMX 7204' to 10.1 % for 'SME 7126'. No other entry had soluble solids as high as 'SMX 7204'. All eastern types had soluble solid levels above 11.0%. Flesh color ranged from 4.0 for 'Eclipse' to 2.0 for 'Cruiser'.

Table 1. Total yields, average fruit weight, soluble solids, and internal color rating for cantaloupe replicated trial. NFREC Quincy, Spring 1999.

Entry	Yield cwt/A	Average fruit weight (lbs)	Soluble solids (%)	Flesh color^{z}
Zodiac (W)^{y}	726 a^{x}	3.5 cd	11.1 c-e	2.3 de
SMX 7119 (E)	717 a	5.0 a	12.3 bc	3.5 ab
SMX 7204 (W)	668 ab	3.2 de	13.9 a	3.4 ab
Cruiser (W)	647 ab	3.0 e	10.5 e	2.0 e
Allstar (W)	640 ab	2.9 e	11.2 c-e	2.5 c-e
Athena (E)	618 a-c	3.8 bc	12.5 b	2.3 de
Eclipse (E)	617 a-c	4.1 b	12.4 b	4.0 a
Desert Princess (W)	599 bc	3.0 e	10.4 e	3.5 ab
Vienna (E)	586 b-d	5.1 a	11.0 de	3.8 ab
SME 7126 (W)	580 b-d	4.0 bc	10.1 e	2.3 de

Desert Queen (W)	521 cd	3.0 e	11.9 b-d	2.5 c-e
SME 7124 (W)	518 cd	3.7 bc	11.0 de	3.3 a-c
Cordele (E)	501 cd	3.9 bc	11.0 de	3.0 b-d
SME 7122 (W)	477 d	3.6 b-d	10.6 de	2.3 de

[z] Rating 1-5 with 1 being pale orange and 5 being intense orange.
[y] W = western type and E = eastern type.
[x] Mean separation in columns by Duncan's Multiple Range Test, 5% level.

(Olson, Vegetarian 00-01)

Sanitizers for Vegetable Packinghouse Recirculated Water

Proper sanitation of water (especially recirculated water) used in dump tanks, hydrocoolers, etc. of fresh vegetable packinghouses is important for delivering sound produce to the consumer. Not only do unsanitary conditions promote direct product loss through decay, but rising food safety concerns about human pathogens are becoming increasingly important to consumers. Because water is one of the best carriers of pathogens, it must be treated (either chemically or physically) to prevent the accumulation of pathogens in the water and prevent cross-contamination of sound produce. Such treatments are not particularly effective at reducing pathogen levels already on the surface of produce; it is much more effective to prevent contamination in the first place. This means following Good Agricultural Practices regarding water quality, use of manure and municipal biosolids, harvesting practices, and worker, field and packing facility sanitation.

Although chlorine is currently the sanitizer of choice for most vegetable packinghouses, other chemicals have been approved by the EPA for contact with food products. This article will briefly list some of the approved antimicrobial chemicals and discuss advantages and disadvantages of using each (Table 1).

Chlorine

Chlorine is currently the predominant method used by packinghouses to sanitize water systems. Although chlorine is available in three forms - sodium hypochlorite, calcium hypochlorite, or chlorine gas - it is the resulting hypochlorous acid (HOCl) that is primarily responsible for killing pathogens. Currently, IFAS recommends using 100 to 150 parts per million (ppm) of free chlorine with a water pH between 6.5 and 7.5.

The main advantages to using chlorine are that it is effective at killing a broad range of pathogens and that it is relatively inexpensive. It also leaves very little residue or film on surfaces. However, chlorine is corrosive to equipment and water pH must be monitored and adjusted often to maintain chlorine in its active form. Continual addition of chlorine without changing the water can result in the accumulation of high salt concentrations that may injure some products. Further, chlorine can react with organic matter to form small amounts of different trihalomethanes (THMs) that are thought to be carcinogenic. However, the relative risks from chlorine-generated THMs on the surface of fresh horticultural produce is extremely low.

Chlorine dioxide (ClO_2)

Chlorine dioxide is a synthetically produced yellowish-green gas with an odor like chlorine but with 2.5 times the oxidizing power of chlorine. This higher potency translates into less chemical required for the same sanitizing effects compared to chlorine. ClO_2 is typically used at concentrations between 1 and 5 ppm. However, it usually must be generated on-site because the concentrated gas can be explosive and decomposes rapidly when exposed to light or temperatures above 50 ^oC (122 ^oF). These concentrated gases also poses a greater risk to workers than sodium or calcium hypochlorite. Noxious odors from off-gassing can be a common problem, especially at higher concentrations, which restricts its use to well-ventilated areas away from workers. Unlike chlorine, ClO_2 does not hydrolyze in water and is virtually unaffected by pH changes between 6 to 10 and does not react with organic matter to form THMs. However, in addition to ClO_2, some generators produce free chlorine that may form THMs and ClO_2 may produce other potentially hazardous byproducts (e.g. chlorate and chlorite). One additional drawback is that simple assays to monitor chlorine dioxide concentration are currently not available.

Peroxyacetic Acid (PAA)

Peroxyacetic acid is a strong oxidizer formed from hydrogen peroxide and acetic acid. The concentrated product (40% PAA) has a pungent odor and is highly toxic to humans. PAA is very soluble in water with very little off-gassing and it leaves no known toxic breakdown products or residue on the produce. Unlike chlorine and ozone, it has good stability in water containing organic matter, which can greatly increase the longevity of the sanitizer, and it is not particularly corrosive to equipment. PAA is most active in acidic environments with pH between 3.5 and 7, but activity declines rapidly at pHs above 7-8. High temperatures and metal ion contamination will also reduce its activity.

Ozone (O_3)

Ozone gas is one of the strongest oxidizing agents and sanitizers available. An expert panel declared ozone to be Generally Recognized As Safe (GRAS) in 1997 and ozone is currently legal for food contact applications. Although ozone is not particularly soluble in water (30 µg/ml or 30 ppm at 20 ^{o}C), concentrations as low as 0.5 to 2 ppm are effective against pathogens in clean water with no soil or organic matter. In practice, even concentrations of 10 ppm are difficult to obtain and concentrations of 5 ppm are more common.

Ozone decomposes quickly in water with a half-life of 15 to 20 minutes in clean water but less than a minute in water containing suspended soil particles and organic matter. Thus, ozonated water should be filtered to remove these particulates. The cooler temperatures of hydrocoolers may also extend ozone's half-life. The antimicrobial activity of ozone is stable between pH 6 and 8 but decomposes more rapidly at higher pHs. Ozone breaks down to oxygen and no other toxic by-products have been reported.

Because of its strong oxidizing potential, ozone is toxic to humans and must be generated on-site. Prolonged exposure to more than 4 ppm ozone can be lethal. Ozone has a pungent odor that can be detected by humans at 0.01 to 0.04 ppm. OSHA has set worker safety limits of 0.1 ppm exposure over an 8 hour period and 0.3 ppm over a 15 minute period. At concentrations in water above 1 ppm, off-gassing can result in concentrations in the air that exceed OSHA limits of 0.1 ppm. Another disadvantage of using ozone is that it is highly corrosive to equipment, including rubber and some plastics.

Table 1. Sanitizing chemicals for packinghouses.

Compound	**Advantages**	**Disadvantages**
Chlorine	Relatively inexpensive.	Corrosive to equipment.
(Most widely used sanitizer in packinghouse water systems.)	Broad spectrum - effective on many different microbes.	Sensitive to pH. Above or below 6.5 to 7.5 reduces activity or increases noxious odors.
	Practically no residue left on the commodity.	Can form small amounts of potentially carcinogenic compounds (e.g. trihalomethanes).
		Can irritate skin and damage mucous membranes.
Chlorine Dioxide	Has 2.5 times the killing power of chlorine.	Must be generated on-site.

	Activity is much less pH dependent than chlorine.	Greater human exposure risk than chlorine. Off-gassing of noxious gases is common.
	Does not form trihalomethanes like chlorine.	Concentrated gases can be explosive.
Peroxyacetic acid	No known toxic residues or byproducts.	Activity is reduced in the presence of metal ions.
	Produces very little off-gassing.	Concentrated product is very toxic to humans.
	Less affected by organic matter than chlorine.	Sensitive to pH. Greatly reduced activity at pH above 7-8.
	Low corrosiveness to equipment.	
Ozone	No known toxic residues or byproducts.	Must be generated on-site.
	Can reduce pesticide residues in the water.	Ozone gas is toxic to humans. Off-gassing can be a problem.
	Less sensitive to pH than chlorine (but breaks down much faster above ~ pH 8.5).	Treated water should be filtered to remove particulates and organic matter.
		Very corrosive to equipment (including rubber and some plastics).
		Highly unstable in water - half life ~ 15 minutes; may be less than one minute in water with organic matter or soil.
Note: Although **Quaternary Ammonia** is an effective sanitizer with useful properties and can be used to sanitize equipment, it is **not registered for contact with food.**		

(Ritenour, Sargent and Brecht, Vegetarian 00-01)

Vegetable Gardening

Top Ten Vegetables of the 20th Century

Just about everyone has their list of top tens – of athletes, movies, actors, news stories, or whatever. So I thought I would compose a list of the top ten vegetables that have been the most popular or important to vegetable gardeners in Florida over the past 100 years. Please bear in mind that my career as Extension vegetable specialist covers only 38 years of that period, however, I am looking at old gardening records, especially during the thirties through fifties.

First, I will list the 10 most important crops. It seems customary to begin with the 10th on the list, then build toward Number One. I guess anyone could make a case for almost any one of these as their all-time favorites, or add some not on my list. Anyway, here goes.

Table 1. Top-ten vegetables for the 20th century.

Rank	Vegetable	Leading variety	Worst problem
10	Collard	Georgia strains	Leaf-feeding larvae
9	Pepper	Early Calwonder	Mosaaic virus
8	Lettuce	Great Lakes	Climatic stress
7	Peas, Southern	California Blackeye	Cowpea curculio
6	Radish, summer	Early Scarlet Globe	Poor root formation
5	Squash, summer	Summer Crookneck	Poor fruit set
4	Cucumber	Poinsett	Downy mildew
3	Corn, sweet	Silver Queen	Corn earworm
2	Potato, Irish	Sebago	Seed-piece rot
1	Tomato	Better Boy	Blossom drop and blossom-end rot (tie)

(Stephens, Vegetarian 00-01)

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