August 18, 1980

Prepared by Extension Vegetable Crops Specialists

D.N. Maynard
Chairman

James Montelaro
Professor

Mark Sherman
Assistant Professor

R.K. Showalter
Professor

W.M. Stall
Associate Professor

J.M. Stephens
Associate Professor

TO: COUNTY EXTENSION DIRECTORS AND AGENTS (VEGETABLE AND HORTICULTURE) AND OTHERS INTERESTED IN VEGETABLE CROPS IN FLORIDA

FROM: J.M. Stephens, Extension Vegetable Specialist

VEGETARIAN NEWSLETTER 80-8

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NOTE: Anyone is free to use the information in this newsletter. Wherever possible please give credit to the authors.
I. NOTES OF INTEREST

A. "VEGETARIAN" MAILING LIST UPDATE

Postal regulations require that we update the newsletter mailing list annually. If you wish to continue receiving the "Vegetarian", please complete the enclosed card and return by September 30.

(Stephens)

B. NEW PUBLICATION

A research report titled, Lettuce Evaluation, has been prepared by J.M. White, Sanford AREC. Copies are available from Sanford AREC or the Vegetable Crops Department as Research Report CF 80-8.

(Maynard)

C. VEGETABLE CROPS FACULTY

Dr. Thomas E. Humphreys joined the Vegetable Crops Department on July 1 after many years on the faculty of the Botany Department in IFAS. Tom will have a full time research appointment working on mechanisms involved in sugar transport in vegetables. We're pleased to welcome Tom to the Vegetable Crops group.

(Maynard)

D. DIAL MARKET NEWS

Market news is just a dial away and available 24 hours a day for many buyers and sellers of farm products. Below are numbers of automatic telephone answering devices for market news information.

FLORIDA

<table>
<thead>
<tr>
<th>Location</th>
<th>Number</th>
<th>Product/Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belle Glade</td>
<td>(305) 996-0235</td>
<td>Vegetables (Oct.-June)</td>
</tr>
<tr>
<td>Fort Myers</td>
<td>(813) 332-2114</td>
<td>Citrus &amp; Vegetables (Oct.-June)</td>
</tr>
<tr>
<td>Fort Pierce</td>
<td>(305) 465-5239</td>
<td>Citrus &amp; Vegetables (Oct.-June)</td>
</tr>
</tbody>
</table>
THE VEGETARIAN NEWSLETTER

Immokalee (813) 657-2793 Vegetables & Watermelons (Oct.-June)
Miami (305) 666-7106 Fruits & Vegetables (all year)
Seffner (813) 621-4241 Fruits & Vegetables (all year)
Winter Park (305) 628-0319 Citrus & Vegetables (all year)
Plant City (813) 754-2826 Vegetables & Watermelons (Jan.-June)
Pompano Beach (305) 946-4343 Vegetables (Oct.-May)
Palatka (904) 328-6668 Cabbage & Potatoes (Jan.-June)
Trenton (904) 463-2427 Watermelons (May-June)
Quincy (904) 875-2414 Vegetables & Watermelons (May-July)
(Agricultural Outlook, June 1980)

E. SOUTH FLORIDA TOMATO GROWERS INSTITUTE PROGRAM

NINETEENTH ANNUAL SOUTH FLORIDA TOMATO GROWERS INSTITUTE

September 11, 1980
Palm Beach County Agriculture Center
531 North Military Trail
West Palm Beach, Florida

Program Coordinator - Raleigh S. Griffis
Extension Agent - Palm Beach County

9:15 REGISTRATION
9:30 INTRODUCTIONS & REMARKS
   Clayton E. Hutcheson, Extension Director, Palm Beach County
9:40 IFAS TOMATO RESEARCH
   Dr. D.N. Maynard, Chairman, IFAS Vegetable Crops Department
9:55 PANEL DISCUSSION OF TOMATO IPM
   Dr. K.L. Pohronezny - AREC Homestead
   Dr. D.S. Schuster - AREC Bradenton
   Growers
THE VEGETARIAN NEWSLETTER

11:00  EFFECTS OF POTASSIUM, CULTIVAR AND SEASON ON TOMATO BLOTCHING, RIPENING AND GRAYWALL
       Mr. Dave Picha, Graduate Student, IFAS-Gainesville

11:20  VARIETY RELEASES
       Dr. W.E. Waters, Director-ARC Bradenton

11:35  FLOW THROUGH ETHYLENE GASSING SYSTEM FOR TOMATOES
       Dr. D.D. Gull, IFAS-Gainesville

11:50  LEGISLATIVE ACTIVITY - Washington - Tallahassee
       Mr. Wayne Hawkins, Manager of Florida Tomato Committee

12:05  BOX LUNCH
       Courtesy of Mr. Dwight Smith of W.R. Grace & Company

1:30   INTERACTION OF VARIETIES, PLANTING DATES AND NUTRITION
       Dr. P.H. Everett - ARC Immoklee

1:50   NUTRIENT AND WATER INGREDIENTS FOR MAXIMUM PRODUCTION EFFICIENCY
       Dr. C.M. Geraldson, AREC Bradenton

2:10   CULTURAL PRACTICES FOR MACHINE HARVEST ON MULCHED BEDS
       Dr. H.H. Bryan, AREC Homestead

2:45   REDUCTION OF TOMATO BACTERIAL SPOT BY HYPOCHLORITE TREATMENT
       Dr. R.T. McMillan, Jr., AREC Homestead

3:00   BIOASSAY PLANTS FOR NEMATODE DETECTION
       Dr. R.T. McSorley - AREC Homestead

3:15   QUESTION AND ANSWER SESSION
       Mr. Raleigh S. Griffis, Extension Agent, Palm Beach County
A. DRIP IRRIGATION

There has been renewed interest in several areas of the state in the use of drip irrigation on vegetables. In switching from the present irrigation system in the field to drip, there are several factors that must be addressed. Questions arise on the installation and use of drip; the following may help answer some of these questions.

A drip system includes a main line from the pump, filters, fertilizer and chlorine injectors, sub mains or laterals, drip line, and necessary fittings.

The initial cost will run approximately $500.00 to $550.00 per acre. The filters, injectors, main and lateral lines and the fittings normally are used over a five year period with special maintenance. The drip lines are not reused. The drip lines themselves cost from 2 to 3 cents a running foot. The total cost per acre will depend on the crop grown, between row spacings and replacement needs.

Water Pressure

Water pressure in the main lines varies from 14 to 40 psi and in the drip lines from 4 to 14 psi depending on which drip system is used. Keeping a constant pressure in the drip lines is important and is the function of the sub mains or lateral lines. Because of this pressure regulation, drip irrigation can be used on relatively uneven fields. Each manufacturer has specifications on the engineering of their system.

Water Quality

The water source used in drip irrigation systems varies. If the water is drawn from wells, and is free of high mineral content such as iron, a simple screen filter can be used. If the water is drawn from surface reservoirs such as ponds and ditches, one or two sand filters must be employed to remove fine silt or organic matter that can plug the drip lines. All systems must have a method of injecting chlorine into the system to keep algae and slime bacteria from clogging the lines. (The use of chlorine will be explained in a coming article).

One of the distinct advantages of drip irrigation is that water with a higher salt content can be used.
Fertilizer

The fertilizer can be applied with drip irrigation. All the initial phosphate and minor elements should be added in the bed along with a starter amount of N and K. If the irrigation water has a high pH, most phosphate sources should not be injected. Aluminum and other impurities in the phosphate will precipitate and clog the line. Nitrogen and potash then can be injected through the system to give a high degree of control of the plant growth.

The placement of the dry fertilizer has not yet been worked out for all areas. Incorporation of these nutrients into the bed has been shown to be better than banding in some cases. If fertilizer bands are used, placement must be within the wetting pattern.

Soil Types

The use of drip irrigation has been shown to increase yields of vegetables grown in the rock soils of Dade county. In these soils the water distributes to form a good root wetting pattern in the beds. In some sand areas, however, the wetting pattern is not as wide.

Initial research at several locations indicates that intermittent watering gives a better soil moisture pattern, and equal to higher yields have been obtained with drip irrigation as compared to other irrigation methods.

To properly use drip irrigation, it must be considered an integral part of the crop management system. It cannot be turned on and forgotten.

For anyone considering trying drip for the first time, it is suggested that it be installed on a small trial basis only.

III. HARVESTING AND HANDLING

A. IS COOLING WORTH THE ENERGY?

Temperature control is the most important tool at the disposal of produce handlers. From the quality maintenance perspective, the benefits of cooling are unquestionable. These benefits include reductions in respiration rates, water loss, ripening rates, and decay problems. Thorough cooling of a product to its lowest safe temperature (see table 1) immediately after harvest, and subsequent handling in
marketing channels at this temperature results in the maximum shelf-life. Maintenance of the proper product temperature from producer to the consumer requires the conscientious effort of many different individuals. This effort involves the consumption of energy, the cost of which is still increasing. From the handler's perspective, one might ask, "Is it worth the energy?"

The answer to this question is yes. California estimates place the amount of energy consumed in cooling at less than 1% of the total energy used producing and marketing a fresh vegetable. Data for Florida vegetables presented in Table 2 was calculated by Jerry Gaffney, Agricultural Engineer, with the U.S.D.A., Gainesville. On the average cooling, energy amounts to only one half of one percent of the total consumption. Proper temperature management may be viewed as cheap insurance protecting the total energy investment. Decisions concerning product temperatures are among the most critical management decisions facing produce handlers. From both the energy and quality standpoint, proper cooling is worth the energy.

1The subject of product temperature management was reviewed by Kasmire in the February, 1980, Vegetarian Newsletter. (Sherman)

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Safe storage temperature (°F)</th>
<th>Commodity</th>
<th>Safe storage temperature (°F)</th>
<th>Commodity</th>
<th>Safe storage temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artichoke, globe</td>
<td>32</td>
<td>Garlic</td>
<td>32</td>
<td>Parsnip</td>
<td>32</td>
</tr>
<tr>
<td>Artichoke, Jerusalem</td>
<td>31-32</td>
<td>Ginger</td>
<td>55</td>
<td>Peas</td>
<td>32</td>
</tr>
<tr>
<td>Asparagus</td>
<td>32-36</td>
<td>Horseradish</td>
<td>30-32</td>
<td>Peppers, sweet</td>
<td>45-50</td>
</tr>
<tr>
<td>Bean, Lima</td>
<td>32-40</td>
<td>Kale</td>
<td>32</td>
<td>Potatoes&lt;sup&gt;1&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Bean, snap</td>
<td>40-45</td>
<td>Kohlrabi</td>
<td>32</td>
<td>Pumpkins</td>
<td>50-55</td>
</tr>
<tr>
<td>Beets, bunched</td>
<td>32</td>
<td>Leek</td>
<td>32</td>
<td>Radish</td>
<td>32-55</td>
</tr>
<tr>
<td>Broccoli</td>
<td>32</td>
<td>Lettuce</td>
<td>32</td>
<td>Rhubarb</td>
<td>32</td>
</tr>
<tr>
<td>Brussels sprouts</td>
<td>32</td>
<td>Melons</td>
<td>36-40</td>
<td>Rutabaga</td>
<td>32</td>
</tr>
<tr>
<td>Cabbage</td>
<td>32</td>
<td>Muskmelons (3/4 slip)</td>
<td>36-40</td>
<td>Salsify</td>
<td>32</td>
</tr>
<tr>
<td>Cabbage, Chinese</td>
<td>32</td>
<td>Muskmelon (full slip)</td>
<td>32-35</td>
<td>Spinach</td>
<td>32</td>
</tr>
<tr>
<td>Carrots, topped</td>
<td>32</td>
<td>Casaba</td>
<td>45-50</td>
<td>Squash, summer</td>
<td>32-50</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>32</td>
<td>Crenshaw</td>
<td>45-50</td>
<td>Squash, winter</td>
<td>50-55</td>
</tr>
<tr>
<td>Celeriac</td>
<td>32</td>
<td>Honey Dew</td>
<td>45-50</td>
<td>Sweet potato</td>
<td>55-60</td>
</tr>
<tr>
<td>Celery</td>
<td>32</td>
<td>Persian</td>
<td>45-50</td>
<td>Tomato, mature green</td>
<td>50-70</td>
</tr>
<tr>
<td>Collards</td>
<td>32</td>
<td>Watermelon</td>
<td>40-50</td>
<td>Tomato, firm-ripe</td>
<td>45-50</td>
</tr>
<tr>
<td>Corn, sweet</td>
<td>32</td>
<td>Mushroom</td>
<td>32</td>
<td>Turnip</td>
<td>32</td>
</tr>
<tr>
<td>Cucumber</td>
<td>45-50</td>
<td>Okra</td>
<td>45-50</td>
<td>Turnip greens</td>
<td>32</td>
</tr>
<tr>
<td>Eggplant</td>
<td>45-50</td>
<td>Onion</td>
<td>32</td>
<td>Watercress</td>
<td>32-35</td>
</tr>
<tr>
<td>Endive &amp; Escarole</td>
<td>32</td>
<td>Parsley</td>
<td>32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>1</sup>Winter and spring-harvested potatoes are usually not stored. However, potatoes for fresh market can be stored at 50°F for 2 to 3 months without curing. Storage temperatures near 70°F are required for chipstock potatoes.

<table>
<thead>
<tr>
<th>Source</th>
<th>BTU/lb</th>
<th>% TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>2722</td>
<td>29</td>
</tr>
<tr>
<td>Harvesting and Packing</td>
<td>1445</td>
<td>16</td>
</tr>
<tr>
<td>Transportation</td>
<td>1233</td>
<td>13</td>
</tr>
<tr>
<td>Wholesaling</td>
<td>1366</td>
<td>15</td>
</tr>
<tr>
<td>Retailing</td>
<td>2558</td>
<td>27</td>
</tr>
<tr>
<td>TOTAL</td>
<td>9324</td>
<td>100</td>
</tr>
<tr>
<td>Cooling (from harvesting &amp; packing through retailing)</td>
<td>45</td>
<td>0.5</td>
</tr>
</tbody>
</table>

(Sherman)

B. CARROT QUALITY AND CONSUMPTION TRENDS

Carrots are nutritious and lead all major vegetables in vitamin A. Indians liked carrots so well they would steal them from the early settlers gardens when they stole nothing else. However, popularity and per capita consumption have declined from 11.7 lbs. in 1945 to 7.3 lbs. in 1958, and down to 5.7 lbs. in 1978. Florida produced few carrots until recent years. Our production has increased to about 10% of the U.S. supply in winter and spring with 1,177,000 cwt being produced last year. 74% of these Florida carrots were shipped for fresh use and 26% for processing. 17% of the fresh market carrots were the mini-type.

Carrot harvesting, handling and packaging are highly mechanized. Tops are cut off in the field and the roots are transported to a packinghouse for washing, sizing, grading and packaging in plastic bags of 1 or 2 lb. capacity. Recently adopted automatic packing equipment provides more uniformly weighed carrots at less labor cost.

Carrots are generally harvested before reaching full maturity because they are more tender, have a brighter orange color and the flavor is more mild. Carrots of good quality should be sweet, firm, fresh, smooth, well-colored and well-shaped with no forking.
deeper the orange color, the more vitamin A in the carrot. Undesirable characteristics include poor top trimming, regrowth of tops, growth cracks, sunburn and green color at the stem end. Carrots that are limp, flabby, soft, shriveled, tough, bitter or decayed are highly undesirable.

When handled properly, carrots can be stored at 32°F and 95% RH for several weeks or months depending upon maturity and local conditions. Mature carrots store longer than those harvested immature. Carrots can lose moisture rapidly if the tops are not cut off and the roots protected with suitable packaging. Bitter flavors develop from ethylene given off by other nearby commodities.

Carrots are harvested in the U.S. in all months. They are easy to prepare by merely washing, scraping, peeling, cutting into sticks or shredding, they are low in calories with only 42 calories per 100 grams, and yet consumption has declined 22% in the last 20 years. Recent surveys of food preferences in away-from-home dining show carrots with a low rank among vegetables. Bitter, disagreeable flavors have been blamed for their decreasing popularity.

Carrots breeders are emphasizing better flavor in their development of new hybrid varieties, but selection based only on higher soluble solids is not sufficient for eating quality improvement. A recent study involving varieties grown in Florida, Texas and California showed that carrot flavor was influenced by genetic and environmental factors. Flavor differences within roots indicated selection for reduced core size would improve eating quality. New higher quality varieties are urgently needed.

Carrot consumption may also be increased by adding carrot sticks to school lunch menus. In a recent U.S.D.A. test, 140 tons of Florida carrots were distributed in 2,000 schools and the response was very good with requests for more.

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(Showalter)
A. SEWAGE SLUDGE: BENEFITS AND HAZARDS FOR GARDENERS

As energy costs increase and availability of raw materials decrease, efforts to conserve energy and recycle waste materials have gained momentum. Horticulture, including vegetable gardening, is in a unique position to utilize waste materials such as sewage sludge which might otherwise become environmental problems. The vast quantities of sludge generated by our people represent a valuable source of organic fertilizer for growing plants.

However, it is well known that sludges contain heavy metals and other potentially toxic materials that would contaminate soils and food crops. With awareness of energy shortages and pollution abatement coming at a time of heightening concern for the quality of food that we eat, it is no surprise that a great deal of horticultural research is being aimed at the recycling of human and other wastes for crops production.

A recent report by the U.S.D.A. summarized of the annual production of various kinds of organic wastes in the U.S. About 75% of the 730 million dry tons of waste is generated equally by crop residues and animal manures. A general breakdown of municipal garbage is: 8% plastics, 13% glass, 5% stone, 50% metals and papers, 22% other organics. Sewage sludge comprises only about 5% of the total organic waste available from all sources and only about 1/4 of this is currently being utilized.

The benefits of using organic wastes on land for crop production have long been known. The most notable of these benefits are: (a) improved water movement into the soil; (b) increased soil capacity to hold more water; (c) improved soil aeration; (d) increased rooting depth; (e) less water run-off and erosion problems; (f) supply needed plant nutrients, both major and micronutrients, in a slow release form.

Nutrient Composition of Sewage Sludge (Page, Univ. Cal., Riverside)

<table>
<thead>
<tr>
<th>Nutrient %</th>
<th>Min.</th>
<th>Max.</th>
<th>Ave.</th>
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</thead>
<tbody>
<tr>
<td>N</td>
<td>1.0</td>
<td>10.0</td>
<td>3.0</td>
</tr>
<tr>
<td>P</td>
<td>1.0</td>
<td>6.0</td>
<td>1.5</td>
</tr>
<tr>
<td>K</td>
<td>0.05</td>
<td>1.0</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

From the above table it is obvious that the supply of nitrogen, phosphorus and potassium in sewage sludge is rather low. For example, the N-P-K ratio of undigested sludge composted at the U.S.D.A. research center at Beltsville, Maryland was 1.6% N, 1.0% P and 0.2%
Only 20% of the plant nutrients are mineralized (released) in the first year of application, and of this, half of the nitrogen is lost to the air through ammonization. Most sewage sludges would not be a good source for potassium and large amounts would have to be applied to meet crop growing needs.

The dollar values for the major nutrients have been calculated on the basis of content and current prices of the inorganic fertilizers. (Page: ASHS: Fort Collins, Colorado, 1980) valued nitrogen in sludge at $4.60 per ton; phosphorus at $15.20 per ton; and potassium at $.58 per ton.

The trace and micronutrient effects of sludge can be described as (a) plant deficiency corrective, (b) phytotoxic and (c) diet toxic. Among the necessary micronutrients available from most sludges are sulfur, boron, calcium, copper, magnesium, managanese, iron, molybdenum and zinc. The elements posing potential hazard to plants due to excess amounts (phytotoxic substances) are copper, boron, chromium, nickel and zinc. The element cadmium (Cd) poses far the greatest danger to humans through consumption of plants grown with sludge fertilizer.

The amount of Cd in sewage sludge varies greatly with the source of the sludge, being highest from industrial cities. It may vary from 5 to 500 ppm, with the average being 15 ppm. The Food and Drug Administration daily allowances set a limit of 70 micrograms per day (adult intake). Studies have shown that Cd does increase in plants grown on sludge amended soils, so there does exist a potential danger from Cd.

One area where sludge amended soil media might be used safely is for growing vegetable transplants. Studies have shown that although Cd levels increased in transplants grown on sludge-amended media, there were no increases in the edible portions of tomato, cabbage and muskmelon plants at harvesting.

Due to the possible hazards associated with sludge, the EPA is in the process of drawing up guidelines for the use of sludge. The exact nature of the general recommendations for the use of sludge on food crops are not known at this time. Until such time that adequate guidelines are drawn up, it is advisable that gardeners should restrict the use of sewage sludge to non-food chain plants such as ornamentals and lawns. Much progress is being shown with the handling and processing of sewage sludge prior to its usage. Composting of sludge is one of the latest developments and will be discussed in a later article.

(Stephens)
B. KNOW YOUR MINOR VEGETABLES - MUSHROOM

The mushroom (Agaricus campestris and Agaricus bisporus) is classified as a fungus which grows upon decaying organic matter. Mushrooms are incapable of producing their own food. They cannot use the energy of sunlight as green plants do. Their "food" consists of carbohydrates and proteins produced during the fermentation and decomposition of organic material.

Like many vegetable crops, strains of A. campestris and A. bisporus vary in growth habit, color, yielding ability and other characteristics. The most common variation is color, and three groups - the whites, creams and browns - are recognized. Actually, the cultivated mushroom is a horticultural adaptation of the common field mushroom which is found in pastures and grassy places.

The edible part of the mushroom is the "toadstool" fruiting body or reproductive part of the plant. The main body of the fungus is the mass of fine thread-like white growth that can be seen throughout the composted material on which the mushroom is feeding. This mass of absorbing vegetative parts is called "mycelium".

The edible reproductive part consists of a stem and cap. "Gills" are found on the underside of the cap. These are arranged somewhat like spokes in a wheel and on them are borne the multitude of spores which start new plants. When the mushroom first appears above ground, it looks like a button, so small ones are harvested and called "buttons".

A spore is an asexual "seed" which contains no endosperm. In order to produce a new plant body, a spore must land on some kind of organic material that is in the right stage of decomposition to provide food for the germinating spore.

Climatic Response

Mushrooms grow best in a moist, cool, well ventilated place. Temperatures need to be controlled within a range from 50° to 70°F. Humidity must be maintained above 70% R.H., or mushrooms tend to dry out and split.

Culture

Compared with the culture of other vegetables, the production of mushrooms is fairly complicated.

Mushrooms are best grown indoors in trays or beds filled with an organic planting medium (compost). Horse manure has long been used, but other materials are suitable. Some materials which have been used
alone or in combination with horse manure are alfalfa hay, corn cobs, cornstalks, straw, sawdust, dried brewe'r's grains and poultry manure. Here are the usual steps taken to grow mushrooms.

Step 1. Composting. Trays are filled with fresh compost, which is allowed to ferment at 140°F for four to six days (or until odor of ammonia disappears). Trays are then moved to a well-ventilated, 75-80°F room for "spawning" (planting spores). This temperature should be 75° to 80°F.

Step 2. Spawning. Spawn is the propagating material for mushrooms. It contains spores and spawning materials such as manure, tobacco stems, or grain. Spawn most often purchased from speciality spawn makers. Spawn is planted either by the broadcast method or by planting in small pieces 1 1/2 inches deep at 10 inch intervals. With temperatures held at 70°F, the cottony growth of mushroom spawn is allowed to grow through the upper 3 inches of the bed of compost.

Step 3. Casing. After two or three weeks of growth, a one inch layer of "casing" soil is spread over the surface of the bed. Generally, a not-too-sandy loam is preferred. The casing soil helps hold in gasses.

Step 4. Growing. After casing, trays should be kept at 50°F to 62°F and kept sprinkled until the first tiny mushrooms appear in about three to four weeks. After that, watering is done only as needed.

Step 5. Harvesting. Picking may commence at the first signs of buttons, and last for 6 or 7 weeks or longer. Each mature mushroom is between 1 and 2 inches in diameter. Harvesting may be done daily or every few days, depending on the occurrence of the mushrooms.

Small home units may be started by purchasing ready-to-grow kits from major vegetable seed companies. Larger quantities of spawn are available from some of these seed companies and from companies which specialize in producing spawn.

For more information on mushrooms, copies of "Producing Mushrooms in Florida", VC 73-1, by G.J. Stout and D.E. Buffington, are available from the Vegetable Crops Department.

(Stephens)