VEGETABLE CROPS DEPARTMENT

The VEGETARIAN Newsletter

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Prepared by Extension Vegetable Crops Specialists

George A. Marlowe, Jr.  James Montelaro
Chairman                  Professor

J. M. Stephens            J. R. Hicks
Assistant Professor       Assistant Professor

S. R. Kostewicz
Assistant Professor

R. K. Showalter
Professor

D. D. Gull
Associate Professor

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

FROM: James Montelaro, Vegetable Crops Specialist

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A. Seasonal Influence on Crop Maturity

Florida vegetable growers have experienced two distinct situations in the last two growing seasons. The 1970-71 season was one in which crops were harvested 2 to 3 weeks later than when they were expected. On the contrary, in the 1971-72 season, crops were harvested 2 to 3 weeks earlier than had been planned. This wide variation emphasizes the influence the season can exert on plant growth.

The general response of plants to unfavorable conditions is a slowing in the rate of growth until more optimal conditions prevail. The resumption of the rate of growth is slow and can be compared to the regaining of momentum of a temporarily slowed flywheel. The length of this "lag period" is determined by the severity and duration of the unfavorable conditions. It is this period of slowed growth that results in differences between calendar and physiological age of plants.

Temperature, all other factors being equal, exerts the most pronounced effect on plant growth. Moderate changes in temperature can exert pronounced changes in the growth rate. If we consider the temperature range of the last two seasons, we find that 1970-71 was a cool, wet season. The 1971-72 season has been a warm, moderate season. The cool weather of 70-71 resulted in slow growth of the crops which extended the period from planting to the desired harvest stage. Result: Harvest 2 to 3 weeks later than expected. The warm weather of the 71-72 season is allowing continuous rapid growth of the crops following planting. Result: Harvest 2 to 3 weeks earlier than when expected. This variation is seasonal temperatures is one of the difficulties in predicting when a crop will be ready for harvest.

One method of measuring desired maturity, the linear heat unit system, has been used with some success for many years by growers for certain crops which change quite rapidly in quality after an optimal stage. The method utilizes a system which keeps a summary of "heat units" during the season and harvest takes place after a certain number is accumulated. The linear heat unit system, however, is not readily adaptable to all crops.

Most crop production has relied on the calendar age method of determining when to harvest. That is, crop X is supposed to reach desired maturity in Y number of days. But as the results of the last two seasons have shown, this can be misleading. There are varieties within any given crop that are classified early, midseason, or late maturing. It is possible to find specific numbers of days listed for a variety indicating when it will reach maturity. It often is possible to find different numbers of days listed for the same variety but which are from different sources. Why the variation?

It is important to know and remember that these values are not absolute. They usually have been derived from averages of a number of seasons. One further aspect to remember is that the average season in one area will be different from another area. Thus, the performance of a variety may differ from its "advertised" value due to a difference in season from where the seed was produced and evaluated versus where the production area might be.
Another factor to consider is how the "average" was derived. That is; is the value an average of the early and late seasons over the years, or is it an average of only the early seasons over the years? This type of information is relatively hard to obtain.

One of the important functions of a variety trial program is to evaluate how varieties perform under conditions of a specific area. Thus, a "hot" variety from another area may not be as desirable as "standard" varieties of the local area.

Desired maturity is directly influenced by the effects of the season on growth and the reliance on absolute calendar age is misleading and incorrect. The primary seasonal attribute influencing crop maturity is that of temperature in terms of its regulation of the growth processes of plants.

(Kostewicz)

B. Pinworm on Tomatoes

Tomato pinworm (Keiferia lycopersicella Busck) has been reported over the years as a pest of greenhouse tomatoes in the north. It is a field pest of tomato in southern California, Mexico and other Latin-American countries.

Recently, we have had several reports of severe tomato pinworm infestations in greenhouses in north and central Florida. A home garden plot of tomatoes in Tampa was reported destroyed by this insect. The gardener, a professional entomologist, made a positive identification of the pest. It was tomato pinworm.

The U. S. Department of Agriculture Farmers' Bulletin 2045 describes the worm and the damage it does as follows:

"The tomato pinworm is a small caterpillar about ¼ inch long, with a slender yellow or ash-gray body bearing dark-purple spots and with a light-brown or yellow head. It feeds on the foliage of tomatoes and burrows into the fruit around and under the stem, causing small pinholes."

Tomato pinworm has been observed in Florida tomato fields in limited numbers. Growers should keep a lookout for it, as it is possible for it to become a serious tomato pest in the future. Tomato pinworm has been reported to attack potatoes, eggplant and certain weeds closely related to the tomato family.

In the meantime, greenhouse operators are advised by Mr. James Brogdon, Extension Entomologist, to use the insecticide Sevin on a weekly basis when tomato pinworm invades their greenhouse tomato crop.

(Montelaro)

C. Late Blight on Tomatoes and Potatoes

The February issue of the "Vegetarian Newsletter" carried an article on late blight control after receiving reports of the seriousness of the disease this season. A follow-up survey was made by the vegetable specialist and county agents from Palm Beach and Dade Counties. The disease was found to be very serious on tomatoes in Palm Beach County and serious on potatoes (not on tomatoes) in Dade County.
All involved in the problem are convinced more than ever that the reason for failure in control of late blight is poor application techniques. In Dade County, the Agricultural Extension Agent's Office teamed up with Plant Pathologists from the Experiment Station in an attempt to deal with the problem. Late blight control was discussed in detail by Dr. Conover and Dr. McMillan at a meeting held for tomato and potato growers in Homestead. The points covered by Dr. Conover are summarized in a mimeo he prepared for the meeting. It covers the subject from A to Z including such topics as speed, droplet size, pressure, nozzle numbers, arrangement and size, gallonage, frequency of application, etc. Every tomato and potato grower (as well as producers of other vegetables) could benefit tremendously from this report. Anyone wanting a copy can request one from this office.

(Montelaro)

D. Lettuce Mosaic Control

Lettuce mosaic is a virus disease which has been a serious problem at certain times on all lettuce types in the major producing areas in Florida. It also attacks escarole and endive. This disease is unique in that the main source of inoculum is from seed and not maintained locally in wild hosts. According to Dr. Tom Zitter, Experiment Station Virologist at Belle Glade, it may be possible to reduce the incidence of lettuce mosaic significantly by:

1) eliminating the source of inoculum which is introduced by the seed, and
2) use of good cultural practices whereby infested crop residues are destroyed shortly after harvest.

Growers from the Sanford-Zellwood and Belle Glade areas working with the Institute of Food and Agricultural Sciences and Florida Department of Agriculture representatives are now formulating plans to put the above ideas into practice. Similar programs have proved to be 85 to 90% successful over a period of years in California. Those interested in lettuce production will be kept informed of developments in this program through the medium of this newsletter or they may write this office directly.

For the present, lettuce growers are advised to buy the best quality lettuce seed available. Seed that has been tested and found essentially free of mosaic (0 in 30,000 seeds) are available for some varieties of lettuce. Even though it is more costly, we consider it to be a very worthwhile investment. In addition, lettuce growers should destroy all lettuce crop residues as soon after harvest as possible.

(Montelaro)
II. HARVESTING AND HANDLING

A. Controlled Ripening of Florida Tomatoes

During the last three years, there has been a transition from shipping green tomatoes to northern ripening rooms to grower-level ripening in specially constructed ethylene treatment rooms.

The use of volatiles to promote ripening of certain fruits dates from the ancient Chinese. As early as 1925, it was demonstrated that ethylene, at concentrations of as low as 250 ppm, caused acceleration of tomato ripening.

Ethylene is a naturally occurring gas. It is non-poisonous but flammable and explosive in concentrations from 30,000 to 280,000 ppm. However, at the concentrations which are effective in fruit ripening, ethylene may be handled with complete safety if simple precautions are taken while the gas is being admitted to the treatment chambers. These precautions include elimination of open flames, no smoking, and exclusion of equipment capable of producing sparks.

The tomato fruit is a living product, and a minute quantity of ethylene is produced during growth and maturation. At the advanced mature-green stage, the production of ethylene is greatly accelerated and, therefore, the tomato will ripen naturally. The addition of external ethylene at this stage of development will not affect the rate of ripening. Ethylene applied to less mature tomato fruits (those which have not developed sufficient ethylene to initiate ripening) will cause an immediate initiation of color development and other ripening processes. Within any given box of green tomatoes, there will be fruit of varying physiological age and, therefore, variation in the rate of ripening. Application of ethylene will initiate ripening of those less mature fruit and, therefore, result in a pack of more uniform coloration.

1. Recommendation for Treatment

Only tomatoes that are fully mature-green as commercially feasible should be placed in a gas-tight room where a temperature of 68-72°F can be maintained. The relative humidity within the room should be maintained at about 90%. Ethylene should be injected into the room at a concentration of 1000-2000 ppm and circulated with internal fans. Ethylene will soon come to equilibrium with the air, and because of its diffusibility it will permeate inside of the stacked boxes of tomatoes. The duration of gassing should be from 24 to 72 hours depending upon response of the tomatoes. Weather conditions during growth, cultural practices, maturity, and temperature all affect the ripening response; therefore, all lots of tomatoes will not react the same.

During the gassing operation, the respiring fruits are consuming oxygen and evolving carbon dioxide. In these gas tight rooms, the carbon dioxide level can increase to 3% in less than 12 hours. High levels of carbon dioxide have an inhibitory effect upon ethylene-induced ripening. Laboratory tests are being conducted to determine carbon dioxide level which interferes with tomato ripening. Accumulation of carbon dioxide in ripening rooms can be reduced by operation of a carbon dioxide "scrubber." Such scrubbers are routinely used in
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controlled-atmosphere storage of apples. However, due to excessive amounts of carbon dioxide being evolved by the tomatoes, a "flow-through" or "trickle" system would be far more economical. It is a common commercial practice to gas tomatoes for 12-24 hours, then open the rooms and inspect the fruit; tomatoes may be regassed for 24-hour intervals once or twice more depending upon coloration of the fruit. At the recommended ethylene concentration and use of a scrubber, rooms could be entered for fruit inspection without having to regass afterward.

In commercial gassing rooms, ethylene is most easily metered on a weight basis. A room having a volume of 1000 cu. ft. would require 1.25 ounces of ethylene to obtain the desired 1000 ppm concentration.

2. Precautions

A high quality tomato must possess more than good external appearance. Suitable acidity, sugars, and the flavor volatile content are characteristics that account for repeat sales by the consumer. Immature tomatoes do not possess these desirable characteristics, nor will they develop during the ripening process. Gassing and sale of underdeveloped fruits will only result in consumer dissatisfaction and enhancement of purchasing of more desirable tomatoes from competing areas or utilization of substitute products.

If additional information is desired, contact D. D. Gull, Vegetable Crops Department, University of Florida, Gainesville, Florida, 32601.

(Gull)

B. Transpiration

Transpiration is water loss (or evaporation) from living tissue. This process is directly and indirectly responsible for a large portion of the difference between the amount of produce which is originally sold by the packer and the amount ultimately sold by the retailer. The direct loss is due to a reduction in quality. A wilted commodity (example, lettuce, cucumbers, carrots, etc.) simply does not have the appearance or texture (crispness) that is associated with high quality. This loss of quality often results in reduced prices, if the product can be sold at all. The indirect loss is much more discreet. Most fresh produce can lose 1 or 2% (some commodities can lose much more) of its total weight without noticeable effects, but there is a difference in the weight sold by the packer and the amount sold by the retailer.

Transpiration, like respiration, cannot be completely eliminated, but it can be controlled to some degree. Most fruits and vegetables contain between 80 to 90% water and the relative humidity in the air space within the commodity is maintained at or above 99%. Since water vapor, like other gases, tends to diffuse, or move from areas of high concentrations to areas of lower concentrations, there will be some water loss as long as the air surrounding the produce has a relative humidity of less than 99%. The recommended relative humidity for most fruits and vegetables is between 85 and 95%. Below 85%, transpiration is usually rapid enough to become a problem and above 95%, it is almost impossible to control the growth of molds and other organisms in the storage room. In addition, a tremendous amount of refrigeration coil surface is necessary to maintain a relative humidity above 95%. When air is cooled, the water holding capacity
of that air is reduced. This means that in a produce storage room operating at 33° F., the air returning to the refrigeration coils is probably a little above 33° and is saturated with water picked up from the produce. If the coil temperature of the refrigeration unit is 28°, that portion of the air (not all) which comes directly in contact with the coils will be cooled to 28° with the corresponding loss of water. This air will return to the room and remove heat from the 33° air, cooling it to about 32° and also remove moisture from the warmer air. This cycle repeats over and over with the moisture being picked up from the produce and deposited on the refrigeration coils. The closer the coil temperature is to the room temperature, the less drying effect there will be. However, the closer the coil temperature is to the room temperature, the greater the proportion of air which must come into direct contact with the coils and hence, the need for larger coil area.

In relation to refrigeration and yet from a different angle, when produce is stored in a refrigerated room, the room temperature also has a pronounced effect on transpiration. Fresh produce will lose moisture twice as fast at 50° as at 32° and twice as fast at 70° as at 50° at a relative humidity of 90%. Again, this is due to the greater moisture holding capacity of air at higher temperatures.

The rate of air movement has a tremendous influence on desiccation of fresh produce. As mentioned earlier, water vapor moves from areas of high concentration (in produce) to areas of lower concentration (air). However, gradients of varying moisture concentration will develop if the air flow is not too great. For example, the relative humidity in the produce may be above 99%, while at the surface of the produce it may be 99%. A little farther away, it may be 98% and so on until eventually, at some distance it will be 90% or at whatever the room is being maintained. However, if the air movement is rapid and flowing directly over the produce, the relative humidity will still be above 99% within the produce, but at the surface it can be 90% or lower depending on the relative humidity of the room.

Containers also play a role in transpiration of fresh produce. They can act in the beneficial manner described above of restricting air movement. They may also act in a detrimental manner by absorbing water from the produce. This problem can be reduced by using a container or liner that does not readily absorb moisture.

Waxing is another method of restricting air movement and reducing moisture loss. With waxing, as well as other types of restricting air movement, care must be taken to avoid creating a static system where there is no ventilation or air exchange.

The type of vegetable also determines how great a problem transpiration will be. Usually the greater surface area commodities have the greatest transpiration rates. Lettuce and other leaf crops are prime examples of high surface area commodities. In some commodities, such as radishes, carrots, etc., the tops, which readily lose water, are removed to prevent depleting water from the edible portion. Sweet corn is another example of the unedible portion being detrimental to the edible portion. With the shank intact, the outer husks on an ear of corn will remain green and turgid while another ear, with the shank trimmed, will show loss of color and wilting of the outer husks. With the shank intact, the husk has access to the moisture in the kernels. With the shank trimmed, the husk is on its own and consequently kernel denting is much slower.

(Hicks and Showalter)
A. Poultry Manure for Vegetable Crops

Wherever still available, poultry manure should be considered as a fertilizer and soil conditioner for vegetable gardens.

Studies were conducted on sandy soils at Auburn University in 1962-63 to determine the effects of using poultry manure alone and in combination with inorganic fertilizer. In 1968, the researchers, L. M. Ware and W. A. Johnson, published Bulletin 386, "Poultry Manure for Vegetable Crops."

Here in brief summary are a few findings of the Auburn study:

1. Rates of 3, 6, and 9 tons of poultry manure per acre gave equal increases in yields of the first crop of tomatoes. Thus, for a single crop on sandy soil, three tons of dried broiler manure per acre would give satisfactory yields.

2. Rates of 3 and 6 tons per acre were adequate for only the spring crop; however, the 9-ton rate gave suitable yields over a two-year period (a residual effect).

3. Best method of applying was broadcast rather than in the row. In all cases, manure was applied 3 weeks before planting; fertilizer was applied as 1,000 pounds of 6-6-6 at planting and repeated 4 weeks later.

4. Manure with commercial fertilizer gave higher yields than fertilizer without manure.

5. Treatments receiving both manure and commercial fertilizer did not give higher yields than those receiving manure alone either of the first two years. However, for the residual period of three years, the fertilizer plus manure gave higher yields than the manure alone.

6. Repeated applications of manure did not appreciably affect soil acidity. Repeated applications of commercial fertilizer increased soil acidity considerably.

B. Florida Garden Poultry Manure Recommendations

Based on the above study and other factors, the following suggestions are made for the use of poultry manure in Florida home gardens. Consideration has been given to the variability of manure due to type, age, and condition of bird; to the kind of feed used; to the age of degree of rotting of the manure; to the moisture content of the manure; and to the kind and amount of litter or bedding mixed in the manure.
Suggested Application - Broadcast evenly over the entire soil surface and spade or roto-till into the soil 15 pounds per 100 square feet (about 3 tons per acre) supplemented with 1 to 2 pounds of ground rock phosphate, raw bone meal, or superphosphate. After spreading the manure, broadcast 2 to 3 pounds of 6-6-6 or 6-8-8 (or similar analysis fertilizer) per 100 square feet.

At planting time, band apply 2 to 3 pounds of 6-6-6 or 6-8-8 (or similar analysis fertilizer) per 100 square feet of row. Thus, on a 1-foot wide bed such as for radishes, you would distribute the 2 pounds of fertilizer in a band beside 100 feet of row; whereas, with a 3-feet wide bed you would band the 2 pounds along 30 feet of the row. Sidedressings should be made (if needed) with the 6-6-6 fertilizer.

(C. Stephens)

C. Know Your Vegetables - Chayote

The chayote has been grown in Florida for many years to a limited extent. While native to Guatemala, it is popular throughout tropical regions, where it is known by several names including "vegetable pear", "mirliton", and "mango squash".

It is a tender, perennial-rooted cucurbit, with climbing vine and leaves resembling those of its cousin, the cucumber. The light green, pear-shaped fruit, which contains a single, flat edible seed, may weigh as much as two or three pounds. While fruits may be slightly grooved and prickly, those in Florida are usually smooth. A root-like, starchy tuber (also edible) forms under the crown. In most cases, it is the fruit for which the plant is grown.

Main varieties are Florida Green, Monticello White and the imports.

Culture

Supports - Some type of trellis or support for the climbing vines is required. Most trellises in Florida have been constructed about head high to facilitate walking beneath the vines for harvesting and other operations. Other types of support, such as a single-row, angle-staked trellis might work as well.

Seeds - The whole fruit is planted as a seed. Each fruit has a single large, close-fitting seed which sprouts as soon as the fruit reaches maturity unless placed in cool storage. Fruits stored at 50° to 55° F. should remain in good condition for planting for as much as six to eight weeks.

Planting - The entire fruits are planted one-per-hill in hills spaced 12 feet apart in rows spaced 12 feet apart. The fruit is placed on its side with the smaller, stem-end sloping upward. While the stem-end is often left slightly exposed, in colder areas of Florida growers have found that the fruit should be completely covered with soil to protect the bud from cold damage.

Fertilizing - Well rotted animal manures or composted materials are beneficial. On most sandy soils, about 3 pounds of 6-8-8 fertilizer per plant should be applied in three applications - 1 pound at planting time, 1 pound in the middle of the summer, and 1 pound when fruits are small. Fertilizing at more frequent intervals might be necessary when conditions warrant.
Use - The chayote may be served in many ways - creamed, buttered, fried, stuffed, baked, frittered, boiled, mashed, pickled, in salads, or in pies. Commercially, the biggest market appears to be for pickling.

Storage - Fruits may be stored in edible condition for several weeks if wrapped in newspaper and kept cool (50⁰-55⁰ F.). At room temperature, the fruit will shrivel and sprout. The longer fruits are stored, the poorer the quality becomes.

(Stephens)