March 7, 1980

Prepared by Extension Vegetable Crops Specialists

D. N. Maynard
Chairman

R. F. Kasmire
Visiting Professor

R. K. Showalter
Professor

J. M. Stephens
Associate Professor

James Montelaro
Professor

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

FROM: James Montelaro, Professor and Extension Vegetable Specialist

VEGETARIAN NEWSLETTER 80-3

IN THIS ISSUE

I. NOTES OF INTEREST
   A. Vegetable Field Day at Immokalee - Another Reminder
   B. Vegetable Field Day - Belle Glade

II. COMMERCIAL VEGETABLE PRODUCTION
   A. Plastic Mulch Culture - Suggestions for Refinements
   B. Developments in Starting Vegetable Crops - Sowing Primed Seed

III. HARVESTING AND HANDLING
   A. Precooling Vegetable Fruits

IV. VEGETABLE GARDENING
   A. Mini-Mulching Strawberries
   B. Know Your Minor Vegetables - Chinese Radish

NOTE: Anyone is free to use the information in this newsletter. Whenever possible please give credit to the authors.

dsv
I. NOTES OF INTEREST

A. Vegetable Field Day at Immokalee - Another Reminder

Dr. Paul Everett and Dr. Dave Dougherty have announced preliminary plans for a Vegetable Field Day to be held at Immokalee. A program of items to be discussed will follow at a later date. In the meantime, place the following information on your calendar and make plans now to attend.

**DATE:** Wednesday, April 23, 1980  
**TIME:** 1:00 pm to 4:00 pm  
**PLACE:** Agricultural Research Center, Immokalee, Florida

B. Vegetable Field Day - Belle Glade

Plans are being finalized for another Vegetable Field Day according to Dr. Joe Good, Director and the Committee Chairman, Dr. Subramanya of the Agricultural Research and Education Center, Belle Glade. A final program of topics to be discussed at the field day will be issued later. In the meantime, place the following information on your calendar, also and make plans now to attend.

**DATE:** Thursday, May 8, 1980  
**TIME:** 8:30 am (Registration)  
**PLACE:** Agricultural Research and Education Center, Belle Glade, Florida

II. COMMERCIAL VEGETABLE PRODUCTION

A. Plastic Mulch Culture - Suggestions for Refinements

Plastic mulch culture has been used extensively for over 10 years for the production of strawberries, tomatoes, peppers, and eggplant in Florida. It shows considerable promise for the production of many other crops including cauliflower, lettuce and endive. The transition from open culture to plastic mulch culture was accomplished with few, if any, major setbacks. This does not mean that there is not room for improvements. On the contrary, many small, but significant mistakes have been noted over the years. It might be worthwhile to call attention to some of the more obvious in hope that the system can be made to work even better.

**Bed Height** - Height of bed is extremely important because it helps regulate moisture levels in the soil. If the bed is too high in a well-drained soil, subsurface irrigation may fail to maintain an adequate level of moisture at the soil surface. Conversely, a flooding rain may destroy a crop planted on low beds with poor drainage. Drainage characteristics of the soil and type of irrigation to be used dictate the height of bed needed. Low beds (2 to 4 inches) should be used on well-drained soils with overhead or drip irrigation. On the poorly drained soils where subsurface irrigation is used, beds should be 6 to 8 inches high. In addition, arrangements should be made to drain excess rain water rapidly.
Moisture Control - Occasionally, growers pushed for time, fumigate, apply mulch and plant in a relatively dry soil resulting in poor nematode control and/or slow growth. Therefore, fumigants and mulch should not be applied unless the soil is firm and moist (at field capacity level). Fertilizer that is placed on a dry soil surface or allowed to dry subsequently cannot be utilized by the plant efficiently. Thus, the surface should never be allowed to dry out during the crop season.

Fertilizer Placement - Much has been said and written about fertilizer placement under plastic mulch. The most common mistake observed is the failure to place nitrogen and potassium in complete contact with the surface soil. Without complete contact, fertilizer materials do not go into the soil solution sufficiently to supply plant needs. We have modified recommendations on surface placement of fertilizer to clarify this important point. By suggesting "the placement of the soluble N and K one-half to one inch deep and firming the soil", the problem can be eliminated.

Bed Crown and Ridges - The ideal bed shape for a one-row crop under plastic culture is one with a perfectly flat top. On a two-row system, as used in peppers and other crops, a slight crown in the middle of the row may be used to advantage. Ridges, especially near the base of plants, should be avoided. Even the low ridges developed by presser wheels in transplanting are conducive to extra accumulations of fertilizer in the plant stem and root zone. These slight changes in fertilizer soil movement can cause severe seedling injury.

There are many more seemingly insignificant items that affect the overall success or failure of plastic mulch culture. The grower, more than anyone else, has the best opportunity to observe, to study changes, and to make necessary modifications to further improve an already successful system of culture.

(Montelaro)

B. Developments in Starting Vegetable Crops - Sowing Primed Seed

Seed priming consists of placing seeds in an osmotic solution with a concentration that allows seeds to imbibe water and go through the first steps of germination but does not permit radicle protrusion through the seed coat. Such treatments have been referred to as 'advancing', 'invigoration', 'hardening' or 'vigorization' (particularly when salts are used). In many species tested, seed priming has caused a marked increase in germination rate, total germination and seedling uniformity, especially at below optimum environmental conditions. This process has been shown to overcome such problems as thermidormancy in lettuce and celery. Priming causes 'slow' and 'fast' germinating seeds of a single lot to attain the same stage of germination readiness. This is of considerable importance in obtaining uniform emergence of seedlings. Major advantages of this system over pregerminating seed for fluid drilling is that seed can be primed without specialized equipment, redried and then stored for extended periods of time, and finally planted using conventional planting equipment.

There are several factors involved in order to successfully prime seed. These include osmotic source, the amount of available water (water potential), duration of the soak, temperature, air supply, need for light and redrying procedure. One of the major disadvantages with seed priming is that all these variables have to be studied and determined for each species because the degree of acceleration in germination may differ with species, cultivar, and seed lot.
Much research to date has been conducted in an attempt to standardize the procedures as much as possible.

**Osmotic source** - This can be a salt such as KNO₃ or an inert material such as polyethylene glycol (PEG). The use of salt solutions may add some nutritional value to the treatment, however, extended soaking in the salt solution can damage the germinating seed. The major advantage of PEG is that it is chemically inert and does not have an adverse effect on seed and seedling growth.

**Osmotic concentration** - This depends on how much water is to become available to the seed. Usually osmotic solutions of -6 to -12 bars are used (-6 bars means that more water is available).

**Aeration** - In general, priming treatments which involve immersion of the seeds have been successful only in cases where the soak duration was short or extra aeration was provided. Aeration for a small amount of seed can be provided by spreading a single layer of seeds on a moist surface (paper) supplied with the osmotic solution or by 'floating' the seeds on a PEG solution. Large quantities of seed may be treated by using external air pumps or by frequent pumping and draining of the solution.

**Temperature** - Radicle emergence during the soak treatment may be prevented by priming the seed at temperature below the optimum range for germination of the species. Generally, temperatures of 5° to 20°C are best, with 15°C being established by many as a suitable prime-temperature for most seeds. High soaking temperature may be detrimental to the seed.

**Soak duration** - The duration of the soak is dependent on the species being treated, soak temperature, osmotic potential and the type of aeration. It is generally felt that the shorter the duration the less problems with pathogens and radicle emergence.

**Need for light during seed priming** - Even though most vegetable seeds do not require light for germination some respond better when light is used during priming. The reasons for this are unknown at present. It is suggested that light always be used in cases where it is needed for normal germination, i.e., celery.

**Redrying of primed seeds** - This is one of the most important aspects of priming. If the seeds are primed (germinated) too long then redrying may kill the seed. Redrying should be slow usually at normal room temperature and at a relative humidity of 50-70%. Rapid drying with hot air may drastically reduce seed vigor and viability.

**Storage** - Primed seeds should be stored as any fresh seed, at low temperature and low relative humidity (10°C, 50% R.H.)

In summary, osmotic preconditioning of seed under controlled temperature conditions or "seed priming" may be useful in promoting better seed germination, seedling emergence and plant uniformity under adverse environmental conditions. However, the priming technique has shown variable results from species to species and even among cultivars of the same species. This variation, in response to priming, may be due to factors inherent in the seed, the osmotic source being used or other conditions prevailing during soaking. Therefore, the conditions for priming that will give the best results when the seed is sown should be considered on small quantities of seed before being placed in a large operation.

(Cantliffe & Montelaro)
III. HARVESTING AND HANDLING

A. Precooling Vegetable Fruits

Prompt, thorough cooling of fresh fruits and vegetables after harvest to desirable transit temperatures helps maintain product quality and slows their deterioration rate by slowing the rates of respiration, water loss, ripening, softening, growth of decay causing organisms, rates of ethylene production, and reduces the sensitivity of products to ethylene in the atmosphere.

Of the several cooling methods available forced-air cooling is most adaptable for precooling fruits, including vegetable fruits. Forced-air cooling can be used for cooling products in field containers (boxes or bins) or in packed shipping containers. Most presently used cold rooms, including small ones, used for cooling can be easily and inexpensively modified for forced-air cooling, which can provide cooling rates 6 to 10 times faster than room cooling. Although forced-air cooling requires more space, the faster cooling rates achieved provide more product cooling per unit of space, and therefore is more efficient than room cooling and requires less total space.

Fruit type vegetables are especially adapted to forced-air cooling because most have a relatively low bulk-density in packed shipping containers. They have regular shapes that allows cooling air to easily pass over and around each fruit and absorb heat from its surface. Sufficient venting (5% to 7%) of side or end panels of shipping containers is necessary to permit enough air to move through containers for rapid cooling.

Fans used in forced-air cooling must move enough air against the resistance offered in the system (known as static pressure) from containers and product to provide cooling rates desired. Effective channeling of the cooling air is essential for forced-air cooling. This requires a basic understanding of the method. Therefore, some engineering assistance would be helpful in modifying present cold rooms for forced-air cooling. We can help you plan for this type of conversion. Planning and designing new forced-air coolers definitely requires professional engineering if the system is to operate efficiently.

Although vacuum cooling is used as supplement to cooling sweet peppers its main use is to dry the stems and thus retard stem end decay. Limited, though often adequate pepper cooling is achieved by vacuum cooling. Unless stem end decay is a major problem (as is common in Florida) vacuum cooling would not be the preferred cooling method for peppers because of large capital investment required for this method.

Effective vacuum cooling requires a high surface-to-mass ratio of products to be cooled. Thus, leafy vegetables are adapted to vacuum cooling but fruits (except peppers) are not. Sweet peppers have a large amount of surface in proportion to their mass and are therefore somewhat adaptable. However, water is not readily transpired through nor evaporated from the surfaces of sweet peppers, which limits their adaptability to vacuum cooling. The amount
of cooling achieved (to 50°F or 55°F) is enough. They should not be cooled to lower temperatures because they are susceptible to chilling injury.

Hydro-cooling is less desirable for cooling fruits, even though it is used, because of water beating damage and the opportunities for spreading decay. Hydrocoolers should be drained and cleaned daily and the cooling water should be chlorinated.

Package-icing is not adaptable for cooling most fruits, even though it is used to a limited extent for cooling cantaloupes.

(Kasmire)

IV. VEGETABLE GARDENING

A. Mini-Mulching Strawberries

If you did not get around to mulching your strawberries with plastic when you set them out, you might want to consider "mini-mulching" them now. The mini-mulch technique utilizes a small square of plastic placed around each strawberry plant. Cut 1.5 to 4 mil thick, black plastic mulch into one-foot square pieces. Make a three to four-inch slit in the center of each piece of plastic. Place one plastic square over each plant and pull the leaves, fruit and flowers through the slit. Snug the plastic flat against the ground beneath the plant.

The plastic mini-mulch acts as a barrier between the soil and all above ground parts, thus reducing rots and possible insect injury. Weed growth is reduced although not completely eliminated. The edges of the plastic may be raised to allow any needed cultivation, watering or fertilizing.

An additional utilization for the mini-mulch mats is for cold protection. During the day of an impending cold front moving in, pull the four corners of each mat together over the top of each plant. Make sure the corners and sides overlap to eliminate air leakage, then tape the corners together. Heat absorbed by the soil beneath the plant will slowly release and be trapped to some extent by the overlapping plastic cover. Cold protection by this method should not be expected to prevent injury altogether, especially when freeze conditions are severe enough to freeze the berries. However, frost-bite to tender blossoms and young berries can be greatly minimized by this procedure. Placing hay, styrofoam chips, or other insulative material over the plant before wrapping it up would provide additional protection. Of course, untapeing, unwrapping and removing insulating material from each plant after the cold has passed would be a simple operation in the home garden.

From a mulching standpoint, materials other than black plastic might be used, not only on strawberries but other crops as well.

(Stephens)

B. Know Your Minor Vegetables - Chinese Radish

The Chinese radish (Raphanus sativus L. Longipinnatus Group) is also known as Daikon, Japanese radish, Oriental radish, and winter radish.
Chinese radishes originated in the Orient (Asia), as did the common spring or summer radishes. Chinese radishes have extremely large roots, some weighing up to 100 pounds. Most however, are in the ten to twenty pound class at full maturity. These big, late maturing radishes were known in Europe much earlier than the smaller kinds. Chinese radishes grown in Florida vegetable gardens have reached twenty to thirty pounds in our sandy soils.

It is quite common for Chinese radishes to have a leaf-spread of more than two feet. The leaves differ from common types by being greatly notched and spreading from the tops of roots in a rosette fashion.

Some varieties form large round to top-shaped roots, while others are elongated and cylindrical in shape. Some commonly available varieties offered by U. S. Seed companies are Chinese Rose (round), Chinese White (cylindrical), and Celestial (same as White Chinese).

This type of radish is usually cooked rather than eaten fresh. As a cooked vegetable, they are a major food item in the Orient and in the U. S. by Orientals. Chinese radishes are seldom grown in Florida gardens, but are grown by a handful of commercial growers of oriental vegetables.

Their culture is quite similar to that for the common radish. Seeds should be planted 3/4 inch deep in the fall (September through October) so that the roots enlarge in the cool months. Due to the size of the mature plants, they should be spaced from four to six inches in rows spaced three feet apart. To accommodate the large root size, plant on high raised beds fortified with liberal amounts of organic matter (compost). At each cultivation, work the soil around the root higher and higher as it grows. Some of these roots are 18 to 24 inches in length, so require a loose, friable soil.

Chinese radishes take up to 6 months to reach full size. Most reach best usable size in 60 to 70 days. They are pithy and pungent when overmature, but are still tender and edible even when quite large.

(Stephens)