TO: COUNTY EXTENSION DIRECTORS AND AGENTS (VEGETABLES AND HORTICULTURE) AND OTHERS INTERESTED IN VEGETABLE CROPS IN FLORIDA
FROM: James M. Stephens, Extension Vegetable Specialist

VEGETARIAN NEWSLETTER 76-4

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NOTE: Anyone is free to use the information in this newsletter. Whenever possible, please give credit to the authors.
A. Commercial Production Guide Update

In the last issue of the Vegetarian, we promised that we would give a situation statement as to availability of our publications. The following list is the status as of March, 1976. Where applicable quotas will be observed as in the past.

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(Kostewicz, Montelaro, Marlowe)

II. COMMERCIAL VEGETABLE PRODUCTION

A. Soil Preparation and Herbicides

Preplant incorporated and preemergence surface applied herbicides are dependent upon proper soil conditions for their best activity and weed control. A weed control program should be an integral part of a grower's production schedule and should be treated with the same concern and care as any other part of the operation. A grower should avoid a last minute search for a material he can use because he overlooked the weed aspect. Frequently, poorly planned last-minute applications do not give the desired control because of improper application conditions.

Some basic considerations which apply across the range of herbicides in terms of application are:

1. **Herbicide**
   
   (a) Use only materials labeled and recommended for the crop.
   (b) Use a herbicide that fits the problem weed situation in the field.
   (c) Use the proper rate.
(2) Application Equipment
   (a) Use an applicator designed for herbicides.
   (b) Make sure it is in proper operating condition.
   (c) Calibrate.

In terms of preplant incorporated materials, the following points are important considerations.

(1) Soil Moisture - Know what the label says in regard to moisture, i.e., do you incorporate when the soil moisture is at a level suitable for seeding? What effect will subsequent irrigation following planting have on the material?

(2) Depth of Incorporation - Does the material you plan to use need deep or shallow incorporation? Are there any special requirements such as rototilling or will cross discing do the job?

(3) Weather Conditions - Some herbicides are very subject to volatilization or decomposition if left on the surface for a long period of time. It is most often best to incorporate at the time of application or very shortly thereafter because of these factors.

Preemergence materials are also influenced by certain soil conditions:

(1) Soil Moisture - Some materials are best applied to "drier" soils; some need irrigation following application and still others may have specific limitations on irrigation amounts that follow application. CHECK THE LABEL--Any pertinent information will be on it.

(2) Soil Situation - Most of these herbicides need to be applied to finely prepared weed-free surfaces. Too much debris (clods, tree roots, etc.) can cause problems of uneven coverage by interruption of the spray pattern. Most of these materials are not effective on germinated or emerged weed seedlings. Thus, make certain that the surface is weed-free when applying (i.e., don't let the weeds get ahead of you).

The grower must have a planned approach to dealing with weed problems. Time spent analyzing his production program, reading the label suggestions and requirements, and integrating the two can result in a much improved overall weed control program.

(Kostewicz)

B. Benefits Not Anticipated With Full-Bed Mulch Culture of Vegetables

Use of full-bed plastic mulch culture in Florida vegetable production increased from about 2,000 acres to 35,000 acres over the past few years. During this limited period, we have learned a lot about this new cultural system. Not only have yields of mulched crops been increased, but improvement in uniformity and appearance of most of these commodities has been noted.

We had anticipated such advantages as a more uniform supply and efficient use of water and fertilizer, better soil pest control with fumigants, reduction of leaching of fertilizer, etc., from full-bed mulch as compared to open culture. What proved to be surprising is the number of advantages (and some problems) not anticipated by even the experienced extension or research workers. On the negative side, the most serious and oftentimes costly problem found under full-bed mulch is poor seedling survival. Advantages of the system noted over the years, but not anticipated, far outweighed anything on the minus side. These advantages are discussed here so that growers using full-bed mulch or considering it may evaluate this new system fully.
In addition to those expected, some of the benefits not anticipated from full-bed mulch culture are as follows:

1. Significant reduction in tractor usage.
2. Increased protection against frost under certain conditions.
3. Increased protection against certain viruses.
4. Increased protection during rainy periods.
5. Increased protection from soluble salt injury in more advanced stages of growth.
6. Increased protection from bacterial spot on peppers and tomatoes.
7. Reduction in nematode injury where fumigation is not used or fails.

Significant reduction in tractor usage has been reported from actual records by several growers whose operations can be classified as medium to large. Almost total elimination of cultivation for weed control and sidedressings as compared with open culture accounts for the reduction in tractor usage.

Increased frost protection is hard to measure. However, plastic-mulched strawberries are not injured as easily as are straw-mulch berries. Difference in air temperature at plant level may be only 1° or 2°F--enough to save flowers and tender fruit in plastic-mulched berries. This may or may not be true when the comparison is made with crops grown on bare soil.

It was noted early that plastic mulch treated with aluminized or white reflective paint to lower temperature also repelled aphids sufficiently to lower incidence and severity of viruses--especially in peppers. There are indications that this may be true of other crop viruses.

Plastic mulch, by preventing leaching and helping to create an overall good root environment, tends to lessen the hazards of excessively wet seasons. Exception to this is the problem of root damage from flooding-type rains moving dissolved, surface fertilizer salt downward into the root zone upon receding. Growers of full-bed mulched tomatoes have reported satisfactory (not excellent) yields from crops subjected to as much as 42 inches of rainfall. That much rain almost always results in total or near total failure in open-culture crops.

Injury from the upward and downward movement of fertilizer salts under open-culture can be insidious in that it is hard to detect. Periods of dry weather followed by light rainfalls result in movement of fertilizer salts into the root zone often causing serious damage to roots. Except for the danger of soil flooding, as described above, salts cannot move downward in large quantities to injure roots under full-bed mulch.

County extension agents and growers have noted reduction in the incidence of severity of bacterial spot on pepper and tomatoes grown under plastic culture. On a number of occasions, tomatoes and peppers grown in the same fields were affected less by bacterial spot under full-bed than under open-culture. Plant pathologists hypothesize that initial bacterial infection comes from the soil spattered on the leaves by rain.

Field observations and research have shown that full-bed mulch crops grown in nematode-infested soil will produce considerably better than they would have without mulch on those same soils. It is believed that maintenance of nearly ideal growing conditions under plastic mulch permits the limited functional roots to supply the plant with a goodly portion, if not all, of the water and nutrients needed to grow. Of course, the purpose of full-bed mulch culture is to obtain maximum economic yields. To reach that goal, good soil fumigation is a must.
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The unanticipated benefits discussed here are based on information gathered by the writer over the past few years from review of research, field visits, talks with county extension agents, growers, industry representatives, etc. They have not all been tested by research workers. Nevertheless, the writer feels that these observations are important in any consideration of crop production using or anticipating use of full-bed mulch culture.

(Montelaro)

C. Soil Water Influence on Root Development

Most vegetable growers know how important it is to maintain an active, healthy root system for the production of high-quality, high-yielding crops. Most growers, therefore, try to create as favorable a root environment as possible before planting seed or setting plants.

As Florida growers go forth into the period of greater monitoring of irrigation water, higher costs of fumigants, fertilizers, seed, plants and other production inputs, a brief look at some of the factors influencing root development and function may be of interest.

Water is one of the most important factors in plant growth, thus immediate replacement of water loss is essential to the water balance of crops. Loss in turgor results in closure of stomata, decrease in photosynthesis, stoppage of cell enlargement, and eventually death by desiccation. In annual vegetables, most of the water and fertilizer salt absorption occurs at the tips of newly formed roots, a very good reason to encourage continuous root growth. Dr. Paul Kramer, of Duke University, reported the following water absorption patterns in sweet corn in a sandy soil.

<table>
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<th>Age of Plant Days</th>
<th>Percent Absorption</th>
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<th>Depth Inches</th>
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<td>2.8</td>
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<tr>
<td>98</td>
<td>95</td>
<td>14.0</td>
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These figures indicate the degree of intense absorption in the very limited, somewhat shallow area close to the plant.

The rate of root growth decreases, as a general rule, as soil moisture increases above field capacity because of the corresponding reduction in soil aeration. Research shows that aeration is the most important factor in root growth. It is well established that roots require oxygen for their respiratory activities and that slight excesses of carbon dioxide and reduced oxygen can reduce nutrient absorption.

The four principal methods of studying root growth are: excavation, measurement of root material at various sampling depths, measurements of radioactive material taken up from known positions in the soil near the plant, and measurement of the quantities of radioactive material transported down into the roots from isotopes (labeled sugar) injected into the stems or leaves.

In a recent study on vegetable root development in England on well fertilized sandy soils (pH 6.5, 140# N, 130# P2O5 and 240# K2O per acre), it was found that 63% of the root mass of the following crops occurred at the following depths:

- Carrots, 84 days; high fertilizer 9 inches, low fertilizer 13 inches
- Lettuce, 57 days; high fertilizer 4 inches, low fertilizer 7 inches
- Lettuce, 57 days; high moisture 6 inches, low moisture 12 inches
Plant age and root concentration studies showed that 63% of the root mass was produced at the following depth:

Tomatoes 95 days, 17 inches; pepper 96 days, 5 inches; onions 100 days, 4 inches; cabbage 73 days, 7 inches; and peas 116 days, 13 inches.

These workers concluded that deeper root systems were associated with lower nutrient and soil moisture levels. If the nutrient status or soil moisture was too low, the plants were, of course, stunted and growth and yield were much reduced. As soil moisture tension increased near the surface, more moisture was extracted at successively lower depths. Plants usually wilted before much of the available moisture was used at the lower depths.

Water replacement is important in crop production today; it may even become critical in future crop management. It may be that less water better placed will improve soil aeration and maximize nutrient uptake as well. Someday, the question "Check your air and water?" may apply to crop production as much as it does to the modern freedom machine, the automobile.

NOTE: There are many other factors in the soil which affect root development. Some of these factors interact with water further complicating the subject of soil water root development relationships.

(Marlowe)

III. VEGETABLE GARDENING

A. Timely Gardening Topics

These questions and answers are suggested for agents' use in developing periodic (weekly) radio or newspaper briefs. They are based on letters of inquiry from Florida gardeners.

(1) Timely Topic for Week of April 18-24

Question

I purchased tomato plants which are very long. Should I stake these immediately to prevent them from blowing over and breaking?

Reply

Quite often the only plants available when you are ready to set them in your garden are tall, spindly, leggy plants. Such plant condition results usually from overcrowding in the seedbed or transplant production container, or from too much shade.

These plants may still be used, and may even be preferred to more sturdy, better grown plants. For example, it would be better to buy and set spindly plants of a proven, well-adapted variety than beautiful plants of a non-adapted variety that would not set fruit. So don't be "taken in" altogether by dark green sturdy looking plants. First check the pedigree.

Rather than staking the plants early, set them deeper than normal and slant them at an angle in the soil, covering up about two-thirds of the stem. The tomato plant has the ability to grow roots from this covered stem. Once firmly established, the plant can be staked as usual.
(2) Timely Topic for Week of April 25-May 1

Question

What could be causing my radishes to split and crack?

Reply

Some splitting and cracking of radish roots can be expected under most all growing conditions. Normally, this amounts to less than five percent of the roots. Amounts in excess of this are usually due to over-maturity or over-watering. Most radish varieties mature in 25 to 35 days. Roots left in the soil beyond this length of time tend to get pungent and pithy (cottony) and start to crack open. Soil moisture studies showed more cracking occurred where the soil was kept very moist than where it was maintained at a dryer level.

(3) Timely Topic for Week of May 2-8

Question

How can I keep insects and bugs from ruining my vegetable garden?

Reply

Insects can be quite damaging in home vegetable gardens, especially as the days get warmer. There generally is a wide range of injurious insects frequenting the average garden. Some of the most common are aphids, stink bugs, leaf miners, Colorado potato beetles and larvae, Mexican bean beetles and larvae, flea beetles, cutworms, fruitworms, tomato hornworms, pinworms, corn earworms, cabbage worms, bean leaf rollers, wireworms, and white grubs. Those who grow a specialty crop may run into an insect that likes only that kind of vegetable. For example, sweet potato weevils seriously restrict the growth of sweet potatoes in Florida. Control of all these insect pests is usually not 100%. However, some damage to vegetables in the garden can be tolerated without completely ruining the edibility of the vegetables. There are many good cultural practices which help to reduce severity of injury, yet these alone are usually unsatisfactory under Florida conditions. Such "organic" techniques as interplanting vegetables with repellent crops are unreliable. Likewise, the use of natural predatory insects, like the lady beetle and spraying mantis, provides only limited benefits. Best control is obtained by dusting or spraying at the first signs of insects or insect injury. Garden supply stores have an assortment of reasonably effective insecticides which are safe when used properly as directed with adequate precautions. These may not control every insect pest in all situations, but generally they are sufficiently effective for average infestations.

(4) Timely Topic for Week of May 9-15

Question

I noticed some sort of viny weed growing on my carrots the other day. Please tell me what it is.

Reply

Chances are the viny weed pest is dodder (Cuscuta gronovii). It is not often a pest on vegetables, since they are cultivated so frequently. Dodder is first noticed as a tangle of branched threadlike leafless stems, with no green color, free
from the soil, twining around the stems and leaves of the host plant. The common color is yellowish or orange. Tiny white, pink or yellowish flowers occur in clusters. At points where the dodder penetrates the host plant (carrot leaf stem, for example), swelling may occur. Dodder produces small seeds, which sometimes spread into gardens and fields along with vegetable seeds. Upon germination in moist soil, the dodder seedling twines about a host plant. It penetrates the host tissue with specialized cells called haustoria, then it breaks connection with the soil by shriveling. Rather than letting it become established in the garden, pull the dodder from the plants and burn or destroy it.

(Stephens)

B. Know Your Vegetables - Celeriac

Celeriac (Apium graveolens var. rapaceum) is also called turnip rooted celery, knob celery and celery root due to its relationship and resemblance to celery. The edible portion is the swollen, knobby stem which forms at and beneath the soil surface. It is irregularly rounded, with twisted roots extending downward. At best edible size, celeriac measures from three to four inches across. The interior texture is smooth and white, similar to kohlrabi or turnip root. The stalks and leaves resemble celery, but the stalks are hollow and not very palatable.

Celeriac may be used raw or fresh. Since it has the celery flavor, it is often used as flavoring in soups and stews. It is best to peel celeriac before cooking, to remove the tough, stringy outer skin. Many recipes include ways to utilize celeriac.

'Prague' is the leading variety; 'Delicacy' is also grown. In Florida, neither celeriac nor celery is often grown in most gardens. This most likely is due to their requirement for abundant soil moisture for seed germination and subsequent plant growth. Overhead sprinkling on sandy soil, which is a most common gardening situation, is not adequate for good celeriac production. Like celery, celeriac is a cool-season crop which should be seeded August-December and transplanted through February in Florida. It should be cultivated and cared for in much the same fashion as celery. Seed should be planted shallow (1/8-1/4") and protected from the sun with a shade cover.

Celeriac is stored at 32°-40° and moist conditions. Thus stored, it should last 3 to 4 months. The composition per 100 g edible portion has been reported as: 88% water, 45 calories per 100 g, 2% protein, 3% fat, 8.8% carbohydrate, 1.4% fiber, .8% sugars, and .1% starch, a trace of iron has been noted, but information on vitamins and mineral content is scanty.

(Stephens)