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

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VEGETARIAN NEWSLETTER 78-6

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THE VEGETARIAN NEWSLETTER

I. COMMERCIAL VEGETABLE PRODUCTION

A. Cultivation Injury to Crop Roots

Vegetable growers generally are aware of potential root damage from cultivation. The question is, "are they really aware of (1) how much damage and (2) how inconspicuous it is to the casual observer?" The consequence of root damage was demonstrated clearly by a study conducted recently by Dr. J. M. White at AREC Sanford, Florida. In tests with cabbage made at 3 planting dates, he studied the effects of sweep size, cultivation depth and frequency of cultivation on marketable yield and head weight.

Table 1 shows that no cultivation was better than with 8-inch sweeps which in turn was better than with the large sweeps. Not only were yield and head weight reduced, but percent marketable heads at first harvest was reduced.

Table 1. First harvest marketable yield, average marketable head weight, and percent marketable heads for three planting dates of cabbage as affected by sweep sizes used in cultivation.

<table>
<thead>
<tr>
<th>Size of sweeps</th>
<th>Yield $^z$</th>
<th>Head Weight $^y$</th>
<th>Percent $^x$</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>80.8 $^w$  a</td>
<td>3.30 a</td>
<td>86</td>
</tr>
<tr>
<td>8 inch</td>
<td>69.8       b</td>
<td>3.03 b</td>
<td>79</td>
</tr>
<tr>
<td>22 + 18 inch</td>
<td>62.2       c</td>
<td>2.93 b</td>
<td>69</td>
</tr>
</tbody>
</table>

$^z$ Marketable weight per plot (2.5 x 25 feet) in pounds.

$^y$ Average marketable head weight in pounds.

$^x$ Percent of marketable heads on first harvest.

$^w$ Mean separation of Duncan's multiple range test, 5% level.
The similar results were obtained with depth of cultivation (Table 2) and frequency of cultivation (Table 3). Yield, head weight and percent marketable heads at first harvest were all reduced with increasing depth and frequency of cultivation.

Table 2. First harvest marketable yield, average marketable head weight, and percent marketable heads for three planting dates of cabbage as affected by depth of cultivation.

<table>
<thead>
<tr>
<th>Depth in inches</th>
<th>Yield^Z</th>
<th>Head Weight^Y</th>
<th>Percent^X</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>80.8^W a</td>
<td>3.30 a</td>
<td>86</td>
</tr>
<tr>
<td>1 - 1.5</td>
<td>70.1 b</td>
<td>3.05 b</td>
<td>79</td>
</tr>
<tr>
<td>4 - 5</td>
<td>62.4 c</td>
<td>2.86 c</td>
<td>69</td>
</tr>
</tbody>
</table>

^ZMarketable weight per plot (2.5 x 25 ft.) in pounds.
^YAverage marketable head weight in pounds.
^XPercent of marketable heads on first harvest.
^WMean separation by Duncan's multiple range test, 5% level.

Table 3. First harvest marketable yield, average marketable head weight and percent marketable heads for three planting dates of cabbage as affected by number of cultivations.

<table>
<thead>
<tr>
<th>Number of cultivations</th>
<th>Yield^Z</th>
<th>Head Weight^Y</th>
<th>Percent^X</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80.8^W a</td>
<td>3.30 a</td>
<td>86</td>
</tr>
<tr>
<td>3</td>
<td>75.6 b</td>
<td>3.15 a</td>
<td>82</td>
</tr>
<tr>
<td>5</td>
<td>65.3 c</td>
<td>2.95 b</td>
<td>73</td>
</tr>
</tbody>
</table>

^ZMarketable weight per plot (2.5 x 25 ft.) in pounds.
^YAverage marketable head weight in pounds.
^XPercent of marketable heads on first harvest.
^WMean separation by Duncan's multiple range test, 5% level.
Vegetable growers, unlike some agronomic crop producers, do not employ the "no-till" method. Obviously, some cultivation is necessary. The question then is how to cultivate most efficiently to accomplish the primary purpose of weed control (and other purposes occasionally) without injuring the crop. No exact recommendations for all crops and conditions can be made but a few "rules of thumb" should be of benefit to growers. They are as follows:

1. Use herbicides and all other means of weed control available.
2. Reduce number of cultivations to as few as possible.
3. Cultivate as shallow as possible.

This study should serve to emphasize the importance of careful planning and execution in the use of cultivation in vegetables. Every time cultivation is anticipated, attention should be directed to the need for it and especially to selection, adjustment and operation of equipment.

(Montelaro)

B. Some Similarities Between War Strategy and Integrated Pest Management Systems

War movies and history books tell us that some of the key factors in a successful battle depend on knowing:

- Who and where the enemy is,
- When and where the action is to take place,
- How many units are likely to be involved,
- The strengths and weaknesses of these units, and
- The effectiveness of the supply function.

When such information is lacking the strategist is not able to determine what size guns to use, how soon to start the bombardment, how many units to activate, or what supplies are needed.

The modern view of integrated pest management (IPM) is very much like battle strategy. IPM depends more on information and effective use of its control tools than on merely blasting away at a partially known enemy with guns often much too large for the purpose.
IPM systems were born out of a need and are just about the only practical, economical, and environmentally sound alternative growers may have for the future crop management programs. Pesticides may become so restricted in number, so expensive, and so involved in biological problems that the use of chemicals alone may never again be the primary weapon in pest control. IPM involves the wise use of chemicals along with physical, biological, and crop management methods.

Integrated pest management, as a part of crop management, involves an understanding of all of the biological factors that modify the growth and development of the crop and its pests. These factors, collectively called the crop ecosystem, interact in a very complex manner, some of which we understand, yet much remains to be revealed by careful research.

To understand this ecosystem for IPM purposes we must know:

- The numbers and types of pests that usually cause damage to the crop.
- The level of damage to the crop that can be tolerated economically.
- The primary and secondary food sources of these pests.
- The manner in which environment interacts with the pests and the crop.
- The manner in which the crop variety; nature and length of the crop season; and cultural practices interact with these pests.

A detailed case history of the field in which the crop is to be grown is an early and important part of IPM and crop management. Preventative procedures such as modification of soil pH liming; reduction of nematodes, weeds, and soil insects by fumigation, flooding, or fallowing; and correction of potential nutrient deficiencies by proper fertilization are some good management practices which may be needed as a result of indications in the field history.

The vegetable grower using an IPM system needs frequent monitoring of his growing crop in order to determine when a danger level or economic threshold is at hand. This monitoring or scouting of crop fields must be done by trained personnel who can observe and record the numbers and types of pests present and other unusual field signs and symptoms. This information is then summarized, evaluated and reported to the grower on the same day. The evaluation should consider the economic threshold; the possible influence of weather changes; the control tools available (including their cost and effectiveness); the natural enemies of the pest; and the impact of these control measures on the applicator, the crop, and other elements of the environment.
A typical scouting procedure for fresh market tomatoes in Florida serves as an example. The scouting and recording of pest type and number begins as soon as the seedlings emerge and continues until harvest is almost completed. In the field, an observation area of 6 to 10 plants is established for every 2 to \( \frac{2}{3} \) acres. Visits are made to these stations twice a week. Records are made for the following:

**Foliage Diseases**

- Early Blight
- Late Blight
- Southern Blight
- Verticillium Wilt
- Fusarium Wilt
- Southern Bacterial Wilt

**Fruit Insects**

- Pinworm
- Armyworm
- Fruitworm

**Nematode Injury**

- Wilting, Stunting
- Nutrient deficiencies

**Foliage Insects**

- Vegetable leaf miner
- Pinworm
- Armyworm, S-F-B
- Fruitworm
- Aphids
- Cabbage Looper
- Cucumber Beetle
- Flea Hopper

**Fruit Disorders**

- Blossom End Rot
- Mishapen Fruit

**Weeds**

- Dominant Species
- Average Height
- Percent Ground Cover
As soon as the scout completes these detailed field reports, the results are summarized. A comparison is then made between present and previous counts to indicate spread or decline of the pests observed. With a crop such as tomatoes, in which worm-riddled fruit are not marketable, a zero tolerance may be established. A low level of foliar insects or diseases may be tolerated providing yield or quality are not decreased significantly.

The scouting reports provide the pest control specialist, county extension agent, or farm manager with the information needed to decide what action must be taken. Consideration must be given to the target pests, natural enemies of the pests, crop development, climatic conditions, etc. Measures selected to reduce (not eliminate) target pests with least damage to the natural enemies are usually recommended.

If a low level population of lepidopterous larvae (caterpillar) is noted, a chemical of fairly low toxicity such as thiodan, or a biological control such as Bacillus thuriengensis may be indicated. However, if a threshold level is noted, a more comprehensive pesticide such as methomyl may be indicated.

Like the effective battlefield commander, the grower should not use heavy artillery when automatic rifles will do the job. Overuse of heavy artillery pesticides can destroy natural enemies as well as target pests, upset more of the ecosystem than is really necessary and waste a rather valuable input – money.

Time is a prime consideration in an IPM program. The scouting reports must be accurate and current, the summarization and evaluations meaningful, and the information must be relayed to the decision maker in time for corrective action to be taken. As a well-meaning, bright young tomato grower said in a recent grower meeting explaining IPM: "A report on Friday showing some crisis developing in my fields doesn't help me a bit, because I can't get a spray crew out on weekends". For this reason monitoring should be done as early in the week as possible, reports returned to growers quickly, and pests should be encouraged to take it easy over the weekend.

(Marlowe)

C. Weeds That Vegetable Growers Should Know

Crop production using similar cultural practices and technologies often causes major weed shifts. For example, repeated use of the same herbicide or planting the same crop for several years will result in a few resistant weed species that begin to predominate. Worldwide, there are 18 weeds that predominate in row crops, plantation crops, aquatic environments, etc.

Table 1 contains a list of 12 weed species that commonly infest vegetable
fields, both in Florida and around the world. In addition, many of these weeds are known to host other plant pests that cause serious economic crop losses.

Table 1. Selected list\(^1\) of the "world's most troublesome weeds" that are common or troublesome pests and probable host of other plant pests in Florida's vegetables.

<table>
<thead>
<tr>
<th>Weed Name</th>
<th>Nematodes</th>
<th>Other Pest</th>
<th>Diseases</th>
<th>Viruses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutsedge (Cyperus rotundus)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Nutsedge (Yellow) (Cyperus esculentus)</td>
<td>NR(^2)</td>
<td>NR</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Bermudagrass (Cynodon dactylon)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Barnyardgrass (Echinochloa crus-galli)</td>
<td>NR</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Junglerice grass (Echinochloa calona)</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goosegrass (Elusine indica)</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Johnsongrass (Sorghum halepense)</td>
<td>NR</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purslane (Portulaca oleracea)</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lambsquarter (Chenopodium album)</td>
<td>NR</td>
<td>NR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crabgrass (Digitaria sp.)</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smooth amaranthus (Amaranthus hybridus)</td>
<td>Yes</td>
<td>NR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spiny amaranthus (Amaranthus spinosus)</td>
<td>Yes</td>
<td>NR</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


2/ NR = Not Reported.
In Florida, five of the "most common" weeds in vegetable fields (Table 2) are also listed in the "world's most troublesome weeds". However, only 3 of Florida's "most troublesome" weeds are on the world's list. Perhaps, the cultural practices, crop rotations, and technologies commonly used in Florida's vegetable industry allow for a different group of weeds to predominate. Whatever the reason, growers and professional agriculturists need to concentrate their efforts on improving weed management strategies aimed at controlling the "most troublesome" weeds in vegetables. Successful control will involve a combination of management practices designed to suppress or kill the various types of "troublesome weeds." Continuous modification of these management practices will be necessary as the weed species continue to shift in response to the weed management strategies employed.

Table 2. Florida's "most troublesome" and "most common" weeds in vegetables

<table>
<thead>
<tr>
<th>Weed Name</th>
<th>Most Troublesome</th>
<th>Most Common</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutsedge (Cyperus rotundus)</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Goosegrass (Eleusine indica)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Common ragweed (Ambrosia artemisiifolia)</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Burning nettle (Urtica urens)</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Narrowleaf singalgrass (Brachiaria sp.)</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Texas panicum (Panicum texanum)</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Black nightshade (Solanum nigrum)</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Wild celery (Apium leptophyllum)</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>Buttonweed (Diodia sp.)</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>Spiny amaranthus (Amaranthus spinosus)</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Crabgrass (Digitaria sp.)</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Purslane (Portulaca oleracea)</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Florida puslay (Richardia scabra)</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Cutleaf evening primrose (Oenothaa laciniata)</td>
<td>-</td>
<td>9</td>
</tr>
</tbody>
</table>

II. HARVESTING AND HANDLING

A. Handling Spring Harvest Potatoes for Fresh Market

It has been reported that there are currently decay problems with Florida potatoes in terminal markets. An investigation has determined that several factors have contributed to this problem.

1. Freshly harvested potatoes are being run through packinghouses without being dried properly before bagging.

2. Sizable quantities are being bulk-loaded in closed trailers for shipment to repackers in the north. Loadings observed were wet and no refrigeration could adequately cool or dry these potatoes.

3. Some packinghouses have removed driers for economy reasons. Wooden rollers have been a source of breakdowns and cause excessive skinning and abrasion of tubers.

4. Several loads of potatoes from the Hastings area that had excess decay at the terminal were dug immediately following heavy rains (up to 4 inches), the tops having been killed several days prior to the rain. These factors in combination contribute to increased incidence of transit decay.

The following points are apparent following a literature review and discussions with knowledgeable people.

"Bacterial Soft Rot of Potatoes in Southern Florida", University of Florida AES Technical Bulletin 348 by George D. Ruehle has very valuable information that has not been improved on even though the research was conducted in 1936-1940 at Homestead. For example:

1. Bacterial soft rot developing in transit and storage begins in the field as a secondary organism and follows late blight tuber rot, Fusarium tuber rot, or other infections. It may be a carryover from seed piece decay or lenticel infection from waterlogged land.

2. Exposure of harvested tubers to a dry atmosphere stops surface infection.

3. Harvesting when fields are dry reduces decay.

4. Drying potatoes thoroughly and rapidly after washing reduces decay.

5. Pre-cooling is less reliable than drying in the prevention of rot.

6. Dip treatment in a chlorine solution is of little or no value without thorough drying following treatment and is no better than drying alone.
7. Washing increases susceptibility to decay and infection especially in the presence of decayed tissue in the wash water.

8. Drying with heated air of 130°F to 150°F for 3 to 4 minutes is the best treatment with a minimum of weight loss.

(Marvel)

B. Shipping Watermelons

The following report was prepared by Alice Dow, Biological Laboratory Technician, ARS, USDA, Orlando, Florida, to be a part of the May, 1978 Vegetarian article on handling watermelons and it was omitted. Since the information is so important and timely we are putting it in this issue.

A growing European market for Florida watermelons and the extended shipping times involved have increased the importance of finding the optimum conditions for the shipment of quality melons. Temperatures, field treatments, and varieties were investigated as the specific variables applicable to domestic as well as foreign shipments.

Small lots of melons were held at 45°, 50°, and 60°F for 4, 7, and 14 days to simulate the temperatures and times involved in overseas shipments. The melons were then held at 70°F for 1 week to simulate retail shelf-life and the home environment. From this preliminary experiment, the cultivar Charleston Gray and the breeding line #75-1 were selected over Smokylee and Crimson Sweet for further testing. Decay incidence increased with the length of time stored, and was less at 60°F than at the lower temperatures.

In a subsequent experiment, fungicidal sprays in the field were added to the variables and larger numbers of Charleston Gray and #75-1 were used. The following conclusions were drawn from this experiment:

1. The optimum shipping temperature for watermelons is 60°F.

2. Charleston Gray was the superior cultivar for shipping of those tested.

3. Field treatments with Dithane M-45 five weeks and two weeks and Difolatan 4F five days prior to harvest reduced postharvest decay incidence by 26%.

4. Breeding-line #75-1, if field treated as above and held at 60°F, can be shipped acceptably.

(Marvel)
A. June Gardening Roundup

June is a busy month for Florida vegetable gardeners. While many of the extreme south Florida gardens are about done for the season, those in central through north Florida are still in the production stage. Since most vegetables have been in the garden for two or three months, now is the time to take a look at some of the developments, problems, and rewards.

Insect and disease pests have not been overwhelming in most areas. In general, gardeners have had to do little or no spraying. Most serious insect pests have been aphids, cabbage worms, squash borers, corn bud worms, and tomato or corn fruit worms. Other insects have fed on a variety of vegetables, but their damage has not been severe so far.

With the onset of the rainy season and warmer nights, this is expected to change. Tomato or corn fruit worms and pickle worms probably will reach a stage of destructiveness such that spraying will be necessary. Likewise, gardeners should be on the lookout for plant diseases to reach a severe level. Severely diseased individual plants should be pulled out of the garden and disposed of. Remaining plants should be sprayed weekly with a good garden fungicide. At this stage, spraying will not be helpful in controlling such diseases as wilts and virus mosaics.

Some gardeners are concerned that the mosaic virus diseases in their vegetable garden may spread onto their nearby fruit trees. There should be little concern here, for the virus involved is quite specific to its host plant. It generally attacks only plants closely related to the plant on which it lives in the garden. Weeds in and around the garden should be removed, for some of them are hosts for the virus.

June is a good month to evaluate some of those varieties that were selected at random from the seed catalogs back in the winter or early spring. Gardeners should determine how well new varieties compared with the old reliables. Some questions should be asked. Did the trial variety produce a strong, vigorous plant? If a root crop, did the roots form and enlarge as desired? How about quality of the edible product? Were the bean pods straight and plump, or were they mishapen and dwarfed.

What about disease resistance? Gardeners should record which varieties performed well in order to plant them in another season.

Mulching effects are readily apparent in June. While weeds in unmulched gardens are difficult to deal with, mulched gardens should have few weeds. Nematode injury is obviously reduced by mulching. While nematodes attack mulched vegetables, the effects are not too severe due to the better conditions existing in the root zone. Perhaps the most striking benefits of
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Mulching to be observed is soil moisture control. While vegetables growing on unmulched, hot, sandy Florida soils droop and wilt readily, those in mulched gardens are standing tall. Mulching definitely pays.

Some of the mulching materials observed have been newspaper, oak leaves, pine straw, hay, wood shavings, old carpets, gravel, rocks, peanut hulls, and plastic.

One innovation worth noting is the use of old tires in the garden. The tires are placed flat on the ground, and tomato plants (2 or 3 per tire) are planted inside the hole in the tire. The tires form a support for the plants, and more importantly the fruits rested on the tires rather than on the soil, reducing fruit rots.

Another observation has been the use of black plastic mulch placed in the bottom of the furrow. Irrigation water is run down the furrow and seeps through small holes punched in the plastic. Furrow irrigation, wherever possible with or without plastic, shows good results compared to overhead sprinkling.

One gardener struck on a great idea for getting the full, delightful benefits of her 'Silver Queen' sweet corn. She pulled the ears of corn from her garden, went directly to the kitchen, and placed two unshucked ears into the microwave oven. After 6 minutes in the oven, she removed ears and shucked them. The marvelous part was that all the silks came off with the shuck leaving nothing but clean, white, shimmering rows of kernels, with all the juicy taste and flavor long associated with 'Silver Queen'.

(Stephens)

B. Know Your Vegetables - Rampion

Rampion (Campanula rapunculus) is a biennial plant grown as an annual vegetable for its leaves and roots.

Rampion, a native of Britain, was once used much more widely. It is seldom, but occasionally, grown in Florida gardens. People in Asia and Africa in addition to some areas in the United States and Europe grow it.

The leaves are entire and long-oval in shape, 6 inches or more in length. They form a rosette at the root crown. The roots are up to 1 foot long, slender, white, and sweetish. Roots may be cooked or eaten raw, as are some forms of radish, and the tops may be eaten raw as in salads or as a cooked green. An old Elizabethan recipe suggests the roots should be boiled and stewed with butter and oil and sprinkled with black pepper. The flavor is more nutty than radishes. The flavor is disagreeable to many who try it. The roots often are scraped before using.
Culture is similar to the ordinary radish. Although a biennial, the Rampion plant will sometimes go to seed in a hot summer. Therefore, for best results, it should be sown from seeds September through March in Florida.

Rows should be spaced nine inches apart, with 3 to 4 inches between plants. Roots can be stored under refrigeration for later use. Seeds are available in herb company seed catalogs.

(Stephens)