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Prepared by Extension Vegetable Crops Specialists

D. N. Maynard
Chairman

R. F. Kasmire
Visiting Professor

J. M. Stephens
Associate Professor

R. K. Showalter
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 80-1

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I. NOTES OF INTEREST

A. New slide set on Vegetable Gardening

By now all counties should have received the slide set and cassette tape entitled "You can Grow Vegetables. Part 1. "Soil Preparation and Liming". This is the first of a five-part series on Florida vegetable gardening. It is the result of a cooperative effort between the Editorial and Vegetable Crops Departments, and goes to you courtesy of the Rhom and Haas Company. Hopefully, you will find the set useful in your county educational programs.

(Stephens)

B. New Publication on Vegetable Gardening

Also by now you have received the new Circular 463, "Grow a Row of Vegetables in Florida". This is an informational jacket containing eleven individual crop leaflets. The circular was developed for use with limited resource families that might exist in your county. However, feel free to use it whole or in part wherever there is a need. Copies of the leaflets without the jacket are available from the IFAS Publications Distribution Center, Bldg. 644, University of Florida, Gainesville, 32611.

(Stephens)

C. A Cucumber Variety Trial

Growers interested in a Fall cucumber variety trial can get a copy of the results by requesting Research Report CF-80-2 from the author, Dr. J. M. White, AREC Sanford, Florida or from this office. Among the top were four named varieties. 1) Raider, 2) Sprint 440S, 3) Sprint S, and 4) Poinsett 76 with yields of 420, 370, 313, and 311 bushels of fancy cukes per acre respectively.

(Montelaro)

II. COMMERCIAL VEGETABLE PRODUCTION

A. Micronutrient Use in Vegetable Production

One of the most mismanaged practices in vegetable crop production in Florida is in the use of micronutrients. Not only is cost increased in many cases, but yield and quality are reduced as well. A thorough understanding of the behavior of the micronutrients in both the soil and plant is necessary in order to avoid costly mistakes. Following is a brief summary of factors affecting availability, crop requirements, diagnosis of deficiencies, and application of micronutrients to vegetable crops.

I. Micronutrients (minor elements) - the group includes iron, manganese, zinc, copper, boron and molybdenum.

II. Factors Affecting Availability of Micronutrients
A. Total Supply - Many virgin soils in Florida are deficient or almost completely lacking in one or more of the micronutrients. Boron is quite often deficient in sandy soils. New mucks need a rather heavy application of copper before they can be made to produce economically and the marls require manganese and zinc even after years of cultivation.

B. Soil pH - Iron, manganese, zinc, copper and boron are more available at low pH and become less available as the pH increases. The reverse is true of molybdenum. This may be presented graphically as follows:

<table>
<thead>
<tr>
<th>pH and Availability</th>
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<tbody>
<tr>
<td>Relative Ams.</td>
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<tr>
<td>Available</td>
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<tr>
<td>5</td>
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<td>4</td>
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<td>3</td>
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<td>2</td>
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</table>

Soil pH

C. Leaching - Heavy rains may leach the "available form" of some of the micronutrients. Boron is "quite soluble" and may be depleted from the soil reserve. With most of the micronutrients, as the available forms are used up or leached, more becomes available in time from the reserve supply of insoluble forms.

D. Balance with Other Elements - Balance (ratio of one element to another) between the various elements in the soil is also important. Heavy applications of one element, including the majors and secondaries, may cause a deficiency of another element. On the old celery soils of Sanford, Florida, fungicide applications over many years resulted in an excess of copper. This, in turn, causes an imbalance that shows up as an iron deficiency in some vegetable crops.

E. Aeration - The supply of air (degree of aeration) in the soil may, under certain conditions, affect the supply of available forms of the essential elements. Plant roots require oxygen to carry on their life processes, including absorption of plant nutrients. Generally speaking, a soil well-supplied with air is best for nutrient availability and root growth.

F. Soil Moisture - Availability of micronutrients may be affected at both, low and high extremes of soil moisture. Dry soil supplies considerable less boron than a similar soil at good moisture levels. Under water-logged conditions, microorganism activity is curtailed, aeration is reduced and conditions are set up to cause some elements to revert to toxic forms. Soil moisture levels which are judged best for plant growth are, also, best for nutrient availability.
G. Soil Temperature - Temperature of a soil affects availability of micronutrients in a roundabout way by influencing microorganism activity and root growth.

III. Requirements for Micronutrients

Crops and even varieties and strains within a crop vary considerably in their requirements for individual micronutrients. The following table shows that green beans have a low requirement for iron but a high requirement for manganese. The reverse is true for spinach. Relative requirements for three of the micronutrients for several crops are as follows:

<table>
<thead>
<tr>
<th>Micronutrient Requirements</th>
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<tbody>
<tr>
<td><strong>BORON</strong></td>
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<tr>
<td>Low</td>
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<tr>
<td>Green Beans</td>
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<tr>
<td>Medium</td>
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<tr>
<td>Tomatoes</td>
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<tr>
<td>High</td>
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<tr>
<td>Cabbage</td>
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<tr>
<td><strong>IRON</strong></td>
</tr>
<tr>
<td>Low</td>
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<tr>
<td>Green Beans</td>
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<tr>
<td>Medium</td>
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<tr>
<td>Tomatoes</td>
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<tr>
<td>High</td>
</tr>
<tr>
<td>Spinach</td>
</tr>
<tr>
<td><strong>MANGANESE</strong></td>
</tr>
<tr>
<td>Low</td>
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<tr>
<td>Spinach</td>
</tr>
<tr>
<td>Medium</td>
</tr>
<tr>
<td>Tomatoes</td>
</tr>
<tr>
<td>High</td>
</tr>
<tr>
<td>Green Beans</td>
</tr>
</tbody>
</table>

IV. Disorders and Symptoms Caused by Micronutrient Deficiencies in Plants

All plants do not show the same symptoms to a deficiency of any one of the micronutrients. Micronutrient deficiencies may be confused with virus diseases, cold, heat, or wind injury and many other plant disorders.

In many cases, a deficiency of one micronutrient would be somewhat similar to toxicity from another micronutrient. With experience, a grower can learn to identify a developing deficiency condition in time to correct the condition. The following are some symptoms and diseases caused by deficiencies of the micronutrients:

Iron -- yellowing of the new growth. In some cases, only a branch or few branches of a plant may show symptoms.

Zinc -- new leaves abnormally small, mottled or uniformly yellow, dead areas common. Example--white bud in corn.

Boron-- new bud light in color, brittle and deformed. Internodes short showing rosetting. Roots retarded, dark. Example--hollow stem in cabbage.

Copper -- symptoms not so pronounced. Leaves yellow and entire plant greatly retarded.

Manganese -- yellowing appears first between veins of leaves. Veins remain green. Tissue may die.

Molybdenum -- affects growing points. Example--whiptail of cauliflower.

V. Diagnosis of Micronutrient Deficiencies

Being able to anticipate problems in micronutrient nutrition, and also being able to diagnose a micronutrient imbalance in growing crops are extremely important. There are a number of factors, which if considered carefully, will help a grower with those two aspects in a micronutrient fertilization program.

A. Visual Symptoms - When a crop shows visual symptoms of a micronutrient deficiency, the potential yield of that crop has already been reduced. Nevertheless, if the condition is diagnosed and corrected in time, such a crop may still produce economical yields. A grower, with careful observation and experience, can learn to recognize many micronutrient imbalances on the crops he grows.
B. Soil and pH - By learning the characteristics of their soil and
knowing the relationship of pH to micronutrient availability, a grower can
often prevent the development of micronutrient problems.

C. Crops and Variety - Many crops, and even varieties within crops,
vary in their requirement for micronutrients. A micronutrient fertilization
program should be adjusted to the crop grown.

D. Fungicide Program - Many present-day organic fungicides contain
a micronutrient which may serve, not only to help control diseases, but in nutrition
as well. The anticipated disease control program for a specific crop should be
taken into consideration when planning a micronutrient fertilization program for
that crop. Fungicides supplying micronutrients are:
- Zineb--zinc
- Maneb--manganese (plus zinc)
- Basic Copper--copper
- Ferbam--iron

A potato or cabbage grower planning to use maneb may supply all of
the manganese needed by those crops through the use of this fungicide.

E. Fertilizer Program - The amount and kind of fertilizers affect
availability of micronutrients as well as need for micronutrients by plants.
High rates of phosphorus tend to depress the uptake of iron. An acid forming
fertilizer tends to increase availability of zinc, manganese, and other micro-
nutrients. The reverse should be true for base-forming fertilizer.

F. Weather - Environmental factors, especially temperatures affect
micronutrient availability. Soil moisture and temperature affect the speed
of chemical reaction in soil, speed of organic matter breakdown and even absorption
rates by plants. Plants may not be able to absorb sufficient boron from a dry
soil even though this would not be true if the soil moisture was adequate.

G. Use of Chemical Tests - A chemical analysis of a soil to determine
the capacity of that soil to supply micronutrients is time consuming, expensive,
and almost worthless without sufficient experience and testing with the crop,
the soil, and the area involved. However, periodic testing (once every 3 or 4
years) to note change in amount and ratio of the micronutrients can be valuable.

Leaf tissue analysis offers considerable promise, but require experience,
good lab facilities, and know-how and experience with the specific crop in an area.

H. Grower Trials in the Field - A grower has an opportunity to teach
himself on many occasions. When spraying micronutrients, leave one or two rows
out to see whether or not obvious results are obtained.

VI. Supplying Micronutrients to Crops

A. Soil Management - By properly managing a soil, a grower can produce
high yields and quality without excessive cost or trouble.
1. Test soils and apply the right kind and right amount of lime.
2. Use fertilizers with common sense. Avoid over-fertilization with
any elements.
3. Keep a good cover crop on the land when not in use.
4. Use good irrigation and drainage practices.
5. Maintain good soil tilth and avoid compaction.

B. Soil Applications - When needed, apply micronutrients in fertilizer
or lime. They may be supplied as inorganic chemical salts, chelates and glass
frits. Do not use excessive amounts.

C. Foliar Feeding - The micronutrients, when needed, can be supplied
very economically to plants through the use of foliar sprays or dusts. However,
the use of foliar sprays to supply the major elements (nitrogen, phosphorus, potassium)
is generally not a practice to be recommended.

Micronutrients can be supplied to the leaves of plants in the form of
inorganic chemical salts, chelates, and fungicides.

(Montelaro)
A. Developing County Extension Vegetable Marketing Programs:
Rough Handling as a Cause of Product Market Quality Loss

Rough handling is probably the most common cause of damage to fresh market fruits and vegetables, and the easiest to correct. Most damage causing marketing losses occurs in harvesting and packing house operations in producing areas. Therefore, elimination of rough handling caused losses is adaptable to county Extension programs.

Rough handling causes mechanical damage, e.g. bruises, crushing, cuts, scratches, punctures, and abrasions that provides entrance for decay-causing pathogens which ordinarily do not infect fruits and vegetables. Mechanical damage, caused by rough handling, also causes increased water loss, shrivel, product respiration and ethylene production rates, which enhance senescence.

Types of rough handling include throwing, dropping, tumbling, rubbing, (against rough or sharp fixed surfaces, or other product units), crushing, and crowding (e.g. in overpacking). Cracking and splitting are more extensive in early morning harvested vegetables that are more turgid than those harvested later in the day. Water loss through abraded surface areas is greater in the afternoon when there is a greater difference between the vapor pressure in the ambient atmosphere and that inside the products.

Most rough handling probably occurs because producers, packers, and shippers do not understand the deteriorating effects of such handling on the products. Obvious damage such as cracked, split, severely punctured, or crushed products can be detected and culled during grading. However, the effects of bruising, abrasion, and crowding (in overpacking) require additional time for the resulting damage to become apparent; this occurs during transit and market distribution. Thus, the discrepancy between damage observed by wholesalers and retailers vs. that observed by growers and shippers is a common factor in many perishables claims involving marketing losses.

Excessive haste in operations causes lots of damage to products. Reducing the cost of operations is the most common reason (excuse) offered for hurried operations. This is understandable but the value of the faster handling is lost when the marketing losses exceed the amount of the reduced handling costs. Speed in handling is essential in many operations if they are to be completed on time, but excessive speed tends to result in careless handling and damages products. I believe that one reason much hurried, careless handling continues to occur is the lack of communication between destination market handlers, who see the damaged products resulting from such handling, and the supervisors responsible for the operation causing the damage.

Eliminating rough handling provides a greater packout of marketable product. Higher quality products at the market place command higher prices, return greater profits, and provide a better reputation in markets (i.e. products with which minimum marketing losses are experienced generally enjoy a favorable reputation in markets - they sell when others won't).

County agents can help reduce rough handling damage, and losses, through the following steps:

1. Learn to recognize rough handling. No fruit or vegetable can be considered as a "hardware" item, although some are treated as such by the fresh produce trade. All fruits and vegetables are susceptible to mechanical damage caused by rough handling.
2. Study operations or handling steps that you believe are damaging. Compare products (from same lot, of course) that are subjected to the particular operation (treated) with those not subjected to it (control), a control is essential for the comparison. Replicate the comparisons with comparable products from the same lot - i.e. compare products of equal size, shape, maturity, and time of harvest. After collecting your treated and control samples store them at a simulated transit temperature (e.g. 30°F) for a few days, followed by two days storage at room temperature. This will allow the necessary time for the damage to manifest itself, and appear as destination market handlers might see it.

3. Examine and rate the products for damage. You can use a simple rating by separating product units into those that are undamaged or only slightly damaged, moderately damaged (these would still be acceptable to some consumers but not to others) and severely damaged (unmarketable only because of the damage).

The following rating scale requires more judgment but can provide more meaningful information from a study: 1 = no damage; 3 = slight but not objectionable damage; 5 = moderate damage, requiring trimming (e.g. of lettuce or celery) or price reduction to sell; 7 = severe damage, (unsaleable, but undamaged parts of a fruit or vegetable would still be edible); 9 = extreme damage (completely unusable). Assigning a numerical value to each damage category helps you to statistically analyze the results and make them more valuable to your cooperators. Take pictures of representable samples of each type and degree of damage.

4. Show the results to your cooperators. Give them a written progress report of your study and its results.

5. If the damage problem is a common one in your county, conduct a demonstration of its effects. It is best if you can suggest an alternative, better way to handle the product. But even if you don’t, the growers or shippers will be made more aware of the problem and may develop their own solutions.

6. Prepare a newsletter article on the study.

Rough handling damage is one of the most common causes of marketing losses. It is also a cause that we can help to eliminate through effective county Extension programs.

(Kasmire)

IV. VEGETABLE GARDENING

A. Fluid Drilling of Pre-Germinated Seeds

Gardeners who are looking for new ways to improve their gardening success should be interested in a new concept for sowing vegetable seeds called Fluid Drilling of Pre-Germinated Seeds.

The idea was first conceived in England and is based on the old grower practice of first soaking seeds to start them sprouting before planting. However, Fluid Drilling goes further than pre-soaking (sprouting) seeds. Fluid Drilling involves (1) germinating seeds under controlled, optimum conditions, (2) selecting the best sprouted seeds and mixing them with a protective gel, and (3) dispersing the gel containing the germinated seeds into the seed furrow.
While the procedure does require more steps than simply sowing dry ungerminated seeds, the extra effort pays off in many instances due to the many advantages which have been demonstrated for the procedure. Researchers in Florida have shown that fluid drilling of pre-germinated seeds results in earlier emergence, a better stand, and more uniform production.

Dr. H. H. Bryan, et al., F.S.H.S. Proc. 91:88-90. 1978, reported the following steps for pre-germinating several kinds of vegetable seeds - tomato, lettuce, cucumber, cabbage, okra, corn, squash, broccoli, and turnips.

First, obtain the equipment needed, which are: (1) clear plastic box with sides 2 to 3 inches high or about the size of a shoe box; (2) absorbent paper tissues; (3) wet-strength paper towels; (4) clean low pressure water source; (5) mist sprinkler; (6) clear cover for the box (may be plastic bag); (7) nylon strainer; (8) gel powder; (9) measuring spoon; (10) stirring spoon; (11) gel dispensing device such as cake-icing syringe or plastic bag with corner clipped off; and (12) scissors.

Then proceed as follows:

1. Line the bottom of the plastic box with several layers of unmedicated absorbent paper, then cover with a single layer of wet-strength paper towel.

2. Add water slowly to the paper until it is wet through. Hold paper in place while pouring off excess.

3. Distribute seeds (one kind) evenly in a single layer on the paper and sprinkle water over the seeds.

4. Place the lid on the box or cover the box with plastic film. Put the box in a warm place (65-72°F) but not in direct sunlight. Most seeds can be germinated in the dark.

5. Look at the seeds every day to see if they have germinated. Some kinds of seeds germinate quickly while other take longer. Do not allow roots on small seeds to grow more than 3/16 inch or more than 3/8 inch on large seeds before planting.

6. When most of the seeds have germinated, they may be mixed in gel and planted. If it is not convenient to plant right away, the box of sprouted seeds may be placed in the refrigerator for a few days, but not frozen.

7. Now prepare to mix the seeds with gel by first discarding the ungerminated seeds and carefully washing the germinated seeds off the paper into the strainer. Do not handle the delicate germinated seeds with the finger.

8. Sprinkle a level teaspoonful of gel powder into a cup of tap water while stirring rapidly. Continue to stir for 1 - 2 minutes then let stand for 10-15 minutes. Mix about half the seeds in 1/2 of the gel with a finger or stirrer, then add the rest of the seeds to the gel and stir in carefully until all are well distributed throughout the gel. If seeds sink, the gel needs to be thicker. Do not store the seed-gel mixture overnight.

9. Transfer the mixture to the dispenser (syringe or plastic bag).
10. Extrude the seed gel into the seed furrow in a continuous bead just thick enough to provide the desired amount of seeds per foot of row. Cover with soil and water as usual for freshly sown seeds.

11. Since this is a new technique, proceed with caution. Experiment with less expensive seeds rather than more expensive hybrid seed.

*Note: Several gels are suitable for fluid drilling. Cellulose wallpaper paste (without fungicide) mixed at 1/2 strength has been suggested.

(Stephens)

B. Know Your Minor Vegetables - Water Celery

A report on water celery, (Oenanthe javanica D.C.) or (O. stolonifera Wall.), was made by Morton and Snyder in F.S.H.S. Proc. 91:301-305. 1978. This is a shortened version of that report.

Water celery is also known as water dropwort; in Japanese as "seri", in Chinese as "su-kan"; in Thai as "pak chi lawm"; in Malay as "shelum"; and New Guinea as "damoe".

It is a perennial herb with creeping stolons and long, threadlike, white rootlets. The erect, slender, hollow green stems range from 4 inches to 5 feet high. The deep green leaves, having an odor like carrot tops, are celery-like in shape and size. Tiny white fragrant flowers form in compound umbels of 10 to 25 blooms.

Where Grown

The plant grows wild in freshwater marshes, swampy fields, along ditches, pools, canals, and streams in many oriental areas of the world such as Malay, India, Thailand, China, Japan, and New Guinea. It is cultivated in many of these places and in Hawaii.

In Florida

It has been grown in Florida only experimentally. In a test planting at Belle Glade in December 1977, sprigs were set out 9 inches apart in a concrete tank of flooded muck soil. It withstood temperatures as low as 31°F and by March had spread over a large area of the tank. Several cuttings of leafy stalks were made periodically every 2 or 3 weeks. The flavor and tenderness were acceptable to Oriental customers trying the water celery. There was a tendency for the planting to become densely matted after several cuttings indicating a need to remove shoot roots along with the tops. Almost no pests were observed on the test plantings.

Use

The tops are eaten raw in salads or as a garnish like parsley. The young stems and leaves are also eaten raw or steamed with rice, or boiled and chopped as greens. Obviously, there are many oriental recipes which include this vegetable.

(Stephens)