Vegetable Crops Department
The Vegetarian Newsletter

February 9, 1976

Prepared by Extension Vegetable Crops Specialists

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

FROM:  Stephen R. Kostewicz, Extension Vegetable Specialist

VEGETARIAN NEWSLETTER 76-2

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THE VEGETARIAN NEWSLETTER

I. NOTES OF INTEREST

A. Manuscript on Production of Transplants

We have a limited supply of a department report entitled "Vegetable Transplant Production" authored by Dr. George A. Marlowe, Jr. This manuscript should be of interest to anyone producing vegetable transplants, either containerized or bare-rooted. Anyone desiring a copy can request it by writing us at the Vegetable Crops Department, 3026 McCarty Hall and asking for Vegetable Crops Extension Report VC 1-1976.

(Kelly and Montelaro)

II. COMMERCIAL VEGETABLE PRODUCTION

A. Diagnosing Nutrient Deficiencies in Vegetable Crops

A quick diagnosis of a nutrient deficiency in a field of vegetables can mean the difference between success and failure with any crop. Even if not of immediate help, an accurate diagnosis can be of considerable value toward the prevention of the same problem in future crops. An accurate diagnosis is not an easy undertaking. It requires the best of the art as well as the science of vegetable production.

How then does a person go about making a quick and accurate diagnosis of a "so-called" nutrient deficiency? Note the use of the term "so-called" nutrient deficiency. Too often what was thought to be deficiency symptoms turns out to be plant injury resulting from viruses, fungi, bacteria, nematode or insect attacks, disorders caused by wind, extremes in temperature and air humidity, genetic factors, etc. Once "other causes" are eliminated, it is a rather simple task to diagnose a nutrient deficiency.

There are five "techniques" which may be used in diagnosing plant deficiencies. They are (1) visual identification, (2) soil analyses, (3) tissue analyses, (4) soil application tests, and (5) foliar application tests. All five techniques are worthy of consideration. The experienced fieldman may use a combination of two or more of the techniques to make an accurate diagnosis. Following is a brief discussion of the techniques and how they may be used as diagnostic tools.

(1) VISUAL IDENTIFICATION - This is the quickest and least expensive of the five techniques. Visual identification of a nutrient deficiency should not be relied upon by the beginner. Only the well-trained experienced fieldman, familiar with the crop, the deficiency and the area, generally is capable of making a recommendation solely on his on-the-spot observations.

Those interested in improving their proficiency in visual identification of nutrient deficiency should avail themselves of the literature available on keys for pinpointing possibilities and the abundant literature giving good descriptions, pictures, etc. Expertise in visual identification is obtained over a period of time by first determining deficiencies by one of the other four techniques.

(2) SOIL ANALYSES - As a diagnostic tool, soil analyses can be of great value in ascertaining nutrient deficiencies in a growing crop. A drawback is the time and cost involved in sampling and analyzing the sample. Soil analyses include such determinations as pH, levels and ratios of major, secondary and micronutrients, total soluble salts, toxic or harmful ions and even chemical composition of nutrients. Since benchmarks are not always available to make a judgment, experienced fieldmen often sample extremes. By this is meant soil areas of a field showing the best (or devoid of symptoms) and the worst plants. By comparing extreme values, it is often possible to pinpoint the deficiency accurately.
(3) TISSUE ANALYSES - What applies to soil analyses applies to tissue analyses as well. References can be found in the literature giving deficient, adequate and excessive levels of most nutrients for most crops. However, sampling methods, age of plants, season, lab techniques and many other factors affect nutrient levels in plant tissue. Tissue analyses are very time consuming and expensive.

As stated for soil analyses, sampling of plants showing extremes may prove to be most rewarding. Samples should be drawn primarily from affected plant parts. For instance, if the roots are chlorotic, that portion only may need to be analyzed.

(4) SOIL APPLICATION TESTS - This technique is used to a limited extent but can be of considerable value under certain conditions. The addition of nutrients singly to the soil in areas of suspected deficiencies may help pinpoint the problem. Results may be slow in coming or they may not materialize due to chemical or physical complications in the soil. NOTE: Solution culture is similar to soil application tests in many ways. It is a complicated test to set up and operate and for that reason it is not recommended except for the research scientist.

(5) FOLIAR APPLICATION TESTS - Probably the least known and least used technique, foliar application, may be the most accurate of all techniques used. Simply, the technique is what the name implies—application of nutrients to the foliage of plants. Selecting an area of the field showing typical symptoms, nutrients of the major, secondary, micro, or all groups are sprayed individually to single plants or a plot of plants. Within two to three days, absorption through the leaves may show dramatic improvements in one (sometimes more) treatment. Conversely, antagonism between nutrients may show an intensification of the problem in plants or plots of plants sprayed with another nutrient or nutrients. For example, a plant exhibiting a deficiency symptom may be greened with a foliar application of iron. However, other plants treated with manganese, zinc or copper may show an intensification of the deficiency. In other words, a deficiency of nutrients may actually be a toxicity or excess of another.

Those interested in this technique need only to obtain a small hand sprayer, wooden labels (or tags) and a small amount of the nutrient chemicals. Simply select an area in the field with severely affected plants. Lay out the plots or select single plants. Apply the chemicals singly at the rates suggested in the following table. Be sure to label or tag each plot or plant accurately for identification later. NOTE: If foliar injury is observed, reduce the concentration and treat another plant or plot. It is advisable to treat duplicate plots or several individual plants being sure to label each accurately.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Chemical Sources</th>
<th>Rates, Level Tablespoon/l gal. water</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Nitrogen</td>
<td>Calcium nitrate, Magnesium nitrate</td>
<td>1 to 2, 1 to 2</td>
<td>Results may be confounded by Ca and Mg ions.</td>
</tr>
<tr>
<td>2. Phosphorus</td>
<td>Phosphoric acid</td>
<td>2 to 3</td>
<td>Other soluble materials may be used.</td>
</tr>
<tr>
<td>3. Potassium</td>
<td>Potassium sulfate</td>
<td>1 to 2</td>
<td>&quot;&quot;</td>
</tr>
<tr>
<td>4. Calcium</td>
<td>Calcium chloride</td>
<td>1 to 2</td>
<td>&quot;&quot;</td>
</tr>
<tr>
<td>5. Magnesium</td>
<td>Magnesium sulfate (Epsom salt)</td>
<td>1 to 2</td>
<td>&quot;&quot;</td>
</tr>
<tr>
<td>6. Boron</td>
<td>Boric acid, Borax</td>
<td>2 to 3, 1 to 2</td>
<td>Borax should be dissolved in warm water first.</td>
</tr>
</tbody>
</table>
Nutrients, Chemical Sources and Rates for Foliar Application Tests for Diagnosing Deficiencies in Vegetable Crops (continued)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Chemical Sources</th>
<th>Rates, Level Tablespoon/1 gal. water</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Copper</td>
<td>Copper sulfate (Bluestone)</td>
<td>1 to 2</td>
<td>Copper fungicides and chelates are good sources of Cu.</td>
</tr>
<tr>
<td>8. Iron</td>
<td>Iron sulfate (Ferrous)</td>
<td>1 to 2</td>
<td>Chelates are good sources of iron. Ferrous ion oxidizes rapidly.</td>
</tr>
<tr>
<td>9. Manganese</td>
<td>Manganese sulfate</td>
<td>1 to 2</td>
<td>Chelates are good sources.</td>
</tr>
<tr>
<td>10. Zinc</td>
<td>Zinc sulfate</td>
<td>1 to 2</td>
<td>Chelates are good sources.</td>
</tr>
<tr>
<td>11. Molybdenum</td>
<td>Sodium molybdate</td>
<td>1/2 to 1</td>
<td>Rarely encountered, except at low pH.</td>
</tr>
</tbody>
</table>

Availability of some of these materials may present a problem. Some can be obtained from drugstores, garden and farm supply dealers, chemical supply houses (mail order), fertilizer formulations and others. Properly stored, these materials will last for a long time. Take care not to cross-contaminate the bottles.

A beginner should realize that there are no hard and fast rules. The guidelines given here should be modified as experience dictates. With time and effort, it is possible for any technically trained fieldman to develop a high degree of proficiency in diagnosis of nutrient deficiencies.

(Montelaro)

B. Late Blight Control Update

Recent reports out of South Florida indicate severe outbreaks of late blight on tomatoes and potatoes. Again as they did in 1968 and 1972, growers are doubling and tripling recommended amounts of fungicides for each application and increasing the number of applications without complete success. See articles in the April, 1963, February, 1972 and March, 1973 issues of this newsletter for these articles. When asked, Dr. Robert McMillan, Plant Pathologist at AREC, Homestead, reiterated what he and Dr. Conover have said many times in the past. Most of the failure results from poor application techniques especially excessive speed of the spray rig. In a report dated 1972, they list four principles determining success or failure. They are:

(1) Fungicides must be present before infection occurs.
(2) Fungicides must be present where a spore "lands" on the plant. This means complete coverage of plant.
   (a) if fungicides are not present at that exact spot, infection results.
   (b) all susceptible tissue, i.e. both leaf surfaces, stems, and fruits, must be covered with a fungicide, since spores may "land" anywhere.
(3) Fungicides must be reapplied often and thoroughly enough to maintain effective residues and to protect new growth.
(4) Any compromise of these principles will be revealed by disease when inoculum is available and weather favors disease development.
The report discusses factors involved in obtaining good coverage which is a must for good control. These include speed, droplet size, pressure, nozzle arrangement, size and numbers, gallonage, frequency of application, etc. A copy of the report entitled "Some Factors Affecting Fungicidal Application" authored by Dr. Robert A. Conover, Plant Pathologist, AREC, Homestead, is available upon request from the Vegetable Crops Department, 3026 McCarty Hall, University of Florida, Gainesville, Florida, 32611.

(Montelaro)

C. Some Effects of Soil Water Quality on Vegetable Crop Growth and Development

Since man first cultivated crops, the availability of water for production has been of prime consideration. A recent worldwide survey of factors which limit crop yields showed that water quality was as much of a restriction as quantity of water. In areas of the world with low rainfall or insufficient water for irrigation the quality problem is usually compounded by poor internal drainage, inadequate leaching of salts from the soil, and high evaporation.

Soil water quality, as applied to Florida vegetable production relates mostly to the total soluble salt level (TSS) and the composition of salts within this total. Soluble salt levels may be expressed in parts per million (ppm) or in some measure of electrical conductivity (EC) or resistance (mhos). Sodium, boron and chloride levels seriously impair soil water quality in some arid regions of the Western United States. Salt (sodium chloride) water intrusion into irrigation sources is becoming a problem in Florida wherever the extraction rate exceeds the replenishment and dilution rate of more pure water such as rain.

The salts in the soil solution come from the weathering of rocks, mineralization of organic matter, and application of fertilizers. Plant nutrients are absorbed in the form of salts or their constituent ions, but all salts may be harmful to yield and development beyond the small quantity required for plant growth. Crops vary in their response to excess salt levels. In a recent USDA study, yield reductions of 25% were associated with the following salt readings:

- Beets 6080
- (highly salt tolerant) Tomatoes 4352
- Cabbage 2560
- Sweet Corn 2555
- Onions 2432
- Sweet potato 2240
- Lettuce 1932
- Carrot 1600
- Beans 1280
- (highly salt sensitive)

The study revealed that high salt levels may exhibit some benefits under some conditions, such as firmer heads of cabbage, higher sugar content of carrots, and hastened maturity of potatoes, but perhaps resulting in reduced crop yields. These same factors were associated with decreased soil moisture levels which in essence is similar to the effect of excess salts. Drought symptoms are generally different from salt excess. However, salt excess usually does not cause wilting.

Vegetables also respond differently to excess salts at various stages of growth. Excess salts delay or prevent seed germination; decrease root development and stunt seedlings; inhibit leaf size, and disturb chlorophyll production. In more mature plants, excessive salt levels are associated with decreased plant size, lower yields, smaller fruit, more culls and yellowing of foliage. High salts delay flowering in sweet corn.

As shown by Dr. S. S. Woltz of the AREC-Bradenton, high soluble salt levels in the soil solution reduce water uptake by roots of tomatoes and cause nutritional
imbalances or toxicities. For example, sulfate may reduce calcium uptake, excess calcium may reduce potassium uptake, and excess sodium may reduce the uptake of calcium, potassium, and magnesium.

Vegetable growers are becoming more aware of the problems associated with high soil salt solutions. In the irrigated agriculture of the western U.S., leaching is a common preventive. To achieve the same tomato yield on soils of increasing salt levels, a study revealed that irrigation frequency had to be increased from 16 times at the 1000 ppm salt level to 22 times at 1200 ppm, to 29 times at the 1400 ppm salt level.

Florida growers should monitor their soil salt solution levels frequently to avoid the salt problem rather than trying to correct the problem. It is not easy to correct salt problems in the soil after high levels have been established. Dr. James Montelaro has been a long term advocate of programs which provide growers a means of preventing this serious problem. The excellent suggestions he has presented in previous issues of the Vegetarian (72-1, 72-4, 72-6 and 75-5) should be a part of every county program.

D. Vegetable Varieties and the Small Local Sales Grower

The popularity of direct local grower to consumer sales outlets in recent years has brought many questions about suitable varieties. In general, most of those inquiring have had little experience with the crops they plan to grow and are seeking information which will enable them to make the right selection. It is human nature to want to try something new and this certainly is reflected in vegetable variety selections. New varieties appear every year and are accompanied by appropriate fanfare and publicity making them attractive to the grower. However, it is this author's opinion that the grower we are referring to should be advised to stick to recommended (proven) varieties for the major part of his planting. After he has had experience with the crop, he may then take the opportunity to experiment with new varieties.

The following guidelines are proposed to help advise interested growers.

1. Use recommended varieties. Modern-day plant breeders have developed varieties which contain features such as disease resistance, high yield, uniformity and high quality. Frequently, these "highly tuned" varieties are developed for particular production area conditions which may or may not be present in all growing areas. New varieties or selections are continually being released and this necessitates a constant trial program to evaluate how they will perform under our conditions. Such trials are conducted in Florida and are the basis for our recommendations (refer to specific production guides).

2. Use the highest quality seed available. Many definitions of what good seed should be can be found, but in general it should be true to type and with high germination, and good seedling vigor. We are protected by seed laws in Florida by which seed companies must operate, but occasionally problems do occur. One should not try to save his own seed or use old "bargain" priced seed. These usually are poor quality and result in serious problems. Good seed is cheap when one considers its price in relation to the total money invested in fertilizer, fuel, labor, etc., used in the production of a crop.

3. Handle seed properly. Seeds are living organisms which are respiring, but at a very low rate. The biggest threats to seeds on the most damaging conditions which can make "good seed bad" are high temperature and high humidity. Some points to remember when storing seed before planting or between successive plantings are:
(a) Keep seeds in the original container or a sealed container.
(b) Keep them cold.
(c) Keep them under low humidity conditions.
(d) Do not handle roughly especially if the seeds are large (beans for example). Rough treatment can break or split seeds which results in no germination for that seed.

(4) Seeds versus transplants. The advantage of transplants is one of earliness. This factor is especially important in the spring and less so in the fall. With transplants, the time in the production field is less than if seeded. Transplants can be set out after last chance of frost and thus gain several weeks over seeded crops. Not all crops can be transplanted nor are transplants easy or cheap to grow or handle. Good transplants are:

(a) Stout, not leggy or stretched.
(b) Good green color, not pale or starved looking.
(c) Free of diseases and insects.
(d) Hardened properly to reduce transplanting "shock" in the field.

(Kostewicz)

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 February 15-21

Question

I have an average size garden, roughly 1000 square feet in size. How much money can I save by growing my own vegetables in this plot?

Reply

When calculating the economic feasibility of gardening, certain considerations must be kept in mind. First, larger gardens pay bigger dividends. Second, crops grown determine margin of profit, since some crops (tomatoes, for example) are worth more than others (radishes, for example) based on retail price and yield from a given area. Third, labor must not be considered as a cost item, or a profit will probably not be realized.

To arrive at the answer to your question, make a simple cost and returns comparison. Total up all your material expenses such as seed, fertilizer, fumigant, insecticide, fungicide and water. Then figure your equipment costs on items like hoes, rakes, rototillers, garden hoses, sprayers and sprinklers. Most of such items will last about five years with good care, so use 1/5 of the purchase price as an expense entry. Next, figure potential yields from the crops to be grown. Calculate retail value based on the prices you would have to pay in the stores for the same product. Now, subtract total expenses from total value. You should come up with roughly $150-250 per 1000 square feet saved by growing your own rather than buying. One more thing to remember, the produce you grow may mature rather suddenly, so you must plan your garden so that you have a usable assortment of vegetables coming into harvest over a broad range of time. Otherwise, you may end up giving any "profits" away to your neighbors.
(2) Timely Topic for Week of February 22-28

Question

Does home preservation of vegetables pay off in a money-saving way?

Reply

To answer this question, one must speak in generalities. However, cost and returns studies have been done which give us a fairly clear picture. Indications are that food frozen at home under best conditions costs almost 19 cents per pound more than that purchased. With unsuitable or poorly-operating freezers and high electric rates, home freezing may add as much as 53 cents a pound to the cost of food. For the most economical home-freezing of foods, a person must select a freezer to fit family needs, use it properly, freeze only foods liked by the family and in usable amounts, and find lowest-cost food sources possible.

On the other hand, home canning can provide savings if produce is home-grown (or obtained free), and if jars and equipment are available from previous years. There still are small savings if jars and produce have to be purchased. Of course, savings may be nullified if commercially canned foods can be bought in case lots at discounted prices. Just for example, a 1974 study showed tomatoes could be canned for 4.3 cents per quart (excluding the jar and the produce). The cost would rise to 50.9 cents per quart if tomatoes and jars had to be purchased. In the stores, canned tomatoes were selling for 64-90 cents per quart.

(3) Timely Topic for Week of February 29-March 6

Question

I am often told that the vegetables in my garden may need micronutrients. What can I do to supply them?

Reply

The secondary plant foods iron, zinc, copper, boron, manganese, and molybdenum are essential for good plant growth, but are needed in very small amounts. For this reason, they are called micronutrients. It is quite easy to over-supply plants causing toxic results. When conditions call for a need to supply them, garden fertilizers can be purchased which contain micronutrients, either in a water-soluble form available to plants or in more slowly available forms. The fertilizer tag or container label will tell which ones are in the bag. There is a wide variety of sources of these plant foods, including both soluble and insoluble forms. Common sources are sulfates, oxides, "chelates" and "frits". In the fritted forms, elements are held in ground up glass. There are spray forms of minor elements available, but these are usually one soluble material for a specific problem—like iron sulfate to correct an iron deficiency. Also, organic materials such as plant residues in compost release micronutrients as they decompose. Even commonly used fungicides such as maneb, zineb and copper supply micronutrients to the plants as they are sprayed on for disease control (manganese, zinc, and copper, respectively).

(4) Timely Topic for Week of March 7-13

Question

How much sulfur should I use to make my garden soil more acid?
In general, most soils require about 1/3 as much sulfur to lower the pH as the amount of lime needed to raise it to the same extent. Therefore, on sandy soils with a little bit of organic matter, three pounds of limestone per 100 square feet (equivalent to about 1200 pounds per acre) will adjust the pH upward by 1 unit (say from pH 5.0 to pH 6.0). To reduce it from pH 6.0 down to 5.0, sulfur at one pound per 100 square feet (400 pounds per acre) would be required. A commonly used garden practice is to apply calcium sulfate (gypsum) or magnesium sulfate ( epsom salts). With these materials, sulfur, calcium and magnesium are added to the soil, but the pH is neither lowered nor raised to any appreciable extent.

(Stephens)

B. Know Your Vegetables - Paprika

Paprika (Capsicum annuum) is a type of mild pepper which is dried, ground and used as an herb or spice. Most of the paprika peppers grown in the U. S. have been introduced from Southern Europe. In areas where grown, selections have been made for color, shape and thickness of pods, and flavor of the ground product. Some of the local selections have become fairly well established as to type, but none as varieties. Processors have developed varieties for dehydration, but these are not available for public planting.

The so-called Hungarian paprika has been grown more widely in the U. S. than any other paprika. The Spanish paprika has been grown to a limited extent.

Hungarian paprika produces fruits two to five inches long, depending on the strain; the shape varies from conical (pointed) to oblong (tapering); walls are usually thin. Some strains are more pungent (hot) than others, but usually they are mild. There appears to be great variability in the strains of paprika from Hungary. Some are much smaller and rounder than the Hungarian already described.

Spanish paprika has larger, longer fruits, usually five to nine inches long, with thick walls. The ground powder is bright red with good flavor. Due to the larger, thicker, flesher pods of the Spanish paprika, it is also more susceptible to disease in the field than the smaller Hungarian paprika.

The Spanish type is usually milder, due to the complete removal of the "hot" central portion--the placental core and its seeds.

However, like other peppers, paprika appears well adapted to Florida and to other warm areas of the South. Very little paprika pepper is grown in Florida. It was grown commercially in South Carolina and Louisiana years ago.

Paprika is started from seed, early in the spring as soon as frost danger has passed. Plants are spaced 12 inches apart in rows three feet apart. Fruits of varying degrees of maturity are found on the plant in summer and fall because flowers are produced over a long period. Fruits are picked when fully mature, indicated by the bright red color. Drying and curing of the peppers require clear hot weather or artificial heat in a suitable structure. Home gardeners can dry them by placing mature peppers in mesh bags and hanging the bags up in an attic, a heated room or structure (130°F to 150°F) for about three days to a week. About 85% of the pod weight is lost in drying.

(Stephens)