Vegetarian 87-2

February 20, 1987

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I. NOTES OF INTEREST

A. Vegetable crops calendar


II. COMMERCIAL VEGETABLES

A. Pounds per acre or pounds per ton — are growers applying the correct amount of fertilizer?

One important step in proper vegetable fertilizer management is a soil test to determine exact fertilizer needs. Another important corollary is to apply the correct amount of a fertilizer material to achieve the optimum growth. One common problem surfaces every year regarding application rates. The problem discussed below is particularly acute with micronutrients.

Many growers use a fertilizer blend with a "micronutrient package" in it. It is usually expressed in terms of "units per ton" or "pounds per ton" and is a "shot-gun" approach to fertilization. Let's assume (and that's a big assumption) that the grower really needs micronutrients in his fertilizer. Let's assume that the soil test reflects a need for 2 pounds of copper, 5 pounds of manganese, 1 pound of boron, and 5 pounds of zinc per acre. The grower needs to apply these amounts at planting along with 60 pounds of nitrogen, 120 pounds of P₂O₅, and 60 pounds of K₂O per acre. His fertilizer dealer has the following fertilizer for sale, the tag of which is reproduced below:

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen (N)</td>
<td>6%</td>
</tr>
<tr>
<td>Phosphorus (P₂O₅)</td>
<td>12%</td>
</tr>
<tr>
<td>Potassium (K₂O)</td>
<td>6%</td>
</tr>
<tr>
<td>Boron (B)</td>
<td>.02%</td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>.10%</td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>.10%</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>.05%</td>
</tr>
</tbody>
</table>

To achieve the correct N, P₂O₅, and K₂O rates, he needs 1000 pounds per acre. But what about the micronutrients? At 1000 pounds per acre, he is getting only 0.2 pounds of B, 1.0 pounds of Mn and Zn, and only 0.5 pounds of Cu per acre. If his crop really needs these micronutrients, the grower might be in trouble.

The solution to the problem is to work with the fertilizer dealer to formulate a material that, when applied at the proper rate, would result in the desired amounts of all nutrients in pounds per acre. A better fertilizer material would be:

<table>
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<tr>
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<tr>
<td>Manganese (Mn)</td>
<td>.10%</td>
</tr>
<tr>
<td>Zinc (Zn)</td>
<td>.50%</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>.20%</td>
</tr>
</tbody>
</table>

When applied at 1000 pounds per
acre at planting, this material can supply what the grower needs.

Two points are apparent regarding fertilizer use. 1) If the grower really needs micro-nutrients, he must be careful that he has a fertilizer formulated to suit his needs and that he applies it at the correct rate to achieve the needed nutrients in "pounds per acre". "Pounds per ton" only tells him the concentration of particular nutrients in the fertilizer.

"Pounds per ton" equals "pounds per acre" only when the fertilizer material is applied at a rate of one ton per acre. 2) The micronutrient "package" concept can cause trouble. If the grower arbitrarily purchases a fertilizer with a "package", there often is not enough micronutrients present in situations when they are really needed. If the grower doesn't need micronutrients, then he will be wasting money. Extra micronutrients build up in the soil and could become toxic to plants.

(Hochmuth Veg. 87-02)

III. PESTICIDE UPDATE

A. Screening pre and postemergence herbicides for control of Parthenium (Parthenium hysterophorus) Control

Parthenium is rapidly becoming a predominant weed pest in the Dade County agricultural area. For a description of the weed see Florida Weed Science Society Newsletter Vol. 7, No. 2 or Vegetarian Newsletter 85-7. Commonly called pound cake weed, santa maria, or dog-flea weed, it does not appear to be as serious a competitor as pigweed (Amaranthus retroflexus) or spiny amaranth (Amaranthus spiosus) because of slow germination and early growth characteristics. Thus for crops that are commonly cultivated such as snap beans or squash, control through cultivation and crop competition appear satisfactory.

Crops that are not commonly cultivated such as in tomato row middles where polyethylene mulch culture is used or in tropical fruit crops, parthenium weed pressure is increasing. In tropical fruits, it has become predominant and a most-difficult-to-control weed pest.

In addition to the potential for damage to agriculture, parthenium produces contact dermatitis and can cause severe allergic skin reactions. This dermatitis has been documented in the United States, Australia, and India. It has been called "The Scourge of India" because of an epidemic involving thousands of adult males there.

Parthenium has become a major problem in Dade County since about the late 1970's. It apparently has a wide range which includes the coastal plains and adjacent provinces from Florida to Texas and as far north as Massachusetts, west to Michigan and Oklahoma as well as other geographic areas such as the West Indies, Mexico, and Central and South America.

Because of reports of poor control of parthenium with some herbicides and the fact that no herbicides are currently registered for parthenium, a series of screening tests were initiated by R. V. Tyson and H. H. Bryan to investigate the efficacy of pre and postemergence herbicides for the control of this weed pest.

In screenings of selected preemergence herbicides, 6 herbicides provided greater than 80% control of parthenium for over 79 days. These herbicides were metribuzin, atrazine, atrazine + metolachlor (Bicep), linuron, oxyfluorfen, and fomesafen. In addition, imazaquin provided 96% control for 42 days.

Results of experiments with postemergence herbicides indicate that paraquat applications alone
provide poor control of parthenium. The control improves with greater application rates, however, it continues to be inadequate.

Diquat applications provide satisfactory control and parthenium control improved with increasing rates of diquat in tank-mix combinations with paraquat.

It was also noted that 7 herbicides applied postemergence provided greater than 80% control of parthenium for a period of 53 days. These herbicides were fomesafen, imazaquin, acifluorfen, bentazon, dinoseb, metribuzin, and cyanazine.

Results of these experiments indicate that there is reasonable flexibility in selection of pre and postemergence herbicides for parthenium control assuming proper labeling for these products can be obtained.

(Tyson and Stall Veg. 87-02)

B. Photodegradation of paraquat and glyphosate applied to polyethylene mulch film

A common practice in the production of polyethylene-mulched crops is the broadcast, preplant application of paraquat (Gramoxone) to the polyethylene film and uncovered row middles to kill emerged weeds. In Florida, several different colors of polyethylene film are used with white and black being the most common. Usually 2 weeks or longer pass after application of the mulch before transplanting operations begin, during which time weeds can make significant growth. Frequently, rates of 1.0 lb paraquat/acre or higher are required to kill these weeds. Transplanting often begins within 24 hr after application of herbicide. Injury similar to that obtained with paraquat has been observed on tomato and other crops in Florida when transplanting was followed by rainfall or heavy dew with wind, causing contact of plant foliage with the polyethylene film (J. P. Gilreath, personal observation). Generally, this phenomenon has been observed when transplanting and rainfall occur within 3 days after paraquat application. These observations suggest that injury is due to dissolution of paraquat residues on the polyethylene film. Furthermore, temporal decreases in injury suggest that photodegradation of paraquat residue alleviates the problem.

Paraquat also is used to kill tomato vines at the end of the season to eliminate potential sources of disease inoculum for the next season. This is especially important at the end of the fall crop as land preparation for the spring season begins shortly after the last harvest in many production areas. When applied in this fashion, considerable paraquat residue remains on the mulch film. The fate of this residue has become increasingly important where double cropping is practiced since planting of the second crop, such as cauliflower or cucurbits, may follow the clean-up operation by just a few days.

Many growers in south Florida have reported increased difficulty in controlling seedling nightshade with paraquat and in some fields, torpedo grass has become a problem. As a result, some growers have begun using glyphosate (Roundup) to control these weeds with application made broadcast prior to transplanting. Glyphosate is also used to a limited extent for tomato vine kill, particularly in the fall when vine kill is sometimes more difficult to effect with paraquat. Thus, both paraquat and glyphosate residues may present a significant problem to growers when used as described.

Research has been conducted over the past 2 years at the Gulf Coast Research and Education Center
to determine a) if paraquat residues could be responsible for the observed injury to tomato, b) the photodegradation rate of paraquat residues on polyethylene mulch and the associated decreased injury to tomato, c) the effect of polyethylene mulch color on paraquat photodegradation rate, and d) the photodegradation rate of glyphosate under similar conditions as measured by bioassay.

Paraquat: Duplicate replicated experiments were conducted in October and November, 1984 on black and white polyethylene mulched beds. Duplicate samples were taken 0 to 144 hours after application of 1 lb/acre paraquat, one set for quantitative analysis, while the second set was used in a tomato plant bioassay.

Results indicated no difference due to mulch color. Substantial injury was observed from 0 to 96 hours after application with 50% or more crop loss anticipated until 120 hours (5 days) after application. Paraquat residue from plastic 0 to 48 hours following application reduced vigor to a point where if the plants survived, a marketable crop was not expected. From 120 hours on, plant vigor was acceptable with very little crop loss expected. Quantitative analysis indicated 60% of the applied paraquat was recovered immediately after application (275 ppm). The greatest decrease in concentration occurred in the first 24 hours, dropping about 50%. Correlation of concentration and vigor indicates that apparently concentrations below about 30 ppm of eluted paraquat are not particularly injurious to 6-week old tomato plants (120 hours).

Glyphosate: Experiments were conducted in July, September, and October of 1986 to determine the duration of phytotoactivity of glyphosate residues when applied at a rate of 1.0 lb/acre to white polyethylene film mulch. Black polyethylene mulch was not used since previous work with paraquat indicated mulch color had no effect on paraquat photodegradation. The sampling and bioassay procedure was the same as that used for paraquat. In July, samples were collected 1, 4, 8, 24, 30, and 48 hours after application. This experiment was terminated prematurely due to a sudden rain storm washing the polyethylene. In September, samples were collected 0, to 168 hours after application. The sampling interval in the October experiment ranged from 24 to 366 hours after application with samples collected every 24 hours.

Glyphosate photodegradation rate decreased with each successive experiment, presumably in response to decreasing day length and decreasing intensity of insolation. Even after 48 hours, plant vigor was less than 40% of that for untreated plants in July; whereas, in September, this had dropped to less than 30% during the same time interval. During the September experiment, photodegration occurred at a linear rate; however, not until the last sampling period (168 hours) had tomato plant vigor reached 70% of that observed for untreated plants. In October, all plants were killed by residue during the first 48 hours after application. Even after 336 hours, glyphosate residues were still very injurious to young tomato plants with vigor less than 30% compared to untreated plants.

Thus, growers who broadcast-spray paraquat preplant at a rate of 1 lb/acre in mulched production situations should delay planting 5 days after application to lessen the chance of injury from paraquat residue. Applications of greater than 1 lb/acre would likely require a waiting period longer than 5 days. Preliminary analysis of data from additional studies indicate an even longer waiting period would be required in January and shorter in
August.

If growers are using glyphosate, a much longer waiting period is indicated with a minimum of 7 days during the longer days of summer. Later in the fall and winter, at least 2 weeks is required for photodegradation and growers are advised to exercise caution when transplanting following such an application.

Dew and rainfall can have a very pronounced effect on the photodegradation rate of both herbicides when applied to polyethylene mulch. Thus, if a grower experienced no injury during a period with rainfall or heavy dew, he may be lulled into a false sense of security only to later suffer severe loss when little to no dew and/or rainfall occurs.

(P. R. Gilreath, J. P. Gilreath and S. J. Duranceau Veg. 87-02)

Ed Note: The following article by P. R. Gilreath, Florida Cooperative Extension Service, Palmetto, J. P. Gilreath, Gulf Coast Research and Education Center, Bradenton, and S. J. Duranceau, University of Central Florida, Orlando has been edited heavily, especially in the material and methods section to fit in this publication. For those needing more information on these experiments please contact the authors.

(Stall)

IV. VEGETABLE GARDENING

A. Fertilizing the vegetable garden.

The soon-to-be released revision of Circular 104, Vegetable Gardening Guide, includes a section on fertilization and pH adjustment. This section has been rewritten for this revised edition by Dr. Gerry Kidder, Extension Soil Scientist. While there are no major changes, I think it would be helpful to include his section here so that it may become familiar to all of us.

Adjusting soil pH - The best pH range for gardens on sandy soil is between pH 5.8 and 6.3. When the soil pH is below 5.5, an application of 2 to 3 pounds of finely ground dolomitic limestone per 100 square feet will usually raise the pH sufficiently. Lime should be applied only when its need has been established by a reliable soil test such as the IFAS Home Lawn and Garden Soil Test. Application of lime when it is not needed may cause plant nutritional problems.

Lime needs are best met 2 to 3 months before the garden is to be planted. However, lime may be applied as late as one or two weeks before planting. Make sure the lime is thoroughly mixed into the soil to a depth of 6 to 8 inches, then water to promote the chemical reaction. Do not lime alkaline soils.

Instead, use garden fertilizer containing the essential micronutrients lacking under alkaline conditions. Applications of sulfur to slightly alkaline soils may be helpful, but are of little benefit on the high pH soils.

Fertilizing - Unless very large quantities of organic fertilizer materials are applied, commercial fertilizer is usually needed for Florida gardens. Gardeners find it convenient to use commonly available fertilizer grades such as 6-8-8 or 15-15-15. Be sure to include micro-nutrients if soil pH is above 6.3. The quantities shown are usually sufficient:
Fertilizer

Soil Grade
sand, marl 6-8-8
rock, or 15-15-15
clay
Organic soils (muck or peat) 0-12-20

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Fertilizer Grade</th>
<th>Amount to Broadcast on 100 sq. ft.</th>
<th>Amount to Band on 10 ft. of row</th>
</tr>
</thead>
<tbody>
<tr>
<td>sand, marl</td>
<td>6-8-8</td>
<td>2-5 lb.</td>
<td>5 oz.</td>
</tr>
<tr>
<td>rock, or clay</td>
<td>15-15-15</td>
<td>1-2 lb.</td>
<td>2 oz.</td>
</tr>
<tr>
<td>Organic soils</td>
<td>0-12-20</td>
<td>1-2 lb.</td>
<td>2 oz.</td>
</tr>
</tbody>
</table>

Broadcast the indicated amount of fertilizer over the entire garden plot one to two weeks before planting. Band the other portion at planting time in 1 or 2 bands each 2 to 3 inches to the side of and 1 to 2 inches below the seed level or plant row.

In addition, during the growing season, it may be desirable to side-dress 2 or 3 times with appropriate fertilizer at half the banded rate shown in the table. On mineral soils, a grade such as 15-0-15 may also be used for sidedressing at a rate of 1/2 to 1 oz. per 10 ft. of row. Side dress just beyond the outside leaves.

If a different fertilization recommendation accompanies your soil test, use those specific recommendations rather than the general ones given here.

My comments: With both the old and revised guidelines, it is necessary for gardeners to calculate the area occupied by a given vegetable. The gardener should broadcast (scatter) up to 5 pounds of fertilizer over the calculated area. Additional fertilizer then should be banded on the basis of row length and fertilizer grade.

Obviously, there are several modifications that can and do work out satisfactorily. In some cases, all of the fertilizer is broadcast before planting. In other situations, all is banded, either on one side or on both sides of the row. Some gardeners use liquid fertilizer poured at the base of each plant. The point is that our guidelines are not that rigid, but they do serve as the basis for a good sound fertilization program in most instances.

(Stephens, Veg. 87-02)

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