January 10, 1974

Prepared by Extension Vegetable Crops Specialists

J. F. Kelly   James Montelaro   J. M. Stephens
Chairman   Professor   Assistant Professor

S. R. Kostewicz   J. R. Hicks
Assistant Professor   Assistant Professor

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

FROM: James Montelaro, Vegetable Crops Specialist

VEGETARIAN NEWSLETTER 74-1

IN THIS ISSUE:

I. COMMERCIAL VEGETABLE PRODUCTION
   A. Using Phosphorus Efficiently During Period of Shortages
   B. Beware of Services and Materials Offering "Miracle Results"
   C. Transplants

II. HARVESTING AND HANDLING
   A. Tomatoes: Freezing Versus Chilling

III. VEGETABLE GARDENING
   A. Gallup Poll Shows Vegetable Gardening on Increase
   B. Know Your Vegetables - Malabar Spinach

NOTE: Anyone is free to use the information in this newsletter. Whenever possible, please give credit to the authors.
THE VEGETARIAN NEWSLETTER

I. COMMERCIAL VEGETABLE PRODUCTION

A. Using Phosphorus Efficiently During Period of Shortages

For the first time since World War II, growers are experiencing shortages of fertilizers for the production of vegetables. This article, which deals with phosphorus, is the second in a series in an effort to help growers deal with this serious problem. Phosphorus (commonly referred to as phosphate) has been plentiful, inexpensive and used abundantly (probably too much so) in the past by Florida vegetable growers. In the opinion of the writer, a slight to moderate reduction in the supply may not be so serious a problem as feared by many growers. This opinion is based on the fact that growers generally have used considerably more phosphorus than necessary to produce vegetable crops over the past years.

To learn to use phosphorus as efficiently as possible is more important presently than at any time since World War II. The incentive now is to be able to grow the acreage of vegetables needed without a reduction in yield and quality with less phosphorus than was used in the past. This can be done in many vegetable producing areas of the State without serious consequences. To succeed in this effort, growers should understand some of the basic facts relative to the behavior of phosphorus in the soil. These are presented together with suggestions for modifications which can be made to reduce the total amount of phosphorus used in vegetable production.

(1) Residual Phosphorus Use

Have soil tested and determine the rate of phosphorus needed based on the residual amount found in the soil. Phosphorus accumulates from continued fertilizer applications and can build up to very high levels. Some of the old vegetable land in the Sanford area have been found to contain up to 7,000 pounds of phosphorus per acre. Most of it is in insoluble forms which become available as plants remove the soluble phosphorus from the soil solution. As a "rule of thumb," we suggest reducing standard rate of phosphorus applied by two-thirds when residual level is high and by one-third when residual level is in medium range. This suggestion can save from 50 to 100 pounds of phosphorus per acre on many vegetable soils in Florida.

(2) Placement

A small amount of phosphorus properly placed in the soil can be as beneficial to a crop as larger amounts placed improperly. Plants have the greatest need for phosphorus when roots are developing rapidly during early stages of growth. A small quantity (10 to 20 pounds P₂O₅ per acre) placed in the seed drill or root zone of transplanted crops can give seedlings the fast boost needed for good crop development.

Placement of phosphorus in close proximity to seedling roots is especially important to certain crops especially under conditions of cold soil temperatures. Seedling crops like tomato, pepper, eggplant primarily, but others as well, cannot forage for phosphorus adequately in cold soils.
(3) Timing

Since as much as 50% of total phosphorus uptake in some crops occur when plants have developed only 20% of total growth, most or all of the phosphorus should be applied before or very shortly after seeding or transplanting. Sidedressing of crops in the advanced stages of growth with phosphorus may be of no benefit to that crop and a waste of a valuable fertilizer material. The reason for not using phosphorus regularly in sidedressings is two-fold. If placed on the surface, phosphorus will be fixed there and not move to the root zone and crops in advanced stages of growth with extensive root systems do not respond to additional phosphorus unless quite deficient in the soil.

(4) Adjusting pH

In general, availability of phosphorus is at a maximum at pH 6.5 to 7.0. Have soil tested and adjust pH to this level. At pH levels of 4.5 and below, it is rendered insoluble by reacting with iron and aluminum. In highly calcareous soils, phosphorus reacts with calcium to form insoluble compounds.

pH can be adjusted upwards quite easily with lime. Except in the high pH, calcareous soil, slight downward adjustments of pH can be made by using acid-forming fertilizer materials. Since phosphorus applied to the calcareous soil is quickly changed to insoluble forms, application should be split into several smaller ones in order to supply some soluble phosphorus at regular intervals during growth of the crop.

(5) Sources of Phosphorus

Sources of phosphorus vary considerably in availability to the crop to which they are applied. Generally, triple and regular superphosphates are readily available forms. On the other hand, the phosphorus in the highly-ammoniated superphosphates is only partially available to the crop to which it is applied. Ammoniated superphosphate can be used to supply some of the phosphorus requirements if (1) it is not too highly ammoniated, and (2) mixed with other readily available sources. Proportionately more can be used if degree of ammoniation is cut down from about 7% to 3 or 4%.

(6) Maximum Benefits from Phosphorus

To obtain maximum benefits from the phosphorus applied to crops, growers should use good agricultural practices. Organic matter should be maintained at a good level as it increases availability of phosphorus. Good moisture level is important, also in helping to maintain phosphorus availability.

Probably the most important factor is the use of a well-balanced fertilizer program. Maximum benefits from phosphorus can be obtained only if there is adequate nitrogen, potassium, secondary and minor elements present in the soil.

(Montelaro)
B. Beware of Services and Materials Offering "Miracle Results"

Vegetable growers are continually bombarded with "services and materials" which promise "miracle results." It is surprising to see how many growers are taken in without so much as a quick check with his county extension agent. In one instance, a self-proclaimed expert moved into a vegetable growing area of moderate-size, family farms with miracle advice on how to save crops damaged by a severe freeze. It was estimated that farmers in the area were tricked out of twenty-five thousand dollars or more in a very short period of time. Multiply such figures by other similar situations in Florida and the total take can reach into the hundreds of thousands of dollars annually.

We hasten to add that all new services and materials offered to vegetable growers do not fall into the category described above. There are many consultants, fieldmen, etc., who represent reputable companies offering reputable services and materials to the growers. This group usually works closely with extension and research people in Florida and takes pride in referring prospective customers to them in support of their claims. On the other hand, the seller of miracle results often introduces his services and materials to growers without adequate prior testing by Experiment Station workers. He relies on so-called demonstrations on neighboring farms or on testimonials from other growers. It is difficult indeed for any grower to evaluate a service or material on that basis.

Vegetable growers are urged to look into new products and services very carefully before investing money in them. Especially suspect are those that make extravagant claims ranging from total pest control to correction of all physiological disorders. Vegetable growers should know the salesman, the company and the services and materials being offered before buying. If there are any doubts, they should be checked with their county agricultural extension agent for an evaluation. This bit of simple advice can save vegetable growers in Florida a tidy sum of money over the years. (Montelaro)

C. Transplants

The use of containerized transplants has been increasing for a number of years. The term containerized as used here denotes all methods which encourage or promote soil adhering to the root system to be transferred together with the transplant. The most recent development in containerized transplants is a system of production in which the transplant has a "soil" matrix around the roots without a band or pot to hold its shape. However, the use of bare-rooted transplants continues to predominate in most areas of Florida where transplants are used. They, up to now, have been less expensive and do not require specialized transplanting equipment. However, a great deal of interest has been stimulated in the last several years because of favorable grower experience with the containerized type. The use has been with the relatively low population/acre crops such as tomatoes and peppers. The high population crops such as celery and cabbage will probably not fit into the picture because of the expense involved.

Some of the factors which have led to the favorable response have been:

(1) A lack of quality bare-rooted transplants in the normal channels.
(2) Successful trials with containerized transplants.

Example: Survival in the field has been greater, hence less resetting (less labor), and better uniformity in plant size in the field has been observed.

(3) Development of transplant machinery capable of handling containerized type.

(4) Development of containers or growing systems which have:

(a) Reduced unit costs of containerized transplants.
(b) Reduced the need for handling a great bulk or volume of material.

In light of the energy and production material situation, growers currently using direct-seeding may have to reconsider the use of transplants (bare-rooted or containerized). Using transplants has certain benefits from the standpoint of conserving materials and energy. For example, during the period when the plants are in the seedbeds compared to the period shortly after the plants are direct-seeded in the field, savings may result from:

(1) Less fertilizer usage - direct-seeded fields must be fertilized and thus subject to potential leaching for a period of time. Seedbeds or plantbeds will use much less total fertilizer and because of the size can be covered or protected from extremes of weather to prevent leaching losses.

(2) Less water consumption and energy to pump it. (Easier and less costly to water a small area versus a large field.)

(3) Less pesticide materials used because of the reduced area. For example, less of everything (spray material, tractor fuel, etc.) required to spray a seedbed versus a field.

(4) Less energy, labor and material to protect the plants from extremes in environment. Frost and freeze protection, wind injury, "sandblasting" and other potential dangers to the crop are easier and less costly to combat on a small area basis than a large area.

(Kostewicz)

II. HARVESTING AND HANDLING

A. Tomatoes: Freezing Versus Chilling

The Vegetarian for February, 1972 contained a general article on chilling injury which consisted primarily of a list of Florida vegetables which are subject to chilling injury and the minimum temperature at which these commodities may be held. During December, we had some cool weather in the State which resulted in some freeze damage and again brought up some questions on freeze versus chill damage. Since tomatoes are our most valuable crop, they are used as an example. However, most of the article is applicable (in general) to other crops subject to chilling injury.
Freeze damage results when the temperature drops to approximately 31° F and causes ice crystals to form inside the tissues of a tomato fruit. These ice crystals rupture the cells and result in a soft, glossy, water-soaked appearance. If the freeze was severe enough, the entire fruit will collapse. These fruits will also lose moisture very rapidly when exposed to direct sunlight so the damage will be evident within 24 hours. On the other hand, a slight freeze may result only in a faint yellowish color over the affected area and may not be evident for up to 4 days. Tissue temperature, particularly in the field, is not necessarily the same as air temperature. The fruit may "hold" heat which will result in a tissue temperature higher than the ambient temperature or it may lose heat via radiation cooling which may cause tissue temperature to be below the air temperature. Tissue temperature does not necessarily mean pulp temperature in the middle of the fruit, but may apply to a small section of tissue anywhere in or on the fruit. This means that there may be both frozen and healthy areas in the same fruit. In green tomatoes, the border between these two areas may be very sharp and distinct.

Chilling injury is an entirely different phenomenon. When a tomato fruit is chilled, the injury symptoms are much more subtle and are usually not apparent until several days after removal from the damaging temperature (usually during ripening). During chilling, there is no ice crystal formation since--by definition--chilling occurs above the freezing point. Chilling injury is not well understood, but it does appear that specific metabolic processes of sensitive commodities are disrupted by temperatures in the chilling range. This range varies for crops, varieties, and maturities so it is practically impossible to give definite temperatures at which chilling will occur for a crop such as tomatoes. For example, both green and pink fruit are susceptible but not to the same degree since greens show the effects of chilling more readily than pinks. The temperature-duration effect and the accumulative effect are also important factors in producing chilling injury.

The temperature-duration effect is very simple and means that the lower the temperature the shorter the exposure time necessary to produce chilling injury symptoms. For instance, green tomatoes would get the same amount of injury from prolonged exposure to 45° F as the same fruit exposed to 40° F for a shorter period of time.

The accumulation effect means that a tomato fruit "remembers" the temperature to which it has been exposed. This can present problems when some field chilling has occurred, particularly in the week to 10 days preceding harvest. Even if the fruit has not been exposed to cool enough temperatures to show chilling injury, it may be predisposed to such symptoms and the normal handling (particularly if handling temperatures are borderline) may result in losses.

There appear to be changes in the ripening patterns as the ripening or storage temperature is reduced. These changes (including higher acidity and less red color) are not directly associated with chilling injury although there may be some relation. Chilling symptoms include poor color, uneven or blotchy ripening, brown seed (not speckled), and development of Alternaria rot around the stem scar.

The surest way to prevent chilling damage is to avoid temperatures that could contribute to the problem. Although there may be periods in Florida where field chilling could present a problem, the biggest problem seems to be in
transportation and marketing where lower temperatures are used to retard the rate of ripening. If this practice happens to coincide with some field chilling, problems can result. With the current handling system, there seems to be little need for using temperatures of below 60°F and certainly none for going below 55°F. The higher temperatures will result in a faster rate of ripening for the fruit, but it will also mean more uniform and concentrated ripening and certainly, in some cases, less loss and higher quality tomatoes.

Freezing damage is quick, final and usually results in a cull fruit. On the other hand, chilling is a slow, cumulative process which often can be avoided.

(Hicks)

III. VEGETABLE GARDENING

A. Gallup Poll Shows Vegetable Gardening on Increase

The following report was released in mid-1973 by George Gallup as a result of a nationwide poll conducted to find out the value and current status of vegetable gardening. The energy crisis had not surfaced when the poll was taken.

Princeton, New Jersey, June 27, 1973--Soaring food prices, coupled with the increasing interest in a "return to nature," have apparently served to swell the number of American households that will have a vegetable garden this year. In fact, a nationwide Gallup survey conducted in late spring revealed that there were 3 million more vegetable gardens in 1973 than in 1972. The survey found that nearly 4 in 10 U.S. households (27 million) grew some of their own vegetables in 1972.

Present vegetable gardeners are apparently succeeding in lowering their food costs. The survey found that gardeners regard "a saving in food costs" as their main reasons for gardening.

There is also a strong suggestion from the survey that many Americans, particularly young adults between 18 and 29, are turning to gardening as a way to "return to nature."

Reflecting this desire to return to nature is the survey findings that two-thirds (66 percent) of the U.S. population regard a sizable piece of land up to one acre as a very or fairly important criterion for the selection of a new home. More than half (54 percent) regard vegetable gardens as important, and a large majority (68 percent) of city dwellers say they would prefer to live in a suburban area, small town, rural area or farm.

Reflecting the economic aspects of vegetable gardening, the poll found that nearly half of the nation's non-gardeners would have a vegetable garden if it could be proven that by doing so they could save between $200 and $300 per year.

More than half (59 percent) of the respondents who said they were interested in gardening, but did not have the land, indicated they would be interested in using a "community garden."
THE VEGETARIAN NEWSLETTER

Following is a breakdown of the vegetable gardening status of U. S. households for 1972:

A. Those households which had the land and had a garden--respondent did garden.
   29 percent  40 million people*  20 million households**

B. Those households which had the land and had a garden--respondent did not garden.
   10 percent  14 million people*  7 million households**

C. Those households which had the land and did not vegetable garden.
   16 percent  22 million people*  1 million households**

D. Those households that do not have the land but would vegetable garden if they did have the land.
   22 percent  30 million people*  15 million households**

E. Those households which do not have the land and would not vegetable garden even if they did have the land.
   14 percent  20 million people*  10 million households**

F. Don't know what they would do.
   9 percent   11 million people*  5 million households**

* Projected from U. S. population base of 137 million persons, 18 and older.

**Projected from U. S. population base of 68 million households.

(Stephens)

B. Know Your Vegetables - Malabar Spinach

Malabar spinach (Basella rubra L.) is also known as Ceylon spinach, climbing spinach, gui, acelga trepadora, Bretana, Libato, vine spinach and Malabar nightshade.

It is not a true spinach, but its leaves resemble spinach and are used in the same way. It comes from India, and is distributed widely in the tropics, particularly in moist lowlands. It is rare, even among gardeners here in Florida, although it probably would grow well if tried.

In the tropics, it grows well on a variety of soils, seemingly without regard to fertility. Moisture is important and the plants make their best growth during warm, rainy periods. Light shade seems to be beneficial.
Malabar spinach can be grown from seeds or cuttings. The vine should be trellised. Two vines are sufficient to supply a small family all summer. Being ornamental, they can be trained to climb over doorways for easy accessibility. Thick, fleshy leaves are cut off together with some length of stem to keep the plant pruned to a desired shape. Stems that are too tough to eat can be put back in the soil and rerooted.

When cooked, Malabar spinach is not as slick in texture as many greens, such as spinach. The Bengali version is to cook it with chopped onions and hot chilies, then fry in a little mustard oil.

(Stephens)