# The Vegetable & Small Fruit Gazette

**March 2008**
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## Quote for Thought from Pete Ferretti

*Have more than thou showest, Speak less than thou knowest.*

*~ Shakespeare, 'King Lear' from The Harper Book of Quotations*

# Micronutrients and Growing Great Tomatoes

Steve Bogash, Regional Horticulture Educator, Penn State

One of the great misconceptions among growers is in the understanding of the importance of micronutrients in creating a great tomato harvest. While the required amounts of these nutrients are very low in comparison to the levels of macronutrients, their importance is still very high. Typically major nutrients or macronutrients are expressed as a percentage of dry matter in plant tissue while the much smaller micronutrient levels are expressed as ppm (parts per million). These smaller amounts lead many to believe that they are less important. However, plant health and fruit quality suffers greatly when there are insufficient amounts of these micronutrients as they are important in cell division, development of flavor compounds, cell wall formation, fruit set and other plant biochemical processes.

Major nutrients include Carbon (C), Hydrogen (H), Oxygen (O), Nitrogen (N), Phosphorus (P), and Potassium (K). Of these, C, H, and O are classed as structural elements, are extracted by plants from the air and water and make up 90-95% of plant tissue. N, P, and K are commonly considered as the macronutrients, make up much of the remaining plant tissue and are the 3 numbers expressed as percentages on fertilizer bags. Required in lesser amounts as critical micronutrients by plants are Calcium (Ca) and Magnesium (Mg) followed by Sulfur (S), Boron (B), Chlorine (Cl), Copper (Cu), Iron (Fe), Manganese (Mn), Molybdenum (Mo), and Zinc (Zn). Of great interest in our industry at this time as well as receiving a lot of research are the elements Silicon (Si), Sodium (Na), Vanadium (V) and Nickel (Ni). So far these last four elements are not considered critical nutrients, but research indicates that they may be beneficial in the right circumstances.

We will consider the list of currently considered “critical” micronutrients for our region. Mo, Mn, and Cl have been left out of this section as they are seldom a problem. All of the tissue levels are based on samples of whole leaves collected as “Most Recently Mature”. On a typical tomato plant, this is the fourth or fifth whole leaf down from the growing point. This leaf will be fully expanded and no longer yellow in appearance.

Calcium (Ca): Calcium is critical in cell wall formation. Plant Ca deficiencies include Blossom End Rot (BER) along with many variations of skin cracking. Calcium deficiencies are typically part of a series of problems including uneven watering, low pH, moisture stresses, and imbalances with the nutrients K, Mg and N. Ca tomato tissue levels at fruiting should be near 3%. Calcium Nitrate and Calcium chelates are typically applied through irrigation or foliarly to increase available calcium. Irrigation must be managed properly to solve a Ca deficiency.

Magnesium (Mg): The comments for Mg are very similar to Ca as these elements must be in balance with each other. Like Ca, severe Mg deficiency can cause BER. Mg tomato tissue levels at fruiting should be near 0.9%. Field observations indicate that a ratio of ¾ parts Ca to 1 part Mg, assuming that both are near the peak of sufficiency, produces excellent fruit with strong skins and minimal cracking. Magnesium sulfate, Sul-Po-Mag and Magnesium Oxides are common sources of additional Mg.

Sulfur (S): Sulfur is especially important in the creation of the complex of organic compounds that make up the odor and flavor profiles of vegetable fruit. Tissue sulfur levels at fruiting should be between 0.8 and 1.2%. Potassium sulfate, Sul-Po-Mag, Magnesium sulfate and Ammonium sulfate are all common sources of sulfur. Since these are common materials used in blending fertilizers, S is seldom a limiting nutrient.

Boron (B): Boron is extremely important to growers in our region as this element is often deficient in our soils. B deficiency is often expressed as poor development or death of the growing point since it is very important in many cellular division processes. Borax and Solubor are often applied foliarly at ½ -1 pounds/acre annually. B tissue levels should be between 50 and 75ppm. Bringing B tissue levels to 75 ppm can increase fruit quality by reducing cracking and uneven ripening.

Copper (Cu): Although copper deficiency is seldom seen in the field, observations indicate that keeping Cu levels near 20 ppm will enhance plant growth and aid in the plant's ability to resist diseases. Most copper bactericides/fungicides supply sufficient amounts of Cu when used in rotation as part of an overall disease management program.

Iron (Fe): Iron is very important in the plant's ability to utilize N and S. Many plant biochemical processes require small amounts of Fe. Recommended tissue levels are 100-300 ppm. Iron deficient plants have interveinal chlorosis and yellowing of younger leaves. High pH soils or irrigation water can cause Fe deficiency. Iron chelate and Ferrous sulfate are good sources of additional Fe. Tomatoes benefit greatly from the management of irrigation water to a pH of 6.2-6.5. This increases Fe and K availability.

Zinc (Zn): Zn deficiency can appear as poor growth and/or poor fruit set and often appear very similar to Fe deficiency. The only way to identify this problem is by tissue testing. Zn levels should be between 20 and 50 ppm. Zinc chelates, sulfate and oxides are common sources of additional Zn.
The best method to avoid micronutrient deficiencies as well as produce the largest crop with the greatest packout is to regularly soil and tissue test plants at critical points. Always test a tomato field prior to planting and apply nutrients as recommended. Then submit plant tissue for analysis at first blossom, 6-8 mm green fruit, first fruit color (pink) and again at first harvest if you are planning on keeping the plants fruiting. If you need information on collecting proper plant tissue for analysis, please contact the author.

# Thinking of Using Drip Irrigation this Season?

Bill Lamont, PSU, Horticulture

I have long believed that water would be a commodity traded in the future just like oil is now! All we have to do is look around the country and we can see the beginnings of water rights being bought and sold, water being diverted to populated areas, and the lack of water for crop production in areas hit by the recent droughts. We have to remember that in the production of vegetables all we are doing in packaging water in another form and selling it to the consuming public. We are indeed fortunate that vegetables are a major component of a healthy diet and if we look carefully we can see a shift toward preventative medicine based largely on the premise if we eat the right food, exercise, and drink good quality water we can prevent a lot of the current medical problems that we see around us. Drip irrigation can help us supply high quality vegetables to the marketplace while conserving our precious water resources. Drip irrigation is a method of applying small amounts of water, often on a daily basis, to the plant's root zone.

No matter the size of the system, a drip irrigation system has four major components and two options.

***Major Components***

* Delivery system: emitters or line source drip tubing
* Filters: sand, disk, or screen
* Pressure regulators: spring or valve
* Valves: hand-operated, hydraulic, or electrical

***Options***

* Controller: simple electric clock or computer
* Fertigation system: electric pumps, hydraulic pumps, venturi systems, etc.

How you put these components together, and which options you choose, will depend on the size of the system, the water source, the crop, and the degree of sophistication you desire.

## Advantages and Disadvantages

Although many advantages favor installation of a drip system, there are some limitations as well.

***Advantages***

1. Smaller water sources can be used, as drip irrigation may require less than half of the water needed for sprinkler irrigation.
2. Lower pressures mean reduced energy for pumping.
3. High levels of water management are achieved because plants can be supplied with precise amounts of water.
4. Diseases may be lessened because foliage remains dry.
5. Labor and operating costs are generally less, and extensive automation is possible.
6. Water applications are precisely targeted. No applications are made between rows or other non-productive areas.
7. Field operations can continue during irrigation because the areas between rows remain dry, resulting in better weed control and lower production costs.
8. Fertilizers can be applied efficiently to roots through the drip system.
9. Watering can is accomplished on varied terrains and in varied soil conditions.
10. Soil erosion and nutrient leaching can be reduced.

***Disadvantages or problems***

1. Initial investment costs may be more on a per acre basis than other irrigation options.
2. Management requirements are high. A critical delay in operation decisions may cause irreversible damage to crops.
3. Frost protection that can be achieved by sprinkler systems is not possible with drip systems.
4. Rodent, insect, or human damage to drip tubes may cause leaks.
5. Filtration of water for drip irrigation is necessary to prevent clogging of the small openings in the drip line.
6. Water distribution in the soil is restricted.

## Specific Adaptations to Vegetables

Because vegetables are usually planted in rows, drip tape/tubing with prepunched emitter holes, called a line source emitter, is used to wet a continuous strip along the row. Also since most vegetables are considered annuals, a thin-walled disposable tubing (4 or 8 mil thick) generally is used for only one season. Less emphasis is usually placed on buried mainlines and sub-mainlines to allow the system to be dismantled and moved from season to season. Costs may be high, so a goal should be to develop an inexpensive yet functional system that allows maximum production with minimal costs. You may purchase an entire system from an irrigation dealer or adapt your own components. Assistance in design from an irrigation dealer or professional can be very helpful in avoiding problems later on.

## Water Sources

The water supply may come from wells, ponds, lakes, municipal lines, or pits. Well water sources generally are fairly clean and require only a screen filter to remove particles. However, precipitates or other contaminants in the water should be determined by a water quality test prior to considering a drip system. Municipal sources generally provide documentation of water quality tests, making it easier to spot potential problems. Surface water such as streams, ponds, pits or rivers will contain bacteria, algae or other aquatic life, and sand filters are an absolute necessity. Sand filters are generally more expensive.

## Major Components of a Drip System

1. Delivery system
   * Mainline distribution to field
   * Sub-mainline (header line)
   * Connectors/Feeder tubes
   * Drip tape/tube
2. Filters
3. Pressure regulators
4. Valves or gauges

## Delivery System

* Mainline distribution to field: Buried underground polyethylene plastic pipe or PVC pipe or above-ground aluminum pipe can be used to deliver water from its source (pump, filtering system, etc.) to sub-mainline (header line).

* Sub-mainline (header): It is common to use vinyl "lay flat" hose or polyethylene pipe as the sub-mainline (header line). The vinyl "lay flat" hose is durable, long-lasting, and lays flat when not in use

so equipment can be driven over it. The lay flat hose and connectors/feeder tubes are retrieved after each growing season and stored until the following year.

* Connectors/Feeder tubes: Water flows to the drip tubing through small plastic tubes attached to plastic connectors that connect the sub-mainline (header line) and each drip tube. This allows some flexibility season to season when the sub-mainline is laid out and the drip tubes are not in exactly the same place.

* Drip tube: The design of most drip tubing consists of an inner and outer chamber that allows for even water distribution over a wide range of conditions. Most tubing is polyethylene black plastic, 4 to 8 mil thick, with holes at intervals of 8 to 24 inches. In general, the sandier the soil, the closer the spacing needed. 12-inch spacing is common. The tubing is shipped flattened on a roll and is often called drip tape. Most drip tapes emit water at about 25 gallons per 100 feet per hour when operated at l0 psi pressure. Standard rolls of tape (7,200 feet) contain enough tubing tape for 1 acre of crop on 6-foot row centers.

## Filters

Filters are essential to the operation of a drip system and may be viewed as the most important component of a drip system. For wells or municipal water a screen filter or disc filter can be used. Screen filters (150–200 mesh screen) are available in sizes from ¾ inch (used only for ½ acre) to 6-inch (used with several acres). Some filters have a valve to open and flush the filter. Disc filters operate with a series of discs stacked vertically to separate out small particles. Although more expensive to purchase, they are reliable and easy to clean.

For any open or surface water sources, sand filters are an absolute necessity. They are installed as pairs of sand-filled canisters and can be back-flushed to accomplish cleaning. Canisters from 14 inches (enough for 2 acres) to 48 inches in diameter are used, depending on the size of the system. I have used a lot of stainless steel canisters over the years to clean the water from ponds.

The need to clean or flush filters can be determined by the loss of pressure through the filter. You can install pressure gauges on either side of the filter to indicate the need to flush when pressure loss exceeds 5 to 7 psi. With only one pressure gauge behind the filter, watch for reduced operating pressure in normal operation. When stream or river water is used, a sand separator is usually needed to remove suspended sand from the water before it enters the sand filter.

## Pressure Regulators

Most drip tubing is designed to operate at 8 to 15 psi pressure, with 10 psi being standard operating pressure. A spring-type (used on smaller systems) or diaphragm-type pressure regulator can be purchased to hold pressure steady. These are inexpensive and reliable. Both adjustable and pre-set types are available.

## Valves or Gauges

Watering several fields or sections of fields from one water source can be accomplished by a zone system using valves to open and close various lines. A backflow/anti-siphon valve is a necessity on a well or municipal source where fertilizers or chemicals are to be injected into the line. Hand-operated gate or ball valves or electric solenoid valves can be used to automate the system using a time clock, water need sensor (discussed later), or automatic controller box (“computer” controller).

## Optional Additions

Fertigation or chemigation: Soluble fertilizers can be added to the drip irrigation water to provide uniform crop fertilization. A simple "hozon" venturi injector siphons soluble fertilizer from a bucket or jug into the line at a pre-set ratio (usually 1:16 or 1 gallon for every 16 gallons of water flowing through the line). The hozon injection system, however, is only suitable for ½ acre plantings or less. Other venturi units are available in sizes up to 2 inches in diameter. More expensive injectors with greater capacity and accuracy, use electric or hydraulic "pumps" to inject fertilizer solutions from a stock tank into the line. A hydraulic device, called a Dosatron, can be set at various dilution rates and operates with water flowing directly through the device, which is placed in the mainline. Use only high quality, soluble fertilizers that completely dissolve. All fertilizer injections should be made as close to the field as possible and ahead of a secondary screen filter in the line so that any contaminants are filtered out.

Fertigation is most commonly used to supply nitrogen since it is highly soluble and moves easily through soils to roots. Phosphate and potash are best applied prior to planting and not injected through the irrigation system. Other chemigation applications may include pest control measures, but check label restrictions on use in chemigation applications. If any fertilizer or chemicals are applied through the system a check valve to ensure no contamination of the water source is a necessity. For regulations on water use, well and valve requirements, and water permits contact the Pennsylvania Department of Agriculture.

Drip systems operate most effectively when used in conjunction with plastic mulches. Mulches reduce evaporation of water from soils and improve economy of drip water application. Vegetable operators typically use 4-foot-wide rolls of black or white-on-black polyethylene plastic mulch on 5-foot row centers with drip tape buried 1 to 3 inches deep below the plastic and either 3 to 5 inches to the side of the row or in the center, depending upon whether a single- or double-row crop is being grown. Use care in laying tubing straight so it will not be damaged when transplanting. Plastic laying machines can lay drip tape and plastic mulch in one operation.

## Maintenance

The drip system filter should be checked daily and cleaned if necessary. A clogged screen filter can be cleaned with a stiff bristle brush or by soaking in water. Sand filters need to be back-flushed. Check lines for excessive leaking. A large wet area in the field indicates a leaking drip tube. You can install a connector to the leaking tube or bypass the leak with a short piece of feeder tube.

Excessive mineral precipitates on drip lines can be dissolved with acids, usually phosphoric acid. Tapes buried under plastic mulches are much less apt to become clogged from precipitates.

Bacteria, algae and "slime" in lines can be removed by injections of chlorine or commercial bacterial control agents applied through the fertigation system. Use a 2 ppm chlorine daily "rinse" at the end of the irrigation cycle or a 30 ppm "shock treatment" if slime becomes a problem in the system. Consult with a drip system representative for dilution rates for commercial cleaning products.

Periodic flushing of the mainline, sub-mainline and drip tape is an excellent maintenance practice. Adapters are available for the ends of each drip tape to automatically flush lines at the end of each irrigation cycle, or they can be manually opened to allow a few gallons of water to flush from the end. This will prevent any build-up of particles or slime at the end of the drip line.

# Know Your Enemy: Large Crabgrass

Dave Johnson, PSU Southeast Research and Extension Center

There are several crabgrass species worldwide and in the United States, but most commonly we run into large crabgrass (*Digitaria sanquinalis*) and to a lesser extent smooth crabgrass (*D. ischaemum*) in Pennsylvania. Large crabgrass is the scourge of those wanting weed-free lawns, but is also an important weed in several cropping systems. Crabgrasses are old world species, and seeds were commonly used as a food source in Europe, Asia, and Africa. Large crabgrass was introduced into the United States as a forage crop. It is has good forage quality and grows well in hot, dry conditions, so it was promoted for a time in as a hay crop.

Large crabgrass' ability to grow in severe conditions makes it a problem weed in many areas. The plant is an annual that reproduces by seed, and its prostrate growth habit allows it to survive mowing very well. The plant produces many spreading stems (tillers) that easily root at their nodes. These rooting nodes also allow for vegetative spread. The leaf sheaths and blades are covered with fine, downy hairs, while the stems are smooth (see photo below). The actual stems are often not visible until the plant is larger. The plant has a membranous ligule, which is the small organ where the base of the leaf blade meets the stem. Smooth crabgrass is similar, but has much fewer hairs and is generally a smaller plant.

Emerging seedlings have very small, wide leaves, and many plants often emerge in a small area. As it gets older, the plant produces many tillers and takes on its prostrate growth habit. Seedheads are open panicles, and spikelets are arranged in 2 rows along the side of each spike. Older stems often have a red or purple color.

Large crabgrass can be a difficult weed to control because it tends to emerge later in the season than other annual weeds. Emergence may occur after most of the cultivation passes are finished for the crop, and thus a carpet of crabgrass is commonly observed late in the season. Mulches can be effective initially, but as the season progresses and they breakdown crabgrass seedlings can emerge through them. The late germination also means it can emerge after residual herbicide concentrations in soil degrade to below rates required for activity.

Several herbicides are initially effective against crabgrass. These include the "grass" herbicides such as Dual, Outlook, Surpass, etc, and also Prowl, Surflan, and Treflan. However, these are usually applied prior to crop and weed emergence, and are often not persistent enough to control late-emerging crabgrass and usually do not provide season-long control.

Since it is a grass species, the postemergence grass herbicides will control emerged (but not too big) large crabgrass plants. Products labeled on several vegetables include Assure II, Poast, Prism, Select, and Targa. Specific vegetable crops for which these can be used vary, so check the labels carefully, and be sure to observe preharvest intervals. Proper adjuvants must be used (see labels) for effective control. These products DO NOT provide residual activity, and will only control plants that are emerged at the time of application. Prevent drift to desirable grass species such as corn, sweet corn, and lawns, as severe injury to these grass crops can occur. Some of these products can also be used in tree, vine, and small fruit crops.

Postemergence products for sweet corn include Callisto, Impact, and Laudis. While these products are mostly for broadleaf weeds, they will also control emerged crabgrass, as long as they are small. Accent is weak on this species.

The non-selective herbicides, such as Gramoxone and pelargonic acid (Racer), which can be used with shielded sprayers in several crops, are generally not effective on crabgrass. They only control the plant tissue that the spray droplets come in contact with, and good coverage is needed. Even so, crabgrass can often regrow by producing new tillers.

Large crabgrass, and its close relative smooth crabgrass, are weeds that most of the general public is aware of. They can survive in many conditions, and their late emergence and prostrate growth habit makes them difficult to control.

Figure 1. Large crabgrass plant, showing prostrate growth.

# Answers to 10 Questions that Growers Frequently Ask Beekeepers

Dr. James E. Tew, Ohio State University

### 1. Why are honey bees for pollination in short supply?

In the mid-1980s, two new species of predaceous mites established themselves in the US. They have been infesting and killing both managed and wild colonies ever since. Finally, across the US, most wild honey bee colonies have been killed leaving only managed colonies to provide honey bee pollination services. The mites can be controlled in managed colonies. Concurrent with the colony decline, honey prices have risen causing some beekeepers to allocate colonies to honey production rather than crop pollination. Therefore, there are fewer honey bee colonies and many of the remaining colonies are being directed toward honey production.

### 2. What does a "strong" bee hive look like?

The definition of a strong bee hive can vary depending on the season of the year. In the early spring months, a bee hive being used for tree fruit pollination should minimally have adult bees on five of the colony's ten frames. There should be developing bees (brood) on two or more frames of the five frames that are covered by adult bees (estimated population of 15,000 - 20,000 adult bees). A colony having adult bees on eight of the colony's ten frames and having five frames of brood is a stronger colony (20,000 - 32,000 adult bees) and would be a more efficient pollinating unit. Evaluating entrance activity without knowing internal colony conditions is not an accurate way to assess colony strength.

### 3. How many colonies should be used to pollinate an acre of tree crops? An acre of vine crops?

One strong colony (or two average colonies) per acre for tree crops (See Question 2 above). Two strong colonies per acre for vine crops (about 1 colony per 50,000 plants) (See Question 2 above).

### 4. Can bees other than honey bees be used?

Yes, in fact, other species of bees can frequently be better pollinators than honey bees. However, populations of these bees are difficult to manage and annual population numbers may be erratic. Encourage populations of these bees in your area by providing undisturbed nesting areas and applying insecticides cautiously, but plan to rely on honey bee colonies as a pollinator insurance service.

### 5. Can a grower keep his/her own bees?

Certainly, but the grower must plan to become a beekeeper (to some extent). Different from past years, bees left untended cannot manage for themselves. Basic bee management and disease control cannot be ignored.

### 6. Do bees from colonies that I rent wander from my crop or orchard?

Yes they do. But if crop flowers are the most common flower and are nearby, many (if not most) bees will stay on the targeted crop. Decrease competition from other weed flowers within and around the orchard or field by mowing or using herbicides. Additionally, commercial bee attractants are available that will train bees to crop blossoms first. These attractants are helpful, but still will not keep all foragers on the targeted crop.

**7. Why have bee colony rental rates gone up in past years? What are average rental prices?**
The costs of controlling mites in bee hives have increased operating costs. Additionally, the costs of replacement bees has steadily risen (again in response to mite control costs) thereby increasing the costs of maintaining colony numbers. Depending on the crop, hives are renting for $40 - $70 based on colony strength and nearness to the crop to be pollinated.

**8. How much notification do beekeepers need before moving colonies in or moving colonies out?**
If prior arrangements have been made, the beekeeper should be expecting your call. Overall, probably twenty-four hours is common. However, weather can change everything. Both the grower and the beekeeper must remain flexible.

**9. Where is the best place for the beekeeper to put the colonies in my planting?**
In general, spread the colonies around the planting in groups. The larger the orchard or field, the larger the number of colonies in these "islands of bees". There is probably no practical reason for spreading colonies in singles or doubles. Foraging bees will equalize themselves within the crop. Make sure that the beekeeper can get trucks and equipment into the crop and that the colonies can be managed while they are on site. Avoid locations near human activity.

**10. Will the bees attack human workers in the orchard or planting?**
The most disturbing time for bee colonies is the morning after the move into the orchard. Give them a wide area then. Beyond that, just stay a reasonable distance away from the hive locations. Foraging bees within tree canopies or on vine crop blossoms are practically harmless and will make every effort to avoid human interaction.

# New SARE Professional Development Program for Extension, NRCS, Non-Profit, and Anyone Who Works Directly with Farmers

Erica Freney, NY Beginning Farmer Project Coordinator

### Whole Farm Planning Training Program - First Session April/May

We invite anyone who works directly with farmers to enroll in this educational opportunity. This is a unique opportunity to expand your skills and expertise in a topic much needed by your farmer clientele. Whole farm planning is essential for many farmers looking to expand, diversify, transfer assets to the next generation, and improve environmental conditions and farm profitability.

This training will involve three intensive sessions. Each session will last 3-4 days. The first session will be held in April/May, 2008, the second session in September/October 2008 and the third session will be held in February/March, 2009. The sessions will focus on:

- farm/family goal setting,
- farm resource delineation,
- on-farm decision making,
- farm financial planning and analysis,
- reading the land/environmental monitoring,
- grazing planning

All expenses for the training will be paid through a Northeast SARE Professional Development Grant. Covered expenses include travel, room and board, and supplies and materials. Additionally, a program mentor will assist participants through the use of a list serve, interactive web site and other distance education methods.

Farmer-educators will receive an additional $300 per session as a stipend for their time and to help defray costs while they are away from the farm. Participants will be required to attend all three sessions and work with at least two farms between sessions to implement the knowledge and skills gained during their training. Farmer participants may use their own farm as one of the two required.

Two concurrent training sessions will be offered. One set of sessions will be held in central NY and the other will be held in central New Hampshire. Twelve participants will be accepted for each training site (NY and NH). The training is targeted at educators across the Northeast and Mid-Atlantic regions. For more information about the New York sessions call Phil Metzger at (607) 334-3231, Ext. 4 (Central NY RC&D). For information about the New Hampshire sessions, call Seth Wilner at (603) 863-9200 (UNH Cooperative Extension).

# Calculating how much Sodium Nitrate (Chilean Nitrate) can be Applied on Organic Farms

Elsa Sánchez, Penn State Horticulture

Sodium nitrate, also known as Chilean Nitrate, is not allowed to account for more than 20% of the nitrogen requirements of organic crops in the United States according to the National Organic Standard. Its use is also prohibited by the International Federation of Organic Agriculture Movements (IFOAM) and most other standards for organic production outside the United States.

To calculate the amount of sodium nitrate permitted, first determine the amount of nitrogen recommended for the crop. This information varies by crop and can be found on soil test reports or in the Commercial Vegetable Production Recommendations guide for Pennsylvania. Next, multiply the recommended rate by 0.20 (20%) to determine how much of the recommended nitrogen can be satisfied by sodium nitrate.

____________ lbs N recommended/acre x 0.20 = ________ lbs N/acre that can be supplied by sodium nitrate

**Example:**
<u>80</u> lbs N recommended/acre (crop dependent; from soil test report or the Commercial Vegetable Production Recommendations guide for Pennsylvania) x 0.20 = <u>16</u> lbs N/acre that can be supplied by sodium nitrate

Sodium nitrate has an analysis of 16-0-0. This means that nitrogen comprises 16% of it or, in other words, that 16 pounds of nitrogen are in 100 pounds of sodium nitrate. To determine how much sodium nitrate to apply, multiply the amount of nitrogen/acre that can be supplied by sodium nitrate by 6.25, which is equivalent to dividing this amount by 0.16.

______ lbs N/acre that can be supplied by sodium nitrate x 6.25 = _______ lbs of sodium nitrate/acre to apply

**Example:**
<u>16</u> lbs N/acre that can be supplied by sodium nitrate x 6.25 = <u>100</u> lbs of sodium nitrate/acre to apply

Therefore, if the recommendation is to apply 80 pounds of nitrogen per acre, you can apply 100 lbs of sodium nitrate per acre, which will supply 16 pounds of nitrogen per acre. The balance of the crop's nitrogen needs will need to be supplied through other nitrogen sources approved for use in organic production.

# Function of Plant Growth Regulators (PGR's) in Plants

Mike Orzolek, Penn State Horticulture

There have been many new supplemental and nutritional materials appearing on the commercial market in the last 3 years. Some have plant growth regulators as active ingredients in their composition. Below is a table of current Plant Growth Regulators naturally occurring in horticultural crops and their function in the plant.

| **PGR** | **Where produced or found** | **Major functions in the plant** |
|---|---|---|
| Auxin (IAA) | Embryo of seed, meristems of Apical buds and young leaves | • Stimulates stem elongation (low concentration only), root growth, cell differentiation, and branching;<br>• Regulates development of fruit;<br>• Enhances apical dominance;<br>• Functions in phototropism + gravitropism;<br>• Promotes xylem differentiation;<br>• Retards leaf abscission. |
| Cytokinins | Synthesized in roots and transported to other organs | • Affect root growth and differentiation;<br>• Stimulate cell division and growth;<br>• Stimulate germination;<br>• Delay plant senescene. |
| Gibberellins | Meristems of apical buds and Roots, young leaves, embryo | • Promote seed and bud germination, stem elongation, and leaf growth;<br>• Stimulate flowering and development of fruit; affect root growth and differentiation. |
| Brassinosteriods | Seeds, fruit, shoots, leaves, and floral buds | • Inhibit root growth;<br>• Retard leaf abscission;<br>• Promote xylem differentiation. |
| Abscisic Acid | Leafs, stems, roots, green fruit | • Inhibits growth;<br>• Closes stomata during water stress;<br>• Promotes seed dormancy |
| Ethylene | Tissues of ripening fruit, nodes of stems, aging leaves and flowers. | • Promotes fruit ripening, opposes some auxin effects;<br>• Promotes or inhibits growth and development of roots, leaves, and flowers, depending on species. |

From: Experiments in Plant Physiology by Carol Reiss, Cornell University 2005 Pearson Education, Inc. published as Benjamin Cummings.

# Announcement – Calendar of Events
# 2008 Vegetable and Small Fruit Field Day

**Sponsored by**

**The Pennsylvania Vegetable Growers' Association**
**&**

**Penn State Cooperative Extension Service**

## Wednesday – July23, 2008
## Horticulture Research Farm
## Russell E. Larson Research Center
## Rock Springs, PA

**8:00 am to 4:30 pm**

**Featuring**
**Field Demonstrations**
**&**
**Field Research Projects**
**For more Information, please contact**
**Michael D. Orzolek at 814/863-2251 or** mdo1@psu.edu

# While You're Pruning Your Raspberries and Blackberries…

Kathy Demchak, Penn State Horticulture

Pruning is therapeutic – not only for a lot of us who enjoy pruning, but also for your plants. Pruning keeps plants healthy by encouraging new growth and opening up the plant canopy, and provides an opportunity to remove disease-infected or insect-infested canes. Here are some signs and symptoms of various diseases and insects to watch for while you prune your raspberries and blackberries. If you're done pruning by the time you read this, you may want to take another look before the plants leaf out to see if you missed any of these items.

## Diseases

*Crown gall*: This systemic bacterial disease causes galls to form usually near the crown, though galls can also appear on the canes. Galls will be brown and cracked-looking at this time of the year. The largest galls can be the size of a golf ball, and several may be clustered together into a mass of galls in severe cases. If you find plants with galls, dig them out, and check the soil for galls that have broken off. You probably won't be able to completely eradicate the problem, but this will help. Thoroughly clean your pruners with alcohol before moving on to uninfected plants.

*Anthracnose*: This fungal disease causes circular or oval pits on the canes. These lesions are more noticeable on canes that retain a reddish or greenish color, such as blackberries and black raspberries. Spores produced from these lesions will infect the young canes that will emerge soon. Prune out canes that are severely pitted, remove them from the planting, and be sure to apply a good coating of lime sulfur at green tip.

*Botrytis or gray mold*: This fungus overwinters as sclerotia on the canes, which are tiny black, oval-shaped structures. Use cultural controls, i.e., anything that encourages drying of the foliage – and bloom sprays later on.

*Cane blight*: The epidermis of infected canes develops a silvery color by spring. Later on, buds may fail to break or lateral shoots may wilt (these can also be symptoms of winter injury). Remove infected canes.

## Insects

*Raspberry crown borers:* You may be able to notice holes at the base of canes where larvae have bored in to enter the crown area. Especially with thornless blackberries and black raspberries (plants that send up new canes from the crown area), number of canes may decrease, and growth from infested crowns will be weak. Canes may break off making galleries in the crown visible. Because these borers take two years to mature, you may be able to find larvae in the crowns. A soil drench of Capture can be applied in fall or spring, as larvae overwinter in the soil.

*Red-necked cane borer:* Watch for a swelling on the cane. If you find one, carefully peel or scrape off the bark and look for tunnels that circle the stem. Remove any canes that have swellings. Adults are present anytime during the summer and are ¼-inch long beetles with a reddish section behind the head. Spray a labeled insecticide (Admire or Pyrellin) if necessary when adults are present.

# Upcoming Meetings

If you have a meeting you would like to announce, please send the meeting title, date, location and contact information to esanchez@psu.edu.

## Local

- ✓ March 6, 2008. **KPA Study Circle**, Fleetwood, PA. For more information contact Mena Hautau at (610) 378-1327 or mmh10@psu.edu or John Berry at (610) 391-9840 or jberry@psu.edu.

- ✓ March 6, 2008. **Southeastern Pennsylvania Vegetable Day**. For more information contact Scott Guiser at (215) 345-3283 or sxg6@psu.edu.

- ✓ March 11 or 13, 2008. **Vegetable and Small Fruit Meeting**. Location TBA. For more information contact Andy Muza at (814) 725-4601 or ajm4@psu.edu.

- ✓ March 12, 2008. Meeting title TBA. Warren, PA. For more information contact Andy Muza at (814) 725-4601 or ajm4@psu.edu.

- ✓ May 21, 2008. **Rodale Research Tour**, Emmaus, PA. Sponsored by Pennsylvania Women's Agriculture Network (PA-WAgN), Pennsylvania Department of Agriculture, Southeast RC&D, the Pennsylvania Association of Sustainable Agriculture (PASA) and the Rodale Institute. Registration $15, which includes lunch. For more information visit http://wagn.cas.psu.edu/Register0805.html.

- ✓ July, 2008 (date TBD). **Summer Vegetable Growers Meeting,** Kutztown, PA. For more information contact Mena Hautau at (610) 378-1327 or mmh10@psu.edu.

- ✓ August 7, 2008. **Building a High Tunnel Hands-On Workshop**, Josie Porter Farm, Stroudsburg, PA. Pennsylvania Women's Agricultural Network (PA-WAgN) sponsored event. Registration $15, which includes lunch. For more information visit http://wagn.cas.psu.edu/Register0810.html.

- ✓ September 11, 2008. **Taste of Harvest Winery Tour**, J. Maki Winery at French Creek Vineyards, Chester Co. Pennsylvania Women's Agricultural Network (PA-WAgN) sponsored event. Registration $15, which includes wine tasting. For more information visit http://wagn.cas.psu.edu/Register0813.html.

- ✓ November 18, 2008 (tentative date). **Western Pennsylvania Vegetable & Berry Seminar**, Butler, PA. For more information contact Eric Oesterling at 724 837 1402 or reo1@psu.edu or Lee Young at (724) 228-6881 or ljs32@psu.edu.

## Regional

- ✓ January 13 – 15, 2009. **Atlantic coast Agricultural Convention and Trade Show** (NJ Vegetable Meeting); Trump Taj Mahal. For more information contact Mel Henninger at (732) 932-9711 x 120 or henninger@aesop.rutgers.edu.

## National

- ✓ March 4 – 7, 2008. **Greenhouse Tomato Short Course**; Eagle Ridge Conference Center, Raymond, Mississippi. For more information visit www.greenhousetomatosc.com or contact Dr. Rick Snyder at RickS@ra.mssate.edu.

- ✓ August 10-14, 2008. **92nd Annual Meeting of The Potato Association of America**; Buffalo, NY. For more information contact Don Halseth at (607) 255-5460 or deh@cornell.edu or the website at http://www.hort.cornell.edu/PAA2008/.

## International

- ✓ Sept. 7-10, 2008. **19th International Pepper Conference**; Sheraton Hotel and Conference Center, Atlantic City, New Jersey, USA; contact Dr. Wesley Kline by phone (856) 451-2800 or email wkline@aesop.rutgers.edu or Dr. Andy Wyenandt by phone (856-455-3100 X4144) or email wyenandt@aesop.rutgers.edu

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The newsletter is also posted within three days on the Department of Horticulture Vegetable program website at: http://hortweb.cas.psu.edu/extension/vegcrops/newsletterlist.html.