

PLANT & PEST ADVISORY

VEGETABLE CROPS EDITION \$1.50

MAY 9, 2007



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Nutrition Management for Greenhouse and High Tunnel Tomato Production

Mike Orzolek, Professor of Vegetable Crops, Penn State University, Tim Elkner, Horticultural Educator, and Steve Bogash, Horticultural Educator, Penn State Cooperative Extension

Reprinted from the Vegetable and Small Fruit Gazette, May 2007, Penn State University

As with other crops, growers should become familiar with the growing requirements for tomatoes before planting any tomato plants in a greenhouse or high tunnel. The following are recommendations for fertility management for either a spring or fall crop. These tips and guidelines will help produce healthy, productive, actively growing tomato plants and reduce or eliminate potential nutrition problems.

Always conduct a soil test of the greenhouse soil or media before planting tomato plants. Results to be evaluated include soil pH, soluble salts (optimum range 2.0 to 3.5 mmhos/cm) and all the major and minor nutrients. Any deficiencies should be corrected before planting tomatoes, NOT after planting tomatoes.

Be sure the cations (K^+ , Mg^+ and Ca^{++}) are balanced and approximately in the following range:

Potassium – 3 to 5%, Magnesium – 8 to 12% and Calcium – at least 65%. Potassium must remain above 2.5 % to prevent the appearance of yellow shoulders on mature fruit. Many growers find it beneficial to apply boron at least once in the cropping cycle – preferably early in plant development. The recommended application rate is 8 oz per 100 plants. Also – be sure to run the irrigation system long enough that all fertilizer is cleared from the lines. This will insure that all plants receive an equal amount of fertilizer at each application. Flushing will also help prevent plugging of the emitters from salt build-up.

For optimum tomato production, a nitrogen (N) concentration of 120 to 150 ppm, maintained in the soil solution, will produce a tomato plant large enough to support 18 to 22 pounds of fruit. Too much N in tomato plants results in excessive vegetative growth and

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the plant will/can abort new flower clusters. High N causes the plant to switch from fruit production to vegetative growth. In addition, once excessive N has been applied to the plant it is nearly impossible to control plant growth. Once you encourage rapid vegetative growth in the tomato plant it will not switch back to fruit production until the extra N has been used-up in the plant. This means that the N level (from a tissue test) is readjusted to its normal range of 3.5 to 4.0% nitrogen. Monitoring a fertility program for tomato can be accomplished through tissue testing. An ideal N concentration in tomato leaf tissue from transplanting until the appearance of mature fruit clusters is 3.5 to 4.0%. While good foliage is necessary for fruit quality, too much foliage will reduce yields and ultimately profit.

The fertility program for a spring crop of tomatoes is distinctively different from that of a fall crop. For a spring crop, tomato transplants are set in a greenhouse during a period of short days and relatively low light intensity. As the spring progresses, days are getting longer. Growing conditions for a fall crop are just the opposite.

The following fertility guidelines should be modified according to growing conditions encoun-

tered at each farm. During prolonged periods of dark, cloudy weather, nutrient uptake by the tomato plant is greatly reduced and it may be desirable to skip feeding the tomatoes for one week. Excessive amounts of fertilizer should be avoided when plants are small and before fruit has set on the first cluster.

Fertility Recommendations – Fall Tomato Crop

Modify the spring program as follows:

- Application of potassium nitrate in week 1 at 3 pounds per 50 gallons of water.
- Application of calcium nitrate in week 2 at 3 pounds per 50 gallons of water.
- From weeks 3 to 9, application of potassium nitrate at the rate of 6 pounds per 50 gallons of water.
- From weeks 10 to 20, fertility schedule would be the same as the spring crop.

Note: Generally week 20 in a fall tomato crop would fall in mid-December when environmental conditions are sub-optimum for continued tomato production in the greenhouse.

Fertility Recommendations – Spring Tomato Crop

Weeks after

Transplanting Fertilizer and Amount Applied per 100 Plants

1 and 2	water only - no fertilizer
3 to 6	calcium nitrate – 3 pounds per 50 gallons of water
7	potassium nitrate – 6 pounds per 50 gallons of water
8	calcium nitrate + chelated iron - 6 pounds per 50 gallons of water + 0.25 lbs. iron
9	potassium nitrate - 5 pounds per 50 gallons of water
10	20-20-20 - 5 pounds per 50 gallons of water
11	calcium nitrate + chelated iron - 5 pounds per 50 gallons of water + 0.25 lbs. iron
12	potassium nitrate - 5 pounds per 50 gallons of water
13	calcium nitrate - 5 pounds per 50 gallons of water
14	20-20-20 - 4 pounds per 50 gallons of water
15	calcium nitrate - 5 pounds per 50 gallons of water
16	potassium nitrate - 4 pounds per 50 gallons of water
17	potassium nitrate - 4 pounds per 50 gallons of water
18	20-20-20 - 4 pounds per 50 gallons of water
19	calcium nitrate - 3 pounds per 50 gallons of water
20	potassium nitrate - 3 pounds per 50 gallons of water
21	potassium nitrate - 3 pounds per 50 gallons of water
22	20-20-20 - 2 pounds per 50 gallons of water
23	calcium nitrate - 2 pounds per 50 gallons of water
24	calcium nitrate - 2 pounds per 50 gallons of water

Pest Notes

Gerald M. Ghidui, Ph.D., Specialist in Vegetable Entomology

Onion Maggot Management

Onion Maggot Development

Onion maggots overwinter as pupae and emerge in early May. The first generation usually peaks around mid-May, the 2nd generation peaks around the end of June or early July, and the 3rd generation peaks around mid- to late August. Trapping data shows adult flies emerge at 500-600 degree days, but in some years flies emerged just after 400 degree days. Soil type, moisture, soil and air temperatures, and other factors likely affect adult emergence. In southern NJ, we have already passed 350 degree days, and can expect fly activity to begin within the next week if the weather remains warm.

Onion Maggot Detection Methods

1. Flies generally emerge beginning in late April or early May, but cool weather likely delayed their emergence a bit. Look for flies around onion fields or on dandelions near the margins of onion fields.
2. As a rule of thumb, flies generally become active about the same time that the common weed "yellow rocket" blooms.
3. Onion maggot traps are effective in catching early flies, often before onions emerge. These traps, called 'cone traps', are inexpensive and easy to construct, using bulb onions for bait.
4. Monitoring for damage to onions is a poor detection method, mostly because the early damage often goes undetected, and damage often appears too late. Fields can suffer severe infestation before damage is visible.

Onion Maggot Management

1. Rotation and clean fields are extremely important. Rotation of distances over 1 mile will significantly reduce maggot infestation.
2. Dyfonate, Lorsban and diazinon have been used effectively when applied at-plant. Seed coatings of Trigard have been highly effective for maggot control.
3. Foliar sprays of pyrethroids may be effective when timed against the 3rd generation of adult flies during peak fly populations. Apply early morning or late evening when flies are most active and likely to be in the fields (avoid the mid-day heat as flies will be resting in areas other than the onion fields).

Other Spring Happenings in New Jersey Vegetables

County Agricultural Agent Rick VanVranken reports that **aphids** are becoming a problem in many leafy lettuce fields. Aphid populations expand rapidly when

IPM Update

Kristian Holmstrom, Research Project Coordinator II, Vegetable IPM Program

Blacklight Trapping

Vegetable IPM Program personnel have begun monitoring traps for the presence of **European corn borer (ECB)** and **corn earworm (CEW)**. As yet, no individuals of either pest have been captured. As flights commence and catches are made, trap counts will be published.

Sweet Corn

Check 10 consecutive seedlings each in 10 random locations in the field for the presence of corn **flea beetle**. This pest is capable of transmitting **Stewart's wilt** to small sweet corn plants. If the variety has been purchased with a seed treatment (Gaucho or other systemic insecticide), or a systemic insecticide was used at planting, it is unlikely that flea beetles will be present on the plants. If no systemic insecticide was used and the variety is susceptible to Stewart's wilt, a foliar insecticide treatment should be applied when >6 flea beetles are found per 100 seedlings.

Cole Crops

Imported cabbage worm (ICW) infestations are appearing, and adults (the white cabbage butterfly) are visibly active in fields on warm days. In heading type cole crops like cabbage and broccoli, check 5 consecutive plants each in 10 random locations. Look on the undersides of leaves and on the youngest leaves at the center of the plant. Consider treating if 10% or more plants are infested while in the 0-9 true leaf stage. The

SEE IPM ON PAGE 5

cool temperatures are followed by short periods of warm weather, again repeating cool and warm periods several times. Aphids are much easier to control when populations are small, and become very difficult to control as both the plant and the aphid population increase in size. Imidacloprid applied at plant is an excellent aphid management tool. Foliar sprays of Assail, dimethoate, Fulfill, Lannate, MSE, Orthene, Venom, or any of various imidacloprid foliar sprays are also effective against aphids on lettuce. Check each label for use on leaf and head lettuce, as not all materials are labeled on all lettuce types.

Similarly, aphid populations on early cabbage are being reported in several areas. The **cabbage aphids** usually distort the leaves, warping and curling the foliage. Imidacloprid (both at-plant and foliar sprays are labeled), Assail, Fulfill, MSR, Orthene, and Venom are registered for use on cabbage and related crops. Check each label for use on the various cabbage-related crops, as not all materials are labeled on all Brassica crops. □

Vegetable Disease Update

Andy Wyenandt, Ph.D., Specialist in Vegetable Pathology and Wesley Kline, Ph.D., Cumberland County Agricultural Agent

✓ **Collard/Turnip – Peppery leaf spot** - Symptoms of Peppery leaf spot include water-soaked spots that turn purplish-brown surrounded by yellow ‘halos’. These lesions can be up to 1/8 inch and can join together turning leaves yellow can causing them to drop off. The pathogen can survive in the soil and on debris from previous crops. During cool, wet periods, the disease can become severe and be spread by splashing rain. Best management practices for control include i) start with clean seed ii) plant in clean beds and iii) use proper crop rotation of one year or more. If Peppery leaf spot has been a problem in the past, beds should be sterilized prior to planting.

✓ **Cucumber/Pickles – Angular leaf spot** - Symptoms are distinct and easily diagnosed. Small water-soaked **lesions** develop on leaves and expand until they are **delimited by larger secondary veins** in leaves resulting in angular lesions. After time these lesions turn brown and infected tissue drops-off resulting in ‘shotholes’. Angular leaf spot can be spread by splashing rain, insects, on the hands of workers and on farm machinery. Working in the field when the foliage is wet favors the spread of the disease. The disease can also be spread by blowing wind and in irrigation water. Best management of Angular leaf spot begins with clean-seed and planting in fields that has been out of cucurbit production for at least 2 years. Cultivating when foliage and soil are wet and irrigating with pond water should be avoided. There are cucurbit varieties with resistance. Add label rate of fixed copper + mancozeb to fungicide maintenance program and repeat applications every 7 days.

✓ **Lettuce – Bottom Rot/Drop – Reports of lettuce drop have increased this past week**, growers should take precautions to help control Bottom rot (*Rhizoctonia*) and Lettuce drop (*Sclerotinia*) which may cause potential problems. For Bottom Rot, Endura 70W (boscalid, Group 7) at 8 to 11 oz/A, or Rovral 50WP (iprodione, 2) at 1.5 to 2 lb/A or OLF should be applied one week after transplanting or thinning and 10 and 20 days later. For Lettuce drop, the biological Contans 5.3WG at 2 to 4 lbs/A pre-plant can be incorporated at a depth of 1 to 2 inches; or apply Rovral (iprodione, 2) at 1.5 to 2 lb/A 50WP or Endura (boscalid, 7) at 8 to 11 oz 70W/A beginning one week after transplanting or thinning and again at 10 and 20 days later. For more information on control of Bottom rot and Lettuce drop and other important diseases of lettuce please see the 2007 *New Jersey Commercial Vegetable Production Recommendations Guide*.

✓ **Pepper – Phytophthora blight**

For control of the crown rot phase of blight:

Apply 1 pt Ridomil Gold 4E/A or 1 qt Ultra Flourish 2E/A (mefenoxam, 4). Apply broadcast prior to planting or in a 12- to 16-inch band over the row before or after transplanting. **Make two additional post planting** directed applications with 1 pint Ridomil Gold 4E or 1 qt Ultra Flourish 2E per acre to 6 to 10 inches of soil on either side of the plants at 30-day intervals. Use formula in the “Calibration for Changing from Broadcast to Band Application” section of *Calibrating Granular Application Equipment* to determine amount of Ridomil Gold needed per acre when band applications are made.

When using polyethylene mulch, apply Ridomil Gold 4E at the above rates and timing by injection through the trickle irrigation system. Dilute Ridomil Gold 4E prior to injecting to prevent damage to injector pump.

✓ **Strawberry – Anthracnose fruit rot** - Strawberry anthracnose can be extremely destructive during warm, wet weather causing significant fruit rot. Symptoms of Anthracnose include blackish-brown circular spots on maturing green fruit and soft, sunken (flat) circular lesions on ripe fruit. On ripe fruit, lesions can expand rapidly and are often covered with a pinkish-orange spore mass. Spores are spread from infected to healthy fruit with splashing water. Control of Anthracnose always begins with a 7 to 10 day preventative spray program no later than 10% bloom and/or prior to disease development. For control apply the following combinations:

- #1) captan (M3) at 4 lb 50WP/A plus Pristine (pyraclostrobin + boscalid, 11 +) at 18.5 to 23.0 oz 38WG/A
- #2) captan 5(M3) at 4 lb 50WP/A plus Abound (azoxystrobin, 11) at 6.2 to 15.4 oz 2.08F/A, or Cabrio (pyraclostrobin, 11) at 12 to 14 oz 20EG/A
- #3) Captevate (captan + fenhexamid, M3 + 17) at 3.5 to 5.25 lb 68WDG/A

For subsequent applications, alternate:

- captan (M3) at 4 lb 50WP/A plus Abound (azoxystrobin, 11) at 6.2 to 15.4 oz 2.08F/A, or Cabrio (pyraclostrobin, 11) at 12 to 14 oz 20EG/A with captan (M3) at 4 lb 50WP/A, or Captevate (captan + fenhexamid, M3 + 17) at 3.5 to 5.25 lb 68WDG/A

To help manage fungicide resistance development, do not make more than 2 consecutive applications of either Pristine (pyraclostrobin + boscalid, 11 + 7), Cabrio (pyraclostrobin, 11) or Abound/Quadris (azoxystrobin, 11) before switching to another fungicide chemistry.

✓ **Tomato – Bacterial spot and speck** – Both bacterial diseases can cause serious problems in the field if infections begin in the greenhouse prior to transplanting. Symptoms of spot and speck look very similar on infected leaves. Lesions are small, circular, blackish-

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Weekly Weather Summary

Keith Arnesen, Ph.D., Agricultural Meteorologist

Temperatures averaged near normal, averaging 56 degrees north, 58 degrees central and 58 degrees south. Extremes were 85 degrees at Pomona on the 1st, and 34 degrees at Flemington and Charlotteburg on the 7th. Weekly rainfall averaged 0.50 inches north, 0.32 inches central, and 0.01 inches south. The heaviest 24 hour total reported was 0.85 inches at Flemington on the 1st to 2nd. Estimated soil moisture, in percent of field capacity, this past week averaged 96 percent north, 88 percent central and 72 percent south. Four inch soil temperatures averaged 56 degrees north, 59 degrees central and 59 degrees south.

Weather Summary for the Week Ending 8 am Monday 5/7/7

WEATHER STATIONS	RAINFALL			TEMPERATURE				GDD BASE50		MON %FC
	WEEK	TOTAL	DEP	MX	MN	AVG	DEP	TOT	DEP	
CANOE BROOK	.60	18.47	8.99	79	37	56.	0	163	100	94
CHARLOTTEBURG	.30	14.07	4.74	75	34	55.	1	130	104	91
FLEMINGTON	.85	17.77	8.72	79	34	56.	-1	155	85	94
NEWTON	.27	10.36	2.05	74	38	56.	1	119	79	90
FREEHOLD	.15	13.29	4.31	81	39	61.	3	246	145	83
LONG BRANCH	.27	13.09	3.81	82	45	57.	0	164	83	78
NEW BRUNSWICK	.75	17.71	9.02	81	37	57.	-2	181	60	94
TOMS RIVER	.65	11.47	2.42	87	44	59.	1	215	128	88
TRENTON	.10	14.46	6.32	81	42	58.	-1	214	72	70
CAPE MAY COURT HOUSE	missing									
DOWNSTOWN	missing									
GLASSBORO	.00	10.77	2.18	83	43	61.	2	278	136	67
HAMMONTON	missing									
POMONA	.03	9.07	1.14	85	37	57.	-1	225	121	60
SEABROOK	.00	11.65	4.34	84	40	60.	0	287	133	67
SOUTH HARRISON	missing									
WES KLINE -- GDD BASE 40 PINEY HOLLOW										
LAST WEEK	150 (Ending 4/30/07)									
THIS WEEK	M (Ending 5/7/07)									
The missing stations are a result of a computer failure. We hopefully will have the data when it is restored.										

DISEASE UPDATE FROM PAGE 4

brown and with time develop a halo, or yellowing of tissue surrounding the lesion. As lesions develop they can coalesce (join together) and can cause premature death. Since sources for these diseases include seed, weed hosts, volunteer plants and contaminated wood (benches) make sure production or holding areas are disinfested, weed-free and clean prior to introducing transplants. Inspect all seedlings prior transplanting. Infections can occur on all parts of the tomato plant and can easily be spread during transplant production and transplanting with contaminated equipment and workers hands. Tomato plants with suspected symptoms can be treated with streptomycin (Agri-Mycin 17, Agri-Strep, 25) at 1 lb/100 gallons, or 1.25 teaspoon per gallon prior to transplanting every 4 to 5 days. After transplanting apply Actigard at 0.33 oz 50 WG/A, or fixed copper (M1) at 1 lb a.i./A plus a mancozeb (Dithane, Manex II, Manzate, Penncozeb, M3) at 1.5 lb 75DF or OLF, or ManKocide (M1 + M3) at 2.5 to 5.0 lb 61WP/A, or Cuprofix MZ (M1 + M3) at 1.75 to 7.25 lb 52.5DF/A on a 7 day schedule. ☐

IPM FROM PAGE 3

threshold may increase to 20% from 9 true leaves to the early head stage. Once heads form, the threshold becomes a more conservative 5%, in order to protect the marketable portion of the plant.

While scouting for caterpillar pests, note the presence of **crucifer flea beetle**, especially on new transplants or recently emerged plants. This pest can be very destructive, particularly to newly emerged seedlings. Consider treating if 50% or more plants have flea beetles on them, and damage is visible. ☐

New Ideas Available from Northeast Farmers on Video

The following horticultural videos are now available for just the cost of shipping (\$5) as VHS tapes: Farmers and their Weed Control Machines, Farmers and their Diversified Horticultural Marketing Strategies, Farmers and their Ecological Sweet Corn Production Practices, and Farmers and their Innovative Cover Cropping Strategies. All of these videos are also now available on DVD, for \$15 each, including shipping. Also available on DVD only for \$15 is the brand new video: 'High Tunnels' featuring six northeast farmers. All of these were funded by Northeast SARE, and are available from the UVM Center for Sustainable Agriculture, 63 Carrigan Ave., Burlington VT, 05405. Make check to 'UVM' and please include complete contact information including phone or e-mail. For more information, go to www.uvm.edu/vtvegandberry then click on 'videos.' □

Reaching Consumers or Clients?

Jhilson Ortiz, Senior Program Coordinator - Agriculture

A well-formulated question always brings a useful/good answer.

A consumer is different from a customer or client because even as clients of the business, they are the end consumer.

Based on this concept, local, regional and national organizations support and sponsor **direct marketing** initiatives among farmers and retailers, and among farmers and consumers.

So, whom should you reach, consumers or clients?

That, basically depends on how costly is it to put your product in place ready for sale and consumption.

Consumers and direct consumer retailers are expecting you to deliver a good product at a good price, in any given place. When dealing with this group, make sure you are able to position the highest *quantity* of product per *volumetric* transportation cost at the shortest *distance*. Those in plain language means, please, fill the truck and deliver it to one place.

As a farmer, you'll discover it is easier to just sell your products at the closest farmer market or your own roadside farm.

But, what if those two are not profitable possibilities? Then, look for production and commercialization partnerships with your fellow farmer. Working under this "cooperative effort" plan requires lots of work and agreement to reach objectives, but it is worth the time and effort.

With the help of like-minded farmers, you will be able to jump the transportation gap a little longer by lowering transportation costs, enhance your offering power by increasing your offer size, and maybe even improve your product portfolio mix if your partner has other quality items.

Good luck with your trade and don't forget to keep open the communication channel with your buyer. □



Vegetable Integrated Crop Management Twilight Meeting

Farmer To Farmer Education
Tuesday, May 22, 2007– 6:00 PM
A.T. Buzby Farms
Black Rd., Woodstown, NJ

This is our 2nd meeting of the 2007 season. Future meetings are tentatively scheduled for mid August at the Rutgers Agricultural Research and Extension Center, 121 Northville Rd., Bridgeton and September, site yet to be selected. See future mailings.

At this event we will be discussing vegetable production methods used at A.T. Buzby Farms. Our hosts Andy and Eric Buzby will review and discuss the following:

- Transplant production
- No-Till Vegetable Production
- Drip Irrigation for Sweet Corn
- Equipment Modifications
- Farm Gate Sales and Tail Gate Marketing

This meeting is for farmers to learn from other farmers. Cooperative Extension Agricultural Agents will be at the meeting to participate in the conversation.

Ron Good, NJDA will talk about retail marketing opportunities

Michelle Casella will give an update on Worker Protection Standards

Wes Kline will give an update on Food Safety Activities

Pesticide recertification credits will be given at the conclusion of the meeting

For further information contact County Agricultural Agents Michelle Casella at 856-307-6450 or minfante@aesop.rutgers.edu; Wesley Kline at 856-451-2800 or wkline@aesop.rutgers.edu or Richard VanVranken at 609-625-0056 or vanvranken@aesop.rutgers.edu. □

English as a Second Language for Agriculture Workers

The New Jersey Farm Productivity Enhancement Training Program announces another course offering for New Jersey's agricultural community. Since a large number of farm/agricultural workers speak Spanish as their primary language, a critical need for English language training exists. This grant-funded class will present the basics of spoken "American" English to Spanish-speaking agricultural workers. The course is comprised of six (6) four-hour sessions (8:30 am - 12:30 pm) and will be held at the Cumberland County office of Rutgers Cooperative Extension in Millville, N.J. Course dates are June 5, 12, 19, 26, and July 3 and 10, 2007.

Program topics are tailored for workers in agricultural and farm-related industries. The vocabulary and phrases introduced are agricultural and will include interpersonal, day-to-day job-related communication in English. The course assumes that attendees have little or no knowledge of English and will introduce basic expressions, sounds, pronunciation and sentence structure.

Registration fee is \$35 for the entire six days of training (24 hour total) and covers course materials and breakfast at each session. To receive a Rutgers University certificate of completion all six sessions must be attended. For further information: Please call Program Coordinator Keith Wilson at (732) 932-9271 ext. 617 or e-mail kwilson@cook.rutgers.edu.

Course code# AP0201ID08 □

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Pesticide User Responsibility: Use pesticides safely and follow instructions on labels. The pesticide user is responsible for proper use, storage and disposal, residues on crops, and damage caused by drift. For specific labels, special local-needs label 24(c) registration, or section 18 exemption, contact RCE in your County.

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