The Vegetable and Small Fruit Gazette

Vol. 5, No. 9- September 2001

Horticulture Department
The Pennsylvania State University

In this Issue:

Tip for the Month: "At the end of the game, the kings and the pawns go into the same box".

Comments from the Editor

Bill Lamont, Department of Horticulture

We have two excellent in-service training programs being offered to agents this month on September 20th and 21st. The schedules and information on the programs are presented below. I want to thank Ron Hostetler for his excellent article "Growth Stages in a Potato Crop" and look forward to Mary Concklin's article for the October issue. As always, the Vegetable and Small Fruit Gazette Team encourages your feedback so that we can better serve your needs and address your concerns.

Schedule for Agent Articles

Bill Lamont, Department of Horticulture

October	Mary Concklin
November	John Esslinger
December	Andy Muza

Where to Find the Vegetable and Small Fruit Gazette

Bill Lamont, Department of Horticulture

The current and back issues of the Vegetable and Small Fruit Gazette can be found at the following website:
http://hortweb.cas.psu.edu/extension/vegcrops/newsletterlist.html

---

In-Service Training Scheduled for September 20th and 21st, 2001

Bill Lamont, Department of Horticulture

In trying to better coordinate the in-service training efforts in the department we are going to schedule an in-service training program for the High Tunnels on September 20 with dinner and refreshments at Dr. Lamontís house that evening and then an in-service training program for Ornamentals on September 21. Participants for both the High Tunnel and Ornamentals in-services are invited to Dr. Lamontís cookout. I have received notice of intent to attend one or both in-service programs and the dinner in-between from some agents already and would appreciate hearing from others so we can print the appropriate number of informational packets and also can figure the amount of food that we will need to prepare for the cookout the evening in between the in-services. There is no cost for the dinner at the Lamont's. Maps to Dr. Lamont's home will be available at the in-service training session on Thursday or you can request a map to be faxed to you. For more information contact Dr. Bill Lamont for the High Tunnel In-service and either Jim Sellmer or Rick Bates for the Ornamentals In-service.

High Tunnel In-service Program

Bill Lamont, Department of Horticulture

The training session on "Horticultural Crop Production in High Tunnels" will take place

September 20, 2001 from 8:30 AM-4:30 PM at the Horticulture Research Farm at Rock Springs. The training will be conducted at the "High Tunnel Research and Education Facility" and will cover all phases of horticultural crop production, environmental changes measured in high tunnels and also wider width tunnels will be on display . Agents will provide updates on their high tunnels out in the state and we will discuss plans for 2002. Also bring your cameras for photo opportunities.
We will meet at the Horticulture Research Farm in the Vegetable and Fruit Building.

Schedule
AM
At Vegetable and Fruit Building

8:00-8:30 Coffee and donuts will be available.

8:30-9:00 Introductions. Overview and update on the Center for Plasticulture and the High Tunnel Research and Education FacilityóDr. Bill Lamont

9:00-9:30 Update and discussion on the Satellite High Tunnels located or to be located at Blair, Indiana, Lancaster, Lackawanna, Erie, Dauphin (Milton Hershey School), Franklin, Bucks, Potter and Greg Burns own tunnels in Elk countyóAgents and specialists.

9:30-10:00 Powdery Mildew Identification and Control in High Tunnel Crops- Dr. Gary Moorman, Department of Plant Pathology

Break 10:00-10:15

Move out to High Tunnel Research and Education Facility

10:15-10:45 Tips for High Tunnel Construction and View Wider High Tunnels and Associated Design Changes- Dayton Reese and Bruce Dye

10:45-11:30 Update on Compost, Water Management, and Pepper Production in High Tunnels - Eric Burkhart

11:30-12.00 Environmental Monitoring in High Tunnels- Eric Burkhart

PM

12:00-1:00 Lunch (Provided)

1:00-1:45 Update on Cut Flower Production in High Tunnels - Dr. E. Jay Holcomb

1:45-2:30 Update on Small Fruit Production in High Tunnels - Kathy Demchak

2:30-2:45 Break

2:45-3:30 Update on Vegetable Production in High Tunnels - Dr. Mike Orzolek

3:30-4:00 Marketing and Economics of Crop Production in High Tunnels - Dr. Jay Harper

4:00-4:30 Closing comments and questions

6 PM Dinner at Bill Lamont's house for participants of both the high tunnel and ornamental in-service training programs.

The 3rd Annual Ornamental In-service

Jim Sellmer, Department of Horticulture

The in-service will be held at University Park, PA. Your hosts for the day will be Rob Berghage, Rick Bates, Greg Hoover, and Jim Sellmer. This will be the second fun filled educational day after a joy filled day at the High Tunnel In-service held by our esteemed vegetable colleagues Bill and Mike and the evening gathering for sustenance at the Lamont Hacienda prior to our day on Sept 21.

The tentative schedule for the Ornamentals in-service is as follows:

Tentative Schedule--(all times are approximate and liable to change without notice)

9-3 pm

Trial Garden: Berghage/Sellmer/G. Hoover
1.5 hours (9-10:30 am)
Herbaceous plants and woodies evaluations including common insect & mite pests.

1.5 hrs (10:45-12:15)
Pot-in-Pot (LMRC): Bates/Sellmer/G. Hoover
Process of construction and issues of PiP production Insect & mite pests in production

Break for lunch 12:30-1:30

1.5 hrs (1:45-3:15)
Street Tree Evaluation (Gerholds Plots @ FRL): (2hr) Bates/Sellmer/G. Hoover
Plot introduction
Street Tree Highlights
Related Insect & Mite Pests which attack the Highlighted Trees

3:30 pm Return from whence you came happy, full, educated and excited for a new day

Please note that planning for the evening meal on Sept 20 requires pre-registration. If you intend to participate in both trainings or plan to arrive on Sept 20 for dinner at Bill Lamont's house and participate in the Ornamentals Training the next day Sept 21, please notify either me at jcs32@psu.edu or Bill Lamont at wjl1@psu.edu.

Bug vs. Bug- Managing Two-Spotted Spider Mite with the Predatory Midge *Feltiella acarisuga*

Cathy Thomas, Integrated Pest Management Program Pennsylvania Department of Agriculture

Two- spotted spider mite (*Tetranycus urticae*) populations can increase rapidly especially during hot, dry periods. Most of the difficulty in controlling this pest is initial detection. Since there is no winged stage, sticky traps are ineffective, hence, plant inspection is the only method to assess if mites are present. Damage is caused by larvae, nymphs and adults piercing the plant cells and sucking out the contents. damaged cells appear as yellowish white spots (chlorophyll is destroyed) on the upper surface of the leaf. As populations increase, the whole leaf will eventually turn yellow. Crop losses may occur when about 30% of the leaf surface is damaged.
(See July 2001, August 2001 issue for more information on managing two-spotted spider mite)
The most commonly used biocontrol for two-spotted spider mite is the predatory mite, *Phytoseiulus persimilis*. A natural enemy that can be used with predatory mites is the predatory midge, *Feltiella acarisuga*. *Feltiella* is good at finding hot spots, so the two predators are complimentary. *Feltiella* can be an effective year-round predator and is particularly useful on hairy leaved plants (such as tomatoes) . This is a predator that you might see naturally in your greenhouses (and garden) if spider mites densities are high and you are not using pesticides.

Life Cycle

The adult is a delicate, pink-brown fly, only about 1 mm long, with long legs. They do not feed and only live 3-4 days after emerging from the cocoon. High humidity improves midge emergence. Optimal conditions for *Feltiella* are 68-81ƒF and relative humidity greater than 60%, although larvae can tolerate a wider range of conditions than the adult. Adults actively search for spider mite colonies. Each female lays an average of 30 shiny yellow eggs near high densities of mites, usually where webbing occurs. The tiny eggs hatch in 5-7 days. The brownish yellow midge larvae grow to about 2 mm long. Upon hatching they move to a spider mite, sink their mandibles in, and suck out the contents. They can consume over 300 mite eggs as they complete their development in about a week in the greenhouse. Under cooler conditions the larval stage may take up to a month to complete. They then spin fluffy white cocoons on the underside of leaves, usually along a leaf vein, in which to pupate. The pupal stage lasts approximately one week in the greenhouse, but longer under cooler conditions.

Application

- Start early to control spider mite populations since spider mites reproduce quickly at high temperatures and low humidity.
- Always use *Feltiella acarisuga* in conjunction with a predatory mite such as *Phytoseiulus persimilis*.
- *Feltiella* larva feeds on eggs, nymphs and adults of two-spotted spider mites.
- Monitor for predator activity by checking spider mite colonies for larval development and for shriveled mites that have been fed upon. Monitoring should be done once a week, consistently.
- Concentrate predator introductions at spider mite hot spots as soon as possible after delivery.
- Open the box containing predators in the greenhouse and place as close as possible to spider mite infestations. Let the box stand for at least one week until adults have emerged.
- Consult your supplier for rates and introduction schedule.

Products

Feltiella acarisuga is shipped to the grower as pupae on leaves in units of 250.

Product names from major suppliers of *Feltiella acarisuga*
•Biobest , *Feltiella* , system (*Therodiplosis persicae* - system), www.biobest.be 303-661-9546
•Kopperts , Spidend, www.koppert.nl, 734-641-3763

This predator can be obtained through most biological control distributors.

Benefits

- The adult midge is capable of flying and locating colonies of spider mites.
- Applicable in crops where scouting is difficult (ie.ornamentals)
- Can and should be introduced with predatory mites such as Phytoseiulus persimilis.
- Active in cold and dark weather in spring and fall.

Provides long lasting protection with several introductions.

Please phone or email me if there are specific issues you would like me address in this column.
Cathy Thomas
Integrated Pest Management
Program Bureau of Plant Industry/Rm. 100
2301 N. Cameron Street Harrisburg, PA
17110 717/705-5857
E-mail: c-cthomas@state.pa.us

Pumpkins and Pollination in 2001

Mike Orzolek, Department of Horticulture

During the growing season in 2001, I have heard growers complain about great foliage on their pumpkin plants, but few fruit - what happened this year. Two problems come to mind: poor pollination and pumpkins, especially Howden that were planted in early June and did not set fruit even at the end of July. The male flowers looked perfect, but the female flowers never opened and the ovaries turned yellow and shriveled similar to unfertilized flowers after anthesis. The stigma of these unopened flowers turned black and a few exhibit black streaks into the ovary.

Pollination of female pumpkin flowers requires at least one active beehive per acre, sunny, warm days, especially from daybreak until 11:00 am, adequate pollen in the male flower (anther) that has not been consumed by Diabrotocites and optimum soil moisture and nutrition for pollen tube development.

In regards to the lack of female flowers, this was observed on pumpkins in 2001 when ambient temperatures were above about 65ƒF during the night. Howden tends to be a particularly susceptible variety to this physiological problem, although other pumpkin varieties are affected as well. This problem was observed in pumpkin fields in NY, CT, MA, and VT during the summer of 2001. The warm night temperatures tend to affect the developing females more than the open or ready to open female flowers. If you have encountered this problem, consider evaluating new varieties that may not have this physiological problem and cooler nights (below 65ƒF) will improve fruit set especially if you were growing the variety Howden.

Also keep in mind that excessive nitrogen applications will encourage leaf growth and development at the expense of pollination and pumpkin fruit production. Always soil test prior to planting your pumpkin crop and consider at least one tissue analysis of pumpkin leaves at least 4 to 6 weeks after field establishment.

Aphid-Borne Viruses Deliver Trick to Halloween Pumpkins

Alan MacNab, Department of Plant Pathology

Symptoms: Viruses are causing losses in some fields of pumpkins. Symptoms can be mild to severe on foliage and fruit. Mild mottling can occur on leaves and fruit. The major effect on such fruit is that normal ripening is delayed; this can result in the need to harvest over an extended period, and the loss of sale of some fruit. Severe symptoms include distinctly stunted and distorted new leaves, bumpy fruit, and distinct dark green and orange patches on mature fruit.

What viruses affect pumpkins? At least five viruses can affect pumpkins. These are cucumber mosaic virus (CMV), papaya ringspot virus (PRSV), squash mosaic virus (SqMV), watermelon mosaic virus-2 (WMV-2), and zucchini yellows mosaic virus (ZYMV). In Pennsylvania pumpkins, WMV-2, ZYMV, and PRSV were detected during a recent survey. WMV-2 accounted for 94% of infections, and was the most prevalent and widespread virus. In addition, ZYMV accounted for 9% of infections and was detected in

southeastern Pennsylvania, and PRSV accounted for 5% of infections and was detected in southwestern Pennsylvania.

What is the source of the viruses? These viruses overwinter in biennial and perennial plants, including many weeds.

How do the viruses get into pumpkin plants? Aphids are the major vectors that pick up the viruses from virus-infected weeds and other plants, and then inoculate the pumpkin plants when they probe and feed on the plants. Some aphids are very efficient at inoculating plants. Time for an aphid to transmit a virus has been determined to be about 30-seconds! Considering the fact that aphids sometimes fly, and can be carried long distances by wind, it is not surprising that aphid-borne viruses sometimes are a severe problem.

Are the viruses seed-borne? None of the viruses detected during the recent survey of Pennsylvania pumpkins is seed-borne. The only virus of the five noted above that is seed-borne is SqMV.

What controls are possible? Controls traditionally focus on the source, the vector, and plant resistance:

1. Eliminate or avoid the source: Minimize weeds in and around plantings. Some weeds are a source of viruses, and also harbor the aphid vectors. For some fields, where viruses are severe yearly, it may be necessary to stop growing the crop in a specific field, and move production to fields where less inoculum is present around the fields.
2. Eliminate or minimize the number of aphids that land on crop leaves: Use of aphicides does not provide adequate control of the virus, presumably because at least some aphids transmit the virus before the aphids are controlled (Aphids can transmit the virus in less than a minute). In some crops, it is possible to "repel" aphids by growing plants on reflective mulch; however, this is not effective for crops like pumpkins which produce extensive vines that quickly cover the ground. In some crops, floating row-covers can minimize number of aphids that land on plants; however, this technology is not feasible for large commercial pumpkin fields.
3. Resistance: The best control likely will be resistance. Some seed companies are working on this now and are making some progress with ZYMV. Eventually, resistance to multiple viruses should be available.

Thatís a Berry Good Question!!!

Kathy Demchak, Department of Horticulture

Q. Straw mulch for winter protection of strawberries is getting more expensive, and is sometimes difficult to find. Is it possible to seed oats or another crop between then rows of strawberries, then let this crop act as the mulch once it is killed off by a freeze? (paraphrased from a conversation with Ernie Mast)

A. This is something that others have thought about, too, and research has been done on cover crops between the rows for use for winter protection, and for other uses as well. Charlie OíDell (Virginia Tech) had tried this with a number of crops including oats and millet, but after several winters, came to the conclusion that they simply did not provide enough winter protection. He also noted that these crops had decomposed and were pretty much gone by the next harvest season, so there was no mulch there to keep berries clean. Marvin Pritts has done related research at Cornell, where the primary emphasis of the work was on the use of cover crops for weed control. From the standpoint of value as mulch, the crop could help to hold additional applied straw mulch in place. Effects on yield have varied, with either no change or slight decreases resulting from the cover crop, presumably from some competition with the strawberry plants. So, the bottom line is that this isnít a practice recommended for winter protection.

Got a question? Send it to Kathy Demchak, at 102 Tyson Bldg., University Park, PA 16802. You will be credited with the question, or can remain anonymous, as you wish.

Switch Registered for Strawberries

Kathy Demchak, Department of Horticulture

Strawberry growers have another product to use for grey mold control. Switch, from Syngenta, is a mixture of 2 active ingredients, cyprodinil and fludioxinil. It has provided a very high level of grey mold control in independent studies. Tree fruit and grape growers may recognize cyprodinil as the active ingredient in Vangard, which is labeled for use against scab on apples, brown rot on peaches, and bunch rot and powdery mildew on grapes, among other uses. Fludioxinil is marketed as Maxim, which is used to treat seeds of many crops and seed potatoes.

Potato Musings

Bill Lamont, Department of Horticulture

Last week we harvested some very nice Eva's and Kueka Golds from the plasticulture plots as well as the conventionally planted plots at the Horticulture Farm, Rock Springs, PA. We also harvested some nice specialty potatoes especially Michigan Purple, grown using silver reflective mulch and drip irrigation. We are in the process of developing a new potato planter for use with plasticulture potatoes. We will report on the results of our research in upcoming issues of the gazette.

Growth Stages in a Potato Crop

Ron Hostetler, County Agent, Cambria County

The potato is a member of the plant family Solanaceae, which also includes tomato, pepper, eggplant and tobacco, as well as weeds such as nightshade, groundcherry, and buffalobur. Unlike other crops, however, potatoes are not produced from true seeds but rather are grown vegetatively from tuber "seed" pieces. It is convenient to divide the growth and development of the potato plant into five distinct life stages.

Growth Stage 1 *Sprout Development*
Sprouts develop from eyes on seed tubers and grow upward to emerge from the soil. Roots begin to develop at the base of emerging sprouts.

Growth Stage 2 *Vegetative Growth*
Leaves and branch stems develop from above ground nodes along emerged sprouts. Roots and stolons develop at below-ground nodes. Photosynthesis begins.

Growth Stage 3 *Tuber Initiation*
Tubers form at stolon tips but are not yet appreciably enlarging. In most cultivars the end of this stage coincides with early flowering.

Growth Stage 4 *Tuber Bulking*
Tuber cells expand with the accumulation of water, nutrients and carbohydrates. Tubers become the dominant site for deposition of carbohydrates and mobile inorganic nutrients.

Growth Stage 5 *Maturation*
Vines turn yellow and lose leaves, photosynthesis decreases, tuber growth slows and vines eventually die. Tuber dry matter content reaches a maximum and tuber skins set.

The potato crop in Pennsylvania is in the late maturation growth stage with some varieties already being harvested. Here are a few things that should be done during this growth stage to promote tuber quality:

1. If irrigating, reduce irrigation to promote tuber skin set and minimize tuber diseases.
2. Schedule vine-killing operations to allow complete desiccation of the vines before harvest.
3. Continue application of fungicides and insecticides, if appropriate until vines are completely dead.
4. Inspect, repair, and sanitize the storage and harvest equipment. Make necessary modifications to harvest equipment to minimize bruising.
5. Train personnel for a safe, low-bruise harvest, ensuring that tubers are not dropped from heights of more than 6 inches.
6. Begin harvest after vines are completely dead, but early enough in the season to avoid frost damage.
7. Remove as much soil and debris as possible from tubers during harvest.
8. Harvest when the soil is not too moist or dry to minimize bruising. Spore survival in dry soil is more unlikely. A highly bruised potato crop will place additional stress on the crop in storage.

Black Dot on Potato

Sara Mahoney and Dr. Barbara Christ
Department of Plant Pathology

This growing season, which has been hot and dry for most of our production areas, has resulted in stress on the potato crop. Due to this stress, there have been numerous reports of dying plants. Much of this is due to black dot, a disease that is favored by these extreme conditions and stressed plants.

Black dot, which is caused by the fungus Colletotrichum coccodes, affects both the plants and the tubers. This disease can cause significant yield losses in the field as well as loss of tuber quality in storage. This fungus also causes anthracnose on tomato and occurs on other solanaceous crops and weeds.

Symptoms

Black dot appears in the field in mid to late summer as chlorosis and wilting of the tops of plants. This is also characteristic of fusarium and verticillium so the symptoms may not be recognized as black dot. Frequently, stems have white sunscald-like lesions similar to sites of corn borer damage. Diseased plants eventually turn brown and die. Several small black dots, which are the sclerotia of the fungus, appear on the infected stem tissue. On the stems below the ground the outer tissue scales away and the exposed woody vascular tissue turns a purplish color. The black sclerotia are also produced on the internal and external woody stem tissue. These symptoms can also be found on the stolons.

Tubers that are infected develop grayish discolorations that resemble silver scurf. Tuber injury is more severe on thin skinned then on netted-skinned cultivars. "Black dots" or sclerotia will also appear on the tuber surface. This disease can survive in the soil consequently infecting new plants, several seasons later. It is spread to new uninfested fields on seed pieces infected with the sclerotia. Occurrence of black dot is ideal in well-irrigated, sandy soils.

References:

Pavlista, A.D., E.D. Kerr, R.B. OíKeefe. 1992. Black Dot Disease of Potato. University of Nebraska. http://www.ianr.unl.edu/pubs/plantdisease/g1090.htm

Zitter, T.A., L. Hsu, D.E. Halset. Valley Potato Grower Dec. 1995. Facts about Black Dot disease; causing problems in many areas.

Comparison of Black Dot and Silver Scurf

Silver Scurf

- Helminthosproium solani

- Affects the skin on potato tubers causing losses in quality and water loss in storage.

Symptoms

- In the field symptoms begin as small tan or brown spots, which expand and develop a silvery sheen.
- In storage the disease spreads through contact and air circulation. Symptoms appear as black circular lesions on the tuber, which eventually spread and disfigure the appearance of the potato.
- No resistant cultivars

Controls

- Seed treatments (Dithane, Tops MZ, Maxim MZ).
- Crop rotation , Silver scurf is not known to remain in the soil for more than one year.
- It is important not to plant too early or harvest too late. Delayed harvest after vine kill increases severity of disease.
- Clean harvesting and handling equipment frequently to reduce disease spread.
- Thoroughly disinfect storage areas. Eliminate free moisture and try to attain a low relative humidity and good ventilation.

Black Dot

- *Colletotrichum coccodes.*
- Both plants and tubers are affected. Significant yield loss in the field and tuber quality loss in storage.

Symptoms

- Appears mid to late summer as chlorosis and wilting of tops of plants (similar to fusarium and verticillium). Plants eventually turn brown and die. Sclerotia can be found on infected stem tissue.
- Infected tubers develop grayish discolorations that resemble silver scurf. Injury is more severe on thin-skinned cultivars.
- No resistant cultivars.

Controls

- Plant certified seed.
- Rotate crops , stay out of potatoes for four to five years.
- Prevent wounds and damage to plants by providing windbreaks.
- Keep plants adequately watered, but not too wet.
- In storage keep relative humidity at 90% or above.
- Store potatoes at 40æF if possible
- Wash tubers and use good sanitary practices.

Upcoming Meetings

Bill Lamont, Department of Horticulture

Local

December 5, 2001: Western PA Vegetable Growers Meetings, Butler, PA. Contact: Eric Oesterling (724) 837-1402.

Regional

January 29-31, 2002: Mid-Atlantic Fruit and Vegetable Growers Convention, Hershey, PA. Contact: Bill Troxell (717) 694-3596.

National