

# VEGETABLE AND SMALL FRUIT GAZETTE

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**Tip for the Month:** "Great work is done by people who are not afraid to be great" –  
Fernando Flores

## **Comments from the Editor**

Bill Lamont, Department of Horticulture

Plan on attending on August 14, 2000 the Vegetable and Small Fruit Field Day sponsored by the Pennsylvania Vegetable Growers' Association at held at the Horticulture Research Farm, Russell E. Larson Research Center, Rock Springs, PA. You do not want to miss this event. There is plenty to view and discuss with friends over lunch. You can even stay over for Ag Progress Days which will be held August 15,16 and 17 at Rock Springs. I want to thank Eric Oesterling and Ron Hostetler for their excellent articles and to Scott Guiser for forwarding another article to me for inclusion in this issue. Don't forget to check out Dr. MacNab's disease reminders, especially with the weather we have been having recently. The Vegetable and Small Fruit Gazette Team encourages your feedback so that we can better serve your needs and address your concerns.

## **Bug Against Bug**

Cathy Thomas, Integrated Pest Management Program  
PA Dept of Agriculture

## Production, Distribution and Quality Control of Biological Control Organisms

Most of the successes in greenhouse biological control have occurred in the Netherlands and the United Kingdom, mainly because these countries together contain more than half of the world's greenhouse acreage. An important event occurred when

Koppert (1967), a cucumber grower, entered the natural enemy business. Koppert is currently the international market leader in the field of biological crop protection. Large scale production of natural enemies such as *Encarsia formosa*, and *Aphidius colemani* takes place in the main facility located in the Netherlands. In addition to Kopperts, there are several other large producers such as Biobest (Belgium) – a leader in bumblebee pollination and biocontrol producer, Novartis BCM (England and California) – a division of Novartis Crop Protection and Applied Bio-Nomics Ltd. – Canada’s largest producer of biological controls. There are also some small companies in the US that specialize in the production of predatory mites, lacewings and trichogramma parasitoids.

Distributors for these biocontrol producers are found throughout the US and Canada. For example, International Technology Services (ITS), Lafayette, CO is the U.S. distributor for Biobest Biologicals. Together with the technical support staff at Biobest, they have a full-time entomologist to answer pest control and pollination questions. A list of distributors in the US can be found at this web site: [www.anbp.org](http://www.anbp.org), which is the Association of Natural Bio-control Producers. Most distributors require orders to be placed by Thursday (since they must be shipped from Europe or Canada) for delivery the following Wednesday. Products are delivered directly to your farm or greenhouse via UPS, Airborne or FedEx. Insist on guaranteed live delivery and overnight express only.

These large natural enemy producers screen for quality and use expiration dates. Check biocontrol shipments for this date and be cautious of suppliers who do not put dates on the material. A non-reputable supplier could have material that is weeks old and not viable. When biocontrols arrive at your operation check for viability. Predatory mites can be monitored by shaking material onto a white sheet of paper and observing movement.

Parasitoids such as *Aphidius colemani* are shipped in bottles. Within 24 hours after placement in the greenhouse check bottles for parasitoid emergence. If you observe high mortality of parasitoids call your distributor immediately. During warm weather months, biocontrols should be shipped with cooling material. Inform employees that you will be receiving biocontrols so that they can be stored in a cool area if you cannot distribute them immediately.

Web sites to explore: [www.bugsandbees.com](http://www.bugsandbees.com) , [www.ipmlabs.com](http://www.ipmlabs.com).

In the next issue, I will be discussing different methods of introducing natural enemies. Please contact me if there are specific issues you would like to see addressed in this column.

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### **August Disease Reminders**

Alan MacNab, Department of Plant Pathology

## DISEASE IDENTIFICATION

Identification information is available in the colored publication, "Identifying Vegetable Diseases" which is available from most extension offices.

## ASPARAGUS

Rust: Continue applying fungicide sprays to young plantings. In addition to mancozeb, Nova is now labelled for rust control on asparagus.

## BEANS

Mosaic Viruses: Use resistance to BV-1. Provide good weed control; weeds are a source of bean viruses. Do not plant near clovers; they are a source of bean viruses. Do not make successive plantings in adjacent strips or fields; the few diseased plants that appear in early plantings act as an important virus source for later adjacent plantings.

White Mold and Gray Mold: Apply protective fungicide sprays when warranted. Wet conditions immediately before and during bloom promote disease development. Ronilan is very effective, although only labeled for snap beans; Benlate and Topsin M also are good when timed well, and can be used on snap and other beans.

## BEANS, LIMAS

Downy Mildew: During wet weather, when conditions favor disease, use fungicides. Conditions that favor late blight of tomatoes and potatoes also favor downy mildew of lima beans.

## BEETS

Leaf Spots: Use fungicides where disease usually occurs.

## CABBAGE:

Fusarium Yellows: This disease is favored by hot weather. When possible, avoid susceptible varieties.

Clubroot: Where present, it is too late to apply controls for this year. Determine the source if possible. Then plan rotation, pH adjustment, or Terraclor use for next season. Wet soil conditions favor development.

Downy Mildew and Leaf Spots: These diseases become most important late in the season. Where anticipated and warranted, fungicides provide some control. For downy mildew, Ridomil Gold/Bravo 81W (1.5 to 2 lb/A) is effective and can be applied at 14-day intervals until 7 days before harvest. Weekly applications of Bravo and maneb also provide control. For downy mildew only, Aliette can be used (3 to 5 lb/A) at 14 day intervals until 3 days before harvest.

## CARROTS and CELERY

Leaf Spots: Continue regular fungicide sprays; they are most important for the remainder of the season. Wet weather will promote their appearance and development.

## CUCURBITS

**Bacterial Wilt:** Where present, it is too late to attain control this year. Plan cucumber beetle (bacteria carrier) control for next year.

**Powdery Mildew, Leaf Spots, and Blights:** Use regular fungicide sprays unless varieties are resistant to the diseases of concern. Leaf diseases are of major importance on muskmelons (cantaloupes) during late season. Quadris 2.1F (11 to 15.4 fl.oz./A) and NOVA 40W (2.5 to 5 oz/A) are excellent for powdery mildew, a disease which appears yearly starting about mid- to late-season. Use the high rates if powdery mildew is present. (Nova received a new federal label in 2000 for use on cucurbits, asparagus, snap beans, and tomatoes.) On cucurbits, to reduce the chance of resistance development in the fungus, alternate Quadris and Nova, and use the high labelled rates if powdery mildew is present. When NOVA is used, Bravo can be added to help control diseases in addition to powdery mildew. Ridomil/Bravo 81W is especially good for downy mildew, a disease that appears less frequently than powdery mildew in Pennsylvania.

**Scab:** For susceptible varieties, use fungicides when conditions are cool and wet. For cucumbers, use resistant varieties for next year. Beware of this disease if late plantings of susceptible cucumbers are planted.

**Mosaic Viruses:** Use resistant varieties. When resistant varieties are not available, control perennial weeds, plant in large fields, and control aphids.

**Fusarium Wilt:** It is too late to apply controls for this year. For future years, try rotation, resistance when available, and if necessary, soil fumigation. Symptoms appear first on plants in wettest areas of fields, and the disease is more prevalent in cool soil than in warm soil. The variety Athena may have the most resistance.

## EGGPLANT

**Verticillium Wilt:** Follow rotations that avoid susceptible crops for as many years as possible. Where present yearly, consider fumigation where crop value warrants the expense.

## ONIONS

**Leaf Spots:** Apply fungicides on a regular schedule, especially for those planned for storage. Defoliation diseases are active in August. Note that Ridomil Gold/Bravo, Ridomil Gold MZ, and Aliette are labeled for onions, and are materials of choice if one has difficulty controlling downy mildew. Other materials listed in the Commercial Vegetable Production Guide are good for other leaf diseases that affect onions.

## PEPPER

**Mosaics and Virus Spots:** It is too late to affect control for this year. For future years, use TMV resistance, plant in large fields, control aphid vectors, and eliminate perennial weeds near fields.

**Bacterial Spot:** Where present, determine source. Did it come on plants? If present, start basic copper sprays early and tank mix with maneb. Plan to rotate to fields not recently planted to tomatoes or peppers. This can be a serious problem. Inoculum can be seed-borne. If disease is detected in a field, do not work in the field when plants are wet. The bacteria that cause this disease are spread less when plants are dry than when plants are wet.

Phytophthora blight: This disease is promoted by wet soil (poor drainage and/or heavy rainfall). The most severe losses are reported on cherry and cheese types. Follow a 3-year rotation between susceptible crops such as pepper, cucurbits, eggplant, and tomato. Ridomil Gold 2E (1 pt/A) or Ultra Flourish 2E (1 qt/A) soil applications (banded over the row at planting, and directed onto the soil at the base of plants at 30 days and 60 days after planting) are helpful. In addition, provide the best drainage possible; in some areas, for susceptible peppers, it is necessary to grow them on high ridges. In place of a "60 days after planting" application (above), Ridomil Gold/Copper can be applied as sprays at 10 to 14-day intervals to prevent the stem and fruit rot stage of this disease. If the "60 days after planting" application is made, fixed copper alone can be applied as a spray at 7- to 10-day intervals to control the stem and fruit rot stage of this disease.

### PUMPKIN and SQUASH

Powdery Mildew: Use regular fungicide sprays. Start applications no later than when powdery mildew is detected on 1 leaf in 50 leaves; usually, powdery mildew symptoms appear first on the underside of leaves. Quadris 2.1F (11 to 15.4 fl.oz./A) and NOVA 40W (2.5 to 5 oz/A) are excellent for powdery mildew, a disease which appears yearly starting about mid- to late-season. Use the high rates if powdery mildew is present. (Nova received a new federal label in 2000 for use on cucurbits, asparagus, snap beans, and tomatoes.) On cucurbits, to reduce the chance of resistance development in the fungus, alternate Quadris and Nova, and use the high labeled rates if powdery mildew is present. When NOVA is used, Bravo can be added to help control diseases in addition to powdery mildew, and also slow development of resistance. Ridomil/Bravo 81W is especially good for downy mildew, a disease that appears less frequently than powdery mildew in Pennsylvania.

Phytophthora blight: This disease is promoted by wet soil (poor drainage and/or heavy rainfall). Follow a 3-year rotation between susceptible crops such as pepper, cucurbits, eggplant, and tomato. Ridomil Gold 2E (1 to 2 pints/treated A) applied at planting as labeled for Pythium and cottony leek control may be helpful. Foliar applications of Ridomil Gold/Bravo 81WP at 3 lb/A may be adequate; it is labeled for application at 14-day intervals.

### SWEET CORN

Leaf Spots and Rust: Some varieties have some resistance. Fungicides are effective for leaf spots but less effective for rust. Tilt and mancozeb are labeled for rust; Tilt is somewhat systemic and sometimes is the material of choice when rust is especially difficult to control at the end of the season.

Maize Dwarf Mosaic (MDM): Aphid vector control may help in large fields. Where MDM is present, plan to try tolerant varieties in future years.

### TOMATOES

Bacterial Speck and Spot: If spots are a yearly problem, and symptoms appear on leaves, continue sprays with basic copper plus maneb/mancozeb. Next year, rotate to new fields, use pathogen-free seed, and spray seedlings regularly with streptomycin before transplanting. If symptoms are not present on leaves now, the fixed copper applications may not be needed for the rest of the season. Where present, try to avoid working and spraying in plantings when they are wet.

**Bacterial Canker:** Bacterial canker is appearing in some fields. I suspect that inoculum source is either infected seed, or infested soil. The causal bacteria can persist in soil for at least 3 years! Control is very difficult at this time. Do not work in affected plantings when plants are wet. Application of fixed copper tank mixed with either maneb or mancozeb, as for bacterial spot and bacterial speck, may help slow spread in fields.

**Fruit Rots and Leaf Spots:** Where possible, rotate and provide adequate fertility. Continue a good fungicide program. In addition to the standard fungicides, Bravo and mancozeb, which provide good control, Quadris is an excellent new fungicide for early blight control.

**Late Blight:** As of July 18, 2000, I have reports of late blight in a commercial tomato planting near Albany, New York (confirmed June 23); on 10-12 tomato plants in a home garden near New Kensington, Pennsylvania (confirmed July 12 and destroyed July 13); and in about 1500 A of potatoes in Michigan (early-mid July). Pennsylvania weather conditions have been very favorable for development of late blight. Fungicides are needed to protect tomatoes (and potatoes) whenever environmental conditions favor disease development. Up-to-date information is available on the toll free "Hotline": 1-800-PENN-IPM = 1-800-736-6476.

### **Cucurbit Powdery Mildew Control**

Alan MacNab, Department of Plant Pathology

Following the recent labeling of Nova for use on cucurbits, we now have two excellent fungicides with different modes of action for use in powdery mildew control programs. These materials are Quadris and Nova. Here are details of a suggested powdery mildew control program that should provide good control and minimize the chance for pathogen resistance to the fungicides:

1. For the first spray, apply Quadris when disease is detected in nearby fields, or when powdery mildew first appears in a field (when 1 leaf in 50 has any sign of powdery mildew).
2. For the second spray, apply Nova. Nova can be tank mixed with Bravo, which provides control of additional diseases, and helps minimize chance that the pathogen will develop resistance to powdery mildew.
3. Then continue to alternate the Quadris and Nova applications on a 7-day schedule.
4. Switch to the highest rates and shortest labeled intervals when disease pressure is heavy.
5. Multi-site contact protectant fungicides (without systemic activity) with some activity against powdery mildew and some other diseases are Bravo and fixed copper fungicides. Fixed coppers can be somewhat phytotoxic, especially on young tissue when temperatures are high, but have been used to advantage for powdery mildew control late in the season.

Fungicides, rates, and restrictions for cucurbit fungicides mentioned above are as follows:

Quadris 2.1F. 11-15.4 fl.oz./A. Re-entry interval is 4 hours. For powdery mildew, alternate with an effective fungicide with a different mode of action (e.g. Nova). Do not make more than 6 applications/season. Do not apply more than 2.88 quarts/season to a planting. Do not apply within 1 day of harvest.

Nova 40W. 2.5 to 5 oz./A. Re-entry interval is 24 hours. For powdery mildew, alternate with an effective fungicide with a different mode of action (e.g. Quadris). Do not apply more than 1.5 lb/season to a planting. Applications can be made up to and including the day of harvest.

Bravo 6F, 2-3 pints/A; Bravo 82.5W, 1.8-2.7 lb/A. Re-entry interval is 48 hours. Applications can be made up to and including the day of harvest.

Fixed coppers, see rates and restrictions on specific labels. Re-entry periods vary from 12 to 48 hours. Applications usually can be made up to and including the day of harvest.

### **Powdery Mildew on Cucurbits Under High Tunnels**

Alan A. MacNab, Plant Pathology

Question: Will growth of cucurbits under high tunnels influence powdery mildew development?

Answer: Powdery mildew will be more important on cucurbits grown under high tunnels than on cucurbits grown in the open.

This answer may be surprising to some. For some diseases, presence of a canopy over the plants slows radiational cooling overnight and prevents or greatly diminishes formation of dew. And the canopy prevents plants from getting wet from rainfall, and also prevents splashing of pathogens within the plant canopy. However, for powdery mildew, although infection by the fungus is favored by high humidity, infection has been reported to occur at relative humidity as low as 46%; and no infection occurs when leaves are wet from dew or rain. My personal experience from tests to determine the effect of canopies on disease development, is that powdery mildew will develop earlier and will be more severe on plants under a canopy (like a high tunnel) than on plants that are not grown under a canopy.

#### Control considerations:

1. Always use varieties with the most resistance possible.
2. Never start with transplants grown where powdery mildew is present.
3. Never overlap plantings of cucurbits under high tunnels.
4. Promptly clean out all plant refuse after harvest.
5. Maintain strict weed control under high tunnels at all times, including the time when the crop is being grown, and when crops are not being grown. The powdery mildew fungus can survive on some weeds that can survive from season to season.
6. For late season cucurbit plantings under high tunnels, avoid plantings that are close to field plantings where powdery mildew is present.
7. If you are considering use of fungicides for control, plan to prevent the disease from getting started. Use an appropriate fungicide as soon as there is any chance of powdery mildew appearance, and then continue a regular application program. Follow label directions for all materials used. Information I have from PDA and the EPA indicates that fungicides labeled for cucurbits can be used unless there are specific restrictions on the label which prohibit their use. Make sure you follow all label instructions related to

timing, alternating unrelated materials, and use of high labeled rates when disease pressure is greatest. I am concerned that if powdery mildew is more severe and if fungicides such as Quadris and Nova are used for prolonged periods on cucurbits, the chance for development of resistance to these materials will increase. If you do use these materials on plants under tunnels, make sure you do not use more than the maximum amount per season (2.88 qt/crop/acre for Quadris and 1.5 lb/crop/acre for Nova).

### **Service with a Smile is Good Business**

William Lesser, Cornell University

There is a lot of talk in this country now about the “service economy.” What that means in practice is more of us are working (part time) at McDonald’s and as supermarket checkers. Such changes say a lot about the national economy, but here I want to emphasize what they say about service. Service positions - working directly with the public, often at low-skill and low-salary positions - are not necessarily service. We have much to learn about real service from the Europeans and others.

In France, for example, service is a skilled, respected career. In fact, what is so renowned about expensive French restaurants, besides the food, is the service. There is none of the proverbial French snootiness. The entire staff greets you by name at the door. You feel like a welcome guest, not a customer. This attention works as well in New York as in Paris. Following a \$10 lunch near Roscoe, the French proprietress thanked my wife and me personally and shook our hands. Did I remember that effort and will I go back?

What does this have to do with marketing agricultural products? The universal point is that we all like to be fussed over, to be made to feel important. This is true whether we are buying a fancy dinner, a truckload of tomatoes, or a single cucumber. Here I am not referring to the proverbial joking of the salesman, but to working at being considerate of your customers. Try to remember something personal about them: preferences, family events, sports teams followed. If this does not come readily, then write something down when a transaction is completed and study your notes in idle minutes. Instilling a real service mentality in employees is difficult, but remember that example is the best teacher.

Perhaps what really characterizes service is sincerity. If I serve you because service and your satisfaction are important to me, that is sincere. If I put up a purchased sign saying, “Our Customers Are Number One,” and everyone around me has the same sign, that isn’t sincere. And, all in all, sincerity is tough to fake. Service, real service, is good business. It just needs to be done and to be felt, not only talked about.

(Reprinted from the Smart Marketing series [March 1993] Department of Agriculture Economics, Cornell University)

### **That’s a Berry Good Question!!!**

Kathy Demchak, Department of Horticulture

Q. My blueberries are mulched with sawdust. How should I take a soil sample? Should I include mulch or scrape it away to sample only the soil? (Eddie Rankin, Twin Springs Fruit Farm)

A. The sample should be taken from the area in which the roots are growing. Where mulch is used, most of the roots are often located at the soil-mulch interface, with fewer roots in the mulch or soil. So, taking a sample to an 8"-10" depth consisting of both mulch and soil in this case would be good. As an aside, in unmulched soils, roots often go much deeper. From time to time, especially if nutrient deficiency symptoms are noticed, it is a good idea to check the pH of the mulch and soil separately, as the pH of the two can be quite different.

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.

### **New Pesticide Labels for Berries**

(Kathy Demchak, Jim Travis, and Greg Krawczyk)

Nova 40W (myclobutanil, Rohm and Haas) now has a supplemental label for use on several small fruit crops. Probably of most interest is the use as an orange rust protectant for black raspberries and blackberries. The labeled rate for this use is 1.25 to 2.5 oz of product per acre, applied at 10 to 14-day intervals, with a maximum of 10 oz/acre applied per growing season. Nova 40W is also labeled for control of cane and leaf rust, and yellow rust on blackberry and raspberry; powdery mildew on strawberry, raspberry, blackberry, gooseberry and currant; leaf spot on strawberry and raspberry; leaf blight on strawberry; and anthracnose on gooseberry. Rates and timings for these uses vary with the crop and disease, so consult the label for specifics. In all of the above uses, applications may be made up to the day of harvest.

Confirm T/O (tebufenozide, Rohm and Haas) is labeled for use on blueberries against 3 species of leafrollers, spanworms, green fruitworms, and gypsy moth. It is also labeled for use on caneberrries for 4 species of leafrollers, alfalfa loopers, and gypsy moth. See the label for rates and timings, as these vary with the pest targeted.

Anthracnose is primarily a problem in rainy, warm harvest seasons, and is a much larger problem in the southeastern United States than it is in Pennsylvania. The disease can be caused by several different *Colletotrichum* species, which cause a fruit rot, a crown rot, and a leaf spot, as well as lesions on petioles and runner stolons. Symptoms of anthracnose fruit rot are light brown spots on the fruit, which typically turn dark, brown or black, then enlarge. Flowers and flower buds can also become infected, and appear to dry out. Symptoms of anthracnose crown rot are rarely noticed until the plants collapse or die, usually in the fall or spring following transplanting during warm weather. When the crown is cut through lengthwise, a brownish horizontal V shape can be found, originating near the base of a petiole. Symptoms of the leaf spot either resemble ink spots, or cause irregular lesions at the tips or margins of the leaves, depending on the species causing the infection. On the runners and petioles, lesions begin as small red streaks, and then turn dark, sunken, and elongated.

The primary source of the disease is infected transplants from the nursery. The plants normally don't show symptoms until after being transplanted to the production field. Inoculum overwinters mainly in infected plants and plant debris. The inoculum is primarily disseminated by splashing water.

Mulching with straw, and using drip irrigation rather than overhead can decrease the spread of inoculum. The use of raised beds on plastic mulch seems to increase the incidence. There is no satisfactory method of chemical control.

## **Potato Musings**

### **Potato (tomato) Late Blight**

Ronald Hostetler, County Agent, Cambria County

As most of you know, late blight has shown up in a garden in Western PA; Albany, NY; and Michigan. The weather conditions – cool and wet – have been ideal for the spore to live and be past on. According to plant pathologists we must have 1.2 inches of rain over 10 days and a 5 day average temperature of 45°F to 79°F to be blight favorable—then after 10 days of consecutive blight favorable days, late blight will appear 7 to 14 days later.

With this knowledge we know that late blight organisms are around and we need to keep the plant foliage covered with a protective fungicide spray. Page 168 of the 2000 Commercial Vegetable Production Guide gives the fungicides that are recommended. Apply one of these and repeat every 7 days or better yet follow a reliable disease forecasting system to schedule fungicide applications. Be sure to call the 1-800-PENN-IPM toll free number and get the latest results from Dr. Alan MacNab, Plant Pathologist at Penn State, and the Pennsylvania department of Agriculture. He has weather stations throughout the state, and from their recordings he can accurately predict the possibility of late blight.

Good growing conditions mean plenty of new growth and this new growth is a likely candidate for late blight spores to land on and develop. This is why it is important to know if blight conditions exist, and if so, when we should again apply fungicides.

New strains of the fungus that causes late blight are present in the area. These strains are aggressive on potatoes and resistant to Ridomil Gold. It is therefore important to properly apply one of the protective fungicides that destroy late blight.

If a field contains new late blight infestations here are some comments from Dr. MacNab, Penn State, about destroying plantings with severe late blight. One should consider destroying a planting if the planting can not be salvaged, or if other nearby plantings are threatened by infection from the first field.

1. Spray with an effective fungicide: When possible, spray the planting with an effective fungicide if the planting has not been sprayed within the past 5 days. The objective is to kill spores so that they are incapable of causing disease in surrounding fields.
2. Kill the vines: Kill vines with a chemical that acts quickly: A fast-acting chemical vine killer is better than disking a living crop if active spores are present on the plants. When a living crop is disked, the procedure can dislodge spores, which can be blown by the wind to other fields.

3. Disk the field: After applying the vine killer, and after the vines are no longer vigorous with evident sporulation on the leaves, consider disking the field. This makes sure all plants are dead, and for potato tubers, disking also helps start the tuber rotting process as soon as possible. The late blight fungus can continue to grow in any late blight infected tubers that are alive and such tubers pose a threat if they survive the winter and sprout next season.

Some pointers given by Leigh Marrow, Crops Specialist, at the University of Maine, Cooperative Extension.

Make the final hill big, after the set has been established. This will place more soil over the tubers. Shallow tubers are most susceptible to spore infection later.

Do not rely only on metalazyl; use chlorothalonil or EBDC's. It is undetermined if metal (coppers, tin) tank mixes are more effective than standard applications. Metals may be most useful when the blight levels and weather conditions necessitate spray intervals of closer than five days. Use standard materials every five days and metals in between or during vine desiccation. Research will be conducted on combination treatment during 1995.

Keep foliage covered. New infections can occur on the growing tips of the potato plant. This area of the plant can outgrow its protection in four days or less during June and July. Frequent applications are more important than the fungicide selected. Optimize spray equipment. Use adequate water and pressure to cover plants. By the end of July there can be 2.5 times more foliage than ground area. Use more water now than earlier in the season. Be certain all nozzles are operating well.

Raise booms as the crop grows. Operate booms at the proper height. Blight can often get started in a field at the tops of plants that were missed by fungicide. New "air assisted" sprayers show promise for penetrating the middle canopy, but whatever sprayer is used to not miss the new, upper growth.

Beware of irrigation when blight is present. Irrigation can fill the humidity gaps and aggravate blight situations. Heavy irrigation can carry spores down to tubers as well.

Finally if you hear of any rumors or reports of late blight present at any location in or near Pennsylvania, phone a report to Alan MacNab at 814-692-7990

### **Potato Leafhopper on Vegetables**

Eric Oesterling, Extension Agent, Westmoreland County

Potato leafhopper probably isn't on anyone's list of "top ten insect pests of vegetables" but it can sneak up on you. Although it got its common name from potato, it is best known as the most serious insect pest of alfalfa. However, potato leafhopper can damage many different plants. It seems to prefer legumes, including beans but can cause damage to many crops: from hay to vegetables and fruit, even fruit trees and shade trees.

These are tiny insects; adults are about 1/8 inch long, in the shape of a narrow wedge and pale green in color. Adults have wings and fly when disturbed. Nymphs are smaller, wingless and pale green to yellow. They move quickly when disturbed, typically moving sideways to the opposite side of the leaf. They have piercing sucking mouthparts and feed by extracting fluids from the plant, in the process blocking the tiny phloem tubes at the point of feeding. This blockage results in yellowing of the leaves, marginal burn and sometimes cupping of leaves. Heavy feeding results in an overall stunting of the plant.

In a typical year we usually have to worry about leafhopper damage from mid June to mid August. Potato leafhoppers do not survive the winters in Pennsylvania but large numbers of adults are carried northward from the Gulf States every spring. It seemed like they arrived in Pennsylvania early this year with our early spring and many storm fronts blowing in from the southwest. It usually takes a few weeks for the populations to build to the point of causing economic damage to crops. Females can lay 2 or 3 eggs a day in stems and leaf veins and the entire life cycle takes a month or more. In addition to feeding damage potato leafhoppers are known to spread virus diseases. Vegetables crops that can be damaged include (but not limited to) potatoes, tomatoes, beans, muskmelons, cucumbers, carrots and lettuce.

Potato leafhoppers are not hard to control once you notice them but they are easy to overlook, because of their small size, the fact that they feed on the undersides of leaves and hide when disturbed. Once damage is obvious the crop has already suffered economic loss so monitor crops and control if numbers reach the threshold. You can monitor for this insect using a sweep net. If a field of alfalfa hay is mowed next to a susceptible vegetable crop, keep a close eye on the vegetable field. Adult leafhoppers will move out of the mowed hayfield looking for something to feed on. Leafhoppers can be controlled with many common insecticides – organophosphates, carbamates, and pyrethroids. Check the Pennsylvania Vegetable Production Guide for thresholds and insecticide recommendations - they vary from crop to crop.

#### References:

“Potato Leafhopper Fact sheet” Lee Townsend, Entomologist, University of Kentucky

“Insect Pests of Field Crops,” Bulletin 545, Ohio State

“Commercial Vegetable Production Recommendations for Pennsylvania”

#### **Upcoming Meetings**

Bill Lamont, Department of Horticulture

#### Local

August 14, 2000. Vegetable and Small Fruit Field Day, Horticulture Research Farm, Rock Springs, PA. Contact: Mike Orzolek: 814-863-2251

August 15-17, 2000. Ag Progress Days, Ag Progress Day Site, Russell E. Larson, Research Center, Rock Springs, PA. Contact: Bob Oberheim 814-692-5262.

#### Regional

January 30-Feb. 1, 2001: Mid-Atlantic Fruit and Vegetable Growers Convention, Hershey, PA. Contact: Bill Troxell (717) 694-3596.

#### National

September 23-26, 2000: 15th International Agricultural Plastics Congress and the 29th National Agricultural Plastics Congress, Hershey, PA. Contact: Pat Heuser, Executive Secretary, American Society for Plastics (814) 238-7045.