

# PLANT & PEST ADVISORY

VEGETABLE CROPS EDITION \$1.50

APRIL 26, 2006



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## Recognizing and Controlling Important Fungal Diseases in Fresh-Market and Processing Tomatoes

*Andy Wyenandt, Ph.D., Specialist in Vegetable Pathology*

**W**ith transplanting beginning in the next week or so it's not too early to think about common fungal diseases in tomatoes such as **Septoria leaf spot**, **Early blight** and **Anthracnose fruit rot**. All three diseases are soil-borne and can lead to pre-mature defoliation and/or fruit rot. Interestingly, all three diseases are easily identified by the symptoms they produce on infected tomato plants.

*Septoria leaf spot will only infect the foliage and stems of the tomato plant.* Symptoms to scout for are small, circular lesions with a dark outer edge and brownish-tan center. Black spore producing bodies will develop in the center of these lesions. When scouting, look for Septoria leaf spot on the lower foliage of the tomato plant early in the season. The disease will work its way up the plant causing pre-mature defoliation. If left untreated Septoria leaf spot can cause 100% defoliation.

*Early blight will affect the foliage, stems and fruit.* Early blight will produce brown, concentric lesions on the foliage and stems that are much larger than the lesions produced by Septoria leaf spot. Early blight, like Septoria leaf spot can also cause severe defoliation. Early blight can also infect green and red fruit through the stem attachment. Lesions that develop on the fruit also produce brown, concentric rings.

*Anthracnose fruit rot, or red fruit rot, can infect green fruit and foliage, although symptoms only appear on ripe fruit during the later stages of the growing season.* Anthracnose lesions begin as slightly depressed circular lesions that enlarge. As lesions enlarge they become more flat and develop black, speck-like fruiting bodies in the center of the lesion.

Control of all three diseases should begin with a weekly preventative fungicide program which focuses on alternating fungicide chemistries. In fields in highland areas not rotated away from tomatoes and late planted fields, begin sprays shortly after transplanting. In all other areas, begin sprays when crown fruit reach one-third their final size. Begin a preventative fungicide program with chlorothalonil (Bravo, Equus, Echo, M5) at 2 to 3 pt 6F/A or Mancozeb (Dithane, Manzate, Manex II, Penncozeb, M3) at 3 lb 80WP/A and alternate with a strobilurin (Amistar, Flint, Cabrio, (11) or Tanos, 11 + 27) or Endura (boscalid, 7) at 2.5 to 3.5 oz 70W/A. Strobilurin fungicides have a maximum-season

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# Vegetable Grower's Guide to Understanding the Strobilurin Fungicides (FRAC Group 11)

*Andy Wyenandt, Ph.D., Specialist in Vegetable Pathology*

The strobilurin, or QoI, fungicides (FRAC group 11) have been on the market for a few years now and have been extremely useful in controlling a broad spectrum of common vegetable pathogens. Interestingly enough, the basic strobilurin compound (or chemistry) was initially identified and isolated from a natural compound in a common wood rotting fungus associated with trees.

You may know some of strobilurins as azoxystrobin (Amistar or Quadris), trifloxystrobin (Flint) or pyraclostrobin (Cabrio). All strobilurin fungicides inhibit fungal respiration by binding to the cytochrome b complex III at the Q<sub>0</sub> site in mitochondrial respiration. Simply said, the fungicide works by inhibiting the fungi's ability to undergo normal respiration. As you can see, the strobilurin chemistries have a very specific target site, or mode-of-action (MOA). Although highly effective, any fungicide chemistry like the ones in FRAC group 11 with a very specific MOA may lose efficacy (i.e. become less effective).

Why is that? Fungal populations have the ability to develop resistance to certain fungicide chemistries over time. For example, let's say we apply a QoI fungicide on pumpkin for Powdery mildew control and we estimate 99% control of the Powdery mildew population after the first application. Two weeks later we apply another QoI fungicide and control 90% of the population. Finally, we apply a third QoI fungicide application (six weeks after the first) and control 10% of the population. Why isn't the fungicide controlling Powdery mildew like it once did earlier in the season? Let's keep in mind that we know this particular group of fungicides (FRAC group 11) has a specific MOA. Therefore, each time the fungicide is applied it acts against the fungus in the same exact way, by interfering with fungal respiration by binding at the cytochrome b complex! Eventually, the fungus 'figures' this out, and a small segment of the population ever so slightly undergoes a change (i.e. a mutation) to avoid being controlled by the fungicide. How small does the change in the fungus have to be? Well, in a 'technical sense', a single nucleotide polymorphism of the cytochrome b gene leads to an amino acid substitution of glycine with alanine at position 143 of the cytochrome b protein (Kuck and Mehl, 2003). For us, knowing the specifics on the technical jargon isn't so important, its

understanding what is at stake. So, if we hear someone speak about G143A resistance development to the QoI fungicides (where resistance is already known to develop in cucurbit Powdery mildew and Downy mildew), we know what they are talking about and how important it is! So much so, that if Powdery mildew develops resistance to one strobilurin compound it may develop what is known as cross resistance and become resistant to all chemistries in FRAC group 11, even if only one chemistry was used! So even though we were controlling a large portion of the Powdery mildew population at the beginning of the season, there was another Powdery mildew population developing that had developed resistant to the QoI fungicide. Eventually, the QoI resistant population becomes much larger than the population we were controlling, the fungicide doesn't work anymore, and, as we all know, Powdery mildew eventually takes over the entire field.

So, how do we avoid the chances for fungicide resistance like this to develop? It's simple, don't let the fungus 'figure out' what it is being sprayed with and do this by rotating different fungicide chemistries (i.e. FRAC groups)! Proper fungicides rotations are necessary when fungicides with specific MOA's are used in spray programs for controlling important diseases. That's why it is so important that labels are followed precisely and that certain classes of fungicide chemistry are not mis- or overused. All strobilurin fungicides should be tank mixed with a protectant fungicide, when possible. Remember tank-mixing high-risk fungicides (i.e. FRAC group 11) with low-risk, protectant fungicides (FRAC groups M1-M9) helps reduce (and/or delay) the chances for resistance development. Never tank mix strobilurins together and never apply any strobilurin fungicide (either the same chemistry or different chemistry) in consecutive applications! Remember, Amistar acts against the fungus the same way as Flint does and so on. Even though you are spraying two different chemicals, each has the same MOA and is acting against the fungus in the same exact way. □

## Vegetable Diseases of the Week

Andy Wyenandt, Ph.D., Specialist in Vegetable  
Pathology



*Anthrachnose fruit rot of tomato.*



*Septoria leaf spot of tomato.*



*Early blight causing rot in ripe tomato fruit.*

## Recycle those Plastic Pesticide Containers – Get One Core Credit

The NJ Department of Agriculture announces its 2006 schedule for a *free* program to recycle empty plastic pesticide containers at the Cumberland County Solid Waste Complex.

Non-refillable, high-density polyethylene # 2 (HDPE #2) containers used by agricultural, professional and commercial pesticide applicators will be accepted at the collection sites. In addition, HDPE #2 plastic pales, bulb crates, and similar items will be accepted.

Pesticide containers must be no larger than 55 gallons and triple rinsed. The MSDS booklet and the lid must be removed. The metal handles must be removed from the plastic pales.

The program is open to anyone who holds a New Jersey Department of Environmental Protection pesticide license including state, county and municipal government agencies. Participants must follow the processing guide or the material will be rejected. You do not need a pesticide license to participate in the program if non-pesticide containers are recycled.

One core credit will be issued to NJDEP pesticide license holders who bring in properly rinsed pesticide containers. To receive credit, participants must bring their pesticide license to the collection site and must follow the processing steps. Pesticide credits will not be issued for recycling items other than pesticide containers.

Contact Karen Kritz, Recycling Program Manager, at (609) 984-2506 or karen.kritz@ag.state.nj.us with questions about this recycling program or other recycling questions.

### **2006 Pesticide Container Collection Program Schedule**

**Location:** Cumberland County Solid Waste Complex, 169 Jesse Bridge Road (located off Route 55 Exit 29), Deerfield, New Jersey

**Time:** 9 a.m. to Noon

**Dates:** Friday, May 19

Friday, June 23

Friday, July 28

Friday, August 25

# Vegetable Disease Update

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

## ✓ Asparagus – Phytophthora crown and spear rot –

Asparagus season is here and in fields with low spots (poorly drained soils) or fields with a history of crown and/or spear rot apply Ridomil Gold 4E (mefenoxam, 4) at 1 pt/A over beds just before 1<sup>st</sup> harvest. For new plantings apply the same after planting seedlings or after crown covering. For more information please see *2006 New Jersey Commercial Vegetable Production Recommendations Guide*.

## ✓ Cole crops – Downy Mildew and Alternaria –

Symptoms of Downy Mildew include purple to yellowish-brown spots on upper leaf surfaces. A grayish-white spore mass will develop and cover the underside of leaves under ideal temperatures (night temperatures of 46 to 61°F and day temperatures below 75°F). Downy mildew can kill young plants. Heavily infected leaves may drop providing entry points for bacterial infections (Black rot and Soft rot). Symptoms of Alternaria on infected leaves include small, expanding circular lesions with concentric rings that may have a 'shot-hole' appearance as lesions age. Heavily infected seedlings may result in damping-off. Control of Downy mildew and Alternaria begin with preventative fungicide applications. Use one of the following at the first sign of disease and continue every 7 to 10 days (Please refer to the pesticide table on page F17 of the *NJ Commercial Vegetable Production Recommendations* to determine which fungicide is labeled for each specific crop): Amistar (azoxystrobin, 11) at 2.0 to 5.0 oz 80 WDG/A (Alternaria only; labeled for use on leafy greens only), or Bravo, Echo, Equus (chlorothalonil, M5) at 1.5 pt 6F/A or OLF, or maneb (M3) at 1.5 to 2 lb 80WP/A or OLF, or Ridomil Gold Bravo (mefenoxam + chlorothalonil, 4 + M5) at 1.5 lb 76.5WP/A (14-day schedule), or Switch (cypridonil, 9) at 11 to 14 oz 62.5WG/A (Alternaria only). For downy mildew only, apply Actigard (acibenzolar-S-methyl, P) at 1 oz 50WG/A (begin applications 7-10 days after thinning and re-apply every 7 days for a total of 4 applications per season.), or Aliette (fosetyl Al, 33) at 3 to 5 lb 80WDG/A (on 14-day schedule). For more information please see *2006 New Jersey Commercial Vegetable Production Recommendations Guide*.

✓ **Lettuce** – Spring lettuce season is underway and growers should take precautions to help control Bottom rot (*Rhizoctonia*) and Lettuce drop (*Sclerotinia*). 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 Rovral 50WP can be applied at 1.5 to 2 lb/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 *2006 New Jersey Commercial Vegetable Production Recommendations Guide*.

✓ **Lettuce/Spinach – Damping-off** - Wet weather over the past few days has made it ideal for damping-off caused by Pythium and Rhizoctonia. The sudden collapse of seedlings or transplants with blackish/brown stems is a signature sign of damping-off. To help suppress damping-off apply Ridomil Gold 4E (mefenoxam, 4) at 1 to 2 pt/A or Ultra Flourish (mefenoxam, 4) as a 7 inch soil-surface spray at seeding or transplanting or as a soil surface spray afterwards. For more information on the control of Damping-off on specific crops please see the *2006 New Jersey Commercial Vegetable Production Recommendations Guide*.

✓ **Spinach (Downy Mildew)** - The use of Ridomil Gold (mefenoxam, 4) at 1 to 2 pt 4E/A or Ultra Flourish (mefenoxam, 4) at 2 to 4 pt 2E/A at planting for damping-off control will provide early season control. Beginning 2 to 3 weeks after emergence (and prior to symptom development), apply the following on a 7 to 10 day schedule (do not use if temperature is high). Actigard (acibenzolar-S-methyl, P) at 0.75 oz 50WG/A, or Amistar (azoxystrobin, Group 11) at 2 to 5 oz 80WDG/A or Quadris (azoxystrobin, 11) at 6.2 to 15.4 fl oz 2.08F/A, or Cabrio (pyraclostrobin, 11) at 12-16 oz 20EG/A. (For downy mildew control use a minimum of 4 oz of Amistar 80WDG/A and do not make more than one consecutive application of FRAC group 11 fungicides, Amistar or Cabrio). Rotate to one of the following fungicides: Aliette (fosetyl Al, 33) at 3 lb 80WDG/A, or Kocide (fixed copper, M1) at 2 lb 61DF/A (Copper containing fungicides may cause some phytotoxicity), or Ridomil Gold Copper (mefenoxam + copper, 4 + M1) at 2.5 lb 70WP/A (on 14-day schedule). For more information please see the *2006 New Jersey Commercial Vegetable Production Recommendations Guide*.

✓ **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-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 weed hosts, volunteer plants and contaminated wood (benches or stakes) make sure production or holding areas are disinfested, weed free and clean prior to introducing transplants, and inspect all seedlings prior to holding and transplanting. Infections can occur on all parts of the

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# Weekly Weather Summary

Keith Arnesen, Ph.D., Agricultural Meteorologist

Temperatures averaged much above normal, averaging 55 degrees north, 56 degrees central and 58 degrees south. Extremes were 84 degrees at New Brunswick, Hammonton and Canoe Brook on the 21st, and 31 degrees at Freehold on the 18th. Weekly rainfall averaged 2.27 inches north, 2.35 inches central, and 1.92 inches south. The heaviest 24 hour total reported was 2.61 inches at Flemington on the 22nd to 23rd. Estimated soil moisture, in percent of field capacity, this past week averaged 93 percent north, 84 percent central and 78 percent south. Four inch soil temperatures averaged 56 degrees north, 57 degrees central and 58 degrees south.

Weather Summary for the Week Ending 8 am Monday 4/24/ 6										
WEATHER STATIONS	RAINFALL			TEMPERATURE				GDD BASE50		MON %FC
	WEEK	TOTAL	DEP	MX	MN	AVG	DEP	TOT	DEP	
CANOE BROOK	2.14	4.36	-3.40	84	41	57.	5	156	149	100
CHARLOTTEBURG	2.08	4.74	-2.83	81	38	53.	3	99	99	100
FLEMINGTON	3.24	5.78	-1.63	83	40	56.	4	144	135	100
NEWTON	1.62	4.07	-2.65	81	35	53.	2	107	107	100
FREEHOLD	2.07	4.67	-2.72	82	31	55.	1	171	149	100
LONG BRANCH	2.95	5.46	-2.19	75	44	55.	2	120	105	100
NEW BRUNSWICK	1.90	4.23	-2.83	84	43	57.	2	180	146	100
TOMS RIVER	2.66	4.21	-3.23	78	38	56.	3	151	135	100
TRENTON	2.16	4.63	-2.08	82	42	57.	2	176	131	100
CAPE MAY COURT HOUSE	1.35	2.76	-3.75	80	40	57.	2	173	137	99
DOWNSTOWN	1.54	3.32	-3.39	83	39	58.	2	187	138	100
GLASSBORO	2.41	4.31	-2.75	82	44	59.	4	210	165	100
HAMMONTON	1.51	3.49	-3.36	84	39	58.	3	194	152	100
POMONA	2.28	3.33	-3.27	81	40	57.	3	169	143	100
SEABROOK	2.43	4.26	-1.70	83	44	58.	2	252	201	100
SOUTH HARRISON	2.16	3.74	-2.89	82	45	59.	NA	237	NA	NA
WES KLINE — GDD BASE 40 PINEY HOLLOW LAST WEEK 124 (Ending 4/17/06) THIS WEEK 125 (Ending 4/24/06)										

## Tomato and Potato Disease Forecasting Reports for 2006

Andy Wyenandt, Ph.D., Specialist in Vegetable Pathology

Tomato and Potato Disease Forecasting Reports will start approximately the 1<sup>st</sup> week of May (next week!). Like in years' past, the Tomato Report will track DSV accumulation for the timely control of **Early blight**, **Septoria leaf spot** and **Anthraxnose fruit rot**. The Potato report will track DSV accumulation and conditions favorable for Late blight and Early blight development. **If you received 2005 reports, you are already on our list to receive reports in 2006!** Anyone interested in receiving these weekly reports either by FAX or email should contact Andy Wyenandt at (856) 455-3100 ext. 4144 or by email at wyenandt@aesop.rutgers.edu. ☐

### TOMATO DISEASES FROM PAGE 1

usage and should not be mixed together in a single application or used in back-to-back applications singularly or together. The alternation of fungicide chemistry helps to reduce the potential for the build-up of fungicide resistance. Remember that any fungicide maintenance program should begin with regular scouting. Scouting on a regular basis will help you stay on top of potential problems and may reduce fungicide use. For more information on controlling important diseases of tomato please see the *2006 New Jersey Commercial Vegetable Production Recommendations Guide*. ☐

### DISEASE UPDATE FROM PAGE 4

tomato plant and can easily be spread during transplant trimming with contaminated equipment and by workers' hands. Tomato plants with suspected symptoms can be treated with streptomycin (Agri-Mycin 17, Agri-Strep, 25) at 1 lb a.i./100 gallons, or 1.25 teaspoon per gallon prior to transplanting every 4 to 5 days. After transplanting apply Actigard (P) 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. ☐

# Spring Insect Pest Management

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

## Seed corn maggots

**Seed corn maggot** adults are active, and current weather conditions (cool temperatures, plenty of moisture) will be beneficial to oviposition and survival of maggots. Wet fields with previous maggot history, or fields near wooded areas, are most susceptible to maggot damage.

For cucurbits, use Lorsban or diazinon seed treatments, or diazinon preplant/at-plant treatments, for effective protection from seed corn maggot (consult label for all rates/restrictions, etc).

In sweet corn, many more options are available, including the seed treatments Gaucho, Lattitude, and Concur (all imidacloprid), Cruiser (thiamethoxam), Kernal Guard and Kickstart (permethrin), and Poncho (clothianidin) as well as Lorsban SL and diazinon planter-box. If seed treatments are not used, consider soil treatments of Counter, diazinon, Force, Fortress, Furadan, Lorsban, Ambush, Pounce, or Baythroid XL. Be sure to follow all label instructions because misplacement of insecticide may allow maggots to survive.

## Cucumber beetles on cucurbits

Seedlings and young cucurbit plants are most susceptible to both direct **cucumber beetle** feeding damage as well as **bacterial wilt** (transmitted by beetles). At plant, post-plant and trickle irrigation treatments are effective for cucumber beetle control. Use either Admire PRO or imidacloprid, Platinum (thiamethoxam), Furadan 4F (NJ Special Local Needs Label, 24-C) or Venom (dinotefuron). Protection of plants is necessary until vines begin to run, approximately 3-4 weeks after emergence.

Growers that wait to determine beetle pressure can opt to use foliar sprays of Ambush, Asana, Capture, methoxychlor, Pounce, Sevin, or Thiodan for control of cucumber beetles. Thorough spray coverage of upper and lower leaf surfaces is recommended. Remember that you can *not* use Actara, Assail or Provado for foliar applications.

Also, avoid overuse of Sevin (carbaryl) or the pyrethroids (Ambush, Asana, Pounce, Capture) to reduce the potential of **aphid** and **spider mite** outbreaks during the summer.

## Corn Flea Beetles


It is highly likely that the **corn flea beetle** populations will be high this spring because of the 2005-2006 mild winter conditions throughout the east coast. These pests transmit **Stewart's Bacterial Wilt** disease to corn plants, and can seriously damage susceptible varieties. Consider varieties resistant to Stewart's Wilt, or use a seed treatment that will control flea beetles (thus reducing the incidence of the disease). Several seed treatment options are available, including Cruiser, Gaucho, and Poncho (these are available only as commercially treated seed, and many have restrictions). Follow all label directions and restrictions when using these materials.

Seed treatments are most beneficial when susceptible sweet corn varieties are planted. A lower seed treatment rate (4 oz./100 lbs seed) will work fine if beetle pressure is low, but a higher rate may be necessary when beetle pressure is high. It is predicted that beetle pressure will be higher than usual because of the mild winter.

If a seed treatment is not used, an alternative is to use either a soil application (Counter or Furadan) or foliar applications as beetles appear (treat susceptible varieties at spike stage of corn growth if 5% of the plants are infested with flea beetles) using either Asana, Baythroid, Mustang MAX, Lannate, Lorsban, permethrin, Sevin, or Warrior (several foliar applications may be necessary if beetle population remains higher than threshold). □

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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 RCRE in your County.

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