

# PLANT & PEST ADVISORY

VEGETABLE CROPS EDITION \$1.50

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## Vegetable Growers Guide to Understanding the Strobilurin Fungicides

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

The strobilurin, or QoI, fungicides (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-group 11, with a very specific MOA are very likely to lose efficacy* (i.e. become less effective). Why is that? Fungal populations have the ability to develop resistance to certain fungicide chemistry over time. For the purpose of an 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, 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 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

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**FUNGICIDE RESISTANCE FROM PAGE 1**

isn't so important, its understanding what is at stake! So, if we hear someone speak about G143A resistance development to the QoI fungicides, 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 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! Proper fungicides rotations are necessary when fungicides with specific MOA's are used in spray programs for controlling important diseases and reducing the chances for fungicide resistance. . 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. *Never* tank mix strobilurins together and *never* apply any strobilurin fungicide (either the same chemistry or different chemistry) in consecutive applications unless allowed by the label! 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 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** – Cutting has started in some areas 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 *2005 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, M4) at 1.5 pt 6F/A or OLF, or maneb (M2) at 1.5 to 2 lb 80WP/A or OLF, or Ridomil Gold Bravo (mefenoxam + chlorothalonil, 4 + M4) at 1.5 lb 76.5WP/A (14-day schedule), or Switch (cyprodinil, 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 *2005 New Jersey Commercial Vegetable Production Recommendations Guide*.

✓ **Lettuce – Bottom Rot/Drop** – Spring lettuce season has started and 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 Ronilan 50DF (vinclozolin, 2) at 1 to 2 lbs/A or OLF, or Rovral 50WP 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 *2005 New Jersey Commercial Vegetable Production Recommendations Guide*.

✓ **Parsley – Septoria Blight /Bacterial (blight) leaf spot** – Leaf spots caused by Septoria blight are easily distinguished by small, angular to round leaf spots with grayish-brown centers with a definitive dark,

**SEE DISEASES ON PAGE 3**

brown margin. Numerous black fruiting bodies develop and are visible in the center of lesions (see photo in VDOW). Spread of Septoria blight is by wind-driven rain, heavy dews and overhead irrigation. Workers and equipment may also spread the disease during wet conditions. Best management practices include i) proper crop rotations of at least 2 years and by using clean or treated seed ii) *scout fields early* for symptom development iii) keeping workers and equipment out of fields with wet foliage iv) plowing under residue of harvested crop and avoid planting in fields adjacent or near previously infected fields. Applications of azoxystrobin (Amistar or Quadris) and fixed copper can be alternated every 7 days for control. Bacterial leaf spot (*Pseudomonas syringae*) of parsley showed up at the same time as Septoria blight. Leaf spots caused by Bacterial blight appear as small brown to black spots on the leaves. It does not have the grayish brown centers or brown margins like Septoria. The pathogen can be soil or seed borne and develops during cool, moist weather. The disease spreads during cool rainy periods or under sprinkler irrigation; and a high plant density. The same control measures listed for Septoria will assist in preventing spread of Bacterial leaf spot as long as the fixed copper is included with the azoxystrobin. If Oxidate is used, follow the label carefully.

✓ **Spinach (Downy mildew and White rust)** - 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 OLF. For downy mildew control use a minimum of 4 oz of Amistar 80WDG/A and do not make more than one consecutive application. 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 *2005 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 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/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 75WP 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 52.5 DF/A on a 7 day schedule. □

## Disease Briefs

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

### **Soybean rust found in southern Georgia on volunteer plants and moving south in Florida**

Soybean rust was found in southwest Georgia (Seminole Co.) close to the Florida and Alabama state lines on volunteer soybean plants last week. *This is the first report of SBR on Soybean this year in the US.* All previous reports of SBR have been on Kudzu in Florida. SBR was also reported in Dade County, FL last week on Kudzu. This is the first report of SBR moving in a southern direction since it was first reported this year.

### **Controlling Anthracnose fruit rot in strawberry**

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. (see photo in Vegetable Diseases of the Week). 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 +7) 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 o 20EG/A

#3) Captevate 68 WDG at 3.5 to 5.25 lb/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 68 WDG at 3.5 to 5.25 lb/A

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**BRIEFS FROM PAGE 3**

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.

**Recognizing Timber rot in greenhouse and field-grown tomatoes**

Timber rot is a soil-borne fungal disease that can cause a stem rot in greenhouse and field-grown tomatoes. Prolonged cool, wet weather conditions and soils favor the development of Timber rot (or White mold) which has a wide host range that includes peas, beans, cabbage, lettuce, and pumpkin and squash. Symptoms of Timber rot on tomato include brownish-tan lesions that develop at the base of the main stem or near branching points. Lesions become dry and brittle with time and infected plants will begin to wilt as lesions begin to girdle the plant. White, fluffy fungal growth will accompany infected areas and black fruiting bodies, called sclerotia, will develop on the surface of the lesion or in the stem or branch of the plant. Sclerotia are a key diagnostic feature of Timber rot. When scouting for Timber rot growers should look for wilted plants with brownish, to perfectly tan lesions at the base and at branch points of tomato plants. If these lesions are dry and brittle, look for white fluffy growth on the surface or in the stem (see photo in Vegetable Diseases of the Week). **Breaking these lesions apart** will often reveal black sclerotia. Sclerotia can survive in soil for many years and a long, proper crop rotation is the best method of control. Infected tomato plants should be removed from the greenhouse, and if possible, from the field to prevent further inoculum development. For more information on the control of Timber rot of tomato and white mold on other specific crops please see the *2005 New Jersey Commercial Vegetable Production Recommendations Guide*. □

**Vegetable Diseases of the Week**  
*Andy Wyenandt, Ph.D., Specialist in Vegetable Pathology*



*Anthracnose fruit rot of Strawberry.*



*Septoria leaf spot of Parsley.*



*Timber rot of greenhouse tomato.*

## Pest Notes

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

### New Labels for 2005

Platinum – has added early season **cucumber beetles** to the cucurbit vegetable label (Federal Section 2ee recommendation). This label previously had **aphids** and **whiteflies**, but no cucumber beetles (even though it worked against the beetles).

Avant – has added **cabbage webworm** and **cross-striped cabbageworm** to the cole crops label.

Discipline – has the same active ingredient as Capture, and is labeled on the same crops against the same pests as Capture. Both Discipline and Capture are listed under the common name 'bifenthrin' in the *NJ Commercial Vegetable Production Recommendations for 2005*.

Rimon – also called novoluron, is now labeled on potatoes at 2-12 oz/A for **Colorado potato beetles**. This product is a chitin inhibitor (or insect growth regulator) and works very well against potato beetles. Refer to label for all restrictions and precautionary statements.

Proaxis – very similar to Warrior in chemistry and activity (Proaxis is an isomer of Warrior) and has essentially the same labels as Warrior, for both pests and crops.

Assail – a label was just approved by the federal EPA for use on potatoes against **Colorado potato beetle**. Use no less than the 1.0 oz rate listed on the label. Assail, or acetamiprid, is a neonicotinoid compound and is effective against Colorado potato beetle, **aphids**, **flea beetles**, and has activity against **European corn borer**.

Diazinon – all uses for **home outdoor**, **home garden**, **lawn**, and **non-ag** are cancelled, but the commercial ag uses are still labeled. The AG500 and the 50WP formulations are available.

ApiLife VAR tablets for the control of varroa mites in beehives has received an Emergency Exemption, Section 18, for use in New Jersey. Two treatments (of 3 tablets each) can be made per year during the 2005 season.

Coumaphos – CheckMite Strips can be applied to beehives at a time when bees are not producing a surplus honey crop for the control of small **hive beetles** and **varroa mites** in beehives. It is recommended for use in honey bee colonies that are used as cell builders for producing queens. This label is an Emergency Exemption, Section 18 label, for use in New Jersey during the 2005 season.

Admire 2F – has received a Special Local Needs label (or 24-C label) for the state of New Jersey for the control of the **white grub** complex (damage from grubs of **Asiatic garden beetle**, **European and Masked Chafer**, **Japanese beetle**, and **oriental beetle**) on Christmas Trees. Use 16 – 32 oz/acre (maximum 32 oz per season). A copy of this label **must** be in possession of user at time of application. □

## Don't Let Obstructions Get in the Way of Greenhouse Sprays

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

Over the past few weeks several bacterial pathogens have been identified on greenhouse tomato transplants. In at least one case, symptoms seemed to be isolated to areas where preventative spray coverage was probably not adequate. Bench tops, bench legs, fertigation/water/irrigation systems, etc. can all pose as obstructions during spray applications. These items may also help to create conditions which keep leaves wetter and humidity higher in certain areas of the greenhouse. This creates microclimates which may become conducive to disease development.

Your first goal should be to identify potential areas in the greenhouse where problems may occur. Then develop a plan of action for yourself and/or for the employees making sure they understand where problems may occur and how to deal with each situation. These are the areas where extra effort should be taken to spray. Also, these are good areas to scout for disease and insect problems. Scout the rest of the greenhouse, but pay particular attention to the obstructed areas. □

## EPA Requests Comment on NRDC Tolerance Petition to Revoke All Carbaryl Uses

The carbamate insecticide carbaryl is currently under review for reregistration. EPA released a Revised Interim Reregistration Eligibility Decision Document (IRED) for carbaryl on October 27, 2004. Subsequently, the Natural Resources Defense Council (NRDC) has formally petitioned the EPA to *revoke or modify all existing tolerances for the pesticide carbaryl*. Their petition requests cancellation of all carbaryl uses considered for reregistration in the Revised IRED by EPA. You are urged to submit comments in support of NRDC's position, or to submit detailed explanations why loss of a particular carbaryl use would negatively affect your commodity/industry. Comment on this petition is open until May 31, 2005.

You can access the petition on EPA's website - Edocket <http://docket.epa.gov/edkfed/index.jsp>. Hit 'quick search' and enter Docket number 'OPP-2005-0077'. You may also submit comment to Dhol Herzi, USDA Office of Pest Management Policy at [dherzi@usda.gov](mailto:dherzi@usda.gov).

Submitted by George Hamilton, Ph.D., Specialist in Pest Management. □

# Weekly Weather Summary

Keith Arnesen, Ph.D., Agricultural Meteorologist

Temperatures averaged below normal, averaging 52 degrees north, 53 degrees central and 55 degrees south. Extremes were 74 degrees at Flemington and New Brunswick on the 27th, and 32 degrees at Long Branch and Charlotteburg on the 2nd. Weekly rainfall averaged 0.86 inches north, 1.66 inches central, and 1.24 inches south. The heaviest 24 hour total reported was 2.10 inches at Freehold on the 30th to 1st. Estimated soil moisture, in percent of field capacity, this past week averaged 87 percent north, 86 percent central and 65 percent south. Four inch soil temperatures averaged 52 degrees north, 53 degrees central and 54 degrees south.

The following table contains meteorological information since the start of the growing season March first. The table is updated each Monday and the following is an explanation for each column.

Week=total rainfall for the previous 7 days ending Monday morning

Total=total rainfall since March 1<sup>st</sup>

Dep=departure from normal of rainfall since March 1st. A negative sign indicates below normal and no sign indicates above normal.

Mx=highest temperature for that 7 day period

mn=lowest temperature for that 7 day period

Avg=average temperature for that 7 day period

Dep=departure from normal of the average temperature for that 7 day period

Total=total number of growing degree units since March 1st Dep=departure from normal of growing degree units

%fc=percent of field capacity (soil moisture)

## Weather Summary for the Week Ending 8 am Monday 5/ 2/ 5

WEATHER STATIONS	RAINFALL			TEMPERATURE				GDD BASE50		MON %FC
	WEEK	TOTAL	DEP	MX	MN	AVG	DEP	TOT	DEP	
BELVIDERE BRIDGE	.60	9.00	.97	72	36	52.	-3	131	86	98
CANOE BROOK	.76	9.05	.22	72	35	54.	-1	165	130	84
CHARLOTTEBURG	.98	11.17	2.48	71	32	50.	-2	100	91	93
FLEMINGTON	1.12	10.87	2.41	74	34	53.	-2	126	86	93
NEWTON	.84	9.44	1.69	70	37	52.	-1	116	98	85
FREEHOLD	2.42	11.10	2.73	73	36	55.	-1	158	95	100
LONG BRANCH*	1.60	8.59	-.07	59	32	46.	-9	34	-15	100
NEW BRUNSWICK	1.22	9.13	1.07	74	36	55.	-2	146	64	95
TOMS RIVER	2.18	9.50	1.04	70	39	54.	-2	116	61	100
TRENTON	.86	8.24	.65	73	38	54.	-4	148	49	90
CAPE MAY COURT HOUSE	1.03	6.91	-.46	67	41	53.	-4	89	6	72
DOWNSTOWN	1.40	8.69	1.09	70	39	54.	-4	134	29	98
GLASSBORO	1.36	9.89	1.88	72	40	56.	-2	170	71	97
HAMMONTON	1.30	8.53	.74	71	39	55.	-3	150	56	87
POMONA	1.07	8.12	.69	69	40	54.	-2	109	42	91
SEABROOK	1.28	9.24	2.45	71	41	57.	-1	207	99	96
SOUTH HARRISON	1.50	9.62	1.99	70	41	56	NA	183	NA	NA

\*Temperatures at Long Branch look considerably too low and they may have thermometer problems.

WES KLINE — GDD BASE 40 PINEY HOLLOW

Last Week\* 117 (Ending 4/25/05)

This Week 101 (Ending 5/2/05)

\*February total base 40 equals 32 units

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