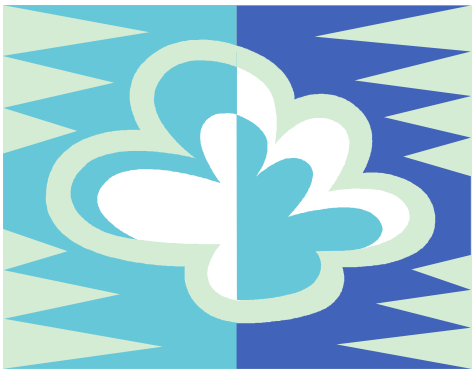
RUTGERS COOPERATIVE EXTENSION AT THE NEW JERSEY AGRICULTURAL EXPERIMENT STATION

PLANT & PEST ADVISORY

VEGETABLE CROPS EDITION $1.50 APRIL 18, 2007



INSIDE

Diseases Briefs

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

Growers guide to understanding the DMI or SBI (sterol biosynthesis inhibitor) fungicides (FRAC code 3).

The **DMI** (**De**M**e**thylation **I**nhibitors) or **S**terol **B**iosynthesis **I**nhibiting (**SBI**'s) **fungicides belong to FRAC code 3** which include the triazoles and imidazoles. Some of these fungicides are commonly known as Tilt (propiconazole), Nova (myclobutanil) and Procure (triflumizole). **SBI's work by inhibiting the biosynthesis of ergosterol** which is a major component of the plasma membrane of certain fungi and needed for fungal growth .

Resistance by fungi to the SBI fungicides has been characterized and is generally known to be controlled by the accumulation of several independent mutations, or what is known as 'continuous selection' or 'shifting', in the fungus. Such that, in any given field population the sensitivity to the SBI fungicide by the fungus may range from extremely high (highly sensitive, i.e. will be controlled by fungicide) to moderate (partially sensitive) or low (mostly resistant to fungicide). This type of resistance is also known as quantitative resistance. With quantitative resistance there are different levels of resistance to the fungicide due to independent mutations, which is unlike the target mutations that occur in qualitative resistance associated with the QoI fungicides (FRAC code 11). Because different levels of resistance to the SBI fungicide may exist in the field, the fungal population may behave differently to different rates of the SBI fungicide being applied. Such that, it is suggested that using a higher rate of a SBI fungicide, may improve control when lower rates have failed. For example, let's say that a Powdery mildew population on pumpkin has 25% high, 50% moderate, and 25% low sensitivity to a SBI fungicide. If fungicide is applied at the low rate, only 25% of the population (highly sensitive) may be controlled. Whereas, if the high rate was used, 75% of population may have been controlled. The main point here is that if low rates of SBI fungicides have been used and control seems to be weakening, bumping to a higher rate may improve control.

Unfortunately, it is difficult to determine what proportion of the powdery mildew population is sensitive or not sensitive by looking at the field until you have begun spraying. The best advise, if you are using low rates and think those rates are not working like you

SEE DISEASE BRIEFS ON PAGE 2

Disease Briefs from page 1

feel the rate should be bumped up to the high rate the next time the fungicide is sprayed, and if the high rate doesn't work it may be safe to assume the fungal population has grown mostly resistant. Importantly, if the high rate fails, whether you bumped up to a high rate or started with one, and control does not seem adequate *do not continue* to use the fungicide. *Recognizing if and when fungicide chemistries are failing and when fungicide resistance is developing is critical* to producing successful crops and why *scouting* on a regular basis, at least before and after each fungicide application, is important. Regular scouting can help reduce unwarranted and ineffective fungicide applications and help reduce wasted costs. Remember to always tank mix SBI fungicides with protectant (M) fungicides (i.e. chlorothalonil) to help reduce the chances for fungicide resistance developing. Always apply SBI fungicides according to label rates and resistant management recommendations and always be aware of the fungicide rates you are applying.

Understanding and controlling damping-off.

Damping-off is caused by a number of important vegetable pathogens and is very common this time of year. Damping-off can kill seedlings before they break the soil line (pre-emergent damping-off) or kill seedlings soon after they emerge (post-emergent damping-off). Common pathogens that cause damping-off include *Pythium*, *Phytophthora*, *Rhizoctonia* and *Fusarium* spp. Although all four pathogens are associated with damping-off, the conditions which favor their development are very different.

In general, Phytophthora and Pythium are more likely to cause damping-off in cool, wet soils. While, Rhizoctonia and Fusarium are more likely to cause damping-off under warmer, drier conditions. In general, Pythium tends to kill seedlings before they emerge where Rhizoctonia and Fusarium tend to kill seedlings after they emerge. There are exceptions to the rules in some cases, but none the less, all damping-off pathogens can cause serious losses if not controlled properly.

Control of damping-off depends on a number of factors. First, is recognizing the conditions which may be leading to the problem (i.e. weather, greenhouse growing conditions) and secondly, properly identifying the pathogen causing the problem. Why is this so important? The fungicides applied to prevent or control damping-off are specific in the pathogens they control. Fungicides used to control Pythium or Phytophthora won't control the other damping-off pathogens. Why is this? The biology of the fungus and the mode of action of the fungicide dictates fungicide efficacy. For example, Ridomil Gold and Ultra Flourish (mefenoxam, FRAC code 4) and Previcur Flex (propamocarb, 28) helps control the 'water molds' (Pythium's and Phytophthora) where Terraclor (PCNB, 14), Rovral (iprodione, 2) and Amistar (azoxystrobin, 11) helps control damping-off caused by Rhizoctonia. Therefore, it is extremely important to know which pathogen is causing the damping-off problem and which fungicide to properly apply. Always refer to the fungicide label for crop use, pathogens controlled and application rates.

Copper Applications and Oxidate

Andy Wyenandt, Ph.D., Specialist in Vegetable Pathology and Michelle Infante-Casella, Agricultural Agent, Rutgers Cooperative Extension of Gloucester County

Heavy rain, winds and hail can all cause injury to vegetable plantings. Some injury is quite noticeable, such as hail damage; however, other injury may go unnoticed. Cultural practices such as tying, staking, cultivation and pruning can also create entry ways for bacterial infections. Many growers may plan on applying copper fungicides in tank mixes. *Although temperatures have been cool over the past few weeks. Be careful, when temperatures are high*. High temperatures increase the possibility of *phytotoxicity* when using Copper-based fungicides. In order to avoid this problem, growers should watch the daytime temperatures closely and avoid spraying if temperatures remain high.

Management strategies to help avoid bacterial problems include not working in fields when the foliage is wet. Additionally, if overhead irrigation is used try to irrigate in the morning so foliage will dry quickly. Bacterial diseases thrive and spread when foliage remains wet for long periods of time.

Additionally, the product Oxidate is a management option for control of bacterial diseases, especially in tomatoes. However, remember that *Oxidate has no residual activity* and should be used accordingly. Take caution when using this product on any crop and make sure to read the label. According to the product MSDS Oxidate contains hydrogen dioxide (synonym for hydrogen peroxide) and peroxyacetic acid. The MSDS also states that the pH is 1.33 and that combinations of Oxidate with bases and metals (to name a couple) should be avoided due to reactivity issues and product instability. Mixtures of Oxidate and copper hydroxide may possibly produce soluble copper which is known to be phytotoxic. ❑

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 –** 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 1st harvest. For new plantings, apply the same after planting or after crown covering. For more information please see *2007 New Jersey Commercial Vegetable Production Recommendations Guide*.

✔ **Cabbage – Damping-off –** To help control losses due to damping-off pathogens apply Ridomil Gold (mefenoxam, 4) at 1 to 2 pt/A 4E or Amistar (azoxystrobin, 11) at 0.125 to 0.25 oz 80WDG or OLF/1000 row ft. (for Rhizoctonia only) or Quadris (azoxystrobin, 11) at 0.4 to 0.8 fl oz 2.08F/1000 row ft (for Rhizoctonia only) in a band up to 7 in. after seeding. For more information please see *2007 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 3.5 to 5.0 oz 80 WDG/A or Quadris (azoxystrobin, 11) at 6.2 to 15.4 fl oz 2.08F/A, or chlorothalonil (M5) at 1.5 pt 6F/A or OLF, or Cabrio (pyraclostrobin, 11) at 12 to 16 oz 20EG/A, or Endura (boscalid, 7) at 6 to 9 oz 70WG/A, or maneb (M3) 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 (fosletyl Al, 33) at 3 to 5 lb 80WDG/A (on 14-day schedule). For more information please see *2007 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, brown margin. Numerous black fruiting bodies develop in the center of lesions. Septoria blight is spread 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) *scouting 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** (*Psuedomonas syringae*) of parsley can also show up at the same time as **Septoria blight**. Leaf spots caused by Bacterial blight appear as small brown to black spots on the leaves. The pathogen can be soil or seed borne and develops during cool, moist weather. The disease spreads during cool, rainy weather or with overhead irrigation; and is exacerbated by high plant density. The same control measures listed for **Septoria** will assist in preventing the spread of **Bacterial leaf spot** as long as the fixed copper is included with azoxystrobin and the fungicides are applied preventatively. If Oxidate is used, follow the label carefully.

✔ **Spring Peas – Damping-off -** Use seed already treated with an approved seed treatment, or treat seed with a slurry or dust that contains an approved commercial fungicide-insecticide mixture. For Pythium control and/or for damping-off and root rot caused by Pythium, apply Ridomil Gold (mefenoxam, 4) at 0.5 to 1.0 pt 4E/A or Amistar (azoxystrobin, 11) at 0.125 to 0.25 oz 80 WDG/1000 row ft or Quadris (azoxystrobin, 11) at 0.40 to 0.80 fl oz 2.08F/1000 row ft as a broadcast treatment at seeding. For more information on seed treatment options and control please see the *2007 New Jersey Commercial Vegetable Production Recommendations Guide*.

✔ **Spinach Greens (Damping-off) –** See table on page E30 for seed treatment options. Apply Ridomil Gold 4E/A (mefenoxam, 4) at 1 to 2 pt/A or Ultra Flourish 2E (mefenoxam, 4) at 2 to 4 pt/A pre-plant incorporated or as a soil surface spray after planting. For more information please see the *2007 New Jersey Commercial Vegetable Production Recommendations Guide*.

see ***Disease Update*** *on page* ***4***

Cultivation Tools In Matted Row Strawberries

Mary Jo Kelly, Marvin P. Pritts and Robin R. Bellinder, Department of Horticulture, Cornell University

Reprinted from Vermont Vegetable and Berry News, February 7, 2007, www.uvm.edu/vtvegandberry

Three cultivation tools were compared with a traditional between-row cultivator, an herbicide control, and the conventional herbicide-plus-cultivator weed management program used in a first-year strawberry planting. The new implements were 1) a Rabe Werk flex-tine harrow, 2) a Buddingh finger weeder, and 3) a Bärtschi brush hoe, and the traditional implement was a double-headed multivator.

The flex-tine harrow performed poorly. Its use appeared to stimulate germination of weed seeds as end-of-season weed biomass was high and yield the following year was low. It was also the most labor-intensive treatment to maintain. The finger weeder reduced in-row weed growth dramatically, and productivity of this treatment was high, but its use required additional between-row cultivation with another implement. The brush hoe, while classified as a between-row weeder, reduced in-row weed growth as well, and yields for brushed plots were also high. Cultivation with a multivator resulted in good weed control between rows and high yields, but hand weeding requirements within the row were high.

Weed growth and yields were unacceptable when the herbicide was used alone, but an early-season pre-emergent herbicide application, followed by a single late-season hand weeding and cultivation, resulted in a dramatic reduction in weeds at the end of the year and a notable increase in yield the following year. The conventional herbicide-plus-cultivation weed management program, used in the establishment year by growers who plant in the perennial matted row system, continues to be a good choice if labor is both plentiful and affordable; however, the finger weeder and brush hoe are viable alternatives for situations in which labor is scarce. Organic growers, and growers who plant in non-traditional annual systems, may benefit from their use as well. To read the full research article, see HortTechnology January-March 2007. ❑

Disease Update from page 3

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

#1) captan (M3) at 4 lb 50WP/A plus Pristine (pyraclostrobin + boscalid, 11 +) at 18.5 to 23.0 oz 38WG/A

#2) captan 5(M3) at 4 lb 50WP/A plus Abound (azoxystrobin, 11) at 6.2 to 15.4 oz 2.08F/A, or Cabrio (pyraclostrobin, 11) at 12 to 14 oz 20EG/A

#3) Captevate (captan + fenhexamid, M3 + 17) at 3.5 to 5.25 lb 68WDG/A

For subsequent applications, alternate:

captan (M3) at 4 lb 50WP/A plus Abound (azoxystrobin, 11) at 6.2 to 15.4 oz 2.08F/A, or

Cabrio (pyraclostrobin, 11) at 12 to 14 oz 20EG/A with captan (M3) at 4 lb 50WP/A, or

Captevate (captan + fenhexamid, M3 + 17) at 3.5 to 5.25 lb 68WDG/A

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

✔ **Strawberry – Botrytis (Gray Mold) and Blossom blight –** can cause serious losses in strawberry plantings if not controlled properly. Development is favored by moderate temperatures (59 to 77 F) with prolonged periods of high relative humidity and surface wetness. Control of Gray mold begins with preventative fungicide applications. Apply at 5 to 10 percent bloom and every 10 days until harvest. During periods of excessive moisture, spray intervals of 5 to 7 days may be necessary. Rotate fungicide chemistries to aid fungicide resistance management.

Application #1: captan (M3) at 4 lb 50WP/A plus Topsin M (thiophanate-methyl, 1) at 1 lb 70WP/A or Switch (cyprodinil, 9) at 11-14 oz. 62.5WG/A

Application #2; Elevate (fenhexamid, 17 - See restrictions) at 1.1 to 1.5 lb 50WDG/A, or Pristine (pyraclostrobin + boscalid, 11 + 7) at 18.5 to 23 oz 38 WG/A

Application #3: captan (M3) at 4 lb 50WP/A plus Topsin M (thiophanate-methyl, 1) at 1 lb 70WP or Switch (cyprodinil, 9) at 11 to 14 oz. 62.5WG/A

For subsequent applications, alternate:

Captan (M3) at 4 lb 50WP/A, or Captevate (captan + fenhexamid, M3 + 17) at 3.5 to 5.25 lb 68WDG/A, or Switch (cyprodinil, 9) at 11 to 14 oz. 62.5WG/A or Pristine (pyraclostrobin + boscalid, 11 +7) at 18.5 to 23 oz 38 WG/A, or Thiram (M3) at 4 to 5 lb 65WSB/A. ❑

Weekly Weather Summary

Keith Arnesen, Ph.D., Agricultural Meteorologist

Temperatures averaged much below normal, averaging 40 degrees north, 44 degrees central and 44 degrees south. Extremes were 66 degrees at Long Branch on the 11th, and 23 degrees at Charlotteburg and Flemington on the 11th. Weekly rainfall averaged 6.45 inches north, 5.95 inches central, and 4.13 inches south. The heaviest 24 hour total reported was 6.43 inches at New Brunswick on the 15th to 16th. Estimated soil moisture, in percent of field capacity, this past week averaged 100 percent north, 99 percent central and 98 percent south. Four inch soil temperatures averaged 39 degrees north, 43 degrees central and 43 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 1ST 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 4/16/ 7

	RAINFALL			TEMPERATURE				GDD BASE50		MON
WEATHER STATIONS	WEEK	TOTAL	DEP	MX	MN	AVG	DEP	TOT	DEP	%FC
CANOE BROOK	missing									
CHARLOTTEBURG	6.29	11.95	5.54	52	23	40.	-7	25	25	100
FLEMINGTON	7.75	14.33	8.00	58	23	41.	-9	31	31	100
NEWTON	5.31	8.70	3.05	53	25	39.	-9	20	20	100
FREEHOLD	5.61	11.14	4.73	61	34	46.	-5	62	60	100
LONG BRANCH	5.40	11.04	4.39	66	27	45.	-5	29	29	100
NEW BRUNSWICK	8.82	14.65	8.60	57	26	43.	-9	45	41	100
TOMS RIVER	3.98	9.59	3.20	57	25	42.	-8	62	62	100
TRENTON	5.93	11.37	5.56	56	27	43.	-10	57	45	100
CAPE MAY COURT HOUSE	2.16	6.01	.36	58	28	45.	-7	51	43	100
DOWNSTOWN	4.69	10.40	4.59	60	25	44.	-9	81	68	100
GLASSBORO	4.60	8.64	2.54	58	31	44.	-9	87	75	100
HAMMONTON	4.17	9.37	3.48	60	24	44.	-9	83	72	100
POMONA	3.56	8.25	2.51	59	24	44.	-7	72	69	100
SEABROOK	5.61	10.70	5.57	59	28	46.	-7	103	88	100
SOUTH HARRISON	5.43	10.72	5.11	57	29	44	NA	81	NA	NA

WES KLINE -- GDD BASE 40 PINEY HOLLOW
LAST WEEK 43 (Ending 4/9/07)
THIS WEEK 30 (Ending 4/16/07)

RUTGERS

New Jersey Agricultural
Experiment Station

Plant & Pest Advisory
Rutgers School of Environmental
and Biological Sciences
ASB II, 57 US Hwy. 1
New Brunswick, N.J. 08901

FIRST CLASS
POSTAGE PAID
PERMIT #576
MILLTOWN, NJ 08850

PLANT & PEST ADVISORY
VEGETABLE CROPS EDITION CONTRIBUTORS

Rutgers Cooperative Extension (RCE) Specialists
Gerald M. Ghidiu, Ph.D., Vegetable Entomology
George Hamilton, Ph.D., Pest Management
Joseph R. Heckman, Ph.D., Soil Fertility
Bradley A. Majek, Ph.D., Weed Science
Andy Wyenandt, Ph.D., Vegetable Pathology

RCRE County Agricultural Agents
Atlantic, Richard W. VanVranken (609-625-0056)
Burlington, Raymond J. Samulis (609-265-5050)
Cape May, Jenny Carleo (609-465-5115)
Cumberland, Wesley Kline, Ph.D. (856-451-2800)
Gloucester, Michelle Infante-Casella (856-307-6450)
Hunterdon, Winfred P. Cowgill, Jr. (908-788-1338)
Middlesex, William T. Hlubik (732-398-5260)
Monmouth, Bill Sciarappa, Ph.D. (732-431-7260)
Morris, Peter J. Nitzsche (973-285-8300)
Passaic, Elaine F. Barbour, Agric. Assistant (973-305-5740)
Salem (856-769-0090)
Warren, William H. Tietjen (908-475-6505)

Vegetable IPM Program (732-932-9802)
Joseph Ingerson-Mahar, Vegetable IPM Coordinator
Kristian E. Holmstrom, Research Project Coordinator II

Newsletter Production
Jack Rabin, Associate Director for Farm Services, NJAES
Cindy Rovins, Agricultural Communications Editor

For back issues, visit our web site at:
www.rce.rutgers.edu/pubs/plantandpestadvisory