

PLANT & PEST ADVISORY

VEGETABLE CROPS EDITION \$1.50

JUNE 15, 2005



Pesticide damaged tender young spinach plants, see Field article, page 3.

Heat Stress in Agriculture

Source: U.S. Environmental Protection Agency

Background

In some regions, there are times during the growing season when the temperature stays above 90°F, even at night. High air temperatures and humidities put agricultural workers at special risk of heat illness. Worker Compensation claims for heat illness among agricultural workers are among the highest of any occupation.

Pesticide handlers and early entry workers are at even greater risk. The special clothing and equipment they wear for protection from exposure to pesticides can restrict the evaporation of sweat, blocking the body's natural way of cooling itself, which results in a buildup of body temperature. Exposure to certain pesticides can also produce sweating and there can be combined effects with exposure to heat. In addition, pesticides are absorbed through hot, sweaty skin more quickly than through cool skin.

What is heat stress?

Heat stress is the buildup in the body of heat generated by the muscles during work and of heat coming from warm and hot environments. **Heat exhaustion** and **heat stroke** result when the body is subjected to more heat than it can cope with.

When the body becomes overheated, less blood goes to the active muscles, the brain, and other internal organs. Workers get weaker, become tired sooner, and may be less alert, less able to use good judgment, and less able to do their jobs well.

As strain from heat becomes more severe, there can be a rapid rise in body temperature and heart rate. Workers may not realize that this is happening because there is no pain. Mental performance can be affected with an increase in body temperature of 2°F above normal. An increase of 5°F can result in serious illness or death.

The most serious illness is heat stroke. Its effects can include confusion, irrational behavior, convulsions, coma, and even death. Heat stroke can make survivors very sensitive to heat for months and cause varying degrees of brain and kidney damage. More than 20 percent of people afflicted by heat stroke die, even young and healthy adults. An average of nearly 500 people are killed each year in the United States by the effects of heat.

During hot weather, heat illness may be an underlying cause of other types of injuries, such as heart attacks on the job, falls, and equipment accidents arising from poor judgment.

SEE HEAT STRESS ON PAGE 2

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HEAT STRESS FROM PAGE 1

A program to prevent heat illness will:

Protect health. Heat illness is preventable. When less severe forms occur, they can be treated before they become life-threatening.

Improve safety. Workers with even mild effects of heat illness are more likely to have accidents and use poor judgment.

Increase productivity. People work slower and less efficiently when they are under too much strain from heat.

There are numerous precautions that employers can take against heat stress. Some of them are summarized here:

Training. Train workers and supervisors in how to control heat stress and to recognize symptoms of heat illness.

Monitoring and Adjusting Workloads. Take into account the weather, workload, and condition of the workers, and adjust work practices accordingly. Higher temperatures, high humidity, direct sun, heavy workloads, older workers, and workers unaccustomed to heat are more likely to become ill from heat. Here are things to do:

- Monitor temperature and humidity, and workers' responses at least hourly in hot environments
- Schedule heavy work and PPE-related tasks for the cooler hours of the day
- Acclimatize workers gradually to hot temperatures
- Shorten the length of work periods and increase the length of rest periods
- Give workers shade or cooling during breaks
- Halt work altogether under extreme conditions.

Drinking. Make sure employees drink at least the minimum required amounts of water to replace body fluid lost through sweating. Thirst does not give a good indication of how much water a person needs to drink.

More details on all these measures are included in "A Guide to Heat Stress in Agriculture," May 1993. Issued jointly by EPA and the Occupational Safety and Health Administration, the Guide offers practical, step-by-step guidance for nontechnical managers on how to set up and operate a heat stress control program.

The Guide is available from the U.S. Government Printing Office (GPO) available from farm supply companies and from the U.S. Government Printing Office at: <http://www.gpoaccess.gov/> (click on US Government online bookstore) or call (202) 512-1800 or write GPO, Superintendent of Documents, P.O. Box 371954, Pittsburg, PA 15250, and refer to document number 055-000-00474-9. Copies of the Guide from GPO are \$5.00 each. A summary of the Guide is in chart form – English on one side, Spanish on the other, 24" X 20" is also available from GPO (refer to document number 055-000-00544-3). Copies of the summary chart are \$1.50 each. □

DISEASES FROM PAGE 7

Bravo, Echo, Equus, chlorothalonil, M4) at 1 to 3 pt 6F/A or OLF, or

Gavel (zoxamide + mancozeb, M2 + 22) at 1.5 to 2 lb 75DF/A, or

mancozeb (Dithane, Manex II, Manzate, Penncozeb, M2) at 3 lb 80WP/A or OLF.

Once late blight is detected in the area, switch to one of the following translaminar fungicides which can move into and through leaves:

Acrobat (dimethomorph, 15) at 6.4 oz 50WP/A *plus* a protectant fungicide, or

Previcur Flex (propamocarb HCL, 28) at 1.5 pt 6F/A *plus* a protectant fungicide, or

Tanos (fomoxodone + cymoxanil, 11 + 27) at 8 oz 50W/A *plus* a protectant fungicide.

Return to the use of protectant fungicides when conditions no longer favor the development of late blight.

✓ **Tomato - Stem Rot/Pith Necrosis** – Both bacterial diseases have shown up in isolated areas over the past week. Symptoms begin to develop as green fruit begins to mature. Both bacteria are most likely ubiquitous to tomato fields and develop when weather conditions and cultural practices lead to favorable conditions for disease development. Symptoms include the development of irregular brown lesions on main stems and branches. Late pruning (suckering) can provide entry points for both bacterial diseases, especially during wet conditions. Internally, stems will become brown and mushy. High humidity is necessary for disease development in both cases. High nitrogen and low night temperatures are associated with Pith Necrosis development. Control of both begins with cultural practices such as avoiding working in fields with wet foliage, avoiding late pruning and watching the amount of N applied to plantings.

✓ **Tomato – Bacterial spot and speck** – Symptoms of spot and speck include small, water-soaked spots with a 'greasy' appearance on infected leaves. These lesions will expand and will often form yellow 'halos' at the margins. Lesions may spread and form large, irregular necrotic areas on leaves. On mature plants infections are most evident on older leaves. Bacterial spot and speck will both infect green fruit. Bacterial spot development is favored by high moisture, relative humidity and warm temperatures (75 to 90 degrees) and bacterial speck is favored by cooler, moist conditions (65 to 75 degrees). Bacterial spot produces slightly raised water-soaked spots that with age become 'scabby' and are 1/4" in diameter. Bacterial speck produces much smaller lesions (1/16") that are black and slightly sunken. Control of both spot and speck begins with proper crop rotation (2-3 years without tomatoes or peppers) and in the greenhouse with clean seed and/or transplants and proper greenhouse sanitation. Culturally, Avoid overhead irrigation and *do not work in fields when plant surfaces are wet*. Control of spot and speck should begin in the greenhouse and carry into the field soon after transplanting with a weekly spray program, especially if either has been a problem in the past. □

Pest Notes

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

✓ **General:** The 90-plus degree weather during the past week will be beneficial to **spider mite** populations on many field crops and others. These pests thrive in hot, humid weather, and population levels can quickly increase on cucurbits, eggplant, tomato, and other vegetable crops. Monitor for mite populations frequently (2-3 times per week) to locate potential problems. Effective miticides include Acramite, Agri-Mek, Kelthane, and the pyrethroids bifenthrin and Danitol (see pesticide label for specific uses on each crop).

✓ **Cabbage: Imported cabbageworm** population levels are increasing on cabbage and related cole crops. The worms are dull, velvety green and chew holes in the leaves, often invading the developing head area. The adults are the common white butterflies often seen fluttering around cabbage fields. All the recommended materials are highly effective, including the biological pesticides (Bt's). Obtain thorough coverage of the spray material to ensure adequate control of this pest (use high gallonage, high pressure to force the spray material into the developing head area and to cover the leaf undersides). Remember that many of these newer materials, including the Bt's, must be ingested to be effective, so coverage is important.

✓ **Eggplant:** Cumberland County Agent Wesley Kline reports that many growers are having a difficult time controlling **Colorado potato beetles** on eggplant, even though the plants were treated at planting time with imidacloprid. The cool, wet spring may be partly responsible, as the beetles did not emerge until later than usual, and the excessive moisture may have caused a reduction in effectiveness of the imidacloprid. At any rate, if larvae are surviving on the plants, treat with a NON-NEONICOTINOID insecticide (avoid the use of Actara, Provado, Assail) at this time to reduce the potential of insecticide resistance developing in the beetles. Use a different class insecticide, such as one of the Bt's (Raven, Novodor) for small larvae, cryolite, SpinTor, Thionex, or Vydate. Most likely the pyrethroids (Mustang, Warrior, bifenthrin, etc) will NOT be effective against Colorado potato beetle. Treat while larvae are still small, preferably just after egg hatch, as large larvae cause significantly more damage and are also more difficult to control with pesticides. Be aware that larvae grow rapidly in the hot weather conditions we are currently experiencing.

✓ **Peppers: Aphid** populations are high in pepper fields throughout the southern counties. Periods of cool weather followed by short periods of warm (hot) weather are beneficial to the development of aphid populations. Identify the aphid first for best IPM efforts: look for the black tubercles ("tailpipes") on the **melon aphids**. For **green peach aphid**, use Metasystox-R, Thionex, or

Observations from the Field

Rick VanVranken, Atlantic County Agricultural Agent

The rapid change from cool, cloudy weather to extreme heat and intense sunshine has brought about severe burning of leaves of several vegetable crops, especially tender greens and lettuces. Part of it can be attributed to the weather itself. On cool, cloudy days, the plant produces less waxy cuticle on the leaf surfaces and the plant stretches in search of light. That combination makes the plant a little weaker to resisting high heat and intense sunshine, so when the weather changes, the leaves burn. That burning tends to be either uniformly distributed over the whole leaf, or angular lesions on the edges of the leaves where they wilted back in the mid-day heat.

The other factor that becomes critical in rapid weather changes is proper calibration of spray equipment and measurement of fields. Chemical spray burn can be small specks, larger circles or large patches where the chemical dried on the leaves. Improper calibration, worn nozzles, wrong ground speed or pump pressure can all significantly increase the amount of chemical applied to the plant. Accounting for roadways, ditches, hedges and headlands around fields, it may be that a 5-acre piece may only have 4 acres planted. Filling the sprayer with enough pesticide or fertilizer for the 5 acres gives a 25% increase in the application, which may be the difference between crop safety and burning a tender crop. □

Vydate. However, for either green peach aphid or melon aphid, use Actara, Assail, Fulfill, Platinum, or Lannate. Apply 2-3 days after irrigation, and obtain thorough coverage of the spray on the plant for control of aphids. Although Orthene will control green peach aphids, it is suggested that you use Orthene when you begin your **European corn borer** spray program (when first fruit are on the plant) because of the restrictions of Orthene use on peppers.

✓ **Potato: Potato leafhopper** adults are in South Jersey. Because some growers report that at-plant insecticides may be losing effectiveness because of earlier weather conditions, it is best to monitor frequently for this pest. If leafhopper counts exceed 1 adult per sweep of a net, or 1 nymph per 10 leaves, a treatment is suggested. Asana, Baythroid, dimethoate, Guthion, Imidan, Lannate, Thionex and Vydate are labeled and have shown good results in research trials throughout the area. Remember to avoid the neonicotinoids at this time (Actara, Assail, Provado), and to consider a material that may control both **leafhoppers** and **potato beetles** (Thionex, Vydate).

✓ **Tomato:** Southern states report high populations of **stink bugs** in field crops, and expect these pests to cause damage to tomatoes soon (egg masses are starting to show up in tomato fields throughout the southern mid-Atlantic region). Although control of these pests is difficult, Baythroid, Mustang MAX, Monitor, and Warrior have provided the best control of stink bugs on tomatoes in past trials. □

IPM Update

Kristian Holmstrom, Program Associate in Vegetable IPM

Sweet Corn

Hot weather and warm nights have resulted in significantly higher adult **European corn borer (ECB)** trap catches in all areas of the state recently. Despite this, the catches are somewhat lower than might be expected during a “normal” season. It is likely that adult ECB activity overall will be lower than usual, especially in the southern counties, due to the extended stretch of cold weather we experienced through the second half of May. The highest catches this past week are in Hunterdon and Mercer Counties (see ECB map), with locally high catches through Burlington, Salem and Cumberland Counties. Activity in the northern counties may remain high or even increase somewhat over the next week, while it is likely that we will see declining adult activity in the south. As the first moth flight slows, larval injury in sweet corn plantings will increase dramatically. Be sure to check all whorl and pretassel stage sweet corn plantings for signs of ECB damage. Check 5 consecutive plants each in 10 random locations. Look for the “shot-hole” type injury on leaves and discolored sections in the emerging tassels. Consider treating when 12% or more of samples plants show fresh feeding signs. Additionally, be sure to treat these early sweet corn plantings as they go to full tassel and first silk. This application will help eliminate remaining ECB larvae before they can re-enter the plant near the developing ear. If local light traps continue to catch ECB adults and silking stage corn is present, consider treating weekly to prevent infestations by larvae that have been deposited on or near the ears themselves. These silk stage sprays should be applied even if there are no **corn earworm (CEW)** being caught to generate a schedule.

The highest average nightly ECB blacklight catches are:

Little York	13	Cinnaminson	7	Croton	4
Califon	11	Milford	7	Lawrenceville	4
Clinton	9	Sergeantsville	7	Pennington	4
Oldwick	8	Centerton	4	Pittstown	4

A very few CEW adults have been caught throughout New Jersey over the past week. So few captures have been made that there will be no CEW map. These adults are most likely southern migrants that have come to us on persistent south winds associated with the high pressure system of the coast of the Carolinas. Long range CEW migration will probably stop for a time as the weather shifts this week, and we begin to get breezes from more northerly directions. The highest average nightly CEW blacklight catches are:

Denville	1
Eldora	1
Fishing Creek	1
Hackettstown	1
Tabernacle	1

Peppers

Numerous **ECB** egg masses have been found in pepper plantings throughout the northern counties. This pest poses a threat to small plants as well as developing fruit at this time. Look at 2 leaves each on 5 consecutive plants in 10 random locations in the field. Consider treating if 2 or more ECB eggmasses are found in the sample. For growers in the southern counties, where there are enlarging fruit on the plants, consider weekly insecticide applications as long as local blacklight trap catches exceed 1 per night consistently.

Cole Crops

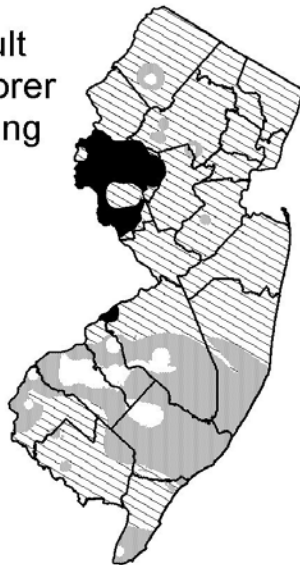
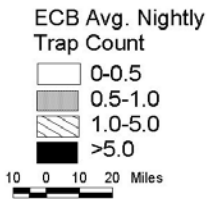
Increasing numbers of **diamondback moth larvae (DBM)** and **imported cabbage worms (ICW)** have been found on broccoli, cabbage and similar crops this week. It is important to check fields weekly to prevent serious injury by these pests. When scouting, be sure to include the inner most leaves in the sample as this is often where larvae feed. Consider treating if greater than 20% of heading type cole crops are infested prior to head formation and if greater than 5% are infested when heads are present. For leafy greens, consider treating if 10% or more plants are infested at any time.

Pumpkins

Recently emerged pumpkin plants are at risk from **striped cucumber beetle** feeding at this time. These yellow and black beetles feed heavily on the seed leaves of small plants and can transmit **bacterial wilt**. This disease can be limiting if it is acquired when the plants are very small. Check 5 consecutive plants each in 10 random locations in the field. Consider treating if beetles are found in more than half the sites and a systemic insecticide has not been used at planting. In some cases, the newly emerged plants may not have taken up an in-furrow applied insecticide and feeding may persist for a day or so.

SEE ECB DISTRIBUTION MAP ON PAGE 5

Distribution of Adult European Corn Borer for the Week Ending June 15, 2005



Data collected and processed by: Kris Holmstrom, Marilyn Hughes
Rutgers Cooperative Extension & Center for Remote Sensing

DOWNY MILDEW FROM PAGE 7

currents and by splashing rain and water. Control of Downy mildew begins with a preventative fungicide maintenance program. There are a number of fungicides labeled for control of Downy mildew and many will help control of important diseases in cucurbits. Growers who have not begun weekly maintenance programs should do so in cucurbit crops. For information on control of Downy mildew and other important diseases of cucurbits, please see the 2005 New Jersey Commercial Vegetable Production Recommendations Guide. □

Weekly Weather Summary

Keith Arnesen, Ph.D., Agricultural Meteorologist

Temperatures averaged much above normal, averaging 77 degrees north, 78 degrees central and 77 degrees south. Extremes were 96 degrees at Canoe Brook on the 9th, and 53 degrees at Freehold on the 8th. Weekly rainfall averaged 1.15 inches north, 0.63 inches central, and 0.35 inches south. The heaviest 24 hour total reported was 0.97 inches at Flemington on the 6th to 7th. Estimated soil moisture, in percent of field capacity, this past week averaged 79 percent north, 80 percent central and 62 percent south. Four inch soil temperatures averaged 74 degrees north, 74 degrees central and 74 degrees south.

Weather Summary for the Week Ending 8 am Monday 6/13/ 5

WEATHER STATIONS	R A I N F A L L			TEMPERATURE				GDD BASE50		MON %FC
	WEEK	TOTAL	DEP	MX	MN	AVG	DEP	TOT	DEP	
BELVIDERE BRIDGE	1.04	11.09	-1.99	91	62	77.	10	547	-1	68
CANOE BROOK	1.27	11.79	-2.43	96	63	79.	11	707	195	76
CHARLOTTEBURG	.93	14.25	.04	92	57	76.	11	560	180	68
FLEMINGTON	1.71	14.82	1.30	93	63	78.	10	634	100	86
NEWTON	.80	12.14	-.58	90	63	77.	11	592	112	65
FREEHOLD	.41	14.79	1.41	93	53	78.	9	664	52	68
LONG BRANCH	MISSING									
NEW BRUNSWICK	.40	12.46	-.67	94	64	79.	10	680	27	76
TOMS RIVER	.26	13.82	.50	91	63	77.	10	577	23	50
TRENTON	1.43	12.07	-.07	93	66	79.	8	682	-13	79
CAPE MAY COURT HOUSE	.24	12.39	.62	90	61	73.	4	469	-151	46
DOWNTOWN	.17	11.50	-.54	94	65	78.	8	620	-98	41
GLASSBORO	.50	13.08	.15	94	67	79.	9	751	54	56
HAMMONTON	.24	11.83	-.76	94	65	78.	8	658	-30	39
POMONA	.52	12.68	1.08	92	66	77.	8	563	-62	51
SEABROOK	.41	12.50	1.18	93	66	79.	9	787	64	47
SOUTH HARRISON	.52	13.11	.29	93	66	78	NA	715	NA	NA
WES KLINE — GDD BASE 40 PINEY HOLLOW										
Last Week* 168 (Ending 6/6/05)										
This Week 268 (Ending 6/13/05)										
* February total base 40 equals 32 units										

Occurrence of QoI Resistance in US and Impact on Managing Downy Mildew in Cucurbits

Margaret Tuttle McGrath, Ph.D., Department of Plant Pathology, Cornell University

Strains of the cucurbit downy mildew fungus resistant to QoI (a.k.a. Strobilurins, FRAC Group 11) fungicides were detected in Georgia and North Carolina in fall 2004 and in Florida in spring 2005. The genetic mutation detected is the same as that in QoI-resistant cucurbit powdery mildew fungal strains. These strains exhibit qualitative resistance, thus resistant ones are highly insensitive to QoIs. It is not possible to re-gain control by increasing the application rate or shortening the interval with this type of resistance.

Development of resistance was not surprising. The cucurbit downy mildew pathogen has developed resistance to other fungicides. Other pathogens have developed resistance to QoIs thus demonstrating that this fungicide group is at high risk for resistance development. Conditions were very favorable for downy mildew in 2004.

Effect of QoI resistance on managing downy mildew in 2005 cannot be predicted. Only 4 samples have been examined. All 4 were resistant; however, this is too small a sample size to make any inferences about the frequency and distribution of resistant strains in the US. In fungicide efficacy experiments being conducted in Georgia and North Carolina where 2 of the tested pathogen isolates were collected, QoI fungicides were not as effective as expected based on previous results. However, this could have been due to high disease pressure resulting from downy mildew starting to develop earlier than usual and conditions being favorable for disease development. While downy mildew resistant cucumber varieties were less severely affected than varieties without genetic resistance, these resistant varieties did not exhibit the very high level of resistance that they had in previous years, suggesting presence of a new strain of the pathogen.

Fortunately there are other management practices for cucurbit downy mildew and non-QoI fungicides labeled for this disease that can be combined and alternated with QoIs to reduce selection of resistant strains and to protect against loss if resistance affects efficacy of QoI fungicides. Select cucumber and melon varieties with resistance to downy mildew when possible. While resistant varieties may not perform as well as in the past, they still are a valuable management tool. Applying a diversity of fungicides to resistant varieties will help manage selection of pathogen strains able to overcome resistant varieties or a specific fungicide.

Minimize leaf wetness by selecting sites with good air movement and without shading, and by avoiding overhead irrigation in early morning when leaves are wet from dew or late in the day when leaves will not have an opportunity to dry before dew forms. It is critical to know what fungicides contain an active ingredient in the QoI fungicide group, which is Group 11 in the system being used by EPA and the agricultural chemical industry.

Products, plus their active ingredient(s) in parentheses, that are registered in New York (also New Jersey) are:

Amistar (azoxystrobin, 11),
Cabrio (pyraclostrobin, 11),
Flint (trifloxystrobin, 11),
Pristine (pyraclostrobin + boscalid, 11 + 7), and
Tanos (famoxadone + cymoxanil, 11 + 27).

Non-QoI fungicides that could be tank-mixed with QoIs and applied in alternation with QoIs are:

Curzate (cymoxanil, 27),
Acrobat (dimethomorph, 15),
Previcur Flex (propamocarb, 28),
Gavel (zoxamide, 22 + M2),
phosphorus acid fungicides (Phostrol, ProPhyt, and Fosphite; 33),
Ridomil fungicides (mefenoxam, 4),
and the protectant fungicides:
Bravo (chlorothalonil, M4),
Maneb (maneb, M2),
Dithane (mancozeb, M2), and
copper fungicides (M1).

Curzate reportedly has good curative activity (about 3 day kickback), thus it is a good choice for the first application after downy mildew is detected. However, it has poor residual activity (only 1-2 days), thus it is critical to tank-mix it with a protectant fungicide and to follow-up with another systemic fungicide when disease pressure is high. A table with relative effectiveness of fungicides for cucurbit diseases based on experiments conducted in North Carolina, where downy mildew occurs regularly, can be obtained at:

http://www.ces.ncsu.edu/depts/pp/cucurbit/control_temp.php.

Furthermore, although downy mildew can be very destructive, luckily it occurs sporadically in the northeastern US, and often appears late enough in the growing season that yield is not impacted. Development of downy mildew in the eastern US plus forecasts for new outbreaks that include the northeast region are posted at a North Carolina State University web site:

www.ces.ncsu.edu/depts/pp/cucurbit/

Please note: the specific directions on fungicide labels must be adhered to — they supersede these recommendations, if there is a conflict. Any reference to commercial products, trade or brand names is for information only; no endorsement is intended. □

Vegetable Disease of the Week

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



Downy Mildew sporulating on underside of Pickle/Cucumber leaf.

Downy Mildew Found on Cucurbits in NJ

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

This week **Downy Mildew** was found on pickle/cucumber in Cumberland County. Downy mildew is not uncommon, but what is though, is that *it has shown up so early* during the past two growing seasons. Last year, Downy mildew was confirmed on June 25th on squash grown near Vineland. This past week Downy mildew was confirmed on cucumber transplants brought in from Florida. Symptoms of Downy mildew began to show up late last week with heavy sporulation. Downy mildew generally does not occur until mid-August in our area. Without adequate control, major losses can occur in cucumber, melon, squash and pumpkin. Symptoms of Downy mildew in early stages of infection include small, slightly chlorotic to bright yellow lesions on upper leaf surfaces. Symptoms typically show up first on older leaves and progress to newer growth. As lesions expand, they may become more yellow and/or brown and necrotic. The margins of lesions are irregular and angular and are bound typically by leaf veins. In conditions when leaf wetness is favored by rainfall and high relative humidity, the fungus will produce dark-grayish fuzzy spore (sporangia) masses on the lower leaf surface. These dark grayish-green spore masses are a diagnostic characteristic of Downy mildew (see VDOW in this issue). Downy mildew can spread easily with air

SEE DOWNY MILDEW ON PAGE 5

Vegetable Disease Update

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

✓ **Cucumber/Pickles – Angular leaf spot**, symptoms are distinct and easily diagnosed. Small water-soaked lesions develop on leaves and expand until they are delimited by larger secondary veins in leaves resulting in angular lesions. After time these lesions turn brown and infected tissue drops-off resulting in ‘shotholes’. Angular leaf spot can be spread by splashing rain, insects, on the hands of workers and on farm machinery. Working in the field when the foliage is wet favors the spread of the disease. The disease can also be spread by blowing wind and in irrigation water. Best management of Angular leaf spot begins with clean-seed and planting in fields that has been out of cucurbit production for at least 2 years. Cultivating when foliage and soil are wet and irrigating with pond water should be avoided. There are cucurbit varieties with resistance. Add label rate of fixed copper + mancozeb to fungicide maintenance program and repeat applications every 7 days.

✓ **Tomato - Early Blight, Septoria leaf spot** Apply the following fungicides on a 7-day schedule or according to Tom-Cast advised sprays using the alternation pattern described below to delay the potential development of resistant to FRAC Group 11 fungicides.

Bravo, Echo, Equus, chlorothalonil, M4) at 2 to 3 pt 6F/A or OLF (also for gray leaf spot, black mold and soil rot), or mancozeb (Dithane, Manex II, Manzate, Penncozeb, M2) at 3 lb 80WP/A or OLF (also for gray leaf spot and leaf mold)

Alternate one of the above fungicides with one of the following:

Amistar, Quadris (azoxystrobin, 11) at 1.6 to 2.0 oz 80WDG/A or OLF (Also for buckeye rot and black mold. Do not apply near apples, see label for details.), or

Cabrio (pyraclostrobin, 11) at 8 to 12 oz 20EG/A, or Endura (boscalid, 7) at 2.5 to 3.5 oz 70W/A, or Flint (triflozystrobin, 11) at 4 oz 50 WDG/A, (Do not apply near Concord Grapes.) or

Tanos (fomoxodone + cymoxanil, 11 + 27) at 8 oz 50W/A + protectant fungicide (also for buckeye rot suppression and gray leaf spot).

✓ **Tomato – Late blight** - *There have been no confirmed cases of Late blight in our region to date.* However, new strains of the fungus that cause Late blight are present in the mid-Atlantic region. These strains are aggressive on tomatoes and resistant to Ridomil Gold. Apply one of the following protectant fungicides and repeat every 7 days or follow a disease forecasting system to schedule fungicide applications:

SEE DISEASES ON PAGE 2

MILLTOWN, NJ 08850
PERMIT #576
POSTAGE PAID
FIRST CLASS

New Brunswick, N.J. 08901-8551
18 College Farm Road
Rutgers' Cook College
Plant & Pest Advisory
COOPERATIVE RESEARCH & EXTENSION
RUTGERS
NJ AGRICULTURAL EXPERIMENT STATION



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