Onion

Wednesday morning 9:00 am

Where: Grand Gallery (lower level) Room C

Recertification credits: 1 (PRIV OR COMM CORE)
CCA Credits: PM(1.5) CM(0.5)

Moderator: Glen Leep, 4L Farms, East Martin, MI

9:00 a.m. Sweet Onion Variety Trials

- Ron Goldy, District Vegetable Educator, MSU Extension

9:20 a.m. Improve Onion Rotation with Mustard Cover Crops

- Mathieu Ngouajio, Horticulture Dept., MSU

9:40 a.m. Managing Onion Insect Pests

- Walter Pett, Entomology Dept., MSU

10:00 a.m. Bacterial Blight and Other Onion Diseases

- Mary Hausbeck, Plant Pathology Dept., MSU

10:20 a.m. Onion Weed Control Update

- Bernard Zandstra, Horticulture Dept., MSU

BACTERIAL BLIGHT AND OTHER ONION DISEASES

Dr. Mary K. Hausbeck (517-355-4534)
Michigan State University, Department of Plant Pathology

Bacterial diseases occur each year and can be minor or major problems. Bacterial soft rot symptoms include water-soaking and discoloration of scale tissues to a pale yellow to light brown. As the disease progresses, tissues become soft, and break down into a watery, foul-smelling viscous liquid. Leaves wilt and whiten. The bacteria can occur in soil and crop debris, and are spread by rain, irrigation water and insects (Schwartz and Mohan, 1995). *Erwinia* enters the bulb through the neck tissue of maturing plants and through wounds. The bacteria can survive on infested crop residues in the soil, and be spread by rain and irrigation or by direct contact with the infested soil (Howard et al., 1994). The onion maggot can harbor the bacteria in the guts of the larvae, and adult flies can spread the pathogen. Optimum weather for infection is 68-86ºF (20-30ºC) and high humidity. Infection can continue in storage or transit if the temperature is >37ºF (3ºC) (Schwartz and Mohan, 1995).

Center rot is caused by the bacterium, *Pantoea ananatis*. Symptoms of center rot include the rapid death of the two center leaves followed by a soft rot of the heart of the bulb. Little is known about the epidemiology and control of this disease.

Slippery skin is caused by the bacterium, *Burkholderia gladioli* pv. *alliicola*. The disease first occurs as softening of the neck tissue, with 1-2 inner bulb scales that are water-soaked. The rot progresses down along the scales, and does not affect adjacent scales; however, the bacteria can invade other scales. Plants may have 1-2 wilted leaves in the middle of the leaf cluster, which turn pale yellow to off-white and die back (Howard et al., 1994). Eventually, all internal tissue may rot, then dry out and shrivel the bulb. The center core of the infected bulb may slip out the top if the base is pressed. The bacterium enters leaves and maturing bulbs through wounds, probably before or at harvest. Young leaves are only slightly susceptible. The disease is usually more severe if onion tops are damaged by hail or high winds, or subjected to wet or rainy conditions prior to harvest. Mature bulbs are very susceptible and can rot completely within 10 days at room temperature (Schwartz and Mohan, 1995).

Sour skin, another bacterial disease (caused by *Burkholderia cepacia*) first appears on onion bulbs as slimy, pale yellow to light brown decay and breakdown of one to several inner bulb scales. The bulb may appear normal, but the neck region may soften after leaves have collapsed (Schwartz and Mohan, 1995). One to two leaves may turn light brown, and young leaves may die back. Affected leaves can easily be pulled out of the bulb. Healthy scales may slip off during handling of bulbs with advanced disease. The bacterium, *B. cepacia*, has been found in organic soils and irrigation water (Howard et al., 1994). Infection generally occurs through a wound in the presence of water from rain, irrigation or flooding, or can occur when water with bacteria strike young leaves and flow down them into the neck area. Young leaves are much more susceptible than older leaves, and infection can remain latent until the plant begins to form a bulb. Infection into the bulb occurs along the infected leaf, and does not move between scales. Temperatures >86ºF (30ºC) favor rapid disease progression (Schwartz and Mohan, 1995).

Bactericide products such as copper fungicides (Kocide, Champ, copper sulfate) are the only products that are currently both registered and effective in limiting bacterial populations that are responsible for these onion diseases. These copper fungicides are most effective if applied before bacterial populations become established at a level high enough to cause disease. Coppers also should be applied prior to and after heavy rains to help limit the spread of bacteria to other onion plants in the field. Copper fungicides can be safely tank-mixed with other products used to control fungal pathogens.

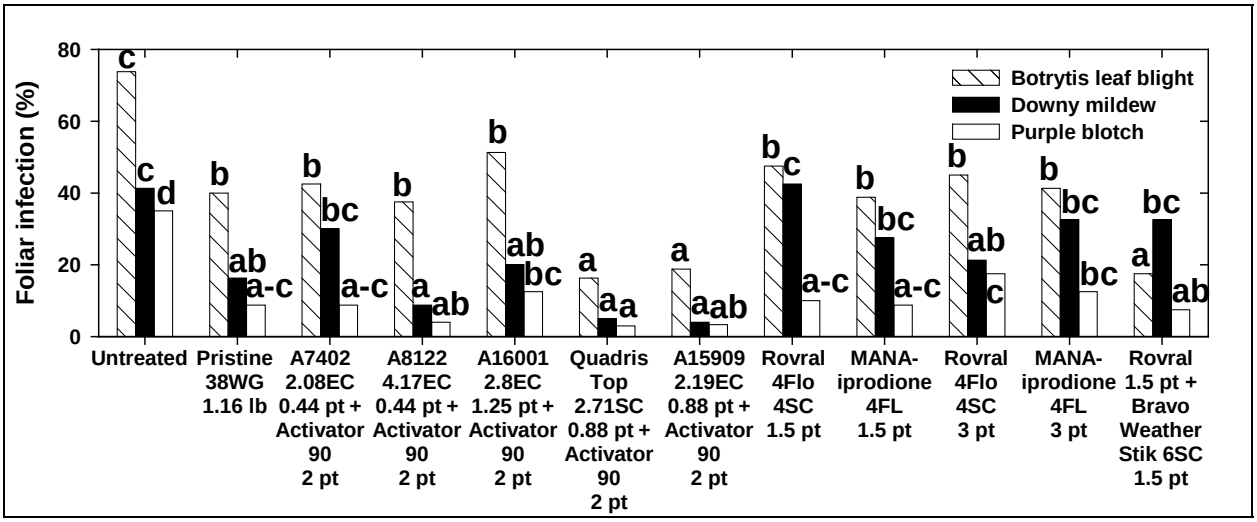
Onion Fungicide Trials 2008

Historically chlorothalonil (Bravo) and iprodione (Rovral) fungicides have been very effective in controlling both onion leaf blight and purple blotch. The newer classes of strobilurin fungicides (Quadris, Pristine) are also very effective and should be used in rotation with the established products for season long control of both onion foliar blights. When onion downy mildew appears in the state, growers should also include mefenoxam products (Ridomil Gold MZ or Ridomil Gold Bravo) and mancozeb (Dithane, Manzate) in their spray program.

Michigan State University conducts yearly fungicide screens to evaluate existing and new fungicides for their control of all three fungal pathogens. During the 2008 experiments, all three diseases developed in both trials held at the MSU Muck Soils Research Farm.

A twelve treatment trial was conducted to evaluate fungicides for control of the foliar diseases, Botrytis leaf blight (*Botrytis squamosa*), downy mildew (*Peronospora destructor*), and purple blotch (*Alternaria porri*), of onion. Botrytis symptoms first developed in mid-Jul and steadily increased in severity until harvest. Both downy mildew and purple blotch also became a factor in the trial at the middle of Aug, and when combined with the existing *Botrytis* infections, resulted in rapid defoliation of the plot. All of the treatments were effective in limiting both Botrytis and purple blotch infections compared to the untreated control on 8 Aug (Fig. 1). The treatments of Quadris Top 2.71SC and A15909 2.19EC, both tankmixed with Acivator 90, were especially effective in limiting all three foliar pathogens. Starting in mid-Jul, leaf yellowing and tip burn was apparent on all treatments that had Activator 90 in the tank mix. This symptom was very noticeable several days after treatment applications and seemed to increase in severity with more applications.

Figure 1. Twelve treatment trial at MSU Muck Farm that included fungicides for the control of onion foliar blights.



The heavy disease pressure on the foliage and the damage caused by the phytotoxicity resulted in yield differences in the plot. Treatments without the Activator 90 product had significantly higher yields than the untreated control. Treatments 2 (Pristine 38WG 1.16 lb), 8 (Rovral 4Flo 4SC 1.5 pt), and 12 (Rovral 4Flo 4SC 1.5 pt + Bravo WeartherStik 6SC 1.5 pt) had the highest total yield for all treatments.

A second trial was conducted evaluating sixteen treatments for the control of onion foliar diseases at the Muck Soils Research Farm. Botrytis symptoms first developed in mid Jul and steadily increased in severity until harvest, and as with the first trial, the additional pressure from purple blotch and downy mildew infections resulted in defoliation of the ineffective treatments. All of the treatments were effective in limiting Botrytis infection compared to the untreated control on 8 Aug (Table 1).

Table 1. Onion foliar blight trial conducted at MSU Muck Farm, 2008.

		Botrytis infection			Foliar infection (%)[y]		
	Treatment and rate/A, applied at 7-day intervals	# leaves 8 Aug	Severity[y] 8 Aug	Foliar (%)[y] 5 Sep	Downy mildew	Purple blotch	Plot health[z]
1	Untreated	23.8 cde	2.5 bc	62.5 ef	17.5	27.5 f	3.5 h[w]
2	LEM 17 1.67SC 1.05 pt	21.3 bcde	2.5 bc	50.0 cde	17.5	20.0 def	4.3 fgh
3	LEM 17 1.67SC 1.5 pt	28.3 e	3.0 c	73.8 f	11.3	23.8 ef	3.3 h
4	LEM 17 1.67SC 1.05 pt + MSO 8.33SC 4 pt	26.3 de	3.0 c	56.3 de	20.0	22.5 ef	3.5 h
5	LEM 17 1.67SC 1.5 pt + MSO 8.33SC 4 pt	19.8 bcde	2.5 bc	56.3 de	15.0	22.5 ef	4.0 gh
6	Pristine 38WG 0.75 lb	16.5 abc	2.0 ab	35.0 abc	23.8	16.3 cd	6.5 cde
7	Pristine 38WG 0.75 lb + MSO 8.33SC 4 pt	11.0 a	1.8 ab	28.8 a	16.3	3.8 abc	8.5 ab
8	Pristine 38WG 1.15 lb	20.5 bcde	2.5 bc	33.8 abc	21.3	11.3 bcd	6.0 def
9	A7402 2.08EC 0.44 pt + Activator 90 8.33EC 2 pt	14.5 ab	1.8 ab	48.8 bcde	26.3	10.0 abc	6.5 cde
10	A8122 4.17EC 0.44 pt + Activator 90 8.33EC 2 pt	20.8 bcde	2.3 abc	42.5 abcd	10.0	7.5 abc	7.5 abcd
11	A16001 2.8EC 0.88 pt + Activator 90 8.33EC 2 pt	15.8 abc	2.0 ab	41.3 abcd	7.5	7.5 abc	7.0 bcde
12	A16001 2.8EC 1.25 pt + Activator 90 8.33EC 2 pt	11.0 a	1.5 a	47.5 bcde	11.3	12.5 cd	5.5 efg
13	Quadris Top 2.71SC 0.63 pt + Activator 90 8.33EC 2 pt	13.8 ab	2.0 ab	32.5 ab	5.0	1.5 a	8.8 ab
14	Quadris Top 2.71SC 0.88 pt + Activator 90 8.33EC 2 pt	13.3 ab	1.8 ab	26.3 a	2.5	2.8 ab	9.0 a
15	A15909 2.19EC 0.66 pt + Activator 90 8.33EC 2 pt	18.3 abcd	2.0 ab	33.8 abc	8.8	7.5 abc	8.0 abc
16	A15909 2.19EC 0.88 pt + Activator 90 8.33EC 2 pt	15.3 abc	2.0 ab	26.3 a	7.5	3.8 abc	8.3 abc

[z]Plot health rated on a scale of 1=10 where 1=dead and 10=no disease.
[y]Based on an estimation of percentage of foliage infected.
[x]Botrytis infection severity rated on a scale of 1 to 5, where 1=no lesions per plant, 2=trace-10 lesions, 3=10-25, 4=25-50, 5=>50 lesions.
[w]Column means with a letter in common or with no letter are not significantly different (Fisher LSD Method; *P*=0.05).

Treatment 6 was especially effective in limiting both number of *Botrytis*-infected leaves as well as infection severity. On the last evaluation date treatments 6, 7, and 12 were very effective in limiting the amount of foliage infected by *Botrytis*. Treatments 4, 6, and 7 were very effective in limiting both downy mildew and purple blotch compared to the untreated control. Treatments 6 and 7 had the best plot health ratings compared to all other treatments and the untreated control. Starting in mid-Jul, leaf yellowing and tip burn was apparent on all treatments that had Activator 90 in the tank mix. This symptom was very noticeable several days after treatment applications and seemed to increase in severity as more treatments were applied. The heavy disease pressure on the foliage and the damage caused by the phytotoxicity resulted in yield differences in the plot. Treatments without the Activator 90 product had significantly higher yields than the untreated control. Treatments 2, 8, and 12 had the highest total yield for all treatments.

Literature Cited:

Howard, R.J., J.A. Garland, and W.L. Seaman, eds. 1994. Pp. 178-197 in: Diseases and Pests of Vegetable Crops in Canada. The Entomological Society of Canada (co-publisher), Ottawa, Ontario.

Schwartz, H.F., and S.K. Mohan. 1995. Compendium of onion and garlic diseases. APS Press, The American Phytopathological Society, St. Paul, MN.