Integrated Pest & Crop Management

Phomopsis Cane and Leaf Blight of Grapevines

By Andy Allen

Phomopsis is a common disease of grapevines in all of the major grape producing regions of the world. It is the first of the major diseases to infect vines at the start of the season and is one of the "Big Five" diseases with which all vineyards in the Midwest and Eastern U.S. must contend (the others being black rot, powdery mildew, downy mildew, and bunch rot). Though it is commonly referred to as Phomopsis Cane and Leaf Blight it actually attacks all green tissues of the vine including the bunch stalk or "rachis" and the immature berries. While the level of susceptibility varies with the grapevine cultivar, all cultivars are susceptible to some degree. Many common cultivars grown in Missouri are moderately or highly susceptible to Phomopsis, including Concord, Catawba, Vignoles, Chambourcin, Chardonel, Seyval blanc, Vidal blanc, and Traminette.

The most common forms of Phomopsis infection are the cane and leaf blights. These infections take place shortly after growth commences in the spring and first appear 3 to 4 weeks later as small black lesions on the basal 2-3 internodes of the young shoot or as small chlorotic or pale green spots with dark centers on the basal leaves. The lesions on the shoots gradually enlarge and may coalesce into larger wounds that crack and give the basal area of the shoot a rough appearance. If enough lesions coalesce the shoot may be weakened and break under the stress of high winds. If heavily infected, the leaf infections can cause the basal leaves to pucker or become distorted, taking on a ragged appearance. The cane and leaf forms of Phomopsis infection do not cause serious economic damage in themselves, but since the basal internodes of the canes are the portion retained during winter pruning to become the fruiting units of the vine if they become infected the disease will overwinter on them and they will serve as the source of inoculum for the next spring. More importantly, new cane and leaf infections can also serve as sources of inoculum for berry and rachis infections in the current season.

Phomopsis overwinters in the vineyard on infected canes, including dead wood not removed from the vines during winter pruning, as well as any infected rachis left on the vine at harvest. So the first step in Phomopsis control is sanitation, i.e. the removal of any infected wood or tissues, including old, dead spurs. This is particularly important on old vines, where non-thorough pruning over the years may have left a lot of dead or infected canes or spurs, causing the buildup of a large amount of inoculum. There is some research evidence indicating that late dormant applications of liquid sulfur or lime sulfur may reduce the amount of overwintering inoculum, but not enough to prevent problems from developing. The most important step in Phomopsis control is the timely first application of a protectant fungicide. Phomopsis infections can take place when the shoots are only about 1¼ to 1½ inches in length,

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Consider Your Burndown Herbicide Options

By Kevin Bradley

With the extremely low cost of glyphosate (sold as Roundup, Touchdown, etc.), it's easy to be tempted to use this herbicide, and this herbicide only, as your burndown herbicide of choice on your no-till corn and soybean acres. However, there are many reasons you should consider adding another herbicide tank-mix partner to your burndown glyphosate application. First and foremost, the addition of a herbicide other than glyphosate adds another herbicide mode of action onto the acre, which is critical in the management of glyphosate-resistant weeds that are present like giant ragweed and marestail (also called horseweed). Both of these weed species have already emerged this spring and are present in many Missouri corn and soybean fields right now (Figure 1). As I have indicated in previous newsletter articles and presentations, typically more than half of our giant ragweed population that is going to emerge for the season has done so by the time of our typical soybean planting dates in Missouri. This is to an even greater degree true for marestail as well; typically about 75% or more of the population of this weed has emerged before we plant soybeans in Missouri.

Figure 1. Glyphosate-resistant giant ragweed seedlings in a field in Randolph County. This picture was taken on April 7th of this year. Usually more than half of the annual population of giant ragweed that will occur in a field will emerge prior to soybean planting.

Figure 2. Growers should consider adding a herbicide tank-mix partner with glyphosate for fields like this that are covered with henbit this spring.

The best way to deal with either of these weeds is to add an effective herbicide tank-mix partner to your glyphosate burndown like 2, 4-D, Clarity, or Sharpen. These tank-mix partners allow flexibility in planting either corn or soybeans, although you must be careful to follow the preplant intervals for both 2, 4-D and Clarity. Although it seems to be a standard practice in corn to apply a residual, pre-emergence herbicide that has activity on your most problematic weed species, it is much less common in soybeans. For fields that will be planted to soybeans, you may also want to consider the addition of a herbicide that provides both burndown **AND** residual control of these weed species. Any of the herbicides that contain chlorimuron (Classic, Envive, Valor XLT, etc.), cloransulam (Authority First, FirstRate, Sonic), or saflufenacil (Sharpen, Optill, Verdict) generally provide good burndown control of giant ragweed and marestail, and provide some residual activity on these species as well. For a complete listing of corn and soybean herbicides that are effective on these weeds and others, consult the

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2011 Missouri Pest Management Guide (MU Ext. Publ. M171), http://weedscience.missouri.edu/publications/m00171.pdf.

In addition to any glyphosate-resistant weeds that may be present in your fields, another reason to consider using a herbicide other than just glyphosate in your burndown is to achieve better control of the winter annual weed species that are currently present. Some of the most common winter annual weeds that we encounter across the state are henbit, chickweed, and field pennycress, and if you didn't make a fall herbicide application last year, it is likely that your corn or soybean fields are covered up with these weeds right now. In fact, henbit is blooming in most no-till corn and soybean fields throughout the state as I have seen many "fields of purple" in my travels lately. Although we tend to get away with burndown herbicide applications that are made to henbit that is blooming, it is not an ideal time to make a herbicide application to this species. Several states in the southern U.S. have already experienced problems with burning down henbit earlier this spring. I don't know if we will experience similar problems or not but we should be aware of the possibility and one way to decrease the chances of this occurring is to add a herbicide tank-mix partner to your glyphosate burndown.

Figure 3. Field pansy is one species that is not controlled well with applications of glyphosate alone.

Lastly, there are some winter annual weeds — like field pansy (Figure 3) — that just simply are not controlled well with applications of glyphosate alone. For these species, you must add an additional herbicide tank-mix partner that is effective on the weed in question in order to achieve complete burndown weed control in an effort to start with a clean field at corn or soybean planting.

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so the first fungicide application should be made when the new shoots are about 1 inch long. This timing is critical since the only fungicides that are highly effective against Phomopsis are the protectant materials mancozeb, captan, and ziram. We see Phomopsis lesions on basal internodes and leaves every year in many Missouri vineyards because the first fungicide application in those vineyards is not properly timed. And unlike black rot, powdery mildew or downy mildew for which there are materials that have a retroactive ability to stop young infections, there are no materials with retroactive or "rescue" ability against Phomopsis.

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Wheat Foliage Diseases and Their Management

By Laura Sweets

The 2011 growing season is already presenting challenges for Missouri producers. The first dry fall in several years saw an increase in wheat acres from a record low in 2009-2010 to an estimated 750,000 acres planted in the fall of 2010. Most fields have greened up and in southern Missouri some fields are approaching flag leaf emergence. So far reports of foliage diseases on wheat in Missouri have been minimal. However, as the wheat begins to move through flag leaf emergence and towards boot and flowering stages of growth, it is important to scout fields for foliage diseases.

There are definitely foliage diseases that can cause losses on winter wheat in Missouri. Leaf rust, stripe rust and Septoria leaf blight are the three most likely to cause losses on soft red winter wheat grown in Missouri. Powdery mildew can be a problem on hard red winter wheat and, under the correct environmental conditions, may also cause losses on soft red winter wheat. The incidence and severity of these foliage diseases will depend on the weather conditions during the growing season, the susceptibility of the variety to each of these diseases and the amount of inoculum in the field or area.

There have been reports of leaf rust developing on wheat in southern states recently. However, there have not yet been any reports of leaf rust or stripe rust on winter wheat in Missouri. The development of foliage diseases on wheat and their severity this season will depend to a large degree on the weather conditions the rest of the season. Most wheat foliage diseases are favored by warm, wet conditions. Frequent light rains, heavy dews, high relative humidity and warm temperatures would be ideal for the buildup of the foliage diseases. The buildup of foliage diseases prior to flowering can lead to yield losses, especially if weather conditions remain favorable for disease development during and after flowering. It is important to scout wheat fields for foliage diseases, especially if there are scattered periods of precipitation as the temperatures warm up. There are a number of foliar fungicides labeled for use on winter wheat. This year in particular, it will be important to evaluate fields for stand and yield potential as well as for incidence and severity of foliage diseases before making a decision on foliar fungicide application.

Lesions of **Septoria leaf blotch** begin as light yellow flecks or streaks. These flecks expand into yellow to reddish-brown, irregularly shaped blotches. Dark brown specks (fruiting bodies or pycnida of the causal fungus, *Septoria tritici*) may be scattered within the centers of mature lesions. Lesions may coalesce killing larger areas of leaf tissue.

Stagonospora glume blotch (formerly called Septoria glume blotch) may also begin as light yellow flecks or streaks on leaves. The lesions also turn yellow to reddish-brown but usually have a more oval to lens-shaped appearance than those of Septoria leaf blotch. Again, the dark brown specks or fungal fruiting bodies of the causal fungus *Stagonospora nodorum* may be evident within the lesions. Symptoms of Stagonospora glume blotch are more common on heads than foliage of wheat. Infected heads will have dark blotches on the glumes.

The initial symptoms of **tan spot** are small tan to brown flecks on the leaves. These expand into tan to light brown, elliptical lesions which often have yellow borders. The centers of mature tan spot lesions may have a dark brown region caused by outgrowth of the fungus. But the fungus which causes tan spot, *Pyrenophora tritici-repentis*, does not produce pycnidia or fruiting bodies as the Septoria fungus does. So mature tan spot lesions do not have the distinct dark brown specks scattered throughout the centers of the lesions as do Septoria leaf blotch lesions. Although tan spot can occur in Missouri, it is not usually a problem in the state.

Leaf rust lesions appear primarily on the upper leaf surfaces and leaf sheaths. Initially, lesions are small, yellow to light-green flecks. Eventually, leaf rust appears as small, circular to oval shaped, orange-red pustules. These pustules break open to release masses of orange-red spores of *Puccinia recondita*. The edges of the open pustules tend to be smooth without the tattered appearance of stem rust pustules. Heavily rusted leaves may yellow and die prematurely.

Stripe rust, caused by the fungus *Puccinia striiformis*, has become more prevalent in Missouri over the last few years. Stripe rust may develop earlier in the season than leaf rust or stem rust. The pustules of stripe rust are yellow or yellowish-red and occur in obvious stripes or streaks running lengthwise on the wheat leaves. This disease is more commonly associated with cooler temperatures, especially cooler night temperatures.

Stem rust, caused by the fungus *Puccinia graminis* f. sp. *tritici*, is most common on stems and leaf sheaths of wheat plants but may develop on any of the above ground portions of the plant including both upper and lower leaf surfaces and glumes and awns. Stem rust pustules are small, oval, and reddish-brown. The ruptured pustules tend to have more ragged edges than leaf rust pustules. Frequently both leaf rust and stem rust occur on the same plant and both types of pustules may develop on an individual leaf.

Powdery mildew infections begin as light-green to yellow flecks on the leaf surface. As powdery mildew develops the leaf surfaces become covered with patches

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of cottony white mold growth of *Erysiphe graminis* f. sp. *tritici*, the causal fungus. These patches eventually turn a grayish-white to grayish-brown in color and small black fungal fruiting bodies may be visible within the patches of mildew growth.

The fungi which cause most of these wheat foliage diseases survive in infested wheat residues left on the soil surface. The next growing season spores are produced during moist periods and are carried by wind currents to susceptible wheat leaves where infection may begin. Disease problems tend to be more severe when wheat is planted in fields with infested wheat residue left on the soil surface. Eventually spores that are produced in the initial lesions on plants are wind blown to other leaves or other plants causing secondary infection.

Leaf rust, stem rust and stripe rust are exceptions to this simplified explanation of disease development. The rust fungi do not survive in infested residue left in a field. Rather, the rust fungi are reintroduced into this area each season when spores are carried up on air currents from the southern United States.

Most of the foliage diseases of wheat are favored by warm, wet or humid weather. Frequently infection begins on the lower portion of the plant. If weather conditions are favorable for disease development, the disease may move up through the plant. Severely infected leaves may yellow and die prematurely. Yield losses tend to be highest when the flag leaves are heavily infected.

There are several fungicides that are labeled for use on wheat to control fungal foliage diseases. It is important to scout wheat fields and determine which leaf diseases are occurring as well as the level of their severity before making a decision to apply a foliar fungicide. In particular be on the lookout for Septoria leaf blotch, Stagonospora glume blotch, leaf rust and stripe rust. When scouting fields, try to identify the disease or diseases which are present, determine the average percent of infection on a leaf and the number of leaves showing infection and determine the stage of growth of the crop. Generally, the profitable use of foliar fungicides on wheat depends on a number of factors including varietal resistance, disease severity, effectiveness of the specific fungicides and timing of fungicide application. The greatest increases in yield are usually obtained when fungicides are applied to disease susceptible varieties with high yield potential at the early boot to head emergence growth stage when the flag leaf is in danger of severe infection. Fungicide applications are seldom beneficial if applied after flowering or after the flag leaf is already severely infected. It is also important to read the fungicide label for specific information on rates, recommended timing of application, frequency of applications, preharvest intervals and grazing restrictions.

A management program for foliage diseases of wheat should include the following steps.

- Plant disease free seed of varieties with resistance to diseases likely to occur in your area.
- Rotate with non-host crops for one or more years.
- Manage residues- if tillage system is a conservation tillage system, particular care should be given to rotation and variety selection.
- Maintain good plant vigor with adequate fertility.
- Control volunteer wheat.
- Use foliar fungicides if warranted (see accompanying tables for additional information on wheat fungicides).

The North Central Regional Committee on Management of Small Grain Diseases (NCERA-184) developed a table containing information on fungicide efficacy for control of certain foliar diseases of wheat. These efficacy ratings were determined by field testing the materials over multiple years and locations by members of the committee. This table is included in this issue of the IPCM newsletter

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Table 1. Management of Small Grain Diseases: Fungicide Efficacy for Control of Wheat Diseases (Revised 4-6-11)

The North Central Regional Committee on Management of Small Grain Diseases (NCERA-184) has developed the following information on fungicide efficacy for control of certain foliar diseases of wheat for use by the grain production industry in the U.S. Efficacy ratings for each fungicide listed in the table were determined by field testing the materials over multiple years and locations by the members of the committee. Efficacy is based on proper application timing to achieve optimum effectiveness of the fungicide as determined by labeled instructions and overall level of disease in the field at the time of application. Differences in efficacy among fungicide products were determined by direct comparisons among products in field tests and are based on a single application of the labeled rate as listed in the table. Table includes most widely marketed products, and is not intended to be a list of all labeled products.

Fungicide(s)				Powdery Mildew	Stagonospora leaf/glum blotch	Septoria leaf blotch	Tan spot	Stripe rust	Leaf rust	Stem rust[5]	Head scab	Harvest Restriction
Class	Active Ingredient	Product	Rate/A (fl. oz)									
Strobilurin	Azoxystrobin 22.9%	Quadris 2.08 SC	6.2 - 10.8	F(G)[1]	VG	VG	E	E[2]	E	VG	NL	45 days
	Fluoxastrobin 40.3%	Evito 480 SC	2.0 – 4.0	G	--[3]	--[3]	--[3]	--[3]	VG	--[3]	NL	40 days
	Pyraclostrobin 23.6%	Headline SC	6.0 - 9.0	G	VG	VG	E	E[2]	E	G	NL	Feekes 10.5
Triazole	Cyproconazole 8.9%	Alto 100 SL	3.0 - 5.5	--[3]	--[3]	--[3]	--[3]	--[3]	--[3]	--[3]	--[3]	30 days
	Metconazole 8.6%	Caramba 0.75 SL	10.0 - 17.0	VG	VG	--[3]	VG	E	E	E	G	30 days
	Propiconazole 41.8%	Tilt 3.6 EC[4]	4.0	VG	VG	VG	VG	VG	VG	VG	P	Feekes 10.5
	Prothioconazole 41%	Proline 480 SC	5.0 - 5.7	--[3]	VG	VG	VG	--[3]	VG	VG	G	30 days
	Tebuconazole 38.7%	Folicur 3.6 F[4]	4.0	G	VG	VG	VG	E	E	E	F	30 days
	Prothioconazole19% Tebuconazole 19%	Prosaro 421 SC	6.5 - 8.2	G	VG	VG	VG	E	E	E	G	30 days
Mixed Mode of Action	Metconazole 7.4% Pyraclostrobin 12%	TwinLine 1.75 EC	7.0 – 9.0	G	VG	VG	E	E	E	VG	NL	Feekes 10.5
	Propiconazole 11.7% Azoxystrobin 7.0%	Quilt 200 SC	14.0	VG	VG	VG	VG	E	E	VG	NL	Feekes 10.5
	Propiconazole 11.7% Azoxystrobin 13.5%	Quilt Xcel 2.2 SE[5]	14.0	--[3]	VG	--[3]	--[3]	--[3]	VG	--[3]	NL	Feekes 10.5
	Propiconazole 11.4% Trifloxystrobin 11.4%	Stratego 250 EC	10.0	G	VG	VG	VG	VG	VG	VG	NL	35 days
	Tebuconazole 22.6% Trifloxystrobin22.6%	Absolute 500 SC	5.0	G	--[3]	--[3]	--[3]	--[3]	E	--[3]	NL	35 days

[1] *Efficacy categories: NL=Not Labeled and Not Recommended; P=Poor; F=Fair; G=Good; VG=Very Good; E=Excellent. Efficacy designation with a second rating in parenthesis indicates greater efficacy at higher application rates.*
[2] *Efficacy may be significantly reduced if solo strobilurin products are applied after stripe rust infection has occurred*
[3] *Insufficient data to make statement about efficacy of this product*
[4] *Multiple generic products containing the active ingredients propiconazole and tebuconazole may also be labeled in some states. Products including tebuconazole incude: Embrace, Monsoon, Muscle 3.6 F, Onset, Orius 3.6 F, Tebucon 3.6 F, Tebustar 3.6 F, Tebuzol 3.6 F, Tegrol , and Toledo. Products containing propiconazole include: Bumper 41.8 EC, Fitness, Propiconazole E-AG, and PropiMax 3.6 EC.*

This information is provided only as a guide. It is the responsibility of the pesticide applicator by law to read and follow all current label directions. No endorsement is intended for products listed, nor is criticism meant for products not listed. Members or participants in the NCERA-184 committee assume no liability resulting from the use of these products.

The Plant Diagnostic Clinic is Now Open!

By Adam Leonberger

As the weather starts to warm up, we start thinking of getting our plants into the ground. Inevitably, some of your plants will get sick. If your leaves are spotted, your ears are rotted, or any other plant related matter, send your sick plant to the Plant Diagnostic Clinic (PDC). The PDC draws upon a network of experts, such as Extension staff and labs from other states. We aim to diagnose your plant related problems and provide accurate, timely answers and management recommendations. Submission forms can be found on-line at our website, plantclinic.missouri.edu.

It is easy to submit a plant sample. Send entire plants with roots intact (dug, not pulled) if possible. When you collect plants or plant parts, make sure a range of the symptoms is represented in your sample. For larger specimens, sample from the transition zone between healthy and symptomatic tissue.

For weed/plant identification, place the sample flat between layers of dry paper. Try to prevent excessive folding of the leaves and place flowers so that you are looking into the center of the flower. Pack the wrapped bundle in plastic, preferably with a piece of cardboard to keep the sample flat. To make packaging easier, fold tall plants once or twice or cut into shorter lengths. For trees and shrubs, collect a terminal or end portion of a leafy branch with at least five leaves or buds.

For insect/arachnid identification, place leak-proof bottle or box in sturdy shipping container with plenty of packaging material to prevent shipping damage. Preserve soft-bodied insects such as caterpillars, aphids, or mites in a leak-proof bottle with 70% alcohol, rubbing alcohol, or hand sanitizer gel. Do not submit insects in water, formaldehyde or without alcohol as they will readily ferment and decompose. Hard-bodied insects such as butterflies, beetles, or bees should be killed by freezing and then cushion specimens in layers of tissue.

It is important to remember that a good diagnosis is dependent upon a good sample, so don't let it go bad in the mail. Wrap samples with a few layers of a dry absorbent material, like paper towels or newspaper. Excess moisture will cause the sample to spoil during shipping. Don't forget to use a sturdy box to send your plant in either. Mail the sample early in the week to ensure that the sample arrives by Friday. If you're in town, feel free to stop by the clinic in person. You can mail samples or visit at 23 Mumford Hall, Columbia, MO 65211.

There is a small fee of $15 for general diagnosis of insect/arachnid identification and plant/weed identification. There is an additional $10 fee for for virus testing, bacterial or fungal isolation that is necessary for a diagnosis. It's a small fee for a lot of information.

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First Intensive Captures of Black Cutworm Moths

By Wayne Bailey

The first intensive capture of BCW moths in pheromone baited traps occurred during late March in 2011. Intensive captures of migrating moths indicate heavy moth activity which may result in problems with black cutworm larvae produced in field corn. Both the date of intensive moth capture along with meteorological data (30-year average) are used in the Missouri Black Cutworm Predictive Model to calculate a predicted date for first occurrence of cutting damage by 4th instar black cutworm larvae. These predicted dates of first cutting are based on meteorological averages in the area of the trap and may vary depending on weather conditions and temperatures from the time the eggs are laid through development of larvae. For instance, if temperatures are warmer than average, then the rate of black cutworm growth and development to 4th instar will be increased by as much as one week. If conditions are cooler than normal, then development of this pest will be slowed and cutting will occur later than predicted. To account for some of this variation in local environmental conditions, the predicted date is updated daily using data from a weather station near the trap site. Intensive moth captures do not always result in economic infestations of black cutworm, but do predict a date for potential first cutting by larvae.

Scouting activities should occur from first emergence of corn plants and continue through the 5th leaf stage of plant development. If this is not possible, then scouting of fields should begin a minimum of one week prior to the predicted date of cutting. Early damage by black cutworm larvae smaller than 4th instars may be visible as minor leaf feeding on corn plants. More than one intensive capture of moths may occur at a trap site. Larvae produced from moths of each intensive capture have the potential to damage corn plants. In instances where intensive captures

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occur at a trap site early in the season and then again a couple of weeks later may result in two distinct larval populations and possibly two economic infestations in the same field. Because multiple black cutworm infestations may occur in a field, producers should continue to scout fields until the corn plants grow through the 5th leaf stage of development. For more information on the black cutworm predictive model and the counties currently monitoring for black cutworm, please visit our Website at: http://ppp.missouri.edu/pestmonitoring/bcw/index.cfm

Listed below are the trap locations with intensive captures (as of 4/11/11) and predicted dates of first cutting of field corn by black cutworm larvae:

Northwest Region

- Holt County (Forbes): Intensive capture date, 04/06/2011. Predicted first cutting, 05/06/2011
- Buchanan County (St. Joseph): Intensive capture date, 04/06/2011. Predicted first cutting 05/06/2011.

West Central Region

- Vernon County (Nevada): Intensive capture date, 03/27/2011. Predicted first cutting, 04/06/2007

North East Region

- Knox County (Novelty): Intensive capture date, 4/18/2007. Predicted first cutting, 4/28/2011. Intensive capture date, 03/31/2011. Predicted first cutting 4/28/2011. Intensive capture date, 04/06/2011. Predicted first cutting 05/02/2011.

East Central Region

- Franklin County (Union): Intensive capture date, 04/05/2011. Predicted first cutting, 04/30/2011.

As roughly illustrated by 2011 early trap data, black cutworm moth captures to this point in the season, follow a pattern beginning around Kansas City, move along the I-70 corridor to the St. Louis area, and then travel northward into northeast Missouri counties. Although this moth capture pattern may vary from year to year depending wind patterns, it is a pattern often observed in Missouri for black cutworm moth movement.

Please be aware that intensive captures in pheromone traps only indicate a need for scouting fields. Intensive captures DO NOT indicate treatment is necessary.

Life Cycle/Biology

The black cutworm, *Agrotis ipsilon* (*Hufnagel*), can be a severe pest of field corn and other crops in Missouri. Moths migrate into the state each srping from more southern states to mate and lay eggs on grasses, in winter cover crops or soybean residues, some bare soil, and low growing winter annual weeds, i.e., henbit, chickweed, curly dock, etc. These activities occur during early spring generally prior to the planting of corn. When this vegetation is killed and corn planted, surviving larvae readily attack emerging corn seedlings. Each female moth is capable of laying about 1,300 eggs either singularly or in small clumps. Larvae grow rapidly and reach the larval stage (4th instar) capable of cutting corn plants in 2-3 weeks. Corn plants may be cut near the soil surface or below ground. The economic threshold for black cutworm larvae attacking field corn seedlings is 4-6% cutting above ground and 2-3% cutting below ground. Most feeding damage typically occurs within 7-10 days following plant emergence.

Black cutworm larvae vary in color from light gray to dark black. The skin is rough or granulated and often appears greasy in texture. The sides and top of larvae are generally a solid gray or black color with an indistinct pale stripe running the length of the back. Black cutworm larvae can be confused with the dingy cutworm, although in Missouri dingy cutworm larvae often occur in the field at least two weeks prior to occurrence of black cutworm larvae. Additionally, dingy cutworms are typically foliage feeders during their larval stages, whereas, the black cutworm foliage feeds when small and cuts corn plants when it reaches the 4th instar stage of growth. There are a total of six instars for the black cutworm with several generations produced each year. However, larvae from the first generation are generally responsible for attacking field corn.

Management Options

Several management options are available for black cutworm in field corn. The destruction of winter annual weeds and vegetation at least two weeks prior to planting corn is a good non-chemical control option. This method depends on high larvae mortality caused by exposure to harsh field conditions and limited food supply. The addition of an insecticide with or without vegetation management provides good larval control prior to and at planting. Seed treatments are an option that historically provided about 50% control of black cutworm larvae in Missouri insecticide evaluations. In most years this rate of control may be sufficient to keep larval numbers below economic threshold levels. The recent addition of transgenic insecticide traits in some corn hybrids provide black cutworm larval control approaching 100% and are growing in popularity. A rescue application of insecticide is

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also effective in controlling this pest. A rescue insecticide is applied when scouting of the crop finds damage has reached or exceeded the economic threshold levels based on the quantity and type of cutting, the presence of half-grown or smaller larvae, and the stage of plant growth is at or less than the 5-leaf stage for corn.. Regardless of the method used, producers are encouraged to scout field corn at least twice per week from the time of emergence through the 5th leaf stage of plant development. Most early season insect corn pests can be found and successfully managed with good scouting practices and the use of an effective integrated pest management program.

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Table 1. Insecticides Labeled for Rescue Treatments

Common Name	Trade Name	Rate of formulated material per acre	Placement	REI	Pre-Harvest Interval Days
permethrin	*Ambush 25WP	6.4 to 12.8 fl oz	foliage	12	30 (grain or stover), 0 (forage)
permethrin	*Ambush Insecticide	6.4 to 12.8 fl oz	foliage	12	30 (grain or stover), 0 (forage)
permethrin	*multiple products	see specific labels	foliage	12	see specific label
esfenvalerate	*Asana XL	5.8 to 9.6 fl oz	foliage	12	21 (grain)
cyfluthrin	*Baythroid XL	0.8 to 1.6 fl oz	foliage	12	21 (grain or fodder) 0 (green forage)
flubendiamide	*Belt SC	2.0 to 3.0 fl oz	foliage	12	1 (green forage and silage) 28 (grain or stover)
bifenthrin	*Brigade 2EC	2.1 to 6.4 fl oz	foliage	12	30 (grain, fodder, graze)
chlorpyrifos +	*Cobalt	13 to 26 fl oz	foliage	24	21 (grain or ears)
gamma-cyhalothrin					14 (graze or silage haravest)
deltamethrin	*Delta Gold 1.5EC	1.0 to 1.5 fl oz	foliage	12	21 (grain, fodder) 12 (cut forage or graze)
zeta-cypermethrin + bifenthrin	*Hero	2.6 to 6.1 fl oz	foliage	12	30 (grain, stover, graze) 60 (forage)
chlorpyrifos	*Lorsban Advanced	1 to 2 pt	foliage	24	21 (grain,ears,forage,fodder)
zeta-cypermethrin	*Mustang Max	1.28 to 2.8 fl oz	foliage	12	30 (grain, stover) 60 (forage)
chlorpyrifos	*Nufos 4E	1 to 2 pt	foliage	24	21 (grain or ears)
microencapsulated methyl parathion	*Penncap-M	4 pt	foliage	48	12 (grain, forage, graze)
carbaryl	Sevin 4F	4 pt	foliage	12	48 (grain or fodder) 14 (harvest or graze forage)
zeta cypermethrin + chlorpyrifos	*Stallion *Tombstone Helios	3.75 to 11.75 fl oz 0.8 to 1.6 fl oz	foliage foliage	24 12	30 (grain or stover) 60 (forage) 21 (grain or fodder), 0 (forage)
lambda-cyhalothrin + chlorantraniliprole	*Voliam Xpress	5.0 to 9.0 fl oz	foliage	24	3
lambda-cyhalothrin	*Warrior II	0.96 to 1.6 fl oz	foliage	24	21 (grain), 1 (graze, forage) 21 (treated feed or fodder)

***Designates a restricted-use pesticide. Use restricted to certified applicators only.**
Read the label and follow all insecticide rate information, directions, precautions, and restrictions.

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First Intensive Captures of Black Cutworm Moths

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Table 2. Non-Foliar Insecticide Applications

Common Name	Trade Name	Rate of formulated material per acre	Placement	REI	Pre-Harvest Interval Days
permethrin	*Ambush Insecticide	0.5 fl oz/1000 ft row	In furrow, T-band, see label	12	30 (grain or stover), 0 (forage)
permethrin	*Ambush Insecticide	6.4 to 12.8 fl oz	Pre-plant, pre-emergence See specific label	12	30 (grain or stover), 0 (forage)
bifenthrin	*Brigade 2EC	0.15 to 0.30 fl oz/1000 ft row	7 inch T-band	12	30 (grain, grazing, feed)
bifenthrin	*Brigade 2EC	2.56 fl oz	pre-emergence	12	30 (grain, fodder, graze)
bifenthrin	*Brigade 2EC	3 to 4 fl oz	pre-plant incorporate	12	30 (grain, fodder, graze)
bifenthrin	*Capture LFR	3.4 to 6.8 fl oz	At-plant broadcast, 5-7 inch T-band or in furrow	12	30 (grain or stover), 60 (forage) 30 (graze or feed)
bifenthrin	*Capture LFR	4 to 5.3 fl oz 3.4 fl oz	pre-plant incorporate pre-emergence	12	30 (grain or stover), 60 (forage) 30 (graze or feed)
chlorpyrifos + gamma-cyhalothrin	*Cobalt	13 to 38 fl oz	At-plant, T-band, see specific labels	24	21 (grain or ears) 14 (graze or silage haravest)
zeta-cypermethrin + bifenthrin	*Hero	4.0 to 10.3 fl oz	At-plant broadcast or 5-7 nch T-band on soil surface	12	30 (grain, stover, graze) 60 (forage)
chlorpyrifos	*Lorsban Advanced	1 to 2 pt	Preplant, At-plant, post-emergence. See label.	24	21 (grain, ears, forage, fodder)
zeta-cypermethrin	*Mustang Max	see specific label	At-plant, T-band	12	30 (grain, stover) 60 (forage)
chlorpyrifos	*Nufos 4E	1 to 2 pt	Preplant, at-plant, pre-emergence	24	21 (grain or ears)

***Designates a restricted-use pesticide. Use restricted to certified applicators only.**
Read the label and follow all insecticide rate information, directions, precautions, and restrictions.

Weather Data for the Week Ending April 12, 2011

By Pat Guinan

Station	County	Weekly Temperature (°F)						Monthly Precipitation (in.)		Growing Degree Days‡	
		Avg. Max.	Avg. Min.	Extreme High	Extreme Low	Mean	Departure from long term avg.	Apr. 1-Apr. 12	Departure from long term avg.	Accumulated Since Apr. 1	Departure from long term avg.
Corning	Atchison	71	46	87	36	60	+11	1.11	-0.05	96	+95
St. Joseph	Buchanan	70	49	85	42	60	+10	0.47	-0.90	99	+93
Brunswick	Carroll	71	48	87	39	61	+11	1.07	-0.16	97	+91
Albany	Gentry	71	46	87	34	59	+10	0.97	-0.35	86	+86
Auxvasse	Audrain	74	51	89	43	62	+11	0.79	-0.67	111	+104
Vandalia	Audrain	73	49	86	42	62	+12	0.70	-0.83	102	+97
Columbia-Bradford Research and Extension Center	Boone	75	51	90	43	63	+11	0.64	-0.90	115	+97
Columbia-Jefferson Farm and Gardens	Boone	74	52	88	44	63	+11	0.83	-0.71	120	+102
Columbia-Sanborn Field	Boone	75	54	90	47	65	+13	1.11	-0.45	132	+109
Columbia-South Farms	Boone	74	52	88	44	63	+11	0.94	-0.60	120	+102
Williamsburg	Callaway	76	52	91	43	64	+13	0.72	-0.76	123	+113
Novelty	Knox	69	47	83	40	59	+9	0.81	-0.51	83	+79
Linneus	Linn	70	48	84	40	59	+10	1.08	-0.04	88	+85
Monroe City	Monroe	72	49	85	40	61	+11	1.02	-0.53	95	+90
Versailles	Morgan	76	53	90	42	65	+12	0.67	-1.18	140	+108
Green Ridge	Pettis	74	51	88	39	63	+12	0.65	-0.91	117	+105
Lamar	Barton	76	54	85	41	66	+13	0.98	-0.60	138	+104
Cook Station	Crawford	79	52	90	38	66	+12	0.79	-0.61	139	+100
Round Spring	Shannon	81	48	91	39	65	+12	1.06	-0.45	125	+95
Mountain Grove	Wright	77	52	86	42	65	+13	1.05	-0.56	129	+111
Delta	Cape Girardeau	75	54	85	44	65	+10	2.25	+0.84	131	+77
Cardwell	Dunklin	78	57	87	46	67	+10	2.09	+0.37	153	+75
Clarkton	Dunklin	78	56	87	47	67	+11	2.23	+0.75	148	+77
Glennonville	Dunklin	77	57	87	46	67	+10	2.66	+1.25	153	+79
Charleston	Mississippi	76	57	85	48	67	+12	3.19	+1.51	145	+86
Portageville-Delta Center	Pemiscot	78	59	88	47	68	+11	2.42	+0.78	160	+82
Portageville-Lee Farm	Pemiscot	78	60	88	51	69	+12	2.44	+0.82	165	+87
Steele	Pemiscot	79	58	89	48	68	+12	1.90	+0.19	159	+84

* Complete data not available for report

‡Growing degree days are calculated by subtracting a 50 degree (Fahrenheit) base temperature from the average daily temperature. Thus, if the average temperature for the day is 75 degrees, then 25 growing degree days will have been accumulated.

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