

Commercial Crop Production

Fruit and Nut Crops - Pecan

Integrated Disease Management for Pecan

Management of diseases and insects is essential for profitable pecan production in Louisiana. Commercial pecan producers must spray at the proper time with recommended fungicides and insecticides. Learning to identify the major insect pests and diseases of pecans is highly desirable and strongly recommended. To obtain adequate disease control and receive maximum benefit from applied fungicides, spray applications must be made on a preventive program. In addition to spraying, cultural practices and sanitation can reduce the severity of certain insects and disease problems. Commercial growers as well as homeowners should follow these practices. More information on pecan IPM can be found on the Pecan IPM-PIPE website (<http://pecan.ipmpipe.org/Index>) or by contacting Dr. Charles Graham at cjgraham@agcenter.lsu.edu.

Plant-resistant cultivars: Pecan scab is the most widespread and destructive disease of pecans. Selecting cultivars that are resistant or tolerant to pecan scab is recommended (Table 2), especially in southern Louisiana where warm and humid conditions favor disease development. It is important to note that a particular variety may be resistant to scab in one location but susceptible to scab in another location. Contact your parish agent to identify cultivars suitable for your area. For a full description of pecan cultivars go to <http://cgru.usda.gov/CARYA/PECANS>.

Use good sanitation practices: Certain leaf diseases such as scab and insects such as the hickory shuckworm overwinter on shucks and leaves. If these are raked and burned, it will help reduce the severity of these problems to some extent the following year. Prune dead and broken limbs from trees to remove potential habitats for certain insects and diseases.

Use optimal levels of fertilizer: Proper fertilization will increase production and boost pest control. Well-maintained pecan trees are less susceptible to attack by certain diseases and insects. Consult the LSU AgCenter's Louisiana Cooperative Extension Service for information on leaf and soil sampling techniques, fertilization and cultural practices.

Ensure good spray coverage: Good spray coverage is essential for good disease control and, to a lesser extent, for insect control. A large air blast sprayer (speed sprayer) has proven very satisfactory for treating large acreages of pecan trees for control of insects and diseases.

Use registered chemicals: The potential for developing isolates of pathogens resistant to fungicides is high in pecan production. To slow the development of resistant pathogen populations: 1) develop a spray program that uses fungicides with different modes of action; 2) avoid consecutive sprays with fungicides with the same or similar modes of action; and 3) only use the labeled rates of recommended fungicides. More information of fungicide resistance management can be found in the front of this guide.

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Table 1. Symptoms, source of inoculum and management of pecan diseases.

Disease	
<p>Anthracnose (<i>Colletotrichum</i> spp., <i>Glomerella cingulata</i>)</p>	<p>Symptoms: Brown-black sunken lesions on the leaves and shucks. In the spring and early summer cream- to salmon-colored spores form on shuck spots.</p> <p>Source of Inoculum: Spores are dispersed in the spring and early summer by rainfall.</p> <p>Management: Plant resistant varieties. Remove and destroy diseased plant material. No fungicides are available for homeowners. Commercial fungicides are listed in Table 4.</p>
<p>Bacterial leaf Scorch (<i>Xylella fastidiosa</i>)</p>	<p>Symptoms: Symptoms of bacterial leaf scorch include chlorotic mottling of the leaves that starts from the tips and margins and progresses toward the midribs. As disease develops, leaf tips and margins become necrotic. Once a tree is infected, there is no cure.</p> <p>Source of Inoculum: The bacterium resides in the xylem vessels (water-conducting channels) of the tree, where it multiplies and blocks these channels and eventually obstructs the flow of water and nutrients within the plant. The bacterium is transmitted and spread by xylem-feeding insects, such as sharp shooters, leaf hoppers or spittle bugs.</p> <p>Management: There are no chemicals available to manage bacterial leaf scorch. Cultural practices that improve plant vigor, such as proper watering and fertilization, may help the infected plants to live longer. Pruning symptomatic branches will not save the plant. Detection and removal of infected plants at early stages may help reduce subsequent spread of the pathogen. Management of insect that transmit bacterial leaf scorch is critical to prevent disease spread.</p>
<p>Brown leaf spot (<i>Cercospora</i> spp.)</p>	<p>Symptoms: Early leaf spots are circular, reddish-brown and often develop grayish concentric zones. Spots become irregular later. Nuts are not susceptible to this fungus. Usually a problem only when trees lack vigor or where rainfall is unusually high. Premature defoliation often occurs when disease is severe.</p> <p>Source of Inoculum: Fungus lives from year to year in infected spots on the old leaves. Spores are windborne.</p> <p>Management: Water and fertilize trees to improve vigor. Fungicides that control scab also control brown leaf spot although not all scab fungicides are labeled for brown leaf spot (see Table 4). Follow Pecan Spray Schedule.</p>

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Table 1. Symptoms, source of inoculum and management of pecan diseases.

Disease	
<p>Downy spot (<i>Mycosphaerella</i> spp.)</p>	<p>Symptom: Appears in late spring or early summer as downy spots on the undersides of the leaflets. Later, greenish-white spots about 1/8 inch in diameter are visible on both sides of the leaves. As the season advances, the color of the spots changes to brown.</p> <p>Source of Inoculum: Fungus lives from year to year in infected leaves.</p> <p>Management: Plant-resistant or tolerant varieties (i.e. Schley, Success, Mahan and Western). Remove and destroy fallen leaves. Follow Pecan Spray Schedule.</p>
<p>Powdery mildew (<i>Microsphaera alni</i>)</p>	<p>Symptoms: This disease affects both foliage and nuts, forming a white superficial fungal growth early in the growing season. Nuts are affected more adversely than foliage. Nuts infected early in the season may abort or be undersized.</p> <p>Source of Inoculum: Infected leaf and shuck debris.</p> <p>Management: Plant cultivars that are less susceptible to disease. Include sulfur in the June, July and August sprays at the rate of 6 lb per 100 gallons or follow Pecan Spray Schedule. A regular scab spray program will manage powdery mildew.</p>
<p>Scab (<i>Cladosporium carpophilum</i>, <i>C. caryigenum</i>)</p>	<p>Symptoms: Early leaf infections produce pinpoint olive-brown lesions often on veins of undersides of leaves. Spots enlarge and coalesce until large areas of leaves may become almost black. Lesions on nuts are small, black and circular, slightly raised at first but later sunken. The entire surface of nuts of highly susceptible varieties may appear black from extensive infections.</p> <p>Source of Inoculum: Fungus may overwinter in infested shucks, leaf stems or leaves. The fungus is spread by windborne spores and is boosted by high humidity.</p> <p>Management: Knock off old shucks and stems before spring. Prune out low limbs to improve air circulation in orchard. Fungicides that control brown leaf spot also control brown leaf spot. Follow Pecan Spray Schedule.</p>
<p>Shuck dieback and stem end blight (<i>Phomopsis</i> spp. and other fungal pathogens)</p>	<p>Symptoms: Disease is more severe in overcrowded orchards or trees that are water or nutrient stressed. The shuck turns black and begins to die near the tip of the nut. The blackened area can spread over the entire shuck, and the shuck may flare open. Stem end blight begins as a brownish black spot on the shuck near the base of the nut. The black area enlarges to cover the entire nut and the nut is easily dislodged from its stem.</p>

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Table 1. Symptoms, source of inoculum and management of pecan diseases.	
Disease	
	<p>Source of Inoculum: Fungi overwinter is dislodged nuts.</p> <p>Management: Reduce tree stress by irrigating sufficiently to support the crop load. Thin trees to avoid overcrowding. No fungicides are effective at controlling shuck dieback and stem end blight.</p>
<p>Vein spot (<i>Gnomonia nerviseda</i>)</p>	<p>Symptoms: Spots (lesions) may originate on vein of leaflets or on leaf stem and are dark brown to black in final stages. On lateral veins, lesions are circular or oval and seldom attain a diameter of more than 1/4 inch. On midribs of leaflets and on leaf stems, spots are long and narrow. When the disease is severe, premature defoliation usually occurs.</p> <p>Source of Inoculum: Fungus lives through the winter on fallen leaves.</p> <p>Management: The pre-pollination spray and first cover sprays are essential for control.</p>
<p>Zonate leaf spot (<i>Cristulariella moricola</i>)</p>	<p>Symptoms: Grayish-brown spots on the upper surface of leaves. Leaf spots are light brown with dark margins on the underside of the leaf. Spots have a concentric ring formation that is more distinct on the leaf underside. Severely infected leaves dry and curl and drop from the tree. Severe defoliation of pecan trees occurs during rainy summers.</p> <p>Source of Inoculum: The fungus overwinters in resting bodies, called sclerotia, on plant debris. Leaf wetness in the spring initiates new infections.</p> <p>Management: No known cultivars are resistant to this disease. Remove wild hosts (i.e. hackberry, sassafras, Virginia creeper and poison oak) of the fungus from around the orchard. Prune lower branches to promote airflow and leaf drying. Follow Pecan Spray Schedule.</p>

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Table 2. Partial list of varieties of pecans and disease resistance profiles. Descriptions of additional cultivars are available at <http://cgru.usda.gov/CARYA/PECANS/>.

Disease-resistance categories: R = Resistant, T = Tolerant, S = Susceptible, VS = Very Susceptible and -=not known.

Cultivar	Pecan Scab	Other Diseases				
		Downy Spot	Powdery mildew	Shuck dieback	Vein spot	Zonate leaf spot
Caddo	T-S	-	S	-	-	-
Candy	R-T	-	-	-	-	S
Cape Fear	T-S	-	-	-	-	S
Creek	T	-	-	-	-	S
Desirable	S	-	-	-	-	S
Elliott	R	-	-	-	-	S
Excel	R	-	-	-	-	S
Gloria Grande	S	-	-	-	-	S
Jackson	T-S	-	-	-	-	S
Kanza	R	-	-	-	S	-
Kiowa	T-S	-	-	-	-	-
Mahan	VS	R	-	-	-	S
Melrose	T-S	-	-	T	-	-
Moreland	T	-	-	-	-	S
Schley	VS	R	-	S	-	S
Success	VS	R	-	S	-	S
Sumner	R-T	-	-	-	-	S
Western	VS	S	-	S	-	S

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Table 3. Seasonal fungicide spray schedule for pecans.

Season	Fungicide Application Timing	Disease
First pre-pollination	When leaves are at least 1 inch long	Anthraco nose Downy spot Scab Vein spot Zonate leaf spot
Second pre-pollination	When leaves have grown (or 10-14 days after first spray)	Anthraco nose Downy spot Scab Vein spot Zonate leaf spot
First cover spray	2-3 weeks after previous spray	Downy spot Scab Vein spot
Second cover spray	2-3 weeks after previous spray	Scab
Third cover spray	2-4 weeks after previous spray	Scab
Fourth cover spray	2-3 weeks after previous spray	Scab
Fifth cover spray ¹	3-4 weeks after previous spray	Scab
Sixth cover spray ²		Scab
¹ Sprays may be omitted during dry weather. ² Do not apply fungicides after shuck split.		

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Table 4. Recommended pesticides, rates and pesticide use restrictions for pecans.					
The symbol ^{OG} indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.					
Disease (Pathogen)	Product Choices¹ and Product Mode of Action Group²		Rate³	PHI⁴	Maximum Use
Anthracnose (<i>Colletotrichum</i> spp., <i>Glomerella cingulata</i>)	azoxystrobin				
	Abound	11	12 fl oz	45	73.8 fl oz
	Aframe	11	12 fl oz	45	73.8 fl oz
	Azaka	11	6-12 fl oz	45 ⁶	73.8 fl oz
	AzoxyStar	11	6-12 fl oz	45	73.8 fl oz
	Satori	11	6-12 fl oz	45	73.8 fl oz
	Willowood Azoxy 2SC	11	6-18.5 fl oz	14	49 fl oz
	Custodia	3, 11	8.6-17.2 fl oz	45 ⁶	69 fl oz
	Orius	3	4-6 fl oz	see footnote ⁶	32 fl oz
	Pristine	7, 11	10.5-14.5 oz	14	32 fl oz
	Quilt	11, 3	14-27.5 fl oz	45	58 oz
	Quilt Excel	11, 3	14-21 fl oz	45	122 fl oz
	Regalia	P5	0.5-1 qt	0	122 fl oz
	Stratego	3, 11	10 fl oz	30 ⁶	-
	tebuconazole + trifloxystrobin				
	Absolute 500SC	3, 11	5-7.7 fl oz	30	30 fl oz
	Adament 50WG	3, 11	4-8 oz	60	46 oz
	Topguard	3, 11	7-14 fl oz	14	32 oz
	Viathon	3, 33	2 pt (early season only)	see footnote ⁶	56 fl oz 16.5 pt
	Willow AzoxyProp	3, 11	14-21 fl oz	45 ⁶	115 fl oz
Ziram 76DF	M	6-8 lb	55	48.2 lb	
Brown leaf spot (<i>Cercospora</i> spp.)	Elast ⁵	M	3 pt	See footnote ⁶	18 pt
	Eminent VP	3	6-16 fl oz	30 ⁶	64 fl oz
	propiconazole ⁵				
	Banner MAXX	3	12 fl oz	See footnote ⁶	24 fl oz
	Bumper ES	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Procon-Z	3	12 fl oz	See footnote ⁶	32 fl oz
	Topaz	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Orbit	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Protocol	1, 3	1.3-2.5 pt	See footnote ⁶	7.5 pt
	tebuconazole ¹¹				
	Monsoon	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Onset 3.6L	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Orius 3.6F	3	4-8 fl oz	See footnote ⁶	32 fl oz
	thiophanate-methyl				
	85WDG	1	0.4-0.8 lb	1	2.5 lb
Topsin M 70WP	1	1 lb	See footnote ⁶	3 lb	

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Disease (Pathogen)	Product Choices¹ and Product Mode of Action Group²		Rate³	PHI⁴	Maximum Use
	Topsin XTRA 2 triphenyltin hydrozide	1, 3	25 fl oz	See footnote ⁶	See footnote ⁹
	Agri Tin	30	5-7.5 oz	30	45 fl oz
	Super Tin 80WP	30	5-7.5 oz	30	45 fl oz
	Viathon	3, 33	2-2.5 pt ⁷	See footnote ⁶	16.5 pt
Downy spot (<i>Mycosphaerella</i> spp.)	azoxystrobin + tebuconazole				
	Custodia	3, 11	8.6-17.2 fl oz	45	69 fl oz
	Elast ⁵	M	3 pt	See footnote ⁶	18 pt
	Enable 2F	3	8 fl oz	28 ⁶	1.5 qt
	Eminent VP	3	6-16 fl oz	30 ⁶	64 fl oz
	propiconazole ^{5,10}		4-8 fl oz	See footnote ⁶	32 fl oz
	Bumper ES	3	12 fl oz	See footnote ⁶	32 fl oz
	Procon-Z	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Topaz	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Orbit	3	1.3-2.5 pt	See footnote ⁶	7.5 pt
	Protocol	1, 3	8-14 fl oz	45	56 fl oz
	Quadris Top	11, 3	14-27.5 fl oz	45 ⁶	122 fl oz
	Quilt	11, 3	14-21 fl oz	45 ⁶	122 fl oz
	Quilt Excel	11, 3			
	tebuconazole ¹¹				
	Monsoon	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Onset 3.6L	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Orius 3.6F	3	4-8 fl oz	See footnote ⁶	32 fl oz
	thiophanate-methyl				
	85WDG	1	0.4-0.8 lb	1	2.5 lb
	Topsin M 70WP	1	1 lb	See footnote ⁶	3 lb
	Topsin XTRA 2	1, 3	25 fl oz	See footnote ⁶	See footnote ⁹
	Topguard	3	7-14 fl oz	14	56 fl oz
	triphenyltin hydrozide				
	Agri Tin	30	5-7.5 oz	30	45 oz
	Super Tin 80WP	30	5-7.5 oz	30	45 oz
	Viathon	33, 3	2-2.5 pt ⁷	See footnote ⁶	16.5 pt
	Willow AzoxyProp	3, 11	14-21 fl oz	30 ⁶	115 fl oz

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Disease (Pathogen)	Product Choices¹ and Product Mode of Action Group²	Rate³	PHI⁴	Maximum Use	
Powdery mildew (<i>Microsphaera alni</i>)	Actinovate ^{OG}		3-12 oz		
	Adament 50WG	3, 11	4-8 oz	60 ⁶	32 oz
	Enable 2F	3	8 fl oz	28 ⁶	1.5 qt
	Eminent VP	3	6-16 fl oz	28 ⁶	64 fl oz
	potassium phosphite				
	Fosphite	33	1-3 qt		
	K-Phite 7LP AG	33	1-3 qt		
	Rampart	33	1-3 qt		
	propiconazole ^{5,10}				
	Procon-Z	3	12 fl oz	See footnote ⁶	32 fl oz
	Topaz	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Orbit	3	1.3-2.5 pt	See footnote ⁶	7.5 pt
	Protocol	1, 3	4-8 fl oz	See footnote ⁶	32 fl oz
	Quadris Top	11, 3	8-14 fl oz	45	56 fl oz
	Quilt	11, 3	14-27.5 fl oz	45 ⁶	122 fl oz
	Quilt Excel	11, 3	14-21 fl oz	45 ⁶	122 fl oz
	sulfur				
	Microthiol Disperss	M	5-10 lb		
	tebuconazole				
	Monsoon	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Onset 3.6L	3	4-8 fl oz	See footnote ⁶	32 fl oz
	thiophanate-methyl				
85WDG	1	0.4-0.8 lb	1	2.5 lb	
Topsin M 70WP	1	1 lb	See footnote ⁶	3 lb	
Topsin XTRA 2	1, 3	25 fl oz	See footnote ⁶	See footnote ⁹	
Trilogy ^{OG}		1%			
triphenyltin hydrozide					
Agri Tin	30	5-7.5 oz	30	45 oz	
Super Tin 80WP	30	5-7.5 oz	30	45 oz	
Willow AzoxyProp	3, 11	14-21 fl oz	30 ⁶	115 fl oz	
Scab (<i>Cladosporium carpophilum</i> , <i>C. caryigenum</i>)	azoxystrobin				
	Abound	11	6-12 fl oz	45	73.8 fl oz
	Aframe	11	6-12 fl oz	45	73.8 fl oz
	Azaka	11	6-12 fl oz	45	73.8 fl oz
	Azoxystar	11	6-12 fl oz	45	73.8 fl oz
	Satori	11	6-12 fl oz	45	73.8 fl oz
	Willowood Azoxy 2SC	11	6-18.5 fl oz	14	49 fl oz
	Custodia	3, 11	8.6-17.2 fl oz	45	69 fl oz
	Double Nickel 55 ^{OG}		see label	0	see label
	Elast ⁵	M	3 pt	See footnote ⁶	18 pt

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The symbol ^{OG} indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

Disease (Pathogen)	Product Choices ¹ and Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use	
	Eminent VP	3	6-16 fl oz	30 ⁶	64 fl oz
	Enable 2F	3	8 fl oz	28 ⁶	1.5 qt
	Helena ProPhyt	33	2-3 pt		
	Pristine	7, 11	10.5-14.5 oz	14	58 oz
	propiconazole ^{5,10}				
	Bumper ES	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Procon-Z	3	12 fl oz	See footnote ⁶	32 fl oz
	Topaz	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Orbit	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Protocol	1, 3	1.3-2.5 pt	See footnote ⁶	7.5 pt
	Quash	3	2.5-3.5 oz	25	14 oz
	Quadris Top	11, 3	8-14 fl oz	45	56 fl oz
	Quilt	11, 3	14-27.5 fl oz	45 ⁶	122 fl oz
	Quilt Excel	11, 3	14-21 fl oz	45 ⁶	122 fl oz
	Regalia	P5	0.5-1 qt	0	-
	Sovran		2.4-4.8 oz ⁸	45	14.4 oz
	Stratego	3, 11	10 fl oz	30 ⁶	30 fl oz
	tebuconazole ¹¹				
	Monsoon	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Onset 3.6L	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Orius 3.6F	3	4-8 fl oz	See footnote ⁶	32 fl oz
	tebuconazole + trifloxystrobin				
	Absolute 500SC	3, 11	5-7.7 fl oz	30	46 fl oz
	Adament 50WG	3, 11	4-8 oz	60	32 fl oz
	thiophanate-methyl				
	85WDG	1	0.4-0.8 lb	1	2.5 lb
	Topsin M 70WP	1	1 lb	See footnote ⁶	3 lb
	Topsin XTRA 2	1, 3	25 fl oz	See footnote ⁶	See footnote ⁹
	Topguard				
	Trilogy ^{OG}	3	7-14 fl oz	14	56 fl oz
	triphenyltin hydrozide		1%		
	Agri Tin	30	5-7.5 oz	30	45 fl oz
	Super Tin 80WP	30	5-7.5 oz	30	45 fl oz
	Viathon	3, 33	2-2.5 pt ⁷	See footnote ⁶	16.5 pt
	Willow AzoxyProp	3, 11	14-21 fl oz	30 ⁶	115 fl oz
	Ziram 76DF	M	6-8 lb	55	48.2 lb
Vein spot (Gnomonia nerviseda)	azoxystrobin + tebuconazole				
	Custodia	3, 11	8.6-17.2 fl oz	45	69 fl oz

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Disease (Pathogen)	Product Choices ¹ and Product Mode of Action Group ²		Rate ³	PHI ⁴	Maximum Use
	Eminent VP	3	6-16 fl oz	30 ⁶	64 fl oz
	Enable 2F	3	8 fl oz	28 ⁶	1.5 qt
	propiconazole ^{5,10}				
	Bumper ES	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Procon-Z	3	12 fl oz	See footnote ⁶	32 fl oz
	Topaz	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Orbit	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Pristine	7, 11	10.5-14.5 oz	14	58 oz
	Protocol	1, 3	1.3-2.5 pt	See footnote ⁶	7.5 pt
	Quadris Top	11, 3	8-14 fl oz	45	56 fl oz
	Quilt	11, 3	14-27.5 fl oz	45 ⁶	122 fl oz
	Quilt Xcel	11, 3	14-21 fl oz	45 ⁶	122 fl oz
	tebuconazole ¹¹				
	Monsoon	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Onset 3.6L	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Orius 3.6F	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Topsin XTRA 2	1, 3	25 fl oz	See footnote ⁶	See footnote ⁹
Viathan	3, 33	2-2.5 pt ⁷	See footnote ⁶	16.5 pt	
Willow AzoxyProp	3, 11	14-21 fl oz	30 ⁶	115 fl oz	
Zonate leaf spot (<i>Cristulariella moricola</i>)	copper hydroxide				
	Badge X2 ^{OG}	M	0.75-1.75 lb	See footnote ⁶	1.6 lb
	Champ Formula 2FL	M	1.33-2.66 pt	See footnote ⁶	23.2 pt
	Kocide 3000	M	0.75-1.75 lb	See footnote ⁶	28 lb
	copper sulfate				
	Cuprofix Ultra 40	M	1.25-2.5 lb	See footnote ⁶	21 lb
	Custodia	11, 3	8.6-17.2 fl oz	45 ⁶	69 fl oz
	Eminent VP	3	6-16 fl oz	30 ⁶	64 fl oz
	propiconazole				
	Amtide 41.8EC	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Banner MAXX	3	12 fl oz	See footnote ⁶	24 fl oz
	Bumper 41.8EC	3	4 fl oz	See footnote ⁶	32 fl oz
	Bumper ES	3	4 fl oz	See footnote ⁶	32 fl oz
	Topaz	3	4-8 fl oz	See footnote ⁶	32 fl oz
	Protocol	3, 1	1.3-2.5 pt	See footnote ⁶	7.5 pt
	Quadris Top	11, 3	8-14 fl oz	45	56 fl oz
	Quilt XCEL	11, 3	14-27.5 fl oz	45 ⁶	122 fl oz
Quilt	11, 3	14-21 fl oz	45 ⁶	122 fl oz	
tebuconazole ¹¹					
Monsoon	3	4-8 fl oz	See footnote ⁶	32 fl oz	
Onset 3.6L	3	4-8 fl oz	See footnote ⁶	32 fl oz	

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The symbol ^{OG} indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.					
Disease (Pathogen)	Product Choices ¹ and Product Mode of Action Group ²		Rate ³	PHI ⁴	Maximum Use
	Orius 3.6F	3	4-8 fl oz	See footnote ⁶	32 fl oz
	thiophanate-methyl 85WDG	1	0.4-0.8 lb	1	2.5 lb
	Topsin M 70WP	1	1 lb	See footnote ⁶	3 lb
	Topguard	3	7-14 fl oz	14	56 fl oz
	Topsin XTRA 2	1, 3	25 fl oz	See footnote ⁶	See label
	Viathan	3, 33	2-2.5 pt ⁷	See footnote ⁶	16.5 pt
	Willow AzoxyProp	3, 11	14-21 fl oz	30 ⁶	115 fl oz

¹Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter.

²Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³Rates are the amount of formation per acre unless otherwise indicated. Usually 100 gallons of water are required to give good coverage with boom sprayers.

⁴Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵Do not apply to trees that will bear fruit within 12 months.

⁶Do not apply after shuck split.

⁷Use 2 pt per acre early in the season and 2-2.5 pt per acre post pollination.

⁸Use 2.4-3.2 oz per acre pre-pollination and 3.2-4.8 oz post-pollination.

⁹Do not exceed a total application of 2.1 lb a.i. thiophanate-methyl and 0.9 lb a.i. tebuconazole per year.

¹⁰Also registered are: Propensity 1.3ME, Propicure 3.6F, Strider and Willowood Propican 3.6EC.

¹¹Also registered are: Tebu-Crop 3.6F, Tebuzol and Topaz.

Information in this section was last updated in December 2018 by Dr. R. Singh.