

Christmas Tree Disease Control Recommendations, 2015

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As we continually gain insight into pesticide and pest interactions, we have the opportunity to greatly improve the efficacy of our management practices. In order to optimize environmental and economic sustainability we have to understand the lifecycles of the pathogens in our Christmas tree fields and also the pesticides used to treat them. Monitoring temperature and wetting events is another critical part of managing disease and can assist in estimating when pathogens are likely present and able to cause infection. Real time and historical weather data and pest models are available via Michigan State University (MSU) at the Enviroweather website found at www.enviroweather.msu.edu.

The information presented here is intended as a guide for Michigan Christmas tree growers in selecting pesticides for use on trees grown in Michigan and is for educational purposes only. The efficacies of products listed may not been evaluated in Michigan. Reference to commercial products or trade names does not imply endorsement by Michigan State University Extension or bias against those not mentioned. Information presented here does not supersede the label directions. To protect yourself, others, and the environment, always read the label before applying any pesticide. Although efforts have been made to check the accuracy of information presented (January 2015), it is the responsibility of the person using this information to verify that it is correct by reading the corresponding pesticide label in its entirety before using the product. Labels can and do change—greenbook.net, cdms.com, and agrian.com are free online databases for looking up label and MSDS information.

Disease	Pathogen	Cultural control	Chemical control	Comments	Reference page ¹ (2nd/3rd)
Armillaria Root Rot <i>Armillaria spp.</i>	All species	Choose a site that is well suited to the growth needs of the desired species. If possible avoid planting on cutover sites, especially those that were red pine, Douglas-fir and other Christmas tree species. If possible, remove stumps and large roots before planting. Maintain healthy, vigorous trees.	Trichoderma asperellum	Efficacy has not been evaluated in Christmas tree fields in Michigan where <i>Armillaria</i> natively occurs. <i>Trichoderma asperellum</i> is a biological fungicide for use in nursery planting mix, bareroot dip, when transplanting ornamentals or a soil drench to protect plants from root pathogens.	114/138
Balsam Fir Needle Rust <i>Uredinopsis spp.</i> and <i>Milesina spp.</i>	Balsam and white fir, potentially Fraser fir	Control is usually not necessary because weather conditions and competition from other fungi keep the damage below serious levels. However, in Christmas tree plantations, disease can cause economic loss.	triadimefon	Some formulations containing triadimefon may be registered but keep in mind that these products are best used preventatively. apply at bud break and 10-14 day intervals. The necessity for control will depend on the level of disease. If disease incidence is high, mow or use a registered herbicide to control ferns which are the source of spores, this will reduce disease in subsequent years. Do not use triadimefon on <i>Abies concolor</i>.	26/42

Broom Rust of Fir <i>Melampsorella caryophyllacearum</i>	Balsam, Fraser and white fir	Remove diseased trees through selective thinning. Infected branches can be pruned from high value trees. Inspect nursery crop and survey new planting areas for broom rust in native balsam or fir trees.	myclobutanil ziram	Typically, removing infected branches or trees will eliminate the problem. To break the life-cycle and control the spread of this disease, eradicating the chickweed is essential. Commercial growers should look for chickweed in the groundcover, between the rows and throughout the planting so it can be controlled where necessary.	77/93
Brown Spot Needle Blight <i>Mycosphaerella dearnessii</i>	Scotch pine	Cultural -Remove severely diseased trees and treat surrounding area with fungicides. Promote good air circulation through pruning and weed control. Shear healthy trees before shearing infected trees. Pruning tools should be sterilized between trees. Avoid shearing infected trees when the foliage is wet. Do not leave live branches on the stumps of harvested trees.	chlorothalonil copper hydroxide copper sulfate mancozeb thiophanate-methyl	Make first application when needles are 1/2 elongated and the second application about 3 weeks later. Repeat after heavy rains and at two week intervals as long as needed.	31/34
Charcoal Rot <i>Macrophomina phaseolina</i>	Fraser fir, spruce	Charcoal rot is a disease that occurs when plants are under heat and drought stresses. Irrigate trees where available to help reduce drought stress. Avoid planting soybeans as a rotational crop.		At this point, no information is available on the effectiveness of fungicides for control of this disease.	NA
Cyclaneusma Needlecast <i>Cyclaneusma minus</i>	Scotch pine	Usually doesn't warrant control efforts. In problem plantations, control weeds and maintain tree spacing to maximize air movement.	chlorothalonil copper hydroxide copper sulfate mancozeb	Many fungicides have shown activity protecting needles from infection. The long and unpredictable infection periods requires multiple applications throughout the growing season to control this disease. In some cases, these application have achieved control but do not improve the tree grade or density of the foliage. Pines typically hold 1-2 years of growth and other factors controlling needle retention may cause heavy needle casting in the fall regardless of levels of infection.	32/35

Cytospora (Leucostoma) Canker <i>Leucostoma kunzei</i>	Spruce, especially Colorado blue and Norway	Remove infected branches. Do not prune or shear infected trees during wet weather. Maintain tree vigor and do not plant trees on marginal sites. Avoid wounding the trees. Harvest as quickly as possible.		At this point, there are no effective chemical controls for Leucostoma canker (Cytospora canker).	83/104
Diplodia Shoot Blight and Canker <i>Diplodia pinea</i>	Red, Scotch, and Austrian pine. Occasionally Colorado blue spruce and Douglas-fir	Do not allow water stress and maintain tree vigor and prevent injury through insect control. Do not shear infected trees during wet weather. Prune out infected branches and sanitize pruning tools between cuts.	azoxystrobin mancozeb* myclobutanil thiophanate-methyl triadimefon	Diplodia tip blight can be controlled with one to three applications of an effective fungicide. Time your application at bud break (candle elongation). Repeat 10-14 days later, just before needles emerge from sheath. Repeat again 10-14 days after needle emergence.	98/96
Dothistroma Needle Blight <i>Dothistroma septosporum</i>	Austrian pine, potentially Scotch pine	Provide for air circulation around the tree by decreasing planting density and controlling weeds which block air movement. Do not plant low lying or cooler areas with susceptible pine.	chlorothalonil copper sulfate copper hydroxide	Two fungicide applications are recommended to control Dothistroma. Apply at bud break to protect the previous year's needles and one in mid June to protect the current year's needles. Some have reported controlling Dothistroma with one application in June.	33/36
Gall Rust (Pine/Pine or Western) <i>Endocronartium harknessii</i>	Scotch pine	Remove branch galls and heavily galled trees before May 1 (before they produce spores). Purchase clean planting stock. Replant infested sites with non host species.	triadimefon mancozeb myclobutanil	In research trials, fungicide application provided fair to poor control. Repeat mancozeb applications after heavy rains and at two week intervals as long as needed.	108/130
Interior Needle Blight <i>Mycosphaerella spp.</i> , <i>Phraeocryptopus nudus</i> , <i>Phyllosticta abietina</i> , <i>Toxosporium spp.</i> , <i>Rhizosphaera spp</i>	Grand and noble fir	Use practices that increase air circulation (e.g. weed control), decreasing needle wetness is beneficial. Do not interplant the next rotation before the current rotation of trees has been completely harvested.	chlorothalonil	Applications of fungicides to new growth on affected Christmas trees during spring has increased the percentage of healthy older green needles. Make the initial application when shoots are 1 1/2 to 2 1/2 inches long, followed by an additional application about 3 to 4 weeks later if conditions are variable for disease development. Applications are not needed in harvest year, especially for clear-cut operations.	

Isthmiella Needlecast <i>Isthmiella faullii</i>		Promote good air movement by controlling weeds and pruning lower branches. Shear healthy trees first and disinfect tools often. Do not shear during wet weather. Space trees adequately and do not interplant rotations. Plant clean nursery stock.	mancozeb*	Time fungicide application to protect current needles during spores released from infected needles during rainy periods in June - August.	NA/44
Lirula Needlecast <i>Lirula nervata and Lirula mirabilis</i>	Balsam, Fraser and white fir	Promote good air movement by controlling weeds and pruning lower branches. Shear healthy trees first and disinfect tools often. Do not shear during wet weather. Space trees adequately and do not interplant rotations. Plant clean nursery stock.		At this point, no information is available on the effectiveness of fungicides for control of this disease.	38/44
Lophodermium Needlecast <i>Lophodermium seditiosum</i>	Scotch pine, red pine, Austrian, and Eastern White Pine	Choose seed sources that are less susceptible and disease free nursery stock. Avoid prolonged periods of moisture and promote good air circulation by irrigating in the morning, controlling weeds and pruning lower branches. Shear healthy trees first and disinfect tools often. Do not shear during wet weather. Do not leave live branches on cut stumps.	azoxystrobin chlorothalonil mancozeb triadimefon	The most important time to protect trees is in August and September. Begin application to coincide with spore release beginning the end of July and through September. For most plantations, two applications, one about August 1 and the other about September 1 will give adequate control. If the weather in the late fall is unusually wet an additional application may be required. If using mancozeb, repeat after heavy rains and at two week intervals as long as needed.	40/46
Phomopsis twig blight and canker <i>Phomopsis spp.</i>	Colorado blue spruce, occasionally white spruce and Norway spruce	Cultural management of plant vigor can help reduce damage caused by plant pathogens, because wounds, water stress and the presence of other pest play important roles in plant susceptibility to infection and disease development. Remove diseased branches and trees as soon as possible.	mancozeb* thiophanate-methyl	Apply fungicides to protect spruce during periods of maximum susceptibility. Fungicide sprays should be timed to protect the new growth from fungal infection and to suppress the development of existing infection sites. A series of applications of protectant fungicides should start at the first indication of bud break and continue at approximate 3 week intervals until the new shoots are fully developed and hardened off.	NA/108

Phytophthora Root Rot <i>Phytophthora cinnamomi</i> , <i>P. cactorum</i> , <i>P. citricola</i> , <i>P. cryptogea</i> , and <i>P. nicotiana</i> among other species	Various species of the fungus <i>Phytophthora</i> are present throughout the United States and are known to infect fir, spruce, and pine trees.	Do not plant on heavy soil or poorly drained sites. Watch for hardpans that hold water 12-16 inches below soil surface. Prevent introduction of <i>Phytophthora</i> by inspecting stock before planting and clean equipment and tools regularly to prevent movement. Rotate your species.	aluminum tris fluopicolide mefenoxam metalaxyl mono and di-potassium salts of phosphorous acid potassium phosphite Trichoderma asperellum	Fungicides will not overcome poor planting sites such as those prone to flooding or are poorly drained. Applications of selective systemic fungicides are used in nurseries. Use in Christmas tree plantations may not be practical or economical. Mefenoxam can be used as a dip, drench or foliar treatment. Read label for details. For best metalaxyl efficacy, 1/2 - 1 inch of irrigation or rainfall is required within 24 hours after application.	116/142
Pine Needle Rust <i>Coleosporium asterum</i>	Scotch and red pine	Avoid planting on sites with poor air circulation and kill tall weeds, aster and goldenrod prior to planting.		Remove goldenrod and aster before August in and around infected plantations by mowing or applying a herbicide.	42/48
Rhabdocline Needlecast <i>Rhabdocline pseudotsugae</i>	Douglas-fir	Plant disease-resistant seed sources of Douglas-fir such as Shuswap. Remove severely affected trees early in the rotation or older trees in fence rows to prevent disease buildup by May 1. Improve air circulation by spacing plants for good air circulation and controlling weeds around the base of trees. Remove and destroy infected trees from Christmas tree plantations. Avoid using east-side and Rocky Mountain seed sources and purchase disease free nursery stock. Do not shear during wet weather. Shear healthy trees first and sanitize tools often. Do not leave live branches on the stumps of harvested trees.	chlorothalonil mancozeb copper hydroxide copper sulfate thiophanate-methyl	Start applying fungicides when trees are 4-5 years away from harvest. Since trees do not break bud at the same time and fungal infection occurs quickly, apply when first buds break, a second spray one week later, and a third spray two weeks after the second. A fourth application may be required three weeks after the third application if wet weather persists.	46/53

Rhizosphaera Needlecast <i>Rhizosphaera kalkhoffii</i> and <i>Setomelanoma holmii</i>	Colorado blue spruce, occasionally white spruce	Remove severely affected trees early in the rotation to prevent disease buildup or older trees in fence rows. Provide adequate space between trees to increase air movement around lower branches allowing the foliage to dry more quickly. Do not leave live branches on the stumps of harvested trees. Do not shear during wet weather. Shear healthy trees first and disinfect tools often.	chlorothalonil copper hydroxide copper sulfate mancozeb*	Phytotoxicity can occur when spraying chlorothalonil on spruce at higher rates and with airblast sprayers. Begin application when the new growth is 1/2 to 2" long. Make additional applications at 3-4 week intervals until conditions no longer favor disease development. For control to be successful it may take 2-3 years of yearly fungicide applications.	48/55
Scleroderris Canker <i>Gremmeniella abietina</i>	All pines; occasionally spruces, firs, and Douglas-fir.	Remove infected branches. Do not shear during wet weather and sterilize tools often. Shear healthy trees first.	chlorothalonil	Begin application when the new growth is 1/2 to 2" long. Make additional applications at 3-4 week intervals until conditions no longer favor disease development.	97/117
Sirococcus Tip Blight <i>Sirococcus spp.</i>	Red and Scotch pines, Colorado blue spruce, occasionally white spruce	Remove and destroy heavily infected trees. Do not shear during wet weather.	azoxystrobin chlorothalonil triadimefon	Begin application when the new growth is 1/2 to 2" long. Make additional applications at 3-4 week intervals until conditions no longer favor disease development.	NA/118
Spruce Needle Rust <i>Chrysomyxa spp.</i>	Black, white, and Colorado blue spruce; occasionally Norway spruce.	Control is not typically warranted because disease rarely occurs in consecutive seasons. Remove and destroy alternate hosts near to plantation. Plant resistant species of spruce, such as Norway or Black Hills. White spruce is moderately resistant, but black and Colorado blue spruce are extremely susceptible.		At this point, no information is available on the effectiveness of fungicides for control of this disease. Avoid planting spruce near swamps that contain Labrador tea and leather leaf.	50/58
Stigmina Needlecast <i>Stigmina lautii</i> Recent research suggests this fungus is very closely related to <i>Phaeocryptopus gäumannii</i>	Colorado Blue spruce, Serbian spruce, white spruce	Promote good air movement through weed control and pruning lower branches. Do not leave live branches on the stumps of harvested trees. Do not shear during wet weather. Shear healthy trees first and sanitize tools often. The Christmas Tree Pest Manual page referenced is for <i>Rhizosphaera</i> needlecast which is believed to be comparable to <i>Stigmina</i> needlecast.	chlorothalonil copper hydroxide copper sulfate mancozeb*	Products that control <i>Rhizosphaera</i> also control of <i>Stigmina</i> . Begin application when the new growth is 1/2 to 2" long. Make additional applications at 3-4 week intervals until conditions no longer favor disease development. Research in North Dakota indicates that fungicide applications may need to be applied yearly to be successful.	48/55

Swiss Needlecast <i>Phaeocryptopus gäumanni</i>	Douglas-fir	Remove severely affected trees early in the rotation to prevent disease buildup or older trees in fence rows. Improve air circulation in fields. To increase air movement, provide adequate space between trees, control weeds and prune lower branches. Do not shear in wet weather and sterilize tools often. Do not leave live branches on stumps of harvested trees.	azoxystrobin chlorothalonil mancozeb thiophanate-methyl	Begin applying fungicides for control beginning 3 years before you plan to harvest the trees. Needle infection occurs shortly after bud break, so you will want to time your application to protect these new needles from infection. Begin application when the new growth is 1/2 to 2" long. Make additional applications at 3-4 week intervals until conditions no longer favor disease development. Labels list a single application at a higher rate. Remember when treating it is better to be on the early side than too late. Repeat mancozeb applications after heavy rains and at two week intervals as long as needed.	52/60
Weir's cushion rust <i>Chrysomyxa weirii</i>	Colorado blue, Engelmann and white spruce	Remove severely affected trees early in the rotation to prevent disease buildup or older trees in fence rows. Provide adequate space between trees to increase air movement around lower branches allowing the foliage to dry more quickly.	chlorothalonil	Begin when bud break is about 10% complete. Two more applications should be made at 7 to 10 day intervals.	NA/58
White Pine Blister Rust <i>Cronartium ribicola</i>	White pine	When shearing Christmas trees, prune off all brown branches that have cankers to prevent the fungus from entering the trunk and killing the tree. Destroy and remove trees with trunk cankers.		At this point, no information is available on the effectiveness of fungicides for control of this disease. Remove and destroy alternate hosts (gooseberry or currant) in or near the plantation before August.	100/120

1. Christmas Tree Pest Manual, Second and Third Edition (Michigan State University Extension Bulletin E-2676)

*Mancozeb labels can be variable; some labels contain recommendations for pathogens or tree species that are not found on all mancozeb labels. Make sure to check the label for a specific pest or tree species to be certain that the product is labeled.

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