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PEST MANAGEMENT GUIDE 9

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BLACKSBURG, VIRGINIA

Control of Insects, Diseases, and Weeds in Christmas Tree Plantations

EXTENSION DIVISION



VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

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KEYS TO PROPER USE OF PESTICIDES

1. Read the label on each pesticide container before each use. Follow instructions to the letter; heed all cautions and warnings, and note precautions about residues.
2. Keep pesticides in the containers in which you bought them. Put them where children or animals cannot get to them, preferably under lock and away from food, feed, seed, or other material that may become harmful if contaminated.
3. Dispose of empty containers in the manner specified on the label.

SEE YOUR DOCTOR IF SYMPTOMS OF ILLNESS OCCUR DURING OR AFTER USE OF PESTICIDES.

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INSECTS-CHRISTMAS TREES

John A. Weidhaas, Jr.

Early detection of insect pests is the key to prevention of serious damage and losses in Christmas tree plantations. Effective control depends on the timely and thorough application of recommended control measures. Growers should be knowledgeable about the more common, injurious insects and mites - their recognition, host plants, damage, seasonal development, and habits. Control measures applied improperly or at other than the proper period in the season are ineffective and a waste of time, materials, and labor.

The recently amended Federal Insecticide, Fungicide, and Rodenticide Act makes it illegal for anyone to use any pesticide inconsistent with the instructions for use that are on the label of the product being applied. The pest and the plant to be treated must be included in the directions on the label of the pesticide product you are applying, and the specified target pest must be present or reasonably expected to be present, or the treatment is in violation of the law.

Amounts of pesticide to use in preparing sprays or applying treatment are specified in this control, even so, they should be determined from the label on the container of the pesticide. Be sure to read ALL of the directions and precautions on the label before and at the time of application of each treatment. Use ONLY the recommended amounts of the formulation. Failure to follow label directions, improper timing, use of excessive amounts of chemical, and treatments for pests not specified on the label may constitute a misuse of pesticides.

Major insects and mites infesting Christmas trees.

Insects and mites vary in their host preferences and their severity on different hosts. The following list of pests associated with each type of tree is an aid in identifying potentially damaging species. The pests are listed in order of importance and occurrence generally. Most insects and the spruce mite tend to be localized on scattered trees rather than uniformly distributed through plantations.

BALSAM FIR	FRAZER FIR	SCOTS PINE
balsam woolly aphid	balsam woolly aphid	pine tip moth
	aphids	pine needle scale
BLUE (AND SITKA) SPRUCE	spruce mite	pine tortoise scale
cooley spruce gall aphid		pine bark aphid
spruce mite	NORWAY SPRUCE	sawflies
white pine weevil	spruce mite	pales weevil
sawflies	white pine weevil	pine webworm
DOUGLAS FIR	eastern spruce gall aphid	aphids
cooley spruce gall aphid	aphids	spittlebug
spruce mite	pine needle scale	
white pine weevil	sawflies	VIRGINIA PINE
		Virginia pine sawfly
EASTERN WHITE PINE	RED PINE	pine tip moth
white pine weevil	pine tip moth	pales weevil
pales weevil	sawflies	
white pine aphid	pine root collar weevil	WHITE FIR
pine bark aphid	northern pine weevil	aphids
sawflies		WHITE SPRUCE
bagworm		spruce mite
pine needle scale		white pine weevil
		sawflies

Pest	Where and When to Apply Control	Control	Remarks
APHIDS (general) white pine aphid	Small winged or non-winged aphids may occur on twigs and/or needles throughout the season, especially in the spring and in fall.	chlorpyrifos or diazinon or malathion or oxydemeton-methyl (Metasystox-R=MSR)* or dimethoate (DeFend, Cygon)	Continual surveillance of plants is necessary since aphids fly in to reinfest plants throughout the season. Re-entry time for fields treated with MSR is 48 hours.

*DO NOT RE-ENTER SPRAYED AREA WITHIN 48 HOURS WITHOUT PROTECTIVE CLOTHING.

INSECTS-CHRISTMAS TREES

Pest	Where and When to Apply Control	Control	Remarks
balsam woolly aphid	Swollen or gouty twigs and crotches indicate infested trees. Aphids are present and lay eggs during June and in the fall. Egg-laying is indicated by production of white cottony masses by adults. Treatments should be applied prior to egg-laying on symptomatic and nearby trees.	no insecticide is labeled for this use.	Lindane has been effective and recommended by the USDA and various states, but currently is not registered for this use.
pine bark aphid	White cottony masses on bark of trunk, branches, and at bases of needles. Overlapping generations occur during the spring and fall. Dormant oil treatments should be applied in March. Other insecticides should be applied 2-3 times at 10-day intervals beginning in mid-April.	diazinon or malathion or lindane or endosulfan. Also, petroleum oil as dormant spray.	Strong spray streams are helpful in washing off the aphids and cottony masses. For a few infested trees, hosing clean with water alone may be effective.
spruce gall aphids	On douglas fir, white cottony patches occur on yellowed spots in the needles. No galls are produced. On blue spruce, pineapple-shaped galls are formed terminally on twigs. On Norway spruce, galls form at the bases of twigs. Spray the entire tree prior to April 1 on the production of cottony masses on the needles or at the bases of the new buds.	diazinon or malathion or lindane or endosulfan (Thiodan)	Cooley spruce gall aphid occurs in Virginia on douglas fir. Cooley and eastern spruce gall aphids are rare on spruces in the State.
BAGWORM	Overwintering eggs inside "bags" on plants hatch in late May or early June. Use insecticide sprays during June with one application. Not effective in late season when larvae are larger. From July until early May, "bags" may be removed and burned where light infestations involve relatively few trees.	<u>B. thuringiensis</u> or diazinon or malathion or carbaryl or dimethoate (DeFend, Cygon) remove and burn "bags" with larvae or eggs.	Sprays applied later may help reduce the infestation, but will give poor control. Bags dropped on the ground can result in egg hatch and infestation.
PALES WEEVIL	Adults move to freshly cut stumps, logs, slash in May to lay eggs. Larvae feed on the bark of the stump, roots, logs, and slash until the following spring. Adults emerge in May and feed on tree bark of newly planted seedlings as well as the lateral branches of healthy trees. Before planting, new tree should be dipped down to and including the root collar only. Keep bundles loose enough to allow thorough penetration of the bundles. Apply treatment as a full-coverage foliar spray immediately after planting. Thoroughly wet seedlings to the point of runoff. Use a 2% spray (5 1/3 fl. oz. per gal. of water). Apply 4 Flowable-clay slurry to roots of seedlings prior to transplanting, using kaolin clay. (See label for directions to prepare slurry) at transplanting, apply 10% Granules in a 6" radius area on the soil around each seedling. Cover granules with soil.	no insecticide is labeled for this use. phosmet (Imidan) carbofuran (Furadan) chlorpyrifos (Dursban) carbofuran (Furadan)	BHC and lindane have been effective in treating stumps, but are not currently registered for this use. dip and swish bundles for 10-15 seconds, drain and allow to dry before planting. Wear rubber gloves during treatment and planting. An extender such as Nu-Film or Plantgard may extend the residue longer on the plants. do not use in excess of 6 gallons per acre. Read precautions carefully - toxic to fish, birds, and other wildlife and highly toxic to bees. thoroughly coat the roots and keep moist until transplanted. Furadan is extremely toxic. Follow all precautions. Do not use at planting if seedlings were treated with Furadan 4F.

INSECTS-CHRISTMAS TREES

Pests	Where and When to Apply Controls	Control	Remarks
PINE TIP MOTH	Three overlapping generations occur during the season. Adults begin laying eggs in mid-April. Eggs are laid on twigs and needles and larvae bore first into needles and then new shoots.	dimethoate (DeFend,Cygon)	Spray entire tree to runoff. This spray is systemic and is trans-located from foliage to new growth. Treat in mid-late April and again in late May to early June.
PINE WEBWORM	Larvae feed on foliage and construct a web of silk and droppings that is usually evident on the stem after most damage has been done and larvae have dropped to the ground to pupate. Sprays should be applied when webs are just beginning to form. The timing for this occasional pest is not well known, but may start in late July or early August.	diazinon	There have been reports of larvae and webbing in June, indicating a possible early generation. Spray the foliage thoroughly.
SAWFLIES	Eggs may be laid on the needles or inserted into the needles. Virginia pine sawfly has one generation each year in early spring; spray in mid-to-late April. Red-headed pine sawflies and other species may occur at various times in the season; spray when seen.	malathion or carbaryl (Sevin) or methoxy-chlor	Sawflies are usually spotty; colonies infest branches or individual trees, here and there, unpredictably. Regular checking of trees for evidence of young sawflies is important. Spot treatments of infestations is often sufficient.
SCALE INSECTS	Pine needle scale - overwintering eggs hatch from mid-to-late May. Eggs of the summer generation hatch in late July. Sprays should be applied after most crawlers have emerged (May 20-25, July 20-25).	malathion or carbaryl or diazinon or oxydemeton methyl * (Metasystox R) or methidathion (Supracide)	Thorough applications of full coverage sprays are essential. Re-entry time for fields treated with MSR is 48 hours.
	overwintering eggs beneath females on needles	dormant oil and ethion	Do not spray oil on spruces or douglas fir
	Pine tortoise scale - Immature females overwinter and eggs are laid in June. Crawler activity is at a peak in mid to late June. Treat June 20-25.	malathion or diazinon or carbaryl or methidathion (Supracide)	Wet the bark of twigs and branches thoroughly.
	overwintering immature females on twigs and branches.	dormant oil or dormant oil and ethion	Do not spray oil on spruces or douglas fir. Be sure to wet the bark thoroughly on twigs and branches.
SPRUCE MITE	Chlorotic stippling of the foliage, often associated with webbing, occurs on the needles. Treat during late April or early May, and/or in September and early October. Sprays during mid-summer may not be as effective.	dicofol (Kelthane)	Mites can build up rapidly and are cool weather pests. Do not wait until damage is severe to apply control.
WHITE PINE WEEVIL	Adult weevils emerge in the spring after periods of temperatures in the 70's. They attack only the upright terminals. Treat only the main leader down to the first whorl. Thorough coverage of all the bark is essential. Treat prior to April 10.	lindane (4T in 3 gals.)	Addition of a spreader-sticker is suggested.
		oxydemeton methyl* (Metasystox-R)	Apply 1% spray (see label). Wear protective clothing and a respirator. Do not apply by mist blower or aircraft. Re-entry time for fields treated with MSR is 48 hours.

* DO NOT RE-ENTER SPRAYED AREA WITHIN 48 HOURS WITHOUT PROTECTIVE CLOTHING.

INSECTS-CHRISTMAS TREES

REFERENCE GUIDE TO PESTICIDES RECOMMENDED

TRADE NAMES	LD50 (Mg/kg)		TYPE	CHEMICAL NAME	FORMULATIONS	AMOUNT TO USE	
	Oral	Dermal				100 gal.	3 gal.
<u>B. thuringiensis</u> Dipel	exempt		B	<u>Bacillus thuringiensis</u>	3.2% SP	½-1 lb.	1½-3 T.
Biotrol 16K					3.2% WP	½-1½ lb.	1½-4½ T.
carbaryl (Sevin)	850	4000	C	1-Naphthyl N-methyl- carbamate	50% WP	2 lb.	6T.
		80% SP			1¼ lb.	3 ¾ T.	
		Sevimol			1 qt.	3 T.	
carbofuran (Furadan)	5	6900	C	2, 3-dihydro-2, 2- dimethyl-7-benzofuranyl methylcarbamate	4F	See pales weevil	
		10 G			1 tsp. per seedling		
chlorpyrifos (Dursban M)	163	2000	OP	0,0-Diethyl 0-(3,5,6- trichloro 2-pyridyl) phosphorothioate	41.2% EC	See pales weevil	
		22.4%			1 pt.	1 T.	
diazinon	400	900	OP	0,0-Diethyl 0-(2-iso- propyl-4-methyl-6- pyrimidinyl) phos- phorothioate	50% WP	1 lb.	3 T.
		AG 500, 4E (48% EC)			1 pt.	1 T.	
		Spectracide 25.0% EC			1 qt.	2 T.	
dicofol (Kelthane)	1100	1230	CH	1,1-Bis (chlorophenyl) 2,2,2-trichloroethanol	35% WP	1-1/3 lbs	4½ T.
dimethoate (DeFend)	371	650	OP	0,0-Dimethyl S-(N- methylcarbamoyl-methyl) phosphorodithioate	2.67 E	3 pts.	3 T.
(Cygon)					2 E	2 qts.	4 T.
dormant oil (Scalecide) (Volck) (Superior)	exempt		-	highly refined petroleum oil: 70-second viscosity; minimum Unsulfonated Residue-92%; paraffinic type	98% miscible	1-2 gal.	½-1 C.
endosulfan (Thiodan)	110	395	CH	6,7,8,9,10,10-Hexachloro- 1,5,5a,6,9,9a-hexahydro- 6,9-methano-2,4,3-benzo (e)-dioxathiepin-3-oxide	50% WP	1 lb.	3 T.
ethion-oil	96	115	OP	60 sec. visc., UR 92%; plus 0,0,0',0'-tetra- ethyl S,S'-methylene bis (phosphorodithioate)	+ 98% miscible (includes 2% ethion)	2 gal.	1 C.
lindane --	125	1000	CH	Gamma isomer of 1,2,3,4, 5,6-hexachlorocyclo- hexane	20% EC	1 qt.	2 T.
malathion (Cythion)	1375	4444	OP	0,0-Dimethyl S-(1,2- dicarbethoxyethyl) phosphorodithioate	25%	1 lb.	3 T.
		57% EC			1½ pts.	1½ T.	
methidathion (Supracide)	25	375	OP	0,0-dimethyl phosphoro- dithioate, S-ester with 4-(mercaptomethyl)- 2-methoxy-1,3,4-thia- diazolin-5-one	2E (24.4% EC)	1 qt.	2 T.

INSECTS-CHRISTMAS TREES

TRADE NAMES	LD50 (Mg/kg)		TYPE	CHEMICAL NAME	FORMULATIONS	AMOUNT TO USE	
	Oral	Dermal				100 gal.	3 gal.
methoxychlor	6000	6000	CH	1,1,1-Trichloro-2,2-bis (p-methoxyphenyl) ethanol	2EC	3 qt.	6 T.
oxydemeton methyl (Metasystox-R) (MSR)	65	250	OP	S-2 [(Ethylsulfinyl) ethyl] 0,0-dimethyl phosphorothioate	2E	1 qt.	2 T.
phosmet (Imidan)	300	-	OP	N-(Mercaptomethyl) phthalimide S-(0, 0-dimethylphosphoro- dithioate	50% WP	Use a 4% dip as directed on the label.	
trichlorfon (Dylox)	450	2000	OP	Dimethyl (2,2,2- trichloro-1-hydro- xyethyl) phos- phonate	80% SP	1½ lbs.	3 3/4 T.
					4E	2-3 pts.	2-3 T.

Abbreviations: B-bacteria, C-carbamate, CH-chlorinated hydrocarbon, OP-organic phosphate, E-emulsifiable, EC-emulsifiable concentrate, F-flowable, SP-sprayable powder, WP-wettable powder.

Lb.-pound, Pt.-pint, Qt.-quart, Gal.-gallon, T-tablespoon, t-teaspoon, C-cup

DISEASES

Samuel A. Alexander, Extension Specialist, Plant Pathology

Chemical control of forest tree diseases has only limited application due primarily to unfavorable cost-benefit ratios. In the forest situation, disease control is based on the application of selected biological and management techniques. However, for Christmas trees and nurseries, chemical control of diseases can be both effective and economical. Additional information on nonchemical control measures, causes and symptoms of forest tree diseases may be found in Virginia Extension Division forest tree disease leaflets.

CROP Disease Controlled	Chemical and Formulation; Rate; Method	Remarks

PINE, All Species		
Needle cast (several fungi)	Bordeaux mixture: 8.0 lbs copper sulfate, 8.0 lbs hydrated lime in 100 gal water; spray to run off OR Bravo 500; 3.5 pt/100.0 gal water hydraulic spray OR 8.5 pt/100.0 gal water high pressure mist sprayers; spray to run off	Apply when needles are one-half and fully developed in spring. Two week intervals during heavy rains.
Brown Spot (<u>Scirrhia accicola</u>)	Bravo 500; 8.5 pt/100.0 gal water for high-pressure mist sprayers; spray to run-off	Apply when needles are one half developed in spring. In severely infected plantations or during an unusually wet year, a second spray should be applied 3-4 weeks earlier.
Diplodia Tip Blight (<u>Diplodia pinea</u>)	Bordeaux mixture; 8.0 lb copper sulfate, 8.0 lb hydrated lime in 100.0 gal water; spray to run-off.	Apply first spray at bud swell, and a second application about 10 days later (candle stage).

PINE, Scotch		
Eastern Gall Rust (<u>Cronartium quercum</u>) Pine-Pine Gall Rust (<u>Endocronatium harknessi</u>)	None	Eradicate all heavily infected trees; remove galls for lightly infected branches; eradication and gall removal should be completed prior to the next spring.
Scleroderris Canker (<u>Gremmeniella abietina</u>)	Bravo 500; 4.5 pt/100.0 gal water for hydraulic sprayers Or 8.5 pt/100.0 gal water for high pressure mist sprayers; spray to run-off	Begin spray application in the spring when new growth appears, repeat at 2-3 week intervals until early July, continue at 4 week intervals until early September.

PINE, White		
Air Pollution injury	Fertilizer 25-9-9; 1 cup for tree < 3 ft 2 cups for tree 3-5 ft 3 cups for tree > 5 ft; ground application	Evenly apply to ground surface around drip-line of tree.

WEEDS-CHRISTMAS TREES

William E. Chappell

Crop	Weed Problem	Chemical Rate/A	Remarks
CHRISTMAS TREES Site preparation	Woody brush and trees	2,4-D and/or 2,4-DP (LVE) 12.0 lb ae (3.0 gal of 4.0 lb/gal formulation in 100.0 gal of fuel oil)	Cut woody brush or trees and wet stumps with spray solution, or wet thoroughly about 2 ft of lower stem and root collar of uncut woody plants. May be used throughout the year. For small areas use 1 cup of weed killer in 2.0-3.0 gal of fuel oil. 2,4-DP marketed as Weedone 170.
	Honeysuckle	2,4-D OR 2,4-D + 2,4-DP 2.0 lb ae (2.0 qt of 4.0 lb/gal formulation	Wet foliage of actively growing plants. For small areas, use 2 oz per 3 gal of water. 2,4-DP marketed as Weedone 170.
	Perennial grasses	dalapon 8.0-10.0 lb (Dowpon 10-2/3 to 13-1/3 lb) OR amitrole-T 2.0 lb (Amitrole-T 1.0 gal or Cytrol 1.0 gal)	In late summer, mow the proposed planting site. When the grass regrowth reaches 3-6 inches (before October) treat planting strips at least 2 inches wide. Plant trees the following spring in the treated strips. An alternative method is to use amitrole-T at the same rate 7-10 days before transplanting. Control is dependent upon the amount of green actively growing foliage at the time of application.
New or established plantings	Most annual weeds	pronamide 1.0-2.0 lb (Kerb 50W 2.0-4.0 lb)	Fall application to fir or pine species established one growing season. High rate has given control of quackgrass and other perennial grasses.
		simazine 3.0 lb (Princep 80W 3.75 lb or Princep 4G 75.0 lb)	Make application after rainfall has refirmed the soil around the roots of the Christmas trees and before weeds start to emerge. Simazine may be applied in the spring or fall but do not use more than one application of simazine per year or injury may result. Do not use on seedlings less than 3 years of age. Simazine applied in the fall or winter to established trees will control certain perennial grasses. If perennial broadleaf weeds are present, they may grow rapidly in the absence of grass.

Weeds -- Christmas Trees (continued)

Crop	Weed Problem	Chemical Rate/A	Remarks
Postemergence to weeds	Emerged weeds	amitrole 1.05 lb + simazine 3.15 lb (Amizine) 7.0 lb/A	Mow heavy growth of weeds around the trees. When weed growth reaches 3-4 inches, use the prescribed rate (7 lb/A of commercial formulation) as a directed spray. Spray will damage trees if allowed to contact foliage.
		paraquat 0.5-1.0 lb (Ortho Paraquat CL 1.0-2.0 qt + X-77 spreader sticker)	Apply as a directed spray for contact kill of undesirable grass and weeds. Do not spray foliage. May be combined with simazine for residual control. For small area application use 1 oz/gal of water and lightly wet foliage. Good coverage is important. A minimum of 50 gal of water per acre is required to insure coverage.
		glyphosate 2.0-5.0 lb (Roundup 2.0-5.0 qt)	Apply as a directed spray to pine spruce or fir when trees are not in active growth. Some contact of bottom foliage may be tolerated. Do not spray over top of trees. For small area application with a hand sprayer use 2 oz/gal of water and lightly wet the foliage.
	Woody plants	2,4-DP (LVE) 12.0 lb ae (3.0 gal of 4.0 lb/gal formulation in 100.0 gal fuel oil or 1.0 pt of Weedone 170 in 3.0-4.0 gal fuel oil)	Apply as a basal spray to sprouts and small trees. Spray lower 12 inches of stem to run-off. Apply any time of the year. Do not allow spray to contact foliage or stems of Christmas trees.

