

Commercial Crop Production

Christmas Trees and Conifers

Integrated Disease Management

Christmas tree growers face many obstacles to growing healthy trees with the largest challenge being pests. The development of an integrated program for managing diseases as well as insects must begin prior to establishing a crop. Successful management of Christmas tree and conifers diseases requires proper identification of the tree species as well as the disease, good sanitation practices, fungicide spray applications that target the pathogen's vulnerable life stage and accurate selection of fungicides

Most diseases of Christmas trees and conifers are caused by fungi and nematodes (Table 1). Fungal diseases can move rapidly through a plantation as fungal spores are dispersed by wind, rain, animals or physical activities such as mowing, pruning or harvesting. Fungal diseases are easiest to identify when fruiting bodies (if produced) are present on the needles.

DISEASE

Symptoms and integrated disease management tactics for Christmas trees and conifers.

Armillaria root rot (*Armillaria* spp.)

Hosts: Most Christmas tree and conifers

Symptoms: Reduced terminal growth. Yellowing and eventual browning of all the needles. A white resin forms at the base of the tree and white fans of fungus form between the bark and wood near the base of the tree. Tan-colored mushrooms may form at the base of the tree. Rapid death of young tree groupings may occur.

Cultural Management: Remove tree. Dig up stumps, root balls and pruning waste and burn on site. For small trees remove as much soil around the root ball as possible. Do not plant a new tree in the same location.

Fungicides: No fungicides are effective at managing *Armillaria* root rot. Soil fumigants may suppress disease.

Botryosphaeria canker and dieback (*Botryosphaeria dothidea*)

Hosts: All Christmas tree and conifers

Symptoms: Disease is more common on environmentally stressed trees. Branch wilting or dieback. Cankers form on twigs and branches. Wood beneath the bark is reddish-brown. Bark may peel from cankered area.

Cultural Management: Maintain proper nutrient and water levels so that trees are not stressed. Protect seedlings from freeze injury. Remove and destroy diseased branches.

Fungicides: No chemicals are available currently.

Botrytis blight (*Botrytis cinerea*)

Hosts: All Christmas tree and conifers

Symptoms: Water-soaked spots on needles and shoots that turn brown and girdle the needle or shoot. Blighted new growth (tip dieback) that resembles cold damage. Gray, fuzzy spores are present on diseased needles and shoots.

Cultural Management: Space new plantings to promote good air flow and drying. Remove weeds from under and around the trees. Prune out infected tips. Disinfect shears with Clorox bleach (20%) or 70% ethanol between cuts. Remove infected seedlings from seedling beds to prevent spore dispersal to healthy seedlings.

Fungicides: Fungicides are not effective for established plantings. Apply dicloran (Botran 75W @ 2 lb/a) preventatively to nursery, greenhouse, container and bare rootstocks.

Cercospora needle blight (*Cercosporidium sequoia*)

Hosts: Cypress (Arizona, Leyland), juniper, red cedar

Symptoms: Disease is more common on environmentally stressed trees or poorly managed trees. Browning of the needles and scales beginning on the inner portions of the lower branches.

Cultural Management: Maintain proper nutrient and water levels so that trees are not stressed. Do not let weeds grow up under or between trees.

Fungicides: Apply copper in mid- to late spring. Copper sulfate (i.e., Cuprofix-Ultra 40 Disperss, Cuproxat); copper hydroxide (i.e., Kocide 2000 or 3000, Kentan DF, Badge X2, Champ Formula 2 Flowable).

Diplodia (Sphaeropsis) tip blight (*Diplodia pinea* formerly *Sphaeropsis sapinea*)

Hosts: Pines (Scotch, red, white, Austrian) and other conifers. Rarely found on Douglas fir or spruce.

Symptoms: Discolored needle tips (brown, yellow, gray) on current season's growth. Needles are stunted; shoots may curl. Branch dieback. Small black fruiting bodies form on needles, cones and shoots. Cankers form on stems and branches and ooze resin that drips and adheres to needles. Trees are most susceptible from bud break to needle elongation.

Cultural Management: Disease is more common on environmentally stressed trees. Maintain proper nutrient and water levels so that trees are not stressed. Do not let weeds grow up under or between trees. Remove and destroy infected twigs, branches and cones during dry weather.

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Fungicides: Azoxystrobin (Equation, Heritage, Satori, Quadris); thiophanate-methyl (Cercobin, Incognito 4.5F, Topsin 4.5FL). Rates vary depending on the product.

Pine-oak gall rust (Eastern gall rust) (*Cronarium quercuum*)

Hosts: Pines (Scotch, red, Virginia, Mugo, Jack and Austrian). Oaks are an alternate host for Eastern gall rust.

Symptoms: Stunting, deformation and twig and branch dieback. Visible, globe-shaped galls form on the stems or branches. Yellow-orange fruiting bodies form on the surface of mature galls in the spring.

Cultural Management: Remove seedlings with galls or cut out branches with galls from established trees. Do not remove branches or trees during sporulation. Monitor and manage gall rust in oak trees that are near the plantation.

Fungicides: Mancozeb (Dithane 75DF Rainshield and Fore 80W Rainshield). Rates vary depending on the product.

Phytophthora root rot (*Phytophthora spp.*)

Hosts: All Christmas tree and conifers

Symptoms: Reduced and stunted growth. Yellowing and eventual browning of all the needles. Bleeding basal cankers and root decay. Rapid tree death.

Cultural Management: Do not plant in fields infested with Phytophthora. Plant in well-drained fields; avoid standing water in the fields.

Fungicides: Fungicides are only effective if used in conjunction with good cultural practices. Fungicides are not effective on trees showing moderate to high levels of disease. Fungicides are most effective when applied to seedlings or at transplant. Dazomat (BasamidG); metalaxyl (Metastar 2E); mefenoxam (Subdue GR, Subdue Maxx). Rates vary depending on the product.

Phomopsis blight (*Phomopsis juniperovora*)

Hosts: Juniper, red cedar, Arizona cypress, arborvitae

Symptoms: Shoot tips turn yellow, then brown. Gray cankers on shoots girdle the shoots and cause dieback. Black fruiting bodies can be seen on the canker with a hand lens.

Cultural Management: Plant resistant varieties. Prune out diseased shoots when plants are dry. Prune by making a cut 3 inches below the dying shoot. Disinfect shears with Clorox bleach (20%) or 70% ethanol between cuts.

Fungicides: Mancozeb (Fore 80WP Rainshield, Dithane 75DF Rainshield); propiconazole (Banner Maxx, Bumper ES, Fitness, Procon Z, Protocol); copper hydroxide (Kocide 2000 or 3000, Champ Formula 2 Flowable); copper sulfate (Cuprofix Ultra 40 Dispers).

Pine wilt disease (nematode) (*Bursaphelenchus xylophilus*)

Hosts: Pines (especially Scotch)

Symptoms: Nematodes are moved from tree to tree by the pine sawyer beetle. Needles turn yellow then reddish-brown and wilt. Needles remain on the tree. Nematodes feed on resin ducts of healthy trees.

Cultural Management: Manage beetle infestations. Remove and destroy diseased trees.

Chemical control: No chemicals are available currently.

Seiridium canker or dieback (*Seiridium unicorne*)

Hosts: Cypress

Symptoms: Water-stressed trees are very susceptible to disease. Yellowing and browning of upper lateral shoots. Elongated dark brown or purple cankers are observed on stems, branches and branch axils resulting in dieback. Cankers are sunken with raised margins. Wood beneath the bark oozes resin and is reddish-brown in color.

Cultural Management: Remove cankered twigs and branches. Prune out infected tips. Disinfect shears with Clorox bleach (20%) or 70% ethanol between cuts. Remove severely diseased trees or trees with cankers on the main trunk.

Fungicides: Effective chemical control is not available currently.

The Christmas tree and conifer section was revised October 2022 by R. Singh.