FPL 25 – Atropellis Canker

The information accessed from this screen is based on the publication: Hopkins, J.C. and Callan B. 1991. Atropellis Canker. Forestry Canada, Forest Insect and Disease Survey, Forest Pest Leaflet No. 25 4p.

Introduction

Atropellis piniphila (Weir) Lohman and Cash is a fungus that causes perennial stem and branch cankers of lodgepole pine (Pinus contorta Dougl.) (Fig). In locations where this disease is prevalent, most or all host trees may become infected and multiple stem and branch infections are common. The disease reduces the value of trees for lumber, or pulp and many countries prohibit its importation in lumber.

This leaflet describes A. piniphila, one of four North American species of the genus which cause disease in pines. The information provided is probably also applicable to A. pinicola Zeller and Goodding. Atropellis pinicola, which attacks western white pine (P. monticola Dougl.) and, occasionally, lodgepole pine, is the only other species of Atropellis found in B.C.

Hosts and Distribution

Atropellis piniphila occurs primarily on lodgepole pine (Fig) but ponderosa pine (P. ponderosa Laws.) is occasionally attacked.

The disease is widely distributed through the range of the hosts in southern and central B.C., Alberta and adjacent portions of the U.S.A. Collections have been made from one location in the Yukon, but few collections have been made north of Babine Lake.

Incidence of this pathogen varies greatly. Recent studies in B.C. indicated it was present in 52% of 169 lodgepole pine stands sampled and in one stand 78% of the trees were infected. The most heavily infected stands were in the Kelowna-Vernon, Kamloops, Burns Lake-Smithers, and Terrace areas. In the southern interior, dense stands were the most heavily infected. In one of the most severely infected stands in Alberta, 40 to 60 stem cankers per tree were common, and one tree had over 100 stem cankers.

In the U.S., A. piniphila is also considered the most important species of this genus. It occurs on lodgepole pine in the northwestern states, in northern California and in the northern regions of the Rocky Mountains. It is also known to attack ponderosa pine in mountainous areas of Arizona and New Mexico. The related A. pinicola has a more limited distribution in the western U.S., but it is suspected to infect more than six species of pine there.

Recognition

Most stem cankers start as infections on undamaged bark in the vicinity of branch whorls. The first symptom usually is a resin drop on the bark surface. The underlying infections gradually extend into the wood where blue-black streaks develop in the direction of the long axes of the wood fibres. Penetration inwards is comparatively rapid through sapwood, but penetration becomes much slower in heartwood. Invaded wood at canker centers is blue-black. At canker tips a reddish-brown color often develops in the sapwood between the bark and the nearest invaded (blue-black) sapwood. Furrowing develops longitudinally on the stem and is deepest on the most vigorous trees. Resin flow usually occurs on the bark surface, and resin flow can be heavy near canker margins. Bark is often cracked at the margins of cankers. Cankers normally expand each year. The rate of growth around the stem is approximately 0.6 cm per year. but longitudinal advance is nearly 5 cm per year; this results in long narrow cankers (Fig). Large stem cankers 40 to 50 years old have been observed occasionally in vigorous trees.

Infections are most numerous on the northern sides of stems; very few cankers develop on the southern sides of stems.

Atropellis fruiting bodies are formed in the central sunken canker zone. Two types of fruiting bodies occur, and these can be distinguished readily after wetting. Apothecia (which produce the sexual spore form, the ascospore) (Fig) are black structures that enlarge rapidly after wetting into stalked saucer-like bodies 0.6 to 4.5 mm in diameter. The conidial (asexual) fruiting bodies or pycnidia are black structures that become globose (0.6 to 1.6 mm across) when wet. They open by one or more splits to release a creamy, sticky mass of conidia.

Superficially, Atropellis cankers may be confused with stalactiform rust on lodgepole pine and white pine blister rust on western with white pine. If infections of A. piniphila are near ground level, early canker and stain symptoms may be confused with black stain root disease (Forest Pest Leaflet 67).

Life History

Ascospores are responsible for spreading the disease. They are ejected into the air from the upper surface of the apothecia within a few hours of being moistened sufficiently by rain (Fig). In southern areas, spores may be released from early spring to mid-fall, and perhaps for an even longer period in coastal B.C. Apothecial production, once started, continues each year for the life of the canker. Spore production can continue for a year or two on standing dead trees that remain shaded.

Ascospores are spread by wind for distances up to 100 m. Some spores are probably carried much farther, but infection from long-distance transport of spores is rare. Conidia of A. piniphila are believed to act as spermatia that fertilize special hyphae and initiate apothecial formation. The conidial fruiting bodies (pycnidia) appear before apothecia on young cankers, but on older cankers they may continue to be produced together with apothecia for

many years.

Resistance of lodgepole pine to A. piniphila takes three forms: Firstly, all trees are resistant until about 15 years. Secondly, in older trees, a second form of resistance occurs which is dependent on the age of the tissues infected. In these trees most infections begin in tissues that are 10 to 14 years of age: many infections occur in tissues 15 to 19 years old, and very few occur in tissues 5 to 9 years old, or in tissues older than 29 years. As a result, the upper crowns remain healthy and infections in the mid-crown tend to be small. Thirdly, existing cankers may be overgrown; this happens only in some vigorous trees.

Damage

Atropellis piniphila changes the composition and usefulness of the wood, and also reduces tree growth. The quality of lumber from infected trees is reduced by blue-black stain, an abnormally high proportion of nonwoody cells, and resin-soaking. The high pitch content of infected wood interferes with penetration by wood preservatives. The value of affected wood for pulp is greatly reduced by the stain, which increases bleaching costs; in addition cankered wood is difficult to debark, if infected trees are malformed, wood fibres and the high pitch content of infected wood can cause chips to be rejected.

Mortality can result from girdling, but this is common only in dense stands. Mortality is uncommon in vigorous trees. except where two or more cankers develop at the same height on the stem and eventually encircle it.

Although Atropellis cankers are known to cause some reduction in tree height and diameter growth, trees with large multiple stem cankers can remain vigorous for many years. These trees can retain healthy crowns for many years until their trunks are nearly girdled. The rarity of infections on southern aspects of exposed stems usually ensures translocation of nutrients down that side of the tree. The absence of infections in the upper crown allows foliage production and photosynthesis to continue until girdling is almost complete.

If numerous young trees (those 5-25 years of age) become infected, the disease may cause stands to become stagnant, especially if the stand was already dense and the trees were slow-growing. Infection or spread in B.C. and Alberta is slower than it is to the south in adjacent portions of the U.S.A. The elongation rate of cankers on Alberta lodgepole pines has been estimated at about 5 cm/year. Fastgrowing A. piniphila cankers on ponderosa pine in the U.S. southwest can rapidly exceed 3 m in length.

Management

Natural control of this canker was achieved either by extensive wild fires in interior areas now dominated by lodgepole pine or by a natural succession to spruce. Fire suppression has limited fire as a natural control of this disease; consequently, other control measures must be taken to to avoid extreme damage to susceptible pine stands.

This disease can be reduced by removing host trees of a susceptible age (over 15 years) that are growing near young regeneration before the regeneration becomes susceptible. It is important to remove all older trees of susceptible species even if they appear healthy, as small and incipient infections are difficult to see. There should be at least 100 m between the nearest old trees and susceptible regeneration to minimize wind dispersal of viable spores to the regeneration. Cankers on logs exposed to sunshine during the summer stop releasing viable spores after a few weeks. Heavily shaded cankers on standing trees may continue to release spores for at least one year after the tree dies.

Thinning, especially in dense stands, can also reduce the number of new infections. Studies in B.C. have shown that thinning in stages from 8000 stems per hectare to 500 per hectare leads to fewer infections at each stage. Perhaps microclimatic changes are primarily responsible for the reduction, but host resistance may also be stimulated. Thinning is most effective in locations with low summer rainfall. Thinning should also remove infected trees and thereby reduce the inoculum. Stands should be thinned before trees reach a susceptible age, especially in stands with infected trees nearby.

Prescribed burning may be the best treatment for infected stands of no commercial value. Infected stands of this type (which are usually dense, old, and on poor sites) can produce large amounts of inoculum to threaten nearby stands.

When areas that have had severe infections are being reforested, a mix of species, or an alternate, nonsusceptible species should be used. Residual small and potentially infected trees should be destroyed after logging. Chemical fungicidal treatments are presently unavailable. In the case of parks, campgrounds, recreation and other high use areas, infected trees may have to be removed to ensure public safety.

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Figures

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Figure 237-0093. Atropellis canker on semi mature lodgepole pine.

Figure 237-0095. Atropellis canker on semi mature lodgepole pine.

Figure 237-0096. Atropellis canker on mature lodgepole pine.

Figure 237-0094. Apothecia fruit bodies of *Atropellis piniphila* on lodgepole pine.