Dr. Sharon M. Douglas
Department of Plant Pathology and Ecology
The Connecticut Agricultural Experiment Station
123 Huntington Street, P. O. Box 1106
New Haven, CT 06504

Phone: (203) 974-8601
Fax: (203) 974-8502
Email: Sharon.Douglas@ct.gov
Website: www.ct.gov/caes

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JUNIPER TIP BLIGHTS

Tip blight and progressive dieback of twigs is common on juniper and occasionally on arborvitae, white cedar, false cypress, hemlock, true fir, and Douglas-fir. In Connecticut, these are primarily caused by two different fungi, *Phomopsis juniperovora* (Phomopsis tip blight) and *Kabatina juniperi* (Kabatina tip blight). However, tip blights can also be associated with cultural, physical, or environmental factors (abiotic factors) such as poor site selection, winter drying and injury, drought, or other similar stresses. Additionally, tip blights can be confused with damage from juniper tip midge and juniper midge. Fungal tip blights become less problematic as plants age, although they can be found on established, older plants, especially on those growing under crowded or stressful conditions.

SYMPTOMS:

Symptoms can develop at random within the canopy of the plant (Figure 1). Tips of affected branches turn brown or ash gray and often show progressive dieback. In extreme cases, the entire plant can be killed, especially young or newly transplanted plants.

Phomopsis tip blight, caused by the fungus *Phomopsis juniperovora*, generally infects healthy, newly developing, immature needles and shoots in spring. However, the fungus can infect any time during the growing season when young, succulent tissue is present. For example, late-season infections frequently occur when plant growth is prolonged by shearing and over-fertilization. Initial symptoms develop as yellow spots on the young needles. These can appear several days after infection. The fungus then progresses into healthy, young stem tissues, where it girdles the stem and results in dieback of the new shoots (Figure 2). These initially appear chlorotic and eventually turn tan or brown. As the disease progresses, small lesions (cankers) form on the stems where infected and healthy tissue meet (Figure 3). Infections typically move from the tips of branches and appear to

Figure 1. Tip blight on juniper—note random distribution of symptoms within the canopy.

gradually move into the stem. Eventually the entire branch may die. Repeated infections can occur during cool, wet periods in spring or fall. Symptoms of Phomopsis tip blight are usually visible by midsummer.

Figure 2. Young, succulent shoots are infected in spring.

Figure 3. As the infection expands, tips develop a blighted appearance. Note the transition from infected to healthy tissue (arrow).

Kabatina tip blight is caused by the fungus *Kabatina juniperi.* The symptoms are very similar to those associated with *Phomopsis*. However, *Kabatina* usually infects wounded, one year or older twigs and does not infect healthy tissues. Infections are associated with injuries from pruning, insect activities, or severe winter weather. Infections usually occur in the fall, so symptoms of Kabatina tip blight generally show up when foliage begins to regain its seasonal color in early spring (March or April)—notably before symptoms of Phomopsis tip blight appear.

DISEASE SPREAD:

Phomopsis and *Kabatina* overwinter in fruiting structures on infected twigs or in plant debris on the ground. In later stages of disease development, small, dark fruiting bodies can be found on blighted needles and twigs. *Phomopsis* fruiting bodies (pycnidia) produce spores throughout the season during wet, cool weather. However, spring and fall infections are most common (Figure 4). In contrast, *Kabatina* fruiting bodies (acervuli) produce spores in fall, when most infections occur (Figure 5). Spores of both fungi are spread by splashing or wind-driven rain.

Figure 4. *Phomopsis* fruiting bodies (pycnidia) (arrows) on symptomatic shoots.

Figure 5. Rows of *Kabatina* fruiting bodies (acervuli) (arrows) visible in symptomatic tip.

To complicate matters further, twig death from abiotic factors can sometimes appear

the same as the fungal-associated blights since fruiting structures of saprophytic fungi (ones that colonize dead tissue) look like plant pathogens (fungi that cause disease). Therefore, the first step to an effective management program is to accurately identify the cause, so microscopic examination is necessary to distinguish *Phomopsis* from *Kabatina*.

Phomopsis produces two types of one-celled, colorless spores (conidia) called alpha conidia. These are ellipsoid and have two distinct oil droplets at either end (Figure 6). Beta conidia are the second type of spore and they are filamentous and slightly curved (Figure 7).

Kabatina produces one type of colorless conidia that is similar to the alpha conidia of *Phomopsis* in size and shape, but lack oil droplets. Viable spores of both fungi can be found on branches that have been dead for as long as two years.

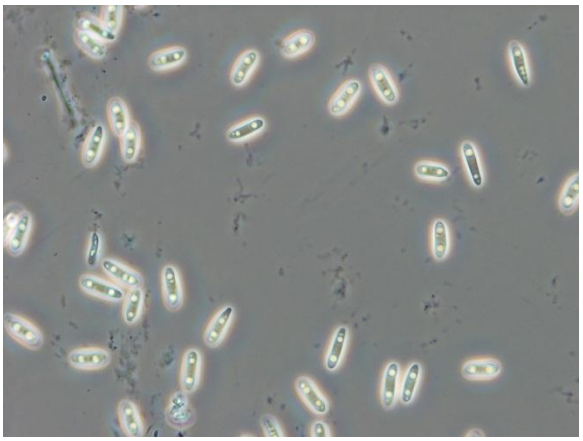

Figure 6. *Phomopsis* spores (alpha conidia) have two distinct oil droplets. *Kabatina* spores are very similar in appearance and size, but lack the oil droplets.

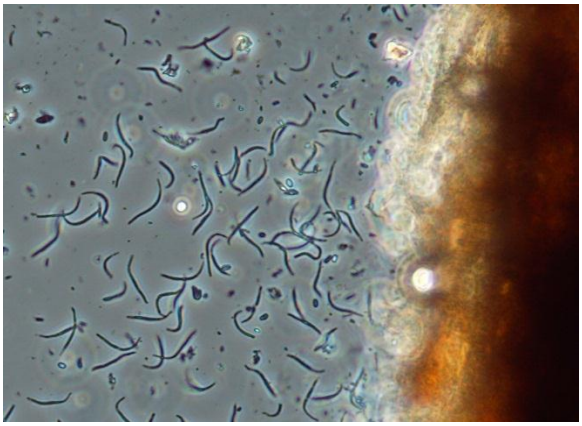

Figure 7. Beta conidia of *Phomopsis*.

MANAGEMENT STRATEGIES:

Tip blights can be managed by following a multifaceted approach. Regardless of the cause, dead tissue should be pruned several inches beyond symptomatic tissue and removed from the planting area. Pruning should be done when the foliage and bark are dry. If possible, tools and equipment should be disinfected with a 10% solution of household bleach, 70% alcohol, or a commercially available compound (e.g., Greenshield, Oxidate).

When watering, avoid overhead irrigation and wetting the foliage or water early in the day to encourage rapid drying. This helps to minimize conditions favorable for infection by both fungi.

New plantings should have adequate spacing to provide good air circulation. Pruning of older plantings can help to reduce tip blight by improving air drainage and foliar drying. It is also important to avoid wounding during transplanting and cultivating.

Plants should be kept as vigorous as possible by following a sound cultural program of fertilizing "as-needed" (determined by soil and/or tissue tests), controlling insect infestations, and watering during any periods of drought.

Resistance can be variable, especially among species and cultivars of juniper. If tip blights are recurring and persistent problems on junipers in a particular site, resistant species or cultivars should be considered for use. Many species of juniper have been reported to be resistant to at least one of the tip blights. For example, *Juniperus chinensis* 'Femina' and 'Pfitzeriana' and *J. comminus* 'Depressa' and 'Saxatalis' are reported to be resistant to *Phomopsis.* *J. chinensis* 'Hetzii' and *J. communis* 'Hibernica' are resistant to *Kabatina.* Additionally, some cultivars are resistant to both fungi and include *J. chinensis* 'Keteleeri,' Mountbatten,' and 'Pfitzeriana'; *J. squamata* 'Prostrata,' and *J. chinensis* var. *sargentii* 'Glauca.'

Fungicide applications can supplement other management strategies for both Phomopsis and Kabatina tip blights. However, the timing of applications will vary depending upon the fungus. Treatment for Phomopsis tip blight should begin when new growth begins to emerge in spring, with follow-up applications at 7-14 day intervals (when conditions are favorable—wet, cool, and cloudy—or according to label instructions) or until new growth is mature and dark green. In contrast, treatments for Kabatina tip blight should begin in late summer or fall since they are targeted to protect tissues from infection. Among the products registered for use for management of *Phomopsis* in Connecticut are thiophanate-methyl, thiophanate-methyl + mancozeb, and copper-based products. Fungicides that specifically list *Kabatina* on the label are limited in Connecticut. However, mancozeb or thiophanate-methyl + mancozeb are registered. Since it is not uncommon for a plant to be infected with both fungi, the combination product of thiophanate-methyl + mancozeb can be used to manage both diseases. All fungicide labels will contain information on dosage rates, intervals for use, and safety precautions.

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