Disease and Insect Resistant Ornamental Plants

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Tsuga

Hemlock

Tsuga, commonly known as hemlock, is a small genus of evergreen trees known for their graceful, pyramidal shape and distinctive drooping, horizontal branches. Hemlocks are used extensively in landscape plantings and are an important component of forests.

Four species are native to North America–*T. canadensis* (Canadian or eastern hemlock), *T. caroliniana* (Carolina hemlock), *T. heterophylla* (western hemlock), and *T. mertensiana* (mountain hemlock). Cultivars offer a range of ornamental options including low growing ground covers, weeping, and upright forms.

Potential disease problems include needle blight, cankers, and rusts. The most serious insect threat to native hemlocks in their eastern range is the hemlock woolly adelgid.

INSECTS

Hemlock Woolly Adelgid, *Adelges tsugae*, is a small, aphid-like insect native to China and Japan. Accidentally introduced from Japan to Richmond, Virginia in the 1950s (6), it has since caused widespread mortality of two native hemlock species, *T. canadensis* and *T. caroliniana* in forests and landscapes throughout eastern North America (5).

Feeding damage causes discolored foliage, premature needle drop, dieback, and eventually tree death. In the insect's northern range, hemlocks typically die within four to ten years following infestation. Nitrogen fertilization increases susceptibility (9).

A combination of control strategies, which include chemical, silvicultural, biological, and host resistance, is being used to slow the spread of this insect and protect remaining hemlock stands (8).

Host Resistance

Resistance has been reported in Asian species and hybrids between North American and Asian species. Long-term research continues in the search for naturally resistant trees and development of resistant crosses.

HEMLOCK WOOLLY ADELGID			
Species/Hybrids	Reference		
	Resistant	Intermediate	Susceptible
Tsuga canadensis			1, 3, 10
Tsuga caroliniana			1, 2, 10
Tsuga chinensis	1, 3, 4, 10		
Tsuga diversifolia			2
Tsuga heterophylla	2		
Tsuga mertensiana	2		
Tsuga sieboldii			1, 2, 10
Tsuga chinensis x *T. caroliniana*		1, 10	
Tsuga chinensis x *T. sieboldii*		1, 10	

Biological Control

Biological control is the most explored long-term management option (8). With no natural enemies in eastern North America, research is focused on identification and introduction of prey-specific predator species and entomopathogens (7). Details can be found at *Biology and Control of Hemlock Woolly Adelgid.*

In New York State, the Hemlock Woolly Adelgid Biocontrol Research Lab at Cornell University is investigating several predator species. *Laricobius nigrinus* beetles and *Leucopis argenticollis* and *L. piniperda* silverflies are common predators of hemlock woolly adelgid in the Pacific Northwest. Releases have been made at multiple locations in NYS. Work continues to determine their effectiveness and to search for more predators (12). More information on the NYS Hemlock Inititiative can be found at the NYS Hemlock Inititiative Blog.

Researchers at Virginia Tech report successful establishment of *Laricobius osakensis* beetles at several release sites from Pennsylvania to North Carolina (11).

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New York State Integrated Pest Management Program

Cornell Cooperative Extension

Produced by the New York State Integrated Pest Management Program, which is funded through Cornell University, Cornell Cooperative Extension, the New York State Department of Agriculture and Markets, the New York State Department of Environmental Conservation, and USDA-NIFA. Design by Karen English, New York State IPM Program. Cornell Cooperative Extension provides equal program and employment opportunities. Posted 5/2019. Search for this title at the NYSIPM Publications collection: ecommons.cornell.edu/handle/1813/41246