SUSCEPTIBILITY OF HONEYLOCUST CULTIVARS TO THYRONECTRIA CANKER

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Abstract. Six cultivars of *Gleditsia triacanthos* were inoculated with the fungus *Thyronectria austro-americana* in May, July, September, and November. Branches were excised and examined in the laboratory the following spring. Small cankers and extended xylem discoloration were present, but wilting and dieback did not occur. The fungus persisted in the wood of every tree inoculated but caused cankers at only 20% of the inoculation sites. More cankers were present on trees inoculated in September and November than in May or July. Cankers were most frequent on 'Sunburst', less frequent on 'Moraine' and 'Skyline', and least frequent on 'Imperial', 'Holka', and 'Shademaster'.

Résumé. Six variétés de *Gleditsia triacanthos* furent inoculées avec le champignon *Thyronectria austro-americana* en mai, en juillet, en septembre et en novembre. Les branches furent excisées et examinées en laboratoire le printempts suivant. Des petits chancres et une décoloration du xylème étaient présents, mais le dessèchement et le dépérissement de la cime ne sont pas apparus. Le champignon a persisté dans le bois de tous les arbres inoculés, mais a causé des chancres à seulement 20% des sites d'inoculation. Plus de chancres étaient présents sur les arbres inoculés en septembre et en novembre qu'en mai ou juillet. Les chancres étaient plus fréquents sur la variété "Sunburst", moins fréquents sur la variété "Moraine" et "Skyline", et le moins fréquent sur le variété "Imperial", "Holka" et "Shademaster".

Honeylocust, *Gleditsia triacanthos,* is planted extensively as a windbreak tree in the Great Plains and as an amenity tree in the midwestern and northeastern states. In the 1980s many honeylocust less than 30 years old began to decline (3, 5, 8, 9). Cankers caused by *Thyronectria austro-americana* were shown to contribute to the decline in several states (3, 4, 5, 6). A wood-boring insect *(Agrilus* sp.) has been associated with cankers and may be a vector for the fungus (5, 11). Another canker-causing fungus, *Kaskaskia gleditsiae,* was proved pathogenic to *Gleditsia triacanthos* var. *inermis* (2), but this fungus is believed to be of the same species as *T. austro-americana* (1).

Susceptibility of honeylocust to Thyronectria appears to be related to environmental stresses, although no direct patterns have been established. Naturally-occurring cankers caused by *T. austro-americana* have consistently been associated with trunk and stem wounds (5, 6) and inoculations with the fungus have been successful only when the host tree is wounded (4, 5, 6, 9). Disease development in *G. triacanthos* varies with size of stem, size and age of wounds, and temperature (7, 9). This paper reports field trials on the effects of season of inoculation of six commercially available cultivars of *G. triacanthos* with *T. austro-americana.*

Materials and Methods

Six honeylocust cultivars ('Holka', 'Imperial', 'Moraine', 'Shademaster', 'Skyline', and 'Sunburst') were provided as grafted stock (1.0-1.3 m tall) and planted in the spring of 1982 in the Illinois Natural History Survey arboretum at Urbana, in a grid with 2.6 m between trees. In 1987 the saplings were 3-4 m tall with a stem diameter of 3.0-4.5 cm at 0.3 m height. The trees had annual twig growth of 40-70 cm.

The isolate of *T. austro-americana* used in this study was obtained in 1981 from the margin of an active canker on a honeylocust and was established as a pathogen of *G. triacanthos* by Stim and Himelick (11). The fungus was stored at 5°C on potato dextrose agar (PDA). In 1987 inoculum was produced by growing the fungus on PDA on petri dishes at 24°C for 5-7 days. The inoculum (conidia and hyphal fragments) was adjusted to 10^7 conidia per ml of sterile distilled water. Approximately 0.03 ml of inoculum was injected with a hypodermic syringe into 2-mm holes drilled completely through a branch at three sites 25-35 cm apart. Inoculated branches (mostly 1-yr-old) were 10-15 mm in diameter. The inoculation sites were wrapped with freezer tape to prevent drying.

Trees were inoculated four times during 1987 in May, July, September, and November. Each tree had a different terminal branch inoculated on each of the dates; 15 trees of each of the six cultivars were inoculated.

The inoculated branches were excised and examined in the laboratory in May of 1988. Both discolored external bark and internal wood were

measured proximal and distal to each inoculation site. Bark canker discoloration was measured to the nearest mm. Stems were then serially sectioned at 10-mm intervals; the extent of red-orange discoloration in the xylem was made to 30 mm above and below the inoculation site. Serial-section wood chips from one of the three inoculation sites on every branch were plated onto PDA to verify pathogen presence.

Results

Thyronectria austro-americana inoculations into vigorously growing honeylocusts resulted in

Figure 1. Thyronectria canker on honeylocust showing typical bark depression.

Figure 2. Dieback and decline of honeylocust approximately 20 years old. Thyronectria canker contributes to these symptoms.

Table 1. The incidence of canker formation and internal discoloration in field-grown honeylocust cultivars inoculated in different months.

Inoculation test	Number of trees inoculated[1]	Inoculation sites with Cankers 6 mm or greater		Inoculation sites with Discoloration greater than 60 mm	
		Number	Percent	Number	Percent
Sectional test					
May	90	27 a[2]	10	209	77
July	90	13 a	5	222	82
September	90	82 b	30	206	76
November	90	90 b	33	222	82
Cultivar susceptibility test					
'Shademaster'	15	1 a[1]	1	94	52
'Holka'	15	16 a	9	107	59
'Imperial'	15	22 a	12	162	90
'Skyline'	15	47 b	26	165	92
'Moraine'	15	47 b	27	166	92
'Sunburst'	15	78 c	43	165	92

[1]Three inoculation sites per tree in the seasonal test and 12 inoculation sites per tree in the cultivar susceptibility test.
[2]Numbers in a column with a letter in common do not differ significantly (DMRT p=.05).

canker formation. Frequently, the cankers were neither large nor abundant. Of the 1,080 inoculation sites, 206 developed cankers. Most cankers were 6-12 mm long; only seven cankers were more than 12 mm long. The largest canker was 41 mm long. Foliage wilt was not observed on any trees.

Inoculations resulted in red-orange discoloration of the xylem that extended well beyond the external bark cankers. In reisolations attempts from discolored wood, the fungus was recovered from 100% of the trees and from 71% of the discolored wood chips.

Honeylocust cultivars responded differently to *T. austro-americana* inoculations. 'Shademaster' had fewer cankers than other cultivars, but was not significantly better than 'Holka' or 'Imperial'. 'Moraine' and 'Skyline' were intermediate in susceptibility and 'Sunburst' was the most susceptible. The xylem tissue on all cultivars became discolored for 60 mm in length at least 50% of the time (Table 1). *Thyronectria austro-americana* was readily reisolated from the discolored wood in the excised branches.

Season of inoculation influenced canker development. Inoculations in May and July resulted in significantly fewer cankers than inoculations in September and November (Table 1). Discoloration of the xylem was present regardless of season of inoculation.

Discussion

In this study, cankers resulting from artificial inoculation were relatively small and more closely approximated the size of those described by Crandall (4) than the larger cankers reported by other researchers (2, 5, 6, 9, 10). The cankers observed in this study might have increased in size if left through the 1988 growing season, or they could have decreased in size through production of surrounding callus (6, 9). Coalescence of small cankers can result in extensive dieback and decline of honeylocust (4).

More cankers resulted from the September and November inoculations in this study than from inoculations made earlier in the year. This may indicate that the causal fungus is not especially virulent in nonstressed trees or that localization of infection by the host is more effective during the season when there is more active growth. These data on honeylocust are not in agreement with those of Born and Crane who found that inoculations in June and July produced more and larger cankers than those made in September (2).

Selection of honeylocust cultivars for resistance to the Thyronectria canker disease would be an important practice in landscape planning. The results of this study support an observation by Kenna (8) that 'Sunburst' and 'Moraine' are more susceptible than other cultivars to *Thyronectria.* Selection of the cultivars 'Imperial', 'Holka', or 'Shademaster' would appear warranted. Other recommendations that could reduce disease incidence are the avoidance of injuries, the maintenance of vigor through suitable fertilization and watering practices, and the pruning out of dead and dying branches.

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