

Effect of Anthracnose on Growth of Grafted Black Walnut

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ABSTRACT

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Black walnut (*Juglans nigra*) may be defoliated during the growing season by anthracnose caused by *Gnomonia leptostyla*, and growth of defoliated trees has been assumed to be reduced. Over a 5-yr period, however, grafted black walnut from 94 clones at Purdue University showed no significant correlation between degree of anthracnose infection and height or volume growth. A very low, but significant, correlation was found between anthracnose incidence and diameter growth, perhaps because diameter growth continues later in the season than height growth and could be affected by early defoliation.

Gnomonia leptostyla (Fr.) Ces. & de Not., which causes walnut anthracnose, is indigenous to North America and often causes severe or complete defoliation of black walnut (*Juglans nigra* L.) (1). The fungus attacks the current year's leaves, nuts, and stems. Small brown to black, circular to irregularly circular spots appear on leaves and nuts and eventually enlarge and coalesce into large necrotic areas.

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Infected leaves may turn yellow and drop prematurely. Severe infection and leaf drop usually occur late in the growing season and apparently have no effect on growth unless repeated year after year (2). Because others have speculated that anthracnose must reduce growth (1), we examined correlations between anthracnose severity and tree growth in height, diameter, and volume.

MATERIALS AND METHODS

In the black walnut tree improvement program at Purdue University, anthracnose damage is assessed annually in mid-September as part of the clonal evaluation process. Anthracnose infection ranges

from nonexistent to moderately severe on the grafted trees. The grafts are rated subjectively on a scale from 1 to 5, with 1 representing very little or no infection and 5 representing severe infection with nearly complete leaf drop. Height and diameter are also measured annually, and volume is calculated by an equation developed by Todhunter et al (3).

For correlation analyses, mean anthracnose ratings of 94 grafted clones over 7 yr old were paired with clonal means for annual height, diameter, and volume growth for 5 yr of measurements. In addition, correlations of anthracnose ratings to annual growth of 2,523 individual grafts were analyzed.

RESULTS AND DISCUSSION

When analyzed on the basis of clonal means, anthracnose infection was significantly correlated with diameter growth but not with volume or height growth (Table 1). The correlation was negative, indicating that as anthracnose increases, diameter growth decreases. Diameter was the only growth trait affected because anthracnose develops late in the growing season, and by the time it has sufficient impact on growth, height growth has

Table 1. Correlations and significance levels for clonal means for annual growth of grafted black walnut in relation to anthracnose severity rating

| Variable (mean annual) | r^2 | Significance | |
|---------------------------|--------|--------------|-------|
| | | r | level |
| Height growth | 0.0025 | 0.0497 | 0.635 |
| Diameter growth | 0.0439 | -0.2097 | 0.043 |
| Volume growth | 0.0105 | -0.1024 | 0.326 |

ceased but diameter growth is continuing. The slight, although significant, correlation between diameter growth and anthracnose infection also indicates an

effect of the disease late in the growing season. Most diameter growth occurs before disease becomes severe, and the impact of the disease is correspondingly slight.

When observations of individual trees were analyzed, no significant correlations were found between disease rating and growth.

Because of the low or nonsignificant correlations with growth, anthracnose resistance should not be considered a primary trait for the selection of superior black walnut genotypes but should be considered secondarily to selection for

growth and form. Trees that are totally defoliated year after year, which were not represented in our select population, probably should be avoided for breeding purposes.

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