

# Optimal Spray Application Rates for Ornamental Nursery Liner Production

In the nursery industry liners are densely planted at a rate of 7000 to 10,000 plants per acre with tree species reaching a height of 6 to 10 ft during 1 to 3 years. This high density of liners can aggravate the severity and incidence of insect infestations and diseases. Increased amounts of insecticides and fungicides are used routinely to suppress and control pests and diseases. To maximize the effectiveness of pesticides, confirmation of the actual spray coverage and spray deposition on targets under field conditions is required. Spray deposition and coverage at different application rates for nursery liners 'Autumn Spire' red maples (*Acer rubrum*) of different sizes were investigated to determine the optimal spray application rates.

The canopy height, lowest branch height, caliper, and leaf area were characterized. A traditional hydraulic sprayer with vertical booms between tree rows was used to apply the spray applications rates of 10, 20, 30, and 40

gal/acre for the 2-year-old liners and 20, 40, 60, and 80 gal/acre for the 3-year-old liners (Figure 1). Nylon screens were used to collect spray deposition of a fluorescent tracer dissolved in water, and water-sensitive papers were used to quantify spray coverage inside canopies.

Spray deposition, coverage, and droplet density inside both 2- and 3-year-old liner canopies increased as the application rate increased (Figure 3). The minimum rates to spray 6.6-ft-tall, 2-year-old 'Autumn Spire' red maple liners and 8.7-ft-tall, 3-year-old liners were 20 and 40 gal/acre, respectively. Based on the characteristics of the liner canopies, an equation was derived to estimate the spray application rate required for different tree liner heights (Figure 2). This equation will help growers to determine optimal application rates to use on different liner canopies based on their height for adequate spray deposition inside canopies.



Fig. 1. Spray deposition and coverage test on (A) 2-year-old and (B) 3-year-old 'Autumn Spire' red maple liner plots with the high ground clearance sprayer (Tracker; GK Machine, Donald, OR).

**USDA** For more information, contact: James Altland, [james.altland@ars.usda.gov](mailto:james.altland@ars.usda.gov), USDA-ARS- ATRU, 27 Horticultural Insects Research Laboratory, 1680 Madison Avenue, Wooster, OH 44691

**ARS** Agricultural Research Service

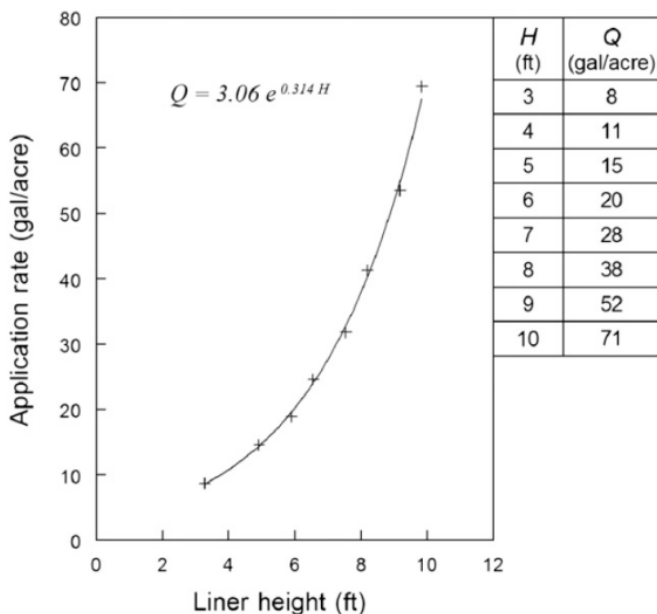


Figure 2. Spray application rates needed for tree liners as an exponential function of liner heights based on the equation  $Q = 3.06e^{0.314H}$ , H (liner height) and Q (application rate).

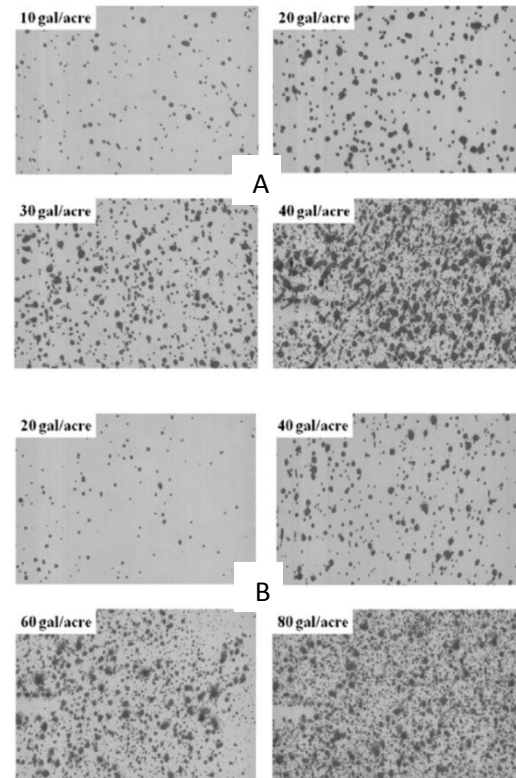


Figure 3. Images of spray deposits on water-sensitive papers at 3 ft height inside canopies of (A) 2-year-old and (B) 3-year-old 'Autumn Spire' red maple liners at four different application rates; 1 gal/acre = 9.3540 L·ha<sup>-1</sup>.