FOLIAR DEPOSITION AND OFF-TARGET LOSS WITH DIFFERENT SPRAY TECHNIQUES IN NURSERY APPLICATIONS

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ABSTRACT. *Information is lacking on spray techniques to improve deposit uniformity within nursery canopies and reduce off-target loss on the ground and via spray drift from the treated area. Spray deposits at various elevations within crabapple trees and on the ground were investigated with an air blast sprayer equipped with conventional hollow-cone nozzles, air-induction nozzles, and conventional hollow-cone nozzles with a drift retardant in a commercial nursery field. Airborne deposits at three elevations on sampling towers and on the ground at several distances from the sprayer were also investigated with the three spray treatments in an open area without trees. To compare field test results, wind tunnel experiments were conducted to assess spray deposits on the floor beyond 0.4 m downwind distance from the nozzles and airborne deposits at 2.1 in downwind from the spray discharge point with the three spray techniques without air assist. Droplet size distributions across spray patterns without air assist were measured with a laser particle/droplet image analysis system. In general, there was no significant difference for deposits within nursery tree canopies and on the ground with three different spray techniques. At the 700 L/ha application rate, which was 360 L/ha lower than the rate typically used in nursery application, the tree canopies received over 4 to 14.5 times as much spray deposit as actually needed from all treatments, and a large portion of spray volume deposited on the ground. Compared with conventional hollow-cone nozzles, drift reduction from air-induction nozzles or the spray mixture with drift retardant treatment was significant in wind tunnel tests but was not significant in field tests.*

Keywords. Air blast sprayer, Airborne, Air-induction nozzle, Drift, Drift retardant, Ground deposit, Low-drift nozzle, Nursery crop, Spray nozzle.

The floral and nursery industries produce high-value crops that require more complicated pest control strategies and more intensive labor than field crop production. Applications of pesticides and other production strategies have ensured adequate and high-quality plants that meet consumer preferences for a wide variety of canopy structure characteristics, growing conditions, and marketing requirements. However, concerns have been raised over the extent of pesticide contamination to the soil, surface water, and ground water from excessive amounts of pesticides. Pesticide contamination in the environment potentially threatens the quality of life and safety of nearby residents because many nurseries operate in small areas close to residential districts and urban or suburban areas. Consequently, environmentally friendly pesticide application is essential for nursery production.

Although the nursery and horticultural industries are among the fastest growing enterprises in U.S. agriculture, little research has been done to optimize their spray application strategies (Krause et al., 2004). Due to crop similarity, air-assisted application technologies for apple and citrus orchards (Fox et al., 1993; Salyani et al., 1987; Doruchowski et al., 1996) are normally adapted to nursery tree crops. However, compared with orchard crops, nursery trees are usually narrow and sharp and are difficult to apply pesticide with conventional delivery systems. Derksen et al. (2004) investigated canopy deposits, spray coverage, and downwind ground deposits from an air blast sprayer and an air curtain sprayer in a nursery field with red maple trees, and found adjustments were necessary to sprayer settings used for orchard applications to obtain uniform spray deposits in

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