Influence of Spray Volume on Spray Deposition and Coverage within Nursery Trees

Information on better utilizing airblast sprayers to achieve high pesticide spray application efficiency in nursery tree production is needed since this is one of the most commonly used sprayers to apply pesticides in ornamental nursery crops. There are no scientific spray application guidelines, so most nursery crops are over sprayed, resulting in high production cost and potential environmental contamination.

Foliar spray deposition and coverage at different heights inside crabapple tree canopies were investigated for a conventional airblast sprayer operating at four different application rates ranging from 230 to 900 liters per hectare (L/ha) (Figure 1). Deposition on the ground at various distances from the sprayer was also measured at the 700 L/ha application rate (Fig. 2). Foliar deposition and coverage on targets below 2.6 m inside tree canopies increased as the application rate increased (Figure 1). Coverage also increased with greater application rates, but the increase was not as marked as observed for foliar deposition (Figure 3). For trees taller than 2.6 m, the sprayer could not deliver uniform spray deposition and coverage across the tree height. The portion of trees below 2.1 m was well covered by the spray deposits with 230 L/ha application rate while higher application rates resulted in over-spray application. Less than 30% of total spray volume was deposited on target trees while over 34% of the total spray volume was lost on the ground. The tree-row volume method to estimate the application rate for nursery trees could cause extremely excessive spray deposits on tree target areas. The equation should be modified so that foliage density and empty space between tree rows is also considered.

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Fig. 1. Spray deposits at four heights [1.2 m, 1.7 m, 2.1 m, and 2.6 m] inside crabapple canopies and four different application rates [230 L/ha, 440 L/ha, 725 L/ha, and 900 L/ha].

Fig. 2. Spray deposits at different distances downstream from the sprayer at 700 L/ha application rate.

Fig. 3. Spray coverage at four heights [1.2 m, 1.7 m, 2.1 m, and 2.6 m] inside crabapple canopies and four different application rates [230 L/ha, 440 L/ha, 725 L/ha, and 900 L/ha]. Error bars represent standard deviations from means.