Within Canopy Movement and Deposition of Insecticide Residues in Orchards During Spray Operations
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**Introduction**

The tree fruit industry has set a goal of reducing production costs by 30% through technology innovation while producing the highest quality fruit. Application technology offers one possible method for achieving this goal. We are studying alternative sprayers and determining whether reduced application rates are feasible. We are also studying alternative row spraying practices. During crop year 2003 we compared bioactivity and residue distribution following one and two sprays of Guthion (azinphos-methyl) or Assail (acetamiprid) at labeled recommended rates (1X) or 0.25X at 0.5X rates. We also examined whether spraying in alternate rows or skipping rows could provide sufficient residues to control codling moth neonates.

**Procedures**

PLOTS were located at a commercial orchard southwest of Quincy, WA. Gala apple trees were delineated for treatments using a stratified block design. Treatment blocks consisted of 5 rows by 40 trees that were divided into four replicates of 10 trees each. Treatments were sprayer (Pak-Blaster, an airblast type sprayer, or Proptec; air-assisted tower mounted sprayer), application rate (0.25X, 0.5X and 1X), and row spray pattern (every row, alternate row, skip row).

Guthion rates were 0.25, 0.5, and 1 lb AI/acre. Assail rates were 0.075 and 0.150 lb AI/acre. For the “every row” spraying pattern, both sides of a single row were sprayed. For the “alternate row” pattern, only the outer side of two adjacent rows were sprayed. For the “skip row” pattern, the outer two rows of a three-row group were sprayed, leaving the middle row unsprayed.

Apples and surrounding foliage were randomly collected from two branches from each of six trees within a replicate plot. Leaf discs (5 cm²) were punched and then bioassayed using neonate codling moth (CM) larvae. Leaf discs were extracted and residues quantified by GC.

**Dose-Response Relationship for Neonate CODLING Moth**

Probost analysis was used to generate LC50 and LC95 estimates (24-h exposures) that were compared to recovered insecticide residues (µg/cm²).

**Residue and bioactivity results from reduced application rate experiments suggested that alternate row spraying may be feasible for controlling CM larvae. Video of spraying operations showed significant cross row movement of spray, suggesting that residues may be sufficient to control CM larvae on non-sprayed adjacent rows. The graph to the right shows that Guthion residues were above the LC95.**

**Conclusions**

1. Initial spray deposition from both an airblast & a Proptec sprayer resulted in Guthion (azinphos-methyl) residues greater than the laboratory estimated LC50 and LC95 at all application rates.
2. Residues of Assail (acetamiprid) were above the LC95 and LC80 at all application rates.
3. Alternate row and skip row spray patterns indicated residues on foliage not sprayed directly with Assail or Guthion were high enough to cause 100% mortality of larvae. Guthion residues were still above the LC95 28 days after application. Assail residues were still above the LC50 28 days later, but bioassays showed near 100% mortality of larvae exposed to treated foliage (data not shown).
4. Data suggested that significant reductions in application rate and area treated have the potential to provide efficacious control of CM larvae.

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