Effect of Different Spraying Patterns on Insecticide Residue Deposits on Apple Leaves and Bioactivity Against Codling Moth Larvae

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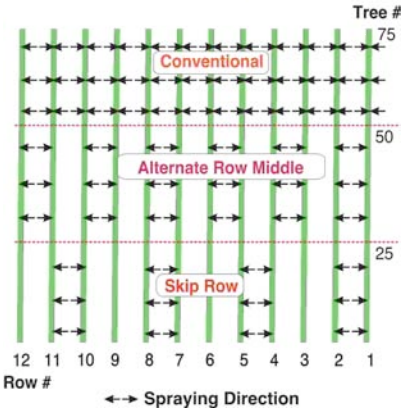
1 Background & Hypothesis

- Use of insecticides to control the codling moth (CM) pest in fruit production can be hazardous to people and their environment. If insecticide use could be reduced without adversely affecting pest control, potential hazards could be minimized.
- One way to reduce use is to not spray every tree row. Past observations have shown that spraying one side of a tree causes significant pesticide residues to deposit on the unsprayed side of the tree and on an adjacent unsprayed row.
- We tested the hypothesis that those residues would be sufficient to kill CM larvae on leaves around the apple.

The spray from one row passes through and under the trees, depositing on the trees at least two rows away.

2 Experimental Design



- A WSU technician used an airblast sprayer to apply Guthion insecticide to every tree row (conventional treatment) or every other tree row (alternative row middle treatment). In a third treatment, a complete row of trees was not sprayed (skip row).

3 Sampling

- Leaf samples were collected from the sprayed and unsprayed side of each tree row, and from the completely unsprayed row. Ten replicate trees per treatment were sampled.

- Forty 10-cm^2 leaf disks were punched from the leaves of each replicate tree.

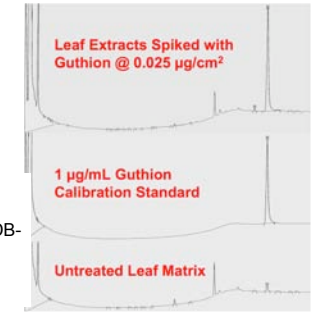
4 Bioassay of Codling Moth Larvae

- CM eggs were obtained from the USDA-ARS lab in Wapato.
- Five neonate CM larvae were placed on leaf disks and the number dead recorded after three hours of exposure.
- Observations were transformed to % mortality.

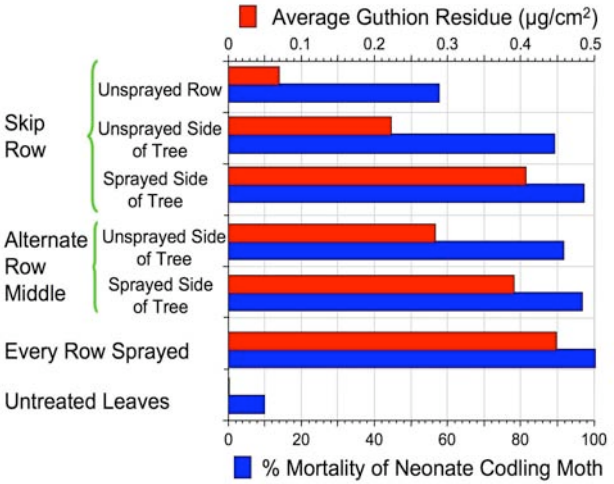
5 Analytical Methods

- Pesticide residues on the leaf surface were extracted by shaking 40 leaf disks in a solution of 2:1 acetone:water.
- The extracted residues were partitioned into dichloromethane using a separatory funnel.
- The dichloromethane was dried over sodium sulfate and then rotary evaporated to dryness. The dried residues were re-dissolved in ethyl acetate.

- Guthion residues were quantified using a gas chromatograph containing a DB-1701 column and a TSD (thermionic specific detector) sensitive to N & P atoms.



6 Results: CM Mortality & Guthion Residues on Leaves



- Larvae started to die within 30 minutes of contact with leaves from the sprayed side of trees.
- After 3 hours of exposure, CM larval mortality averaged >95% on leaves collected from the sprayed side of the trees.
- Larval mortality averaged ≥90% on leaves collected from the unsprayed side of trees, and was <50% on leaves collected from an adjacent unsprayed tree.
- As the average amount of Guthion residues decreased, the mortality of neonate CM larvae decreased as well. Residues and mortality decreased in the following order: sprayed side of tree > unsprayed side of tree > unsprayed tree row.

7 Conclusions

- Guthion residues depositing on the unsprayed side of trees were sufficient to kill neonate CM larvae, even though their concentration averaged ~40% less than the residues on the sprayed side of trees.
- Thus, larvae hatching from eggs laid on leaves nearby an apple may die before they can cause damage to the fruit.

8 Acknowledgments

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