Sprayers and Applications

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Efficacy and Application

• Timing
• Coverage
• Rate
  – Less important
  – Errors in rate can be corrected with good timing and coverage
# Coverage and Droplet Size

<table>
<thead>
<tr>
<th>Droplet size, microns</th>
<th>Droplets per gallon</th>
<th>percent increase in droplets</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>870,000,000</td>
<td>Baseline</td>
</tr>
<tr>
<td>100</td>
<td>6,900,000,000</td>
<td>800% (8x)</td>
</tr>
<tr>
<td>50</td>
<td>56,000,000,000</td>
<td>6400% (64x)</td>
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</tbody>
</table>
Hydraulic Nozzles

• Droplet size range is 50-400 microns, especially when operated at 100-150 psi
• Higher nozzle pressure will reduce the amount of big drops and increase the number of small...
• As the % of fine drops increase, drift potential will increase.
Effects of volume

• 80-100 gpa industry standard
• Volumes <80 gpa, travel speed critical
  – Sprayer must travel slow enough to displace air volume of tree with mist
  – Principle applies to air shear sprayers
    • Acutech, Agtech, Vict air, Windmill
Travel speed

• 2-3 mph and 40-60 gpa for small trees
• Not more than 2 mph and 80-100 gpa for larger trees

Travel speeds and tree height:
Size of ladder needed to harvest is a good indicator
6 foot ladder (10 ft) = 3 mph
8 foot ladder (12 ft) = 2.5 mph
10 foot ladder (14 ft) = 2 mph
12 foot ladder (16 ft) = 1.5 mph
14 foot ladder (18 ft) = 1 mph
Better nozzle selection can increase the treated volume of orchard by 150,000 cubic feet on 14 ft. centers.
Pattern @ 1.5 mph

Pattern @ 2.0 mph

Pattern @ 3.0 mph
Calibration

• 2 mph
  – 176 ft/minute = 17.7 minutes/acre @ 14 ft rows
  – 20.6 minutes/acre @ 12 ft rows

• 3 mph
  – 264 ft/minute = 11.8 minutes/acre @ 14 ft rows
  – 13.8 minutes/acre @ 12 ft rows

• Direct 2/3 of spray to upper 1/3 (smaller trees 1/2) of canopy
Calibration (lg trees)

- 80 gpa
- 17.7 minutes/a = 4.5 gpm
Calibration (sm. Trees)

- 40 gpa
- 13.8 minutes/a = 2.91 gpm
- Pattern not appropriate for lg trees
Factors affecting coverage

• Calibration
• Travel speed
• Tree size
• Training
  – Central leader, vase
• Row width
• Pruning
Pruning

• Pruning can have obvious impacts on coverage
Timing

*most critical aspect of treatments*

- **Models**
  - Indicate biological development
  - Will not tell you how many CM, or distribution
- **Treatments most effective when timed well**
  - Ovicides, before egg hatch
  - Larvicides, as eggs are hatching for entire generation
- **Active residues present for as long as hatch is occurring**
  - Small % hatch can = lg number of CM
  - High populations require nearly 100% of hatch treated
- **Two sprays/gen based on 3-4 moths/trap/week and infestation less than 0.1%**
Guthion activity

- Resistance to Guthion shortens residual
- Higher concentrations will NOT necessarily extend residual control in PROPORTION to rate increase
- Suggested rates
  - 2 lbs/100 gallons
  - 30-80 gal/acre
  - Volume depends on tree size, canopy density
Current Guthion Rules

- 9 lbs/season of 50W
- 7 days between applications
- 14 days preharvest, 14 day re-entry
- Don’t spray during an inversion
- Don’t spray in low humidity and high temp
Adjuvants

• Spreaders, stickers, activators
• Little replicated work in tree fruits
• Manufacturer’s data heavy toward fungicides and row crops, not fruit
Management of Residues

• Wait as long as possible between irrigations and spray area where set just ran
• 1/4” of rain in 5-10 min may eliminate residues. Reapply accordingly.
• Use Surround instead of water to cool
• Haul bins before April or at harvest
• More bin piles = more sources of CM
Bin/Prop Piles

• Don’t spray bins, props or wood pile
  – Poor coverage, no way to accurately time
• Only a problem for 1 season, no carryover population
• Monitor around sources and treat accordingly
Bin Piles

• Avoid taking orchard run bins from CA in May/June and deliver empties from the packing line to the orchard

• Take bins from bin yard in summer, place spring/summer off-line bins in a remote bin yard for late harvest
Bins in orchard

• Leave bins at warehouse as long as possible
• Do not pre-bin the orchard, especially from July through September
  – Reduces infestation of bins from trees
• Scattering bins fresh from storage/warehouse can inoculate the entire orchard.
Border sprays

- In narrow orchards, the entire orchard is the border.
- Border spray only if internal pressure is nearly zero, verified by good monitoring protocols.
- Amount of border to treat is function of pressure and wind direction.
- Good monitoring program necessary if relying on border treatments.
PERSEVERE!

• Choose appropriate travel speed
• Calibrate properly
• Use enough traps (1 per 5 acres)
• Apply treatments timely. Reapply if necessary.
• Minimize bin problems
• Monitor bin/prop piles, wood piles, external sources