Orchard Pesticide Spray Rates

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Pesticide Rates

- **Amount per 100 gallons** (the dilute rate)
- **Amount per acre** (the concentrate rate)
Types of Application

- Dilute = point of runoff
- Concentrate (low volume)
Standard Conversion from Dilute Rate to Per Acre Rate

Based on assumption that it takes 400 gal/A of water to spray apple trees to point of runoff

Rate of pesticide per acre = (Rate per 100 gal water) \times (400 gal/acre)

Example, Guthion 50WP: (0.75 lb/100 gal) \times (400 gal/A) = 3.0 lb/A
<table>
<thead>
<tr>
<th></th>
<th>Old days</th>
<th>Now</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tree size</strong></td>
<td>Big</td>
<td>Small</td>
</tr>
<tr>
<td><strong>Tree spacing</strong></td>
<td>Wide</td>
<td>Narrow</td>
</tr>
<tr>
<td><strong>Sprayer</strong></td>
<td>Handgun</td>
<td>Airblast</td>
</tr>
<tr>
<td><strong>Volume to runoff</strong></td>
<td>400 gal/A</td>
<td>100-250 g/A</td>
</tr>
</tbody>
</table>
### Dilute Volume for Fruit Crops

<table>
<thead>
<tr>
<th>Crop</th>
<th>Dilute volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>apples</td>
<td>400 gal/A</td>
</tr>
<tr>
<td>peaches</td>
<td>300 gal/A</td>
</tr>
<tr>
<td>berries</td>
<td>200 gal/A</td>
</tr>
</tbody>
</table>
Customized Application

• Based on assumption that small apple trees take less than 400 gal/A to reach the point of runoff
Customized Application

• 1\textsuperscript{st} step: determine what volume per acre \underline{to runoff} in YOUR trees

• \textbf{Must} be done even if you never actually make a dilute application

• This is basis of calculating how to do a customized low-volume concentrate spray
Dilute Spraying

• How much water?
  – Standard (400 gal/A)
  – Customized

• How much pesticide?
How to know dilute volume for a specific orchard

1) Experiment with sprayer
2) Use chart of common spacings
3) Use equation
# Dilute volume chart

*(p. 19 of bulletin)*

<table>
<thead>
<tr>
<th>Row spacing</th>
<th>Canopy width</th>
<th>Tree height</th>
<th>Minimum Dilute Gal/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>30’</td>
<td>20’</td>
<td>20’</td>
<td>407</td>
</tr>
<tr>
<td>20’</td>
<td>12’</td>
<td>12’</td>
<td>220</td>
</tr>
<tr>
<td>16’</td>
<td>8’</td>
<td>8’</td>
<td>122</td>
</tr>
</tbody>
</table>
Step 1: get measurements
- Canopy width [ft]
- Tree height [ft]
- Row spacing [ft]
Equations

**Step 2:**
Canopy tree width \( \times \) height \( \times \) row spacing \([\text{ft}]\)\([\text{ft}]\)\([\text{ft}]\)= tree row volume \([\text{cu.ft.}/\text{A}]\)

**Step 3:**
\(\text{TRV} \times 0.7 \text{ gal}/1000 \text{ cu ft} = \text{minimum dilute volume} \,[\text{gal}/\text{A}]\)
Equations, example

- Row spacing 20 ft
- Canopy width 10 ft
- Height 12 ft
- TRV = 10’ x 12’ x (43,560/20’)
  = 261,360 cu. ft.
- TRV x (0.7 gal/1000 cu.ft.) = 183 gal/A
Dilute Spraying

- How much water?
- How much pesticide?
  - \((\text{Dilute rate}) \times (\text{dilute volume})\)
Customized Dilute Spraying, example

- How much pesticide?
  \[(\text{Dilute rate}) \times (\text{YOUR dilute volume})\]

- How much Guthion?
  - \[(0.75 \text{ lb/100 gal}) \times (183 \text{ gal/A})\]
  \[= 1.4 \text{ lb/A}\]
Concentrate Spraying

• Also called ‘low volume spraying’

• Airblast sprayer

• Typically 40-80 gallons per acre

• As amount of water per acre decreases, but the amount of pesticide stays the same, the spray mix becomes more concentrated than in a dilute spray
Concentrate Spraying

• Amount of water to use?
  – Depends on sprayer
  – Whatever volume needed to give adequate coverage
  – Typically 40-80 gallons per acre
Concentrate Spraying

• **What is the concentration?**
  
  \[ \text{concentration} = \frac{\text{amount of water per acre in your sprayer for dilute application}}{\text{amount of water in your sprayer for concentrate application}} \]

• **Example:**
  
  – Your dilute volume = 180 gal/A
  – Your concentrate volume = 60 gal/A
  – Your concentration = 180 / 60 = 3x
Concentrate Spraying

• Amount of pesticide to use?
What rate does label state?

• 3 typical answers:
  – Amount per 100 gal only
  – Amount per acre only
  – Both

• If only the amount per acre is given, then use this rate

• Trend??
Concentrate Spraying

• Amount of pesticide to use?
• 4 possibilities:
  – Label rate per acre
  – Standard conversion
  – Standard conversion less 20%
  – Customized by tree row volume
Standard Conversion from Dilute Rate to Full Per Acre Rate

Based on assumption that it takes 400 gal/A to spray apple trees to point of runoff

Full Rate of pesticide per acre = (Rate per 100 gal water) x (400 gal/acre)

Example, Guthion 50WP: (0.75 lb/100 gal) x (400 gal/A) = 3.0 lb/A
Standard Conversion
Less 20%

- Control with airblast often good with less than the full rate
- Common in 1970s & 1980s
- Example:
  - Guthion full rate = 3 lb/A
  - Guthion full less 20% = 2.4 lb/A
- Risky unless known by experience
Tree Row Volume

your customized amount of pesticide per acre =

The dilute rate [amount of pesticide per 100 gallons] x

your dilute volume
Tree Row Volume, example

- **Captan 50WP**
- **Dilute rate:** 1.5 lb/100 gal
- **Your dilute volume:** 183 gal/A
- **Your customized amount of pesticide per acre =**
  \[(1.5 \text{ lb/100 gal}) \times (183 \text{ gal/A})\]
  \[= 2.74 \text{ lb/A}\]
Tree Row Volume, alternate method

• **Use** percentage of standard
• Determine your dilute volume
• % of standard = 
  \[(\text{your dilute volume}) / 400 \text{ gal/A}\]
• Then multiply this by the full rate of pesticide per acre
Tree Row Volume, alternate method

Example:

• your dilute volume = 183 gal/A
• Your % of standard = $\frac{183}{400}$
  = 0.46 = 46%
• Captan 50WP, dilute rate = 1.5 lb/100 gal
• Captan full rate =
  $(1.5 \text{ lb/100 gal}) \times (400 \text{ gal/A}) = 6 \text{ lb/A}$
• Your rate = 0.46 x 6 lb/A = 2.76 lb/A
3 Final Examples, #1:

• Provado 1.6F, 2 oz/100 gal

• How much for a dilute application to big old trees that require 400 gal/A to runoff?

• (2 oz/100 gal) x (400 gal/A) = 8 oz/A of Provado
3 Final Examples, #2:

- Provado 1.6F, 2 oz/100 gal
- How much for a **dilute** application to **semi-dwarf** trees that require 180 gal/A to runoff?
  - \((2 \text{ oz/100 gal}) \times (180 \text{ gal/A}) = 3.6 \text{ oz/A of Provado}\)
- Note, this is less than the 8 oz/A of Provado needed for big trees in example #1
3 Final Examples, #3:

- Provado 1.6F, 2 oz/100 gal
- How much for a concentrate spray to semi-dwarf trees that require 180 gal/A to runoff, if sprayer applies 60 gal/A?
  - \[(2 \text{ oz/100 gal}) \times (180 \text{ gal/A}) = 3.6 \text{ oz/A of Provado}\]
- Note, compared to #2, this is same amount of Provado but in different amount of water
- What is the concentration? \[180 / 60 = 3x\]
Orchard Spraying

Spray mix = water + pesticide