Spray Tips for Aiding Herbicide Performance

58th Annual Lodi Grape Day
February 2, 2010

Kurt Hembree
Farm Advisor
UCCE, Fresno County
http://cefresno.ucdavis.edu
What can we do to aid herbicide performance?

(assuming we’re using the proper herbicide(s), rates, additives, and spray timing for the weeds being treated)

- Spray nozzle choice (drift/efficacy)
- Spray technique (applicator/conditions)
Tall weeds = erratic or poor control = high spray height = increased drift = increased plant injury = complaints
Treat within a couple weeks of each weed flush if possible.
✔ Spray nozzle choice
Spray nozzles are the least expensive part of any spray job, but often the most overlooked!

Nozzles have been engineered to produce spray droplets of a given size for a given pattern.
Nozzle choice

- Directly affects:
  - spray droplet size
  - spray drift potential
  - uniformity and coverage

- Which impacts:
  - weed control
  - economics
  - environmental quality

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Postemergent Herbicide Drift and Grape Yield
(treated at 4″ shoots)

KAC

Herbicide

RU 2,4-D RU+2,4-D Banv Tran Mile Garl Rapt Stap Shar Chat RU+Goal UNT

Lbs/Vine

0 10 20 30 40 50 60 70 80 90

2007 2008 2009

Kurt Hembree – UCCE, Fresno County
Droplet size classification (droplets <~200 microns drift more)

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Kurt Hembree – UCCE, Fresno County
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Droplets $\sim 200 \, \mu m$ drift more

Less Drift

Better coverage, but more drift

Kurt Hembree – UCCE, Fresno County
Fine (145-225 µm)
Medium (226-325 µm)
Coarse (326-400 µm)
Use an 03 or larger size nozzle to get the carrier and herbicide to the weeds.

**8001** at 30 psi at 5 mph

Fine droplets (~175 µm)

**8004** at 30 psi at 5 mph

Medium droplets (~250 µm)
Spray nozzle choices for herbicide application, drift management, and herbicide performance.

Table 1. Spray nozzle description, operating pressure, droplet size, drift, and general herbicide use patterns

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<th>Spray Nozzle Description</th>
<th>PSI range</th>
<th>Droplet size</th>
<th>Drift management</th>
<th>Preemergents</th>
<th>Systemics</th>
<th>Contacts</th>
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<td>15 – 60</td>
<td>F-C (15 psi), VF-M (50 psi)</td>
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VF (very fine), F (fine), M (medium), C (coarse), XC (extra coarse)

Nozzle tip wear: nozzle tip wear depends primarily on tip material:
(wears quickly) brass > polyacetyl > stainless > ceramic > carbide (little to no wear).
Spray nozzles, drift, and performance

Dr. Kassim Al-Khatib, Kansas State University

Spray Drift

Extended range (22%)

Chamber Design (<6%)

Venturi Design – II (<3%)

Venturi Design – I (<1%)

Air Mix
AI XR
Guardian Air

Turbo TeeJet

TP XR

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Extended Range (XR) Flat Fan

PSI: 15 - 60

C – F (400-145)

Drift rating:
Good (15 - 20 psi)
XR11004VS

20 psi, wind 5 mph
Medium droplets (~225 µm) (PRE or Systemics)

40 psi, wind 5 mph
Fine droplets (~150 µm) (Contacts)

Kurt Hembree – UCCE, Fresno County
Turbo TeeJet (TT)

PSI: 30 - 90
VC – M (500-225)

Drift rating:
Very good
Turbo TeeJet (TT)

Preemerge ✓
Systemic ✓
Contact ?

Kurt Hembree – UCCE, Fresno County
Air Induction (AI)

- Pre-orifice
- Air inlet
- Mixing chamber
- Exit orifice

PSI: 30 - 100
XC – C (500-325)

Drift rating: Excellent

Preemerge ✓
Systemic ✓
Contact

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Air Induction (AI)

30 psi, wind 6 mph

Extremely coarse (~500 µm)

60 psi, wind 6 mph

Very coarse (~400 µm)
Turbo TeeJet Induction (TTI)

PSI: 15 - 100
Drops: XC (>500)

Drift rating: Excellent

Preemerge? Systemic ✓ Contact

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TwinJet nozzles

- TJ60: PSI: 30 - 60
  - M – VF (325-<150)
  - Drift rating: Poor

- DGTJ60: PSI: 30 - 60
  - C – F (400-150)
  - Drift rating: Very good (03-08)

- TTJ60: PSI: 20 - 90
  - XC – M (500-225)
  - Drift rating: Excellent (<30 psi)
  - Very good (>30)

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Spray nozzle trial in grapes 2006 (15 DAT)
Spray nozzle trial 2008 (30 DAT)

Untreated

XR11004VS

TJ60-11004VS

TTJ60-11004VP
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Spray technique

The applicator

Spray conditions
Applicator care, attitude, and skill
Some of the costs associated with a poor spray job:

- Poor or spotty weed control
- Spray drift (crop and non-target damage)
- Waste of time, effort, product, and money
- Illegal residues (fines and lawsuits)
The applicator’s goal should be to...

- deliver the carrier (and herbicide) to the target area accurately, uniformly, and efficiently as possible.
  - to kill the weeds
  - to reduce off-target movement
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<tr>
<td>Spray height</td>
</tr>
<tr>
<td>Spray angle</td>
</tr>
<tr>
<td>Nozzle spacing</td>
</tr>
<tr>
<td>Travel speed</td>
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<td>Spray pressure</td>
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Keep an eye out to make sure nozzles are working consistently.

Warn nozzle example:
Herbicide cost is $20/A; 160 acres treated; 1 of 4 is over by 5-10%, then...

5% over = $0.25/A = $40/160 acres
10% over = $0.50/A = $80/160 acres
General factors that influence spray drift and herbicide performance

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<tr>
<th>Factor</th>
<th>More Drift</th>
<th>Less Drift</th>
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<tr>
<td>Spray droplet size</td>
<td>Smaller</td>
<td>Larger</td>
</tr>
<tr>
<td>Wind speed (3-7 mph)</td>
<td>Higher</td>
<td>Lower</td>
</tr>
<tr>
<td>Air temperature</td>
<td>Higher</td>
<td>Lower</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>Lower</td>
<td>Higher</td>
</tr>
<tr>
<td>Air stability</td>
<td>Stable</td>
<td>Mixing</td>
</tr>
<tr>
<td>Herbicide volatility</td>
<td>Volatile</td>
<td>Non-volatile</td>
</tr>
<tr>
<td>Nozzle orifice size</td>
<td>Smaller</td>
<td>Larger</td>
</tr>
<tr>
<td>Nozzle type</td>
<td>Produce fine droplets</td>
<td>Produce coarse droplets</td>
</tr>
<tr>
<td>Spray pressure</td>
<td>Higher</td>
<td>Lower</td>
</tr>
<tr>
<td>Spray release height</td>
<td>Higher</td>
<td>Lower</td>
</tr>
<tr>
<td>Travel speed</td>
<td>&gt;6 mph</td>
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Summary – to aid herbicide performance

- **Herbicide timing:**
  - preemergent (time close to rainfall, watch the foot traffic)
  - postemergent (small weeds shortly after emergence)

- **Spray nozzle selection:**
  - use size >03 (larger droplets and less plug-ups)
  - reduce drift to improve delivery to target (>200 µm)
  - balance of drop size, pressure and speed with herbicide

- **Spray technique:**
  - applicator care, attitude, and skill
  - spray conditions (environment and delivery)
Thanks for your attention!

http://cefresno.ucdavis.edu