Influence of Tractor Speed and Boom Height on Spray Coverage

Eric P. Prostko\textsuperscript{1}, Glen C. Rains\textsuperscript{2}, and O. Wen Carter\textsuperscript{1}

\textsuperscript{1}Dept. Crop & Soil Sciences
\textsuperscript{2}Dept. of Entomology
UGA - Tifton
Is this a bad combination????
Farm vs. Research?

**Concerns**
- Tractor Speed
- Boom Height
- Coverage
- Quality vs. Quantity?
Herbicide Efficacy

Coverage
Nozzle Type
GPA
Pressure
Boom Height
Tractor Speed

Rate 25%
Timing 25%
Environment 25%
Coverage 25%
Objective

• Evaluate the effects of tractor speed and boom height on spray quality
  – *Coverage*
  – *VMD*$_{50}$
Materials and Methods

- Melroe 3430 Spra-Coupe
- Tractor Speeds
  - 4.4, 6.5, and 9.5 MPH
- Boom Heights
  - 30, 45, 60 in
  - Wind ≤ 3.0 MPH
- 15 GPA (water + dye)
- DG TeeJet Drift Guard Nozzle Tips (20” spacing)
  - 8002DG (50 PSI)
  - 8003DG (40 PSI)
  - 8004DG (53 PSI)
    - Medium Droplet Sizes
- 2 locations in sprayer path
  - 8’ from tractor center (L1)
  - 30” parallel from L1 (L0)
- 5 Kromekote cards (2” X 3”)
  - 10’ apart
- Dropletscan (WRK of Arkansas, LLC)
### Droplet Size - TeeJet

<table>
<thead>
<tr>
<th>DG TeeJet (DG)</th>
<th>}</th>
<th>PSI</th>
<th>}</th>
<th>30</th>
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Results

• Analyzed data as 2 X 3 X 3 factorial
  – 2 card locations
    • 5 cards
  – 3 speeds
  – 3 boom heights

• 90 total data points

• Speed X Boom Height interaction for Coverage and VMD$_{50}$
Influence of Tractor Speed and Boom Height on Spray Coverage (%)

Coverage (%)

<table>
<thead>
<tr>
<th>Boom Height (in)</th>
<th>4.4 MPH</th>
<th>6.5 MPH</th>
<th>9.5 MPH</th>
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<tr>
<td>30</td>
<td>12</td>
<td>11</td>
<td>6</td>
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<td>45</td>
<td>10</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>60</td>
<td>12</td>
<td>10</td>
<td>6</td>
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</table>

LSD 0.10 = 1
CV = 12.523
Tractor Speed Effects on Spray Coverage (%) – 30” Boom Height

\[ y = -1.1802x + 17.49 \]

\[ R^2 = 0.7231 \]

N = 30
Tractor Speed Effects on Spray Coverage (%) – 45” Boom Height

\[ y = -0.5032x + 12.573 \]

\[ R^2 = 0.2892 \]

\( N = 30 \)
Tractor Speed Effects on Spray Coverage (%) – 60” Boom Height

\[ y = -1.2155x + 17.259 \]

\[ R^2 = 0.6876 \]

N = 30
Spray Coverage - 60” Boom Height

4.4 MPH

6.5 MPH

9.5 MPH
Influence of Tractor Speed and Boom Height on Droplet Size ($\text{VMD}_{50}$)

Medium = 236-340 $\text{VMD}_{50}$

LSD 0.10 = 5
CV = 1.83
Summary – Tractor Sprayer

- Lowest coverage at all boom heights was at 9.5 MPH tractor speed (6-8%)

- For 30” and 60” boom heights, negative linear relationship between tractor speed and coverage ($R^2 > 0.68$)
  - ~ 1.2% loss in coverage for each MPH

- Boom height influenced spray coverage as follows:
  - 4.4 MPH: 30” = 60” > 45”
  - 6.5 MPH: 30” = 45” = 60”
  - 9.5 MPH: 45” > 30” = 60”

- Generally, $VMD_{50}$ increased with tractor speed
  - 30” boom: 4.4 MPH < 6.5 MPH < 9.5 MPH
  - 45” boom: 4.4 MPH < 6.5 MPH = 9.5 MPH
  - 60” boom: 4.4 MPH < 9.5 MPH < 6.5 MPH
  - 306 to 345 microns (coarse droplet size)
BackPack Sprayer Coverage Evaluation

- Generally, same MM as tractor study
- September 1, 2015
- 15 GPA
- 3 nozzle boom, 20” spacing
- 20” Boom Height
- 3.5 MPH (walking)
- Wind (<1 MPH)
- 35-40 PSI
- 3 nozzle types
  - 11002DG
  - AIXR 11002
  - TTI02
The Influence of Nozzle Type on Spray Coverage (%) and VMD$_{50}$ (microns)

**Coverage (%)**

<table>
<thead>
<tr>
<th>Nozzle Type</th>
<th>Coverage (%)</th>
</tr>
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<tbody>
<tr>
<td>11002DG</td>
<td>13.4</td>
</tr>
<tr>
<td>AIXR 11002</td>
<td>12.6</td>
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<td>TT102</td>
<td>9.5</td>
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</tbody>
</table>

**VMD$_{50}$ (microns)**

<table>
<thead>
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<th>Nozzle Type</th>
<th>VMD$_{50}$ (microns)</th>
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<tbody>
<tr>
<td>11002DG</td>
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<td>TT102</td>
<td>524</td>
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</table>

LSD 0.10 = 1.8, CV = 18.3
LSD 0.10 = 19, CV = 6

3.5 MPH - Walking
20" nozzle spacing
20" boom height
35-40 PSI
15 GPA
11002DG
VMD$_{50}$ = 322 (C)

AIXR 11002
VMD$_{50}$ = 402 (VC)

TTI 02
VMD$_{50}$ = 524 (XC)

3.5 MPH - Walking
20” nozzle spacing
20” boom height
35-40 PSI
15 GPA
Final Thoughts

• If a grower would drive 4.4-6.5 MPH, not much difference between backpack and tractor.

• If grower drives 9.5 MPH or greater (?), ~50% less spray coverage.

• Could this partially explain observed differences between research and on-farm results???

• **Farmer Resistance?**
  – Too big/late, too fast, too high??????
Acknowledgements

• Technical Support provided by
  – Tim Richards
  – Charlie Hilton
  – Maryssa Davis