Application Technology – Making the Most of $$$ Spent on Pesticides

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Don’t Forget About the Application Process!
Optimizing Applications

Drift reduction

Efficacy
Importance
Droplet Size vs. Coverage

Cutting Droplet Size in Half

Results in Eight Times the Number of Droplets
## Spray Coverage (XR nozzle)

<table>
<thead>
<tr>
<th></th>
<th>XR – 5 GPA</th>
<th>XR – 10 GPA</th>
<th>XR – 15 GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Droplet size</strong></td>
<td>280 µm</td>
<td>280 µm</td>
<td>280 µm</td>
</tr>
<tr>
<td><strong>Spray Classification</strong></td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>Coverage</strong></td>
<td>19.9 %</td>
<td>42.7 %</td>
<td>64.5 %</td>
</tr>
</tbody>
</table>
# Spray Coverage (TTI nozzle)

<table>
<thead>
<tr>
<th>TTI – 5 GPA</th>
<th>TTI – 10 GPA</th>
<th>TTI – 15 GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Droplet size</strong></td>
<td><strong>Droplet size</strong></td>
<td><strong>Droplet size</strong></td>
</tr>
<tr>
<td>800 µm</td>
<td>800 µm</td>
<td>800 µm</td>
</tr>
<tr>
<td><strong>Spray Classification</strong></td>
<td><strong>Spray Classification</strong></td>
<td><strong>Spray Classification</strong></td>
</tr>
<tr>
<td>Ultra Coarse</td>
<td>Ultra Coarse</td>
<td>Ultra Coarse</td>
</tr>
<tr>
<td><strong>Coverage</strong></td>
<td><strong>Coverage</strong></td>
<td><strong>Coverage</strong></td>
</tr>
<tr>
<td>9.7 %</td>
<td>21.2 %</td>
<td>30.6 %</td>
</tr>
</tbody>
</table>
Spray Coverage (Comparison)

<table>
<thead>
<tr>
<th>Sprayer</th>
<th>Droplet size</th>
<th>Spray Classification</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>XR – 5 GPA</td>
<td>280 µm</td>
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<td>19.9 %</td>
</tr>
<tr>
<td>TTI – 10 GPA</td>
<td>800 µm</td>
<td>Ultra Coarse</td>
<td>21.2 %</td>
</tr>
</tbody>
</table>
Spray Volume Effect on Weed Control

5 GPA

20 GPA

Liberty
Spray Volume Effect on Weed Control

5 GPA

20 GPA

Dicamba
Droplet Size Effect on Weed Control

Liberty®
5 GPA
14 DAA

Control
150 µm
300 µm
450 µm
600 µm
750 µm
900 µm
Droplet Size Effect on Weed Control

Dicamba

5 GPA

14 DAA

Control

150 µm

300 µm

450 µm

600 µm

750 µm

900 µm
Nozzle Arrangement

1. All Forward
2. All Backward
3. Alternating
Nozzle Arrangement Effect on Coverage
Top Coverage Cards

- AIXR
- 3D Forward
- 3D Backward
- 3D Alternate
- ULD
- TTI Forward
- TTI Backward
- TTI Alternate
Back Coverage Cards
Aerial Applications
To **increase** our droplet size (reduce our drift potential) should we:

- Increase Pressure
- **Decrease Pressure**
Aerial Applications

To **increase** our droplet size (reduce our drift potential) should we:

- Increase Pressure
- Decrease Pressure
Pressure Effect on Droplet Size

VMDs for 4015 at 140 mph

Courtesy of Bradley Fritz (USDA-ARS)
Airspeed Effect on Droplet Size

VMDs for a 4015 at 40 psi and 0 deflection

Airspeed (mph)

VMD (μm)

652
633
610
582
550
513
425
377
344
315
285
259
235

50 60 70 80 90 100 120 130 140 150 160 170 180

Courtesy of Bradley Fritz (USDA-ARS)
## Aircraft Payloads

<table>
<thead>
<tr>
<th></th>
<th>Boeing 737</th>
<th>C-130 Hercules</th>
<th>Boeing C-17</th>
<th>Cessna 172</th>
<th>AT-802A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Take-off Weight (lbs.)</td>
<td>175,000</td>
<td>155,000</td>
<td>585,000</td>
<td>2,500</td>
<td>16,000</td>
</tr>
<tr>
<td>Payload (lbs.)</td>
<td>45,000</td>
<td>45,000</td>
<td>171,000</td>
<td>800</td>
<td>9,500</td>
</tr>
<tr>
<td>% max weight dedicated to payload</td>
<td>26%</td>
<td>29%</td>
<td>29%</td>
<td>32%</td>
<td>59%</td>
</tr>
</tbody>
</table>
Swath and Droplet Size Displacement

In-Wind

String Pattern Data

Effective Swath Width

WSP Pattern Data

Extra Coarse
Very Coarse
Coarse
Medium
Fine
Very Fine

Courtesy of Bradley Fritz (USDA-ARS), Matt Gill (University of Illinois), and Scott Bretthauer (NAAA)
Swath and Droplet Size Displacement

Cross-Wind

String Pattern Data

Effective Swath Width

WSP Pattern Data

Extra Coarse
Very Coarse
Coarse
Medium
Fine
Very Fine

Courtesy of Bradley Fritz (USDA-ARS), Matt Gill (University of Illinois), and Scott Bretthauer (NAAA)
Summary

• Do the little things when it comes to pesticide applications...
  • They can quickly add up and make or break the application!

• Droplet size, spray volume, and nozzle arrangement are important factors (among others) when it comes to coverage and pest control.

• Goal of aerial applications is the same, but they are extremely different processes than ground applications.

• Aerial applicators face numerous challenges but are still capable of making highly successful pesticide applications.
Remember…

I forget things almost instantly.
It runs in my family.

Just Don’t Forget About the Application Process!
Acknowledgements

- University of Arkansas Weed Science Group
- Arkansas Rice Research and Promotion Board
- Arkansas Soybean Promotion Board
- University of Arkansas System Division of Agriculture
- Brad Fritz, Phil Jank – USDA ARS Aerial Application Technology Unit
- Matt Gill, University of Illinois
- Scott Bretthauer, National Aerial Applicator’s Association
- UNL Pesticide Application Technology Lab