Under Pressure

The impact of pressure on spraying

03 AITX @ 10psi = XC

03 AITX @ 90psi = C

Photos: Dr. Tom Wolf, Agrimetry Research & Training

Jason Deveau
OMAFRA, Simcoe
@spray_guy
• A single nozzle produces a range of droplet sizes.

• The median droplet size (VMD) changes with pressure.

• Rate controllers adjust pressure according to travel speed… 

\[ D_v 0.5 \text{ (VMD)} \]
• You’ve heard it before, but it’s more important than ever
Droplet size and the label: Enlist Duo

Ground Application - Cropland
Apply 50 to 200 L of spray solution per hectare depending on the type of application equipment used. Use sufficient water for even distribution. Spray at low pressures (200 to 275 kPa) when the weeds are actively growing.

Droplet Size: Apply as a coarse to extremely coarse spray (ASABE S-572 Standard). Use drift reducing nozzle tips in accordance with manufacturer directions that produce a droplet classification of coarse to extremely coarse to significantly reduce the potential for drift.

Refer to the Product Use Guide for further information.
Controlling Droplet Size

The most effective way to reduce drift potential is to apply large droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if the application is made improperly, or under unfavorable environmental conditions (see the “Wind Speed and Direction”, “Temperature and Humidity” and “Temperature Inversions” sections of this label).

• Nozzle type. Use only spray nozzles that produce very coarse to ultra coarse spray droplets and minimal amounts of fine spray droplets as defined by the American Society of Agricultural and Biological Engineers (ASABE S-572.1). Do not use conventional flat fan nozzles that produce medium droplets.

Check nozzle manufacturer’s recommendations to determine the proper droplet spectrum, operating pressure, boom height, nozzle spacing and ground speed that will deliver the desired droplet size and spray volume of at least 100 L/ha for the very coarse to ultra coarse nozzle that is selected.
ASABE 572.1 is a standard that defines categories for flat fan spray quality based on the droplet size range, & number relative to volume.
Most nozzle manufacturers voluntarily comply with this standard and provide spray quality information.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>SYMBOL</th>
<th>Dv0.5 (VMD) μm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely Fine</td>
<td>XF</td>
<td>~50</td>
</tr>
<tr>
<td>Very Fine</td>
<td>VF</td>
<td>&lt;136</td>
</tr>
<tr>
<td>Fine</td>
<td>F</td>
<td>136 - 177</td>
</tr>
<tr>
<td>Medium</td>
<td>M</td>
<td>177 - 218</td>
</tr>
<tr>
<td>Coarse</td>
<td>C</td>
<td>218 - 349</td>
</tr>
<tr>
<td>Very Coarse</td>
<td>VC</td>
<td>349 - 428</td>
</tr>
<tr>
<td>Extremely Coarse</td>
<td>XC</td>
<td>428 - 622</td>
</tr>
<tr>
<td>Ultra Coarse</td>
<td>UC</td>
<td>&gt;622</td>
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</tbody>
</table>
### TeeJet AI TwinFan

- ID may be hidden under cap
- Note AI spray quality vs. conventional

<table>
<thead>
<tr>
<th>TIP NO. (strainer screen size)</th>
<th>PSI</th>
<th>DROP SIZE FOR AITTJ60</th>
<th>DROP SIZE FOR TJ60</th>
<th>CAPACITY ONE NOZZLE IN GPM</th>
<th>CAPACITY ONE NOZZLE IN OZ./MIN.</th>
</tr>
</thead>
<tbody>
<tr>
<td>06 Gray (50)</td>
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<tr>
<td>20</td>
<td>UC</td>
<td>XC</td>
<td>0.42</td>
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<td>VC</td>
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<tr>
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<tr>
<td>90</td>
<td>C</td>
<td>C</td>
<td>0.90</td>
<td>115</td>
<td>67</td>
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**GPA**

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<tr>
<th></th>
<th>4 MPH</th>
<th>5 MPH</th>
<th>6 MPH</th>
<th>8 MPH</th>
<th>10 MPH</th>
<th>12 MPH</th>
<th>15 MPH</th>
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<tr>
<td>4 MPH</td>
<td>1.4</td>
<td>0.95</td>
<td>0.71</td>
<td>0.68</td>
<td>0.57</td>
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<td>0.82</td>
<td>0.71</td>
<td>0.99</td>
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</table>

**GALLONS PER 1000 SQ. FT.**

<table>
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<tr>
<th></th>
<th>2 MPH</th>
<th>3 MPH</th>
<th>4 MPH</th>
<th>5 MPH</th>
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<tbody>
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<td>1.4</td>
<td>1.2</td>
<td>1.1</td>
<td>1.1</td>
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<tr>
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<td>2.0</td>
<td>1.4</td>
<td>1.2</td>
<td>1.2</td>
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<tr>
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<td>2.3</td>
<td>1.5</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>5 MPH</td>
<td>2.5</td>
<td>1.7</td>
<td>1.2</td>
<td>1.2</td>
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</tbody>
</table>

**Droplet Size Categories**

- EF: Extremely Fine
- VF: Very Fine
- F: Fine
- M: Medium
- C: Coarse
- VC: Very Coarse
- XC: Extremely Coarse
- UC: Ultra Coarse

May vary with nozzle capacity, spray angle and spray pressure.
However, the X-Files was right...

• Beware nozzles operating at the low and high ends of their pressure ratings – they don’t behave as advertised
• Most 110° AI nozzles rated from ~30 psi

• Fan angle changes a lot over pressure range

• Nozzle spacing / boom height does not

TeeJet AIC 110 04 – work performed by Victoria Radauskas, OMAFRA summer student
These are all “110’s”…
These are all “110’s”...
- Nozzle spacing, boom height and fan overlap matter
- Even at 100% overlap, spray quality & volume matter, too
So, to get good coverage

• Determine typical spray pressure range for driving speed

• Check nozzle tables to confirm nozzle is in middle of pressure range and producing desired spray quality

• Eyeball the boom - less than 100% overlap at low end of range? Adjust pressure & boom height, or maybe switch nozzle rates

• Failing that, consider re-plumbing the boom to adjust nozzle spacing
Again? Seriously...?

• Are you sure your operating pressure is what you think it is?
Friction = Pressure Drop
PWM can create up to 10 psi drop, although manufacturer says it’s accounted for.
Test your gauges

- Build your own cheap and easy pressure gauge tester

http://sprayers101.com/confirm-sprayer-pressure/
1. Select highest flow nozzles
2. Set typical operating pressure (target output / travel speed)
3. Test each section
4. Average and account for difference (minimum?)

Test your boom / section pressure & correct it
• We set the regulator at 160 psi

• Tested relative nozzle output

• Output on one section made no sense…

• Tested section pressure = only 150 psi

• Hose / barb diameter?

“Punk’in” sprayer – New Hampshire
So, to get good coverage – v.2

- Confirm and correct for pressure gauge accuracy / section pressure
- Determine typical spray pressure range for driving speed
- Check nozzle tables to confirm nozzle is in middle of pressure range and producing desired spray quality
- Eyeball the boom - less than 100% overlap at low end of range? Adjust pressure & boom height, or maybe switch nozzle rates
- Failing that, consider re-plumbing the boom to adjust nozzle spacing
To learn more about spraying, subscribe to www.sprayers101.com

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