A Lesson in Spray Quality and Droplet Size

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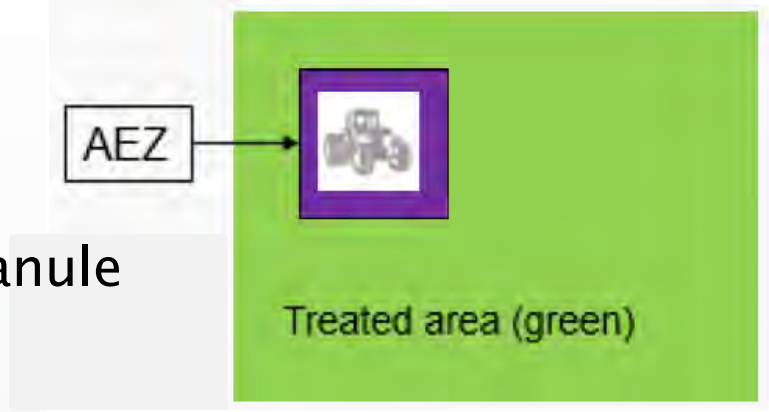
Application Exclusion Zone in Outdoor Production

- EPA will explain in next talk
- Distance determined by
  - Application equipment – spray/granule
    - Air
    - Airblast
    - Fumigant, mist, fog
  - If spray
    - droplet spectrum, noted at 294 microns
    - Medium spray using VMD >294 microns



Let's Talk about Droplets and Spray Quality

Terminology - Micron – µm

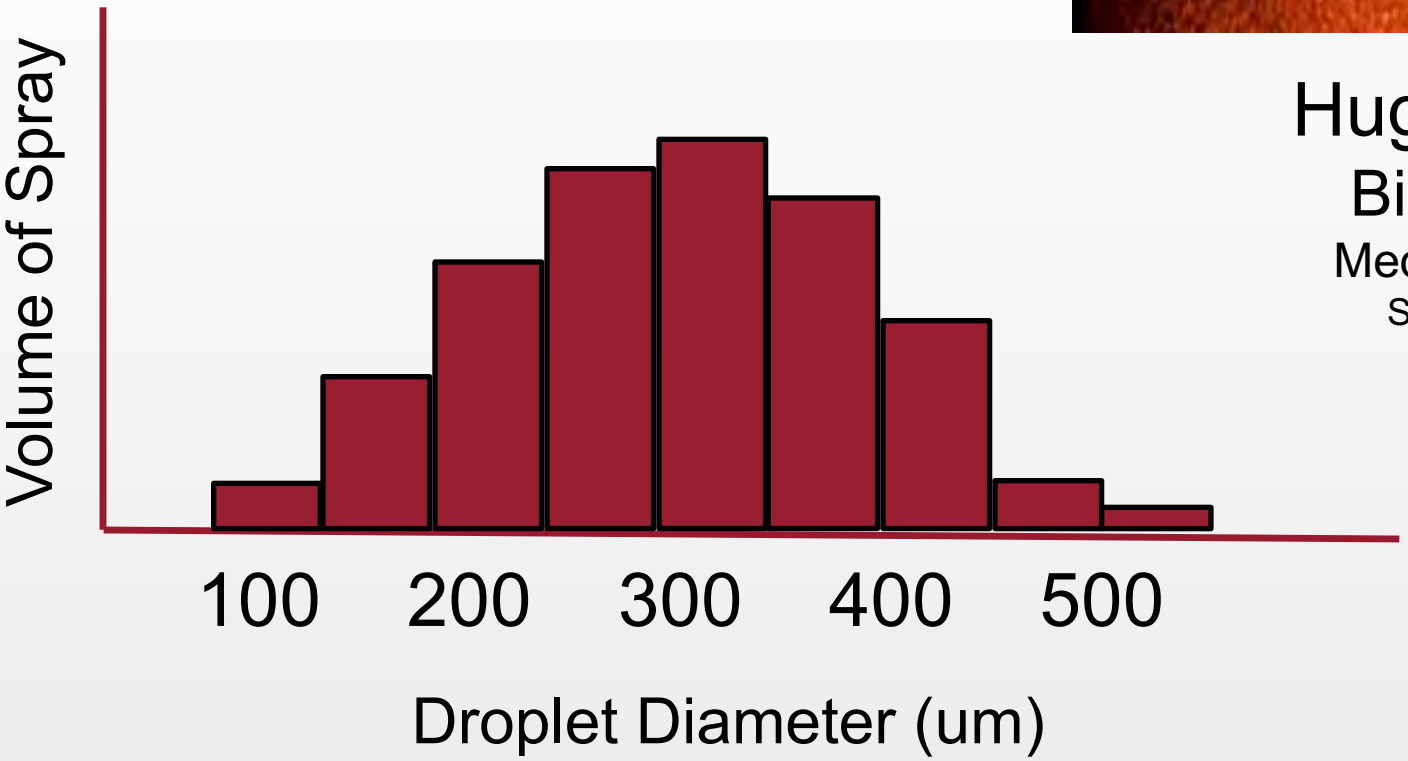
One micron (µm) =1/25,000 inch = 1/1,000 millimeter

pencil lead	2000 (µm)	thunderstorm rain
paper clip	850 (µm)	heavy rain
staple	420 (µm)	light rain
toothbrush bristle	300 (µm)	heavy drizzle
sewing thread	150 (µm)	fine drizzle
human hair	100 (µm)	fine mist
point of a needle	1-25 (µm)	fog

Driftable fines under 150 µm

Spray Spectrum = Quality

Put all the Same Similar Sized Droplets in a Test Tube



Huge drops

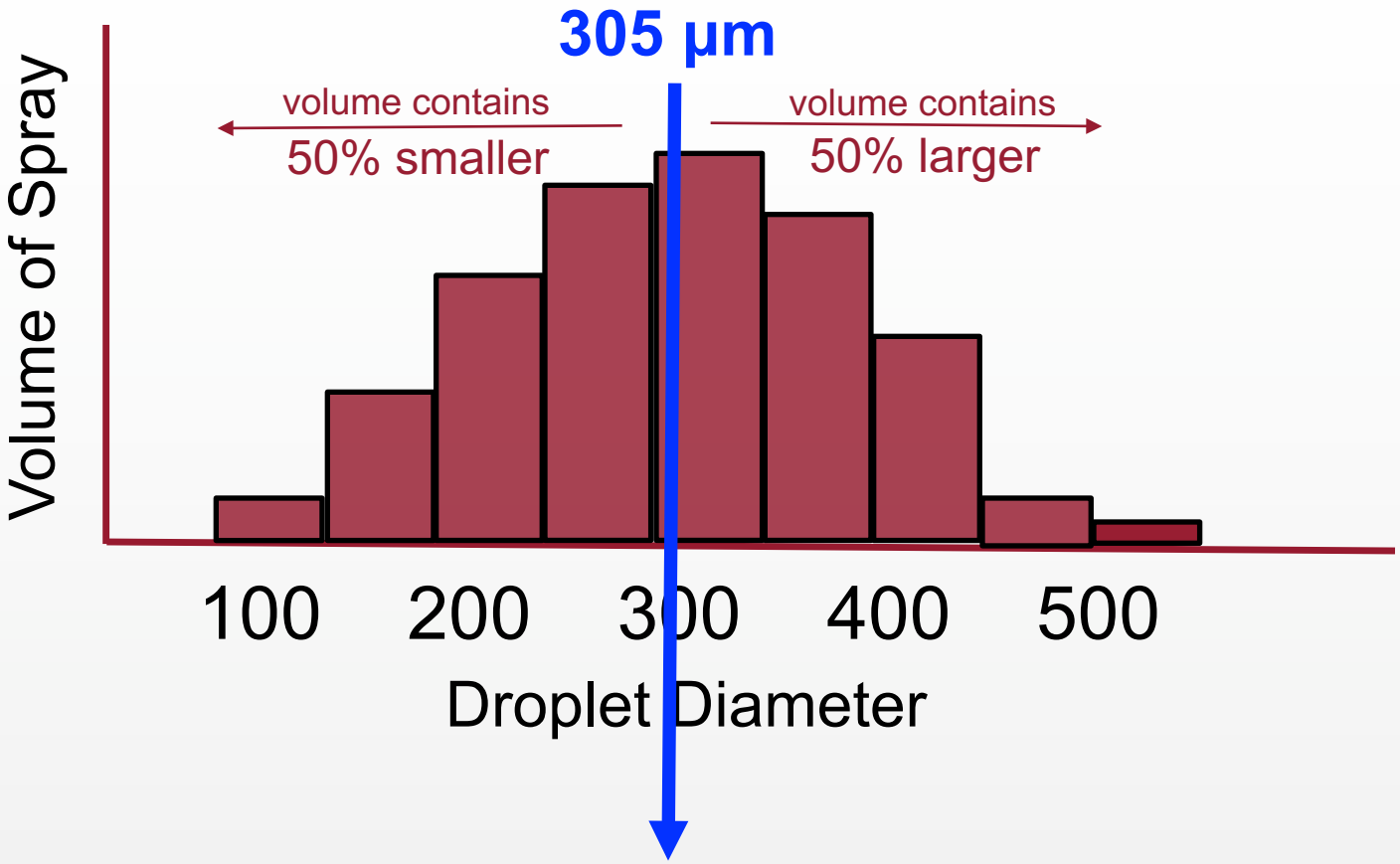
Big drops

Medium drops

Small drops

Tiny drops

Spray Quality and the VMD (volume median diameter)

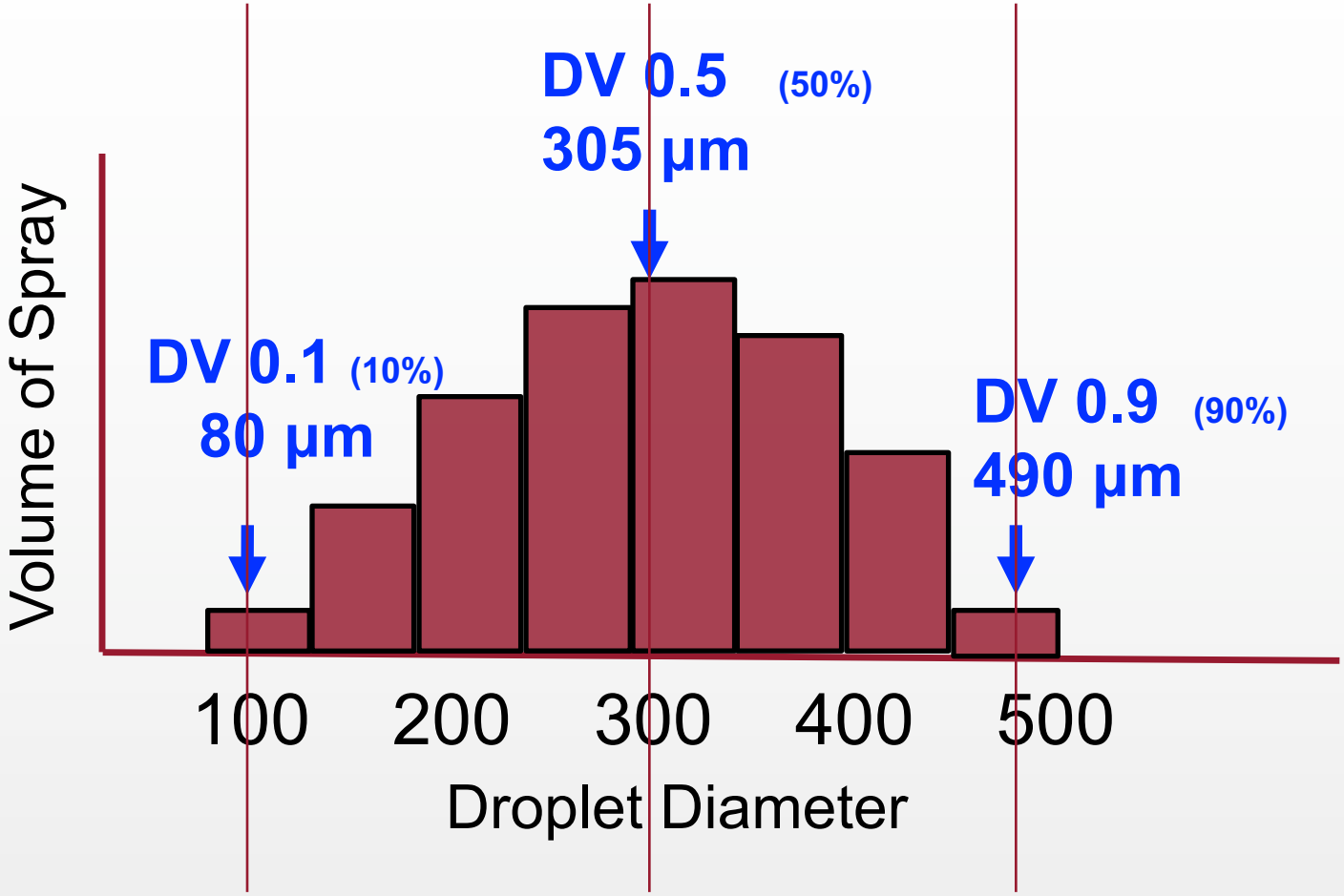


VMD - volume median diameter - Dv0.5 (50%)

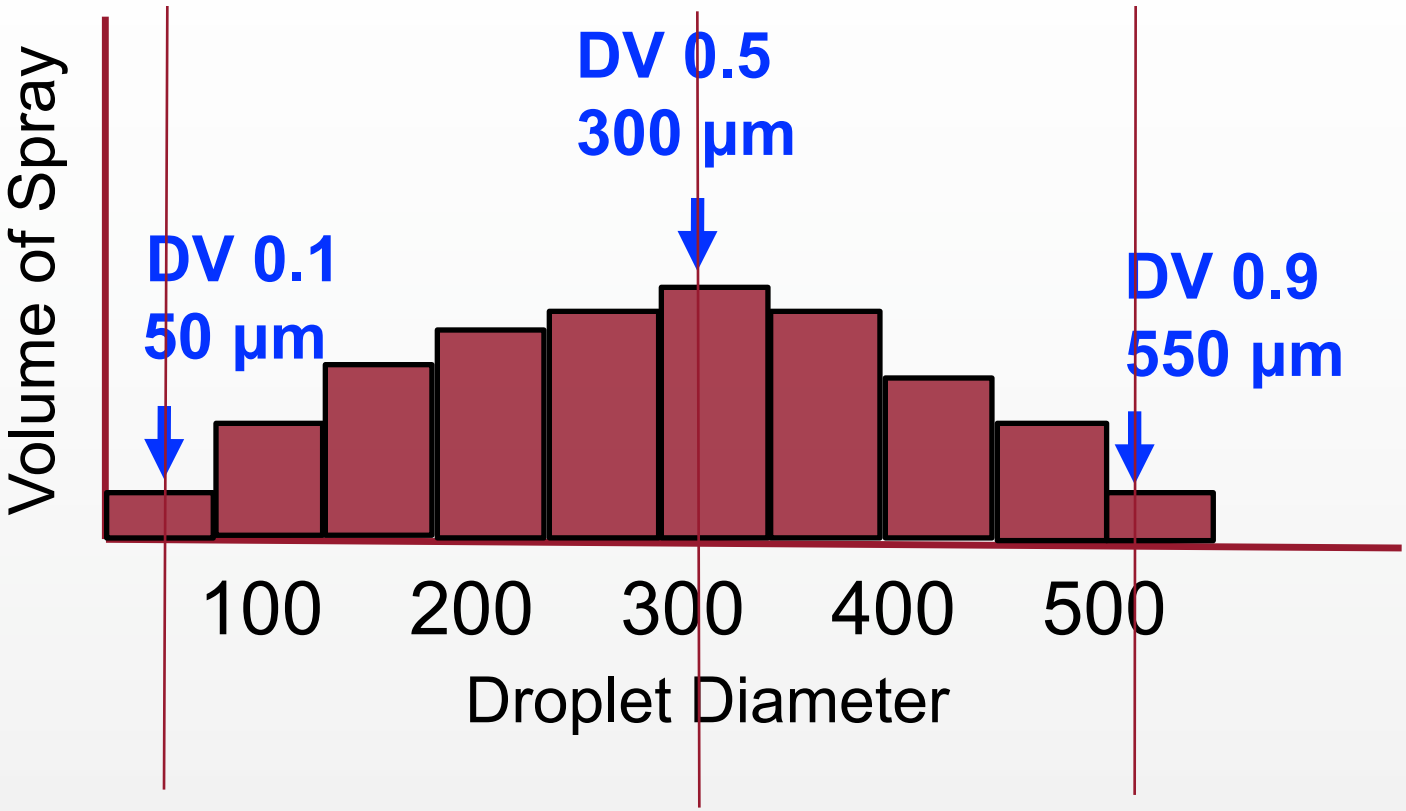
Half the total spray volume is **smaller** and **half** is **larger**

This is the MEDIAN, not the average

Spray Quality - Explained



Spray Quality - Explained



Similar VMD
Lot's more fines: < 150 µm
Lot's more basketballs: > 500 µm

Spray Quality Categories	
ASABE Standard S-572.1	
Category (symbol)	Color Code
Extra Fine (XF)	Purple
Very Fine (VF)	Red
Fine (F)	Orange
Medium (M)	Yellow
Coarse (C)	Blue
Very Coarse (VC)	Green
Extra Coarse (XC)	White
Ultra Coarse (UC)	Black

Spray Quality

Based on ASABE 572.1 Standards

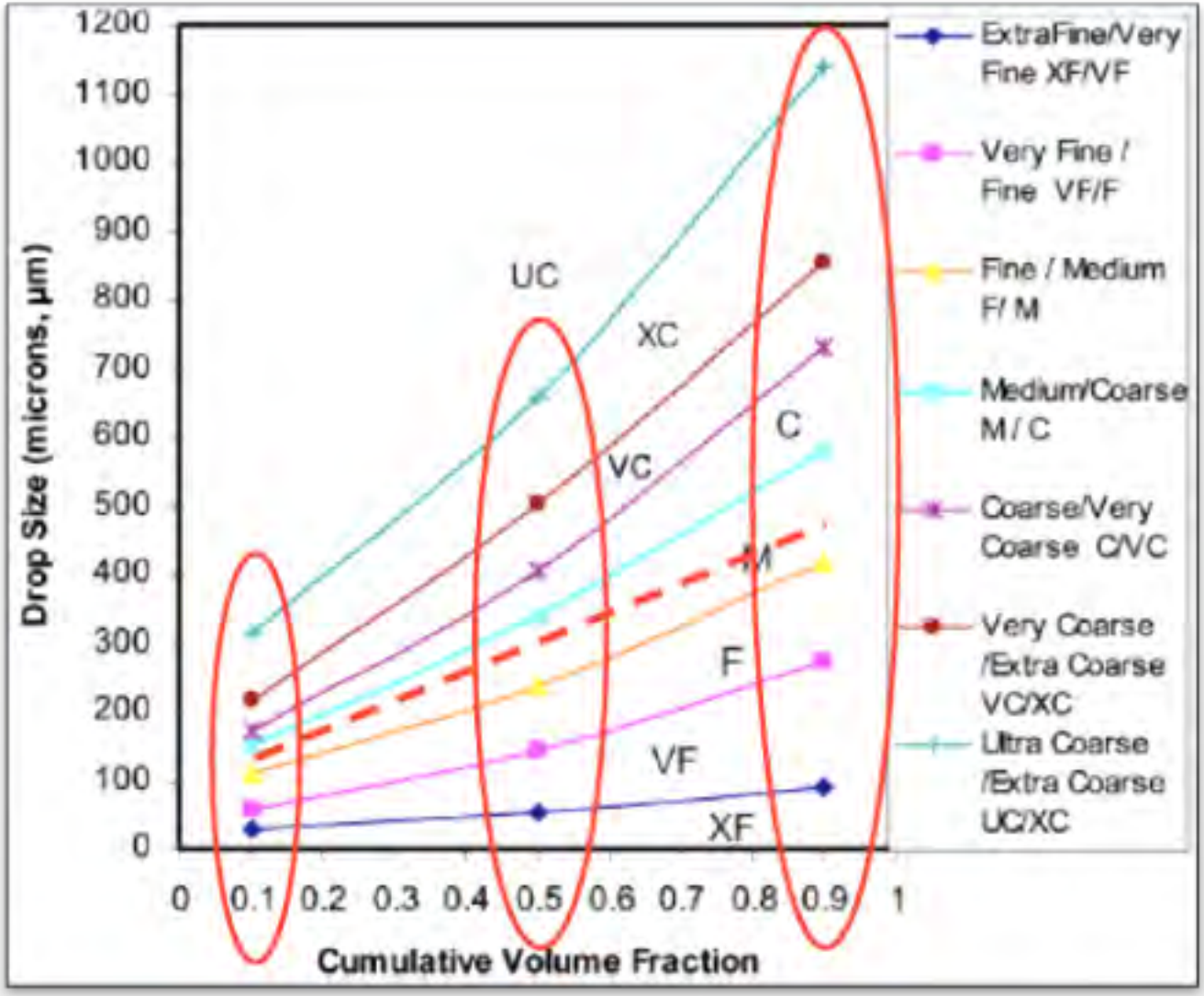
Referenced in nozzle charts

American Society of Agricultural and Biological Engineers

Droplet Sizing

- Measured with a laser-based instrument. Both reference and nozzles to be classified
- Verification and calibration to known standards essential
- Nozzle oriented to scan the entire spray plume
- Ensure a representative cross-sectional sample of the spray plume is obtained

ASABE 572.1 Spray Quality Standard
Plot Volume (- - -) of Droplet Sizes on a Reference Graph



Spray Quality

ASABE S572.1 Droplet Size Classification

The American Society of Agricultural and Biological Engineers (ASABE) developed the ASABE S572.1 standard to measure and interpret spray quality from tips.

Spray Quality*	Size of Droplets	VMD Range (Microns**)	Color Code	Retention on Difficult to Wet Leaves	Used for	Drift Potential
Extremely Fine	Small	<60	Purple	Excellent	Exceptions	High
Very Fine		61-105	Red	Excellent	Exceptions	
Fine		106-235	Orange	Very Good	Good Cover	
Medium		236-340	Yellow	Good	Most Products	
Coarse		341-403	Blue	Moderate	Systemic Herbicides	
Very Coarse		404-502	Green	Poor	Soil Herbicides	
Extremely Coarse		503-665	White	Very Poor	Liquid Fertilizer	
Ultra Coarse	Large	>665	Black	Very Poor	Liquid Fertilizer	Low

*Always read the pesticide label to determine which spray quality is required.

**Estimated from sample reference graph in ASABE/ANSI/ASAE Standard S572.1

The ASABE S572.1

ASABE S572.1 standard uses eight droplet classification categories, six of which are common for agriculture and horticulture.

Very Fine | Fine | Medium | Coarse | Very Coarse | Extremely Coarse

Spray Quality Categories	
ASABE Standard S-572.1	
Category (symbol)	Color Code
Extra Fine (XF)	Purple
Very Fine (VF)	Red
Fine (F)	Orange
Medium (M)	Yellow
Coarse (C)	Blue
Very Coarse (VC)	Green
Extra Coarse (XC)	White
Ultra Coarse (UC)	Black

Spray Quality Color
does not
equate to
Nozzle Color

TXR ConeJet® Hollow Cone Spray Tips
See Pages 20 & 42

AI3070 Air Induction Dual Pattern Flat Spray Tips
See Page 18

The Color Confusion Challenge: Tips and Spray Quality

XR TeeJet® (XR)

	PSI						
	15	20	25	30	40	50	60
XR8001	F	F	F	F	F	F	F
XR80015	M	F	F	F	F	F	F
XR8002	M	M	F	F	F	F	F
XR80025	M	M	F	F	F	F	F
XR8003	M	M	M	F	F	F	F
XR80035	M	M	M	M	M	F	F
XR8004	C	M	M	M	M	F	F
XR8005	C	C	M	M	M	M	F
XR8006	C	C	C	M	M	M	M
XR8008	VC	VC	C	C	M	M	M
XR8010	XC	VC	VC	C	C	C	C
XR8015	XC	XC	VC	VC	VC	C	C
XR11001	F	F	F	F	F	F	VF
XR110015	F	F	F	F	F	F	F
XR11002	M	F	F	F	F	F	F
XR110025	M	M	F	F	F	F	F
XR11003	M	M	M	F	F	F	F
XR11004	M	M	M	M	M	F	F
XR11005	M	M	M	M	M	F	F
XR11006	C	M	M	M	M	M	F
XR11008	C	C	C	C	M	M	M
XR11010	VC	C	C	C	M	M	M
XR11015	VC	VC	VC	VC	C	C	C

80°

110°

80° & 110° > fines

	PSI	DROP SIZE 80°	DROP SIZE 110°
XR8001 XR11001 (100)	15	F	F
	20	F	F
	30	F	F
	40	F	F
	50	F	F
	60	F	VF
XR80015 XR110015 (100)	15	M	F
	20	F	F
	30	F	F
	40	F	F
	50	F	F
	60	F	F
XR8002 XR11002 (50)	15	M	M
	20	M	F
	30	F	F
	40	F	F
	50	F	F
	60	F	F
XR80025 XR110025 (50)	15	M	M
	20	M	M
	30	F	F
	40	F	F
	50	F	F
	60	F	F
XR8003 XR11003 (50)	15	M	M
	20	M	M
	30	F	F
	40	F	F
	50	F	F
	60	F	F
XR80035 (50)	15	M	
	20	M	
	30	M	
	40	M	
	50	F	
	60	F	

	PSI	DROP SIZE 80°	DROP SIZE 110°
XR8004 XR11004 (50)	15	C	M
	20	M	M
	30	M	M
	40	M	M
	50	F	F
	60	F	F
XR8005 XR11005 (50)	15	C	M
	20	C	M
	30	M	M
	40	M	M
	50	M	F
	60	F	F
XR8006 XR11006 (50)	15	C	C
	20	C	M
	30	M	M
	40	M	M
	50	M	M
	60	M	F
XR8008 XR11008 (50)	15	VC	C
	20	VC	C
	30	C	C
	40	M	M
	50	M	M
	60	M	M
XR8010† XR11010†	15	XC	VC
	20	VC	C
	30	C	C
	40	C	M
	50	C	M
	60	C	M
XR8015† XR11015†	15	XC	VC
	20	XC	VC
	30	VC	VC
	40	VC	C
	50	C	C
	60	C	C

A Closer Look

Nozzle Color | PSI | **Spray Quality** | **Type of Nozzle** | GPA & MPH

Nozzle Color	PSI	110°XR/XRC 15-60 PSI	TT 15-90 PSI	TTJ60 20-90 PSI	AIXR 15-90 PSI	AI3070 20-90 PSI	AITTJ60 20-90 PSI	110°AI/AIC 30-115 PSI	TTI 15-100 PSI	GPM	4 mph	5 mph	6 mph
01 TT XR (100)	20	F	C	—	—	—	—	—	—	0.071	5.3	4.2	3.5
	30	F	M	—	—	—	—	—	—	0.087	6.5	5.2	4.3
	40	F	M	—	—	—	—	—	—	0.10	7.4	5.9	5.0
	50	F	M	—	—	—	—	—	—	0.11	8.2	6.5	5.4
	60	VF	F	—	—	—	—	—	—	0.12	8.9	7.1	5.9
	70	—	F	—	—	—	—	—	—	0.13	9.7	7.7	6.4
	80	—	F	—	—	—	—	—	—	0.14	10.4	8.3	6.9
	90	—	F	—	—	—	—	—	—	0.15	11.1	8.9	7.4
015 AI AIC AIXR AI3070 TT TTI XR XRC (100)	20	F	C	—	VC	VC	—	—	UC	0.11	8.2	6.5	5.4
	30	F	M	—	C	C	—	UC	UC	0.13	9.7	7.7	6.4
	40	F	M	—	C	M	—	XC	UC	0.15	11.1	8.9	7.4
	50	F	M	—	M	M	—	VC	UC	0.17	12.6	10.1	8.4
	60	F	F	—	M	M	—	VC	XC	0.18	13.4	10.7	8.9
	70	—	F	—	M	M	—	VC	XC	0.20	14.9	11.9	9.9
	80	—	F	—	M	F	—	VC	XC	0.21	15.6	12.5	10.4
	90	—	F	—	M	F	—	C	XC	0.23	17.1	13.7	11.4
	PSI	15-60	15-90	20-90	15-90	20-90	20-90	30-115	15-100				

Variety and Selection

AIXR TeeJet® (AIXR)

	PSI										
	15	20	25	30	35	40	50	60	70	75	90
AIXR110015	XC	XC	VC	C	C	C	C	M	M	M	M
AIXR11002	XC	XC	XC	VC	VC	C	C	C	C	M	M
AIXR110025	XC	XC	XC	XC	VC	VC	C	C	C	C	C
AIXR11003	XC	XC	XC	XC	VC	VC	C	C	C	C	C
AIXR11004	UC	XC	XC	XC	XC	XC	VC	VC	C	C	C
AIXR11005	UC	XC	XC	XC	XC	XC	VC	VC	C	C	C
AIXR11006	UC	XC	XC	XC	XC	XC	VC	VC	VC	C	C

Turbo TeeJet® Induction (TTI)

	PSI											
	15	20	25	30	35	40	50	60	70	80	90	100
TTI110015	UC	UC	UC	UC	UC	UC	UC	XC	XC	XC	XC	XC
TTI11002	UC	UC	UC	UC	UC	UC	UC	UC	XC	XC	XC	XC
TTI110025	UC	UC	UC	UC	UC	UC	UC	UC	XC	XC	XC	XC
TTI11003	UC	UC	UC	UC	UC	UC	UC	UC	XC	XC	XC	XC
TTI11004	UC	UC	UC	UC	UC	UC	UC	UC	XC	XC	XC	XC
TTI11005	UC	UC	UC	UC	UC	UC	UC	UC	XC	XC	XC	XC
TTI11006	UC	UC	UC	UC	UC	UC	UC	UC	XC	XC	XC	XC

DG TeeJet (DG)

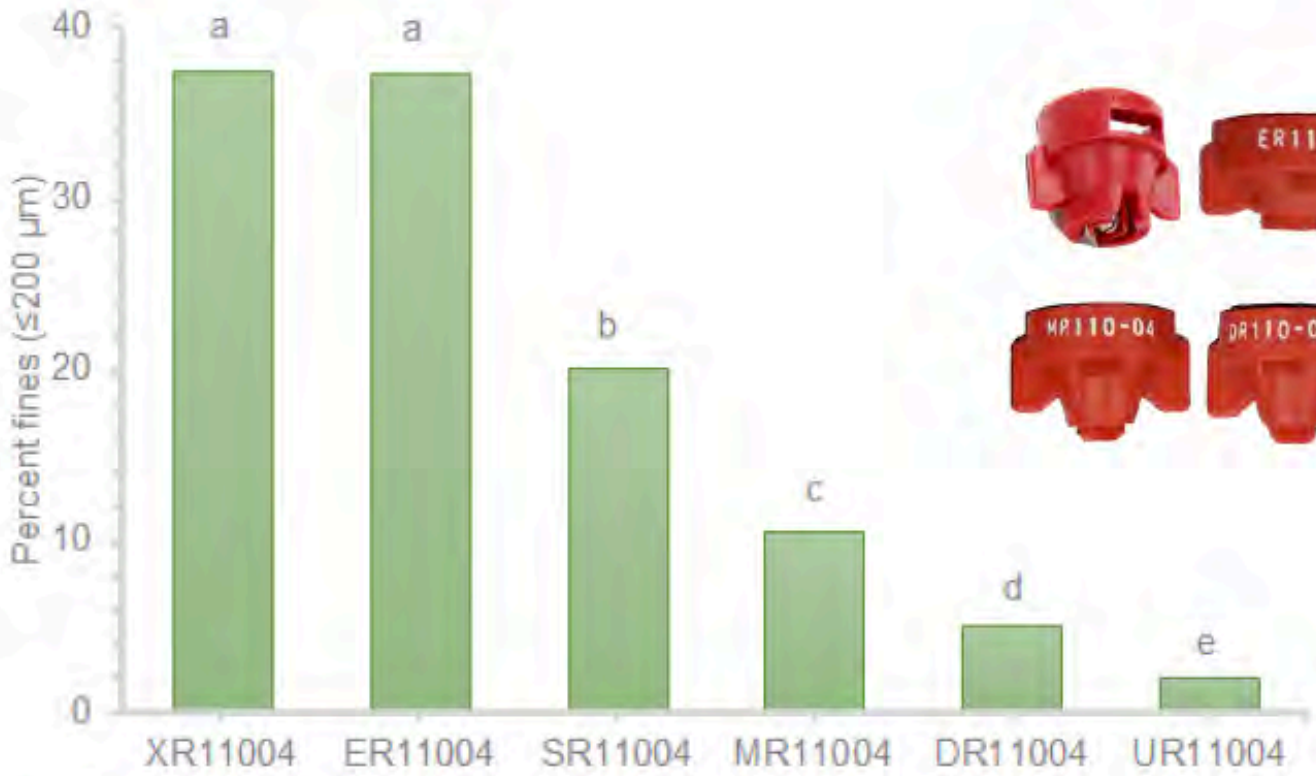
	PSI				
	30	35	40	50	60
DG80015	M	M	M	M	F
DG8002	M	M	M	M	M
DG8003	C	M	M	M	M
DG8004	C	C	C	M	M
DG8005	C	C	C	M	M
DG110015	M	M	F	F	F
DG11002	M	M	M	M	M
DG11003	C	M	M	M	M
DG11004	C	C	M	M	M
DG11005	C	C	C	M	M

Turbo TeeJet® (TT)

	PSI										
	15	20	25	30	35	40	50	60	70	80	90
TT11001	C	C	M	M	M	M	M	F	F	F	F
TT110015	VC	C	C	M	M	M	M	F	F	F	F
TT11002	VC	VC	C	C	M	M	M	M	F	F	F
TT110025	VC	VC	C	C	M	M	M	M	F	F	F
TT11003	VC	VC	C	C	C	C	M	M	M	M	F
TT11004	XC	VC	VC	C	C	C	M	M	M	M	M
TT11005	XC	VC	VC	VC	VC	C	C	M	M	M	M
TT11006	XC	VC	VC	VC	VC	VC	C	C	C	M	M
TT11008	XC	VC	VC	VC	VC	C	C	C	C	M	M

Droplet Sizes Vary Among Nozzle Types

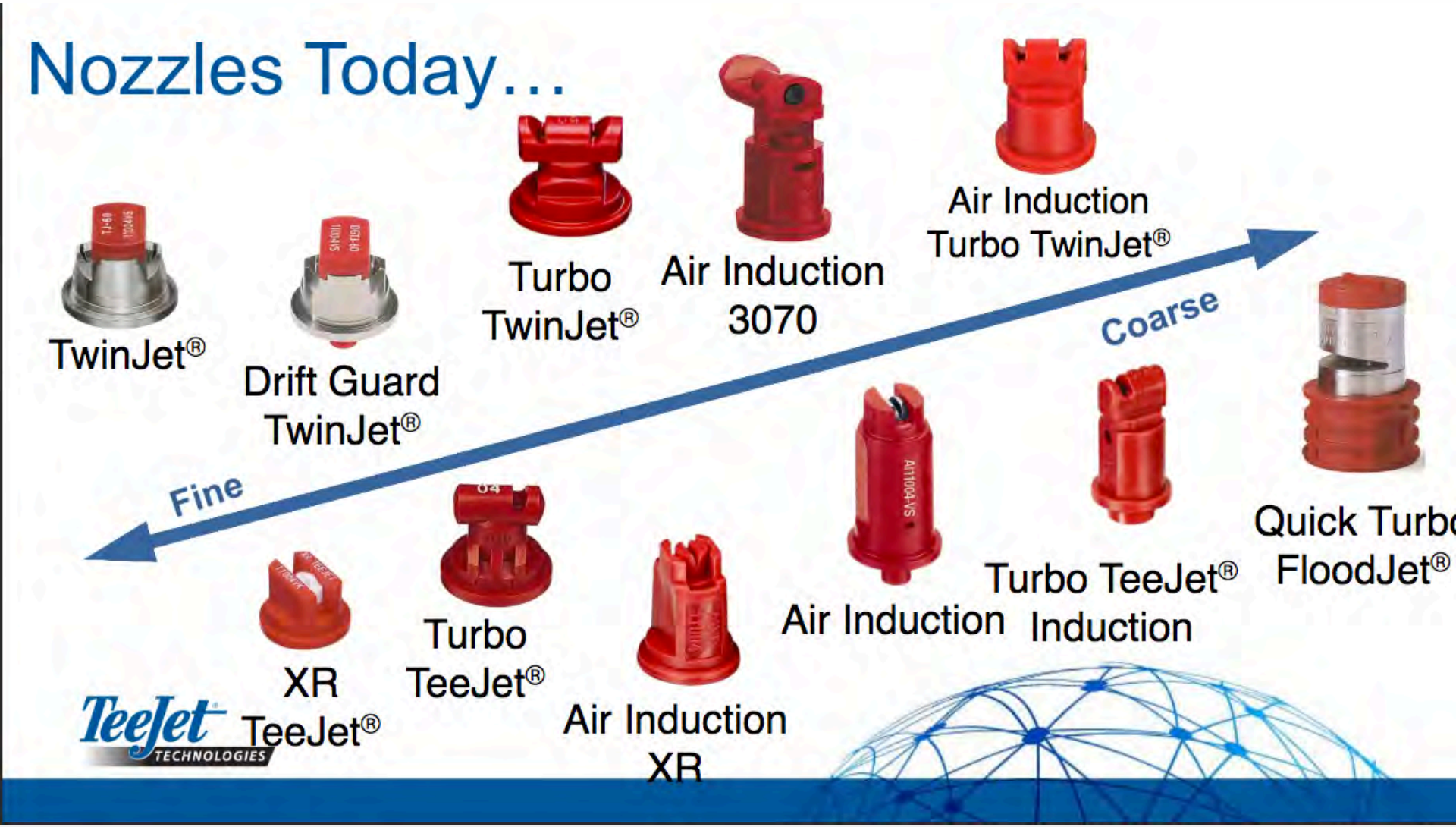
--- % of fines – less than 200 µm



†**Figure 6.** Comparison of percent of fine droplets (≤200 µm) for six non-venturi nozzles.

Thomas R. Butts, Annah M. Geyer, and Greg R. Kruger (2015)
Department of Agronomy & Horticulture, University of Nebraska-Lincoln

Nozzles Today…



XR Flat Fan Nozzle

Images from
Spraying Systems

Turbo TeeJet Induction (TTI)

Older and Newer Nozzle Designs

Nozzle Comparison - 40 PSI Wind
XR, AI, AIXR TeeJet®

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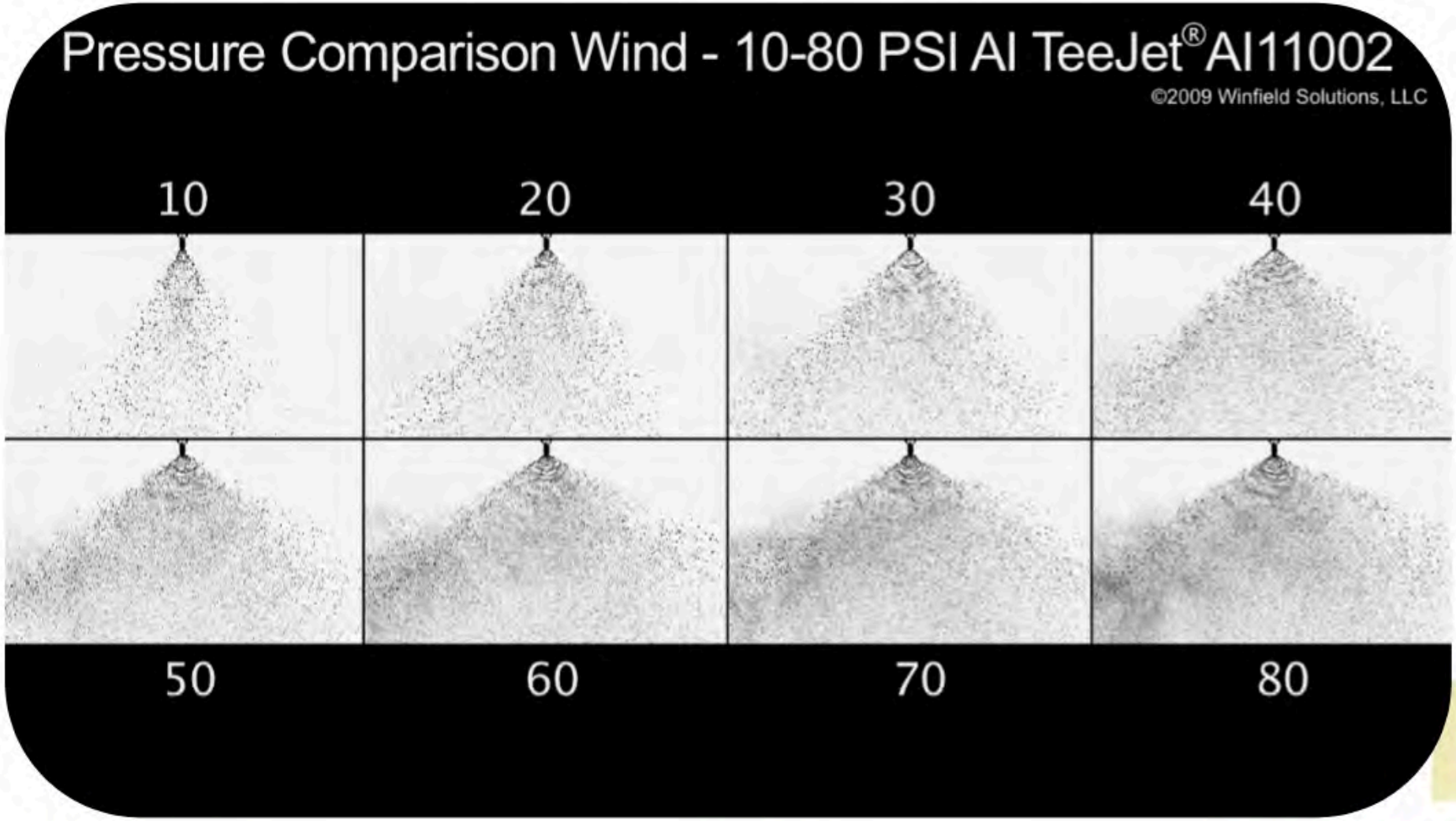

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Water

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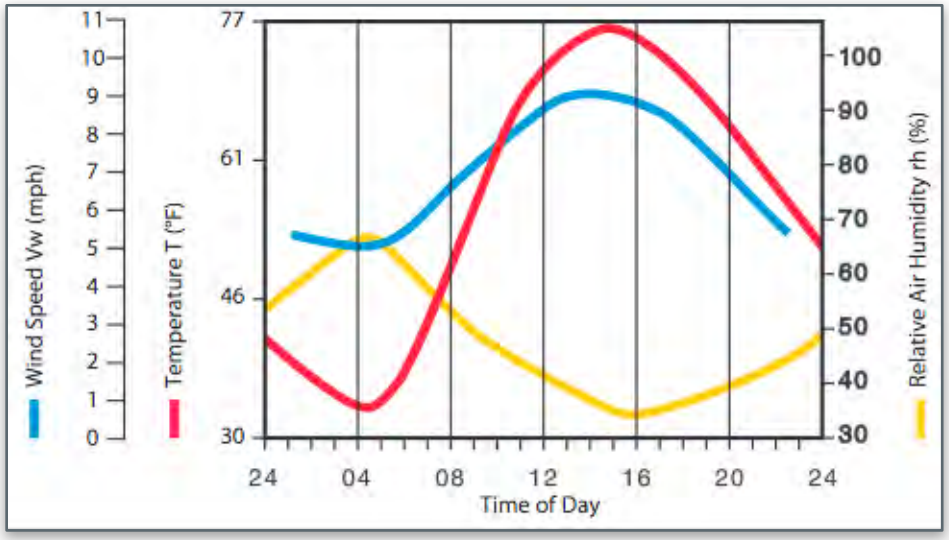
Causes of Spray Drift

1. Applicator - Decision Maker
   - To Spray or Not to Spray – to Stop Spraying
   - Equipment Set Up
   - Assesses the Weather

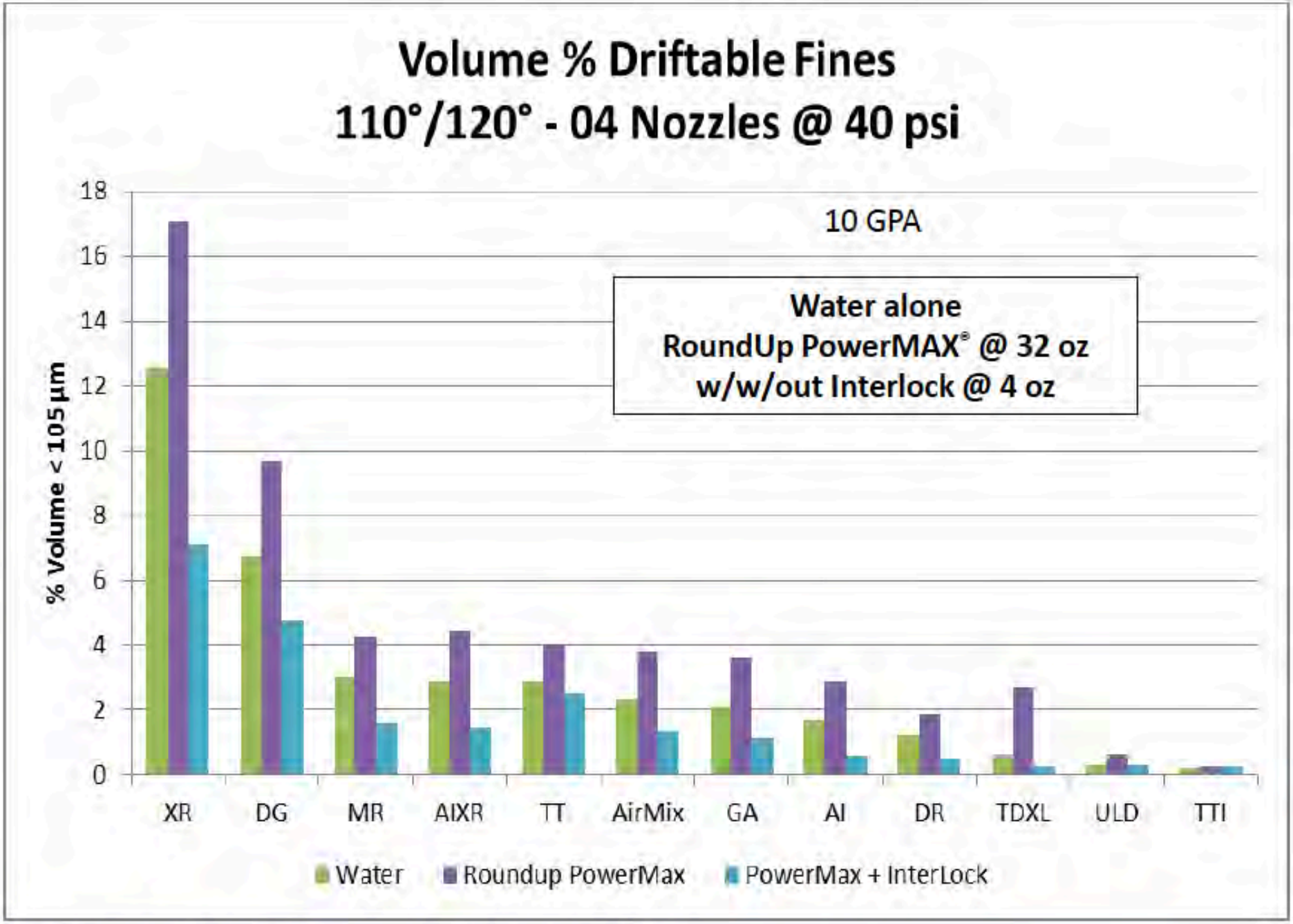


2. Equipment
   - Droplet Size
     - Tip orifice & angle
   - Spray Height
   - Operating Speed
3. Weather
   - Wind Direction
   - Air Flow or Wind Speed
   - Air Stability
   - Temperature and Humidity (drop size)

What Inspectors Need to Ascertain!

Spray Solution Changes Droplet Sizes

- Formulation
- Spray Adjuvants
  - Spreaders, wetting agents
  - Deposition aids
- Tank Mixes



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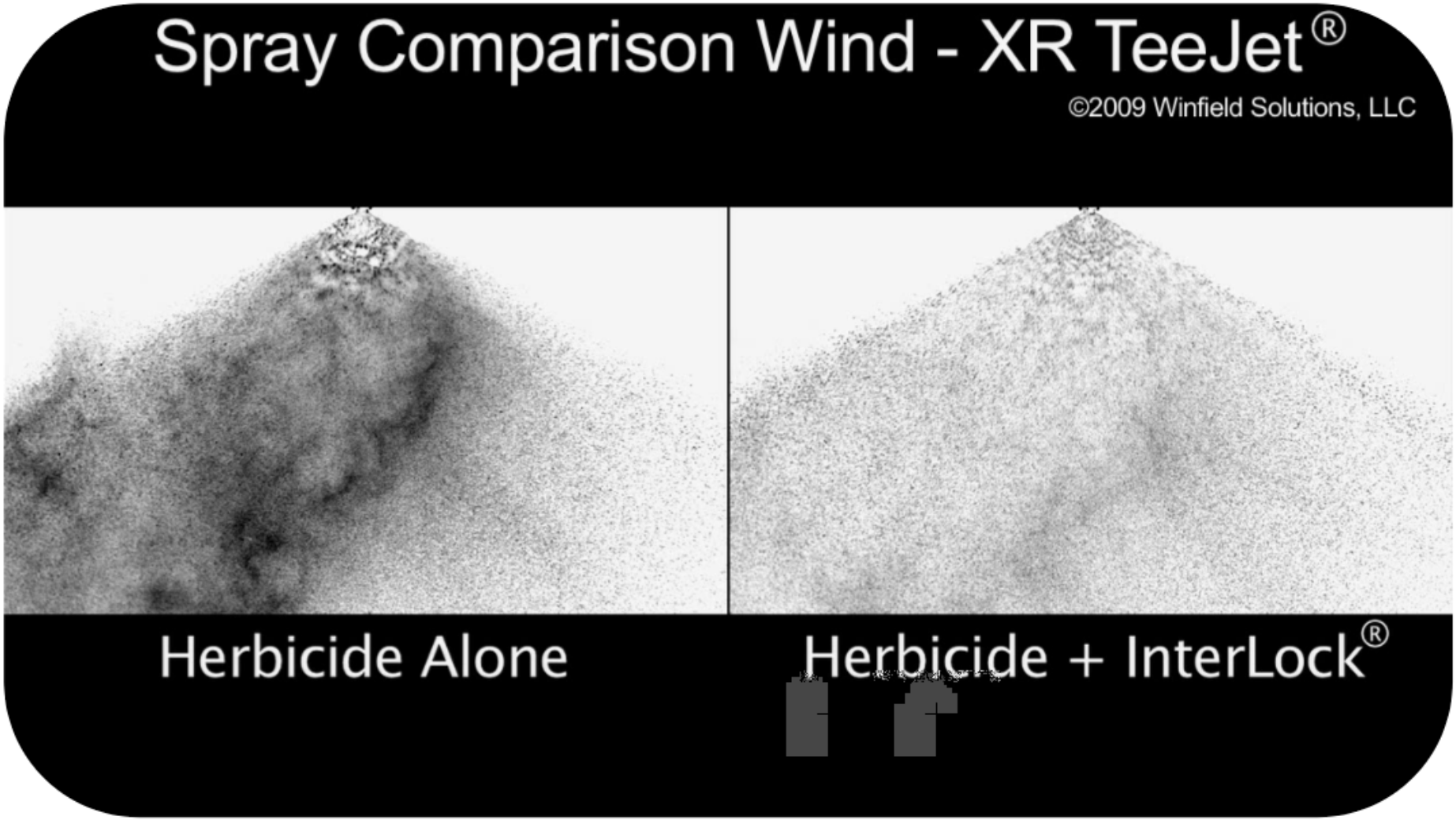
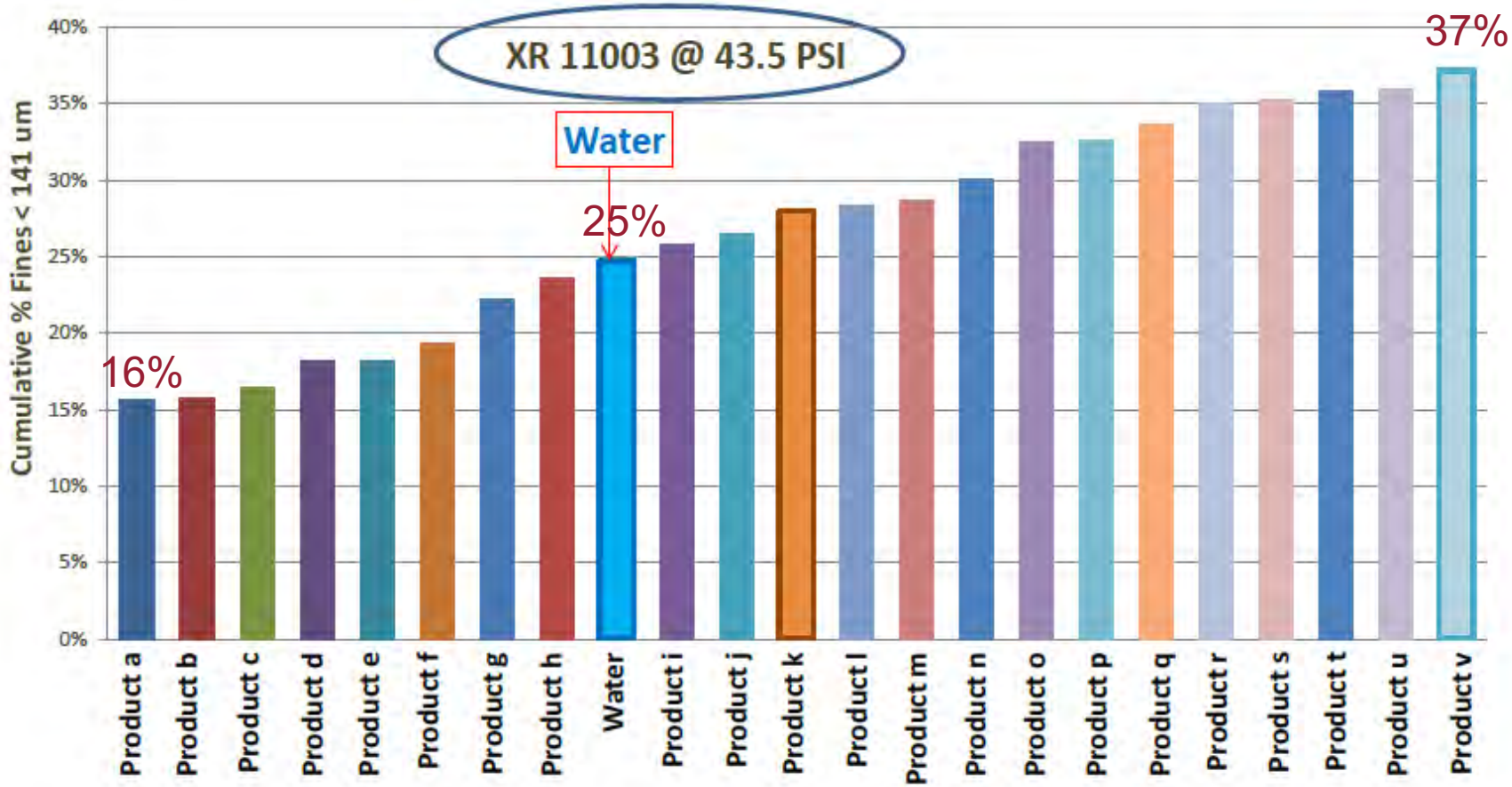
Spray Adjuvants

Some adjuvants hold droplets together, others breakup more easily!



Tank Mix Influences Droplet Size



Without drift reducing adjuvants--other adjuvants indicated by 'mix'

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Other Important Droplet Issues

Relative Span (RS)

- RS = (Dv0.9 – Dv0.1) / VMD
- Dv0.9 = 400, VMD = 300, Dv0.1 = 100
  - Relative span = 1
- Dv0.9 = 650, VMD = 300, Dv0.1 = 50
  - Relative span = 2
- The narrower the RS, the greater precision

Why Use Different Spray Qualities

Spray Quality Categories	
ASABE Standard S-572.1	
Category (symbol)	Color Code
Extra Fine (XF)	Purple
Very Fine (VF)	Red
Fine (F)	Orange
Medium (M)	Yellow
Coarse (C)	Blue
Very Coarse (VC)	Green
Extra Coarse (XC)	White
Ultra Coarse (UC)	Black

Fungicides/Insecticides

Contact Herbicides

Systemic Herbicides

Why Use Different Spray Qualities

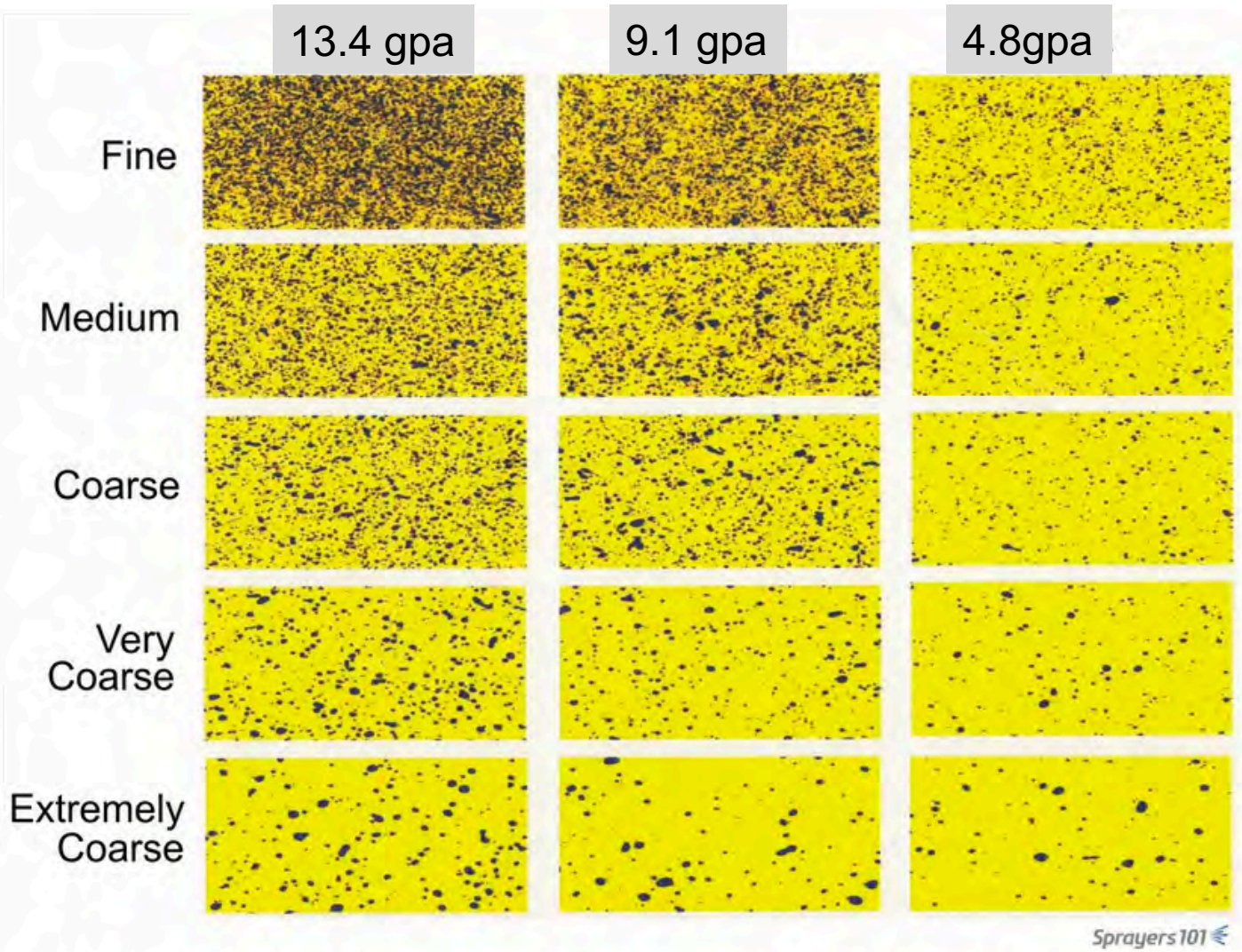
Broadcast Nozzle Selection Guide

	HERBICIDES			FUNGICIDES		INSECTICIDES		DRIFT MANAGE-MENT	PWM NOZZLE CONTROL
	SOIL APPLIED	POST-EMERGENCE		CONTACT	SYSTEMIC	CONTACT	SYSTEMIC		
		CONTACT	SYSTEMIC						
Air Induction Turbo TwinJet Reference page 17	VERY GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT	EXCELLENT	
AI3070 Reference page 18		VERY GOOD	VERY GOOD	EXCELLENT	VERY GOOD	EXCELLENT	VERY GOOD	EXCELLENT	
XR, XRC TeeJet Reference pages 12–13		EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	GOOD	EXCELLENT
XR, XRC TeeJet at pressures below 30 PSI (2.0 bar) Reference pages 12–13	GOOD	GOOD	VERY GOOD	GOOD	VERY GOOD	GOOD	VERY GOOD	VERY GOOD	EXCELLENT
AIXR TeeJet Reference page 8	VERY GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT	EXCELLENT	
AI, AIC TeeJet Reference pages 9–10	VERY GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT	EXCELLENT	

Specialty Nozzle Selection Guide

		HERBICIDES			FUNGICIDES		INSECTICIDES	
		SOIL APPLIED	POST-EMERGENCE					
			CONTACT	SYSTEMIC	CONTACT	SYSTEMIC	CONTACT	SYSTEMIC
DIRECTED SPRAYING	*AI TeeJet* EVEN Reference page 33	VERY GOOD	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT
	TeeJet EVEN Reference page 35	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD
	TwinJet EVEN Reference page 36		VERY GOOD		VERY GOOD		VERY GOOD	
	AIUB TeeJet Reference page 37		GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT
	AITX ConeJet Reference page 43		GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT
	ConeJet Reference pages 32 & 39		EXCELLENT		EXCELLENT		EXCELLENT	
AIR BLAST	*ConeJet* Reference pages 40–43		EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD
	Disc-Core Reference pages 45–46		EXCELLENT	GOOD	EXCELLENT	GOOD	EXCELLENT	GOOD

Coverage and Droplet Size



These water-sensitive papers were sprayed under controlled conditions and they demonstrate the role droplet size plays in coverage. As the droplets get finer, there are more of them, increasing coverage. However, this is really only hypothetical as many drift off target before impinging. As the droplets get coarser, there are less of them, and coverage may be compromised. To compensate for this, higher volumes are used. Credit – Dr. T. Wolf, Saskatchewan.

Sprayers 101 - T. Wolf

Driftable Droplets*

NOZZLE TYPE (0.50 GPM FLOW)	APPROXIMATE PERCENT OF SPRAY VOLUME LESS THAN 150 MICRONS	
	15 PSI	40 PSI
XR – Extended Range TeeJet (110°)	19%	30%
TT – Turbo TeeJet (110°)	4%	13%
TTJ60 – Turbo TwinJet (110°)	3%	10%
TF – Turbo FloodJet	2%	7%
AIXR – Air Induction XR (110°)	2%	7%
AITTJ60 – Air Induction Turbo TwinJet (110°)	1%	6%
AI – Air Induction TeeJet (110°)	N/A	5%
TTI – Turbo TeeJet Induction (110°)	<1%	2%

*Data obtained from Oxford VisiSizer system spraying water at 70°F (21°C) under laboratory conditions.

The Old Guard – XR TeeJet – Extended Range

	PSI	DROP SIZE 80°	DROP SIZE 110°
XR8001 XR11001 (100)	15	F	F
	20	F	F
	30	F	F
	40	F	F
	50	F	F
	60	F	VF
XR80015 XR110015 (100)	15	M	F
	20	F	F
	30	F	F
	40	F	F
	50	F	F
	60	F	F
XR8002 XR11002 (50)	15	M	M
	20	M	F
	30	F	F
	40	F	F
	50	F	F
	60	F	F
XR80025 XR110025 (50)	15	M	M
	20	M	M
	30	F	F
	40	F	F
	50	F	F
	60	F	F
XR8003 XR11003 (50)	15	M	M
	20	M	M
	30	F	F
	40	F	F
	50	F	F
	60	F	F
XR80035 (50)	15	M	
	20	M	
	30	M	
	40	M	
	50	F	
	60	F	

XR 8001

XR 80015

XR 8003

	PSI	DROP SIZE 80°	DROP SIZE 110°
XR8004 XR11004 (50)	15	C	M
	20	M	M
	30	M	M
	40	M	M
	50	F	F
	60	F	F
XR8005 XR11005 (50)	15	C	M
	20	C	M
	30	M	M
	40	M	M
	50	M	F
	60	F	F
XR8006 XR11006 (50)	15	C	C
	20	C	M
	30	M	M
	40	M	M
	50	M	M
	60	M	F
XR8008 XR11008 (50)	15	VC	C
	20	VC	C
	30	C	C
	40	M	M
	50	M	M
	60	M	M
XR8010† XR11010†	15	XC	VC
	20	VC	C
	30	C	C
	40	C	M
	50	C	M
	60	C	M
XR8015† XR11015†	15	XC	VC
	20	XC	VC
	30	VC	VC
	40	VC	C
	50	C	C
	60	C	C

XR 8004

XR 8008

XR TeeJet® (XR)

	PSI 15	20	25	30	40	50	60
XR8001	F	F	F	F	F	F	F
XR80015	M	F	F	F	F	F	F
XR8002	M	M	F	F	F	F	F
XR80025	M	M	F	F	F	F	F
XR8003	M	M	M	F	F	F	F
XR80035	M	M	M	M	M	F	F
XR8004	C	M	M	M	M	F	F
XR8005	C	C	M	M	M	M	F
XR8006	C	C	C	M	M	M	M
XR8008	VC	VC	C	C	M	M	M
XR8010	XC	VC	VC	C	C	C	C
XR8015	XC	XC	VC	VC	VC	C	C
XR11001	F	F	F	F	F	F	VF
XR110015	F	F	F	F	F	F	F
XR11002	M	F	F	F	F	F	F
XR110025	M	M	F	F	F	F	F
XR11003	M	M	M	F	F	F	F
XR11004	M	M	M	M	M	F	F
XR11005	M	M	M	M	M	F	F
XR11006	C	M	M	M	M	M	F
XR11008	C	C	C	C	M	M	M
XR11010	VC	C	C	C	M	M	M
XR11015	VC	VC	VC	VC	C	C	C

AIXR Teejet

	PSI	DROP SIZE	CAPACITY ONE NOZZLE IN GPM	CAPACITY ONE NOZZLE IN OZ./MIN.	GPA 4 MPH	5 MPH	6 MPH	8 MPH	10 MPH	12 MPH
AIXR110015 (100)	15	XC	0.092	12	6.8	5.5	4.6	3.4	2.7	2.3
	20	XC	0.11	14	8.2	6.5	5.4	4.1	3.3	2.7
	30	C	0.13	17	9.7	7.7	6.4	4.8	3.9	3.2
	40	C	0.15	19	11.1	8.9	7.4	5.6	4.5	3.7
	50	C	0.17	22	12.6	10.1	8.4	6.3	5.0	4.2
	60	M	0.18	23	13.4	10.7	8.9	6.7	5.3	4.5
	75	M	0.21	27	15.6	12.5	10.4	7.8	6.2	5.2
	90	M	0.23	29	17.1	13.7	11.4	8.5	6.8	5.7
AIXR11002 (50)	15	XC	0.12	15	8.9	7.1	5.9	4.5	3.6	3.0
	20	XC	0.14	18	10.4	8.3	6.9	5.2	4.2	3.5
	30	VC	0.17	22	12.6	10.1	8.4	6.3	5.0	4.2
	40	C	0.20	26	14.9	11.9	9.9	7.4	5.9	5.0
	50	C	0.22	28	16.3	13.1	10.9	8.2	6.5	5.4
	60	C	0.24	31	17.8	14.3	11.9	8.9	7.1	5.9
	75	M	0.27	35	20	16.0	13.4	10.0	8.0	6.7
	90	M	0.30	38	22	17.8	14.9	11.1	8.9	7.4
AIXR110025 (50)	15	XC	0.15	19	11.1	8.9	7.4	5.6	4.5	3.7
	20	XC	0.18	23	13.4	10.7	8.9	6.7	5.3	4.5
	30	XC	0.22	28	16.3	13.1	10.9	8.2	6.5	5.4
	40	VC	0.25	32	18.6	14.9	12.4	9.3	7.4	6.2
	50	C	0.28	36	21	16.6	13.9	10.4	8.3	6.9
	60	C	0.31	40	23	18.4	15.3	11.5	9.2	7.7
	75	C	0.34	44	25	20	16.8	12.6	10.1	8.4
	90	C	0.38	49	28	23	18.8	14.1	11.3	9.4

DG Teejet

	PSI	DROP SIZE 80°	DROP SIZE 110°	CAPACITY ONE NOZZLE IN GPM	CAPACITY ONE NOZZLE IN OZ./MIN.	GP 4 MPH	5 MPH	6 MPH	8 MPH
DG80015† DG110015 (100)	30	M	M	0.13	17	9.7	7.7	6.4	4.8
	35	M	M	0.14	18	10.4	8.3	6.9	5.2
	40	M	F	0.15	19	11.1	8.9	7.4	5.6
	50	M	F	0.17	22	12.6	10.1	8.4	6.3
	60	F	F	0.18	23	13.4	10.7	8.9	6.7
DG8002† DG11002 (50)	30	M	M	0.17	22	12.6	10.1	8.4	6.3
	35	M	M	0.19	24	14.1	11.3	9.4	7.1
	40	M	M	0.20	26	14.9	11.9	9.9	7.4
	50	M	M	0.22	28	16.3	13.1	10.9	8.2
	60	M	M	0.24	31	17.8	14.3	11.9	8.9
DG8003† DG11003 (50)	30	C	C	0.26	33	19.3	15.4	12.9	9.7
	35	M	M	0.28	36	21	16.6	13.9	10.4
	40	M	M	0.30	38	22	17.8	14.9	11.1
	50	M	M	0.34	44	25	20	16.8	12.6
	60	M	M	0.37	47	27	22	18.3	13.7

80 or 110

Orchard and Vineyard – ConeJets

	PSI	DROP SIZE	CAP T NO IN
TXA800050VK TXB800050VK (100)	40	VF	(
	60	VF	(
	80	VF	(
	100	VF	(
	125	VF	(
TXA800067VK TXB800067VK (50)	40	VF	(
	60	VF	(
	80	VF	(
	100	VF	(
	125	VF	(
TXA8001VK TXB8001VK (50)	40	F	(
	60	VF	(
	80	VF	(
	100	VF	(
	125	VF	(
TXA80015VK TXB80015VK (50)	40	F	(
	60	F	(
	80	VF	(
	100	VF	(
	125	VF	(
TXA8002VK TXB8002VK (50)	40	F	(
	60	F	(
	80	VF	(
	100	VF	(
	125	VF	(
TXA8003VK TXB8003VK (50)	40	F	(
	60	F	(
	80	F	(
	100	VF	(
	125	VF	(
TXA8004VK TXB8004VK (50)	40	F	(
	60	F	(
	80	F	(
	100	VF	(
	125	VF	(

		GPM									
		30 PSI	40 PSI	50 PSI	60 PSI	70 PSI	80 PSI	90 PSI	100 PSI	120 PSI	140 PSI
TX-VS1	100	0.015	0.017	0.018	0.020	0.021	0.022	0.023	0.024	0.026	0.028
		VF	VF	VF	VF	VF	VF	VF	VF	VF	VF
TX-VS2	100	0.029	0.033	0.037	0.040	0.043	0.045	0.047	0.050	0.054	0.058
		VF	VF	VF	VF	VF	VF	VF	VF	VF	VF
TX-VK3	100	0.044	0.050	0.055	0.060	0.064	0.068	0.071	0.075	0.081	0.086
		F	VF	VF	VF	VF	VF	VF	VF	VF	VF
TX-VK4	50	0.058	0.067	0.074	0.080	0.086	0.091	0.096	0.101	0.110	0.118
		F	VF	VF	VF	VF	VF	VF	VF	VF	VF
TX-VK6	50	0.088	0.100	0.111	0.120	0.129	0.137	0.145	0.152	0.165	0.177
		F	F	VF	VF	VF	VF	VF	VF	VF	VF
TX-VK8	50	0.116	0.133	0.148	0.162	0.174	0.186	0.196	0.207	0.225	0.243
		F	F	VF	VF	VF	VF	VF	VF	VF	VF
TX-VK10	50	0.145	0.167	0.185	0.202	0.218	0.232	0.246	0.258	0.282	0.303
		F	F	F	F	VF	VF	VF	VF	VF	VF
TX-VK12	50	0.174	0.200	0.223	0.243	0.261	0.279	0.295	0.310	0.338	0.364
		F	F	F	F	VF	VF	VF	VF	VF	VF
TX-VK18	50	0.260	0.300	0.335	0.367	0.396	0.423	0.449	0.473	0.517	0.558
		F	F	F	F	F	F	VF	VF	VF	VF
TX-VK26	50	0.376	0.433	0.484	0.530	0.572	0.611	0.648	0.683	0.747	0.807
		F	F	F	F	F	F	VF	VF	VF	VF

Aerial and Ground Droplet Calculators

Droplet Calculators

2015 USDA ARS High Speed Nozzle Model

- USDA ARS High Speed Nozzle Model

For Fixed-Wing Aircraft:

- CP-03 Nozzle Model Fixed-Wing
- CP-07 & 09 Nozzle Model Fixed-Wing
- CP 40 Degree Flat Fan (Large Orifice) Nozzle Model Fixed-Wing
- CP 40 Degree Flat Fan (Small Orifice) Nozzle Model Fixed-Wing
- CP-80 Degree Flat Fan Nozzle Model Fixed-Wing
- CP-11TT with Straight Stream Tips Model Fixed-Wing

For Rotary-Wing Aircraft:

- CP-03 Nozzle Model Rotary-Wing
- CP 40 Degree Flat Fan (Large Orifice) Nozzle Model Rotary-Wing
- CP 40 Degree Flat Fan (Small Orifice) Nozzle Model Rotary-Wing
- CP 80 Degree Flat Fan Nozzle Model Rotary-Wing
- CP-80 Degree High Volume Tips for Rotorcraft
- CP-110 Degree Flat Fan for Rotorcraft

GREENLEAF TECHNOLOGIES

CP® PRODUCTS COMPANY

PREP Archive

ASABE S572.1 Droplet Size Classification

The American Society of Agricultural and Biological Engineers (ASABE) developed the ASABE S572.1 standard to measure and interpret spray quality from tips.

Spray Quality*	Size of Droplets	VMD Range (Microns)**	Color Code	Retention on Difficult to Wet Leaves	Used for	Drift Potential
Extremely Fine	Small	<60	Purple	Excellent	Exceptions	High
Very Fine		61-105	Red	Excellent	Exceptions	
Fine		106-235	Orange	Very Good	Good Cover	
Medium		236-340	Yellow	Good	Most Products	
Coarse		341-403	Blue	Moderate	Systemic Herbicides	
Very Coarse		404-502	Green	Poor	Soil Herbicides	
Extremely Coarse		503-665	White	Very Poor	Liquid Fertilizer	
Ultra Coarse	Large	>665	Black	Very Poor	Liquid Fertilizer	Low

*Always read the pesticide label to determine which spray quality is required.
**Estimated from sample reference graph in ASABE/ANSI/ASAE Standard S572.1

The ASABE S572.1

ASABE S572.1 standard uses eight droplet classification categories, six of which are common for agriculture and horticulture:

Very Fine | Fine | Medium | Coarse | Very Coarse | Extremely Coarse

Most agrochemical applications recommend a fine, medium, or coarse spray:

Fine sprays provide enhanced retention for directed spraying on the target including:

- Foliar-acting weed control
- Contact-acting fungicides and insecticides

Medium sprays are the most widely used spray type.

- Used by default by most applications when spray quality is not defined by the label
- Systemic-acting fungicides, insecticides and herbicides.

Coarse sprays are used with systemic, residual, and soil-applied herbicides.

Comparison Accessories	Droplet Size (Microns)	Relative Size Required for Eyeball Gauge
Fog	Up to 25	Point of a Needle (25 Microns)
Fine Mist	25-100	Human Hair (100 Microns)
Fine Drizzle	100-250	Sewing Thread (150 Microns)
Heavy Drizzle	250-500	Toothbrush Bristle (300 Microns)
Light Rain	500-800	Staple (550 Microns)
Heavy Rain	800-1000	Paper Clip (850 Microns)
Thunderstorm Rain	1000-4000	#2 Pencil Lead (2000 Microns)

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Disclaimer

- Brand names appearing in this presentation are for education and illustration purposes only.
- No endorsement is intended, not is criticism implied of similar products not mentioned.

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