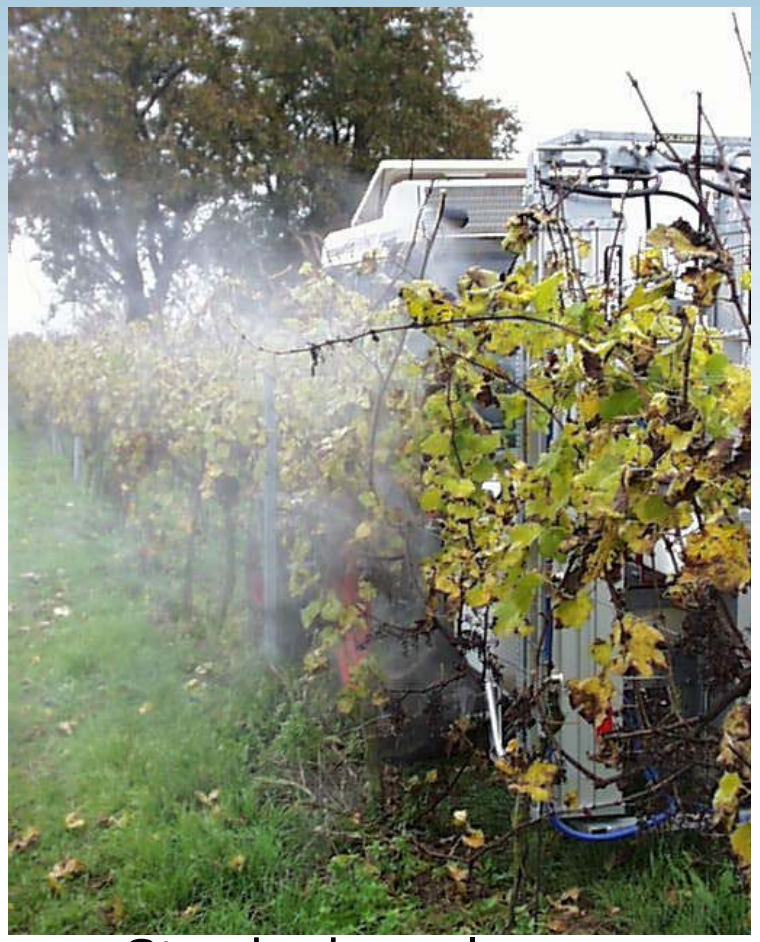
8th Annual Pesticide Stewardship Conference

Educating Applicators About Drift Potential

Stephen Pearson

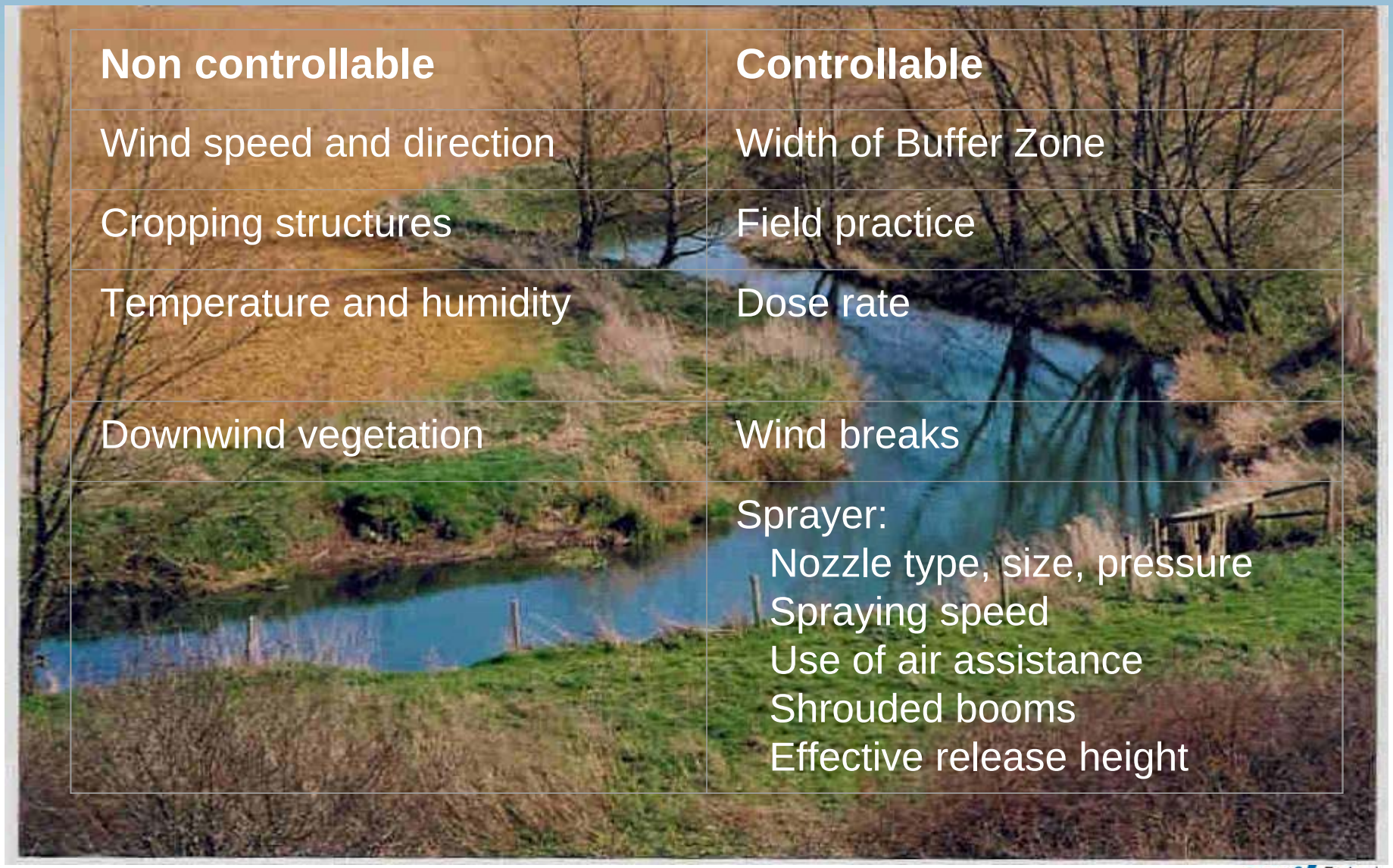
Spray Drift



Standard nozzles

Low drift (air induction) nozzles

Factors that may influence drift



Non controllable	Controllable
Wind speed and direction	Width of Buffer Zone
Cropping structures	Field practice
Temperature and humidity	Dose rate
Downwind vegetation	Wind breaks
	Sprayer: Nozzle type, size, pressure Spraying speed Use of air assistance Shrouded booms Effective release height


Buffer Zone

Drift Management Strategies

- **By selecting the proper drift reduction nozzles is one of the best ways to protect sensitive areas.**

Defining Spray Particles

- **Particles or Droplets - form the spray pattern**

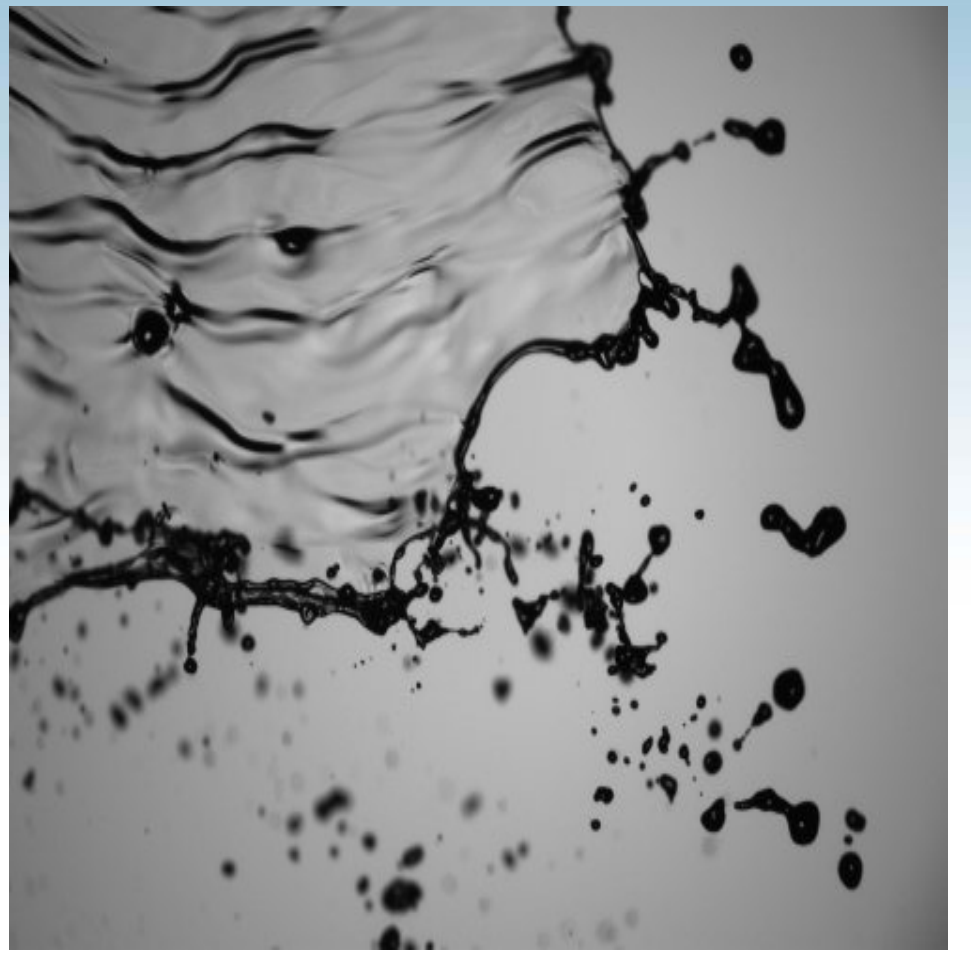
- **Droplet sizes within a spray pattern**
  - Expressed in Microns (micrometers)

Droplet Sizes

- Measured and then expressed in various ways.
- VMD (Volume Median Diameter) or D(v0.5)
- D(v0.1) (Small Droplets in relation)
- D(v0.9) (Large Droplets in relation)

Drop Size

- **The definitive way to define spray atomization.**



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Laser Systems

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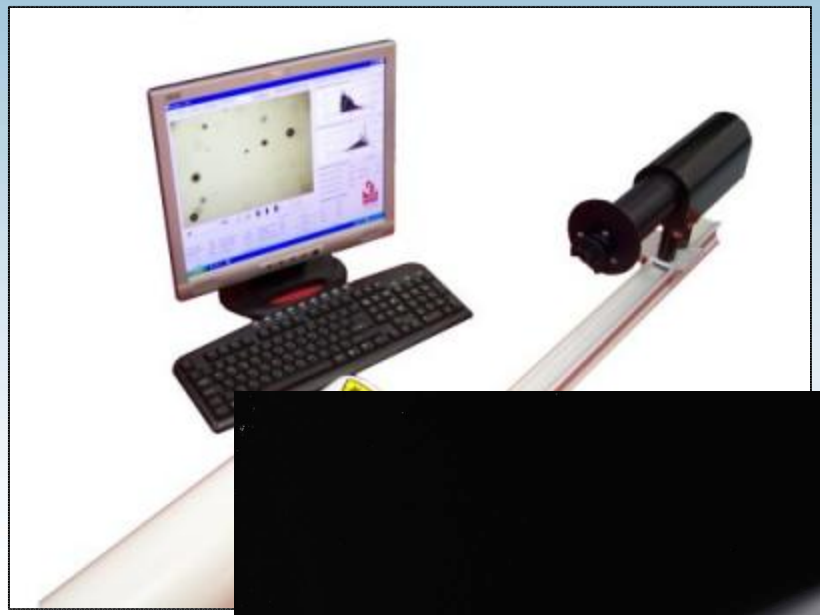
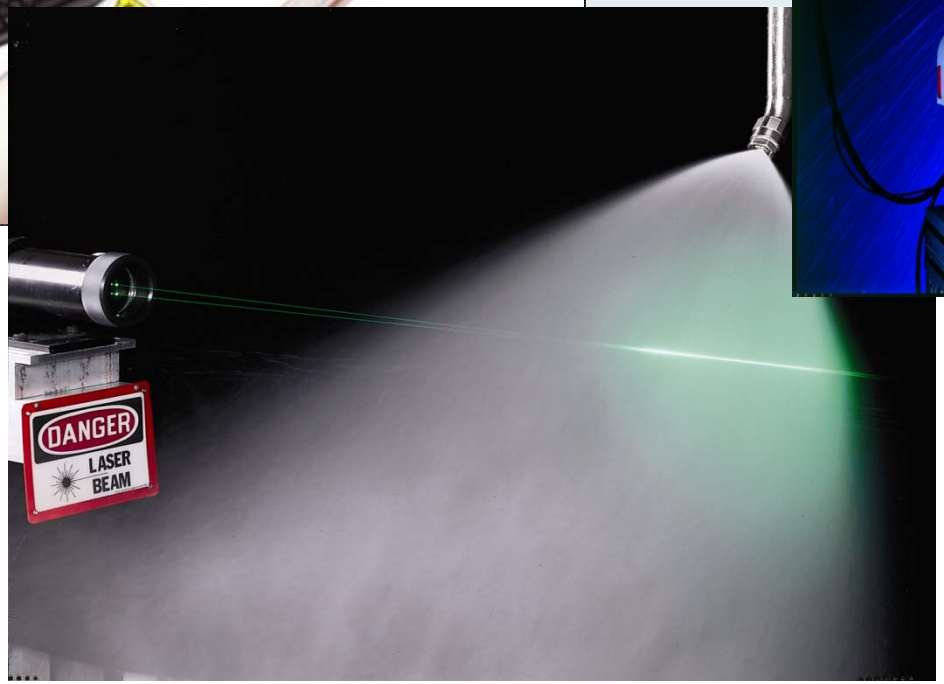




Droplet Size Categories

Category	Symbol	Color Code	Approximate VMD Range (PDPA)	Approximate VMD Range (Oxford)	Approximate VMD Range (ASAE S572)*
Very Fine	VF	Red	< 157	< 136	<144
Fine	F	Orange	157 – 256	136 – 173	144 – 235
Medium	M	Yellow	257 – 360	174 – 214	236 – 340
Coarse	C	Blue	361 – 437	215 – 334	341 – 403
Very Coarse	VC	Green	438 – 526	335 – 412	404 – 502
Extremely Coarse	XC	White	> 526	> 412	> 502

*Data extracted from American Soiciety of Agricultural Engineers (ASAE) Standard S572. Data is an average of three laser measuring instruments (Malvern, PMS, and PDPA) and is based on the following droplet size studies:

1) Womac, A.R., R.A. Maynard, I.W.Kirk.1999. Measurement variations in reference sprays for nozzle classification, Transactions of the ASAE 42(3):609-616

2) Womac, A.R., 2000. Quality control of standardized reference spray nozzles, Transactions of the ASAE 43(1):47-56.

BCPC

1985 BRITISH CROP PROTECTION CONFERENCE–WEEDS

A System for Classifying Hydraulic Nozzles and Other Atomisers into Categories of Spray Quality

SJ Doble

GA Mathews

I Rutherford

ESE Southcombe

Droplet Size Categories

ASAE Standard S572*

Category	Symbol	Color Code	Dv0.1	Dv0.5 (VMD)	Dv0.9
Very Fine	VF	Red	< 57	< 144	< 274
Fine	F	Orange	57 – 111	144 - 235	274 - 415
Medium	M	Yellow	112 - 149	236 - 340	416 - 579
Coarse	C	Blue	150 - 170	341 - 403	580 - 732
Very Coarse	VC	Green	171 - 215	404 - 502	733 - 790
Extremely Coarse	XC	White	> 215	> 502	> 790

***Data extracted from American Soiciety of Agricultural Engineers (ASAE) Standard S572. Data is an average of three laser measuring instruments (Malvern, PMS, and PDPA) and is based on the following droplet size studies:**

LERAP

Local Environmental Risk Assessment for Pesticides

Table 1. Definition of LERAP-Low Drift Star Ratings	
Terminology	Drift Performance (measurable as ground deposit)
No LERAP-Low drift rating	Drift levels greater than75% of that from reference system.
LERAP-Low Drift - one star *	Drift levels greater than 50% and up to 75% of that from reference system.
LERAP-Low Drift - two star **	Drift levels greater than 25% and up to 50% of that from reference system.
LERAP-Low Drift - three star ***	Drift levels up to 25% of that from reference system.

Julius-Kuhn-Institute (JKI) Germany

DIX – Drift Potential Index

Compared to a reference nozzle you can achieve:

Drift Reduction Class

50%

75%

90%

Similar Drift Schemes

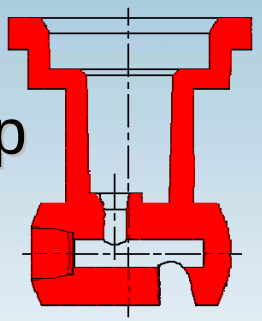
- Netherlands
- France
- Belgium
- Etc

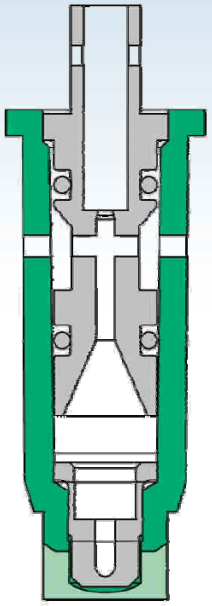
Nozzles

- **Most applicators view the nozzle as the key to managing the drift potential.**

Drift Reduction Nozzle Technology

Pre-orifice to create pressure drop





Venturi effect to produce air-induced, larger droplets

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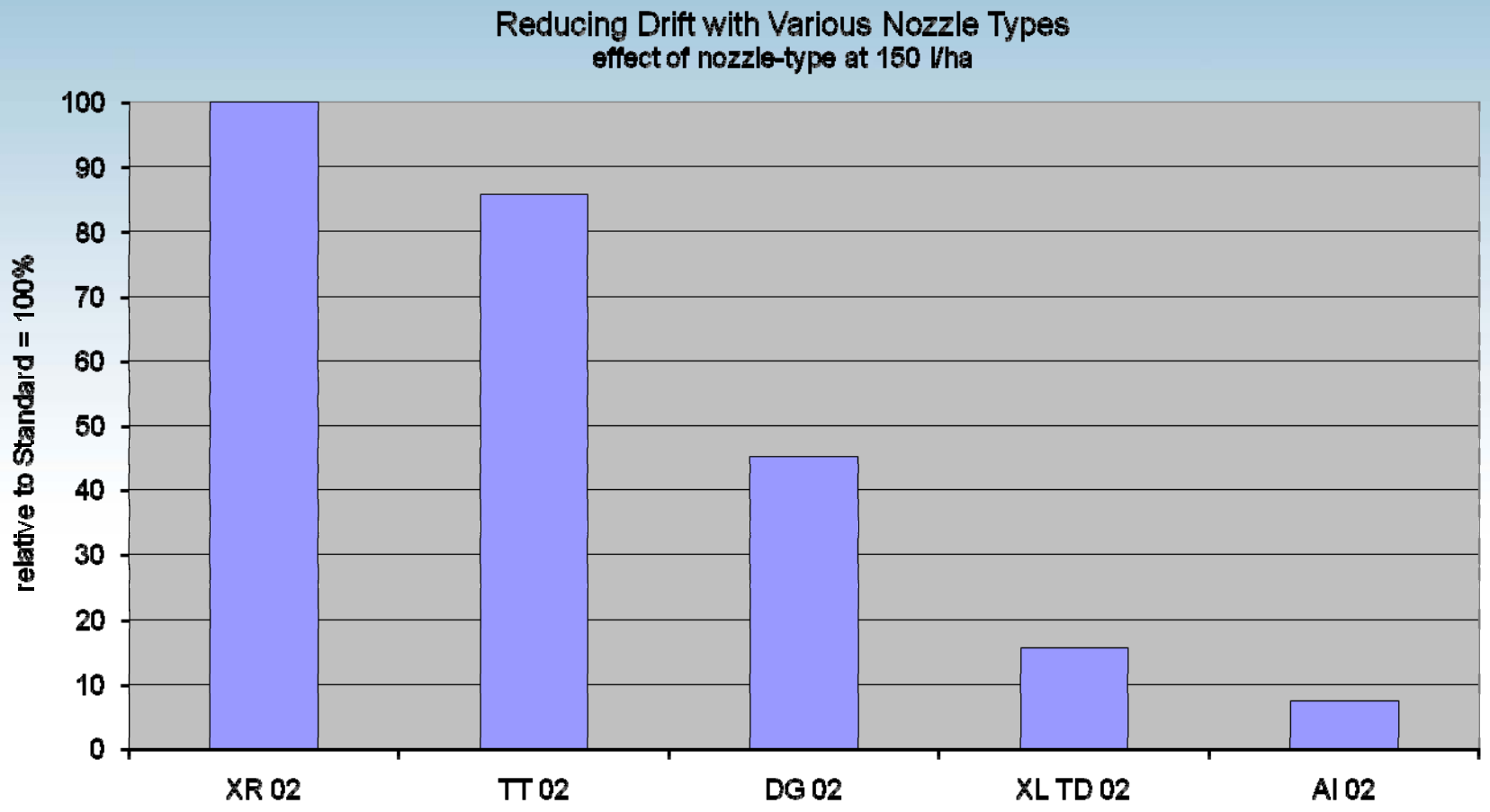
Effect of Nozzle Type



J. van de Zande et al, 2000

Droplet Size Measurement and Classification

ASAE S572 FEB04
Spray Nozzle Classification by Droplet Spectra

American Society of Agricultural Engineers

VF	F	M	C	VC	XC
Very Fine	Fine	Medium	Coarse	Very Coarse	Extremely Coarse

ASAE S572

Table 1 – Classification category threshold values for flat spray nozzles

Classification category threshold	Nozzle spray angle (°)	Nominal rated flow rate[1]		Reference flow rate[2]		Reference operating pressure[3]	
		(L/min)	(gpm)	(L/min)	(gpm)	(kPa)	(psi)
VF / F	110	0.38	0.10	0.48	0.13	450	65.3
F / M	110	1.14	0.30	1.18	0.31	300	43.5
M / C	110	2.27	0.60	1.93	0.51	200	29.0
C / VC	80	3.03	0.80	2.88	0.76	250	36.3
VC / XC	65	3.78	1.00	3.22	0.85	200	29.0

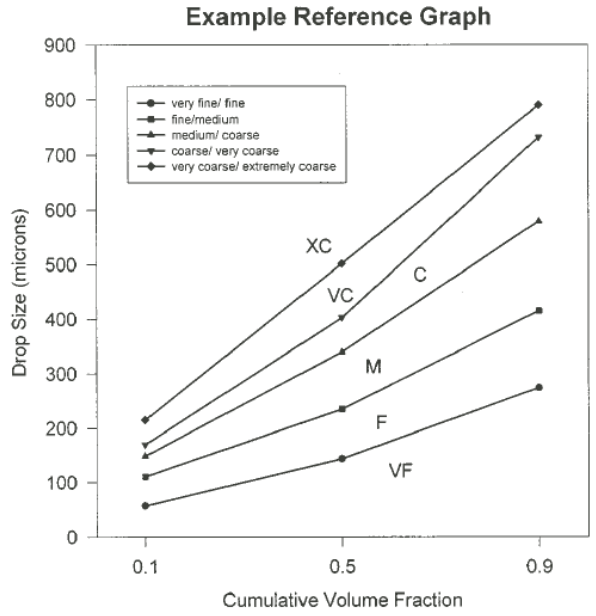


Figure 1 – Sample reference graph developed from measurements averaged from three types of laser instruments.

Droplet Size Categories
ASAE Standard S572*

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Droplet Size Charts

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

XR TeeJet® (XR) and XRC TeeJet® (XRC)

	PSI						
	15	20	25	30	40	50	60
XR8001	M	F	F	F	F	F	F
XR80015	M	M	M	F	F	F	F
XR8002	M	M	M	M	F	F	F
XR8003	M	M	M	M	M	M	F
XR8004	C	C	M	M	M	M	M
XR8005	C	C	C	C	M	M	M
XR8006	C	C	C	C	C	C	C
XR8008	VC	VC	VC	C	C	C	C
XR11001	F	F	F	F	F	VF	VF
XR110015	F	F	F	F	F	F	F
XR11002	M	F	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	M	F
XR11006	C	C	M	M	M	M	M
XR11008	C	C	C	C	C	M	M

TwinJet®

	PSI				
	30	35	40	50	60
TJ60-11002	F	F	F	F	F
TJ60-11003	F	F	F	F	F
TJ60-11004	M	F	F	F	F
TJ60-11006	M	M	M	M	M
TJ60-11008	C	M	M	M	M
TJ60-11010	C	C	C	M	M

DG TwinJet®

	PSI				
	30	35	40	50	60
DGTJ60-110015	F	F	F	F	F
DGTJ60-11002	M	M	M	F	F
DGTJ60-11003	C	M	M	M	M
DGTJ60-11004	C	C	C	C	M
DGTJ60-11006	C	C	C	C	C
DGTJ60-11008	C	C	C	C	C

Droplet size classifications are based on BCPC specifications and in accordance with ASAE Standard S-572 at the date of printing. Classifications are subject to change.

VF	F	M	C	VC	XC
Very Fine	Fine	Medium	Coarse	Very Coarse	Extremely Coarse

TeeJet Technologies

Summary

- Keep the message simple and easy to understand.
- Give the applicators plenty of choices.
- Easy access to information.