Spray Wisely:

Timing and techniques to reduce drift and maintain efficacy

Bill Gordon, Spray Application Specialist - Nufarm Australia

Take home messages:

Sprayer setup and operation dictates how much product will be left in the air, the conditions determine where the airborne fraction will go.

Air movement at night and around sunrise is very different to air movement during the day

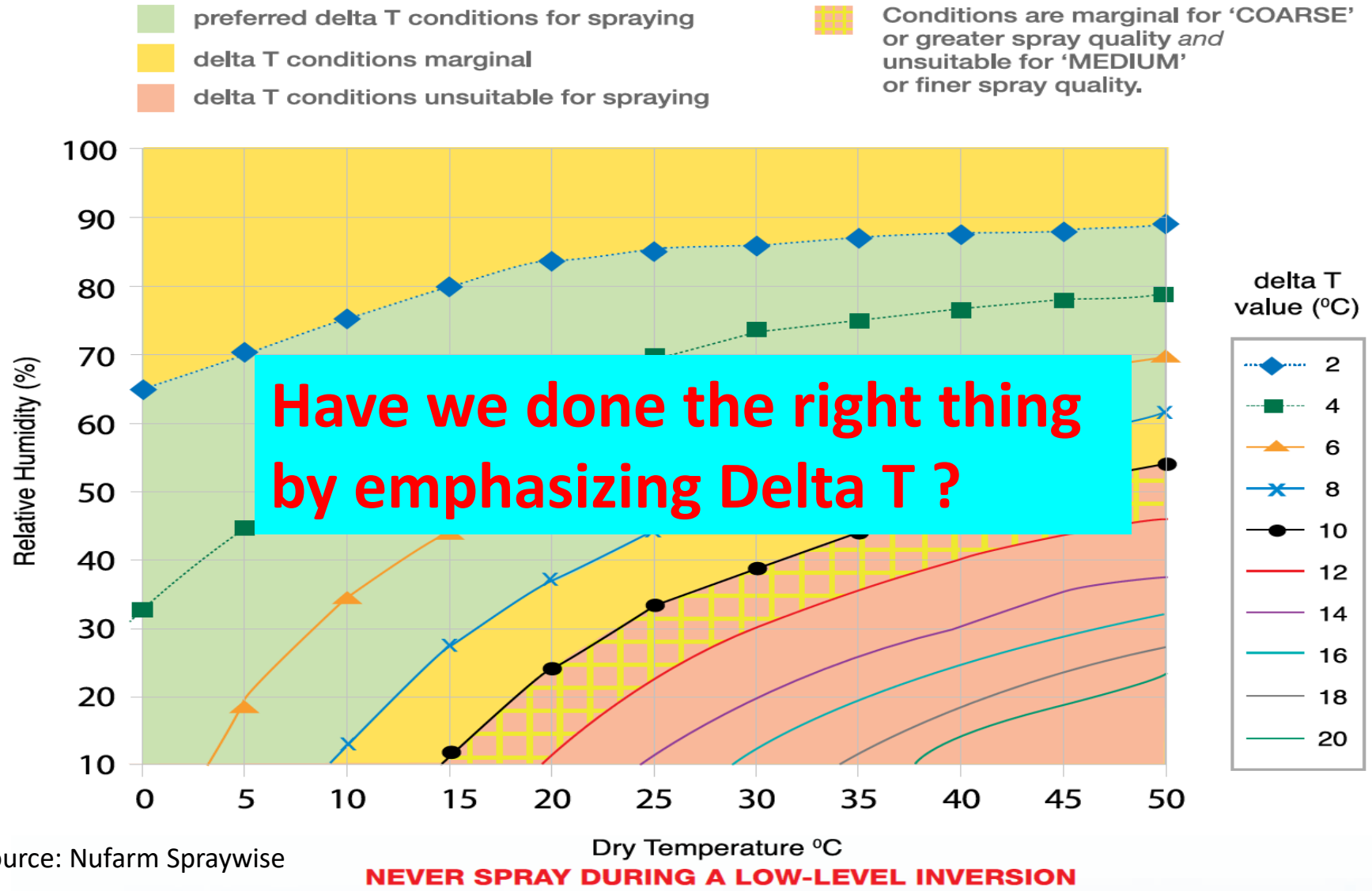
Different types of nozzle can respond differently to the tank mix

Assessing spray deposits is tool for improving spray coverage and efficacy

Main factors that influence spray drift risk

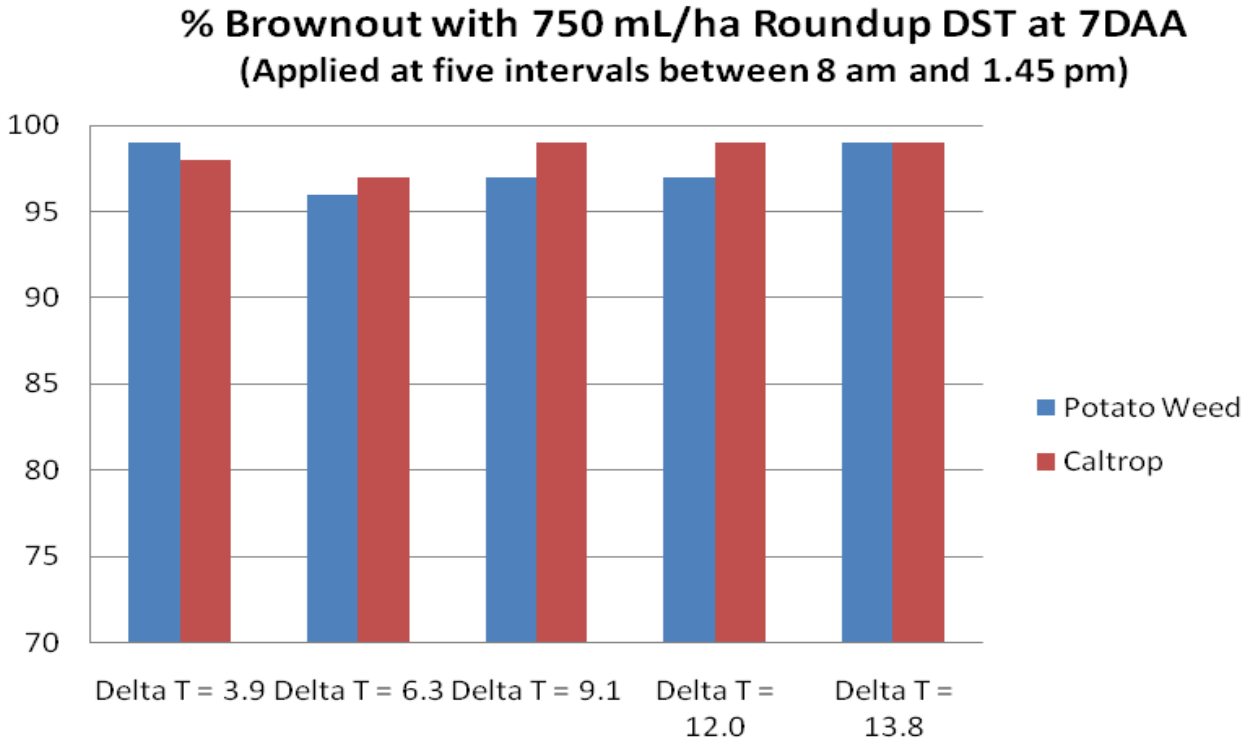
- Conditions at the time of spraying
- Spray Quality / Nozzle choice
- Sensitivity of the target
- Product choice and Rate (including water volume)
- Adjuvant Choice
- Boom Height
- Spraying Speed

Selecting the right delta T conditions for spraying



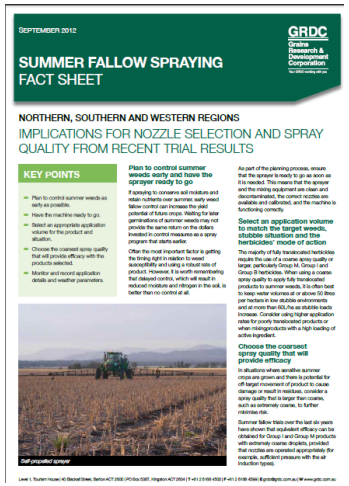
Source: Nufarm Spraywise

Impact of Delta T on efficacy



Potato weed and caltrop on day of spraying (15-Jan-10)

- *In choosing a day to conduct this trial (that is, a day when a wide range of Delta T readings would be achieved over a reasonable time period), the Spraywise Decisions website was used. The predicted Delta Ts, temperatures and humidity readings on the day the trial was applied were accurately predicted by Spraywise Decisions.*
- *For more information visit www.spraywisedecisions.com.au*


SEPTEMBER 2012

GRDC Grains Research & Development Corporation

SUMMER FALLOW SPRAYING
FACT SHEET

NORTHERN, SOUTHERN AND WESTERN REGIONS

IMPLICATIONS FOR NOZZLE SELECTION AND SPRAY QUALITY FROM RECENT TRIAL RESULTS

KEY POINTS

- Plan to control summer weeds as early as possible.
- Have the machine ready to go.
- Select an appropriate application volume for the product and situation.
- Choose the coarsest spray quality that will provide efficacy with the products selected.
- Monitor and record application details and weather parameters.

Plan to control summer weeds early and have the sprayer ready to go

If spraying to conserve soil moisture and retain nutrients over summer, early weed fallow control can increase the yield potential of future crops. Waiting for later germinations of summer weeds may not provide the same return on the dollars invested in control measures as a spray program that starts earlier.

Often the most important factor is getting the timing right in relation to weed susceptibility and using a robust rate of product. However, it is worth remembering that delayed control, which will result in reduced moisture and nitrogen in the soil, is better than no control at all.

As part of the planning process, ensure that the sprayer is ready to go as soon as it is needed. This means that the sprayer and the mixing equipment are clean and decontaminated, the correct nozzles are available and calibrated, and the machine is functioning correctly.

Select an application volume to match the target weeds, stubble situation and the herbicides' mode of action

The majority of fully translocated herbicides require the use of a coarse spray quality or larger, particularly Group M, Group I and Group B herbicides. When using a coarse spray quality to apply fully translocated products to summer weeds, it is often best to keep water volumes at or above 50 litres per hectare in low stubble environments and at more than 60L/ha as stubble loads increase. Consider using higher application rates for poorly translocated products or when mixing products with a high loading of active ingredient.

Choose the coarsest spray quality that will provide efficacy

In situations where sensitive summer crops are grown and there is potential for off-target movement of product to cause damage or result in residues, consider a spray quality that is larger than coarse, such as extremely coarse, to further minimise risk.

Summer fallow trials over the last six years have shown that equivalent efficacy can be obtained for Group I and Group M products with extremely coarse droplets, provided that nozzles are operated appropriately (for example, sufficient pressure with the air induction types).

Self-propelled sprayer

Level 1, Tourism House | 40 Blackall Street, Barton ACT 2600 | PO Box 5367, Kingston ACT 2604 | T +61 2 6166 4500 | F +61 2 6166 4549 | E grdc@grdc.com.au | W www.grdc.com.au

Control (% desiccation or stunting) of heliotrope using Glyphosate / Phenoxy Mix versus Sprayseed®.

Mintaro, S.A. Feb,2012 Mid-Afternoon

(Delta T = 14.5-15.5)

Water Rate (L/ha)	Nozzle Type and Size	Spray Quality	SpraySeed % dessication		Glyphosate/ Phenoxy Mix % Stunting	
			16 DAT	**24 DAT**	16 DAT	**24 DAT**
60 L/ha	Untreated Control		0.0	**0.0**	0.0	**0.0**
	TurboTeejet TT11002-VP (forward)	M	87.5	**92.5a**	27.5	**72.5ab**
	TeeJet AIXR11002VP	C	88.8	**98.0a**	30.0	**78.8a**
	TurboTwinJet TTJ60-11002VP	C	88.8	**94.0a**	30.0	**68.8ab**
	TeeJet AITTJ60-11002VP	C	92.5	**93.8a**	27.5	**70.0ab**
	TurboTeejet Induction TTI11002-VP (alternating forward and backward)	XC	72.5	**82.5b**	25.0	**63.8b**
90 L/ha	Untreated Control		0.0	**0.0**	0.0	**0.0**
	TurboTeejet TT110-025-VP (forward)	M	92.0	**94.5a**	23.8	**63.8b**
	TeeJet AIXR110025-VP	C	89.5	**95.5a**	25.0	**68.8ab**
	TurboTwinJet TTJ60-110025VP	C	85.0	**95.5a**	38.8	**72.5ab**
	Teejet AITTJ60-11002VP	C	94.8	**96.8a**	18.8	**61.2b**
	TurboTeejet Induction TTI1102-VP (alternating forward and backward)	XC	86.0	**92.3a**	21.2	**66.2b**
		LSD (0.05)	*8.6*	***5.9***	*8.3*	***11.5***

Nufarm SprayWise®

24 HOUR RISK PROFILE FOR SUMMER SPRAYING

Nufarm

MIDDAY

Windspeeds must be **above 4 km/h** and **less than 15-20 km/h** (refer to label) blowing away from sensitive areas

Medium spray quality: **Delta T: 2-10**

Coarse spray quality: **Delta T: 2-12**

To start spraying, the sun should be about 20 degrees above the horizon, and wind speed and direction consistent for 30-40 minutes

20°

SUNRISE

Likely to be the best conditions for spraying

Be aware of higher evaporation risk and thermal activity after midday. Monitor plant stress.

Monitor conditions closely

Consider using larger spray quality, higher water rates and managing evaporation with suitable adjuvants (ie. Collide, Activator)

Windspeed should **be above 4-5 km/h** after Sunrise to start spraying

Prepare to **STOP** all spraying if windspeeds start to drop

SUNSET

Nufarm SprayWise®

***EXTREME CAUTION REQUIRED**

High inversion risk

Dangerous air movement

Plan NOT TO SPRAY during this period

CAUTION REQUIRED

Surface Inversion onset likely.

Wind must be **above 11-12 km/h**

Often spraying into the early evening is possible in summer when air movement has continued to mix the air and prevent a surface temperature inversion forming.

Spraying can only occur if the operator can be certain that a surface temperature inversion is not present.

The safest option is not to spray during this period.

Pay very close attention to changes in wind speed and wind direction through out the evening.

Later in the evening air movement can become too unpredictable for safe spraying. **Often by 10-11 pm it has become unsafe.**

Only use XC or UC spray quality, reduce spraying speed and boom height to minimise risk of droplets remaining airborne.

MIDNIGHT

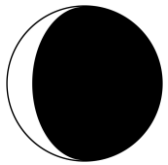
ALWAYS FOLLOW LABEL INSTRUCTIONS

Drift Study Night vs Day Spraying

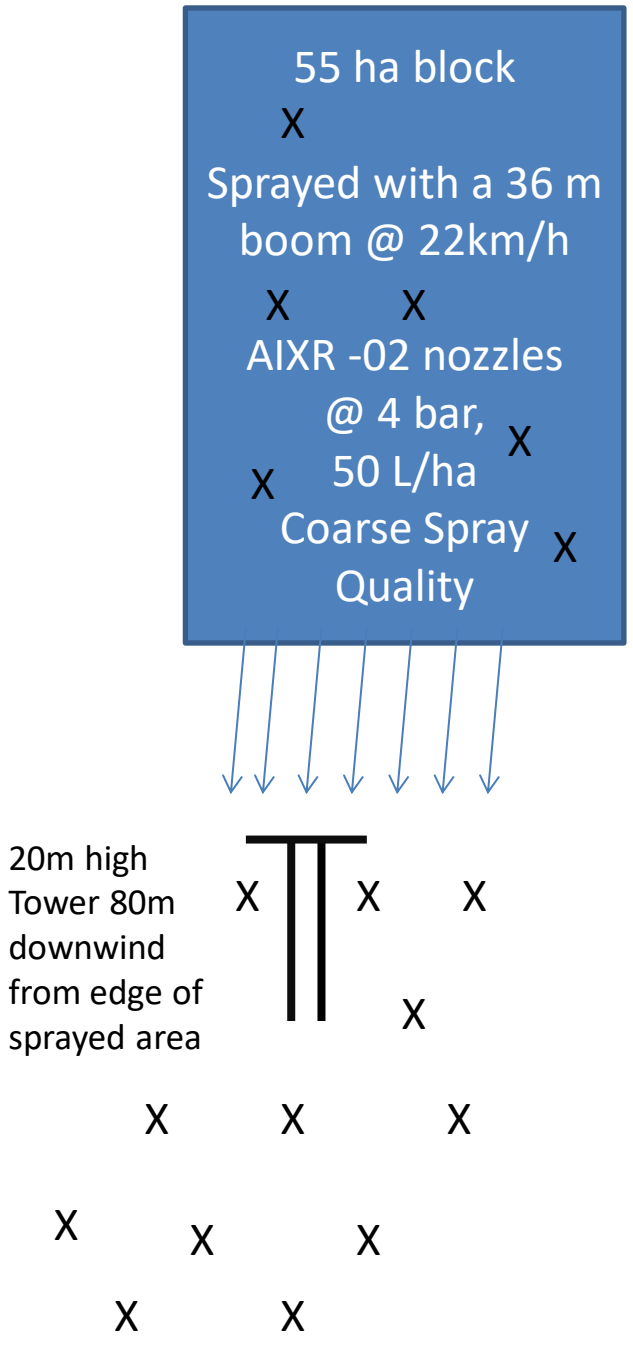
Millee NSW,Feb, 2011

GRDC and CRDC funded research.

- Night Time Spraying conducted around 2.30am



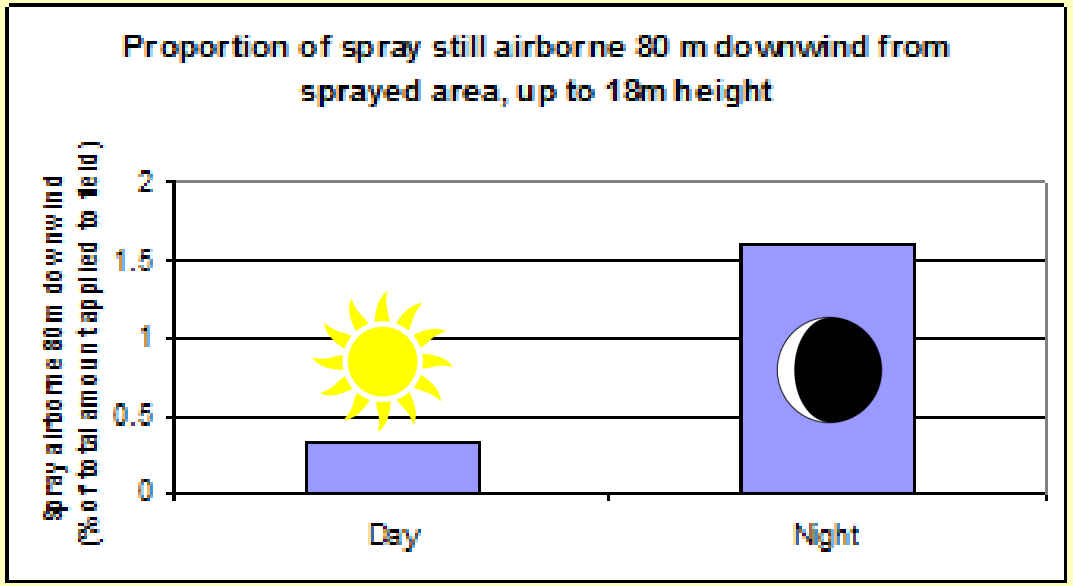
- Daytime spraying conducted around 7.30am



Amount of product remaining airborne at 80 metres downwind from the sprayed field

Night vs Day (Feb 2011, Millee)

	Wind Speed (km/hr)	Wind Direction (°)	Temperature (°C)	Relative Humidity (%)	Stability Ratio
Night	11.6	19	25.5	64	0.26
Day	18.3	4	28.7	61	-0.29



Nozzle Selection and Adjuvant Choice

Your choice of nozzle and spray quality has a big influence on how much product could remain in the air.

- **Fine spray quality** approximately 40-50% less than 150 microns
- **Medium spray quality** approximately 20% less than 150 microns
- **Coarse spray quality** approximately 10% less than 150 microns
- **Very Coarse quality** approximately 5 % less than 150 microns
- **Extremely Coarse** spray quality approx. <2-3 % less than 150 microns

Adjuvant choice can help, but nozzle has the biggest impact!

There are a lot of nozzles out there.....

Many have specific pressure ranges and differences in the droplet size (spray quality) they produce.

Some are affected in different ways by the formulation type or adjuvants that are used.

Impact of formulation and/or adjuvants on nozzle outputs

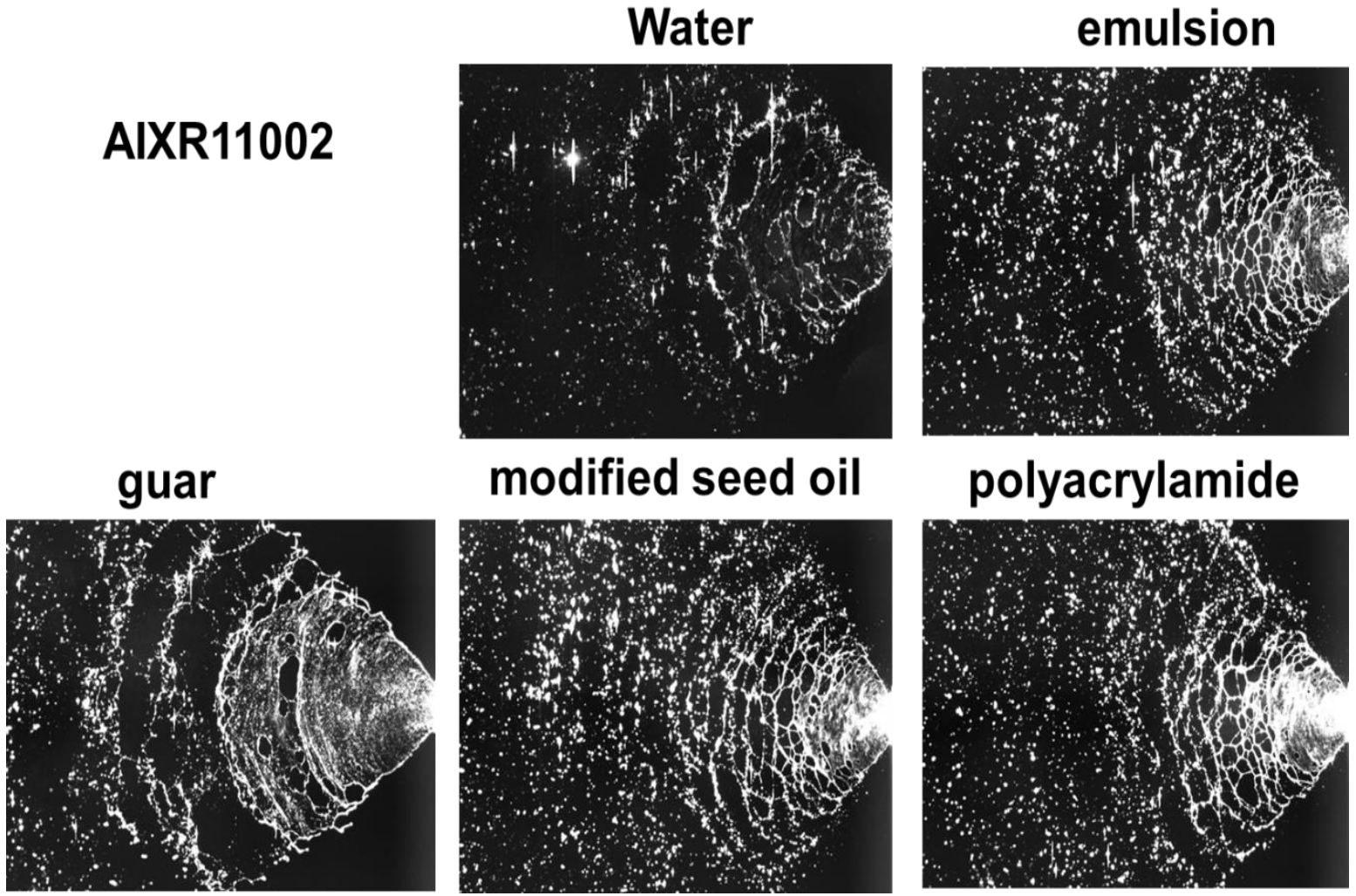
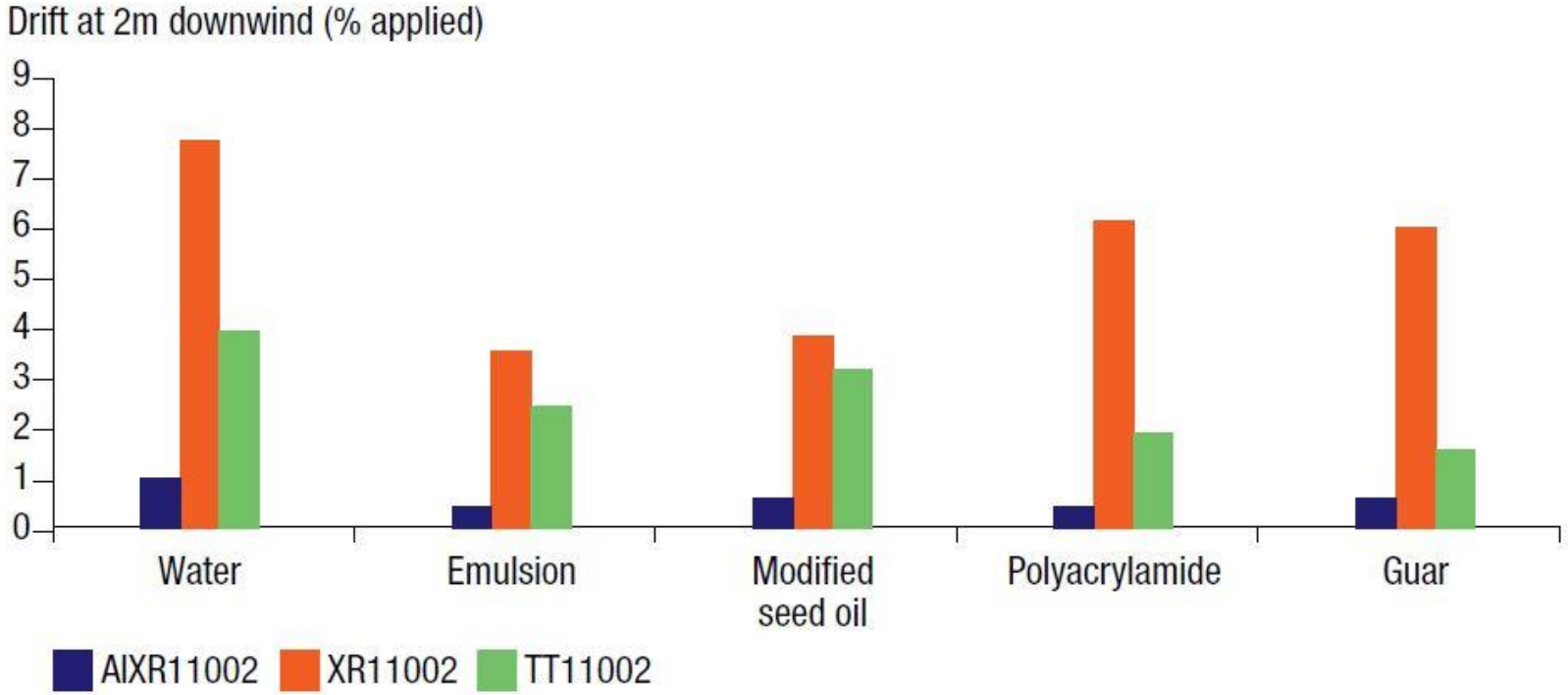


FIGURE 1 **Drift in a wind tunnel for three nozzles and various adjuvants.**



Note: the amount of spray drift from the AIXR (air-induction) remained relatively consistent in this experiment, whereas the tank mix had a much greater effect on the standard XR nozzle and the TT.

SOURCE: UNIVERSITY OF QUEENSLAND CENTRE FOR PESTICIDE APPLICATION AND SAFETY

GRDC

NOZZLE SELECTION GUIDE*

June 2017

BRAND		Extended Range Fans			Pre-Orifice (RUN ABOVE 1.5-2 BAR)						Low Pressure Air Induction (RUN ABOVE 2-3 BAR)													High Pressure Air Induction (RUN ABOVE 3-4 BAR)								
MODEL		TeeJet	TeeJet	Hardi	Lechler	TeeJet	Albuz	Hardi	TeeJet	TeeJet	Hypro	TeeJet	Lechler	Agrotop	Hypro	Hardi	Hardi	Lechler	TeeJet	Hypro	Bello-ricay	ARAG	Albuz	TeeJet	Lechler	Albuz	ARAG	Agrotop	Hardi	Teejet	TeeJet	TeeJet
		XR-110	XR-80	F-110	AD-110	DG-110	ADI-110	LD-110	TT-110	TTJ60 TwinJet	Guardian Air Twin	AI3070 TwinJet	IDK-120	Airmix	Guardian Air	Minidrift	IDKT twinjet	AIXR	ULD-120	bubble-jet	CPA	CVI	AITTJ60 TwinJet	ID	AVI	CPA-ULTRA	Turbo-drop TD	Injet	AI	TTI60 TwinJet	TTI
		2017	2017	2018	2016	2017	2016	2011	2017	2017	2016	2017	2016	2002	2016	2011	2018	2016	2017	2016	2017	2016	2016	2017	2016	2016	2016	2012	2011	2017	2017	2017
Nozzle Size	BAR																															
01 Orange	1.5	F	F	F				M	C		1.5											XC	XC									
	2.0	F	F	F			M	M	M		2.0			C	M							VC	T									
	3.0	F	F	F			M	M	M	not available in this size	3.0	not available in this size	not available in this size	C	M	not available in this size	not available in this size	not available in this size	not available in this size	not available in this size	not available in this size	C	C	not available in this size	C	VC	VC		VC	not available in this size	not available in this size	not available in this size
	4.0	VF	F	F			F	M	F		4.0			M	F							C	C		C	VC	VC	data not available	VC			
	5.0			F				F	F		5.0			M	F							C	C		C	C	C		VC			
	6.0								F		6.0			F	F							M	T		C	C	C		C			
	7.0										7.0											M	M		M	C	C		C			
	8.0										8.0												M		M	C	C		C			
015 GREEN	1.5	F	F	M	M			M	C		1.5		VC	C		UC		C		VC	UC	XC	VC	VC							UC
	2.0	F	F	F	M	M	M	M			2.0																		UC			UC
	3.0	F	F	F	M	F	M	M			3.0													VC	VC	VC			VC	XC	not available in this size	UC
	4.0	F	F	F	F	F	M	M			4.0													C	C	VC	C	C	XC			XC
	5.0			F	F			M			5.0													C	C	C	C	C	VC			XC
	6.0				F						6.0													C	C	C	C	C	VC			XC
	7.0										7.0													C	C	C	C	C	C			VC
	8.0										8.0													M	C	C	C	C	C			
02 YELLOW	1.5	F	F	M	C			M			1.5																				UC	UC
	2.0	F	F	M	M	M	M	M			2.0																			UC	UC	UC
	3.0	F	F	F	M	M	M	M			3.0													VC	VC	VC			VC	XC	UC	UC
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	5.0			F	F			M			5.0													C	C	C	C	C	VC	XC	VC	XC
	6.0				F						6.0													C	C	C	C	C	VC	XC	VC	XC
	7.0										7.0													C	C	C	C	C	C			VC
	8.0										8.0													M	C	C	C	C	C			
025 LILAC	1.5	M	M	M	C			C			1.5																				UC	UC
	2.0	F	F	M	C		M	C			2.0																			UC	UC	UC
	3.0	F	F	M	not available in this size	not available in this size	M	M			3.0													VC	VC	not available in this size			VC	XC	XC	UC
	4.0	F	F	F			M	M			4.0													C	C		VC	VC	VC	XC	VC	UC
	5.0			F				M			5.0													M	C		VC	VC	VC	VC	VC	XC
	6.0										6.0													M	C		VC	VC	C	C	VC	XC
	7.0										7.0													M	C		VC	VC	C	C		XC
	8.0										8.0														C		VC	VC	C			
03 BLUE	1.5	M	M	M	C			C			1.5													UC							UC	UC
	2.0	F	F	M	C	C	C	C			2.0																			UC	UC	UC
	3.0	F	F	M	M	M	M	C	M	C	3.0	C	VC	C	C	VC	C	C	C	VC	C	VC	VC	C	VC	VC			VC	XC	UC	UC
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	5.0			M	M			M	M	M	5.0	M	M	M	C	M	M	C	M	C	M	C	VC		C	VC	C	VC	VC	VC	XC	UC
	6.0				F				M	M	6.0	M	M	M	M	M	M	M	F	M	M	C	T		M	C	C	VC	VC	VC	VC	XC
	7.0										7.0	M	M		M	M					M	C	C		M	C	C	VC	VC	C	VC	XC
	8.0										8.0	M									M		C		C	C	C	VC	C			
04 RED	1.5	M	M	M	C			C	VC	VC	1.5		UC	VC		XC	VC	VC	VC	XC	UC	XC	XC	VC	1.5	UC					UC	UC
	2.0	M	M	M	C	C	VC	C	C	C	2.0	VC	XC	VC	VC	VC	C	VC	C	XC	UC	VC	XC	C	2.0	XC				UC	UC	UC
	3.0	M	M	M	C	M	C	C	C	C	3.0	C	VC	VC	C	C	C	VC	C	VC	UC	C	XC	C	3.0	VC	XC	XC	not available in this size	VC	XC	UC
	4.0	F	F	M	M	M	M	C	M	M	4.0	M	VC	C	C	M	M	C	M	VC	XC	C	T		4.0	C	VC	VC		VC	VC	XC	UC
	5.0			M	M			M	M	M	5.0	M	C	C	C	M	M	C	M	C	XC	C	VC		5.0	C	VC	VC		VC	VC	XC	XC
	6.0				M				M	M	6.0	M	C	M	M	M	M	C	M	C	VC	C	T		6.0	M	VC	VC		VC	VC	VC	XC
	7.0										7.0	M	M			M					C	C	C		7.0	M	C	VC		C	VC	C	VC
	8.0										8.0	M									C		C		8.0		C	VC		C	VC	C	
05 BROWN	1.5	M	M	C				C	VC	VC	1.5		UC	XC		XC	VC	VC	VC	XC	UC	XC	XC	VC	1.5	UC						UC
	2.0	M	M	C		C		C	VC	C	2.0	VC	XC	VC	VC	VC	C	VC	VC	XC	UC	XC	XC	C	2.0	XC					UC	UC	UC
	3.0	M	M	M		C		C	C	C	3.0	C	VC	VC	C	C	C	VC	C	VC	XC	VC	XC	C	3.0	VC	XC	XC	not available in this size	not available in this size	VC	XC	UC	UC
	4.0	M	F	M	data not available	M	data not available	C	C	M	4.0	M	VC	C	C	C	M	C	C	VC	XC	C			4.0	VC	XC	XC			VC	VC	XC	UC
	5.0			M				C	M	M	5.0	M	C	C	M	C	M	C	M	C	VC	C	VC		5.0	C	VC	VC			VC	VC	XC	UC
	6.0								M	M	6.0	M	C	M	M	M	M	C	M	C	VC	C	VC		6.0	M	VC	VC			VC	VC	VC	XC
	7.0										7.0	M	C			M					C	C	VC		7.0	M	VC	VC			VC	VC	VC	XC
	8.0										8.0	M									C		C		8.0		VC				VC	C	

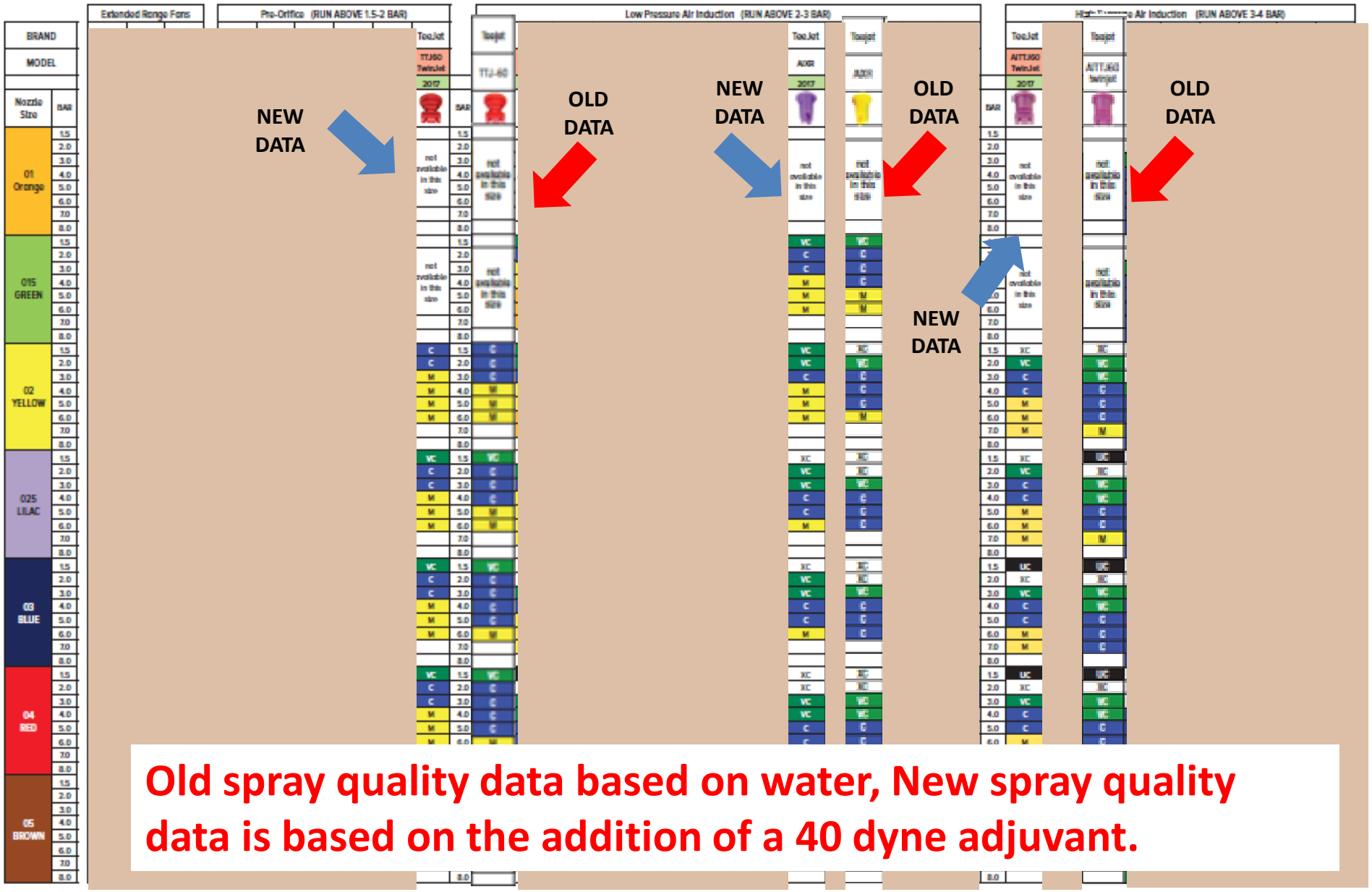
Recently updated

NOTE: SPRAY QUALITY DATA may appear finer than previous versions of this chart as manufacturers undertake new testing requirements. All data has been sourced from the manufacturer's websites as at May 2017 (date catalogue sourced from was published is listed in the chart), except for Agrotop Turbodrop TD (no-exit) and Airmix which were sourced from Nuform Sprayview Publications, published 2012. ? = data not published. Always check current spray quality information according to ASABE S721 or BCPC for older data.

Compiled and updated by: bill.gordon@eau.nuform.com 0418 794 514

NOZZLE SELECTION GUIDE*

June 2017



Old spray quality data based on water, New spray quality data is based on the addition of a 40 dyne adjuvant.

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GRAINS RESEARCH & DEVELOPMENT CORPORATION

NOZZLE SELECTION GUIDE*

June 2017

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MODEL		TeeJet	TeeJet	Hardi	Lechler	TeeJet	Albuz	Hardi	TeeJet	TTJ60 TwinJet	Hypro	TeeJet	Lechler	Agrotop	Hypro	Hardi	Hardi	Lechler	TeeJet	Hypro	Billericay	ARAG	Albuz	TeeJet	Lechler	Albuz	ARAG	Agrotop	Hardi	Teejet	TeeJet	TeeJet
		XR-110	XR-80	F-110	AD-110	DG-110	ADI-110	LD-110	TT-110		Guardian Air Twin	AI3070 TwinJet	IDK-120	Airmix	Guardian Air		Minidrift	IDKT twinjet	AIXR	ULD-120	bubble-jet	CPA	CVI	AITTJ60 TwinJet	ID	AVI	CPA-ULTRA	Turbo-drop TD	Injet	AI	TTI60 TwinJet	TTI
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Nozzle Size	BAR																															
01 Orange	1.5	F	F	F				M	C												XC	XC										
	2.0	F	F	F			M	M	M				C	M							VC	?										
	3.0	F	F	F	not available in this size	not available in this size	M	M	M	not available in this size	not available in this size	not available in this size	C	M	not available in this size	not available in this size	not available in this size	not available in this size	not available in this size	not available in this size	not available in this size	C	C	not available in this size	C	VC	VC	data not available	VC	not available in this size	not available in this size	not available in this size
	4.0	VF	F	F			F	M	F				M	F							C	C			C	VC			VC			
	5.0			F				F	F				M	F							C	C			C	C			VC			
	6.0								F				F	F							M	?			C	C			C			
	7.0																				M	M			C	C			C			
	8.0																					M			C	C			C			
015 GREEN	1.5	F	F	M	M			M	C			VC	C		UC		C		VC	UC	XC	VC	VC									UC
	2.0	F	F	F	M	M	M	M	M			C	C	XC	XC		C		C	XC	XC	?	VC									UC
	3.0	F	F	F	M	F	M	M	M	not available in this size	not available in this size	M	C	C	C	not available in this size	C	not available in this size	C	VC	VC	C	VC	not available in this size	VC	VC	VC			VC	XC	not available in this size	UC
	4.0	F	F	F	F	F	M	M	F			M	M	C	M		M		M	C	C	C			C	VC	C	C	XC		XC	
	5.0			F	F			M	F			F	M	C	M		M		M	C	C	C			C	VC	C	C	XC		XC	
	6.0				F				F			F	F	M	M		M		M	C	C	C			C	VC	C	C	VC		XC	
	7.0											F			M					M	C	C			C	C	C	C	C		VC	
	8.0																			M		M			C	C	C	C	C			
02 YELLOW	1.5	F	F	M	C			M	C	C		VC	VC		XC	VC	VC		VC	UC	VC	XC	VC								UC	UC
	2.0	F	F	M	M	M	M	M	C	C	C	VC	C	C	VC	C	C		VC	XC	C	?	VC							UC	UC	UC
	3.0	F	F	F	M	M	M	M	M	M	M	C	C	C	M	C	C		C	C	C	C	C		VC	VC	VC		VC	XC	UC	UC
	4.0	F	F	F	M	M	M	M	M	M	M	M	M	M	M	C	C	not available in this size	M	C	C	C			C	C	VC	C	VC	XC	VC	UC
	5.0			F	F			M	F	M	M	M	M	M	M	M	M		M	M	M	C			C	C	VC	C	VC	XC	VC	XC
	6.0				F				F	M	M	F	M	M	M	M	M		M	M	M	C			C	C	VC	C	VC	VC	VC	XC
	7.0										F	F			M					M	M	C			C	C	VC	C	C		VC	
	8.0										F									M		C			C	C	VC	C				
025 LILAC	1.5	M	M	M				C	C	VC		XC	VC		XC	VC	VC		XC	XC	XC	XC	VC								UC	UC
	2.0	F	F	M	not available in this size	not available in this size	M	C	C	C	UC	VC	VC	VC	VC	VC	VC	not available in this size	VC	XC	XC	?	VC				not available in this size				UC	UC	UC
	3.0	F	F	M			M	M	M	C	VC	C	C	C	C	C	C		VC	C	VC	VC	C		C	VC			VC	XC	XC	UC
	4.0	F	F	F			M	M	M	M	M	M	C	C	M	C	C		C	C	C	?			C	VC	C		VC	XC	VC	UC
	5.0			F				M	F	M	M	M	M	M	M	M	M		C	M	C	C			M	VC	C		VC	VC	VC	XC
	6.0								F	M	M	M	M	M	M	M	M		M	M	C	C			M	C	C		VC	VC	VC	XC
	7.0										M	M			M					M	C	C			M	C	C		VC	VC	C	C	XC
	8.0										M									M		C			C	C			VC	VC	C		
03 BLUE	1.5	M	M	M	C			C	VC	VC		XC	VC		UC	VC	VC	C	XC	XC	XC	XC	VC	UC							UC	UC
	2.0	F	F	M	C	C	C	C	C	C	VC	XC	VC	VC	XC	VC	VC	C	VC	XC	XC	?	VC	XC							UC	UC
	3.0	F	F	M	M	M	M	C	M	C	C	VC	C	C	VC	C	C	C	VC	C	VC	VC	C	VC	VC	XC	VC			VC	XC	UC	UC
	4.0	F	F	M	M	M	M	M	M	M	M	C	C	C	C	M	C	M	C	C	C	VC		C	VC	VC	VC	VC	VC	VC	XC	UC
	5.0			M	M			M	M	M	M	M	M	C	M	M	C	M	C	M	C	VC		C	VC	C	VC	C	VC	VC	XC	UC
	6.0				F				M	M	M	M	M	M	M	M	M	F	M	M	C	?		M	C	C	VC	C	VC	VC	VC	XC
	7.0										M	M			M	M				M	C	C		M	C	C	VC	C	VC	C	VC	XC
	8.0										M									M		C		C	C	C	C		VC	C		
04 RED	1.5	M	M	M	C			C	VC	VC		UC	VC		XC	VC	VC	VC	XC	UC	XC	XC	VC	UC							UC	UC
	2.0	M	M	M	C	C	VC	C	C	C	VC	XC	VC	VC	VC	C	VC	C	XC	UC	VC	XC	C	XC			not available in this size				UC	UC
	3.0	M	M	M	C	M	C	C	C	C	C	VC	VC	C	C	C	VC	C	VC	UC	C	XC	C	VC	XC	XC			VC	XC	UC	UC
	4.0	F	F	M	M	M	M	C	M	M	M	VC	C	C	M	M	C	M	VC	XC	C	?		C	VC	VC		VC	VC	VC	XC	UC
	5.0			M	M			M	M	M	M	C	C	C	M	M	C	M	C	XC	C	VC		C	VC	VC		VC	VC	VC	XC	XC
	6.0				M				M	M	M	C	M	M	M	M	C	M	C	VC	C	?		M	VC	VC		VC	VC	VC	VC	XC
	7.0										M	M			M	M				C	C	C		M	C	VC		C	VC	C	VC	XC
	8.0										M									C		C			C	VC		C				
05 BROWN	1.5	M	M	C				C	VC	VC		UC	XC		XC	VC	VC	VC	XC	UC	XC	XC	VC	UC								UC
	2.0	M	M	C		C		C	VC	C	VC	XC	VC	VC	VC	C	VC	VC	XC	UC	XC	XC	C	XC			not available in this size	not available in this size			UC	UC	UC
	3.0	M	M	M		C		C	C	C	C	VC	VC	C	C	C	VC	C	VC	XC	VC	XC	C	VC	XC	XC			VC	XC	UC	UC
	4.0	M	F	M	data not available	M	data not available	C	C	M	M	VC	C	C	C	M	C	C	VC	XC	C			M	VC	XC			VC	VC	XC	UC
	5.0			M				C	M	M	M	C	C	M	C	M	C	M	C	VC	C	VC		C	VC	VC			VC	VC	XC	UC
	6.0								M	M	M	C	M	M	M	M	C	M	C	VC	C	VC		M	VC	VC			VC	VC	VC	XC
	7.0										M	C			M					C	C	VC		M	VC	VC			VC	VC	VC	XC
	8.0										M									C		C			VC				VC	C		

NOTE: SPRAY QUALITY DATA may appear finer than previous versions of this chart as manufacturers undertake new testing requirements. All data has been sourced from the manufacturer's websites as at May 2017 (date catalogue sourced from was published is listed in the chart), except for Agrotop Turbodrop TD (no exit) and Airmix which were sourced from Nuform Sprayview Publications, published 2012. ? = data not published. Always check current spray quality information according to ASABE S572.1 or BCPC for older data.

Compiled and updated by: bill.gordon@eu.nuform.com 0418 794 514

Figure 2: Percentage of driftable fines produced with various adjuvants

Using an Airmix 02 nozzle @ 3.5 bar

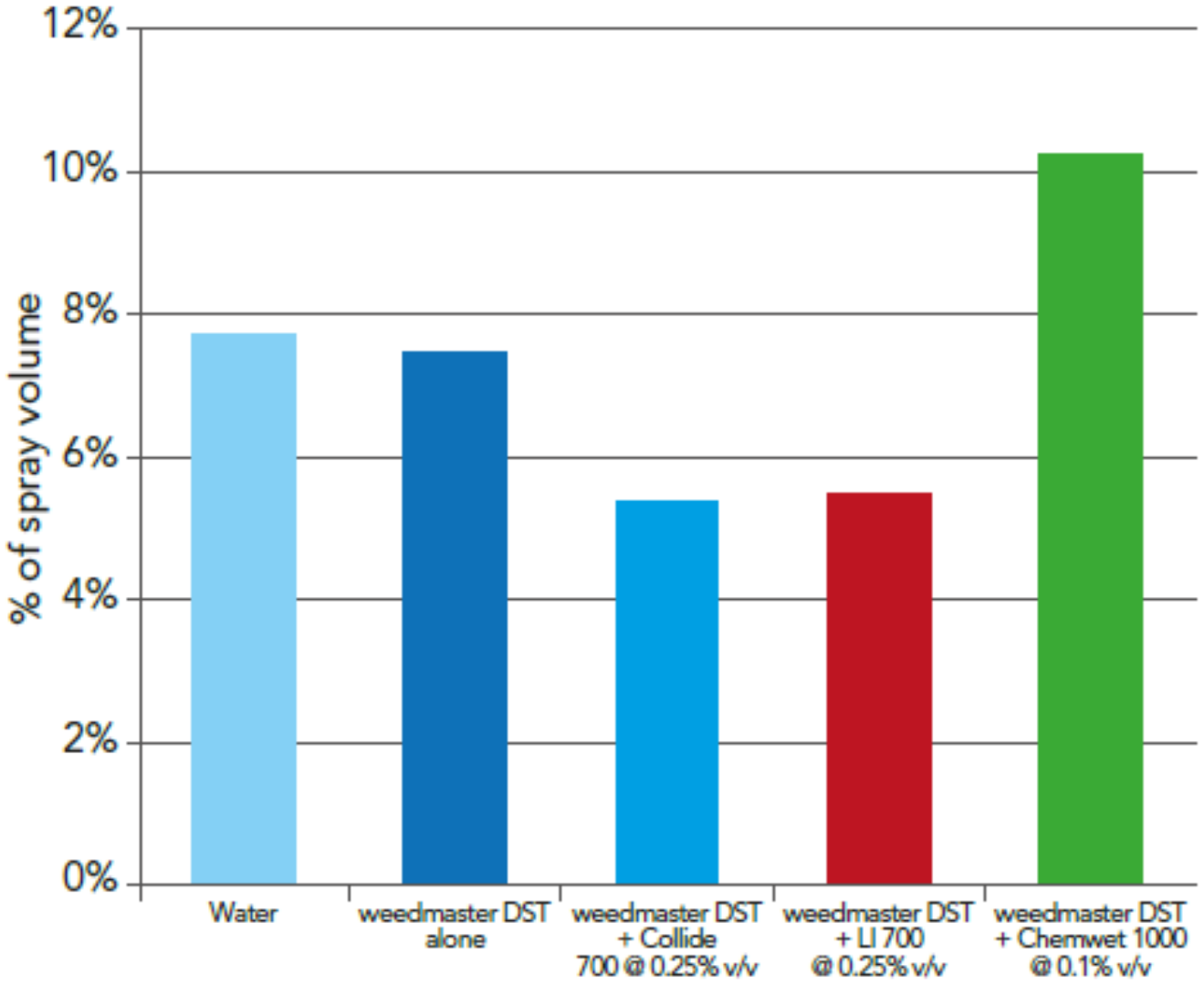
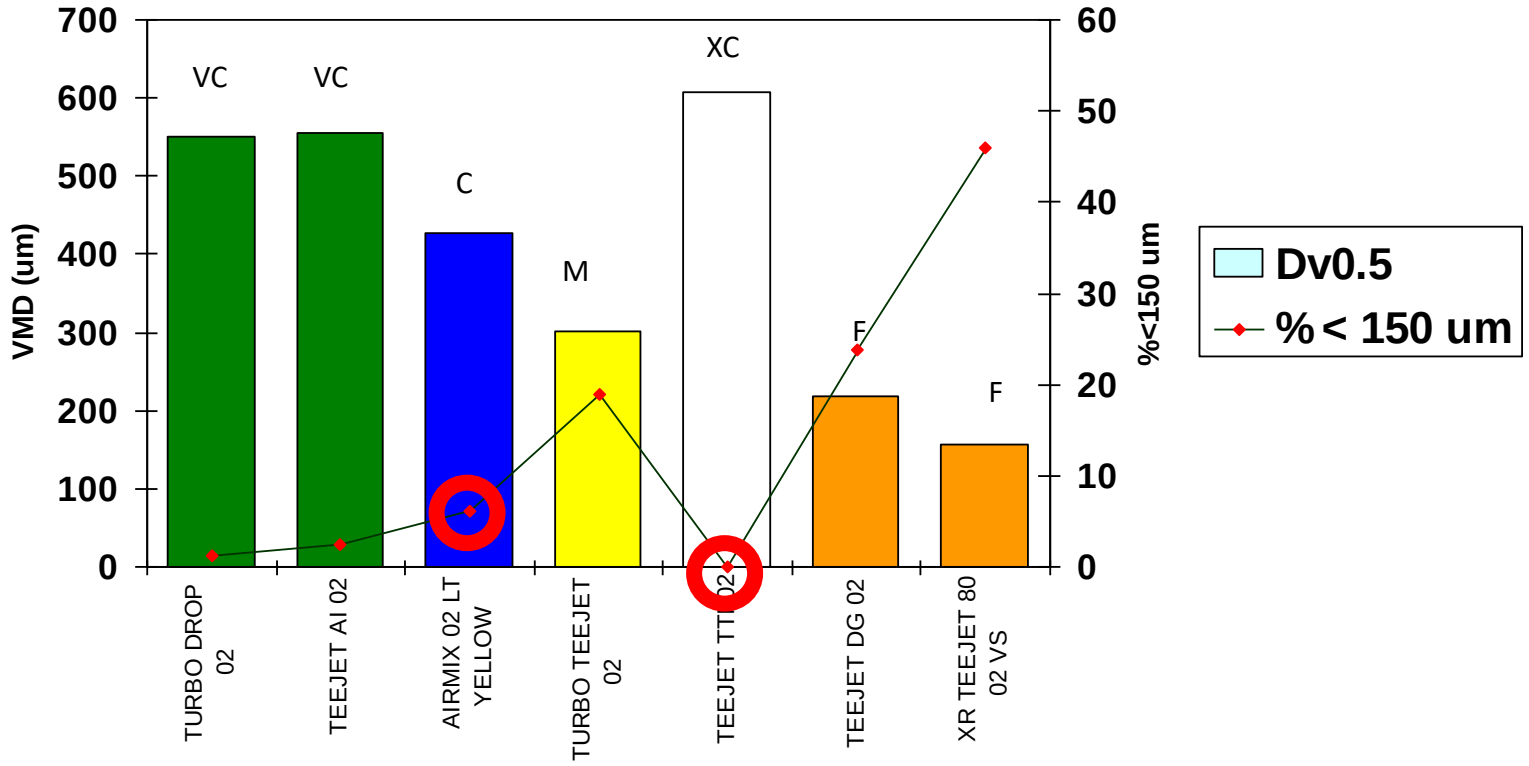


Figure 2: weedmaster DST rate 1.0L/ha 80L water/ha

Source: Uni QLD, Gatton 2012.

Nozzle selection with 2,4 D – low pressure

Tank mix - 0.5% 2,4 D – 9 kph wind speed

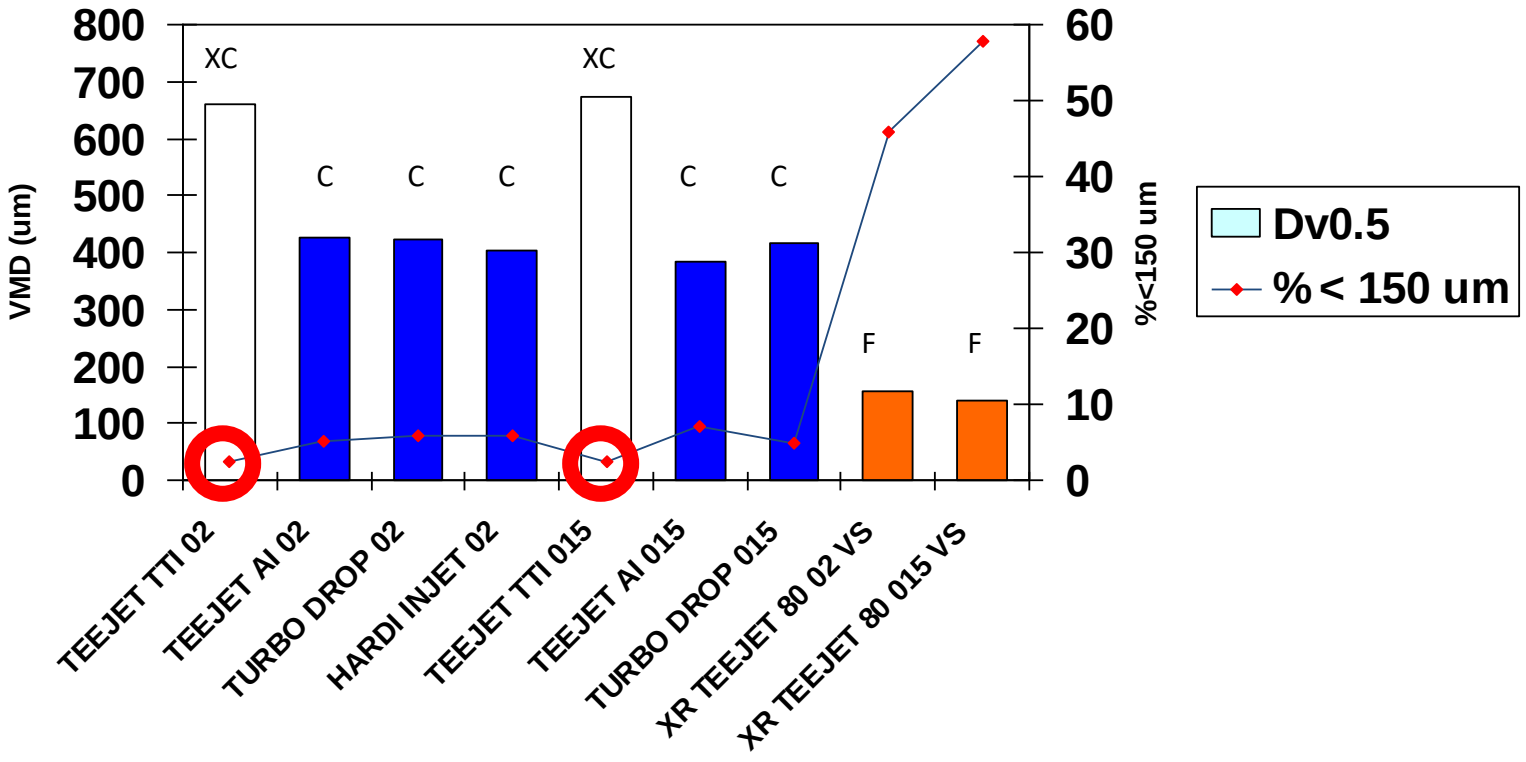


2.75 bar pressure

Source : C-PAS GRDC Project UQ 00032

Nozzle selection with 2,4 D – higher pressure

Tank mix - 0.5% 2,4 D – 9 kph wind speed

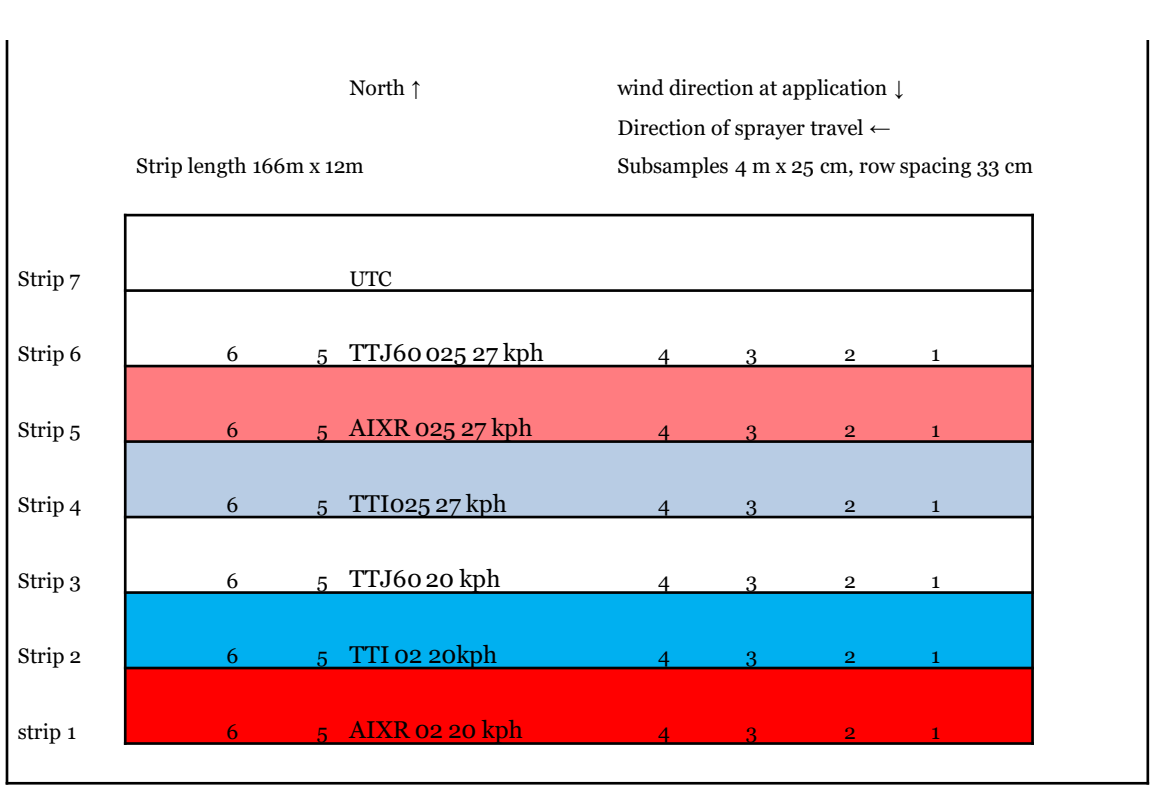


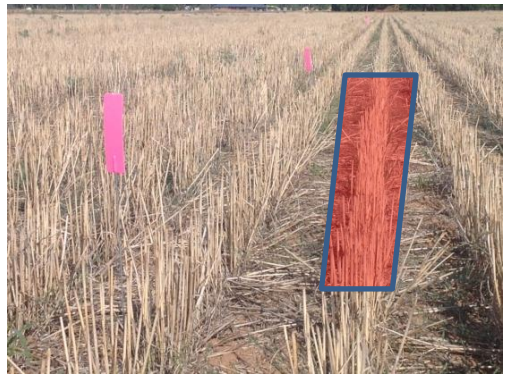
5.0 bar pressure

Source : C-PAS GRDC Project UQ 00032

Results from a single trial evaluating spraying speed and nozzle type on Glyphosate efficacy in a standing stubble

(Awnless Barnyard Grass & other summer weeds) Narrabri - 2014





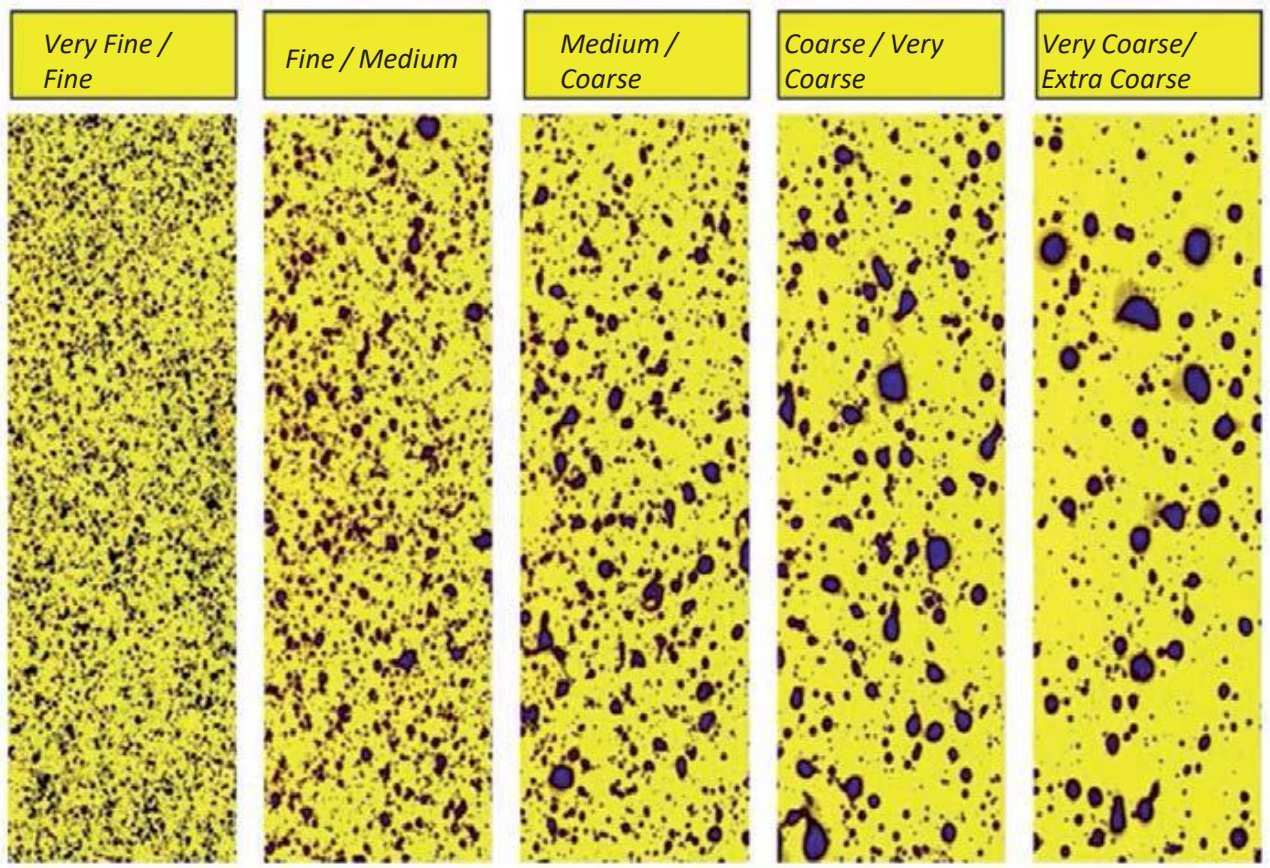
Summary of speed and nozzle effects

- Spraying at 27 km/h resulted in a 9.4% reduction in efficacy in the centre of the sprayer for all nozzles (compared to 20 km/h)

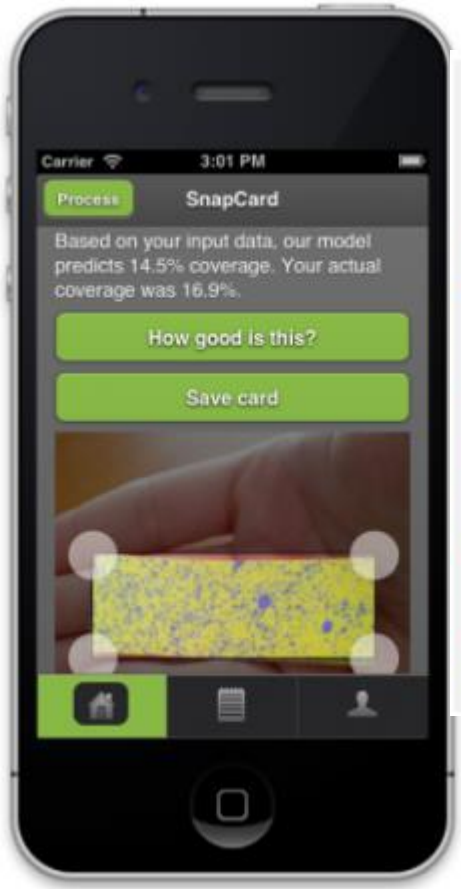
- TTI nozzles (XC) resulted in a 10-12% overall reduction in efficacy at either speed *(at the rate of Glyphosate actually used).*

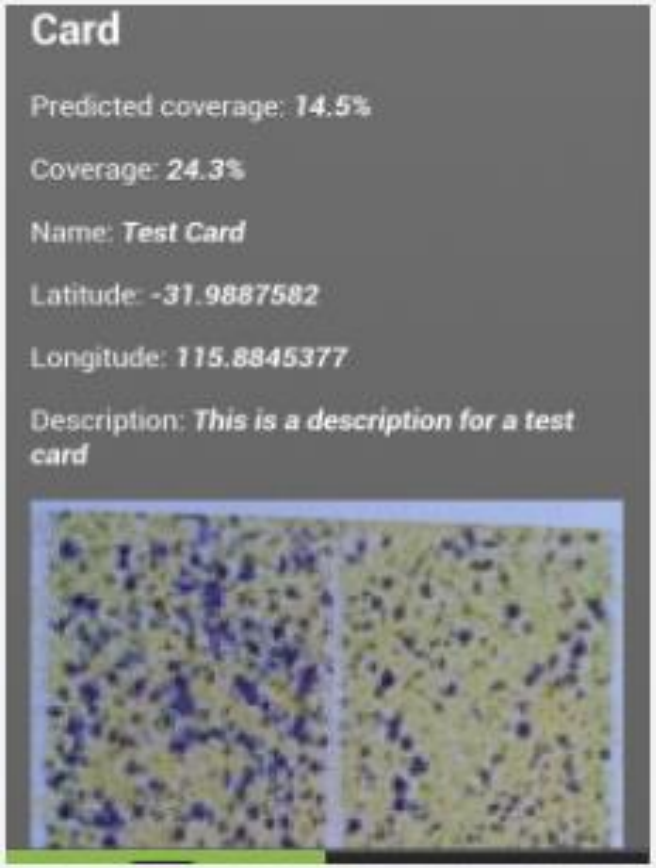
When using larger droplets assess spray coverage and monitor efficacy

Coverage on Water Sensitive paper at the same application volume with different spray qualities



Snapcard App

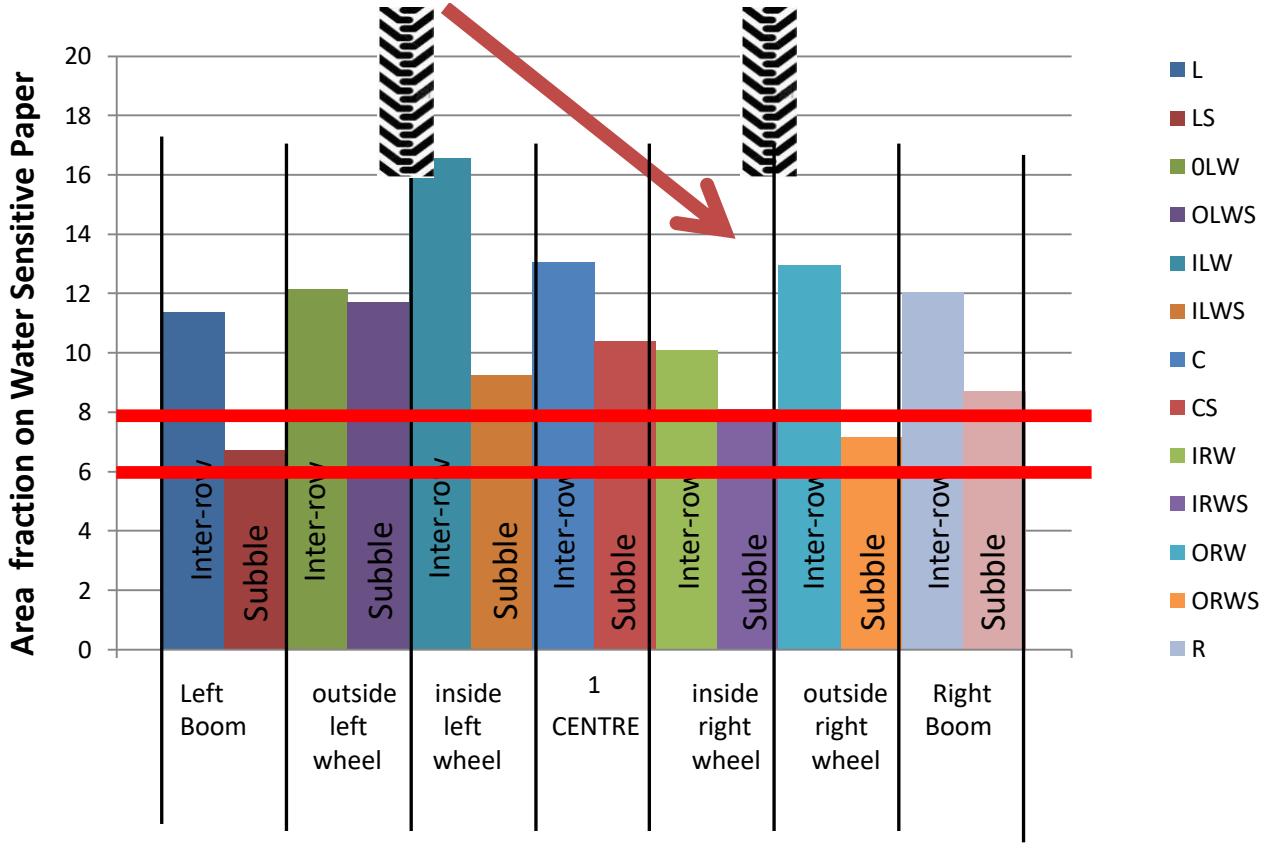




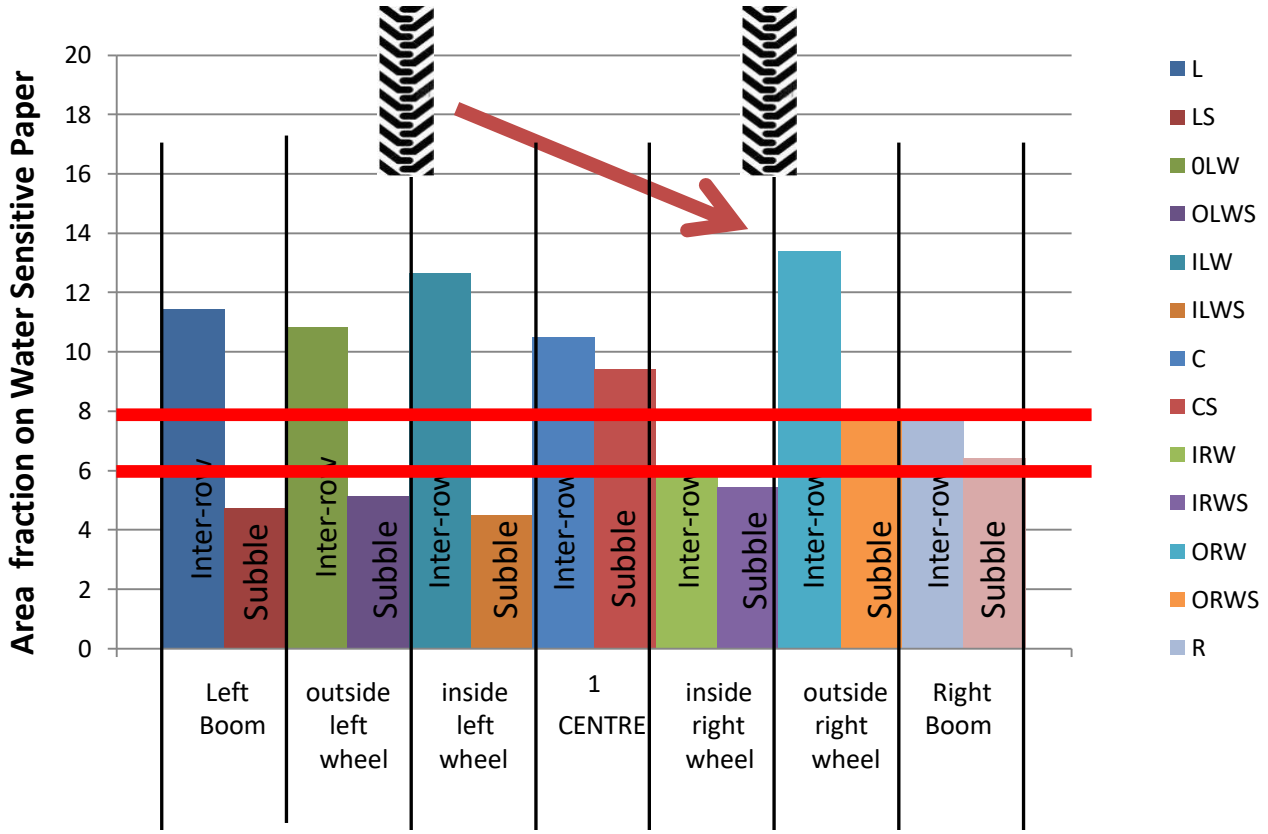
SnapCard spray card coverage screen

Nufarm Grow a better tomorrow.

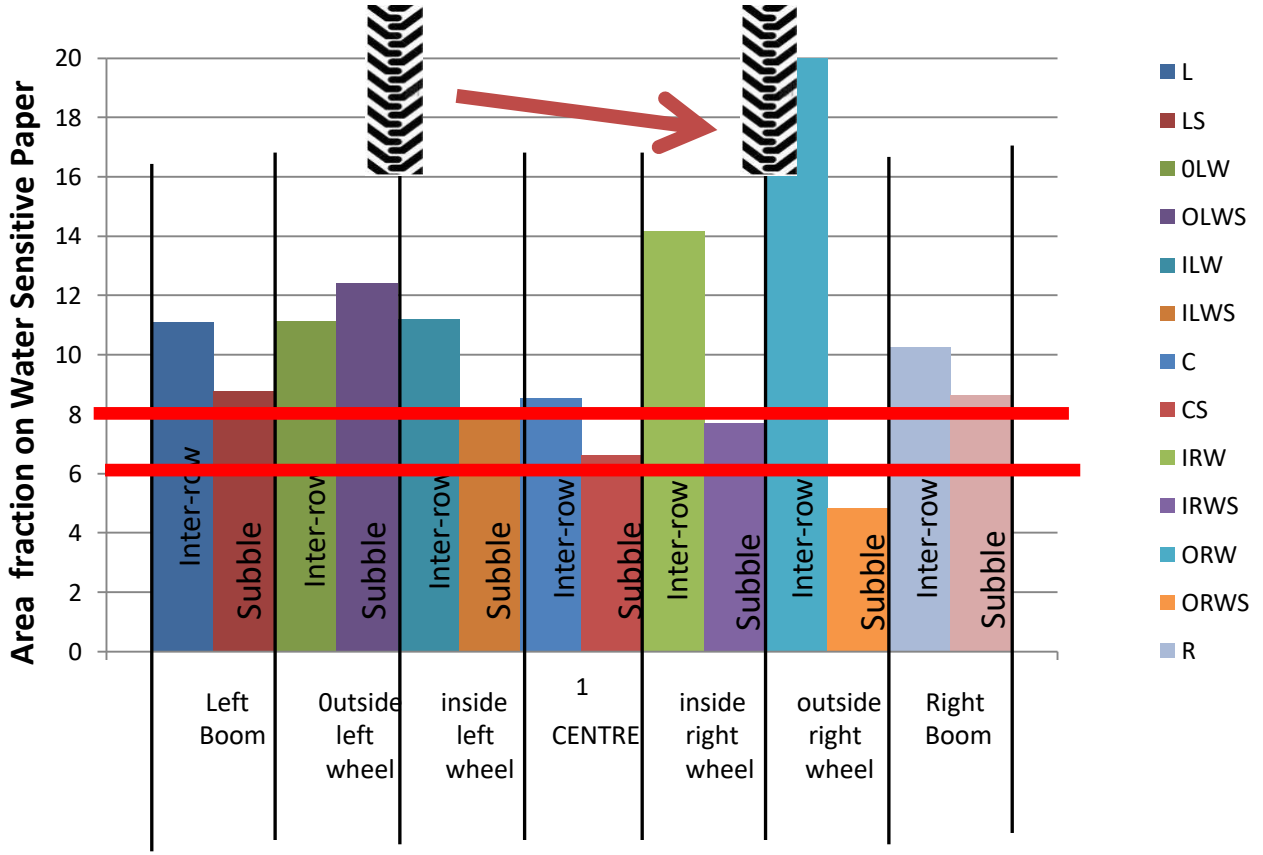
18 km/h, 60 L/ha, 50cm spacing
AIXR 02 @ 4 bar (small end of Coarse)



26 km/h, 60 L/ha, 25cm spacing
AIXR 015 and 02 @ 2.5bar (very coarse)



31 km/h, 60 L/ha, 25cm spacing
AIXR 015 and 02 @ 4 bar (small end of coarse)



Penetration and coverage in a late canola canopy (e.g. fungicide application)

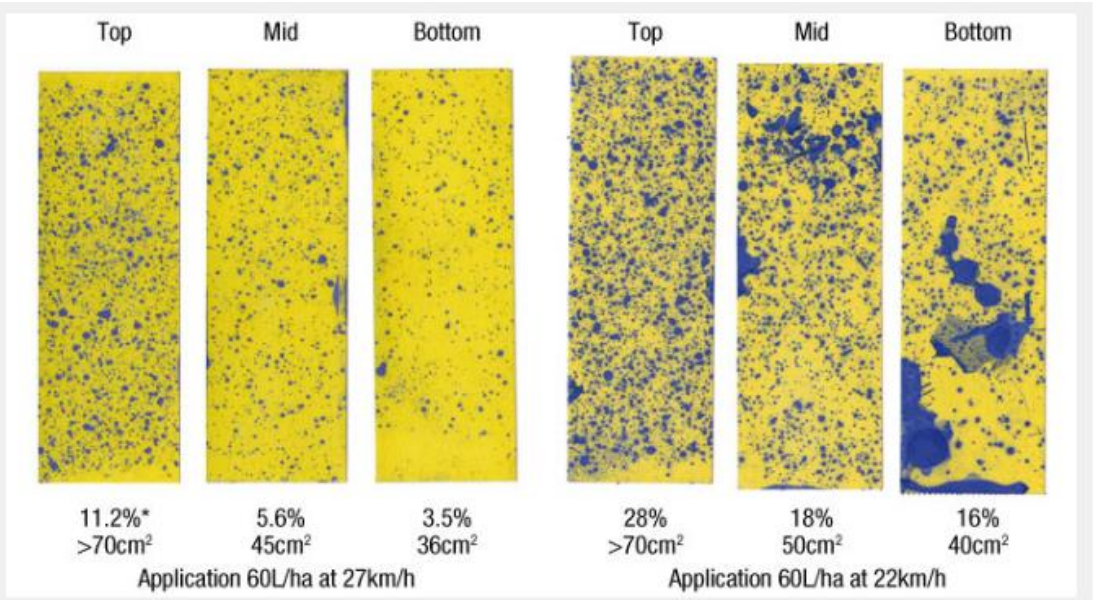


Figure 2 Deposits onto WSP cards at three locations in the canopy (top, mid and bottom).

SOURCE: Bill Campbell

Same application volume, but a reduction in spraying speed, and a minor change in spray quality have made a big difference to the penetration and coverage.

Impact of droplet interception on coverage due to different stubble heights

70cm high, “stripper front’
4.7 t/ha residue

<10cm high, < 2.2 t/ha residue

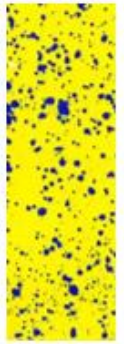
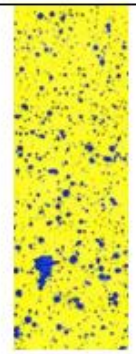
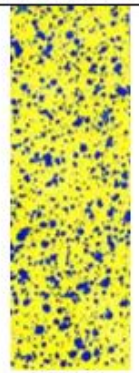
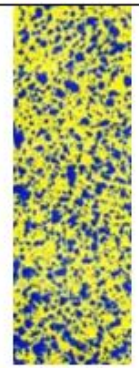
Pre-orifice 02 nozzle 3 bar, 16 km/h 50L/ha	Pre-orifice 03 nozzle 3 bar, 16 km/h 50L/ha	Pre-orifice 04 nozzle 3 bar, 16 km/h 50L/ha
Stripper front stubble		
		
9.9%	10.3%	16.7%
Baled stubble		
		
13.6%	26.2%	35.0%

Table 1. Spray card analysis for stripper front and baled stubble treatments, medium droplet size.

Information from the Hart field site group, trials on stubble penetration and pre-emergent efficacy (S.A. 2015-2016, funded by SAGIT) images by Dr Sarah Noack

Top Ten Tips for reducing spray drift

- Choose all products in the tank mix carefully, this includes the choice of active ingredient, the formulation type and the adjuvant used.
- Understand the products mode of action and coverage requirements
- Select the coarsest spray quality that will provide an acceptable level of control (& check the spray coverage).
- Always expect that surface temperature inversions will form later in the day, as sunset approaches, and they are likely to persist overnight and beyond sunrise on many occasions
- Use weather forecasting information to plan the application.

Top Ten Tips for reducing spray drift

- Only start spraying after the sun has risen more than 20 degrees above the horizon and the wind speed has been above 4-5 km/h for more than 20-30 minutes, with a clear direction that is away from adjacent sensitive areas.
- Set the boom height to achieve double overlap of the spray patterns.
- Avoid high spraying speeds, particularly when ground cover is minimal.
- Be prepared to leave unsprayed buffers
- Continually monitor the conditions at the site of application.

Thanks for Listening.

ANY QUESTIONS?

For further information contact
Bill Gordon – Spray Application Specialist, Nufarm Australia
bill.gordon@nufarm.com

Or your local Nufarm Representative.

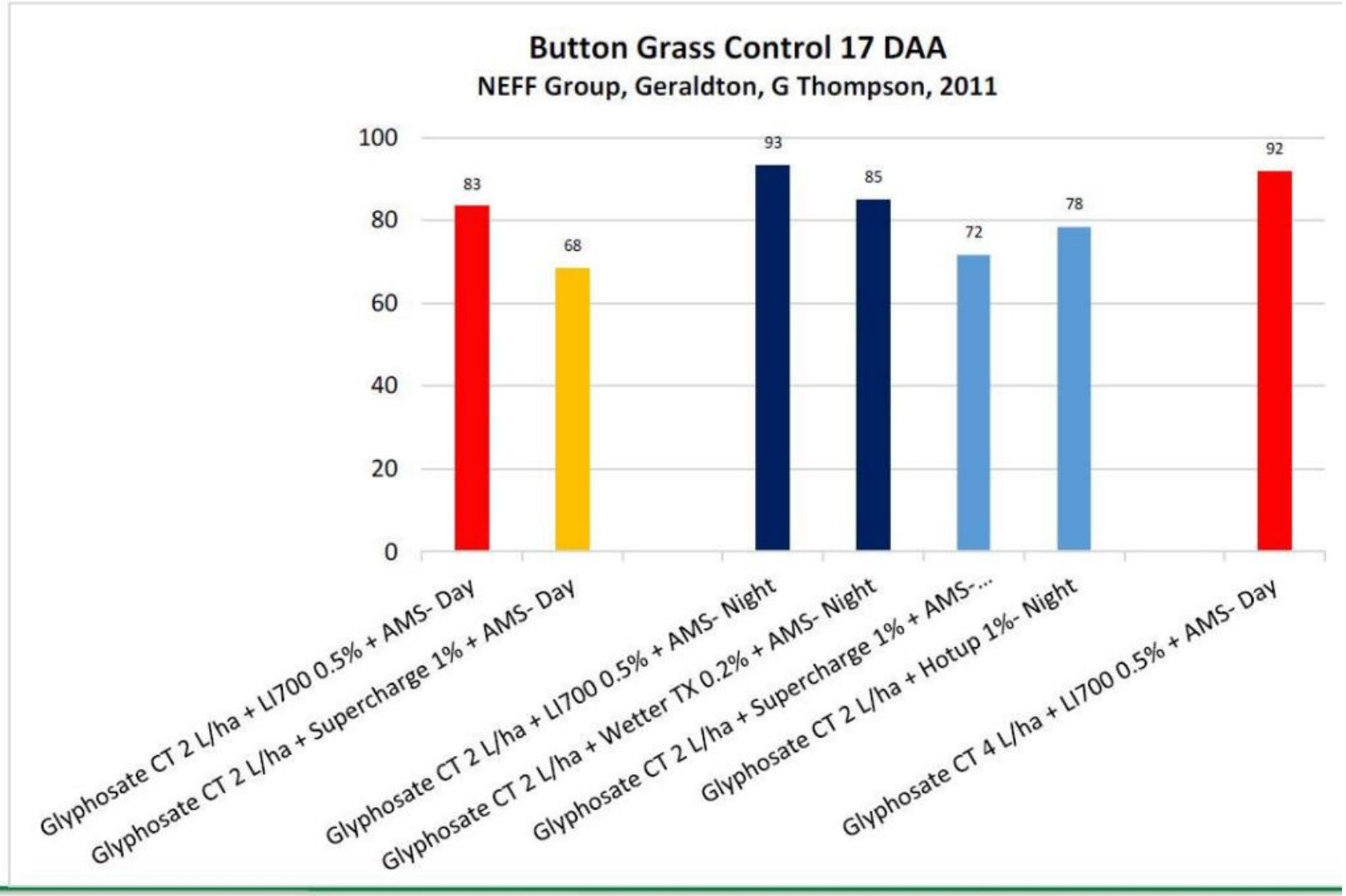
Examples of coverage from Demo's

Coomandook Demo			**Trailing Stoll**			50 cm nozzle spacing		
Standing Stubble 20-30cm	Speed	L/Ha	*Inter-row*	*Base of Stubble*		Spray Quality	Pressure	Nozzle
	14	70	6.6	5.5		**C/VC**	3.5 bar	AIXR 02
	17	70	8	6		**C/M**	5.0 bar	AIXR 02
			RowGator	25 cm nozzle spacing				
	Speed	L/Ha	*Inter-row*	*Base of Stubble*		Spray Quality		Nozzle
	20	70	9	6		**VC/C**	3 bar	Airmix 015
	20	100	13	9		**C/M**	5.5 bar	Airmix 015
Tintinara Demo			**Hardi Trailing**	50 cm nozzle spacing				
SLASHED stubble (>70% cover on ground)	Speed	L/Ha	*top of stubble*	*Under stubble*		Spray Quality	Pressure	Nozzle
	18	70	9	1.5		**VC/C**	5.5 bar	INJET 02
	14	100	15	3.5		**VC/C**	6.5 bar	INJET 02
STANDING STUBBLE 35-30 cm	Speed	L/Ha	*Inter-row*	*Base of Stubble*				
	18	70	7	3.3		**VC/C**	5.5 bar	INJET 02
	14	100	9	4		**C/VC**	6.5 bar	INJET 02
STANDING STUBBLE 35-30 cm	Speed	L/Ha	*Inter-row*	*Base of Stubble*				
	12	80	12	10		**VC**	3.5 Bar	INJET 02**
	12	80	10	7		**C/M**	3.5 Bar	MINIDRIFT

** at big end of VC retention on small rye grass will be low, less than half of this coverage will stay on the rye grass

Why specialty adjuvants with Glyphosate

Oils impede uptake of Glyphosate



Delta T- Day 6.0 (light 6-6.30am), Night 7.6 (night 3.45-5.45 am)

LANDMARK