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Impact of Spray Drift Reduction Technologies on Grass Weed Efficacy

Trial ID: DH2101 **Location:** Narrabri **Trial Year:** 2022
Investigator: Dean Hancock

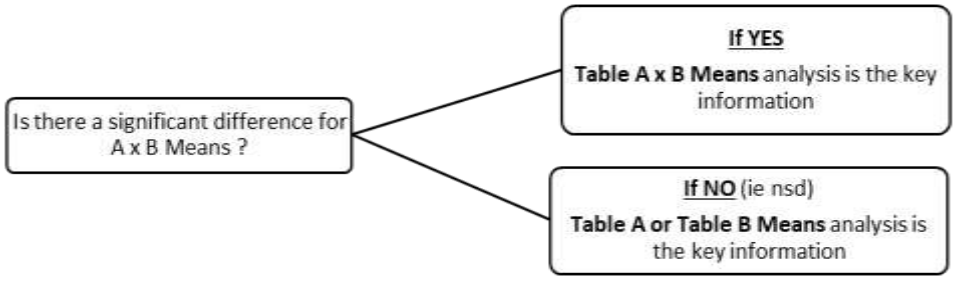
The control of seedling grass weeds in fallows with heavy cereal stubble has frequently been a challenge to the use of drift reduction technologies. This project was designed to evaluate the impact of changes in application volume and speed on the efficacy obtained with drift reduction technologies compared to a standard spray application approach. In addition, it evaluated the impact on grass efficacy of adjuvants with drift reduction properties compared to a standard crop oil.

Objective:	**To evaluate the impact of spray drift reduction strategies on grass weed efficacy**				
Situation:	**Fallow**				
Weed:	**Volunteer barley in wheat stubble ~30 cm tall**				
Application Date:	**03/03/2022**				
Weed Stage at Application:	**4 leaf, ~10cm high**				
Weed Population at Application:	**61/m²**				
Spray Configurations:	**A**	**B**	**C**	**D**	**E**
Nozzles:	**AIXR11002**	**TTI110015**	**TTI11002**	**TTI11002**	**TTI11003**
Pressure:	**400 kPa**				
Application Speed:	**21.6 km/hr**	**16.2 km/hr**	**21.6 km/hr**	**10.8 km/hr**	**16.2 km/hr**
Volume:	**50 L/ha**	**50 L/ha**	**50 L/ha**	**100 L/ha**	**100 L/ha**
Droplet Size:	**Medium/Coarse**	**Extra Coarse/ Ultra Coarse**	**Ultra Coarse**	**Ultra Coarse**	**Ultra Coarse**
Key Evaluation:	**Standard or Benchmark**	**Impact of increased droplet size with slower speed compared to A and C**	**Impact of increased droplet size alone compared to A**	**Impact of increased droplet size with increased volume compared to C**	**Impact of droplet size with increased volume compared to B**
Trial Design:	**Factorial with 5 spray configurations x 3 surfactants (3 replicates)**				
Plot Size:	**4m x 20m**				
Keywords:	**Volunteer barley, knockdown, fallow**				

Trial designed and analysed as a factorial

	In Simple Terms
Table of A Means:	Mean of 'Adjuvant' performance with **ALL** 'Spray Configuration' treatments
Table of B Means:	Mean of 'Spray Configuration' performance with **ALL** 'Adjuvant' treatments
Table of A x B Means:	Mean of 'Adjuvant' performance with **EACH** 'Spray Configuration' treatment

How to interpret?



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NB: Interaction table excluded as no significant differences between adjuvants and spray configuration and to assist in simplifying results

AIXR11002 was the benchmark treatment providing droplets on the border of medium and coarse
TTI110015 provide the same application volume but ultra

Pest Name				**Volunteer Barley**	
Assessment Date				**29/03/2022**	
Assessment Type				**COUNT**	**CONTROL**
Assessment Unit				**/m²**	**%**
Assessment Area				**4 x 0.25 m²/ plot**	
Pest Stage Majority				**~ 3 tillers**	
Treatment-Evaluation Interval				**26 DAA**	
ARM Action Codes				**AS**	
Trt No.	**Treatment**	**Product Rate**	**Appln. Code**		
TABLE OF A MEANS (Adjuvant)					
1	Verdict 520 Uptake oil	50ml/ha 0.5% v/v		6.1t-	90
2	Verdict 520 Collide 700	50ml/ha 0.5% v/v		5.5t-	91
3	Verdict 520 On Coarse	50ml/ha 0.25% v/v		5.7t-	91

TABLE OF B MEANS (Spray Configuration)

	Nozzle	Application Speed	Volume	Droplet Size			
1	AIXR11002	21.6 km/h	50 L/ha	Medium/coarse	A	6.3t-	90
2	TTI110015	16.2 km/h	50 L/ha	Extra coarse/ultra coarse	B	8.6t-	86
3	TTI11002	21.6 km/h	50 L/ha	Ultra coarse	C	6.7t-	89
4	TTI11002	10.8 km/h	100 L/ha	Ultra coarse	D	4.0t-	93
5	TTI11003	16.2 km/h	100 L/ha	Ultra coarse	E	3.9t-	94

Means followed by same letter do not significantly differ (P=.05, LSD)
t=Mean descriptions are reported in de-transformed units

FACTORIAL/POOLED ERROR AOV
Volunteer Barley
29/03/2022
COUNT /m² 26 DAA AS

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	44	27.701258				
R	2	0.005035	0.002518	0.004	0.9964	
A	2	0.112258	0.056129	0.081	0.9221	0.6
B	4	5.660688	1.415172	2.051	0.1144	0.8
AB	8	2.599221	0.324903	0.471	0.8662	1.4
ERROR	28	19.324056	0.690145			

ARM Action Codes
AS = Automatic square root transformation of X+0.5

DAA = Days after Application A

Impact of Spray Drift Reduction Technologies on Grass Weed Efficacy

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Off target herbicide movement is a major industry issue with the interaction of droplet size and weed efficacy often an area of grower uncertainty. Targets of most concern are generally seedling grass control in high stubble load fallow situations.

This protocol was developed to evaluate the impact of spray drift reduction technologies on grass weed efficacy. Previous NGA work has targeted key summer grass weeds, however the challenge is finding sites with 1) sufficient weed pressure to confidently compare treatments at 2) consistent growth stages.

This trial was conducted in a fallow where barley seed was manually spread to provide a high density of weeds. The trial was conducted in wheat stubble from the 2021 harvest, at a harvest height of ~30cm. A 'sub-lethal' rate of Verdict (haloxyfop) was used to evaluate treatments. Group 1 herbicides such as Verdict have limited systemic activity and require thorough coverage of the weed growing point to provide effective control.

Key objectives of this protocol were:
1. To evaluate the impact on efficacy from using ultra coarse v coarse droplets
2. To assess the impact of changing application speed and volume when using ultra coarse droplets
3. To assess the impact on efficacy of drift reduction adjuvant packages
4. To identify drift reduction strategies that maintain efficacy to levels achieved with coarse droplets.

Spray Configurations
(AIXR nozzles were used as the benchmark treatment providing a droplet spectrum on the borderline of medium and coarse. TTI nozzles provided droplet sizes on the borderline of extra coarse/ ultra coarse and ultra coarse)

A. AIXR11002 50 L/ha at 21.6 km/h - **Benchmark treatment**
B. TTI110015 50 L/ha at 16.2 km/h - **Impact of increased droplet size and reduced application speed compared to A and C**
C. TTI11002 50 L/ha at 21.6 km/h - **Impact of increased droplet size alone compared to A**
D. TTI11002 100 L/ha at 10.8 km/h - **Impact of increased volume and reduced application speed compared to C**
E. TTI11003 100 L/ha at 16.2 km/h - **Impact of increased volume alone compared to B**

Conclusions:

Verdict at 50 mL/ha was applied in all treatments to seedling volunteer barley (~2 to 4 leaf stage and ~ 61 seedlings/m^2) growing in 2021 harvested wheat stubble (~ 30 cm tall). A combination of five different spray configurations (nozzle, volume and speed) were used with all applied at a standard pressure of 400 kPa. Different nozzle sizes allowed a comparison of similar droplet sizes at different volumes or application speeds. All spray configurations were tested with three different adjuvants.

A visual assessment at 7 days after application (7 DAA) did not show any obvious biomass reduction effects.

Rainfall events did not allow another assessment until 26 DAA when surviving barley counts were taken. All treatments provided ~ 90% control with no significant interaction between adjuvant choice and spray configuration ie the effect of the nozzle setup was the same regardless of the adjuvant.

Factorial analysis showed no significant difference between the adjuvants with no indication that Collide 700 or On Coarse reduced efficacy compared to Uptake oil.

There was no significant effect of spray configuration on efficacy with no indication that the reduced travel speed alone with TTI110015 provided any benefit compared to the AIXR. If there was any subtle trend apparent, the treatments with 100 L/ha water volume recorded the lowest mean survival counts.

In this situation, the level of seedling volunteer barley control was marginal, however there was no significant impact on control using extra coarse droplets (provided by TTI nozzles) compared to medium/coarse droplets (AIXR nozzle). There was no indication that reducing application speed alone provided any benefit although the increased water volumes resulted in the lowest survival numbers. There was no indication of any reduction in efficacy with the drift reduction adjuvants. It is not possible to identify improved drift reduction strategies from this individual trial but the results are 'supportive' of using increased application volumes when using nozzles producing larger droplet sizes.

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Application Description					
	A	B	C	D	E
Application Date:	3/03/2022				
Application Start Time:	09:00 AM				
Application Stop Time:	12:30 PM				
Application Timing:	EARLY POST-EM				
Application Placement:	FOLIAR				
Air Temperature, Unit:	22.6 C				
% Relative Humidity:	69				
Wind Velocity, Unit:	9.2 km/h				
Wind Direction:	SSE				
Dew Presence (Y/N):	No				
Next Moisture Occurred On:	7/03/2022				

Application Equipment					
	A	B	C	D	E
Application Equipment:	Polaris				
Equipment Type:	BOOM				
Operation Pressure, Unit:	400 kPa				
Nozzle Spacing, Unit:	50 cm				
Boom Length, Unit:	4 m				
Boom Height, Unit:	50 cm				
Nozzle Type:	AIXR	TTI			
Nozzle Size:	11002	110015	11002	11002	11003
Ground Speed, Unit:	21.6 km/h	16.2 km/h	21.6 km/h	10.8 km/h	16.2 km/h
Spray Volume, Unit:	50 L/ha			100 L/ha	

Rainfall:

Closest Weather Station:	Millfield
Distance, Unit:	1.5km

Date	Amount	Unit	Additional Comments
3/03/2022	-		Application
7/03/2022	15	mm	
9/03/2022	12	mm	
27/03/2022	30	mm	
28/03/2022	10	mm	
29/03/2022	-		Surviving weed count