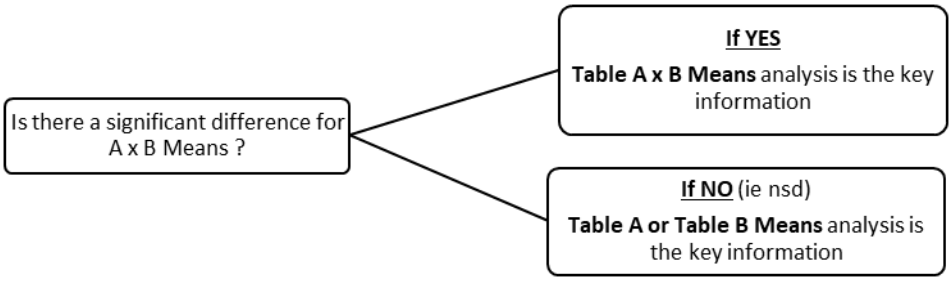
Double Knock Control of Button Grass in Fallow

Trial ID: LB1827 **Location:** Springvale **Trial Year:** 2019
Investigator: Linda Bailey

Objective:	**To evaluate double knock timing and options for button grass control**			
Situation:	**Fallow**			
Application:	**A**	**B**	**C**	**D**
Application Date:	**24/04/2019**	**26/04/2019**	**29/04/2019**	**2/05/2019**
Application Timing:	**Late Post- Emergent**	**2 Days after Application A**	**5 Days after Application A**	**8 Days after Application A**
Nozzles:	**AIXR110015**			
Volume:	**100 L/ha**			
Second Knock Treatment:	**Gramoxone 16 L/ha**			
Weed:	**Button Grass**	**Awnless Barnyard Grass**	**Stink Grass**	
Weed Population at Application:	**15/m²**	**8/m²**	**2/m²**	
Majority Weed Stage at Application:	**All species; fully emerged heads**			
Keywords:	**Button grass, knockdown, double knock, fallow**			

Trial designed as Randomised Complete Block and analysed as a Factorial

	In Simple Terms
Table of A Means:	Mean of 'First Knock' performance with **ALL** 'Second Knock Timing' treatments
Table of B Means:	Mean of 'Second Knock Timing' performance with **ALL** 'First Knock' treatments
Table of A x B Means:	'First Knock' performance with **EACH** 'Second Knock Timing' treatment



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Key analyses highlighted in grey

Trt No.	Treatment	Product Rate	Appln. Code	*Dactyloctenium radulans* Button Grass 20/05/2019 BURNDOWN % 26 DAA/ 24 DAB/ 21 DAC/ 18 DAD	*Echinochloa colona* Awnless Barnyard Grass 20/05/2019 BURNDOWN % 26 DAA/ 24 DAB/ 21 DAC/ 18 DAD	*Eragrostis cilianensis* Stink Grass 20/05/2019 BURNDOWN % 26 DAA/ 24 DAB/ 21 DAC/ 18 DAD	*Dactyloctenium radulans* Button Grass 6/06/2019 REGROWING /m² 43 DAA/ 41 DAB/ 38 DAC/ 35 DAD AS
TABLE OF A MEANS (First Knock)							
1	Glyphosate CT Liase	1500ml/ha 1% v/v		97.9a	97.9b	98.8b	0.22c
2	Verdict 520 Uptake	150ml/ha 0.5% v/v		80.4b	96.3b	97.9cd	2.84a
3	Group A St Liase Uptake	400ml/ha 1% v/v 0.5% v/v		80.4b	97.9b	98.3bc	1.00bc
4	Shogun Uptake	700ml/ha 0.5% v/v		80.4b	96.7b	97.5d	1.56ab
5	Gramoxone	1600ml/ha		99.6a	100a	100a	0.0c
TABLE OF B MEANS (Second Knock Timing)							
1	First knock only	-	A	53.3b	91.3b	94.0b	6.33a
2	Gramoxone	1600ml/ha	B	99.7a	100.0a	100a	0.09b
3	Gramoxone	1600ml/ha	C	99.0a	100.0a	100a	0.03b
4	Gramoxone	1600ml/ha	D	99.0a	99.7a	100a	0.02b
TABLE OF A x B MEANS (First Knock x Second Knock Timing)							
1	Glyphosate CT Liase	1500ml/ha 1% v/v	A A	91.7b	91.7b	95.0b	1.10c
1b	Glyphosate CT Liase Gramoxone	1500ml/ha 1% v/v 1600ml/ha	A A B	100a	100a	100a	0.0c
1c	Glyphosate CT Liase Gramoxone	1500ml/ha 1% v/v 1600ml/ha	A A C	100a	100a	100a	0.0c
1d	Glyphosate CT Liase Gramoxone	1500ml/ha 1% v/v 1600ml/ha	A A D	100a	100a	100a	0.0c
2	Verdict 520 Uptake	150ml/ha 0.5% v/v	A A	26.7c	86.7c	91.7d	23.62a
2b	Verdict 520 Uptake Gramoxone	150ml/ha 0.5% v/v 1600ml/ha	A A B	100a	100a	100a	0.16c
2c	Verdict 520 Uptake Gramoxone	150ml/ha 0.5% v/v 1600ml/ha	A A C	96.7a	100a	100a	0.17c
2d	Verdict 520 Uptake Gramoxone	150ml/ha 0.5% v/v 1600ml/ha	A A D	98.3a	98.3a	100a	0.10c

Means followed by same letter do not significantly differ (P=.05, LSD)

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Scientific Pest Name				*Dactyloctenium radulans*	*Echinochloa colona*	*Eragrostis cilianensis*	*Dactyloctenium radulans*
Pest Name				**Button Grass**	**Awnless Barnyard Grass**	**Stink Grass**	**Button Grass**
Assessment Date				**20/05/2019**	**20/05/2019**	**20/05/2019**	**6/06/2019**
Assessment Type				**BURNDOWN**	**BURNDOWN**	**BURNDOWN**	**REGROWING**
Assessment Unit				**%**	**%**	**%**	**/m²**
Treatment-Evaluation Interval				**26 DAA**	**26 DAA**	**26 DAA**	**43 DAA/ 41 DAB/ 38 DAC/ 35 DAD**
ARM Action Codes							**AS**
Trt No.	**Treatment**	**Product Rate**	**Appln. Code**				
3	Group A St	400ml/ha	A	26.7c	91.7b	93.3c	6.08b
	Liase	1% v/v	A				
	Uptake	0.5% v/v	A				
3b	Group A St	400ml/ha	A	98.3a	100a	100a	0.34c
	Liase	1% v/v	A				
	Uptake	0.5% v/v	A				
	Gramoxone	1600ml/ha	B				
3c	Group A St	400ml/ha	A	98.3a	100a	100a	0.0c
	Liase	1% v/v	A				
	Uptake	0.5% v/v	A				
	Gramoxone	1600ml/ha	C				
3d	Group A St	400ml/ha	A	98.3a	100a	100a	0.0c
	Liase	1% v/v	A				
	Uptake	0.5% v/v	A				
	Gramoxone	1600ml/ha	D				
4	Shogun	700ml/ha	A	23.3c	86.7c	90.0e	12.60b
	Uptake	0.5% v/v	A				
4b	Shogun	700ml/ha	A	100a	100a	100a	0.0c
	Uptake	0.5% v/v	A				
	Gramoxone	1600ml/ha	B				
4c	Shogun	700ml/ha	A	100a	100a	100a	0.0c
	Uptake	0.5% v/v	A				
	Gramoxone	1600ml/ha	C				
4d	Shogun	700ml/ha	A	98.3a	100a	100a	0.0c
	Uptake	0.5% v/v	A				
	Gramoxone	1600ml/ha	D				
5	Gramoxone	1600ml/ha	A	98.3a	100a	100a	0.0c
5b	Gramoxone	1600ml/ha	A	100a	100a	100a	0.0c
	Gramoxone	1600ml/ha	B				
5c	Gramoxone	1600ml/ha	A	100a	100a	100a	0.0c
	Gramoxone	1600ml/ha	C				
5d	Gramoxone	1600ml/ha	A	100a	100a	100a	0.0c
	Gramoxone	1600ml/ha	D				

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Trt No.	Treatment	Product Rate	Appln. Code	*Dactyloctenium radulans* Button Grass 6/06/2019 COUNT /m² 43 DAA/ 41 DAB/ 38 DAC/ 35 DAD AS	*Echinochloa colona* Awnless Barnyard Grass 6/06/2019 COUNT /m² 43 DAA/ 41 DAB/ 38 DAC/ 35 DAD AS	*Eragrostis cilianensis* Stink Grass 6/06/2019 COUNT /m² 43 DAA/ 41 DAB/ 38 DAC/ 35 DAD AS
TABLE OF A MEANS (First Knock)						
1	Glyphosate CT	1500ml/ha		0.25cd	0.26a	0.03-
1	Liase	1% v/v				
2	Verdict 520	150ml/ha		2.88a	0.32a	0.18-
	Uptake	0.5% v/v				
3	Group A St	400ml/ha		1.16bc	0.27a	0.28-
	Liase	1% v/v				
	Uptake	0.5% v/v				
4	Shogun	700ml/ha		1.59ab	0.33a	0.25-
	Uptake	0.5% v/v				
5	Gramoxone	1600ml/ha		0.0d	0.0b	0.0-
TABLE OF B MEANS (Second Knock Timing)						
1	First knock only	-	A	6.59a	1.18a	0.60a
2	Gramoxone	1600ml/ha	B	0.12b	0.0b	0.0b
3	Gramoxone	1600ml/ha	C	0.05b	0.0b	0.0b
4	Gramoxone	1600ml/ha	D	0.02b	0.0b	0.0b
TABLE OF A x B MEANS (First Knock x Second Knock Timing)						
1	Glyphosate CT	1500ml/ha	A	1.19c	1.35a	0.13-
	Liase	1% v/v	A			
1b	Glyphosate CT	1500ml/ha	A	0.0c	0.0b	0.0-
	Liase	1% v/v	A			
	Gramoxone	1600ml/ha	B			
1c	Glyphosate CT	1500ml/ha	A	0.06c	0.0b	0.0-
	Liase	1% v/v	A			
	Gramoxone	1600ml/ha	C			
1d	Glyphosate CT	1500ml/ha	A	0.0c	0.0b	0.0-
	Liase	1% v/v	A			
	Gramoxone	1600ml/ha	D			
2	Verdict 520	150ml/ha	A	23.65a	1.76a	0.73-
	Uptake	0.5% v/v	A			
2b	Verdict 520	150ml/ha	A	0.16c	0.0b	0.0-
	Uptake	0.5% v/v	A			
	Gramoxone	1600ml/ha	B			
2c	Verdict 520	150ml/ha	A	0.20c	0.0b	0.0-
	Uptake	0.5% v/v	A			
	Gramoxone	1600ml/ha	C			
2d	Verdict 520	150ml/ha	A	0.13c	0.0b	0.0-
	Uptake	0.5% v/v	A			
	Gramoxone	1600ml/ha	D			

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Trt No.	Treatment	Product Rate	Appln. Code	*Dactyloctenium radulans* Button Grass	*Echinochloa colona* Awnless Barnyard Grass	*Eragrostis cilianensis* Stink Grass
Pest Scientific Name						
Pest Name						
Assessment Date				6/06/2019	6/06/2019	6/06/2019
Assessment Type				COUNT	COUNT	COUNT
Assessment Unit				/m²	/m²	/m²
Treatment-Evaluation Interval				43 DAA/ 41 DAB/ 38 DAC/ 35 DAD	43 DAA/ 41 DAB/ 38 DAC/ 35 DAD	43 DAA/ 41 DAB/ 38 DAC/ 35 DAD
ARM Action Codes				AS	AS	
3	Group A St	400ml/ha	A	7.19b	1.42a	1.13-
	Liase	1% v/v	A			
	Uptake	0.5% v/v	A			
3b	Group A St	400ml/ha	A	0.43c	0.0b	0.0-
	Liase	1% v/v	A			
	Uptake	0.5% v/v	A			
	Gramoxone	1600ml/ha	B			
3c	Group A St	400ml/ha	A	0.0c	0.0b	0.0-
	Liase	1% v/v	A			
	Uptake	0.5% v/v	A			
	Gramoxone	1600ml/ha	C			
3d	Group A St	400ml/ha	A	0.0c	0.0b	0.0-
	Liase	1% v/v	A			
	Uptake	0.5% v/v	A			
	Gramoxone	1600ml/ha	D			
4	Shogun	700ml/ha	A	12.60b	1.85a	1.00-
	Uptake	0.5% v/v	A			
4b	Shogun	700ml/ha	A	0.06c	0.0b	0.0-
	Uptake	0.5% v/v	A			
	Gramoxone	1600ml/ha	B			
4c	Shogun	700ml/ha	A	0.0c	0.0b	0.0-
	Uptake	0.5% v/v	A			
	Gramoxone	1600ml/ha	C			
4d	Shogun	700ml/ha	A	0.0c	0.0b	0.0-
	Uptake	0.5% v/v	A			
	Gramoxone	1600ml/ha	D			
5	Gramoxone	1600ml/ha	A	0.0c	0.0b	0.0-
5b	Gramoxone	1600ml/ha	A	0.0c	0.0b	0.0-
	Gramoxone	1600ml/ha	B			
5c	Gramoxone	1600ml/ha	A	0.0c	0.0b	0.0-
	Gramoxone	1600ml/ha	C			
5d	Gramoxone	1600ml/ha	A	0.0c	0.0b	0.0-
	Gramoxone	1600ml/ha	D			

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FACTORIAL/POOLED ERROR AOV
***Dactyloctenium radulans* - Button Grass**
20/05/2019
BURNDOWN % 26 DAA 24 DAB 21 DAC 18 DAD

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	59	41521.250000				
R	2	22.500000	11.250000	1.375	0.2651	
A	4	4856.666667	1214.166667	148.434	0.0001	2.4
B	3	23694.583333	7898.194444	965.570	0.0001	2.1
AB	12	12636.666667	1053.055556	128.738	0.0001	4.7
ERROR	38	310.833333	8.179825			

FACTORIAL/POOLED ERROR AOV
***Echinochloa colona* - Awnless Barnyard Grass**
20/05/2019
BURNDOWN % 26 DAA 24 DAB 21 DAC 18 DAD

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	59	1371.250000				
R	2	2.500000	1.250000	0.263	0.7704	
A	4	102.500000	25.625000	5.385	0.0016	1.8
B	3	824.583333	274.861111	57.759	0.0001	1.6
AB	12	260.833333	21.736111	4.568	0.0002	3.6
ERROR	38	180.833333	4.758772			

FACTORIAL/POOLED ERROR AOV
***Eragrostis ciliaris* - Stink Grass**
20/05/2019
BURNDOWN % 26 DAA 24 DAB 21 DAC 18 DAD

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	58	615.000000				
R	2	2.500000	1.250000	1.500	0.2364	
A	4	44.166667	11.041667	13.250	0.0001	0.8
B	3	405.000000	135.000000	162.000	0.0001	0.7
AB	12	132.500000	11.041667	13.250	0.0001	1.5
ERROR	37	30.833333	0.833333			

FACTORIAL/POOLED ERROR AOV
***Dactyloctenium radulans* - Button Grass**
6/06/2019
REGROWING /m² 43 DAA 41 DAB 38 DAC 35 DAD AS

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	59	95.320112				
R	2	2.238426	1.119213	2.341	0.1099	
A	4	9.809551	2.452388	5.130	0.0021	0.57
B	3	39.522026	13.174009	27.560	0.0001	0.51
AB	12	25.585941	2.132162	4.461	0.0002	1.14
ERROR	38	18.164168	0.478004			

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FACTORIAL/POOLED ERROR AOV
***Dactyloctenium radulans* - Button Grass**
6/06/2019
COUNT /m² 43 DAA 41 DAB 38 DAC 35 DAD AS

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	59	95.554631				
R	2	2.295800	1.147900	2.583	0.0887	
A	4	9.913322	2.478331	5.578	0.0012	0.55
B	3	41.133729	13.711243	30.859	0.0001	0.49
AB	12	25.327535	2.110628	4.750	0.0001	1.10
ERROR	38	16.884244	0.444322			

FACTORIAL/POOLED ERROR AOV
***Echinochloa colona* - Awnless Barnyard Grass**
6/06/2019
COUNT /m² 43 DAA 41 DAB 38 DAC 35 DAD AS

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	59	6.365421				
R	2	0.124226	0.062113	2.499	0.0956	
A	4	0.343377	0.085844	3.453	0.0168	0.13
B	3	3.923073	1.307691	52.606	0.0001	0.12
AB	12	1.030132	0.085844	3.453	0.0017	0.26
ERROR	38	0.944614	0.024858			

FACTORIAL/POOLED ERROR AOV
***Eragrostis ciliaris* - Stink Grass**
6/06/2019
COUNT /m² 43 DAA 41 DAB 38 DAC 35 DAD

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	58	16.016895				
R	2	0.859862	0.429931	2.008	0.1486	
A	4	0.836672	0.209168	0.977	0.4319	0.38
B	3	4.106122	1.368707	6.393	0.0013	0.34
AB	12	2.292120	0.191010	0.892	0.5625	0.76
ERROR	37	7.922118	0.214111			

Assessment Type
BURNDOWN = % Burndown/brown out
ARM Action Codes
AS = Automatic square root transformation of X+0.5

DAA = Days after Application A, DAB = Days after Application B, DAC = Days after Application C, DAD = Days after Application D

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Application Description				
	A	B	C	D
Application Date:	24/04/2019	26/04/2019	29/04/2019	2/05/2019
Appl. Start Time:	11:00 AM	1:25 PM	11:40 AM	5:20 PM
Appl. Stop Time:	12:25 PM	1:35 PM	11:50 AM	5:35 PM
Application Timing:	LATE POST-EM	RECOMMENDED	RECOMMENDED	RECOMMENDED
Application Placement:	FOLIAR			
Air Temperature, Unit:	23 C	28 C	25 C	23.5 C
% Relative Humidity:	61	45	53	51
Wind Velocity, Unit:	11.3 km/h	4.5 km/h	9 km/h	6.1 km/h
Wind Direction:	E	SW	NE	NE
Dew Presence (Y/N):	No			
Soil Moisture:	DRY			
% Cloud Cover:	100	60	40	20
Next Moisture Occurred On:	4/05/2019	4/05/2019	4/05/2019	4/05/2019

Pest Stage at Application A	
	A
Pest:	*Dactyloctenium radulans* - Button Grass
Stage Majority, %:	59 100%
Stage Minimum, %:	59 100%
Stage Maximum, %:	59 100%
Diameter, Unit:	20 cm
Density, Unit:	15 m^2
Pest 2:	*Echinochloa colona* - Awnless Barnyard Grass
Stage Majority, %:	59 60%
Stage Minimum, %:	49 40%
Stage Maximum, %:	59 60%
Diameter, Unit:	20 cm
Density, Unit:	8 m^2
Pest 3:	*Eragrostis ciliaris* - Stink Grass
Stage Majority, %:	59 100%
Stage Minimum, %:	59 100%
Stage Maximum, %:	59 100%
Diameter, Unit:	35 cm
Density, Unit:	2 m^2

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Application Equipment				
	A	B	C	D
Application Equipment:	Polaris			
Equipment Type:	BOOM			
Operation Pressure, Unit:	300 kPa			
Nozzle Type:	AIXR			
Nozzle Size:	110015			
Nozzle Spacing, Unit:	50 cm			
Nozzles/Row:	8			
Boom Length, Unit:	4 m			
Ground Speed, Unit:	7.2 km/h			
Spray Volume, Unit:	100 L/ha			

Objectives:

To evaluate second knock timing and options for button grass control.

Conclusions:

The trial was established to compare herbicide efficacy on button grass and to evaluate the impact of second knock timing. Data on awnless barnyard grass and stink grass was also generated. The button grass population was ~15 weeds/m^2 and at fully emerged inflorescence when the first knock was applied. The second knock timings of Gramoxone 1.6 L/ha were 2, 5 and 8 days later.

A burndown assessment was undertaken at 26 days after the first knock application with Gramoxone, as a first knock alone, providing the highest level of burndown on all three weed species (98-100%) followed by Glyphosate CT. The three Group A herbicides provided similar and low levels of burndown when not followed by a second knock. The second knock treatments significantly improved grass burndown for Glyphosate CT and all Group A herbicides, with no apparent difference between application timing.

Weed counts were taken 43 days after the first knock application. On advanced button grass Gramoxone, as a first knock alone or when second knocked with Gramoxone, provided complete control. There was no significant benefit from double knocking Glyphosate CT, however all double knocked Glyphosate treatments provided complete control. In contrast there was a significant benefit from a second knock application of Gramoxone following all Group A treatments, with no apparent difference between application timing.

In this situation, Gramoxone (as a first knock alone or when double knocked) provided complete control of all grass weeds. Glyphosate CT as a first knock alone provided good levels of grass control but complete control when followed by any second knock timing of Gramoxone. All Group A herbicides alone were poor on the advanced grass weed stages with high levels of control achieved when second knocked. In this situation there was no clear difference between second knock timings on any weed or with any product.