TOPIC: HERBICIDES FOR SELECTIVE SPOT SPRAYING APPLICATION ON WINTER WEEDS IN CHEMICAL FALLOW

Group: *Mullewa 2010*

A trial conducted by Grant Thompson at Wyalong Pastoral Co. Teninddewa (Tim & Daniel Critch)

ABSTRACT

1. To assess herbicide treatments on mixed winter weeds in an early / long spray fallow.
2. To identify alternative herbicides to control weeds that have or are developing resistance to traditional herbicides used in winter weed control.
3. To identify possible alternative herbicide mixtures that could be effective in a low area selective spot spraying scenario with weed seeker technology.
4. To identify other modes of action for control of resistant weeds other than Glyphosate.

KEY MESSAGES

- Weed sensing and selective spot spraying with machinery such as the WEEDSEEKER and WEED-IT selective spot sprayers has allowed for very cost effective broadacre spot spraying of weeds without spraying the whole paddock area.
- Selective spot spraying of hard to kill summer weeds is one application where this technology has a potential to save growers significant funds usually allocated to herbicides.
- Elevated rates of non-traditional or previously cost prohibited herbicides of a different resistance group can now be used to achieve much more reliable and faster control of herbicide resistant weeds
- Robust rates of Glyphosate provided the most acceptable levels of control across the 3 winter weeds species tested.
- Gramoxone and Sprayseed at rates of 2L & 4L gave good control of brome grass, but both annual ryegrass and wild radish grew back and at the final ratings showed unacceptable levels of control.
- In a region where Glyphosate tolerant ryegrass populations have been identified, the lack of alternative modes of action to reliably control annual ryegrass and wild radish in fallow is of real concern.

RESULTS

METHODS

Herbicide Application

- Trials spray with hand booms – 2m wide, with Agrotop airmix 110 01 nozzles at 2 bar, 4 km/hr at 98L/Ha (similar application rates and droplet composition as the weedseeker)
- Herbicides applied from 1pm – 5pm during mild dry winter spraying conditions(temps 15-17C), Humidity 50%, Delta T 5, Wind 8-10km/hr SW'ly, (typical of farmer application window in winter late post emergent spraying.
- Herbicide mixtures prepared the evening before and stored in 2L plastic containers.

Weeds

- Brome grass (Bromus spp.) late tillering 15-20cm diam,
- Annual Ryegrass *(Lolium rigidum)* late tillering 15-20cm diam,
- Vol Barley late tillering 15-25cm diam,
- Wild Radish *(Raphanus raphanistrum)* 20-50cm diam, rosette to early flowering (suspected multiple group resistance).

Herbicides used

Glyphosate 450 g/L, Gramoxone 250g/L, Basta, Alliance, Ally, Grazon, Hammer, Estericide 680, Hotshot, Stiker, Sprayseed, Atrazine 600g/L, Glean, BS1000 wetting agent.

Annual Ryegrass (Lolium rigidum)

2L and 4L of Glyphosate provided the best levels of control on annual ryegrass. 2L and 4L of Gramoxone or Sprayseed and 4L Alliance provided impressive initial burndown of ryegrass, but significant regrowth occurred after this and control was ultimately unacceptable. Addition of 250ml Striker to the 4L Gramoxone treatment did not improve ryegrass control. Striker alone at 2L/ha was ineffective on ryegrass.

Brome Grass – (Bromus spp)
Glyphosate at 2L & 4L/ha, Gramoxone and Sprayseed at 2L and 4L/ha and Alliance at 4L/ha provided acceptable control of tillering brome grass in the spray fallow situation. Addition of 2L Atrazine (600gai) to the 2L of Glyphosate (no Amsul added) caused a large reduction in brome control. Addition of Ester 680 to this mix (trt 14) also provided worse control due to the apparent biological antagonism. Addition of 2L Atrazine to 2L Sprayseed improved the final brome control from 93 to 100%. Basta does not appear to have a fit in this situation at either 4 or 8L/Ha. Use of much higher rates through a spot spraying system may be effective and could provided resistance management options. Addition of 100ml Striker (oxyflurofen) to 4L Glyphosate did not appear to improve Brome control.

Wild Radish (Raphanus raphanistrum)
Control of wild radish in this population proved quite difficult with herbicides in the winter spray fallow scenario. Very poor control with **20g Ally** shows that this population is tolerant to the common Grp B herbicide Metsulfuron-methyl. Unacceptable radish control was achieved with **2L Glyphosate 450gai**. The 4L/ha of Glyphosate 450gai treatment achieved the second highest level of control, which is supported by in-field observations from other agronomists and farmers that high rates of Glyphosate are needed to control **multiple resistant radish** plants.

Addition of 800ml of **24-D Ester 680** to 2L of Glyphosate improved control of wild radish from 33% to 87%, showing that there was still some reasonable additive control from this tankmix. However, on a totally susceptible population, this herbicide mix would be considered an effective lethal rate.

Addition of 50ml **Hammer** (Carfentrazone) to the 4L of Glyphosate treatment reduced radish control from 83% to 47%. Clearly the use of rapid burndown herbicides like Hammer did not allow for sufficient translocation of Glyphosate in these bright sunny conditions and regrowth of the radish occurred. The addition of 50ml Hammer to the 2L Glyphosate and 800ml Ester 680 mix did not cause any reduction in efficacy on radish, suggesting the presence of 24D is required in the mix if Hammer needs to be added for weed control of other species. Addition of **100ml of Striker** to the 4L of Glyphosate mix reduced radish control from 83% to 47%, suggesting that the burndown effect of Striker reduced Glyphosate translocation and efficacy.

Treatments containing the bipyridils (**Paraquat or Diquat**) provided impressive initial burndown of wild radish, but ultimately only served to remove the bulk of other weeds in the sward and allowed the radish to regrow relatively uncontested with access to more soil resources. Final radish control was no different when comparing **Gramoxone and Sprayseed** at the 2L and 4L rates, however initial burndown at 9DAA was slightly better when Sprayseed was used. Interestingly, the addition of 20g Ally to the 4L/Ha Glyphosate treatment reduced radish control from 83% to 57%. Considering that 20g Ally treatment alone gave very poor control (7%) of radish, the reduction in control *(not significant at $p \leq 0.05$)* suggests some level of biological antagonism between the high rate of Ally and the efficacy of the Glyphosate on this population.

Further work is needed on the relative efficacy of Glyphosate on wild radish when multiple or stacked genetics for herbicide resistance is present. In field observations from other agronomists *(Bostock pers.comm, 2010)* suggest that wild radish that is resistant to several herbicide groups is more difficult to kill with Glyphosate than a totally susceptible individual.

Table Ratings of Herbicide efficacy at 9 and 35 days after application. *(Control Ratings 1=poor, 10=excellent)*

							BROME		RYEGRASS		RADISH	
	rate		rate		rate		(1-10)		(1-10)		(1-10)	
trt	ml/ha	product	ml,g	product	ml, g	product	9	35	9D	35	9	35
1	2000	GLYPHOSATE CT					5.67	9.67	5.33	9.67	4.67	3.33
2	4000	GLYPHOSATE CT					5.00	10.00	5.33	9.67	5.33	8.33
3	2000	GRAMOXONE					9.00	10.00	8.00	4.67	5.67	1.33
4	4000	GRAMOXONE					9.00	9.67	8.67	7.33	6.67	1.33
5	2000	SPRAYSEED					9.00	9.33	7.00	6.00	5.33	2.67
6	4000	SPRAYSEED					9.00	10.00	8.67	9.00	7.33	1.67
7	2000	GRAMOXONE	800	ESTER 680			9.00	10.00	9.00	9.00	7.67	3.67
8	2000	GLYPHOSATE CT	800	ESTER 680			5.00	9.33	5.33	10.00	4.67	8.67
9	2000	SPRAYSEED	800	ESTER 680			9.00	9.33	7.67	4.33	6.00	2.67
10	0	NIL					0.00	0.00	0.00	0.00	0.00	0.00
11	2000	GLYPHOSATE CT	2000	Atrazine			3.67	6.00	4.00	9.00	5.33	7.33
12	2000	SPRAYSEED	2000	Atrazine			8.67	10.00	8.00	5.00	7.33	1.00
13	2000	SPRAYSEED	2000	Atrazine	800	ESTER 680	8.67	9.67	8.00	7.33	8.33	6.00
14	2000	GLYPHOSATE CT	2000	Atrazine	800	ESTER 680	3.00	6.67	3.00	6.33	3.00	3.67
15	2000	GLYPHOSATE CT	800	Ester 680	10g	Ally	5.00	9.00	5.33	9.33	4.33	8.33
16	2000	GLYPHOSATECTI	800	Ester 680	50	HAMMER	4.67	9.00	5.33	10.00	3.33	8.67
17	4000	BASTA					5.67	3.33	6.00	2.33	2.67	2.33
18	8000	BASTA					6.33	6.33	6.00	6.00	6.33	2.00
19	2000	GLYPHOSATE CT	3000	HOTSHOT			5.67	8.67	5.00	7.67	2.33	3.67
20	20g	ALLY					0.33	0.00	0.33	0.00	0.67	1.00
21	4000	GLYPHOSATE CT	20g	ALLY			5.00	9.67	5.33	9.67	4.33	5.67
22	2000	GLYPHOSATE CT	800	Ester 680	30g	GLEAN	5.00	8.67	4.33	10.00	3.33	6.33
23	2000	SPRAYSEED	800	Ester 680	10g	Ally	8.67	9.67	8.67	6.67	7.67	2.67
24	4000	GLYPHOSATE CT	50	HAMMER			5.00	9.33	4.67	9.00	3.67	4.67
25	4000	ALLIANCE					9.00	9.33	9.00	7.00	7.00	1.33
26	4000	ALLIANCE	800	Ester 680			9.00	10.00	9.00	8.67	7.00	3.33
27	4000	GLYPHOSATE CT	100	STRIKER			5.33	9.33	5.67	9.67	4.67	4.67
28	4000	GRAMOXONE	250	STRIKER			9.00	10.00	9.00	9.67	6.67	1.33
29	4000	GRAMOXONE	3000	HOTSHOT			9.00	10.00	9.00	9.00	7.00	1.67
30	2000	GLYPHOSATE CT	300	Grazon			5.33	8.00	5.67	6.33	2.67	4.33
31	4000	GLYPHOSATE CT	500	Starane			5.00	9.33	5.67	10.00	3.00	2.33
32	2000	GRAMOXONE	500	Starane			9.00	10.00	9.00	8.33	6.33	2.67
33	2000	GRAMOXONE	500	Starane	1000	Atrazine	8.67	10.00	8.00	6.00	6.33	2.33
34	2000	STRIKER					0.67	0.00	0.67	0.00	1.67	0.00
	all treatments applied with 0.1% BS1000											
						LSD 0.01	3.44	6.86	3.44	6.25	3.63	4.54
						LSD 0.05	2.58	5.16	2.59	4.70	2.72	3.41
						CV	44.30	68.80	46.49	73.80	58.50	91.67

Fig 1: 2L Glyphosate CT

Fig 2: 4L Glyphosate CT

Fig 3: 4L Sprayseed

CONCLUSION

Careful consideration of herbicide mode of action and herbicide resistance status is required for resistant weed populations. Using high rates of herbicides in mixtures may increase the level of biological antagonism between the herbicides acting on different pathways in the plant. Caution with dessicant or non systemic herbicides is required in winter fallow situations, as removal of some weeds and subsequent additional stored soil moisture allows for rapid regrowth of weed survivors. Use of rapid burndown contact herbicides in a mix with systemic herbicides must be carefully considered, as reduced translocation may occur when burndown activity is fast in bright sunny conditions.

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