Ryegrass management in a retained stubble system - farm demonstration

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DEMO

Searching for answers

Location:
Yeelanna
Rainfall
Av. Annual: 395 mm
Av. GSR: 314 mm
2015 Total: 358 mm
2015 GSR: 293 mm
Yield
Potential: 3.7 t/ha (W), 2.7 t/ha (Canola), 2.4 t/ha (pulses)
Actual: 3.8-4.4 t/ha (W), 3,5 t/ha (Barley), 1.8 t/ha (Canola), 2.0 t/ha (Beans)
Soil Type
Shallow medium clay loams to acidic sands

Key messages

- **Managing herbicide resistance in ryegrass continues to be crucial in maintaining sustainable crop production on Lower Eyre Peninsula.**
- **Management strategies other than herbicides need to be deployed to ensure sustainable ryegrass control into the future.**
- **Windrow burning proved to be an effective method in reducing ryegrass seed numbers in 2015.**
- **Managing ryegrass on differing soil types will prove a challenge into the future.**
- **Information generated by this project will provide data to simulate how different management strategies can be used to manage ryegrass in a sustainable, cost effective way.**

Why do the research?

Ryegrass management is one of the key drivers of profitability in Lower Eyre Peninsula (LEP) cropping systems, and herbicides have recently been used as the main strategy for control. The intensification of cropping rotations and a decrease in livestock in farming systems has increased pressure on herbicides, resulting in the development of herbicide resistance. Other management strategies need to be assessed to manage ryegrass. The Australian Herbicide Resistance Initiative (ARHI) based at the University of Western Australia developed the Ryegrass Integrated Management (RIM) model. This model enables growers and advisors to run various ryegrass management scenarios, with the model showing the cumulative effect on ryegrass numbers and profitability of the management strategies. This model can be accessed at www.ahri.uwa.edu.au/research/rim.

The GRDC 'Maintaining profitable farming systems with retained stubble - upper Eyre Peninsula' project has a focus on barley grass (upper EP) and ryegrass (LEP). The research on this project has been undertaken by SARDI Minnipa Agricultural Centre staff. As part of this research a LEP farm was selected to monitor in-paddock ryegrass populations and weed management strategies. This research aims to ground-truth the effect (predicted by the RIM model) that various ryegrass management strategies have on ryegrass populations on a LEP farm with high ryegrass numbers and extend this information to EP growers and advisors to assist them in improving ryegrass management decisions using the RIM model.

How was it done?

A recently leased property south east of Cummins with six paddocks was selected to monitor the ryegrass populations under different paddock management options. The property receives approximately 400 mm of rainfall annually. It has an undulating topography where the soil types range from medium clay loams to acidic sands, with ryegrass populations being significantly larger on the acidic sands. The ryegrass population is suspected of having resistance to Group A and D (and possibly Group M) herbicides. It was previously intensively cropped in a wheat/canola rotation (Table 1), where the principle method of ryegrass control was through the application of herbicides. Paddocks were regularly burnt, with a wide cultivated firebreak (which has very high levels of ryegrass).

The six ryegrass populations were assessed across given paddock transects during the 2015 season, as well as crop plant numbers and herbicide resistance. The soil weed seed bank was assessed in 2015 as well, and this assessment will continue over the next 18 months in germination trays at Minnipa to determine the extent of seed dormancy.

The ryegrass management strategies which were implemented by the managers in 2015 include:

- use of triazine tolerant canola (low amounts of Group C herbicides used in the past),
- use of propyzamide pre-emergent (Group D) in canola,
- use of clethodim (Group A),
- using glyphosate under the windrower bar,
- windrow burning and spraying at windrowing time in the canola crops,
- later sowing of cereals in 2015 plus using Fathom barley as a competitive crop, with windrow burning after harvest for ryegrass weed seed control.

The soil weed seed bank samples were taken on the 8 and 14 April. The windrowed paddocks were soil sampled as per the methodology (Figure 1) in the article, Barley grass management in retained stubble systems - farm demonstrations. The early weed counts were done on 26 May and 1 July, when ryegrass plants were also sampled and sent for herbicide resistance testing using the Quick-Test method.

The herbicide resistance Quick-Test takes approximately 4 weeks and involves sampling plants which are growing in the paddock (from seedlings to tillering). Plants can either be sampled before herbicide application or after herbicide is applied and poor control is noticed. For more detail see www.plantscienceconsulting.com.

These ryegrass plants had not had post emergence chemicals applied. Late weed counts were done after windrowing canola and before harvest on 22 October.

What happened?

The ryegrass management strategies undertaken by the farm mangers will be entered into the RIM model in 2016 to determine the impact of these strategies on ryegrass seed set within rotations.

The weed counts taken in May (break crops) and July (cereals) show greater ryegrass weeds present on the grey acidic soils than the red clay loam soils (Table 2). The soil weed seed bank sampling showed the windrows in N5 had some ryegrass and self-sown cereal collected in the windrow, and burning achieved a high rate of seed destruction. The N5 paddock and the 80 Acre paddock had higher levels of ryegrass present in the seed bank (Table 3).

Table 1 Paddock rotataion and chemical use in 2014 and 2015.

Paddock	2015		2014		2013	2012	2011
	Crop	Rate L/ha, Chemical (Group)	Crop	Rate L/ha, Chemical (Group)			
N5	TT canola	1.3 trifluralin (D), 1.7 atrazine (C), 1.0 propyzamide (D), post - 500 clemodim (A)	Scope barley	1.5 trifluralin, 2.5 Boxer Gold (K&J)	CL canola	Wheat	Wheat
Airstrip	Wheat	1.3 trifluralin (D), 2.0 triallate (E), 0.5 metolach (K), 0.3 diuron (C)	CL canola	2.0 trifluralin (D), 1.0 propyzamide (D), 500 clemodim (A), 40 gm On Duty (B)	Wheat	Wheat	CL canola
80 Acre	Beans	1.0 terbyne (C),1.0 propyzamide (D)	Wheat	1.3 trifluralin (D), 2.5 Boxer Gold (K&J)	Wheat	CL canola	Wheat
Shearing Shed	Barley	1.3 trifluralin (D), 2.0 Boxer Gold (K& J) Post - 1.0 Boxer Gold (K)	TT canola	1.7 atrazine (C), 1.0 propyzamide, Post - 500 clemodim (A)	Wheat	Wheat	CL canola
West Well	Barley	1.3 trifluralin (D), 2.0 Boxer Gold (K&J) post - 1.0 Boxer Gold (K)	Wheat	1.3 trifluralin (D), 2.5 Boxer Gold (K&J)	Wheat	CL canola	Wheat
Salt Lake	TT canola	1.3 trifluralin (D), 1.7 atrazine (C), 1.0 propyzamide (D), Post 500 clemodim (A)	Wheat	1.3 trifluralin (D), 2.5 Boxer Gold (K&J)	CL canola	Wheat	Wheat

Table 2 Weed counts (plants/m²) in paddocks in May 2015.

Treatment	Rotation	Ryegrass (plants/m²)		Cereal (plants/m²)
		Grey acidic sand	Clay loam	
N5	Canola	1.3	0.2	
Airstrip	Wheat	2.3	1.2	148
80 Acre	Beans	50.2	0.2	
Shearing Shed	Barley	0.3	0.0	125
West Well	Barley	17.7	3.8	116
Salt Lake	Canola	17.6	3.0	

Table 3 Weed counts (plants/m²) in soil weed seed banks for paddocks, 2015.

Treatment	Barley grass	Ryegrass	Self-sown cereal	Canola	Medic/Other broad leaved weeds
Inter row (before burning)	0.0	0.7	0.0	0.0	1.7
In row non burnt (straw removed from 5 m row - soil collected after burning)	0.1	9.8	38.0	0.0	1.5
In row burnt (In row soil collected after burning) % reduction in seed bank	0.0	0.1 99%	0.0 100%	0.0	0.5 64%
N5 Straw/chaff in row	0.2	3.2	1.6	0.1	0.7
Salt Lake	0.2	1.2	1.2	0.0	1.3
80 Acre	0.1	7.2	0.2	0.0	1.7
Shearing Shed	0.0	0.0	0.0	0.0	2.0
West well	0.2	2.7	0.7	0.0	2.2

Table 4 Herbicide resistance (using Quick-Test) in paddocks, 2015.

Chemical Group	A DENS	A DIMS				B IMIS	C
Chemical	Axial	Select			Factor	Intervix	Atrazine
Rate (ml/ha)	300	350	500	700	180	750	2000
N5 paddock transect	80% RRR						
N5 60 acre	20% RR						
Airstrip paddock transect	40% RR	25% R	15% R	15% R	20% R		15% R
Airstrip creek line	40% RR	10% R					
80 Acre	75% RRR	10% R				15% RR	
Shearing Shed paddock transect	25% RR					50% RR	
Shearing Shed dam and creek	55% RR	20% R					
West Well	60% RR	50% RR	20% R			55% RR	15% R
Salt Lake transect	70% RR	20% R					15% R
Salt Lake gully area	70% RR	20% R					20% R
Salt Lake power pole (high chemical usage area)	90% RR	80% R	5% R				

Resistance-rating: RRR - indicates plants tested have strong resistance, RR - indicates medium-level resistance, R - indicates low level but detectable resistance, S - indicates no detection of resistance

Herbicicide resistance tests taken in-season using the Quick-Test method showed many of the paddocks have resistance to Group A herbicides present, including resistance to some of the newer chemicals and modes of action (Table 4).

It was thought the herbicide resistance may be moving from areas with high chemical weed control use (within the dam and fire break areas) via the waterways with the movement of weed seeds during periods of intense rainfall. The results from the Quick Test show higher levels of resistance across the paddock transects than the areas in creeklines, gullies and dams.

The ryegrass plants were tested for glyphosphate resistance but this was not detected in any of the samples (data not shown).

What does this mean?

Research conducted over a number of years by the Australian Herbicide Resistance Initiative and the University of Adelaide weeds research program has found that keeping ryegrass numbers low is critical not only to reduce the immediate yield loss caused by ryegrass competing with crops, but also as part of sustainable weed control to reduce weed seed set and the potential increase of resistant ryegrass (Preston *et al.*, 2015, Storrie, 2014). Herbicides will continue to form a crucial role in keeping numbers low. However, as resistance to herbicides continues to develop, other practices need to be used to keep numbers to manageable levels.

Resistance tests conducted as part of this project have shown that this property is typical of many on the LEP, as verified by Boutsalis *et al*. (2015) in the 2014 EP survey, with resistance developing to Group A and B herbicides in most paddocks and also likely in Group D (although unable to be tested by this project).

The paddocks monitored as part of this project demonstrates how effective strategies such as windrow burning can be in reducing weed seed numbers. Soil samples have been have been collected to assess weed numbers present at the end of the season and will determine how effective the other management strategies such as different chemical groups and later sowing employed in 2015 were in influencing the overall ryegrass populations in paddocks.

The data collected on this farm throughout 2015 will provide the information needed to be able to simulate (through RIM) the ryegrass population dynamics on LEP, and then allow for a number of management strategies, such as herbicide applications, crop rotation, weed seed capture and others, to be evaluated to provide growers with options on how best to manage ryegrass into the future.

One of the key findings from the monitoring work conducted in 2015 showed that ryegrass populations were lower than expected and strongly influenced by differences in soil type. This may mean that ryegrass could be managed better if methods (involving precision agriculture) can be developed to map and manage soil types differently.

References

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