

Control of clethodim resistant annual ryegrass in break crops

Sam Kleemann, The University of Adelaide
Sarah Noack and Peter Hooper, Hart Field-Site Group

Key findings

- Excellent annual ryegrass control (>85%) with propyzamide either as split application (IBS followed by PSPE) or as a mixture with tri-allate.
- Atrazine also gave effective control this season with rainfall assisting activity (>79%).
- Early crop vigour was suppressed with Outlook & the higher split rate (1 kg/ha IBS followed by 1 kg/ha PSPE) of propyzamide.
- UAN at 20 kg/ha caused some leaf burning, however the crop recovered.

Why do the trial?

Surveys of ryegrass collected from farmer fields at harvest have shown a growing problem with clethodim (Select) resistance in annual ryegrass populations in South Australia. A recent survey (Sainin et al. 2013) showed about 40% of paddocks in the Mid-North of South Australia contained clethodim resistant annual ryegrass in 2008.

The loss of clethodim due to resistance means there are limited post-emergent herbicide options for annual ryegrass control in break crops. Consequently trials have been undertaken to evaluate the efficacy & crop safety of alternate pre- and post-emergent herbicides and their mixtures for the control of ryegrass in break crops.

How was it done?

Plot size	1.4 m x 10 m	Fertiliser	DAP (18:20) Zn 2% @ 75 kg/ha UAN (42:0) 75 L/ha 11 th July 2013
Seeding date	13 th of May 2013	Variety	ATR Gem TT canola

The trial was established as a randomised complete block design with 3 replicates & 17 herbicide treatments (Table 1).

To ensure even annual ryegrass establishment across the trial site annual ryegrass seed was broadcast at 25 kg/ha ahead of seeding & tickled in with a shallow pass with the seeder prior to herbicide application. The ryegrass was previously harvested from commercial paddocks and had low-medium resistance to clethodim.

A standard knife-point press wheel system was used to sow the trial on 22.5 cm (9") row spacings.

Pre-sowing herbicides were applied within an hour of sowing & incorporated by sowing (IBS) the post-sowing pre-emergence (PSPE) herbicides were applied on the 16th May and 3-4 leaf herbicides were applied on 7th July. At the time of the 3-4 leaf herbicide applications, plant available water (PAW) moisture was around 130 mm and 0.6 mm rainfall was received over the next day followed by 11.4 mm 5 days after application.

See Table 1 for the herbicide treatments included in the trial.



Results

At the first time of assessment (early July) majority of the herbicide treatments had significantly reduced annual ryegrass emergence (Table 1). The propyzamide either IBS or as a split application (IBS followed by PSPE) and as a mixture with tri-allate gave excellent control (>90%). Herbicide treatments including atrazine were also very effective this season with rainfall assisting activity (>79%).

In the 2013 Hart trial, herbicide treatments giving better than 90% overall control of annual ryegrass were:

- Propyzamide 1 kg IBS + 1 kg PSPE
- Tri-allate 2 L + propyzamide 1 kg IBS + clethodim (treatments 11, 14 and 17) however, at the time of the July assessment the effect of clethodim was not apparent (ie just tri-allate + propyzamide).

There were also a number herbicide treatments which had poor control (<60%). Herbicide applications which resulted in less effective control were Outlook (IBS+PSPE) and Dual Gold (IBS+PSPE).

At the early time of assessment crop vigour was also assessed. Majority of the herbicide applications had little effect on crop growth compared to the control. Both Outlook and propyzamide gave greatest crop damaged with rating of 3.8 and 3.2, respectively. Other treatments which resulted in slight crop damage were combinations of tri-allate, propyzamide, atrazine or clethodim giving scores of 6-7 (Table 1). Symptoms of clethodim damage were not apparent at this early time of assessment, as clethodim applications were only applied one week prior. For more details on the tolerance of canola to clethodim please refer to the following article in the trials results book "*Clethodim tolerance in canola*".

Final ryegrass head numbers were significantly lower (less than 40 heads per square metre) for tri-allate when applied with clethodim, atrazine and/or propyzamide (Table 1). This is consistent with the earlier annual ryegrass assessments. Propyzamide IBS + PSPE at the 0.5 or 1 kg/ha rate also had a final head number below 40 heads per square metre. Atrazine in a tank mix with clethodim produced similar annual ryegrass control, but when UAN was also added the ryegrass control improved significantly.

Table 1. Effect of different herbicides on annual ryegrass plant (plants per square metre) and head density (heads per square metre) and crop vigour at Hart, 2013. Crop vigour was assessed as a visual score (10 = good vigour and 1 = poor vigour).

Herbicide treatment	Annual ryegrass			
	July Crop vigour	July plants/m ²	July (% control)	October heads/m ²
1. Nil	9.2	64	-	148
2. Tri-allate 3.2 L/ha + Dual Gold 0.5 L/ha IBS	7.7	9	86	87
3. Trifluralin 2 L/ha + Tri-allate 3.2 L/ha IBS	8.0	8	87	63
4. Outlook 0.7 L/ha IBS + 0.5 L/ha PSPE	3.8	27	58	95
5. Propyzamide 1 kg/ha IBS	8.8	19	70	93
6. Propyzamide 0.5 kg/ha IBS + 0.5 kg/ha PSPE	7.3	10	84	42
7. Propyzamide 1 kg/ha IBS + 1 kg/ha PSPE	3.2	5	92	6
8. Dual Gold 0.25 L/ha IBS + 0.25 L/ha PSPE	8.3	48	25	70
9. Experimental 1	7.0	9	86	56
10. Tri-allate 2 L/ha + clethodim 500 mL/ha	8.2	11	83	81
11. Tri-allate 2 L/ha + propyzamide 1 kg/ha IBS + clethodim 500 mL/ha	6.5	3	96	24
12. Tri-allate 2 L/ha + atrazine 1.2 kg/ha PSPE + clethodim 500 mL/ha	6.5	13	79	45
13. Tri-allate 2 L/ha + propyzamide 1 kg/ha IBS + clethodim 500 mL/ha + Liase 2%	7.0	3	96	3
14. Tri-allate 2 L/ha + atrazine 1.2 kg/ha PSPE + clethodim 500 mL/ha + Liase 2%	7.3	5	92	6
15. Tri-allate 2 L/ha + clethodim 500 mL/ha + 20 L/ha UAN	8.2	19	70	60
16. Tri-allate 2 L/ha + propyzamide 1 kg/ha IBS + clethodim 500 mL/ha + 20 L/ha UAN	8.0	3	96	9
17. Tri-allate 2 L/ha + atrazine 1.2 kg/ha PSPE + clethodim 500 mL/ha + 20 L/ha UAN	8.2	11	83	18
LSD (P≤0.05)	1.9	11.9		39.1

Treatments 10-18 were applied at annual ryegrass 3-4 leaf and canola 3-4 leaf. Application of clethodim to treatments 10-17 would not have been assessed at the early sampling time (July) as were only applied 15 days prior.