MALLEE CATCHMENT
TECHNICAL BULLETIN

Technical Bulletin #32

Sustainable management strategies for herbicide resistant ryegrass

Above: Biomass sampling at the canola trial at Yaapeet. Photo: Dodgshun Medlin.

Left: Quadrat counts to quantify crop and weed populations in Yaapeet wheat plot trials in July 2011. Photo: Dodgshun Medlin.

This technical bulletin summarises the findings of field research conducted in 2011 to evaluate strategies for the control of ryegrass in Mallee cropping systems. It focuses particularly on the impact of increasing resistance of ryegrass to herbicide groups and on control strategies that do not exacerbate soil erosion risks.

The continued expansion in ryegrass resistant to group A, B, D and more recently, C herbicides, is a constraint on the viability of extensive cropping, particularly in lower rainfall environments where cereals dominate the farming system. Crop yields decline due to increasing competition from ryegrass as current crop herbicides are less effective and improved chemistry is more expensive for the farmer to apply and likely to lose efficacy over time as resistance develops.

Background

Non-herbicide alternatives to control resistant weeds are available but also have constraints. Cultivated fallows for example, were commonly used but are not applicable in current crop intensive rotations and can be a potential environmental disaster due to wind

At a glance

- Four replicated and randomised field plot trials were established comprising a wheat and canola trial at both Yaapeet and Panitya.
- Additional ryegrass control acheived by using both pre and post-emergent herbicides helps prevent weed seed carryover to future crops and build-up of herbicide resistance.
- Results showed that most of the herbicide options evaluated achieved sufficient ryegrass control to negate competition with crops in 2011.

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Table 1: Ryegrass density (plants/m²) and control (%reduction), wheat density (plants/m²), grain yield (t/ha) and grain protein (%) at Yaapeet.

Treatment name	Ryegrass - 31st August		Wheat crop		
	Plants/m²	% control	Plants/m²	Yield t/ha	Protein %
Control - Nil	86	0.0	88	2.4	10.2
District practice	35	59.1	83	3.1	10.3
Improved herbicide	21	74.9	92	3.3	10.6
New herbicide	34	60.9	88	3.0	10.2
Low cost	28	66.9	86	3.3	10.5
Improved + seed bank reduction	8	90.4	87	3.1	10.3
LSD (P=0.05)	13.5	11.83	n.s.	0.66	n.s.

erosion risk. The use of non-cereal crops to expand herbicide options is constrained by lack of confidence in the viability of these crops.

Attachments to the header that physically destroy weed seeds at harvest are expensive and are still being evaluated locally. Cutting weed infested crops for hay or green manure reduces weed seed set, but sacrifices income from the grain harvest. Herbicides will therefore remain a major tool for controlling resistant ryegrass in crops in the short and medium term at least.

Plot trials were therefore established with wheat and canola at Yaapeet and Panitya, to evaluate a range of herbicide strategies to combat resistant weeds. These strategies include: district practice; best current herbicides; new herbicides and physical intervention such as autumn tickle, to stimulate weed germination; or post emergence sprays to reduce seed carryover to the next season. A trial with a recently released Clearfield® canola variety was included to demonstrate the potential to use imidazoline (imi) tolerant crops with expanded herbicide options for control of ryegrass.

Methodology

Wheat and canola plot trials were established on sites at both Yaapeet and Panitya. The Yaapeet site had ryegrass with strong resistance to Group A diclofop-methyl (fop) herbicides and some resistance to Group D, while the Panitya site had almost 100% resistance to Group D herbicides.

A range of pre-emergent herbicide types, rates and combinations were tested at the Panitya site. At Yaapeet, a nil control was compared with strategies for Catalina wheat designed to represent:

- District practice = 2 L gylphosate + 2 L trifluralin pre-em;
- Improved herbicide = 2 L glyphosate + 2 L trifluralin + 2 L Avadex® pre-em;
- New herbicide = 2 L glyphosate + 118 g Sakura® pre-em;
- Low cost improved = 2 L glyphosate + 2 L trifluralin + 30 g Logran® pre-em; and
- Improved + seed bank = 2 L glyphosate +2 L trifluralin +2 L Avadex® pre-em + 200g Hussar® post-em.

The 44Y84 canola trial had similar strategies except glyphosate was reduced to 1.5 L, the new herbicide was 750g Outlook® and all except nil had a post-em of 500 ml Select® + 300 ml Intervix®. Herbicide efficacy was measured by weed population counts in each plot in July (after crop establishment and before any post-em treatments) and late August (after post-em treatments).

Impacts on crop production were assessed by crop density counts, grain yield obtained with a plot harvester and grain protein or oil content measured at a grain receival site.

The risk of soil erosion at each site was estimated at sowing using Leys method.

Results

Soil erosion risk

Erosion risk was very low, particularly at Yaapeet which had thick stubble residue and cloddy soil after a wet summer. Herbicide applications do little to degrade surface trash cover unless there are repeated applications over an extended period (chemical fallow).

Table 2: Ryegrass density (plants/m²) and control (%reduction), canola density (plants/m²), grain yield (t/ha) and grain oil content (%) at Yaapeet.

Treatment	Ryegrass - 11th July		Ryegrass - 31st August	Canola crop		
	Plants/m²	% control	% control	Plants/m²	Yield t/ha	Oil %
Control - Nil	114	0.0	0.0	34	0.8	43.6
District practice + IMI post	44	58.0	85.0	44	1.4	43.8
Improved herbicide + IMI post	23	77.0	86.9	43	1.4	43.2
New herbicide + IMI post	63	43.8	82.2	43	1.5	44.1
LSD (P=0.05)	37.6	29.43	11.37	n.s.	0.17	n.s.

Table 3: Wheat and weed density (plants/m² and ryegrass controlled (%) at Panitya.

No.	Treatment Herbicide rates/ha	Plants/m²			% Control
		Wheat	Broadleaf	Ryegrass	Ryegrass
1	Untreated	12.0	4.0	289.0	0.0
2	Triflur @ 2L	9.0	5.0	117.0	58.4
3	Boxer Gold @ 2.5L	28.0	2.0	38.0	87.1
4	Avadex @ 2L + Triflur 2L	16.7	6.0	30.0	89.0
5	Avadex @ 2.4L	7.3	7.3	73.0	77.1
6	Sakura @ 118g	12.0	0.0	25.0	90.3
7	Triflur @ 1.5L + Sakura @ 59g	14.0	2.7	18.0	92.8
8	Triflur @1.5L + Boxer Gold 1.5L	10.0	15.0	58.0	80.2
9	Triflur @ 1.5L + Avadex @ 1.6L	9.0	3.0	13.5	94.6
10	Avadex @ 1.6L + Sakura 59g	17.3	10.0	46.0	83.6
11	Sakura @ 88.5g	19.0	5.0	9.0	96.5
12	Avadex @ 3L	20.0	4.0	34.0	87.8

Ryegrass control in wheat at Yaapeet

- Moderate ryegrass density (86 plants/m²) reduced wheat yields by about 0.7 t/ha or $160/ha;
- Pre-em herbicides controlled 59-75% of ryegrass and increased to > 90% by adding a post- em;
- Wheat yields were not significantly different between any of the herbicides used but adding an expensive (approx. $28/ha) post-em reduced ryegrass survival and weed seed set for next year.

Results are demonstrated in table 1.

Ryegrass control in canola at Yaapeet

- Controlling ryegrass increased canola yield by approximately 0.6 t/ha or by $270/ha;
- Imi-tolerant canola variety (44Y84) enabled use of post-em herbicide to improve ryegrass control.

Results are demonstrated in table 2.

Panitya trials: wheat and weed density (plants/m²) and ryegrass controlled (%) at Panitya

- This site had high densities of ryegrass where no control was applied;
- The best herbicide treatments achieved over 90% control of ryegrass with a pre-em application.

Results are demonstrated in table 3.

Conclusions/implications

- Crop yield and income are substantially reduced unless ryegrass is controlled;
- A range of herbicides were effective in reducing ryegrass competition in the current crop;
- To get on top of ryegrass problems and reduce seed carryover and resistance, build-up may require additional post-emergent herbicides which are a longer term investment in the paddocks viability;
- Where ryegrass is a problem, using crop varieties resistant to herbicide groups effective against ryegrass (i.e. herbicide groups that will kill ryegrass but not the crop) increases control options.

Recommendations

1. Test ryegrass seed collected from paddocks where herbicides have been less effective to determine if there is resistance to one or more herbicide groups. This information is critical to selecting both a crop type and ryegrass control strategy appropriate for the level of herbicide resistance in the paddock.
2. Long fallows are not required to control ryegrass. However, hay production to prevent seed set from ryegrass that escapes herbicide control and growing crops and varieties resistant to key herbicide groups are useful strategies to regain control of resistant ryegrass populations.

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Further information

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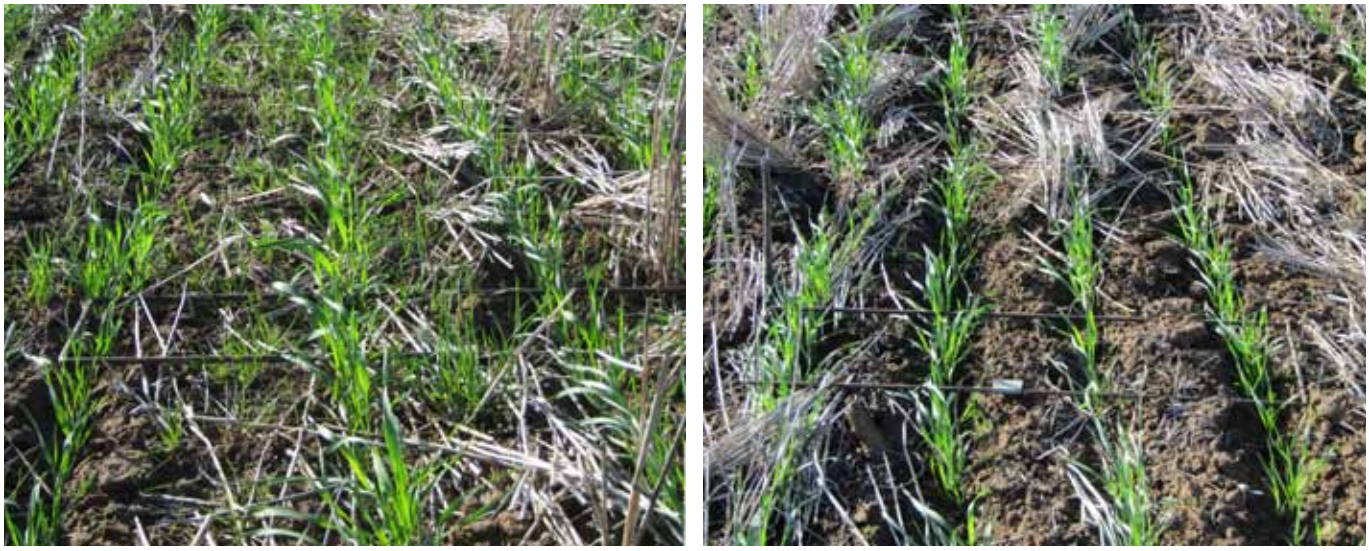
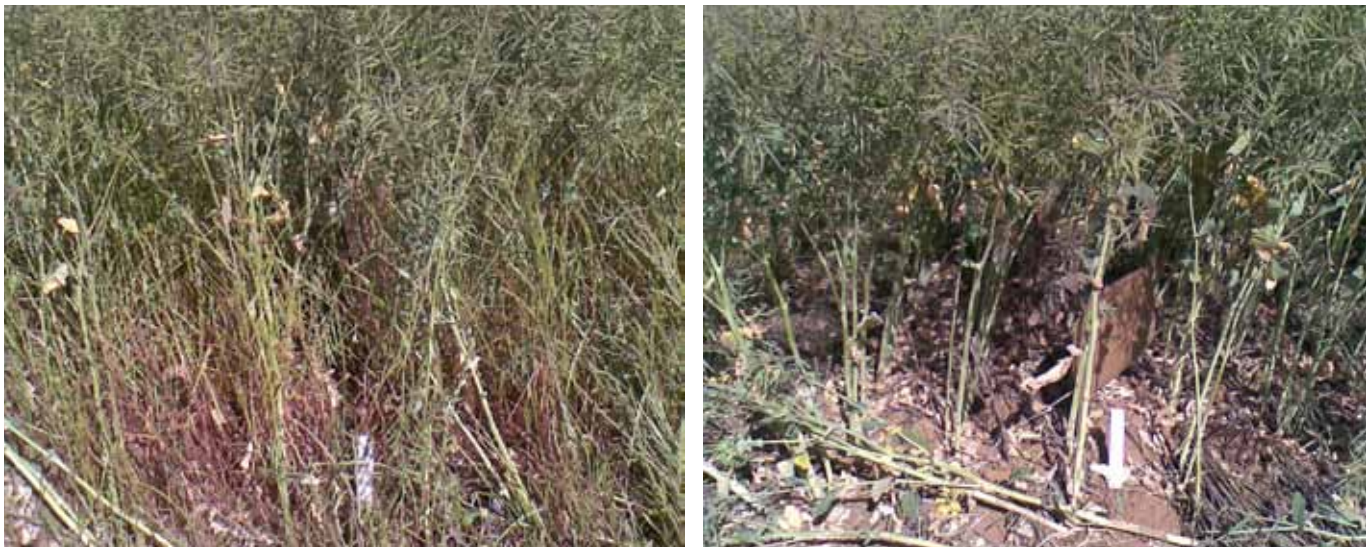
The information for this bulletin has been taken from 'Strategies to prevent degradation of Mallee farmland due to the proliferation of herbicide resistant ryegrass', a report from the Mallee CMA by Dodgshun Medlin. A copy of the report can be downloaded from the Mallee CMA website **www.malleecma.vic.gov.au**



Above: Comparison of poor (left) and good (right) early season ryegrass control in wheat trials at Yaapeet. Photos: Dodgshun Medlin.



Above: Comparison of poor (left) and good (right) rygrass control in canola plots at the Yaapeet site. Photos: Dodgshun Medlin.

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