RESULTS FROM THE DEMONSTRATING RYEGRASS CONTROL STRATEGIES TRIAL NORTH EAST VICTORIA

KEY MESSAGES

- **A trial at Wahgunyah showed a no till treatment had extremely low ryegrass numbers throughout 2024, compared to treatments that received a speed till (autumn tickle).**
- **A ryegrass "blowout" in a previous crop can cause a legacy effect; this can take time and multiple strategies to manage effectively.**
- **A "high-level chemistry" approach can be high cost and high risk if conditions aren't suitable at the time of application.**
- **In this trial, there was a trend to decreasing ryegrass numbers when the sowing rate was increased by 50 percent for canola sown in 2024.**
- **In 2024, ryegrass seed testing indicated resistance to Hoegrass (Group 1, fops) and in 2025, resistance to Roundup (Group 9) and Glean (Group 2, sulfonylurea), was also detected, highlighting how resistant populations can develop over time.**
- **Herbicide resistance testing can inform farmers about the likelihood of a herbicide failure or reduced effectiveness ahead of sowing; if resistance to a herbicide group is detected, farmers can switch to a different group or alter their crop rotation or variety choice.**
- **Non-chemical (cultural) methods of ryegrass control such as choosing a cultivar with a growth habit adapted to the region, increasing seeding rates, cutting hay to prevent ryegrass seed set, grazing, burning and harvest weed seed control can help manage ryegrass populations.**

BACKGROUND

Ryegrass blowout—when ryegrass numbers start to increase at uncontrollable rates—and its subsequent management, was identified as a priority issue for north east Victoria.

The issue had been exacerbated in recent years by excessively wet conditions and poor trafficability, making application of pre-emergent weed control difficult for some products. Consequently, grain growers observed an increase in ryegrass numbers, due to limited control options available over subsequent wet seasons. As a result, there was interest in exploring management strategies in other phases of the rotation, to drive down ryegrass numbers.

This led to the establishment of a two-year demonstration trial at Wahgunyah, in north east Victoria, as part of a Grains Research and Development Corporation (GRDC) National Grower Network (NGN) project investment. The trial demonstrated locally validated weed management strategies to assist growers improve control of ryegrass populations emerging in different environments, and where herbicide application alone fails.

AIM

Controlling annual ryegrass is an ongoing issue for farmers in the Riverine Plains and this trial aimed to explore a range of options to manage, control and ultimately reduce the impact of annual ryegrass in broadacre cropping systems, across a range of seasonal conditions.

METHOD

A two-year demonstration trial (2023–2024) was established to explore and compare current methods of annual ryegrass control. The trial was jointly managed by Riverine Plains and Uncle Tobys and was hosted at the Uncle Tobys trial paddock in Wahgunyah, Victoria.

In consultation with local agronomists, a range of treatments were established in 2023 using the GRDC Weedsmart 'Big 6' framework, as a key reference in the trial design. The 'Big 6' reference principles include: 1) rotate crops and pastures, 2) increase crop competition, 3) optimise spray efficacy, 4) mix and rotate herbicides, 5) stop weed seed set, 6) implement harvest weed seed control.

The treatments used in the trial reflect common practices used by grain growers across the Riverine Plains and the agronomists advising them.

Year 1 (2023)

Table 1 describes the timing of various operations for each treatment applied to a grazing wheat crop (cv Beaufort) sown in 2023. All treatments received pre-emergent chemistry of 1.5 L/ha Trifluralin and 118 g/ha Sakura, incorporated by sowing (IBS), with the exception of the high-level chemistry treatment (Treatment 2) which received Trifluralin IBS. The high-level chemistry treatment received 1 L/ha Mateno herbicide applied early post-emergent (EPE), with glyphosate applied as a desiccant in early December as per label directions. In addition to the described treatments, the entire site also received an in-crop broadleaf herbicide application, as well as a fungicide application. Rainfall at the site during 2023 was 515 mm. No summer sprays were applied between the 2023 harvest and the start of the 2024 winter cropping season.

Ryegrass plant emergence counts were taken across each treatment and at intervals throughout the season, to understand the effect of each treatment. Ryegrass plant samples (collected in-season) and seed samples (collected at maturity) were also sent to Charles Sturt University (CSU) for herbicide resistance testing.

Year 2 (2024)

OptimumGLY® (cv PY525GY) canola was sown during mid April using a tyne seeder with press wheels, as per the farmer's rotation. The trial plots were sown east to west, at right angles to the 2023 trial, to observe legacy effects of the Year 1 treatments, with plots measuring 8m x 8m (Table 2). The site was sown at 25.4 cm row spacings, with 75 kg/ha MAP at sowing and 300 kg/ha urea spread in two separate 150 kg/ha applications on 19 May and 19 July. All treatments, except Treatment 2 (no till), received a speed till in March to a depth of 2.5 cm, using a disc machine.

Table 1 2023 (Year 1) treatments applied to wheat in the *Demonstrating ryegrass control strategies* trial at Wahgunyah

TREATMENT DESCRIPTION	DETAILS
1-Control	-
2-High level chemistry	1 L/ha Mateno herbicide applied early post-emergent (EPE) Glyphosate applied as a desiccant in early December as per label directions
3-Sowing rate increased by 50%	Sowing rate: 120 kg/ha
4-Cut for Hay	Hay cut: 17 October
5-Grazed and burnt	This treatment was grazed and later burnt

Table 2 2024 (Year 2) treatments for the Demonstrating ryegrass management strategies trial at Wahgunyah

TREATMENT DESCRIPTION	CULTIVATION	TREATMENT APPLIED	HARVEST OPERATION
1-Control	Speed till	Standard chemistry	Windrow
2-No till	No till	Standard chemistry	Windrow
3-Direct head	Speed till	Standard chemistry	Direct head
4-High-level chemistry	Speed till	Double-knock with Paraquat Overwatch IBS	Windrow
5-High level chemistry + direct head	Speed till	Double-knock with Paraquat Overwatch IBS	Crop desiccation (Reglone) + direct head
6-50% increased sow rate	Speed till	50% increased sowing rate (sowing rate: 3.3 kg/ha)	Windrow
7-Hay cut	Speed till	Hay cut	Hay removed

Standard chemistry was applied in-season to all plots and the farmer's surrounding canola crop. This included trifluralin, two applications of glyphosate and Dropzone® (2,4-D as dimethylamine and monomethylamine 500 g/L) herbicides and represents common farmer practice in the region. AMS Aviator® Xpro® (bixafen 75 g/L, prothioconazole 150 g/L) was also applied across all plots in late August 2024.

The high-level chemistry treatments in 2024 included standard chemistry, plus a double knock of paraquat (Gramoxone at 835 mL/ha) followed by Overwatch® (bixlozone 400 g/L) incorporated by sowing (IBS). High-level chemistry was only applied to the "high-level chemistry" and "high-level chemistry + direct head" treatments.

The hay cut treatment was applied on 8 October, with the hay removed on 17 October. Crop desiccation in the "high level chemistry + direct head" treatment was achieved by an application of 200 g/L diquat (Reglone) on 1 November. The remaining treatments were windrowed on 4 November and the site was harvested on 23 November.

RESULTS AND DISCUSSION

YEAR 1, 2023

Ryegrass populations across the 2023 Year 1 treatments are shown in Table 3, with relatively low numbers of ryegrass indicated across all treatments throughout the season. Excepting a dry September, the 2023 season was ideal for both crop growth and ryegrass seed set, and the plant counts at sampling on 6 December are lower than expected given the conditions.

Due to logistics at harvest, the original HWSC treatment planned for 2023 (harvest and use a mechanical seed mill) did not proceed, with the treatment instead grazed, then burnt.

Table 3 Average ryegrass plant populations in Year 1 of the *Demonstrating ryegrass control strategies* trial treatments in wheat, Wahgunyah 2023

SAMPLE DATES & WHEAT GROWTH STAGE	19 JULY (GS20)	2 OCTOBER (GS40-50)	6 DECEMBER (PHYSIOLOGICAL MATURITY)
Treatment	**Ryegrass population (plants/m²)**		
Control	6	6	6
High level chemistry	12	6	4
Sowing rate increased by 50%	-	2	1
Cut for Hay	1	2	-
Grazed & burnt	2	1	1

YEAR 2, 2024

Annual ryegrass populations were measured three times over the course of the 2024 season, with the average per treatment presented in Table 4.

Table 4 Average ryegrass populations and grain yield for treatments applied to canola at the *Demonstrating ryegrass control strategies* trial, Wahgunyah, 2024, plus February 2025 ryegrass counts

SAMPLE DATE	23 APRIL	10 JULY	29 NOVEMBER	GRAIN YIELD	18 FEBRUARY 2025
Canola growth stage	**Early vegetative**	**Stem extension / mid vegetative**	**Post-harvest**		**Summer fallow**
Treatment	Average ryegrass population (plants/m^2)			(t/ha)	Ryegrass (plants/m^2)
Control	180	100	20	0.63	1
No till	4	12	8	1.75	0
Direct head	104	88	12	0.84	2
High level chemistry	48	144	12	0.69	4
High level chemistry + direct head	96	140	12	1.30	4
50% increased sow rate	68	96	24	1.46	0
Hay cut	40	116	8	N/A	0

All treatments except the no till treatment had a speed tillage treatment applied in March

As shown in Table 4, 2024 average ryegrass populations fluctuated from early season to mid-July across all treatments, except for the no-till treatment, which remained extremely low throughout the season. High variation was also seen in treatments which had received the same applications to mid July, for example the control and direct head treatments, as well as the high-level chemistry and high-level chemistry + direct head treatments.

Speed tillage was applied to all treatments except the no till treatment and the high early ryegrass populations seen in late April across the speed tilled treatments suggests that ryegrass emergence was stimulated by the soil disturbance. In contrast, the lack of soil disturbance in the no till treatment likely suppressed germination of the ryegrass seed bank, holding back numbers throughout the year. The low ryegrass populations in this treatment potentially increased the amount of moisture available to the canola crop, which was reflected in a more uniform germination and higher yield.

Ryegrass populations in the two high-level chemistry treatments were only marginally different to the standard chemistry treatments (control and direct head treatments) across the three population count timings. The incorporation of Overwatch® IBS in both high-level chemistry treatments was unfortunately met with a subsequent lack of moisture for activation, due to forecast rain not eventuating, leading to minimal response in the target ryegrass plants. The Overwatch herbicide application also failed to generate the commonly observed bleaching, which was only evident in some canola plants by mid-season. As per the Overwatch label, the crop was sown with tynes and press wheels.

Direct heading didn't appear to have any effect on ryegrass numbers compared to windrowing in this demonstration. Choosing which method is best to harvest canola comes down to timeliness, weather conditions and cost, bearing in mind that direct heading allows for a potentially higher maximum yield under ideal conditions, and can help avoid weather-related windrow losses (for example from wind in light windrows or in lodged crops), however there is a higher risk of shattering. In weedy situations, direct heading has a higher risk of weed seed-set, especially if no dessicant is used.

The post-harvest ryegrass counts (December 2024) were much lower than expected across all treatments. This was likely due to a combination of competition by the canola and the effectiveness of the pre-emergent chemistry applied across all treatments. Given the similarity in ryegrass numbers across treatments, it's also possible that the final assessment occurred too late to be fully representative, or that the ryegrass population had already senesced.

The high ryegrass numbers seen early in the 2024 trial are not fully explained by the ryegrass populations present in 2023. High ryegrass populations were visually observed in the 2023 grazed and burnt treatment, and this may have led to increased ryegrass numbers in 2024 along the eastern side of the trial where the grazing treatment was located. While ryegrass is considered to be short-lived (most of the seed population will germinate the following autumn), it's possible that a sizeable ryegrass seedbank carried over from the 2022 season and the 2024 speed tillage operation (autumn tickle) stimulated its emergence.

The increased canola seeding rate treatment of 3.3 kg/ha was designed to increase competition with weeds. Mid season averages suggest that the increased rate helped suppress ryegrass growth compared to most of the other treatments.

YIELD

Dry spring conditions, frost damage late in the season, and harvest rains meant that canola yield was generally lower than expected. As this was a demonstration trial, statistical analysis of yield wasn't possible, however the no-till treatment yielded the most at 1.75 t/ha, which was almost three times as much as the lowest yielding control treatment (0.63 t/ha). The increased sowing rate treatment yielded 1.46 t/ha, while the high-level chemistry + direct head treatment yielded 1.30 t/ha. Due to the high variation in ryegrass numbers across treatments it's difficult to attribute yield response to ryegrass populations alone. However, it's likely that reduced ryegrass numbers in the speed tilled treatment increased moisture availability, promoting more even early emergence and better yields.

FOLLOW-UP COUNTS, 2025

Following a wet late spring and early summer, conditions turned hot and dry during early 2025. Rainfall data from the Bureau of Meteorology Corowa Airport site shows approximately 64 mm rainfall from December 2024 to January 2025; while there may have been enough early summer rain to stimulate ryegrass emergence, there was not enough follow-up to sustain plant growth. This was reflected in the very low ryegrass populations seen across all treatments when counts were conducted in February 2025 (Table 4), which was just before the farmer applied herbicide for seasonal weed control. No chemical or mechanical interventions were applied to the site between harvest and mid February, 2025, other than a buffer spray around the trial site with glyphosate during mid-late December.

LEGACY EFFECTS OF 2023 TREATMENTS

The 2024 OptimumGly® canola treatments were overlaid at right angles to the 2023 wheat treatments, and plant counts taken from the treatment areas provide an opportunity to examine the legacy effects (Table 5).

Table 5 Ryegrass populations measured at the Demonstrating ryegrass control strategies site at Wahgunyah, 2024, showing Year 1 (2023) and Year 2 (2024) treatments

2023 TREATMENT	2024 TREATMENT																				
	Control			No till			Direct head			High level chem			High level chem, direct head			Increased sowing			Hay cut		
	Ryegrass plant population (plants/m^2)																				
	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L	E	M	L
Control	116	120	0	4	4	12	76	72	0	52	72	4	136	108	0	48	84	16	12	100	0
High level chemistry	260	148	4	8	8	0	256	96	24	112	128	12	48	40	0	72	64	20	88	40	12
Increased sowing	88	28	12	0	12	8	40	48	24	36	44	8	92	80	0	84	28	8	32	28	4
Hay cut	192	60	32	0	32	0	96	68	8	8	104	8	132	192	20	24	128	4	8	152	12
Graze	252	144	44	8	12	20	60	156	4	24	376	32	68	288	36	112	192	64	65	268	12

E = Early ryegrass count (late April), M = Mid July counts, L = December (post-harvest) counts

The 'no-till' treatment consistently displayed lower ryegrass populations than the other treatments, even when the 2023 legacy treatments were taken into consideration. The lack of soil disturbance to stimulate ryegrass germination was the most likely cause of this effect.

Where increased sowing rates were applied in 2023, there was a trend to comparatively lower ryegrass populations in 2024.

Where grazing occurred in 2023, there was a trend towards high ryegrass population numbers in 2024, for all treatments except the no till treatment. Despite the low overall ryegrass populations observed across all treatments in 2023, the site was known to have a high background ryegrass population and it's likely that high rates of ryegrass seed shedding occurred before the grazing took place in this treatment, contributing to the numbers observed in 2024. Previous work by Riverine Plains has shown that ryegrass seeds are mostly shed in the month prior to harvest, providing a potential seedbank for the next season.

The application of high-level chemistry in 2023 did not clearly reduce ryegrass populations in 2024, however there was a trend to lower populations where high-level chemistry plus cultural controls, such as increased sowing rates and hay, were applied in 2024.

RESISTANCE TESTING

Understanding the ryegrass herbicide resistance status of paddocks can support farmers in making early, strategic management decisions in preparation for subsequent crops. As part of this project, plants were collected from the Wahgunyah trial site and sent to Charles Sturt University for "quick testing" across a wide range of herbicides. While "quick testing" conducted in 2023 showed no evidence of resistance to either glyphosate or clethodim at the trial site, ryegrass seed testing conducted in 2024 allowed for more accurate testing and showed resistance to Hoegrass, a Group 1 (Fop) herbicide. The seed testing did not detect resistance to either Select (Group 1, dim), Glean (Group 2, sulfonylurea), Simazine (Group 5), Trifluralin (Group 3) or Roundup (Group 9).

Ryegrass seed was also collected and tested in 2025. The results confirmed resistance to Hoegrass (Group 1, fop), and also indicated resistance to Glean and Roundup. The change in status to Glean and Roundup from 2024 (not resistant) to 2025 (resistant), highlights how the resistance status of populations can change over time. It is worth noting that these results only apply to the samples provided, which were collected from within the trial area across the two years of the trial.

CONCLUSION

Using a combination of techniques as part of an integrated management strategy is likely to have the best effect on reducing ryegrass populations, while also helping prevent the development of herbicide resistance, which occurs when the same chemistry is used repetitively.

When selecting varieties, consider their adaptation to the local environment and their ability to suppress weed growth in high pressure paddocks, or that allow alternative in-crop herbicides to be used (for example OptimumGly® canola). Crop growth habit and maturity can also be used as a tool to manage problem populations. Crop topping (dessication), grazing or cutting weedy paddocks for hay, can also help manage heavy ryegrass populations, but their effectiveness will depend on timing and the season at hand.

Making good use of resources such as resistance testing allows a more informed approach to ryegrass management and more efficient use of herbicides.

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