GOA trial site report

Investigating a range of residual herbicides on the effectiveness of control of sow thistle and other weeds in the summer fallow

Grain Orana Alliance

Trial code:	GGWE7824-2
GRDC code:	GOA2302-001SAX
Season/year:	Summer 2024-2025
Location:	Narromine
Trial partners:	Paul M^{c}Caullife
Trial establishment date:	31/12/2024

Keywords

- GGWE782, Heliotrope, Caltrop, summer grass, summer fallows, residual herbicides, Narromine

Take home messages

- Several herbicide or combinations reduced subsequent weed populations.
- Seldom did any one herbicide treatment tested achieved sound control on all weeds present.
- Remaining weeds following the treatment application would have required follow up sprays to achieve satisfactory fallow weed control.
- This would limit any savings in fallow management costs through the use of residuals unless the remaining population could be controlled with spot spraying technology whereby overall chemical usage could be reduced.
- Some options showed some effects on crop establishment and observed crop phytotoxicity, but the yield impacts were not assessed in this trial.

Background

- At the 2022 Narromine National Grower Network (NGN) forum, growers identified summer fallow weed control as a significant and escalating input cost.

- Increasing herbicide costs, herbicide resistance and the increasing prevalence of harder to kill weeds have all contributed to this. Several specific weeds in sow thistle, fleabane and windmill grass have arguably had the greatest impact on these rising costs of managing summer fallows.
- Sow thistle is characterised by an ability to germinate all year around, high seeding rates, quick growth rates and increasing tolerance or resistance to commonly used herbicides. As such sow thistle is a dominant weed in any population that germinates in fallow and is often a key determinant of both the frequency of fallow sprays as well as the herbicide choice and rates employed.

- Given this, employing soil applied residual herbicides to prevent or limit the frequency of germinations as well as the resultant population of sow thistle may offer some potential to reduce fallow management costs.
  - To test the validity of this management approach to reduce costs a series of herbicide trials were established under an NGN project over the period of 2023 and 2024.

Aims

- To investigate a range of residual herbicides that could be applied at the timing of the first fallow spray for control of subsequent germinations of sow thistle and other weeds over the summer fallow period.
- Assess any residual impact these herbicides may have on the establishment of the subsequent crop.

Methodology

- The trials were a randomized and replicated design with the results statistically analysed by ANOVA.
- This site was selected as it was suggested to have a history of sow thistle prominence.
- Trials were established in a commercial fallow with a knockdown herbicide applied before the application of any of the trial treatments to ensure the measured impacts were a result of the residual capability of herbicides rather than any knockdown capacity.
- A knockdown (glyphosate and amine) was applied on the site on the 23/12/2024 with a double knock of paraquat applied 8 days later. The trial treatments listed in **Error! Reference source not found.** were then applied immediately following on the 31/12/2024.
- Sporadic rainfall fell across the summer fallow. A sufficient rain event was received during January (Table 2) with a population of weeds emerging which was counted on the 20/2/2025 (101 days after treatment application, DAA).
- Following the assessment the site was sprayed out with (glyphosate and Garlon®) and with subsequent rain another establishment was assessed on the 31/03/2025. Very low numbers of weeds were observed with no treatment effect.

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Table 1 Treatment list.

Product and rate/ha
Balance® 100 g/ha
Balance® 100 g/ha + Dual Gold® 2000 mL/ha
Balance® 100 g/ha + Terbyne® Xtreme® 1200 g/ha
Dual Gold® 2000 mL/ha
FallowBoss® TORDON® 1000 mL/ha
Impose® 200 mL/ha
Overwatch® 1250 mL/ha
Picoflex® 315 mL/ha
Reflex® 1250 mL/ha
Sakura® 118 g/ha
Terbyne® Xtreme® 1200 g/ha
Terbyne® Xtreme® 1200 g/ha + Impose® 200 mL/ha
Trezac® Arylex® 200 mL/ha
Valor® 280 mL/ha
Valor® 280 mL/ha + Dual Gold® 2000 mL/ha
Voraxor® 240 mL/ha
UTC

Table 2 Monthly rainfall (mm) and long-term average (LTA)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2024	96	48	63	76	70	44	44	47	10	40	73	68	**679**
2025	61	35	69	38	49	44	-	-	-	-	-	-	**296**
LTA	58	50	49	42	41	43	41	36	38	47	47	46	**538**

Results

- The first flush of weeds emerged after rain in January and was assessed in the third week of February at 51 days after application (DAA).
- There was no significant establishment of sow thistle.
- The primary weeds present were heliotrope, caltrop, and summer grass.
- The heliotrope population at 51 DAA in the untreated had an average of 1.2 heliotrope plants/m^2 (Figure 1). There was no heliotrope observed in the Impose® treatment, with a low population follow the Overwatch®, Balance® + Dual Gold®, Balance®, Sakura®, Fallow Boss® TORDON®, and Voraxor® treatments.

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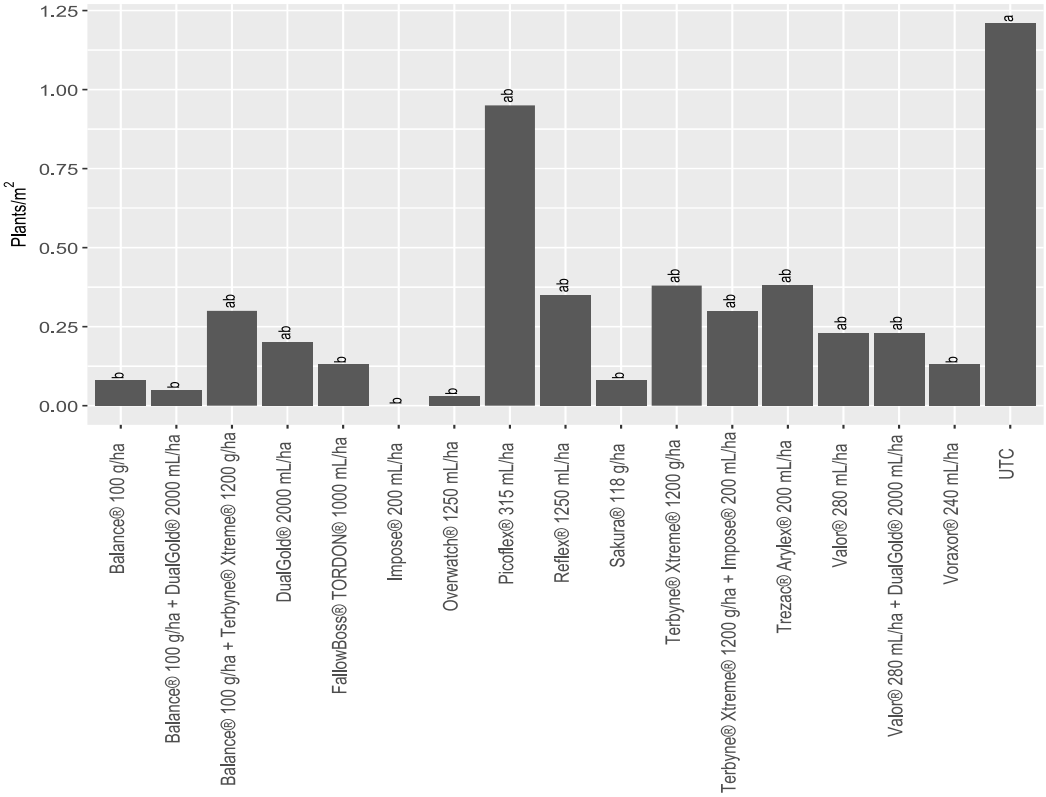

Figure *1* Heliotrope population in response to various herbicide treatments at 51 DAA. Treatments with the same letter are not significantly different.

- Caltrop (Tribulus terrestris) populations at 51 DAA in the untreated control had an average of 1.4 caltrop plants/m^2 (Figure 2). Populations following all the other treatments were highly variable with only the FallowBoss® Tordon® resulting in a population reliably less than the UTC, with a population of 1 plant every 6 m^2.

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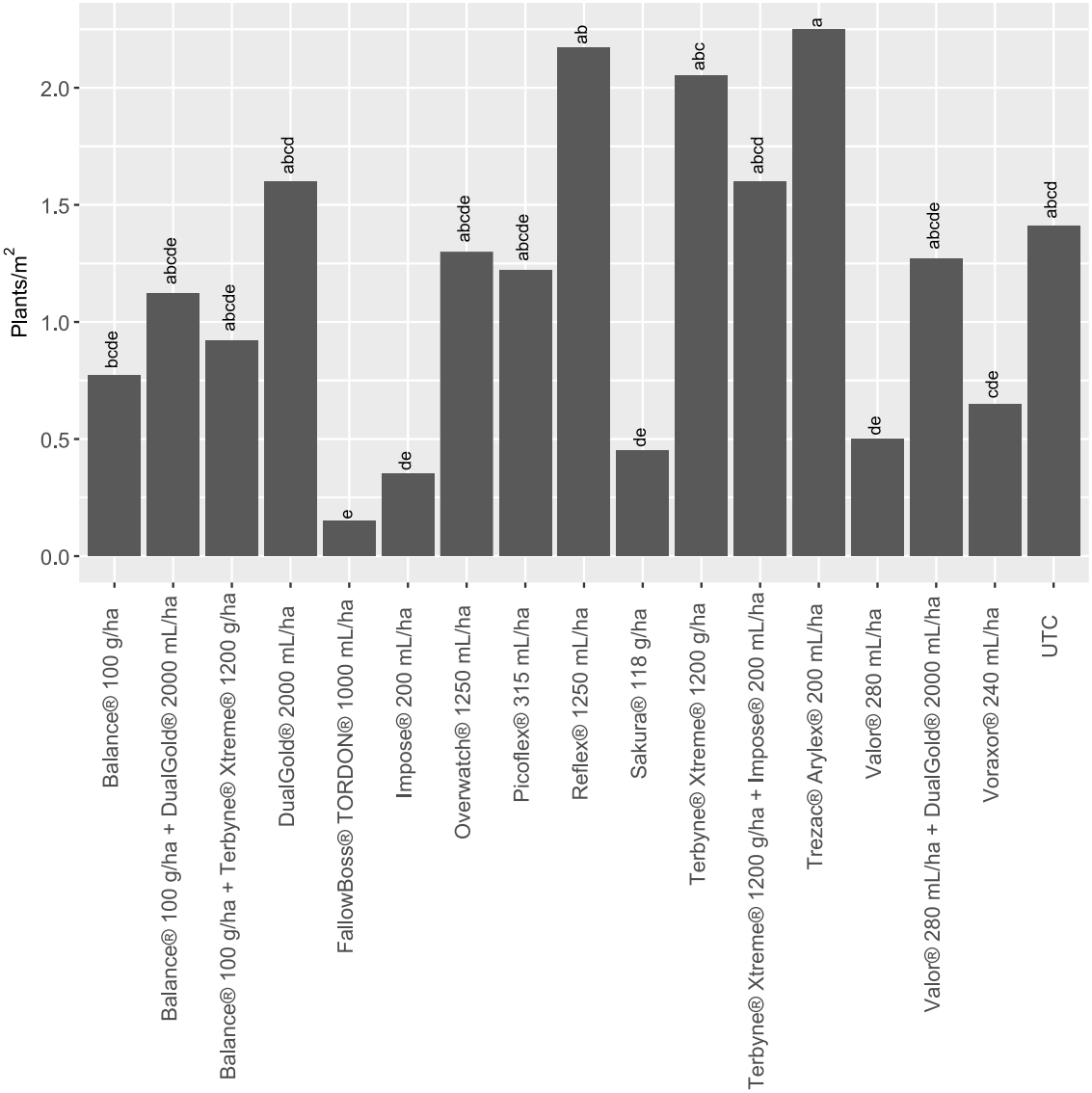

Figure *2* Caltrop population in response to various herbicide treatments at 51 DAA. Treatments with the same letter are not significantly different.

- Summer grass *(Digitaria ciliaris*) at 51 DAA in the untreated averaged 4.2 plants/m^2 (Figure 3). No other herbicide treatment other than Overwatch®, Dual Gold®, and Impose® treatments were different to the UTC. Under these treatments the population still exceeded 1 plant/ m^2.

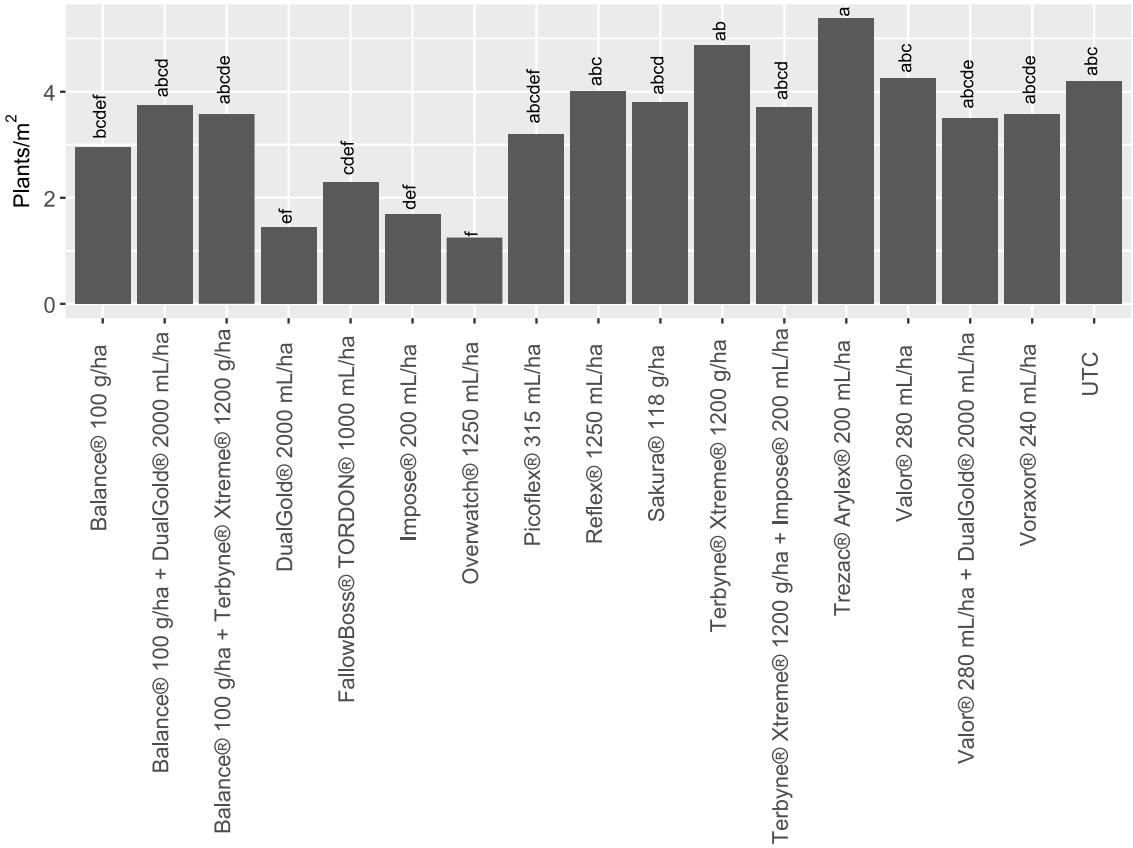

Figure *3* Summer grass population in response to various herbicide treatments at 51 DAA. Treatments with the same letter are not significantly different.

- A second cohort of weeds was assessed at the end of March at 90 DAA, where very low numbers were observed with no differences between treatments.

Establishment:

- Crop establishment and phytotoxicity were scored in the faba bean crop (~5-6 node) on the 13/06/2025 that was planted over the site.
- Trezac®, Picoflex®, Impose® and FallowBoss® Tordon® all resulted in lower establishment scores than the UTC but the magnitude of difference was not large.
- Only the FallowBoss® Tordon® and Picoflex® had a higher observed phytotoxicity score than the UTC (Figure 4).

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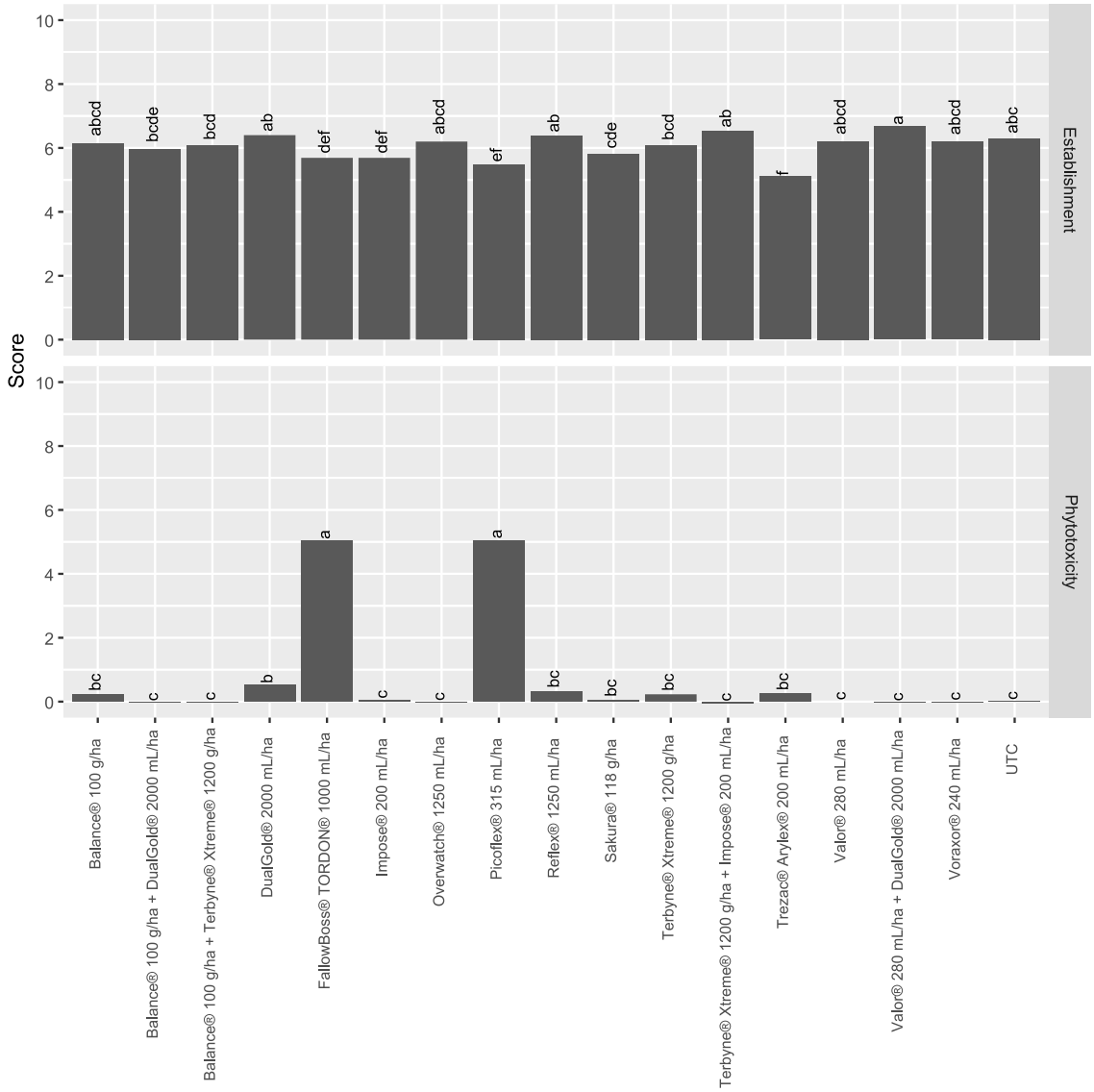

Figure *4* Faba bean establishment (0 = no crop, 10 = excellent), and phytotoxicity scores, (0 = no damage, 10 = crop failure). Treatments with the same letter are not significantly different.

Discussion

- Typical of a summer fallow in central NSW, the mixed population included grasses and broadleaf weeds that germinated following rain (and the first knockdown spray post-harvest). This highlights the need for any residual to have a broad-spectrum activity over a range of weeds to reduce or remove the need to spray fallows and to reduce costs
- Of the products tested FallowBoss® Tordon®, Impose® and Overwatch® often had the lowest population of any of the weeds observed but they were not consistent nor absolute in their weed control. A follow up spray would still have been needed to control some weed numbers or species in all treatments.
- There was no white heliotrope observed in the Impose® treatment (despite no label claims) and low counts of both caltrop and summer grass. Overwatch® has no claims for control of summer grass, white heliotrope nor caltrop, however had reductions in both populations.
- Three months after application there were very low numbers of heliotrope and summer grass, less than 0.1 plants/m^2 in the untreated plots. Caltrop was the most dominant weed (~0.34 plants/m^2 in the untreated plots) however there was no treatment effect, possibly due to the sporadic nature of its germination. There is insufficient information to determine the longer-term value of residuals from this work
- There was observed small (but statistically significant) establishment difference from several products, however only 2 products showed outward phytotoxic symptoms suggesting there could be some subclinical impacts. Subsequent crop yields were not measured in this trial.

Conclusions

Several herbicide options showed some ability to reduce summer fallow weed numbers. Most products tested failed to achieve high levels of control over all the species observed and most would have required follow up herbicide sprays to control survivors. This would limit their ability to reduce fallow management costs significantly.

However, if growers were able to control survivors following the use of these residual products with spot spray technologies such as Weedit, or Weed Seekers, the proportion of the paddock requiring spraying would be much less and overall herbicide usage for their control would be lower than where residual herbicides were not used.

There are also potential crop impacts following the use of these products. The effects were variable, but the yield impacts were not measured. This highlights to growers they should be conscious of label plants backs and potential implications for future crop performance.

Acknowledgements

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Appendix

Weed control results

	Heliotrope				Caltrop				Summer grass			
Product (rate)	**51DAA**		**90DAA**		**51DAA**		**90DAA**		**51DAA**		**90DAA**	
	(plants/m2)											
Balance® 100 g/ha	0.08	b	0.00	a	0.77	bcde	0.10	a	2.95	bcdef	0.00	b
Balance® 100 g/ha + Dual Gold® 2000 mL/ha	0.05	b	0.00	a	1.12	abcde	0.40	a	3.75	abcd	0.00	b
Balance® 100 g/ha + Terbyne® Xtreme® 1200 g/ha	0.30	ab	0.00	a	0.92	abcde	0.27	a	3.58	abcde	0.00	b
Dual Gold® 2000 mL/ha	0.20	ab	0.00	a	1.60	abcd	0.20	a	1.45	ef	0.00	b
FallowBoss® TORDON® 1000 mL/ha	0.13	b	0.00	a	0.15	e	0.02	a	2.30	cdef	0.10	ab
Impose® 200 mL/ha	0.00	b	0.00	a	0.35	de	0.07	a	1.68	def	0.00	b
Overwatch® 1250 mL/ha	0.03	b	0.00	a	1.30	abcde	0.10	a	1.25	f	0.00	b
Picoflex® 315 mL/ha	0.95	ab	0.02	a	1.22	abcde	0.15	a	3.20	abcdef	0.00	b
Reflex® 1250 mL/ha	0.35	ab	0.03	a	2.17	ab	0.53	a	4.00	abc	0.00	b
Sakura® 118 g/ha	0.08	b	0.00	a	0.45	de	0.00	a	3.80	abcd	0.00	b
Terbyne® Xtreme® 1200 g/ha	0.38	ab	0.03	a	2.05	abc	0.00	a	4.88	ab	0.25	a
Terbyne® Xtreme® 1200 g/ha + Impose® 200 mL/ha	0.30	ab	0.00	a	1.60	abcd	0.55	a	3.70	abcd	0.00	b
Trezac® Arylex® 200 mL/ha	0.38	ab	0.00	a	2.25	a	-0.01	a	5.38	a	0.02	b
Valor® 280 mL/ha	0.23	ab	0.00	a	0.50	de	0.00	a	4.25	abc	0.00	b
Valor® 280 mL/ha + Dual Gold® 2000 mL/ha	0.23	ab	0.00	a	1.27	abcde	0.07	a	3.50	abcde	0.00	b
Voraxor® 240 mL/ha	0.13	b	0.00	a	0.65	cde	0.20	a	3.58	abcde	0.00	b
UTC	1.21	a	0.03	a	1.41	abcd	0.34	a	4.19	abc	0.06	b

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Establishment and phytotoxicity results

Product (rate)	Establishment (score)		Phytotoxicity (score)	
Balance® 100 g/ha	6.15	abcd	0.23	bc
Balance® 100 g/ha + DualGold® 2000 mL/ha	5.96	bcde	-0.03	c
Balance® 100 g/ha + Terbyne® Xtreme® 1200 g/ha	6.09	bcd	-0.01	c
DualGold® 2000 mL/ha	6.40	ab	0.52	b
FallowBoss® TORDON® 1000 mL/ha	5.69	def	5.03	a
Impose® 200 mL/ha	5.69	def	0.05	c
Overwatch® 1250 mL/ha	6.20	abcd	-0.02	c
Picoflex® 315 mL/ha	5.48	ef	5.05	a
Reflex® 1250 mL/ha	6.38	ab	0.33	bc
Sakura® 118 g/ha	5.82	cde	0.05	bc
Terbyne® Xtreme® 1200 g/ha	6.08	bcd	0.23	bc
Terbyne® Xtreme® 1200 g/ha + Impose® 200 mL/ha	6.53	ab	-0.04	c
Trezac® Arylex® 200 mL/ha	5.11	f	0.25	bc
UTC	6.29	abc	0.01	c
Valor® 280 mL/ha	6.20	abcd	0.00	c
Valor® 280 mL/ha + Dual Gold® 2000 mL/ha	6.67	a	-0.03	c
Voraxor® 240 mL/ha	6.19	abcd	-0.01	c

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Herbicide registration details

			Registration summary						
Trade name	**Active**	**Rate (mL or g/ha)**	**Fallow application**	**Summer grass**	**Caltrop**	**White heliotrope**	**Sow thistle**	**Control type**	**Notes**
Balance®	750g/kg isoxaflutole	100	Yes	Suppression	No	No	Control	Residual only	Strong residual in fallow; PSPE only
Dual Gold®	960g/L s-metolachlor	2,000	Yes	Control	No	No	Control	Residual (short-term)	Pre-emergent; effective in fallow
FallowBoss® TORDON®	300g/L 2,4-D, 75g/L picloram, 7.5g/L aminopyralid	1,000	Yes	No	Control	Control	No	Knockdown + Residual	Broad-spectrum; discontinued but still referenced
Impose®	240g/L imazapic	200	Yes	Control	Control	No	No	Residual (6–12 weeks)	No label claim for sowthistle
Overwatch®	400g/L bixozone	1,250	No	No	No	No	Control	Residual (up to 12 weeks)	Registered for sowthistle in cereals and pulses
Picoflex®	240g/L picloram	315	Yes	No	Control	Control	Control	Knockdown + Residual (mix)	Tank mix required; flexible fallow use
Reflex®	240g/L fomesafen	1,250	Yes	No	No	No	Control	Residual only	Registered in pulses; strong on sowthistle
Sakura®	850g/kg pyroxasulfone	118	No	No	No	No	No	Residual only	No registration for sowthistle
Terbyne® Xtreme®	875g/kg terbuthylazine	1,200	Yes	No	Control	No	Control	Residual	Registered for sowthistle in fallow
Trezac® Arylex®	25g/L aminopyralid, 30g/L halauxifen	200	Yes	No	No	No	Control	Knockdown + Residual	Arylex active; flexible tank mix options

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			Registration summary						
Trade name	**Active**	**Rate (mL or g/ha)**	**Fallow application**	**Summer grass**	**Caltrop**	**White heliotrope**	**Sow thistle**	**Control type**	**Notes**
Valor®	500g/kg flumioxazin	280	Yes	Control	Control	No	Control	Knockdown + Residual	PPO herbicide; strong residual and burndown
Voraxor®	250g/L saflufenacil, 125g/L trifludimoxazin	240	Yes	No	Control	No	Control	Knockdown + Residual	Dual Group 14 actives; strong on sowthistle, wetter required (Hasten)

Herbicide withholding summary for weeds assessed.

Trade name	Minimum plant-back interval	Rainfall requirement	Notes
Balance®	9–12 months	≥250 mm	Sensitive crop; extended interval recommended
Dual Gold®	6 months	≥150 mm	Moderate risk; check soil type and rainfall
FallowBoss® TORDON®	9–12 months	≥250 mm	High residual; sensitive crops like faba beans require caution
Impose®	9 months	≥250 mm	Pulse crops are sensitive; bioassay may be needed
Overwatch®	0 days	0 mm	☑ No restriction for faba beans
Picoflex®	6–9 months	≥200 mm	Depends on tank mix; check label specifics
Reflex®	0 days	0 mm	☑ Registered for pulses including faba beans
Sakura®	9 months	≥250 mm	Not registered for pulses; conservative interval advised
Terbyne® Xtreme®	6–9 months	≥200 mm	Moderate risk; check soil pH and rainfall
Trezac® Arylex®	6–9 months	≥200 mm	Arylex active; sensitive crops need caution
Valor®	6 months	≥150 mm	PPO herbicide; risk of carryover in dry soils
Voraxor®	6–9 months	≥200 mm	Dual Group 14; sensitive crops may need longer interval

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Spray application details

Spray Application	Narromine
Date Applied	31/12/2024
Start time	9:00 AM
Finish Time	10:00 AM
Water rate (l/ha)	100
Speed (km/hr)	5
Pressure (bar)	2
Equipment	Handboom
Nozzle	Airmix 11001
Boom height (cm)	50
Temp (oC)	27
Wind velocity (km/hr)	5
Wind direction	NW
Humidity (%)	44
Δt	13.4
Cloud cover (%)	10