

# GOA trial site report

## Residual herbicides applied in wheat crops to reduce the incidence of fleabane and other weeds in subsequent summer fallows.

Grain Orana Alliance

2024-07-10

<b>Trial code:</b>	GGWE07723-2
<b>GRDC project code:</b>	GOA2302-001SAX
<b>Season/year:</b>	Winter/Summer 2023
<b>Location:</b>	'Wilgarleigh', Narromine
<b>Trial partners:</b>	Tim Roberts
<b>Trial establishment date:</b>	20/07/2023

### Keywords

GGWE077, fleabane, cat head, sow thistle, goosefoot, summer fallows, resistance, in-crop herbicides, residual activity, application timing, Narromine

### Take home messages

- The dry spring resulted in very low fleabane (FB) numbers
- Several other common weeds were present but of the options tested only one product achieved 100% reduction in the population of one weed species only
  - Mateno® Complete provided 100% reduction of goosefoot.
- All other treatments either had no effect or only reduced the weed populations, and all would have still required follow up treatment to control them
- The use of residual herbicides would not have reduced the need or the costs of fallow management in this circumstance
- Utilisation of Optical spot spraying technology to control the remaining, lower population of weeds may result in a reduction in costs

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## Background

- At the 2022 Narromine GRDC 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 ST, FB and windmill grass have arguably had the greatest impact on these rising costs of managing summer fallows.
- Fleabane (*Conzya bonariensis*) often germinates during the spring period. Often not controlled by earlier in crop applications. Following crop harvest FB is already established and coupled with increased tolerances and/or resistances to a range of typically used fallow management herbicides, reliable control is often difficult and expensive. As such contributing significantly to the costs of managing summer fallows.
- Given the timing of the weeds germination and establishment it is hypothesised that being able to apply residual herbicides within the winter crop may prevent FB establishing and being present post-harvest, and if possible, indirectly reducing the higher fallow management costs associated with the weed.
- This approach has been previously identified utilising Lontrel Advance (Clopyralid) and has been widely adopted by industry. However, an improved understanding of how to finesse the use of this product, including the timing of application, could be very beneficial. There is also suite of other products that could also be utilised in this approach but have not been benchmarked to inform practices but also offer some alternate herbicide mode of action choice to growers.
- To test the validity of this management approach and compare products to reduce costs in managing fallows 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 in wheat crops during the growing season for their impact on:
  - on FB germinations, establishment and growth in the subsequent fallow period
  - any other weeds over the summer fallow period.
- Assess if any of these residual herbicides may impacts on the establishment of the subsequent crop.

## Methodology

- The trials were established as, randomised and replicated small plot trials.
- Potential herbicide treatments were applied to a commercially sown barley crop, in a paddock predicted to have a high FB seed bank.
- Herbicides were applied at predetermined growth stages of the crop. This was done as:
  - some herbicides are only labelled to be applied within certain crop growth stages
  - increasing crop canopies may intercept herbicide spray, preventing the product reaching the ground or resulting in uneven coverage of the ground thus potentially limiting the residual effectiveness to control emerging weeds.

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- At the timing of each herbicide timing, plots receiving residual treatments at that time were also treated with non-residual knockdown herbicides to control any preexisting germinations of FB as detailed below.
- Following each assessment during the fallow period all plots were sprayed out with a non-residual knockdown so that any subsequent count was a function of any ongoing residual effectiveness of the original treatments applied.
- Specific herbicides timing and the non-residual knockdowns used are detailed below-
  - Early-timing applied 20/7/2023:
    - Crop at Z14-20 growth stage
    - MCPA amine or Amicide® Advance applied to remove plants present so residual effectiveness can be assessed.
  - Mid-timing 15/8/2023:
    - Crop at Z25-27 growth stage
    - Amicide® Advance was applied to remove plants present so residual effectiveness can be assessed.
  - Late-timing 11/9/2023:
    - Crop >Z32 stage
    - Amicide® Advance applied to remove plants present, so residual effectiveness can be assessed.

Table 1 Herbicides tested and rates/ha

Product and rates (mL/ha)	Application timing	Target Zadok stage
Amicide® Advance @ 1400	Early	Z14-Z20
Aptitude® @ 200 + MCPA amine 750 @ 300	Early	Z14-Z20
Diuron WDG @ 280 + MCPA amine 750 @ 330	Early	Z14-Z20
Mateno® Complete @ 1000	Early	Z14-Z20
Rexade® @ 100 + MCPA LVE 570 @ 400	Early	Z14-Z20
Amicide® Advance @ 1400 + Grindstone® @ 32	Mid	Z25-Z27
Amicide® Advance @ 1400 + Lontrel® Advanced @ 150	Mid	Z25-Z27
Amicide® Advance @ 1400 + Lontrel® Advanced @ 75	Mid	Z25-Z27
Amicide® Advance @1400 + Picoflex® @110	Mid	Z25-Z27
Amicide® Advance @ 1400 + Trezac® @ 200	Mid	Z25-Z27
Amicide® Advance @1400	Very late	>Z32
Amicide® Advance @1400 + Lontrel® Advanced @ 150	Very late	>Z32
Lontrel® Advanced @ 150	Very late	>Z32
UTC		

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The trial site was sown to faba beans the following year by the grower. The trial treatments were observed for crop establishment and early growth as measured by Normalised Difference Vegetation Index (NDVI) Results

## Results

### Weed control:

Weeds observed throughout the period of observations for this trial were Caltrop, goosefoot, sow thistle, Paterson’s curse, and white heliotrope. Details regarding weed control where adequate treatment effects were observable are detailed below-

### Caltrop

- At the first assessment timing of the 5/12/2023 ~ 2.4 cathead plants/m<sup>2</sup> had established in the untreated plots
- Only Amicide Advance®, Mateno Complete® and Rexade® applied at the early timing, reduced cathead populations.
- Only Grindstone® (aminopyralid 240 g/L), Lontrel® Advanced and Trezac® at mid-timing reduced cathead numbers.
- Late applications did not reduce cathead numbers.

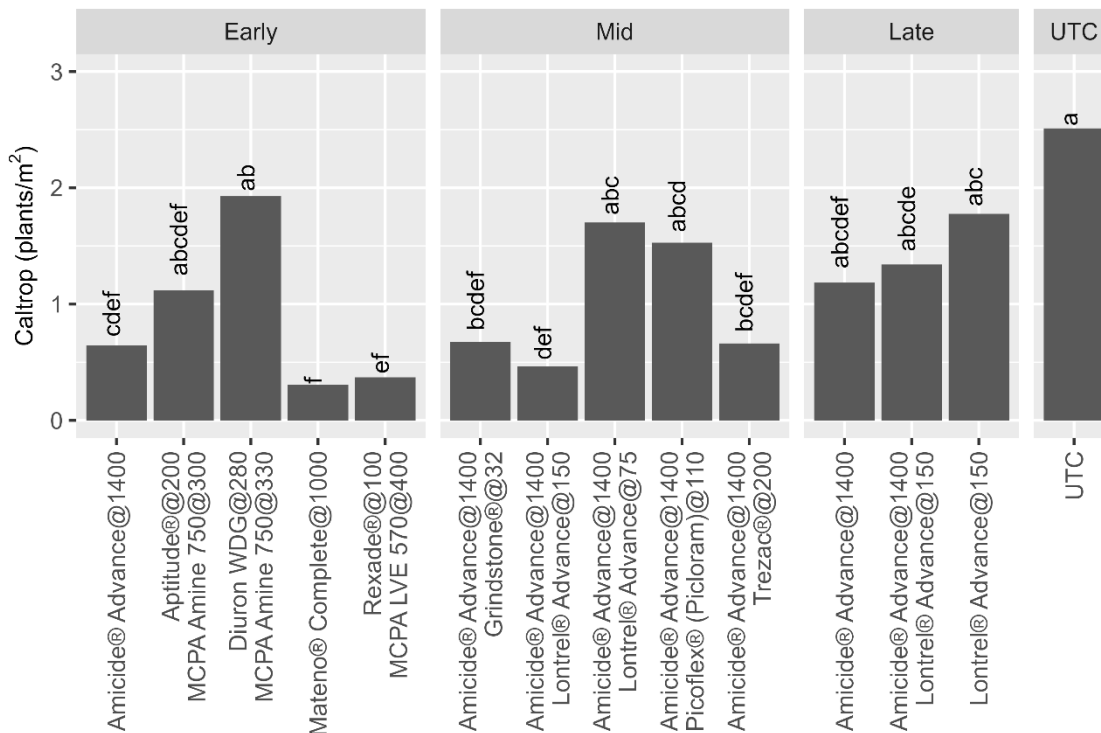


Figure 1 Number of surviving caltrop assessed early fallow period (5/12/2023). Data with the same letter is not significantly different (P<0.05).

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At the second assessment (11/01/2024) timing there was approximately 0.6 caltrop plants/m<sup>2</sup> and no treatment differences, at the last assessment (9/02/2024) there was less than 0.1 caltrop plants/m<sup>2</sup>, and no treatment differences.

## Goosefoot (*Chenopodium sp.*)

- At the first assessment timing the UTC had 4.6 plants/m<sup>2</sup>.
- No goosefoot was observed following Mateno Complete<sup>®</sup>
- No treatments applied at mid or late timing reduced goosefoot populations.

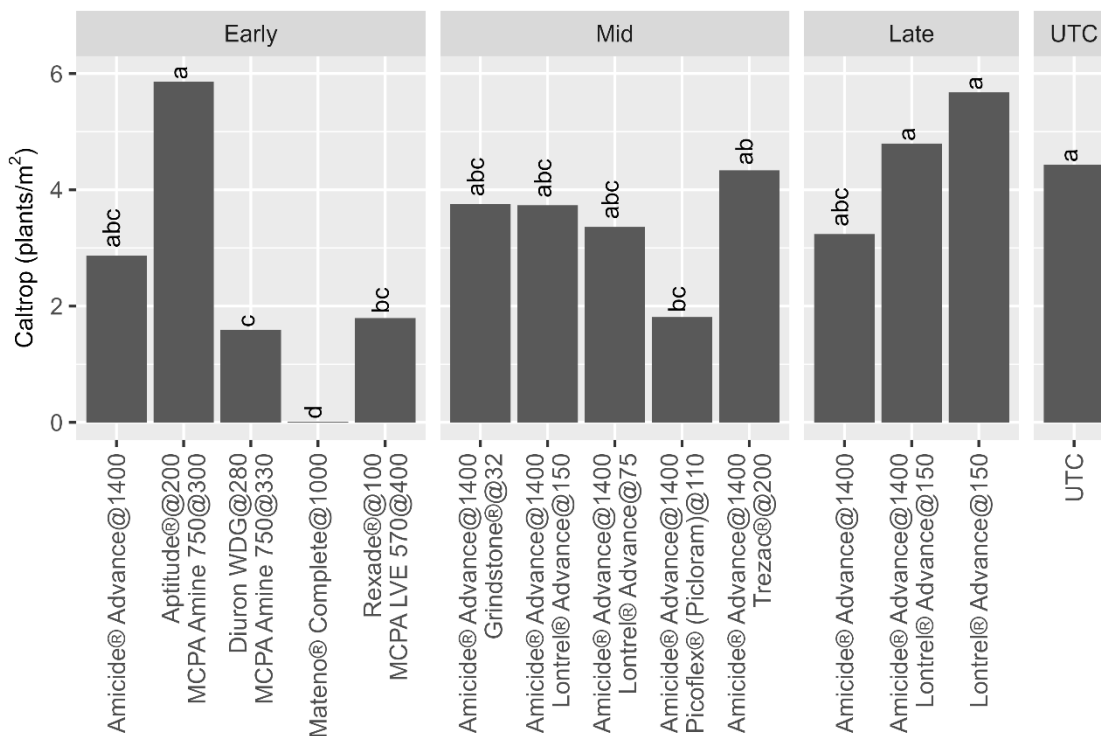


Figure 2. Number of surviving caltrop assessed early fallow period (5/12/2023). Data with the same letter is not significantly different ( $P < 0.05$ ).

Goosefoot populations were scored on the 11/1/2024 and the untreated scored an average of 3.5, which equates to 50-75% ground cover. Three treatments had lower scores than the untreated: Mateno Complete had a score of 0 (no plants present), Lontrel<sup>®</sup> Advance@150 Late and Diuron WDG@280 + MCPA Amine 750@330 Early had scores of approximately 1.5 (less than 25% ground cover).

At the last count on the 22/03/2024 the untreated had a population of approximately 1.8 plants/m<sup>2</sup>, only Lontrel<sup>®</sup> Advance@150 Late continued to have a lower population with 0.5/m<sup>2</sup>.

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## Sow thistle

- Untreated plots had 0.75 ST plants/m<sup>2</sup>.
- Mateno Complete® (early) alone and Picoflex™ (picloram240 g/L) and Trezac® (mid) reduced ST populations compared to the UTC but still resulted in up to 0.5 plant/m<sup>2</sup>.

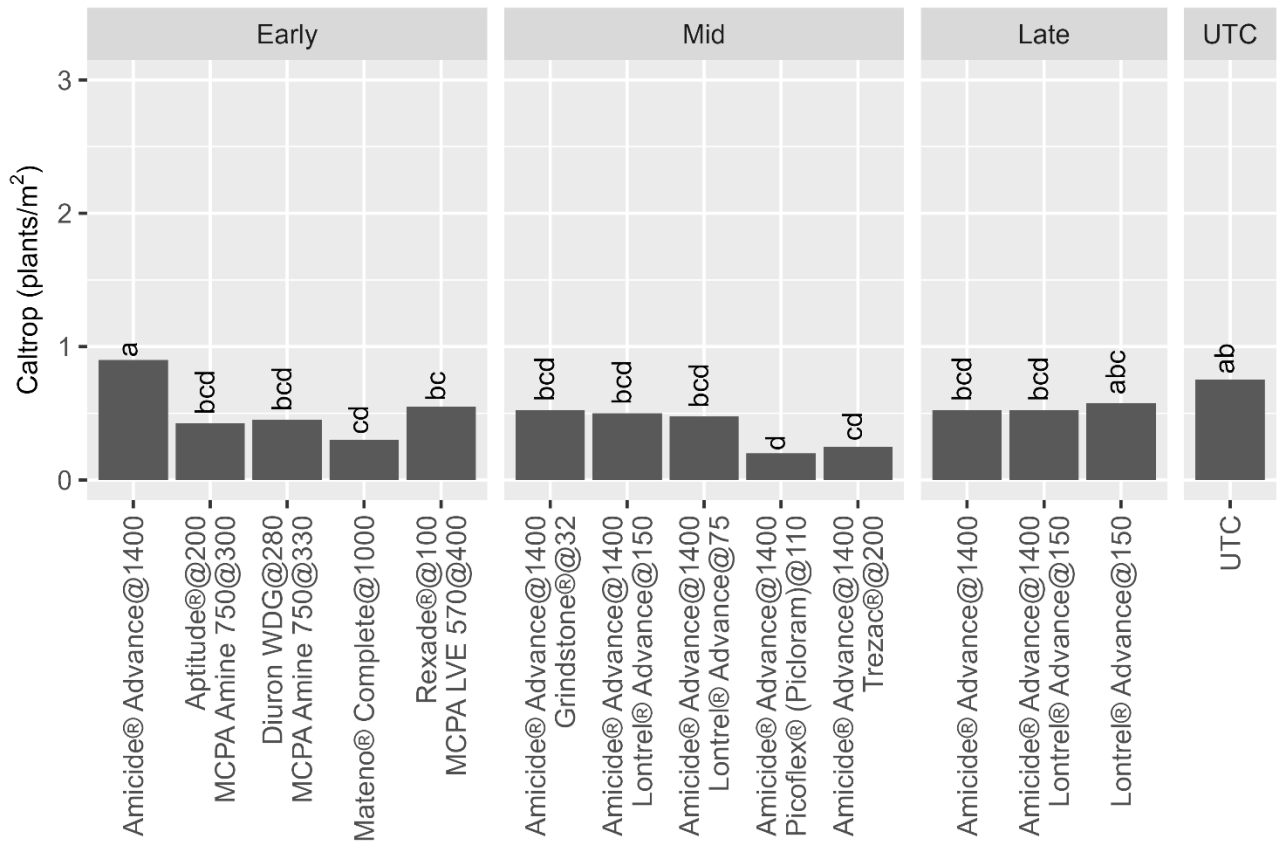


Figure 3. Number of surviving sow thistle assessed early fallow period (5/12/2023). Data with the same letter is not significantly different (P<0.05).

Populations of Patterson’s curse (average across trial of 1.2 and 0.7 plants/m<sup>2</sup> on the 2/02/2024 and 23/03/2024) and very low numbers of white heliotrope were present however there were no treatment differences.

### Establishment:

There was no treatment effect on the various herbicides on establishment or growth as measured by NDVI of the subsequent crop.

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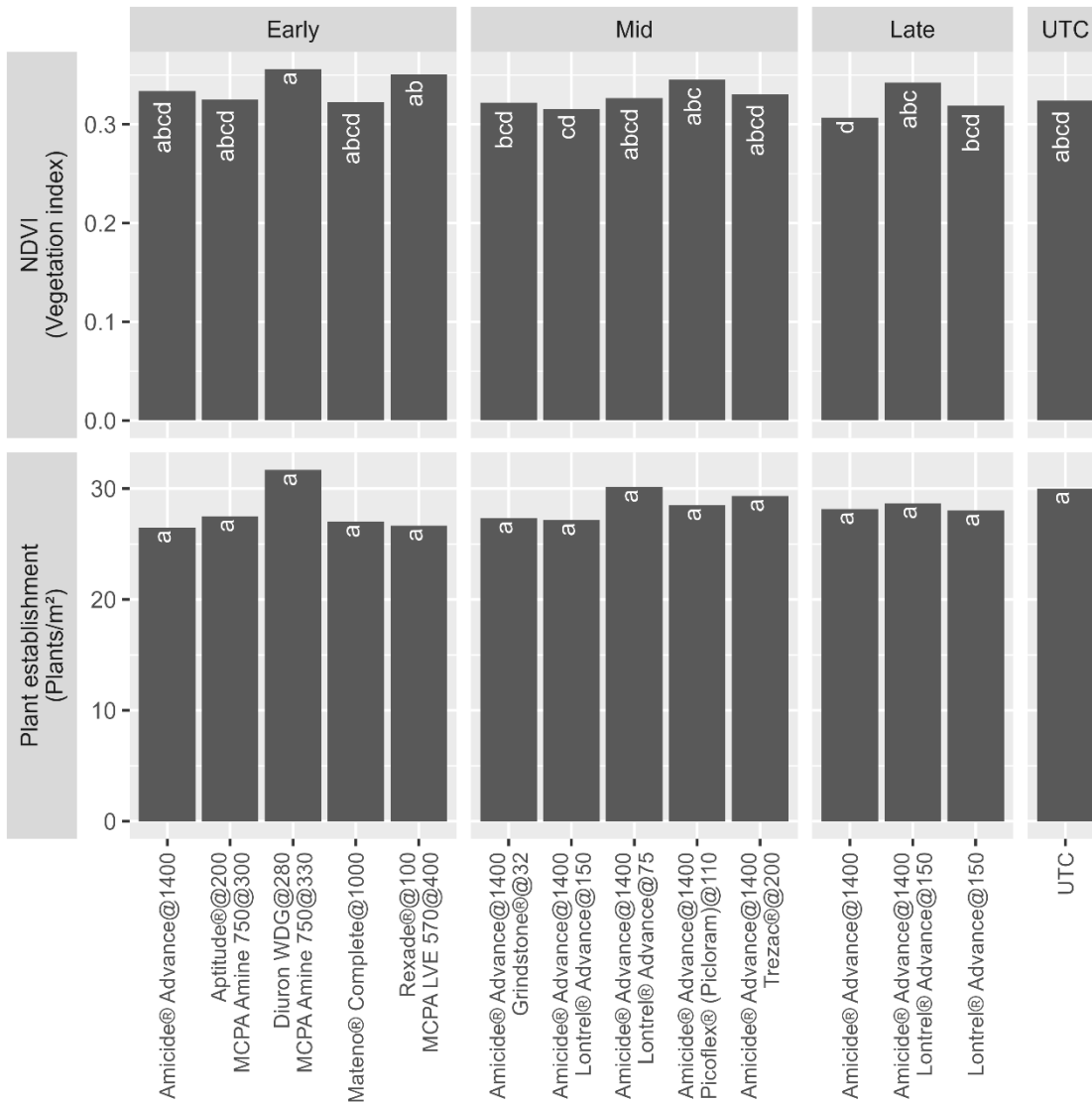


Figure 4 Crop establishment and vegetation index in the subsequent winter crop, assessed 12/06/2024. Data with the same letter is not significantly different ( $P < 0.05$ ).

## Discussion

Spring 2023 was dry and not particularly conducive with FB establishment, with none detected at this site. Despite the site being reported to previously have heavy burdens of the weed. Populations of cathead, goosefoot and ST were small with 2.4, 4.6, and 0.75 plants/m<sup>2</sup> measured in the UTC, respectively.

Several other weeds also were present in the fallow period following this trial that were unaffected by any of the treatments tested. This illustrates the limitation that residual herbicides may have in controlling a broad spectrum of weeds that are often present, which is not always possible. When some weeds are left uncontrolled, follow-up weed control will still be required and costs are incurred. This would limit any saving on herbicides or their application using residuals.

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However, there could be savings if this follow up spraying could be undertaken by the use of spot spraying technology which would result in lower proportions of the paddock need herbicide due to the reduced populations.

In light of this, several of the options tested did result in some impacts on goosefoot, caltrop and sow thistle.

Caltrop populations were reduced following applications of Amicide® Advance®, Mateno® Complete and Rexade®. The impact of the Amicide® Advance is unexplained due to the lack of residual capacity of the product and that the emergence of the caltrop would have been well after the application timing. This observation should not be relied upon in this circumstance.

The Rexade® and Mateno Complete, applied early, Grindstone® and Lontrel® Advanced applied at the mid-crop timing all reduced the populations but did not achieve 100% control so follow-up control would have still been required.

Mateno® Complete provided good control of goosefoot, and was the only product tested that resulted in 100% reduction in the weed population. All other treatments would have resulted in a need for follow-up control of the remaining populations.

All but 3 treatments reduced the ST populations, however, the reduction in plant numbers was not large. All treatments would require follow up treatment to control survivors.

Overall the control of all the weeds present was poor regardless of the products or timings. It is plausible that the level of canopy closure at some of the later timing may have intercepted some of the residual herbicides which in turn impacted the effectiveness of both the knockdown and residual herbicides tested.

## Conclusions

Applying residuals in crops to combat fleabane establishments may be unwarranted in dry springs as evidenced in this trial where none established despite a high weed seed bank.

Although there were some treatments that achieved reduction in some other weed species present, only Mateno Complete was able to achieve 100% reduction on one weed alone- goosefoot. In all other cases, either the residual population or other weeds that were unaltered by the residual products applied would require follow up weed control to maintain an effective fallow. As such there may be little savings possible in the management of the summer fallow though the use of the residual herbicides tested.

There may be some potential for growers to make some saving in chemical usage if this follow up control was undertaken using spot spray technology where the proportion of the paddocks would be lower due to a lower weed burden.

## Acknowledgements

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## Appendix

### Results

Timing	Product (rate)	Goosefoot		Sow thistle		Cat head		Plant establishment	Vegetation index (NDVI)			
		(plants/m2)										
Early	Amicide® Advance@1400	2.87	abc	0.90	a	0.64	cde	26.50	a	0.33	abcd	
	Aptitude®@200 + MCPA Amine 750@300	5.85	a	0.43	bcd	1.12	abc	27.50	a	0.33	abcd	
	Diuron WDG@280 + MCPA Amine 750@330	1.60	c	0.45	bcd	1.93	ab	31.67	a	0.36	a	
	Mateno® Complete@1000	0.02	d	0.30	cd	0.30	f	27.00	a	0.32	abcd	
	Rexade®@100 + MCPA LVE 570@400	1.80	bc	0.55	bc	0.37	ef	26.67	a	0.35	ab	
Mid	Amicide® Advance@1400 + Grindstone®@32	3.75	abc	0.53	bcd	0.68	bcd	27.33	a	0.32	bcd	
	Amicide® Advance@1400 + Lontrel® Advance@150	3.74	abc	0.50	bcd	0.46	def	27.17	a	0.32	cd	
	Amicide® Advance@1400 + Lontrel® Advance@75	3.36	abc	0.48	bcd	1.70	abc	30.17	a	0.33	abcd	
	Amicide® Advance@1400 + Picoflex® (Picloram)@110	1.81	bc	0.20	d	1.53	abcd	28.50	a	0.35	abc	
	Amicide® Advance@1400 + Trezac®@200	4.34	ab	0.25	cd	0.66	bcd	29.33	a	0.33	abcd	
Late	Amicide® Advance@1400	3.24	abc	0.53	bcd	1.18	abc	28.17	a	0.31	d	
	Amicide® Advance@1400 + Lontrel® Advance@150	4.80	a	0.53	bcd	1.34	abc	28.67	a	0.34	abc	
	Lontrel® Advance@150	5.68	a	0.58	abc	1.78	abc	28.00	a	0.32	bcd	
	UTC@~	4.43	a	0.75	ab	2.51	a	30.00	a	0.32	abcd	

### Spray application details

Spray application	Early Z14-Z20	Mid Z25->Z27	Very late >Z32
Date applied	20/07/2023	15/08/2023	11/09/2023
Start time	1:15 PM	12:15 PM	1:00 AM
Finish time	1:30 PM	2:10 PM	1:20 AM
Water rate (l/ha)	100	100	100
Speed (km/hr.)	5	8	5
Pressure (bar)	3	4	30psi
Equipment	Hand boom	Hand boom	Hand boom
Nozzle	Airmix 01	Airmix 01	Airmix 01
Boom height (cm)	50	60	1m
Temp (oC)	16.8	19.6	23.9
Wind velocity (km/hr.)	8-10km	4-6k	0-7k
Wind direction	N	W	E
Humidity (%)	43.2	45.2	31.1
Δt	7	6.4	11.2
Cloud cover (%)	0	0	0