Seed&Field

Technical Report

Efficacy of a range of pre-emergent herbicide products in a commercial onion planting in Onewhero, New Zealand.

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Summary

A field trial was established during spring 2024 to assess the effect of various pre-emergent herbicides on weed control and crop safety. The predominant weed species present in the field were *Anthemis cotula*- Mayweed, and *Lepidium didymium*- Twin cress. Several herbicides and herbicide mixes were shown to be providing significant weed control 33 days post herbicide application, with mixes containing Stomp Xtra, Prominent, and Chloronion having weed populations significantly lower than the untreated control. At the time of the second assessment (62 days post application) only treatments containing Prominent were providing significant levels of total weed control. There was a trend toward the addition of the adjuvant Backrow Max resulting in improved weed control. No crop damage was noted for any of the treatments included in this study.

Method

Experimental site and application details

An experimental area was established within a commercial onion planting of the cv. Seed & Field PLK in a block that was known to have high pressure mayweed, in Onewhero, New Zealand. The crop was seeded on the 10th of August 2024, and no pre-emergent herbicide was applied to the experimental area. The experimental design a randomised complete block design (RCBD) with four treatment replicates. A total of 18 treatments were included in the experiment (including an untreated control) (Table 1). Plots were one bed (1.72m) wide and 7m in length. Pre-emergent herbicide applications were made on the 16th of August 2024 and were applied using a CO2 powered plot sprayer using 11002 AITTJ60 teejet nozzles spaced at 30cm. The sprayer was calibrated to apply a water volume equivalent to 400L/Ha. No contact herbicides were made to the experimental area, all other growing practices were conducted as per the commercial crop.

Herbicide efficacy was assessed on the 18th of September, 33 days after treatment applications were made, and a follow up assessment took place on the 18th of October, 62 days after treatment applications were made. Weed species present were identified and counted from within a one-bed metre sampling area within each plot. Weed control efficiency was calculated based on the number of weeds present and was calculated using the formula below:

$$WCE(\%) = \ (WDc - WDt)/WDc \ \times 100$$

WCE = Weed control efficiency

WDc = Weed population of the untreated control

WDt = Weed population of the treated plot

Statistical analysis

Data were analysed using a 95% confidence interval. Analyses of variance (ANOVA) were computed using the statistical software ARM. Treatment means were separated using Duncans new multiple range test. As the LSD is computed using transformed data, comparisons of means should rely on the letters of separation, rather than the LSD value.

Table 1: Pre-emergent herbicide treatment details

Trt	Product name	Active ingredient	Rate/ Ha
1	Untreated	-	-
2	Stomp Xtra	Pendimethalin	500ml
3	Stomp Xtra + Backrow Max	Pendimethalin + Paraffinic petroleum oil	1L + 400ml
4	Stomp Xtra	Pendimethalin	1L
5	Ethomate	Ethofumesate	1L
6	Ethomate	Ethofumesate	2L
7	Ethomate	Ethofumesate	4L
8	Ethomate + Backrow Max	Ethofumesate + Paraffinic petroleum oil	4L + 400ml
9	Prominent	Prometryn	200ml
10	Prominent	Prometryn	400ml
11	Goltix	Metamitron	2L
12	Goltix	Metamitron	4L
13	Stomp Xtra + Ethomate + Chloronion	Pendimethalin + Ethofumesate + Chloridazon	500ml + 1L + 2L
14	Stomp Xtra + Ethomate + Chloronion + Backrow Max	Pendimethalin + Ethofumesate + Chloridazon + Paraffinic petroleum oil	500ml + 1L + 2L + 400ml
15	Foresite	Oxadiazon	50ml
16	Foresite	Oxadiazon	100ml
17	Chloronion + Ethomate	Chloridazon + Ethofumesate	2L + 4L
18	Chloronion + Ethomate + Backrow Max	Chloridazon + Ethofumesate + Paraffinic petroleum oil	2L + 4L + 400ml

Results

Crop Safety

No crop injury was observed at either of the assessment timings (33 and 62 days after application).

Herbicide efficacy- Assessment one

The predominant weed species identified in the trial area were mayweed and twin cress. Other weeds (Potato - *Solanum tuberosum*, Wireweed- *Polygonum aviculare*, Groundsel- *Senecio vulgaris*) were present in low numbers. At the first assessment on the 18th of September (Table 2), weeds were not identified to the species level, due to large numbers of pinhead weeds making identification difficult, hence these results are presented as a total weed population only. At assessment 1, treatments 2, 3, 9, 10, 14, and 18 all had weed populations that were significantly lower than the untreated control. Treatments 3, 8, 14, and 18 all contained the adjuvant product Backrow Max, results here indicate that the addition of Backrow Max has resulted in improved weed control efficacy when used with an effective herbicide mix.

Table 2: Effect of various pre-emergent herbicide treatments on total weed populations on the 18th of September (33 days after herbicide applications) in a commercial onion planting in Onewhero, New Zealand (presented as weed population per bed metre).

Treatment	Total Weed	WCE (%)
1	25.3 abc	-
2	8.5 def	66.4
3	6.5 efg	74.31
4	13.0 b-f	48.62
5	34.8 a	0
6	27.0 abc	0
7	31.1 ab	0
8	33.8 a	0
9	5.2 fg	79.45
10	2.8 g	88.93
11	20.1 a-d	20.55
12	32.8 ab	0
13	13.0 b-f	48.62
14	5.9 efg	76.68
15	17.5 a-d	30.83
16	15.0 a-e	40.71
17	11.4 c-f	54.94
18	2.4 g	90.51
LSD p=0.05	3.86-19.17	-
SD	0.23t	-
CV	20.15t	-
Shapiro-Wilk^	0.9727	-
P(Shapiro-Wilk)^	0.2048	-
Replicate F	0.834	-
Replicate Prob(F)	0.4835	-
Treatment F	8.017	-
Treatment Prob (F)	0.0001	-

*means followed by the same letter do not differ significantly (p=0.05, Duncans New MRT)

t= mean descriptions are reported in transformed data units, and are not de-transformed

^ calculated from residual

Herbicide efficacy- Assessment two

At assessment 2 (Table 3), weeds were identified to the species level, with treatments 2, 3, 6, 7, 8, 9, 10, 12, 13, 14, 15, 17, and 18 all having significantly lower twin cress populations than the untreated control. Only treatments containing Prominent (treatments 9 and 10) had mayweed and total weed populations that were significantly lower than the untreated control.

Table 3: Effect of various pre-emergent herbicide treatments on the predominant weed species, and total weed populations on the 18th of October (62 days after herbicide application) in a commercial onion planting in Onewhero, New Zealand (presented as weed population per bed metre).

Treatment	Twin Cress	Mayweed	Total Weed	WCE (Total) (%)
1	27.1 a	34.9 ab	70.5 ab	-
2	11.7 b	36.1 ab	50.7 a-d	28.09
3	10.4 b	31.2 abc	48.4 bcd	31.35
4	15.9 ab	38.4 ab	61.4 abc	12.91
5	14.9 ab	80.1 a	100.5 a	0
6	9.5 b	37.3 ab	58.2 abc	17.45
7	8.0 b	37.9 ab	59.3 abc	15.89
8	8.5 b	61.3 ab	76.0 ab	0
9	6.9 b	10.0 cd	19.5 d	72.34
10	13.4 b	8.7 d	25.3 cd	64.11
11	14.8 ab	49.1 ab	72.3 ab	0
12	6.4 b	55.8 ab	67.5 ab	4.26
13	5.9 b	42.0 ab	56.1 abc	20.57
14	5.8 b	23.6 a-d	35.6 bcd	49.50
15	9.5 b	20.3 bcd	38.3 bcd	45.67
16	14.3 ab	25.3 a-d	46.3 bcd	34.33
17	9.6 b	36.7 ab	51.8 a-d	26.52
18	6.2 b	32.3 abc	46.4 bcd	34.18
LSD p=0.05	8.16-11.91	17.33-51.89	29.36-44.80	-
SD	0.91t	0.31t	1.79t	-
CV	27.32t	20.42t	24.5t	-
Shapiro-Wilk^	0.9936	0.9828	0.9886	-
P(Shapiro-Wilk)^	0.9816	0.503	0.8153	-
Replicate F	2.016	0.462	0.227	-
Replicate Prob(F)	0.1244	0.7102	0.8770	-
Treatment F	2.410	2.242	2.221	-
Treatment Prob (F)	0.0090	0.0162	0.0172	-

*means followed by the same letter do not differ significantly (p=0.05, Duncans New MRT)

t= mean descriptions are reported in transformed data units, and are not de-transformed

^ calculated from residual

Future work

Future trials will look to further assess the efficacy of Prominent as a pre-emergence application, with a particular focus on crop safety. As Prominent is also commonly used as a contact herbicide, it would be interesting to assess whether we are getting additional residual herbicide benefits to contact applications. It appears that Ethomate has some efficacy on twin cress, and there did appear be a trend toward higher rates resulting in increased efficacy, future work should look to further assess this trend. Foresite was trialled at very low rates here, and future work should focus on increased rates to elucidate the effect of this herbicide on the weed species presented here.

Appendix:

Appendix i -Weather data

Date	August			September			October		
	Max (°C)	Min (°C)	Rainfall (mm)	Max (°C)	Min (°C)	Rainfall (mm)	Max (°C)	Min (°C)	Rainfall (mm)
1	-	-	-	16.7	7.8	0.2	16.5	11.1	0
2	-	-	-	18.7	8.5	0	16.5	12.4	36.2
3	-	-	-	17	9.1	3	15.3	8.8	0
4	-	-	-	13.9	5.9	0.4	16.5	10.4	0
5	-	-	-	13.6	9.7	1.8	17.6	12.6	4.2
6	-	-	-	14.3	10.7	1.6	17.2	13.4	37.8
7	-	-	-	15.4	9.8	6.2	16.2	12.1	2.4
8	-	-	-	13.8	9.3	0.4	16.1	12.5	5.6
9	-	-	-	15	10.9	0.2	14.4	8.6	0.8
10	-	-	-	15.1	10.2	3.8	14.3	7.4	7.8
11	-	-	-	13.2	7.4	0	15.3	9.1	0
12	-	-	-	12.6	9.2	0	13.9	10.6	0.4
13	-	-	-	15.1	10.1	0	16.3	8.8	10.6
14	-	-	-	16.3	9.9	27	13.8	8.5	2.2
15	-	-	-	13.1	8.3	0	13.6	8	0
16	15.1	10.3	0.8	13	7.9	13.6	17.7	8.8	0
17	15.1	11.1	28	11	5.6	9	17	9.4	0
18	16.5	9.4	3.4	12.4	7.8	1.8	15.9	10.4	0
19	11.9	8.1	7.4	14.5	9.9	18.6	-	-	-
20	11.8	7.2	2.4	12.4	10.1	10.6	-	-	-
21	12.9	8.1	1.6	15.7	9.8	0	-	-	-
22	14.6	9.2	0	18.4	9.9	0.2	-	-	-
23	15.6	10.5	1.2	14.7	11.2	0	-	-	-
24	13.8	8.3	4	14.9	9.6	0.2	-	-	-
25	14.6	8.1	0	13.6	8.4	0	-	-	-
26	16.7	9	2.4	14.8	11	0.4	-	-	-
27	15.1	11.8	6	12.8	8.4	0.8	-	-	-
28	15.1	10.9	0.4	14.4	9.6	0	-	-	-
29	16.7	10.5	14	14.1	8.9	0	-	-	-
30	15.2	10.4	0	16.4	10.7	0	-	-	-
31	17.7	14	19.4	-	-	-	-	-	-