Clopyralid for knockdown and residual control of flaxleaf fleabane in broadacre cropping and fallows

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Summary Flaxleaf fleabane (*Conyza bonariensis* (L.) Cronquist) is a weed of national significance in cereal crops, fallow land, roadsides and non-crop situations that is now found in every state of Australia. There are seven species of *Conyza* in Australia, but flaxleaf fleabane is most widespread and prevalent in broadacre cropping systems. Flaxleaf fleabane is hard to control due to the timing of emergence, rapid growth habit, limited herbicide options, increased tolerance to herbicides with maturity and large seedset (100,000 seeds per plant average). Uncontrolled flaxleaf fleabane seedset in any of these situations results in widespread dispersal as seed is moved readily in wind.

The aims of this work were to determine the rate of clopyralid (Lontrel™ Advanced Herbicide) to control seedling flaxleaf fleabane in crop and the length of residual control provided during the fallow phase.

Results have shown clopyralid applied in cereals provides excellent control of flaxleaf fleabane seedlings and residual control of new germinations.

Keywords Clopyralid, flaxleaf fleabane, in-crop control, fallow weeds, knockdown, residual control.

INTRODUCTION

Flaxleaf fleabane has become a major problem in southern parts of Australia, in crop, fallows and roadsides. Herbicides to control flaxleaf fleabane are limited and are not able to be used broadly due to lack of registrations, cost per hectare or limitations placed on subsequent crop rotations.

On the south coast of Western Australia's cropping region it was noted by several agronomists when clopyralid (Lontrel™ 750SG) was applied in crop there was a significant reduction in the emergence of flaxleaf fleabane plants in the summer fallow. Applications of clopyralid have since become an established practice in this region although not yet a registered use. This use pattern was also established after the wet summers experienced by much of the south eastern Australian cropping regions in 2011/12.

What was not well understood was what rate of clopyralid was required to give effective control of spring germinating flaxleaf fleabane and what rate would provide three or more months residual control.

Studies were completed to define rates of clopyralid for effective knockdown control of flaxleaf fleabane in crop and the length of residual control these rates would provide.

MATERIALS AND METHODS

Field trials Dow AgroSciences conducted four replicated small plot trials to determine what level of weed control and what length of residual control of flaxleaf fleabane was achieved at rates of 45, 60, 90 or 150 g a.e. ha^{-1} of clopyralid (Lontrel Advanced) when applied in-crop.

Trials were conducted at Walla Walla NSW, Young NSW and Lake King Western Australia. Treatments were applied in already established cereal crops or pastures that had small flaxleaf fleabane emerged or an expected population. Applications of Lontrel Advanced (Table 1) were made using precision gas powered hand-held boom with a spray delivery volume of 100 L ha^{-1} using AIXR110015 nozzles or similar. Experiments were designed as randomized complete block (RCB) with four replicates. Plot size ranged from 2.5 to 3 m × 10 m. Fleabane growth stage at time of application varied from 1 to 8 leaf stage depending on site (Table 2).

Table 1. Products used in clopyralid efficacy and residual trials.

Trade name	Active ingredient (g a.e. L^{-1})	Rates tested (g a.e. ha^{-1})
Lontrel Advanced	600 g clopyralid dimethylamine salt	45, 60, 90, 150

Table 2. Weed growth stages in trials.

Trial no.	Growth stage (leaf no.)	Size (cm)
136012MW	1–4 leaf	3 cm
132022CP	2–6 leaf	3–10 cm
132013CP	1–2 leaf	2–3 cm
KA13–713	2–8 leaf	3–10 cm

Assessment of weed control was conducted at four and six weeks after application. A percent scale was used for subjective visual assessment of control, were 100 = complete control. Assessments for residual control were conducted at approximately two and three months after application in trials KA13–713 and 136012MW. Assessment was made by applying a knockdown herbicide (glyphosate or paraquat + diquat) to half of the plot and then counting subsequent germinations of flaxleaf fleabane in a single one metre square quadrat.

Glasshouse trial A study was conducted at Charles Sturt University, Wagga Wagga NSW to determine the residual control of flaxleaf fleabane by clopyralid. The study was conducted as a RCB design at each sowing (clopyralid rate and rainfall being separate factors, each replicated four times) with pots filled with field soil collected from local farms. These pots were then watered to field capacity, left overnight and then sprayed (12th August 2013) with four rates of clopyralid using a spraying cabinet. Table 3 shows the clopyralid rates applied.

Table 3. Products used in clopyralid residual glasshouse study.

Trade name	Active ingredient (g a.e. L^{-1})	Rates tested (g a.e. ha^{-1})
Lontrel Advanced	600 g clopyralid dimethylamine salt	0, 30, 45, 90

Flaxleaf fleabane seeds were collected from paddocks around Wagga Wagga and then sown into pots containing treated soil, at about 500 seeds per pot. They were then covered with moist tissue towel to encourage germination. Pots were then placed in the glasshouse where the temperature remained constant at 21°C. Pots were also watered. All unsown pots were kept outside and subjected to two watering regimes (natural rainfall and additional irrigation).

Pots were sown at three different intervals after spraying, 2 DAA (days after application), 7 WAA (weeks after application) and 4.3 MAA (months after application). The number of emerged flaxleaf fleabane was counted in all pots after each time of sowing until no further emergence occurred.

RESULTS AND DISCUSSION

In the field trials, good to excellent knockdown control of small flaxleaf resulted at 42–56 DAA, even at the lowest rate of 45 g a.e. ha^{-1} of clopyralid, when applied in a cereal crop (Table 4).

Due to dry conditions prevailing after these trials were started, reliable residual data was unable to be obtained.

Results from the pot study showed very good levels of residual control of flaxleaf fleabane (3% emergence) when clopyralid was applied at 90 g a.e. ha^{-1} (150 mL ha^{-1} Lontrel Advanced) after the first sowing assessment (15 DAA). The treatment of 30 g a.e. ha^{-1} showed poor residual control of flaxleaf fleabane (Figures 1 and 2).

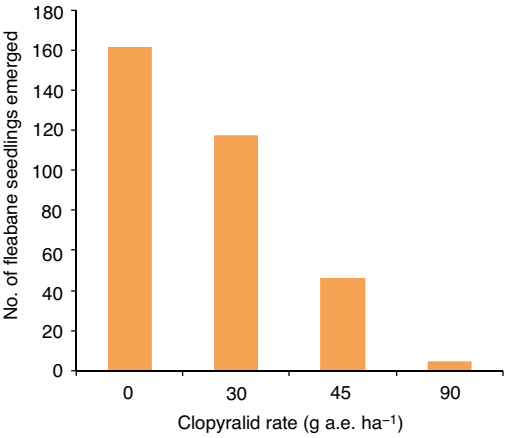

Figure 1. Effect of four soil applied rates of clopyralid on flax leaf fleabane emergence after first sowing – 15 DAA.

Table 4. Flaxleaf fleabane knockdown control by clopyralid.

Rate (g a.e. ha^{-1})	KA13-731	132022CP	132013CP	136012MW
45 g	71 bcd	100 a	91 de	86 e
60 g	80 ab	100 a	95 b-e	92 b-e
90 g	80 ab	100 a	100 a	91 cde
150 g	90 a	100 a	100 a	93 a-d
LSD (P = 0.05)	15.2	0	4.7	7

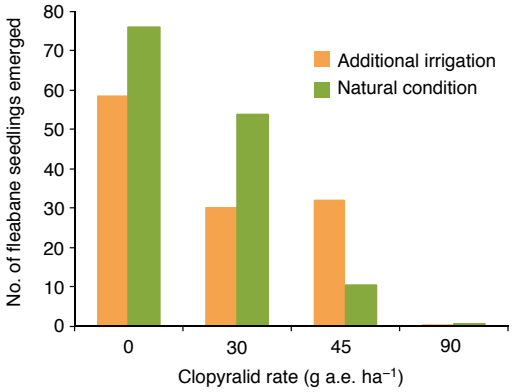

Figure 2. Emergence of flaxleaf fleabane 50 DAA either watered or natural rain treatment, and soil treatment with clopyralid at four rates.

At 50 DAA clopyralid at 90 g a.e. ha^{-1} gave excellent residual control with emergence being less than five plants per pot of flaxleaf fleabane (Figure 2).

At the lower rate of 30 g a.e. ha^{-1} of clopyralid additional irrigation reduced the number of emerged flaxleaf fleabane compared to natural rainfall. However, clopyralid at 45 g a.e. ha^{-1} reduced emergence in the pots subjected to natural rainfall. This could be due in part to the clopyralid breaking down quicker in moist and warm soil. However at 90 g a.e. ha^{-1} there was no difference in the level of residual control between the two watering regimes.

A third sowing was conducted at 108 DAA and then assessed for flaxleaf fleabane emergence 5 MAA. At this assessment differences between the treatments and irrigation timings were not identifiable and were due to flaxleaf fleabane not germinating once temperatures exceeded 30°C (Wu, Personal Communication, 2014).

CONCLUSION

Clopyralid when applied in cereal crops to small flaxleaf fleabane gave effective control (>80% control) when applied at a rate of 60 g a.e. ha^{-1} or higher. Clopyralid also provided residual control of flaxleaf fleabane when applied at 90 g a.e. ha^{-1} for up to 50 DAA and possibly longer depending on rainfall and soil temperature.

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