Fireweed response to boomspray applications of different herbicides and adjuvants

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Summary

Applications of bromoxynil to pastures in south-eastern Queensland have given inadequate control of fireweed (*Senecio madagascariensis* Poir.) under some conditions. Alternative chemicals registered for use in pastures, as well as a range of additives were compared in demonstration plots. 2,4-D amine (dimethylamine salt) and 2,4-D sodium salt gave the best control and did not damage beneficial species.

Introduction

Fireweed, *Senecio madagascariensis* Poir., has become a serious weed of improved and native pastures in south-eastern Queensland. It is a problem in a number of situations: in intensively managed pastures (e.g. kikuyu, *Pennisetum clandestinum* Chiov. and perennial rye grass, *Lolium* spp.) with high inputs of fertilizer and water, in native pastures (e.g. black spear grass, *Heteropogon contortus* (L.) Roem. & Schult.) with no inputs, and in areas where there is a legal obligation to eradicate the weed, as on roadsides or crown land.

Prolonged drought, overgrazing and inadequate control measures led to an alarming increase in this weed during the 1993 season. Fireweed has a tendency to form dense populations, quickly covering large areas of pasture. Boomspraying is the most practical and preferred method of treating the plant.

In 1993 the only registered herbicides for fireweed control were bromoxynil-based (P. Simpson, Queensland Standards Branch, personal communication). These appear to be effective in general (Launders 1979, 1984, Parsons and Cuthbertson 1992), but seem to perform best at higher altitudes in south-eastern Queensland. At low altitudes, sprayed plants have shown a tendency to reshoot from the base. Consultation at field days conducted by the Beaudesert Shire Council revealed that landowners were disappointed with the current recommendations for boomspraying fireweed. In 1993, landholders in the lowland district of Biddadaba had used bromoxynil at 2–6 L ha^{-1}, applied both by air and from the ground, with generally poor results.

Based on what landowners considered was affordable, i.e. up to \$50 ha^{-1}, a demonstration site was treated with herbicides suitable for use in a pasture situation. Also included were a variety of additives that could boost herbicide performance.

Materials and methods

The site was located on a property in the Biddadaba district, Beaudesert Shire, approximately 60 km south of Brisbane. The property was in an overgrazed condition owing to prolonged drought conditions. A dense fireweed infestation on a gently sloping hillside had been treated with bromoxynil at 3 L ha^{-1} in early May 1993. Initial results were satisfactory (brown-out) but by October, 5 months later, the weed had regrown to a height of 20–30 cm. Plants were in the final stages of flowering at the time of spraying (26 October 1993). Of interest in this district was fireweed's tendency to act as a perennial, surviving through the summer. Fireweed grew so densely on the plots that the foliage of adjacent plants touched. Pasture averaged 1 cm in height and consisted of blue couch, *Digitaria didactyla* Willd. and bladey grass, *Imperata cylindrica* (L.) Beauv., with sparse white clover, *Trifolium repens* L. This hillside was chosen because the aspect, soil type and slope were uniform.

Thirteen herbicide treatments (Table 1) were set out in a non-replicated randomized block design. Each block consisted of a herbicide applied to 5 separate plots, each measuring 4 m wide by 25 m long. A guard row of 1 m separated plots. The herbicide with no additives was applied to the first plot, followed by the application of a mixture of herbicide plus Codacide oil 0.5% v/v, LI700 0.5% v/v, Freeway 0.2% v/v, or Ulvapron 1.0% v/v, each as a separate plot. To minimize variation caused by hillside slope, the plots were set out running downhill.

A 4 m boomspray with red fan nozzles (BCPC F80/1.2/3), fitted to a quad bike driven at 5.4 kph, produced an even spray pattern at 2 bar pressure. Water sensitive papers were positioned in the control plot. Visual inspection indicated a uniform spray coverage of the plants at 200 L ha^{-1}. Most of the spraying was carried out during the hottest part of the day (11.00–15.00 h).

The herbicides that were tested are listed in Table 1. Owing to its previous failure (at the recommended rate) to

Table 1. Herbicides tested in the field trial.

Herbicide	Product name	Rate ha^{-1}
2,4-D dimethylamine salt	Amisol	3.2 kg
2,4-D sodium salt	Tornado DF	2-4 kg
Dichlorprop potassium salt	DP600	5 L
Dicamba dimethylamine salt	Banvel 200	1.25 L
Metsulfuron methyl	Brushoff	40-80 g
Clopyralid monoethanolamine	Lontrel	2.5-5 L
Triclopyr butoxyethanol ester	Garlon 600	1 L
Triclopyr butoxyethanol ester plus picloram triisopropanol amine	Grazon DS	1 L
Atrazine plus 2,4-D sodium salt	Nutra D	6 L

Table 2. Effect of different herbicides without additives on fireweed (12 weeks after treatment), grass and clover (7 weeks after treatment).

Herbicide	Rate ha^{-1} (in 200 L water)	Cost ha^{-1} (\$)	Rating[A]		
			Fireweed	Grass	Clover
2,4-D amine	3.2 kg	28.00	4	1	1
2,4-D sodium salt	4.0 kg	35.60	5	1	1
2,4-D sodium salt	3.0 kg	26.70	4	1	1
2,4-D sodium salt	2.0 kg	17.80	4	1	1
Diclorprop	5.0 L	41.25	2	1	1
2,4-D + Dicamba	1.6 L 1.25 L	35.25	3	1	1
Metsulfuron methyl	80 g	124.00	5	1	5
Metsulfuron methyl	40 g	62.00	5	1	3
Clopyralid	5.0 L	236.20	4	1	3
Clopyralid	2.5 L	118.10	4	1	3
Atrazine/2,4-D	6.0 L	39.00	3	3	3
Triclopyr	1.0 L	61.00	2	1	4
Triclopyr/picloram	1.0 L	43.75	2	1	4

[A] Efficacy rating: 1=unaffected, 5=dead.

control fireweed at this site, bromoxynil was not included in the trial. Herbicide efficacy was determined using a mortality rating scale of 1 (alive) to 5 (dead) (Australian Weeds Committee 1979).

Results

Of the different herbicide groups tested, 2,4-D formulated as the amine or sodium salt caused the highest mortality of fireweed (Table 2). A major concern during this trial was the condition of non-target pasture species, especially blue couch and clover. While the 2,4-D formulations damaged neither of these species, atrazine plus 2,4-D caused severe damage to both the grass and clover. Clover was badly injured by metsulfuron methyl, clopyralid, triclopyr and triclopyr plus picloram (Table 2).

Discussion

In this trial the herbicide 2,4-D, formulated as either the amine or sodium salt, and used with appropriate adjuvants (Table 3), gave excellent control of fireweed without damaging beneficial species. The addition of Codacide oil and Ulvapron improved the initial knockdown but did not justify the extra expense in the final assessment. The cost of materials for the effective treatments was in the range of \$30–33 ha^{-1}.

Table 3. The effect of herbicide and adjuvant combinations on fireweed 12 weeks after treatment.

Adjuvant		Herbicide and rate of application ha^{-1}			
Product	Extra cost (\$/ha)	2,4-D amine (3.2 L)	2,4-D sodium salt (3 kg)	Dichlorprop (5 L)	2,4-D amine + dicamba (2.5 L + 1.25 L)
Nil	0.00	4[A]	4	2	3
Codacide oil	5.20	5	5	2	3
LI700	6.50	5	4	3	4
Freeway	9.60	4	5	3	3
Ulvapron	4.10	5	5	3	3

[A] Efficacy rating: 1=unaffected, 5=dead.

The 2,4-D formulations should be appropriate for fireweed control in most situations in south-eastern Queensland. However, there is a need for further experimental work to substantiate the observations made in this demonstration.

Acknowledgments

The assistance of Mat Gallagher of Nufarm Ltd. and Mein Niemyer of Beaudesert Shire Council in setting out the trial is gratefully acknowledged. Trevor Armstrong provided helpful ideas and comments when preparing this paper.

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