BROADSTRIKE* (FLUMETSULAM) ALONE AND WITH PARTNER HERBICIDES ON BROADLEAF WEEDS IN UNDERSOWN CEREALS AND PASTURES, SOUTHERN NEW SOUTH WALES, AUSTRALIA

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Abstract Broadstrike (800 g a.i. kg⁻¹ flumetsulam as a water dispersible granule) at 20 g ha⁻¹ with an adjuvant controls Shepherd’s purse (Capsella bursa-pastoris (L.) Medik), marshmallow (Malva parviflora L./Boiss) and Indian hedge mustard (Sisymbrium orientale Torn), but generally needs a partner herbicide for reliable control of wild radish (Raphanus raphanistrum L.) (bromoxynil), capeweed (Arctotheca calendula L.) (bromoxynil, diuron, terbutryn), Paterson’s curse (Echium plantagineum L.) (bromoxynil, terbutryn, diuron, simazine and MCPA), fumitory (Fumaria spp.) (terbutryn) and wireweed (Polygonum aviculare L.) (2,4-DB amine). The partner herbicide selected would depend on the weed spectrum and crop situation. These mixtures are on the new (September, 1998) Broadstrike label.

Flumetsulam (20 g ha⁻¹) has a niche market as a salvage spray for the control of flowering Shepherd’s purse, wild radish and other brassica weeds in undersown crops and pastures. Registration is pending for salvage spray applications, for wild radish and turnip weed.

Spray volume rate trials with flumetsulam (20 g ha⁻¹) for wild radish control showed that increasing water rates from 25 to 50, 75 or 100 L ha⁻¹ improved the reliability of wild radish control substantially.

INTRODUCTION

During the winter cropping seasons of 1992 to 1998, seventy flumetsulam trials were conducted by the author in southern New South Wales. Most of these trials were post-emergent applied winter broadleaf weed efficacy trials where flumetsulam was either applied alone or with partner broadleaf herbicides. There were also some wild radish water rate comparison trials and late season salvage spray trials.

MATERIALS AND METHODS

Trials were conducted in farmer’s paddocks using natural weed populations and were laid in a randomized complete block design. Most plots were 3 m wide by 8 m long and were sprayed with a propane powered Azo Precision Plot Sprayer and a hand held boom fitted with six flat fan nozzles at 50 cm centres, calibrated to spray 100 L ha⁻¹.

Spray volume comparison trials were sprayed with a motor bike mounted 6 m boom and water rates were adjusted between 25, 50, 75 and 100 L ha⁻¹ by changing the nozzle size and/or varying speed. These plots were 6 m wide and 20 m long.

Weed control in all trials had been assessed by visual ratings and recorded as percent control.

RESULTS AND DISCUSSION

Efficacy - Broadstrike alone Flumetsulam at 20 g ha⁻¹ + Uptake* Spraying Oil at 0.5% v/v gave 100% control (eight trials) of Shepherd’s purse at various growth stages, 98% control (two trials) of four leaf marshmallow and 98% control (three trials) of two to six leaf Indian hedge mustard. Commercially, flumetsulam has given reliable control of most of the annual brassica plant species, apart from wild radish.

Efficacy of flumetsulam + partner herbicides Wild Radish Results with flumetsulam at the label rate of 20 g ha⁻¹ + Uptake Spray Oil can be variable and are size and climate dependent. Numerous trials were conducted by the author to improve reliability of wild radish control.

In four trials on two to four leaf wild radish with flumetsulam at 20 g ha⁻¹ + Uptake Spraying Oil at 0.5% v/v, the average control was 92% with a range of 90% to 97%. This treatment applied at the five to ten leaf stage gave an average control of 73% in five trials with a range of 67% to 75%.

The addition of bromoxynil (200 g a.i. L⁻¹) at 140 g ha⁻¹ to the above rate of flumetsulam, improved average control on two to four leaf wild radish to 94% with a range of 88% to 100% in four trials. At the five to ten leaf stage, the average control was 91% in four trials with a range of 78% to 96%. The addition of bromoxynil to flumetsulam improved reliability on wild radish, while broadening the weed spectrum to control other weeds such as capeweed, while still maintaining very good selectivity to seedling clover.
(Trifolium spp.) and lucerne (Medicago sativa L.) in the undersown situation.

Another area researched with flumetsulam for wild radish control was spray volume.

Flumetsulam at 20 g ha\(^{-1}\) + Uptake Spraying Oil at 0.5% v/v was applied at 25, 50, 75 and 100 L ha\(^{-1}\) in four trials conducted over two years. In two of these trials, the 25 L ha\(^{-1}\) water rate had the Uptake concentration increased to 1% v/v and in another two trials, the Uptake concentration was increased to 1% v/v at the 100 L ha\(^{-1}\) rate. The wild radish in these trials ranged from three to six leaf.

Increasing the water rate from 25 L ha\(^{-1}\) to 50 L ha\(^{-1}\) improved control of the wild radish substantially in all trials. There was also a slight improvement in control by increasing the water rates from 50 L ha\(^{-1}\) to 75 and to 100 L ha\(^{-1}\). The addition of bromoxynil at 140 g ha\(^{-1}\) to the above rate of flumetsulam at the 25 L ha\(^{-1}\) water rate improved the level of control from 8% to 84% and from 85% to 91% at the 50 L ha\(^{-1}\) water rate. The addition of bromoxynil to flumetsulam with lower water rates will improve the reliability for wild radish control as well as broadening the weed spectrum.

Increasing the adjuvant level at the 25 L ha\(^{-1}\) rate also improved the level of control from 8% to 77%, but not to a commercially acceptable standard. The increased adjuvant rate at 100 L ha\(^{-1}\) also improved activity slightly.

When the 100 L ha\(^{-1}\) rate with the 0.5% v/v rate of Uptake was applied on dusk in one of these trials, the level of wild radish control was zero. This supported the author’s prior belief that flumetsulam needs adequate sunlight to be most effective on wild radish.

**Capeweed** The most common broadleaf weed in the area, and one on which flumetsulam displays minimal activity. It was imperative that a reliable mixing partner could be found. Fortunately, flumetsulam is a very compatible mixing partner, which increases the number of candidates available.

For the undersown situation, bromoxynil, at 140 g ha\(^{-1}\), was the best partner as it compliments flumetsulam’s selectivity to seedling clover and lucerne. The important point when using this mix is to apply it to small (<four leaf) target weeds for best results.

Flumetsulam + terbutryn (500 g a.i. L\(^{-1}\)) was also an effective mix for capeweed control and can also be used in the undersown situation too, but at the rate of 250 g ha\(^{-1}\) needed for the most reliable control of capeweed can cause too much damage to the undersown legumes. This rate can be used selectively in established pasture.

Flumetsulam + diuron (800 g a.i. kg\(^{-1}\)) at 240 g ha\(^{-1}\) (mature lucerne only) and flumetsulam + simazine (500 g a.i. L\(^{-1}\)) also gave reliable control of capeweed, but are only recommended for use in the established pasture market. Simazine is generally used for Vulpia spp. control at the 625 g ha\(^{-1}\) rate in southern New South Wales.

**Paterson’s Curse** Flumetsulam alone at 20 g ha\(^{-1}\) plus adjuvant will control Paterson’s curse up to the four leaf stage in most situations. This rate will also give impressive biomass reduction on much larger plants, but it generally needs a partner for total control, especially in established pasture where generally by the time of spraying, most of the target weeds are well past the four leaf stage.

Bromoxynil (140 g ha\(^{-1}\)) is again the best partner for flumetsulam (20 g ha\(^{-1}\)) in the undersown situation. Terbutryn at the 150 g ha\(^{-1}\) rate can be suitable for undersown crops, but this rate can check seedling clover and lucerne plants in some situations.

Terbutryn (150 and 250 g ha\(^{-1}\)), simazine (250 and 625 g ha\(^{-1}\)), MCPA amine (500 g a.i. L\(^{-1}\)) at 250 g ha\(^{-1}\) (clover only) and diuron at 240 g ha\(^{-1}\) (mature lucerne only) are suitable partners for the established pasture market. Bromoxynil can also be used in this market with great success, as long as the target weeds are small at application.

**Fumitory** Five different species of fumitory are found in southern New South Wales, of which three species, denseflower (Fumaria densiflora DC.), common (F. officinalis L.) and bastard (F. bastardii L.), were treated in this group of trials. Flumetsulam at 20 g ha\(^{-1}\) + Uptake Spraying Oil at 0.5% v/v displays little activity on any of these species when applied alone.

Terbutryn at 100 or 150 g ha\(^{-1}\) + flumetsulam (20 g ha\(^{-1}\)) displayed good synergism on all three fumitory species. The ranking for this mix from the most susceptible species to least was bastard, common and denseflower fumitory. Terbutryn at these rates, when applied alone, generally would not control these species. No other partner herbicides displayed this synergism on any fumitory species.

Most agronomists and farmers do not confidently identify the different fumitory species, therefore it is best to use the 150 g ha\(^{-1}\) rate of terbutryn with flumetsulam to ensure reliable control over all species of fumitory.
**Wireweed**  Flumetsulam at 20 g ha\(^{-1}\) alone on wireweed will give variable results, which are best when the wireweed is small and growing conditions are good and temperatures are on the rise.

2,4-DB amine (500 g L\(^{-1}\)) at 500 and 750 g ha\(^{-1}\) has shown to be the best partner with flumetsulam for wireweed control, displaying exceptional synergism both in field trials and commercial use.

2,4-DB, like flumetsulam appears to improve in activity as temperatures rise, and is therefore not at its best with flumetsulam during winter. Unlike most of the other winter weeds, wireweed generally germinates in late winter, which means that the time to treat wireweed generally coincides with the arrival of warmer temperatures, which benefits both flumetsulam and 2,4-DB.

**Salvage Spraying**  Salvage sprays are applied late in the season when the target weeds are flowering and before viable seed is set. Salvage spraying is a technique for reducing weed seed banks in the following seasons.

Flumetsulam at 20 g ha\(^{-1}\) has established itself in this market for the control of Shepherd’s purse, wild radish and most other annual brassica weeds. These sprays coincide with warmer weather, which is when Broadstrike displays its highest level of efficacy. So the results are generally very reliable.

In the established and undersown pasture markets, flumetsulam is the only product with enough selectivity to the legumes to be used in this way.

**CONCLUSIONS**

Flumetsulam had less than expected initial success in the market place due to narrow product weed spectrum and variable results on wild radish. The results from these trials have helped to expand flumetsulam’s registered uses, improve reliability for wild radish control and establish niche markets in southern and central New South Wales. The end result has been the acceptance of flumetsulam by distributors and the farming community and improving sales for the product.

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