ADVANCING SPLATTER GUN TECHNOLOGY FOR RANGELAND WEEDS

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ABSTRACT

To determine whether more rangeland weeds could be susceptible to low-volume high-concentration herbicide applications (e.g., splatter guns), trials were initiated on gamba grass (*Andropogon gayanus*), rubber vine (*Cryptostegia grandiflora*), prickly acacia (*Vachellia nilotica*), and Chinee apple (*Ziziphus mauritiana*). For gamba grass, a rate response trial (0, 9, 18, 27, 36, 45 and 54 g a.i./L of mixture) of glyphosate has shown that 100% mortality can be achieved at rates ≥ 36 g a.i./L of mixture. A rubber vine trial is comparing the effect of timing of applications (between December and May) of two herbicides. Six months after treatment (MAT), Grazon™ Extra (triclopyr/picloram/aminopyralid) recorded the highest (i.e. December application) but most variable efficacy (0-80%) compared to 40-70% for Brush-off® (metsulfuron-methyl). The optimum way to spray plants using Hotshot™ (aminopyralid/fluroxypyr) is being investigated in a prickly acacia trial. Preliminary results, six MAT suggest that more severe damage occurs if the amount applied is calculated on the basis of the whole surface area of plants (i.e. both sides), but spraying from one side appears to be sufficient. For Chinee apple, a screening trial of five herbicides and two rates is showing that Brush-off® (metsulfuron-methyl) and Stinger™ (aminopyralid/metsulfuron-methyl) are the best performing herbicides, but only on smaller plants (< 2 m high) and at the highest applied rates 12 MAT. While promising, the variability in results indicates that many factors may affect efficacy, including the health, size and density of plants, herbicide choice and mixture/application rate, presence/absence of biological control agents and climatic conditions.

Keywords: Chinee apple, gamba grass, prickly acacia, rubber vine, woody weeds.

INTRODUCTION

Low-volume high-concentration foliar spraying using equipment such as splatter guns, has proven a practical alternative to traditional high volume foliar techniques for control of some remote and/or difficult to access invasive weeds, such as lantana (*Lantana camara*), bellyache bush (*Jatropha gossypiifolia*) and Siam weed (*Chromolaena odorata*) (Somerville *et al*. 2011, Brooks *et al*. 2014). Other demonstrated benefits include reduced treatment times and labour costs, as well as minimal off-target damage (Somerville *et al*. 2011). In this paper, we provide a summary on the progress of a Commonwealth Government funded research project investigating whether more rangeland weeds can be controlled using this technique. The weeds being studied are three Weeds of National

Significance [gamba grass (*Andropogon gayanus*), prickly acacia (*Vachellia nilotica*), rubber vine (*Cryptostegia grandiflora*)] and Chinee apple (*Ziziphus mauritiana*).

MATERIALS AND METHODS

Targeted weeds

Gamba grass

At a site near Mt Garnett in north Queensland, a rate response trial using seven different concentrations of glyphosate (0, 9, 18, 27, 36, 45 and 54 g a.i./L of mixture) was implemented in April 2018. The site was slashed in December 2017 to overcome variability in height of plants due to grazing. At the time of application, the gamba grass regrowth averaged 1.9 ± 0.3 m tall.

Rubber vine

Given the variability in efficacy obtained from earlier splatter gun trials on rubber vine (see Campbell *et al*. 2016), further research was initiated in an attempt to define the optimal conditions (i.e. considering factors such as plant size, level of leaf rust and climatic conditions) for effective rubber vine control using splatter gun technology. On a cattle property about 30 km north-east of Charters Towers in northern Queensland, a factorial experiment commenced in December 2017. It incorporates six spraying times (c.a. four weeks apart between December and May) and three herbicide treatments; untreated control, Brush-off® (metsulfuron-methyl) at 3.6 g a.i./L of mixture and Grazon™ Extra (triclopyr/picloram/aminopyralid) at 15/5/0.4 g a.i./L of mixture. Rubber vine plants were on average 2.2 ± 0.5 m high and 3.1 ± 1.1 m wide.

Prickly acacia

In earlier screening trials, Hotshot™ (aminopyralid/fluroxypyr) was identified as the most effective herbicide option. An additional trial was established in April 2018 at a site near Aramac in north-west Queensland to determine whether plant size influences the amount of mixture to be applied, as well as the way plants should be sprayed. Small (average of 1.4 ± 0.4 m tall) and large (average of 2.7 ± 0.4 m tall) prickly acacia plants have been sprayed with Hotshot™ (aminopyralid/fluroxypyr). A mixture rate of 0.7/9.8 g a.i./L was applied at two rates (i.e. based on 10 mL/m^2 of the surface area of single or double sides of plants) to either a single or both sides of plants.

Chinee apple

A trial was initiated near Charters Towers in March 2018 to screen five herbicides at two rates, against an untreated control. Smaller (average of 1.4 ± 0.3 m tall) and larger (average of 2.4 ± 0.3 m tall) Chinee apple plants have been sprayed with Hotshot™ (aminopyralid/fluroxypyr) at 0.7/10 and 1.4/20 g a.i./L of mixture, Stinger™ (aminopyralid/metsulfuron-methyl) at 1.5/1.2 and 4.5/3.6 g a.i./L of mixture, Starane™ Advanced (fluroxypyr) at 10 and 20 g a.i./L of mixture, Brush-off® (metsulfuron-methyl) at 1.2 and 3.6 g a.i./L of mixture, and Grazon™ extra (triclopyr/picloram/aminopyralid) at 10.5/3.5/0.3 and 15/5/0.4 g a.i./L of mixture.

Spraying

Treatments were implemented using either a gas or manually operated splatter gun (N.J. Phillips®). Each herbicide mixture received 2 mL/L of the non-ionic

wetter/spreader/penetrant Pulse® (Nufarm) (1020 g/L polyether modified polysiloxane) and in some instances 1 mL/L of red Spraymate™ Spray Marker Dye (150 g/L Rhodamine B). Unless outlined otherwise in the above sections, 10 mL of mixture was applied per metre squared of surface area of the plant (Chinee apple, prickly acacia, rubber vine) or 4 mL of mixture/0.5 m height (gamba grass).

PRELIMINARY RESULTS

Gamba grass

Gamba grass mortality increased linearly with increasing rates of glyphosate, until 100% mortality was recorded at a rate of 36 g a.i./L of mixture.

Rubber vine

Six MAT herbicide efficacy varied depending on the herbicide and the spraying times. Grazon™ Extra (triclopyr/picloram/aminopyralid) recorded the highest overall mortality (80%) from the December 2017 application, but it also had the greatest variability overall, ranging from 0–80% mortality across the six spraying times. In contrast, the highest mortality (70%) for Brush-off® (metsulfuron-methyl) was after spraying in January 2018 and mortality ranged between 40–70%.

Prickly acacia

Despite high brown out six-weeks after treatment (84–100%) plant size had no discernible effect on regrowth of herbicide treated plants and no herbicide treated plants had died six MAT. However, branch death was generally more severe when the amount of herbicide mixture applied was calculated based on the whole surface area of plants (i.e. both sides) and applied to one side of plants.

Chinee apple

Twelve months after treatment, Brush-off® (metsulfuron-methyl) and Stinger™ (aminopyralid/metsulfuron-methyl) are the best performing herbicides, but only at the higher rates of 3.6 and 4.5/3.6 g a.i./L of mixture, respectively. However, control of larger plants (> 2 m in height) using both herbicides was poor with only 26% showing no signs of live growth. Efficacy was much higher for smaller plants less than 2 m in height, averaging 72% and 92% mortality for Brush-off® (metsulfuron-methyl) and Stinger™ (aminopyralid/metsulfuron-methyl), respectively.

DISCUSSION

The preliminary results from the current trials on gamba grass, rubber vine, prickly acacia and Chinee apple highlight the potential of splatter gun technology for rangeland weeds, but also demonstrate the variable responses that can occur. Gamba grass was highly susceptible, but whether similar results can be achieved on mature plants that contain a combination of new and old growth is the focus of further research. The differential responses obtained in the rubber vine trial where mortality varied between 0 to 80% depending on the timing of application and the herbicide used (i.e. triclopyr/picloram/aminopyralid or metsulfuron-methyl) is consistent with earlier trials

(Campbell *et al*. 2016), and suggests that a number of factors may be influencing efficacy using this technique. Similarly, the ongoing Chinee apple trial is producing mixed results across the size classes. This indicates that either larger plants are more tolerant or, that insufficient herbicide was applied to them to cause mortality. The treatment effects should become clearer in the second year of assessment. Preliminary findings from the prickly acacia work suggests that the way plants are sprayed and how the amount of mixture to apply is calculated can influence plant damage, although further monitoring is also needed to see if this translates into higher mortality, and whether or not a size class effect becomes evident.

Based on the findings to date, some of the key factors that appear to have contributed to variability in efficacy, particularly for the woody weeds, include the health, size and density of plants, herbicide choice and mixture/application rate, presence/absence of biological control agents (i.e. presence of the leaf rust *Maravalia cryptostegiae* on rubber vine) and climatic conditions. This is similar to previous reports for variability in herbicide applications on rangeland weeds (Vitelli and Pitt 2006). On-going monitoring of the current trials and implementation of new research will help refine this technique.

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