Expanding the range of control options for *Calotropis procera* (rubber bush) in the Barkly Tablelands

Meg Humphrys[A], Shane Campbell[B] and Daniel Steel[A]

[A]Department of Land and Resource Management, PO Box 846, Tennant Creek, Northern Territory, 0860. E: Meg.Humprhys@nt.gov.au

[B]Department of Agriculture, Fisheries and Forestry, Tropical Weeds Research Centre, PO Box 187, Charters Towers, QLD, 4820

Keywords: Calotrope, chemical, rangelands, threat, weed

Abstract

The exotic shrub *Calotropis procera* (Aiton) W.T. Aiton (rubber bush) is spreading throughout the Barkly Tablelands region (Northern Territory) where land managers are concerned about apparent impacts. A mixed herbicide trial was established under extensive pastoral conditions within the Barkly Tablelands region as part of a collaborative project funded by Meat and Livestock Australia. The trial evaluated the most promising foliar, basal bark, cut stump and ground application methods which had been identified from parallel trials undertaken in Queensland. Preliminary results at six months indicated that triclopyr/picloram mixed in diesel was highly effective for basal barking, but variable and only moderately effective for cut stump applications. The use of neat glyphosate and a picloram gel for cut stump applications appeared ineffective at this stage, which contrasted with Queensland findings. 2,4-D amine when mixed in water showed promise as a foliar herbicide, but metsulfuron-methyl either alone or in combination with another foliar herbicide (triclopyr/picloram) proved ineffective. Ground applications of two residual herbicides (tebuthiuron and hexazinone) were undertaken in November 2014, but at least 12 months will be required before their effectiveness can be evaluated. Whilst still in the early stages, it is clear that the findings from this research will provide landholders in the Barkly Tablelands with a greater range of control options for management of rubber bush for various situations.

Introduction

Rubber bush (*Calotropis procera)* (Aiton) W.T. Aiton (also known as Calotrope) is native to tropical and subtropical Africa and Asia (Vitelli *et al*. 2008), however the plant has since naturalised in many other regions including Australia, Central and South America, the Caribbean Islands, Indonesia, Mexico and a number of Pacific Islands (Grace 2006).

In Australia, rubber bush is mostly found in northern Queensland, northern parts of the Northern Territory and Western Australia and appears to be spreading in some parts, such as the Barkly Tablelands region, (Grace 2006), a major beef producing area utilising extensive native pastures. Landholders expressed concern on the potential impact on their productivity and profitability, which led Meat and Livestock Australia (MLA) funding a collaborative project to better understand the ecology and invasiveness of rubber bush in context to the threat it poses. The project involved pastoralists, land managers, Charles Darwin University, the Northern Territory Government's Department of Land Resource Management and the Queensland Government's Department of Agriculture, Fisheries and Forestry. The MLA project had a parallel component evaluating control methods in Queensland. Based on these findings the most promising herbicide techniques were applied in the Barkly Tablelands region to test their relevance and effectiveness in that environment.

Methodology

In May 2014 a randomised complete block experiment comprising 12 treatments (including a control) with each replicated three times was established under extensive pastoral grazing conditions in the Barkly Tablelands region. Two replicates were located on a black cracking clay soil (18°36'19.80"S, 135°13'49.80"E) whilst the third was dominated by a brown clay soil (18°23'42.00"S, 133°53’27.60”E). Each block had plots sufficient in size (an average of 361m^2, per plot) to contain 20, medium to large sized rubber bush plants. The plots were established adjacent to each other and were randomly assigned one of the seven herbicides and five application combinations or a control (Table 1). The foliar, basal bark and cut stump treatments were applied to all plants within the plot in May 2014, and the ground applications of the residual herbicides tebuthiuron and hexazinone were manually applied towards the end of October 2014.

The foliar treatments were applied using a QuikSpray® unit, with the entire plant, including stems sprayed to the point of run-off. Basal bark treatments were applied using the traditional technique or the newer thin line method, which is sprayed at a higher concentration (Table 1). An 8-L handheld pneumatic sprayer (Swissmex®) with a 0.6 m wand and an adjustable full cone nozzle was used to spray the entire circumference up to 30-40 cm from the base of the plant for the traditional treatment, but only 5 cm for the thinline method. Cut stump method involved cutting the plant as close to the ground as possible using a brush cutter with a metal blade attachment, then the stumps were sprayed with the same equipment used for basal barking. The herbicide mixture was immediately applied to the cut surface.

Rubber bush plants were evaluated for live growth six months after application (November 2014) for the foliar, basal bark and cut stump treatments. However, due to the onset of the wet season only two replicates could be completed. Further assessments of these treatments will be conducted at 12 and 24 months. Initial assessments of the ground applied residual herbicides will be undertaken after 12 months (October 2015) and then again at 24 months.

Results

After six months, the two basal bark treatments using triclopyr/picloram and the foliar application of 2,4-D amine were the most promising with >90% of rubber bush plants showing no signs of live growth (Table 1). Effectiveness of cut stump applications of triclopyr/picloram was lower but not significantly different from abovementioned treatments, averaging 77%. However, variable results were measured between replicates, with one replicate recording 95% and the other only 60%.

Cut stumping using neat glyphosate produced moderate results, with 60% of plants showing no signs of live growth after six months. This was better than plants treated with picloram gel, which averaged only 15%. Foliar applications of metsulfuron-methyl alone and in a mixture with triclopyr/picloram performed poorly, with >70% of plants still displaying live growth.

Table 1. Herbicide treatments and the percentage of plants exhibiting no live growth (aboveground) six months after application of treatments (mean across two replicates). Figures followed by the same letters are not significantly different from each other (P>0.05). Missing values are for treatments not yet evaluated.

Control method	Herbicide (active ingredient)	Trade name	Application rate (grams active ingredient)	No live growth (%)
Basal bark (Traditional)	Triclopyr/picloram	Access™	40/20 g a.i./10 L mixture	95a
Basal bark (Thinline)	Triclopyr/picloram	Access™	240/120 g a.i./10 L mixture	97a
Cut stump	Triclopyr/picloram	Access™	40/20 g a.i./10 L mixture	77ab
Cut stump	Glyphosate	Squareup 360™	360 g a.i./1 L (neat)	60bc
Cut stump	Picloram	Vigilant™	43 g a.i./kg (neat)	15cd
Foliar*	2,4-D amine	Amine 625	625 g a.i./100 L mixture	92a
Foliar	Metsulfuron-methyl	Brush-off®	12 g a.i/100 L mixture	12cd
Foliar	Metsulfuron-methyl + Triclopyr/picloram	Brush-Off® + Picloram + Triclopyr 400	12 g a.i/100 L mixture + 150/50 g a.i./100 L mixture	27cd

Soil applied	Tebuthuiron	Graslan™	0.3 g a.i./m^2 of canopy cover	-
Soil applied	Tebuthuiron	Graslan™	0.4 g a.i./m^2 of canopy cover	-
Soil applied	Hexazinone	Velpar® L	1 g a.i/m of height (neat)	-
Control	Control			0d

*All foliar herbicide mixtures contained 291 g a.i. of paraffinic oil (Uptake™)/100 L.

Discussion

Basal barking with triclopyr/picloram mixed with diesel has given excellent results to date using both the traditional and newer thinline technique, consistent with Queensland studies (Campbell, Unpublished data; Vitelli *et al*. 2008). The data from these studies has now been used to support an impending label registration for the use of triclopyr/picloram for control of rubber bush using both basal bark techniques.

The foliar application of 2,4-D amine appeared promising in the Barkly Tableland site, however results in Queensland have been variable (Campbell, Unpublished data). The reason for this is not clear, but variability in application, plant size and vigour, environmental conditions at the time of spraying and the presence of dieback (Wilkinson *et al*. 2005) may be some of the likely causes. It appears that smaller plants (< 2 m) are most susceptible particularly if they are healthy with good leaf coverage and the entire plant is sprayed (including the stem). Foliar applications of metsulfuron-methyl have been previously reported to give high mortality of rubber bush (Vitelli *et al*. 2008), but the Barkly Tablelands trial and research in Queensland has demonstrated high variability, and poor efficacy (Campbell, Unpublished data) even when applied in a mixture with triclopyr/picloram.

Efficacy of cut stump applications also varied considerably to findings in Queensland, where neat glyphosate, a picloram gel (Campbell, unpublished data) and triclopyr/picloram (Vitelli *et al*. 2008) all caused high mortality of rubber bush. In the Barkly Tablelands trials neat glyphosate and the picloram gel performed poorly and triclopyr/picloram (Access™) gave mixed results. The reasons for such differences are not clear at this stage but could include some of those suggested above for variability within the foliar applications.

Further measurements, including the third replicate, and at 12 and 24 months will provide greater confidence in results. Whilst still in the early stages, it is clear that the findings from this research will provide landholders in the Barkly Tablelands with a greater range of control options and more confidence in the expected results to manage rubber bush for various situations.

References

Campbell, S., Roden, L., and Crowley, C. (2013). Calotrope (*Calotropis procera*): A Weed on the move in Northern Queensland. In M. O'Brien, J. Vitelli, & D. Thorny (Eds.), Proceedings of the 12th Queensland Weed Symposium. Hervey Bay, Queensland. The Weed Society of Queensland. pp. 11–14.

Grace, B. (2006) The Biology of Australian weeds 45. *Calotropis procera* (Aiton) W. T. Aiton. *Plant Protection Quarterly* **21**, 152-160.

Vitelli, J., Madigan, B., Wilkinson, P., and van Haaren, P. (2008). Calotrope (*Calotropis procera*) control. *The Rangeland Journal.* **30**, 339-348.

Wilkinson, P.M., Thomas-Hall, S., Marney, T.S. and Shivas, R.G. (2005). First record of *Passalora calotropidis* in Australia and its generic position. *Australasian Plant Pathology* **34**, 95-98.