Control of weeds using an experimental blanket wiper

Brad J. Rayner[1] and John R. Peirce[2]
Department of Agriculture Western Australia
[1]1 Queen Street, Busselton, Western Australia 6280, Australia
[2] PO Box 1231, Bunbury, Western Australia 6231, Australia

Summary An experimental blanket wiper was used to evaluate several herbicides for control of the upright growing weeds one–leaf cape tulip (*Moraea flaccida* (Sweet) Steud.), arum lily (*Zantedeschia aethiopica* (L.) Spreng.), and variegated thistle (*Silybum marianum* (L.) Gaertn.), growing in a mixed pasture of annual grasses and legumes. Cape tulip was treated with paraquat, 2,4-D amine, chlorsulfuron, arum lily with paraquat at three rates and variegated thistle with clopyralid, paraquat, MCPA and glyphosate.

There was little difference between spraying or wiping the herbicides. Underground organs of arum lily were reduced 82% by paraquat. The density of cape tulip was reduced some 90% by all treatments and variegated thistle viable seed production was reduced 100% by paraquat wiped and glyphosate sprayed, 99% for clopyralid and 38% for MCPA wiped.

Keywords Cape tulip, arum lily, variegated thistle, blanket wiper.

INTRODUCTION

With the trend to legislate to reduce herbicide usage, particularly in Europe, efforts to decrease the level of residues in the soil, using alternative techniques to achieve this is beneficial. Two techniques currently being assessed are wiping and auto detection of plants. Wipers have been around for some 30 years, but weed auto detection is in its infancy.

The greatest growth in the wiping technique occurred following the introduction of the herbicide glyphosate and was promoted in the cotton and soybean industries in the United States of America (Dale 1979). The first commercial units used ropes that had special properties that allowed the free flow of liquid but also retain enough solution to wipe onto the weed surface without allowing the ropes to drip. These were not particularly popular in Australia as the cost of the ropes was excessive, making the units too expensive (greater than $1000 per metre). In addition they would only operate at a very slow speed (less than four kilometres per hour), and were not very robust (Peirce 1982). There were also problems with wiping some wiry weeds or operating in rough terrain when ropes were ripped from the chemical reservoir, wasting amounts of concentrated solution. Different rope configurations also produced different results. Moore and Jones (1988) showed this in experiments in Western Australia to control bracken (*Pteridium esculentum* (G.Forst.) Cockayne).

An advancement on the 'rope wick' applicators were the blanket or belt rollers (Schepers and Burnside 1976, Welker and Darlington 1980), and these have showed more promise. A review of the technique of wiping, and the modification of commercially or locally manufactured units in Australia, was carried out by the Kondinin Group (Anon. 1995).

Roller wipers have been useful in applying chemicals to sida (*Sida acuta* Burn. F.), flannel weed (*S. cordifolia* L.), sicklepod (*Cassia obtusifolia* L.) and some eucalyptus (*Eucalyptus* spp.) in legume and grass pastures (Price 1996). A similar unit was evaluated against an experimental unit described by Rayner (1993 and 1995) and both showed good reduction of skeleton weed (*Chondrilla juncea* L.) when treatments were carried out just prior to flowering (Peirce pers. comm.)

The use of blanket wipers in Western Australia for control of bracken and cape tulips, both one-leaf and two-leaf (*Moraea miniata* Andrews), has been described by Rayner and Peirce (1996 and 1997). Research has continued and results from experiments on arum lily, cape tulips and variegated thistle, are reported. In addition further uses of the blanket wiper for controlling taller and herbicide resistant weeds in cereal crops as well as uses in a wide range of environmental situations is discussed.

MATERIALS AND METHODS

Experiments were conducted to determine the effectiveness of the blanket wiper for controlling arum lily, variegated thistle and one-leaf cape tulip. The blanket wiper described by Peirce and Rayner (1996) was designed and fabricated at the Department of Agriculture Western Australia. The wiper is two metres wide and is front mounted on a four wheel bike (ATV) incorporating a twelve volt pump and a metering device to control herbicide delivery.

Experiment 1 Arum lily control The site was located in a *Pinus radiata* plantation, (established 1935)

where arum lily has been the dominant understorey species for many years. Treatments were applied using the blanket wiper (single pass) on the 3 August 2000 between the rows of pine trees in an unreplicated experiment. Plot size was 2 × 40 m. Three treatments of paraquat (200 g a.i. L^{-1}) were applied at 1.0, 1.5 and 2.0 L ha^{-1} of product. The volume of application was 40 L ha^{-1} and the speed of application was 3.75 km h^{-1}. Blanket height above the ground was set at 250 mm. Three excavations, 0.5 m^2 × 25 cm deep were taken from each plot on the 21 March 2001 to recover arum lily rhizomes. Numbers and weights of rhizomes were recorded and an analysis of variance carried out on the dry weight.

Experiment 2 Variegated thistle control in pasture Four treatments were applied using the blanket wiper on the 18 October 2000. The treatments were limited to one replicate due to the terrain and spread of the infestation. Blanket wiper treatments were clopyralid 0.3 L ha^{-1}, MCPA (500 g a.i. L^{-1}) 1.5 L ha^{-1}, clopyralid + MCPA at 0.2 L + 1.0 L ha^{-1} and paraquat 2.0 L ha^{-1}. One treatment of glyphosate 3 L ha^{-1} was applied seven days after the wiper treatments by the landowner using a conventional boomspray. The infestation varied in height from 0.5 m to 1.5 m and approximately 20% was flowering. The blanket wiper was set to a height of 0.4 m above the ground. Volume of application for the wiper was 36 L ha^{-1} at a speed of 5 km h^{-1}. Application detail for the boomspray is not available. Seed heads were collected randomly for each treatment on the 20 November 2000 to determine seed production, weight and viability.

Experiment 3 One-leaf cape tulip control in pasture The randomised complete block experiment contained seven treatments replicated three times. Plot size for the blanket wiper was 3 × 45 m and conventional boomspray 6 × 45 m. Treatments were applied 1 September 1999. Volume and speed of application for the blanket wiper was 18.3 L ha^{-1} and 12 km h^{-1} respectively and for the boomspray was 66 L ha^{-1} and 12 km h^{-1}. Treatments for the blanket wiper and the boomspray were paraquat 1.0 L ha^{-1}, chlorsulfuron 15 g ha^{-1}, 2,4-D amine (500 g a.i. L^{-1}) 1.5 L ha^{-1}. All treatments were applied with a non ionic wetting agent at 0.25%. Plant counts were carried out on the cape tulip on 15 November 2000 taking 20 × 0.1024 m^2 quadrats per plot. Count data was transformed using $\sqrt{x + 0.5}$ and analysis of variance carried out.

RESULTS

1. Arum lily Substantial reductions in rhizomes was obtained using all rates of paraquat (Table 1), with a trend for greater reduction as the rate increased. The treatments also caused a noticeable rotting of the rhizomes and this is consistent with the results obtained by Moore and Hoskins (1997). The results also compare favourably for arum lily control using the conventional high volume hand lead spray application (Rayner unpublished reports 2001). Although the analysis of variance was only carried out on values from unreplicated treatments, the evenness of the site and the comparison with previously published results of Moore and Hoskins (1997) would give confidence that the conclusions drawn were valid.

2. Variegated thistle No seeds were produced on the plants wiped with 2 L paraquat at the early flowering stage (Table 2). Blanket wiping reduced seed production by 35% for clopyralid 0.3 L, 30% for MCPA 1.5 L. The boom spray application with glyphosate 3 L gave a 73% reduction. The mixture of clopyralid and MCPA had no effect.

Most treatments reduced the 1000 seed weight between 20 and 60%, and all treatments with the exception of MCPA at 1.5 L reduced seed viability.

3. One-leaf cape tulip All treatments showed a significant reduction in the density of cape tulip one year after they were applied (Table 3). With the exception

Table 1. Control of arum lily.

Chemical product ha^{-1}	Rhizome No. m^{-2}	Rhizome dry wt g m^{-2}	% Reduction dry wt rhizomes compared to nil
Blanket wiper			
Paraquat 1.0 L	53	36.0 a	75
Paraquat 1.5 L	39	27.0 a	80
Paraquat 2.0 L	36	24.1 a	83
Nil	60	141.4 b	0

Values followed by the same letter are not significantly different at the 5% level.

Table 2. Variegated thistle control.

Chemical product ha^{-1}	Seeds $head^{-1}$	1000 seed wt g	% seed Viability
Clopyralid 0.3 L	77	6.6	1
MCPA 1.5 L	83	11.8	60
Clopyralid + MCPA 0.2 L + 1.0 L	123	10.1	18
Paraquat 2.0 L	0	0.0	0
Glyphosate (landowner) 3.0 L	32	6.6	0
Nil	119	15.1	68

Table 3. One-leaf cape tulip control in pasture.

Chemical product ha^{-1}	Counts m^{-2}	% cape tulip reduction compared to the nil
Blanket wiper		
Paraquat 1.0 L	1.9 a	97
Chlorsulfuron 15 g	3.7 a	94
2,4-D amine 1.5 L	4.0 a	93
Boomspray		
Paraquat 1.0 L	12.5 b	78
Chlorsulfuron 15 g	4.6 a	92
2,4-D amine 1.5 L	0.6 a	99
Nil	64.5 c	0

Values followed by the same letter are not significantly different at the 5% level.

of the sprayed treatment of paraquat there was no difference between the treatments. The sprayed treatment of paraquat reduced the density by some 78% and the other treatments gave reductions between 92–99%.

DISCUSSION

The use of a blanket wiper to effectively reduce the growth or seed production of taller weeds without seriously restricting the growth of the shorter growing annual grasses and legumes is a practical option. As shown in previous research the technique can also be applied to Paterson's curse (*Echium plantagineum* L.), bracken, two-leaf cape tulip (*Moraea miniata* Andrews) and Guildford grass (*Romulea* spp.).

In addition to work being conducted in the higher rainfall areas of the south west of Western Australia research has also shown that the blanket wiper can be used to control tall herbicide resistant radish growing in cereal crops. The wiper has also been used to apply glyphosate and paraquat to a range of grasses as a means to reduce seed production in pastured paddocks planned for cropping the following season. and annual grasses.

REFERENCES

Anon. (1995). Weed wipers. Research Report, Farming Ahead with the Kondinin Group. No 45, 24-36.

Dale, J.E. (1979). A non mechanical system of herbicide application with a rope-wick. *PANS* (4), 431-6.

Moore, J.H. and Jones, S.M. (1988). Bracken control with rope wick applied glyphosate. *Plant Protection Quarterly* 3(2), 65-8.

Moore, J.H. and Hoskins, E.B. (1997). Arum lily *Zantedeschia aethiopica* control in the south west of Western Australia. Proceedings of Arum lily workshop held at HMAS Stirling, Garden Island. CRC for Weed Management Systems, Adelaide, Australia, pp. 31-37.

Peirce, J.R. (1982). Rope wick applicators. Farmnote, No 38/82. Western Australian Department of Agriculture.

Peirce, J.R. and Rayner, B.J. (1996). Blanket wipers for tall weed control. Farmnote, No 90/96, Agriculture Western Australia, 4 pp.

Price, T.P. (1996). Development of weed wipers for control of improved pastures. Conservation farming for the semi arid tropics. Proc. of workshop at the NT Rural College, Katherine. 18-20 July 1995. AIAS occasional paper, No. 101, 240-4.

Rayner, B.J. (1993). Using blanket wipers for the control of tall weeds. Agriculture Protection Board of WA. Infonote 43/93, 4 pp.

Rayner, B.J. (1995). Wiping out tall weeds. *Journal. Agriculture Western Australia* 36(1) 4th Series, 18-9.

Rayner, B.J. and Peirce, J.R. (1996). Weed control in Western Australia using blanket wipers. Proc. 11th Australian Weeds Conf. University of Melbourne Vic., Australia. 6-68.

Rayner, B.J. and Peirce, J.R. (1997). Weed control using a blanket wiper. Proc. 16th Asian Pacific Weed Science Soc. Conf. Kuala Lumpar, Malaysian. Malaysian Plant Protection Soc. 2999-302.

Schepers, J.S. and Burnside, O.C. (1976). Maintaining spray solution on a roller applicator. 35th Ann. Res. Report. North Central Weed Control Conf. 136-7.

Welker, W.V. and Darlington, T. (1980). A continuous-belt herbicide wiper. *Weed Science* 28(6), 705-8.