Herbicide and cropping trials relevant to the eradication of branched broomrape (*Orobanche ramosa*) in South Australia

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Summary Branched broomrape, *Orobanche ramosa*, is a scheduled weed in Australia and has been the subject of an extensive quarantine effort in South Australia. A program to evaluate eradication methods has been underway since May 2001. Several trial programs were undertaken and the sulfonylurea herbicides have given excellent control even at very low rates in the first year of the trial. Other group B herbicides will be tested to evaluate the optimum application rate and timing of application. Glyphosate is also an effective herbicide and can be used late in the growing season.
Keywords *Orobanche ramosa*, branched broomrape, herbicides.

INTRODUCTION

Branched broomrape, *Orobanche ramosa* L., is a highly fecund non-green parasitic plant. The fecundity of the plant depends on the vigour and the capacity of the host to provide nutrition for the parasite, which can produce up to 500,000 seeds per plant (South Australian Animal and Plant Control Commission 1999). The seed probably has a long life in the soil in Australia, with retention of viability up to 13 years demonstrated in overseas laboratory trials and from field soils (Linke and Saxena 1991). The predominantly winter rainfall, the persistence in the soil and large number of seeds produced make the control of branched broomrape a long-term venture. Branched broomrape is a scheduled weed in South Australia (SA), where it is the subject of an extensive quarantine effort (Jupp *et al*. 2002).

The weed has a wide host range that includes weeds of cereals in the SA mallee and some legume and brassica crop or pasture species adapted to the area. Evaluation of host species is important for the implementation of management strategies. Weedy hosts frequently encountered are wild turnip (*Brassica tournefortii* Gouan.), capeweed (*Arctotheca calendula* L. (Levyns)) and cretan weed (*Hedypnois rhagadioloides* L.) and, to a lesser extent, salvation Jane (*Echium plantagineum* L.). It also parasitises other introduced and native members of the Asteraceae. Dryland crop and pasture hosts are numerous and some horticultural crops can also be hosts, (Jupp *et al*. 2002). Branched broomrape has the potential to occur over a much larger area than at present, due to the large number and widespread distribution of potential hosts. If its range extended to other agricultural areas, its host range would include other valuable legume, spice and vegetable crops.

MATERIALS AND METHODS

A series of field trials was undertaken in 2001 to test various herbicides and crop options that have been reported to prevent emergence of *Orobanche* species and which might lead to its control in the broomrape quarantine area in SA. The trials were established on a typical mallee sandy loam site with broomrape seed present. The main focus of the trials was to evaluate a number of management options including potential herbicides for the control of branched broomrape within cereal and host crops. Potential herbicides and crops grown in the area are listed in Table 1.

RESULTS

The emergence of branched broomrape was differentially affected by the herbicides used in the trial. As eradication is the goal of the program, only 100%

Table 1. Crops and herbicides evaluated in year 1.

Crop	Variety	Herbicide
Wheat	Frame	Glean
Barley	Galleon	Ally
Wheat	Frame	Logran
Canola	Clearfield canola	OnDuty
Medic pasture	Medic (high seed rate)	glyphosate
Vetch	Blanchfleur	glyphosate
Medic pasture	Medic (low seed rate)	glyphosate
Canola	Clearfield and Oscar canola	OnDuty
Mixed Brassica	Mustard and turnip	glyphosate
Wheat	Clearfield wheat	Midas
Canola	Oscar canola	glyphosate
Pasture	Volunteer pasture	glyphosate
Wheat	Frame	MCPA

control of emergence is considered acceptable. Several Group B herbicides gave 100% control of emergence (Table 2).

Other trials investigated the use of group B herbicides on non-cropped areas and evaluation of reduced rates of Group B herbicides to minimise plant-back considerations. Table 3 shows the results of a trial examining very low rates of common group B herbicides. The trial prevented emergence of branched broomrape and will be evaluated for residual effects this year.

Glyphosate at the rate of 500 mL ha^{-1} was used in several trials and when applied late in the growing season at about the anticipated time of branched broomrape emergence gave excellent control (Table 4).

DISCUSSION

Several herbicide options have been evaluated for the control of branched broomrape. The sulfonylurea herbicides, Logran®, Glean® and Ally® and the imidazolinone OnDuty® and glyphosate may lead to effective and low cost control if their use can be integrated into a sustainable farming system. Other herbicides and increased application rates will be tested in the future. Branched broomrape is largely confined to an area in which the favoured land use is cereals with a short pasture ley; this presents opportunities for control in the cereal phase. The challenge is to identify effective herbicide rates that can be used profitably in the crop, without causing carryover problems in the pasture or legume phases in the farming system.

ACKNOWLEDGMENTS

This program is funded by the Grains Research and Development Corporation and the CRC for Australian Weed Management.

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Table 2. Control of branched broomrape.

Crop	Herbicides and application rate	Mean emergence (m^{-2})
Barley	Ally 5 g ha^{-1}	0.00
Clearfield canola	OnDuty 20 g ha^{-1}	0.00
Frame wheat	Glean 20 g ha^{-1}	0.00
Frame wheat	Logran 30 g ha^{-1}	0.00
Medic 100 kg ha^{-1}	glyphosate 300 mL ha^{-1}	0.00
Vetch	glyphosate 300 mL ha^{-1}	0.03
Medic 20 kg ha^{-1}	glyphosate 300 mL ha^{-1}	0.04
Clearfield canola and Oscar	OnDuty 20 g ha^{-1}	0.07
Mustard and turnip	glyphosate 300 mL ha^{-1}	0.07
Oscar canola	glyphosate 300 mL ha^{-1}	0.19
Clearfield wheat	Midas 600 mL ha^{-1}	0.21
Volunteer pasture	glyphosate 300 mL ha^{-1}	0.89
Frame wheat	MCPA 1L ha^{-1}	1.41
Mean of all treatments		0.22
Mean of all untreated plots		1.68

Table 3. Emergence of branched broomrape following application of low rates of Group B herbicides.

Herbicide	Rate g ha^{-1}	Mean emergence (m^{-2})
Glean	5	0
Ally	1.25	0
Logran	7.5	0
Control	0	10.3

Table 4. Emergence of branched broomrape following two timings of glyphosate application (plants m^{-2}).

	Early 27 July 2001	Late 21 August 2001
Emergence	0.3	0
Mean of untreated		2.93