SHORT-TERM PAIN FOR LONG-TERM GAIN: CONTROLLING WILD RADISH IN WHEAT

Simon Craig and Cameron Taylor (BCG)

TAKE HOME MESSAGES

- Flight, Velocity, Jaguar and the Agritone plus Affinity mix were the herbicides that provided the most effective wild radish control in wheat.
- A two-spray strategy is required to control later germinations of wild radish.
- Short-term pain for long-term gain: including new herbicides (with different modes of action) into the cereal phase will delay the onset of resistance.

BACKGROUND

Wild radish populations and their level of herbicide resistance are increasing across the Wimmera and Mallee cropping regions. In the low and medium rainfall zones of Western Australia (WA), the problem is much advanced. In WA, wild radish populations have exploded and widespread resistance to Group B, C, F and I herbicides already exists. The practice of following tight wheat-lupin-wheat-lupin rotations and the limited available alternatives, have significantly contributed to, and exacerbated, the herbicide resistance problem in the west.

While there is greater crop diversity within Victorian cropping regions, growers have commonly selected herbicides according to their ability to control grasses such as ryegrass or brome grass. As a consequence, growers have placed less emphasis on rotating their broadleaf herbicide groups, thereby increasing the potential for resistance to develop in weeds such as wild radish, Indian hedge mustard and turnip.

Thanks to improved growing conditions over the past three years, farmers have had the option to use canola and pulse crops to reduce grass numbers. Triazine and imidazolinone based herbicides that can be sprayed on Triazine Tolerant (TT) and Clearfield canola varieties also provide an obvious break for broadleaf weeds. However, the overuse of imi-based herbicides is a big concern for the industry, particularly since growers are taking advantage of improved Clearfield cereal varieties (as well as canola) which allows further use of imidazoline-based herbicides. The fear is that resistance will develop in weeds such as wild radish because, to reduce herbicide costs and plant-back restrictions, the rates at which these products are being used are often low, especially in the Mallee. Additionally, with limited broadleaf herbicides available for use in crops such as lentils and field peas, if resistance continues to develop, crop options in future years will be restricted. This, in turn, would place greater pressure on diflufenican (active ingredient in Brodal®). Already in Victoria, there are confirmed cases of diflufenican and phenoxy (MCPA LVE) resistant wild radish populations. During the cereal phase (wheat and barley) of a cropping rotation, there are more herbicide options (with different modes of action) available to control wild radish. Rotating herbicide groups (using herbicides of different modes of action) will help delay the onset of resistance.

In 2012, several trials were established to compare the various options available to growers to control radish in-crop.

AIM

To compare the efficacy of broadleaf selective herbicides to control radish in wheat.

METHOD

The replicated field trial was established on a typical sandy loam soil with a dense wild radish population. Treatments were applied using BCG's Goldacres custom-built 12-line sprayer.

Location:	Corack
Replicates:	3
Crop:	Lincoln wheat
Crop growth stage:	5-leaf to 1st node
Weed growth stage:	Four-to-six leaf
Application date:	23 July
Seeding equipment:	Knife point, press wheels on 30cm row spacing

Table 1. Spraying conditions at the time of application.

Temperature	14.5°C	**Water rate**	150L/ha
Humidity	84%	**Nozzle type**	TT-02
Wind speed	4-5km/hr	**Pressure**	3 bar
Cloud cover (%)	70%	**Soil moisture**	dry topsoil, moisture below

Table 2. List of treatments in the trial.

Treatment	Cost ($/ha)	Residual
Untreated	–	–
Velocity (500ml/ha) + Uptake (0.5% v/v)	16.10	No
Velocity (500ml/ha) + MCPA LVE (350ml/ha) + Uptake (0.5% v/v)	19.00	No
Precept (500ml/ha) + Liase (1% v/v)	14.80	No
Precept (1L/ha) + Liase (1% v/v)	29.40	No
Tigrex (500ml/ha)	5.60	Yes
Tigrex (750ml/ha)	8.40	Yes
Jaguar (750ml/ha)	14.70	Yes
Jaguar (750ml/ha) + MCPA LVE (350ml/ha)	17.10	Yes
MCPA LVE (500ml/ha)	3.40	No
Agritone 750 (500ml/ha) + Affinity DF (85ml/ha)	20.00	No
MCPA 500 (500ml/ha) + Ecopar (400ml/ha)	18.20	No
MCPA LVE (350ml/ha) + Eclipse (5g/ha)	9.50	Yes
Conclude (700ml/ha) + BS1000 (0.2% v/v)	13.00	Yes
Brodal (150ml/ha)	6.30	Yes
Cadence (115g/ha) + Eclipse (5g/ha)	13.90	Yes
Amicide 625 Low (1.4L/ha)	7.70	No
Kamba M (1.7L/ha)	21.30	No
Flight (540ml/ha)	18.40	No
Flight (720ml/ha)	24.50	No

Table 3. Products, active ingredients and herbicide groups.

Product	Active ingredient	Herbicide group
Velocity	210g/L bromoxynil (mixed heptanoic acid & octanoic acid esters) 37.5g/L pyrasulfotole	C H
Precept 300 EC	250g/L MCPA as the 2-ethylhexyl ester 50g/L pyrasulfotole	I H
Tigrex	250g/L MCPA (present as the ethyl hexyl ester) 25g/L diflufenican	I F
Jaguar	250g/L bromoxynil (present as the octanoate) 25g/L diflufenican	C F
MCPA LVE	500g/L MCPA (present as the iso-octyl ester)	I
MCPA 500	500g/L (present as dimethylamine salt)	I
Agritone 750	750g/L MCPA (present as dimethylamine salt)	I
Amicide 625 Low	625g/L 2,4-D (present as dimethylamine & diethanolamine salts)	I
Affinity DF	400g/kg carfentrazone-ethyl	G
Ecopar	20g/L pyraflufen-ethyl	G
Eclipse	714g/kg metosulam	B
Conclude	357g/L MCPA present as the ethyl hexyl ester 7g/L florasulam	I B
Brodal	500g/L diflufenican	F
Cadence	700g/kg dicamba	I
Kamba M	340g/L MCPA (present as dimethylamine salt) 80g/L dicamba (present as dimethylamine salt)	I (phenoxy) I (benzoic)
Flight	35g/L picolinafen 210g/L bromoxynil (present as the N-octanoyl ester 350g/L MCPA (present as the ethyl hexyl ester	F C I
Broadstrike	800 g/L flumetsulam	B

The trial was not harvested and was terminated after the final assessment had been taken.

RESULTS AND INTERPRETATION

At the time of spraying, wild radish plants ranged between two and six leaves, as a result of staggered germination. There was a distinctive header trail effect across the paddock and the trial was subsequently designed so that each treatment ran perpendicular to the header trail. This enabled each treatment to be compared under high and low densities. Weed counts were taken from high density areas as well as outside the header trail (low density). Table 4 shows the reduction in radish plants of each treatment 50 days after herbicide application.

Table 4. Radish plant counts for each treatment under moderate* and high density at 50 days after application (50 DAA).

Treatment	Radish plant counts (m^2) at 50 DAA		
	Moderate density	High density	Average
Untreated	244	559	401
Velocity (500ml/ha) + Uptake (0.5% v/v)	15	72	43
Velocity (500ml/ha) + MCPA LVE (350ml/ha) + Uptake (0.5% v/v)	36	164	100
Precept (500ml/ha) + Liase (1% v/v)	73	348	211
Precept (1L/ha) + Liase (1% v/v)	96	336	216
Tigrex (500ml/ha)	104	333	219
Tigrex (750ml/ha)	47	263	155
Jaguar (750ml/ha)	36	73	55
Jaguar (750ml/ha) + MCPA LVE (350ml/ha)	25	137	81
MCPA LVE (500ml/ha)	187	328	257
Agritone 750 (500ml/ha) + Affinity DF (85ml/ha)	44	65	55
MCPA 500 (500ml/ha) + Ecopar (400ml/ha)	99	49	74
MCPA LVE (350ml/ha) + Eclipse (5g/ha)	116	337	227
Conclude (700ml/ha) + BS1000 (0.2% v/v)	77	379	228
Brodal (150ml/ha)**	169	448	309
Cadence (115g/ha) + Eclipse (5g/ha)	403	445	424
Amicide 625 Low (1.4L/ha)	89	261	173
Kamba M (1.7L/ha)	149	387	268
Flight (540ml/ha)	59	80	69
Flight (720ml/ha)	4	9	7
LSD (P=0.05)	**162**	**196**	**150**
CV%	**95**	**47**	**48**

*There was substantial variation between the weed densities in the plots.

**Used for experimental purposes only.

Four days after herbicide application, the plots sprayed with Agritone 750 (MCPA) plus Affinity DF (carfentrazone-ethyl – Group G) showed the most visual symptoms of herbicide activity and within 21 days of application, the majority of radish plants had been successfully controlled.

Some crop damage (foliage only) was observed where Velocity® and Affinity had been applied. However, the damage was only minor and the crop showed little sign of any damage at 28 and 50 DAA.

Velocity and Flight® (720ml/ha rate) were the most effective treatments. These two treatments, along with Jaguar® and the Agritone plus Affinity mix achieved greater than 85 per cent reduction in plant numbers. Precept and Tigrex did not perform well. This was unexpected as Precept, in particular, has been found to be very effective on wild radish populations in previous studies. Given that Velocity and Precept both contain pyrasulfatole, it appears that the bromoxynil component in the Velocity contributed to the improved result. Other more effective products, such as Flight and Jaguar, also contain bromoxynil. By itself, bromoxynil is not very effective on radish, but the results from this trial would suggest that, when mixed with another product it can improve efficacy. Mixtures containing bromoxynil improved control, performing as well as the Agritone plus Affinity treatment.

Despite having little effect on the number of wild radish plants in the high density area, Conclude® stunted the plants and dried the leaves out. It was uncertain as to what the seed viability and production would have been had the trial gone through to maturity.

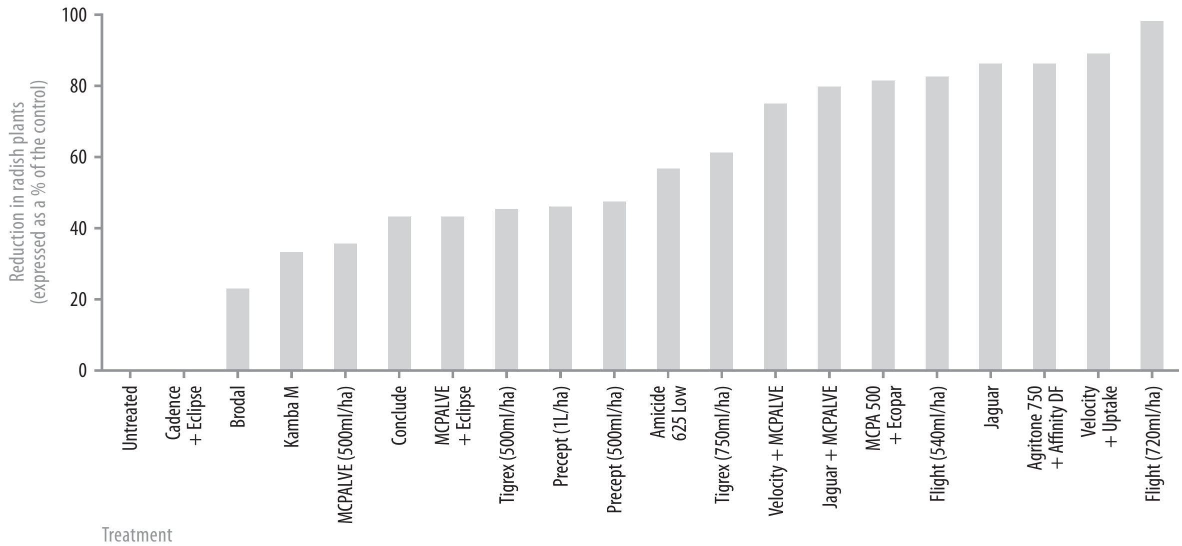

Figure 1. The per cent of radish control (expressed as a reduction in plants compared to the control) for each treatment at 50 DAA.

The findings from this trial indicate that there could be some hormone resistance occurring, which may have led to some of the unusual results. The addition of MCPA LVE to Velocity usually improves the control of wild radish but, in this trial, control was weakened. This could perhaps be attributed to the higher water rate used here. Due to the particular set up of BCG's spray rig, a water rate of 150L/ha was used as opposed to 75L/ha which is the usual water rate used with a commercial spray set-up. It should also be noted that this investigation looked at wild radish control from a one spray perspective. Keeping in mind that wild radish is known to have a long germination period, it is possible that a secondary germination occurred within the 50 day period.

Seed was collected around the trial area at harvest to check the resistance level and also from the control plots to quantify the seed bank level of wild radish. These results were not available at the time this report was written. They will be published at a later date and may provide the answers to some of the questions raised about the unexpected performance of some of the treatments.

COMMERCIAL PRACTICE

From the results of this trial it was concluded that the best wild radish control was achieved by products that contained bromoxynil. However, despite this result, anecdotal evidence and the results of other research trials would suggest that most of the herbicides tested in this trial do work effectively in our region. The particular population tested in this trial may have some hormone resistance not commonly found in the region. The resistance test currently underway should reveal if this was the case.

Farmers should take this as a warning. Reports of hormone resistant wild radish populations are increasing. Wild radish has been an on-going weed issue in the Corack area, motivating regular use of phenoxy-based products, especially during the past decade. This trial reveals some of the issues that may arise if hormone resistance develops in radish populations.

To delay the onset of resistance, farmers should rotate herbicides with different modes of action and/or herbicide sub-groups. While this may increase costs in the short term, it will reduce the longer-term costs.

ACKNOWLEDGMENTS

The project was funded by GRDC (UA00134).