Brome Grass management in direct drilled crops in the Mallee

The aim of this replicated trial was to investigate herbicide control options for brome grass control in direct drilled wheat in the Mallee.

Summary

- Brome grass control in wheat is difficult (except when using Clearfield technology)
- Brome grass is becoming an increasing problem and there is evidence that the problem is increasing faster under direct drill systems with an intensive cereal rotation
- Pre-emergent herbicides such as trifluralin and metribuzin do have activity on brome grass but the effect is slight suppression only (metribuzin is not registered in wheat)
- Early post-emergent herbicides such as Atlantis have good suppression of brome grass but the weeds generally still set seed (but on much smaller seed heads). Metribuzin used post-emergent also has good activity if it rains within 5 days of application but this use is not registered in wheat, and can cause significant crop damage.
- A long term plan, which includes fallow or ley phases (either with chemical or mechanical control), is required for the control of brome grass. In- crop herbicide options do not work consistently, or have other limitations, such as long plant-back periods.

Background

Brome grass is becoming a troublesome weed throughout the Mallee and parts of the Wimmera. The perception in the farming community is that brome grass populations are increasing more quickly in paddocks that are direct drilled and are more intensively cropped with cereals. This is supported by evidence from survey work undertaken in SA (Gurjeet Gill; GRDC Update Bendigo 2004). In the same report, Gill discussed previous work undertaken in WA, which indicated that the population of brome grass may be changing from *Bromus diandrus*, which geminates on the first rain in the season, to *Bromus rigidus*, which germinates over a longer period. As a result, more brome grass plants escape pre-seeding knock-down or cultivation treatments and populations increase, especially since brome grass is difficult to control in cereals.

There are few herbicide options for brome grass in wheat in the Mallee and Wimmera. Pre-seeding herbicides (eg. trifluralin, avadex, lexone etc) may have some activity on brome grass but their activity is highly variable. In-crop herbicides with activity include Monza (sulfosulfuron), which has a very long residual period on alkaline soils and for this reason is not widely used; Atlantis (mesosulfuron) which has good suppression activity but not control; Lexone (metribuzin) which is not registered in wheat but is used post-emergent in barley; and Midas (impazapic and imazapyr) which is part of the Clearfield system for which a special herbicide tolerant wheat needs to be grown (ie. CLF JNZ). CLF JNZ is relatively widely grown, but is not a preferred variety. It does not have tolerance or resistance to CCN, and the herbicide used has a long residual period following a dry season.

This trial was undertaken to investigate activity on brome grass of mixtures of pre-seeding herbicides and to compare these to in-crop herbicides used for control or suppression of brome grass.

Methods

The trial was located south-east of Hopetoun, on a Mallee sandy loam overlying a light clay. The paddock was in canola last year and had 76% standing stubble cover at seeding. Each treatment was replicated four times. Sprayed plots were 3m wide by 24m long. Pre-seeding treatments (IBS) were applied on May 12 and the site was sown on the same day with Yitpi wheat using the owners Gason seed drill (sown at right angles to spray treatments). In-crop herbicide treatments were applied on July 5, when the crop was at the three- leaf growth stage (GS13). No rain was recorded for 18 days after the application of the in-crop herbicides.

Spray treatments applied are listed in Table 1.

Table 1. Spray treatments for the brome grass trial at Hopetoun in 2004.

Product	Abbrev.	Time	Rate	Cost $/ha
TriflurX	T	IBS	1.5L	13
TriflurX + Lexone	T+Le	IBS	1.5L + 130g	20
TriflurX + Lexone + Avadex Xtra + Dual Gold	T+Le+Av+ DG	IBS	1.5L + 130g+ 0.6L + 0.4L	42
TriflurX + Diuron + Avadex Xtra + Dual Gold	T+Di+Av+ DG	IBS	1.5L + 0.5L + 0.6L + 0.4L	39
Duet	Du	IBS	2.3L	21
Duet + Lexone	Du+Le	IBS	2.3L + 130g	28
Duet + Lexone + Avadex Xtra + Dual Gold	Du+Le+Av +DG	IBS	2.3L + 0.5L + 0.6L	50
Duet + Diuron + Avadex Xtra + Dual Gold	Du+Di+Av +DG	IBS	2.3L + 0.5L + 0.6L + 0.4L	46
Atlantis + BS 1000 wetter	Atl	GS13	0.33L + 0.25%	27
Atlantis + Hasten + AmSulphate	Atl+hast	GS13	0.33L + 1% + 2%	30
Lexone	Le	GS13	280g	15

Active ingredients in the herbicides used are listed in Table 2.

Table 2. Active ingredients of herbicides used.

Herbicide	Active ingredient
TriflurX	trifluralin 480 gai
Duet	trifluralin 125 gai + oryzalin 125 gai
Diuron	diuron 500 gai
Avadex Xtra	tri-allate 500 gai
Dual Gold	metolachlor 960 gai
Lexone	metribuzin 750 gai
Atlantis	meso-sulfuron 30 gai

Note: Hasten (used with Atlantis) is an esterfied canola oil.

Assessments included brome grass plant numbers, phyto-toxic scores (using the EWRC methodology), brome grass head numbers and brome grass height (to differentiate between herbicide inactivity and suppression). Wheat assessments included phyto-toxic scores for the herbicides used and harvest yield and quality. The phyto-toxicity EWRC ratings are: 1=no effect; 3=slight but clearly visible effect; 5=severe effect; 7=severe effect which will result in crop or weed damage; and 9=crop or weed dead.

Results

(i) 2004 season

The season started with dry soil, as there had been no rain from late December 2003 to May 2004. Conditions remained dry with only 157mm of growing season rainfall (decile 3). The crop was sown early and emerged well, but showed clear symptoms of water stress by late tillering. Low spring rainfall severely restricted the crop between flowering and grain fill (October).

(ii) Phyto-toxic effect of herbicide treatments on wheat and brome grass

Phyto-toxicity scores were used to determine the effect of the herbicide on the crop (Figure 1) (crops were scored in mid August).

There was no significant difference in herbicide effects on wheat; however there were significant differences in herbicide effects on brome grass between the post emergent applied herbicide, Atlantis + hasten + ammonium sulphate, and all other herbicide treatments (pre-sowing and post-emergent).

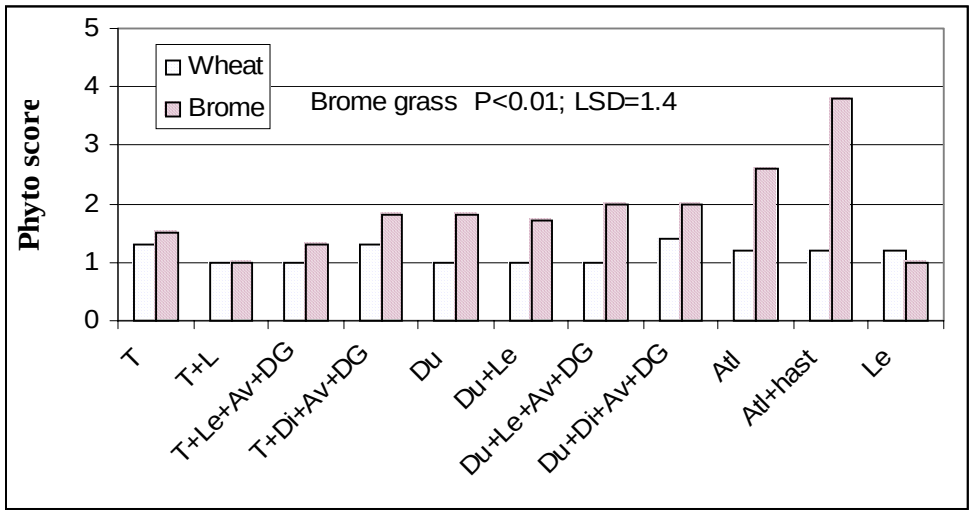

Figure 1. Phyto-toxicity scores for the herbicides treatments on wheat and brome grass.

(iii) Brome grass numbers

Brome grass plant numbers and the effect of the herbicides are shown in Figure 2. Although large differences existed in average brome grass density between herbicide treatments, these differences were not significant (LSD 5%=20). Generally the post-emergent treatments (Atlantis and Lexone) had a higher brome grass plant population (as expected).

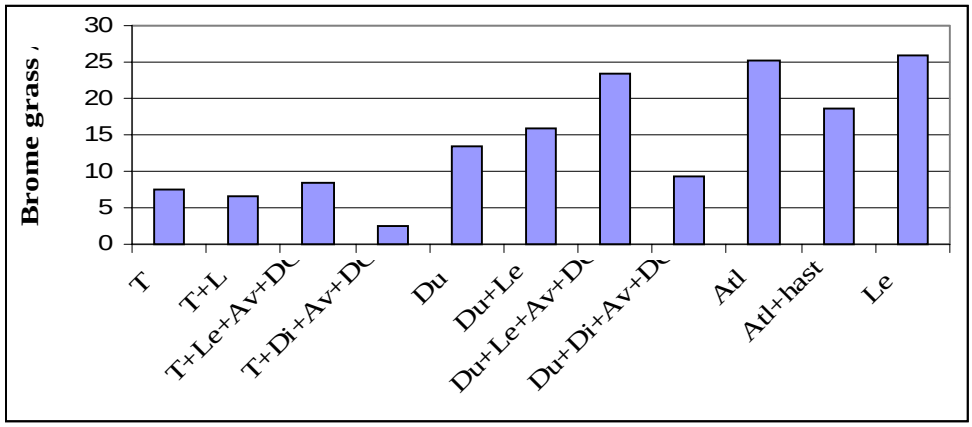

Figure 2. Herbicide effect on brome grass population (plants/m^2)

(iv) Wheat yield

There were small but significant differences in wheat yield between the different herbicide treatments used in the trial (Table 3). The post-emergent herbicide treatments Atlantis + wetter and Atlantis + Hasten + Ammonium Sulphate produced the highest grain yields. Overall the crop yields were relatively low (between 1.2 and 1.5 t/ha) due to the dry season.

Table 3. Wheat yield in the Brome grass trial at Hopetoun in 2004

Product	Timing	Rate/ha	Yield t/ha
TriflurX	IBS	1.5L	1.20
TriflurX + Lexone	IBS	1.5L + 130g	1.32
TriflurX + Lexone + Avadex Xtra + Dual Gold	IBS	1.5L + 130g+ 0.6L + 0.4L	1.34
TriflurX + Diuron + Avadex Xtra + Dual Gold	IBS	1.5L + 0.5L + 0.6L + 0.4L	1.41
Duet	IBS	2.3L	1.33
Duet + Lexone	IBS	2.3L + 130g	1.35
Duet + Lexone + Avadex Xtra + Dual Gold	IBS	2.3L + 0.5L + 0.6L	1.25
Duet + Diuron + Avadex Xtra + Dual Gold	IBS	2.3L + 0.5L + 0.6L + 0.4L	1.25
Atlantis + BS 1000 wetter	GS13	0.33L + 0.25%	1.49
Atlantis + Hasten + AmSulphate	GS13	0.33L + 1% + 2%	1.51
Lexone	GS13	280g	1.31
Level of significant difference			**0.01**
LSD (5%)			**0.17**
Co-efficient of Variation (%)			**10**

Interpretation

Brome grass control is difficult in wheat (unless Clearfield technology is used). None of the herbicides treatments used pre-sowing or post-emergent resulted in control of brome grass. However, the use of Atlantis post-emergence resulted in good suppression of brome grass and these treatments were also the highest yielding.

Atlantis is generally used with a wetter; in our trial we also included a treatment of Atlantis + Hasten + Ammonium Sulphate. It is known that the addition of Hasten (an oil) plus ammonium sulphate increases the activity of the herbicide which does improve the level of control (suppression) but it can also increase the phyto-toxic effect on the crop (which can result in a yield penalty).

Lexone applied post sowing had very little effect on brome grass in this trial. In previous BCG work we have found Lexone to have good activity on brome grass. However, it is well known that it must rain within 5 days of application otherwise the chemical loses activity. In this trial there was no significant rainfall for 18 days following the application of Lexone and the herbicide lost activity over this time.

Commercial Practice

Controlling brome grass in wheat with herbicides is difficult and often the result is poor.

<u>Pre-emergent control options:</u>

Pre-emergent options are often required to reduce the overall level of brome grass but cannot be relied on for control – using these herbicide options will result in brome grass surviving and setting seed.

Trifluralin or other group D herbicides: have some activity but the overall effect is not sufficient for acceptable control.

Trifluralin + Lexone: does have activity on brome grass but moist soil (or rainfall soon after application) is required otherwise the Lexone (metribuzin) component of the mix does not work. The use of Lexone with Trifluralin is not registered on wheat (it can cause significant damage to wheat crops if a post sowing rainfall event washes the product into the root zone).

Trifluralin + products such as Avadex, Diuron and Dual Gold: these mixes are known to have varying levels of additional control on ryegrass but not brome grass.

Early post-emergent control options:

Early post-emergent herbicide options are limited and are often associated with other problems such as residual effects (most of the options are reliant on group B chemistry).

Monza has good activity on brome grass when used when plants are small (up to the 2 leaf stage). On alkaline soils, Monza has a long residual period - very few options exist for re-cropping in the following year(s).

Atlantis has good suppression of brome grass. Atlantis reduces brome grass growth but it generally will still set seed (albeit the seed heads are much smaller). The use of Atlantis with Hasten as an adjuvant increases its activity but it can also increase the phyto-toxic effect on the crop. Atlantis has residual activity on alkaline soils but it is not as severe as Monza.

Lexone has excellent activity on brome grass BUT only when rain soon after application (within 5 days) washes the product into the soil. The safety of this method is also highly questionable because Lexone can cause significant damage to wheat and its use is not registered in wheat (it is in barley).

Clearfield technology:

The use of Midas (Clearfield group of herbicides) on CLF JNZ is the best option for the control of brome grass in wheat. However it must be noted that a pre-emergent herbicide should also be used. Midas cannot be safely used before the 4-leaf stage of the crop (GS14) and in situations with high weed pressure the weeds can already compete strongly with the crop before the product can be safely applied. Using Clearfield herbicides such as Midas in the drier cropping areas also results in restrictions in crop selection for the next season (the product has a long residual period in dry conditions). The current Clearfield variety available, CLF JNZ, is not CCN resistant nor tolerant, which limits its usefulness in the Mallee or Wimmera.

Long term plan for Brome grass:

The only way to beat brome grass is with a long term control. This plan must include control practices other than selective herbicides – Brome grass will, with continued use of group B herbicides (Midas, Monza, Atlantis), develop resistance! Brome grass is relatively soft seeded but it will take at least 2 years (3 years in seasons with late breaks) to run the seed bank down. A long term plan must include a Clearfield phase; a group A phase; a group B phase and the use of Roundup or Gramoxone during the pasture or fallow phase. Mechanical removal through slashing or hay is also worth considering.