Trifluralin use in wheat

The aim of this trial was to investigate new and crop 'safe' techniques for using trifluralin

Summary
Frame wheat is more tolerant to high rates of trifluralin compared to Goldmark and Silverstar. Silverstar was especially sensitive to trifluralin (even at 1L/ha applied immediately in front of sowing) and suffered a large yield loss when 3L of trifluralin was applied immediately prior to sowing (control 3.2 t/ha, 3L/ha trifluralin 2.0 t/ha).

Crop damage and poor weed control can occur if you get your trifluralin application technique wrong. Cloddy soils are at a higher risk of crop damage compared to soils with an even seed bed. At the resistant ryegrass site applying trifluralin immediately prior to, and incorporated by sowing, was safer for the crop compared to applying trifluralin immediately post sowing and incorporated by a single pass with a prickle chain. This was due to too much incorporation with the prickle chain which clearly demonstrates the importance of being extremely careful in not incorporating trifluralin into the wheat sowing band.

Ryegrass numbers were unacceptably high even with the highest rates of trifluralin. Ryegrass numbers were slightly fewer with the incorporated by sowing treatment compared to the post sowing pre-emergent treatment. Ryegrass at this site had already developed a fair degree of resistance to trifluralin, clearly demonstrating the importance of not relying on one control technique for ryegrass.

Trifluralin residues were below detectable levels (<0.05 mg/kg of trilfluralin) in the wheat grain analysed (3L rate in Frame, Goldmark, Silverstar and Rosella).

***Trifluralin is not registered on wheat at rates higher than 1.0L/ha.**

Background
To combat herbicide resistance in ryegrass to the fop and dim group herbicides, growers are using more and more trifluralin. Dealing with resistance requires innovation and many growers are now using trifluralin in new practices which have a large degree of crop safety. Unwise use of trifluralin can result in unacceptable levels of crop damage.

Method
Two trials were undertaken by the BCG in 1998:

1. tolerance trial of three wheat varieties to three rates of trifluralin. This trial was located at the Birchip site. Trifluralin was applied at 1, 2 and 3L immediately prior to sowing. Three wheat varieties; Frame, Goldmark and Silverstar were sown at 80kg/ha. Sowing was with narrow points in a cultivated seed bed. All treatments were replicated three times and each plot was adjacent to a control. The site was grass weed free throughout the season. Measurements included emergence (at the 3 leaf stage) and yield.

2. crop safety demonstration investigating three rates of trifluralin incorporated in two different ways. This demonstration was located at the Resistant Ryegrass Site. Trifluralin was applied at 1, 2 and 3 L, either immediately pre-sowing and incorporated by sowing (IBS), or immediately post-sowing and incorporated by a single pass with a prickle chain (PSPE). Rosella wheat was sown at 80kg/ha with farm machinery and plots were not replicated. Measurements included emergence (at the 3 leaf stage), ryegrass counts (prior to flowering) and yield.

Results

Variety tolerance trial: There were large significant differences in trifluralin effects between the varieties and rates applied (Table 2.6).

Table 2.6 Trifluralin tolerance trial with three wheat varieties (Frame, Goldmark, Silverstar)

Trifluralin	crop establishment plants/m2			yield t/ha		
	Frame	Goldmark	Silverstar	Frame	Goldmark	Silverstar
control	163	175	184	2.85	2.82	3.24
1L	150	155	128	2.69	3.0	2.80
2L	139	106	111	2.50	2.11	2.60
3L	109	94	84	2.53	2.51	2.00
significant differences:	**P<0.01 LSD=17**			**P<0.01 LSD=0.24**		

Crop safety trial: (Table 2.7) Wheat took longer (2 to 3 weeks) to emerge with the 2L and 3L rates of trifluralin compared to the 1L application rate (regardless of whether it was applied before or after sowing). Overall establishment decreased, as the rate of trifluralin was increased. Ryegrass populations decreased with the higher rates of trifluralin, however the PSPE treatments had higher ryegrass numbers compared to the IBS treatments (regardless of rate of trifluralin). The crops had good potential with expected yields in the range of 3 to 3.5 t/ha, however the frosts in late October were devastating and actual yields were less than half of expected.

Table 2.7 Trifluralin on wheat, crop safety demonstration

Trifluralin rate and timing	wheat establishment plants/m2	ryegrass population plants/m2	wheat yield t/ha
1L IBS	162	208	1.47
1L PSPE	144	263	1.48
2L IBS	152	115	1.58
2L PSPE	135	219	1.45
3L IBS	148	117	1.30
3L PSPE	132	196	1.35

Trifluralin is not registered on wheat at rates higher than 1.0L/ha.

Interpretation

Variety tolerance trial: All three varieties were affected by applying trifluralin (even at the 1L rate) immediately prior to sowing. Although the effects were visible at emergence, the yields of Frame and Goldmark were not significantly affected at the 1L rate, Silverstar did suffer a yield loss at the 1L rate. Frame was the most tolerant wheat variety although at the highest trifluralin rate (3L) yields were lower compared to the control (2.5 to 2.8t/ha). Goldmark and Silverstar were less tolerant suffering large yield losses at the higher trifluralin rates (2 and 3L applied immediately pre-sowing).

Crop safety demonstration: Trifluralin at rates higher than 1L/ha showed severe damage on Rosella wheat seedlings. At the higher application rates, wheat seedlings showed the typical thickening of the coleoptile. Approximately 5 weeks after emergence the damage was hardly

visible and the crop had recovered. The PSPE treatment was more severe on seedling emergence and less effective in controlling ryegrass. Even at the highest rate of trifluralin the level of ryegrass control was commercially unacceptable. This could be due to the moderate level of resistance shown by ryegrass to trifluralin at this site. Wheat yields were poor due to the frost in October.

Commercial Practice

Trifluralin is not registered on wheat at rates higher than 1.0L/ha. Higher rates are being used to combat fop and dim resistant ryegrass. If using higher rates it is essential to ensure that tolerant varieties are used otherwise severe yield penalties may occur. Frame appears to be more tolerant to trifluralin compared to Goldmark and Silverstar.

Traditional use of trifluralin (applied 10 days before sowing and harrowed) can cause damage if used at higher rates than 1.0L/ha. New techniques for using trifluralin with more crop safety include applying the chemical right in front of sowing and using the sowing operation (narrow points only) for incorporation, or applying the chemical after sowing followed by a light harrowing (usually with a prickle chain). It is very important to never incorporate the trifluralin into the seed band otherwise crop damage will result.

Ryegrass will develop resistance to trifluralin if used repetitively. Trifluralin should only be used in combination with other ryegrass control techniques for the long-term management of ryegrass in continuous cropping rotations.

Trifluralin residue levels were determined for the 3L trifluralin rates for Frame, Goldmark, Silverstar and Rosella (for the latter for both the IBS and PSPE treatments). No residues were found and all samples had trifluralin residue levels less than 0.05 mg/kg (lowest detectable level and Maximum Residue Level).