



Cultivated versus chemical fallow

The aim of this demonstration was to monitor moisture retention and nitrogen accumulation under cultivated and chemical fallow regimes.

Summary of trial

Effective control of summer weeds before cropping can increase both grain yield and quality. The key to increased yield potential lies in additional sub-soil moisture available to the crop during the subsequent growing season. Summer weeds also deplete mineralised N reserves. Provided there are no limitations preventing crop roots from accessing the sub-soil, the additional soil moisture can be seen in higher grain yields and generally grain protein and test weight.

Why it was conducted:

Over summer 1998/99 the BCG conducted a demonstration at Charlton looking at heliotrope control on fallow. The results in that season highlighted the importance of maintaining fallows in a weed free state. The clean fallow had 70mm more soil water and 33kg/ha more nitrate nitrogen available for crop growth than the plots where heliotrope was not controlled. This resulted in the heliotrope free fallow yielding 1.5t/ha more than where heliotrope was not controlled. The demonstration was established to monitor moisture retention and nitrogen accumulation under chemical and cultivated fallow versus uncontrolled summer weed plots.

How it was conducted:

Treatments were sown at Birchip on the 23rd May. Yitpi wheat was sown at 80kg/ha. Mallee Mix 1 was applied at sowing at 80kg/ha and Urea was pre-drilled on the 2nd May at 40kg/ha.

Four treatments were investigated:

- Single cultivation in September 2001
- Multiple (3) cultivations
- Knockdown and Residual herbicide over summer as needed (RoundUp Extra 1.5L + Ally 5g + Uptake oil 1%).
- Multiple knockdown herbicide over summer as needed (RoundUp Extra 1.5L + Uptake 1%).

Soil moisture and nitrate N was measured prior to sowing.

Results of the trial:

Table 1. Plant available water and mineralised N available at sowing

Treatment	Plant available water (0-100cm)	Mineralised N (0-100cm)
Single cultivation	34mm	86kg/ha
Multiple cultivations	61mm	82kg/ha
Knockdown + Residual	70mm	78kg/ha
Multiple knockdowns	90mm	108kg/ha

Soil profile was dry under single cultivation (34mm) whilst moderate levels of soil moisture occurred under the other treatments (Table 1). Summer weeds were able to establish under the single cultivation treatment. The dry soil profile prior to sowing and the drought conditions during the season has contributed to the below average yields across all treatments.

There were no differences in soil nitrogen levels between the single cultivation, multiple cultivation and knockdown + residual treatment. Chemical fallow had a greater soil nitrogen reserve.

This trial has shown that there is a large difference in the yield and quality of Yitpi wheat when comparing the 4 different cultivation methods (Table 2).

Table 2. Plant establishment, yield and quality results of Yitpi wheat across 4 cultivation methods

Treatment	Plants/m ²	Yield (t/ha)	Protein %	Screenings %
Single cultivation	147	0.21	16.6	5.6
Multiple cultivations	137	0.65	14.9	6.6
Knockdown + Residual	140	0.65	15.5	6.4
Multiple knockdown	124	0.63	15.5	6.3
Significance				
LSD (5%)		0.1	0.5	0.4

Interpretation:

Wheat yields achieved on multiple cultivations or chemical fallow were significantly higher than the single cultivation treatment. There was no difference in grain protein percentage in the mechanical or chemical fallow treatments, however wheat protein was significantly greater under the single cultivation treatment. Significantly higher grain protein was observed in Yitpi grown on single cultivation as moisture was more limiting to yield than nitrogen. Therefore the available nitrogen was not used for yield but rather channelled into grain protein. These results are most likely related to the amount of plant available water at sowing. The amount of water available at sowing under a single cultivation method was half of that compared to the multiple cultivation and chemical fallow treatments. This suggests the importance of maintaining a fallow in a weed free state.

Commercial practice:

There are many reasons for controlling summer weeds, including easier passage of tillage equipment, reducing build-up of weeds along fence lines, reducing disease carry-over or wool contamination and moisture conservation benefits. BCG research over a number of years has shown the benefits of a weed free fallow provided there are no subsoil limitations. Potential sub-soil limiting factors, particularly in the Wimmera/Mallee, include salinity, boron toxicity, sodicity and high pH. As additional soil water is often stored at increased depths below the surface sub-soil limitations reduce plant root access to this moisture. It may also be the case that control of weeds in a previous summer may lead to a reduction in weed numbers in the consecutive summer. To get maximum benefit from a chemical or mechanical fallow it is important to control summer weeds when they are small.