3.4.3 RESPONSE OF RED WHEAT TO PHOSPHORUS AND SULPHUR IN FERTILISER

Location: McMasters property near Lake Bolac.

Researchers:
Design, fertiliser & write-up:
John Montgomery, *Pivot.*
Sowing, weed control & harvest:
Angela Clough & colleagues, *DNRE.*

Background:
No trial site that Pivot previously had with SFS ever tested low in sulphur. However, when SFS inspected the site in spring 2001, the McMaster paddock gave a KCl sulphur level of 5.5 mg/kg. In March 2002 (prior to bed forming), the sulphur level was still 6.8 mg/kg in the surface soil and it did not increase down the soil profile, as shown by sulphur levels in soil samples taken to measure deep nitrogen. Furthermore, deep nitrogen levels indicated that the site was too high in nitrogen to be suitable for a nitrogen trial. It was therefore decided to focus Pivot's trials with SFS in 2002 on measurement of response to sulphur by red wheat and canola. As phosphorus levels in the surface soil were also low (Colwell P 15 mg/kg), response to phosphorus was also measured for red wheat. Organic carbon on the site was 2.3%.

Aims:
1. To compare the effectiveness of sulphate of ammonia, gypsum and elemental sulphur as sources of sulphur for red wheat and canola.
2. To measure response to phosphorus in fertiliser at a range of rates in red wheat.

Design:

Sulphur: All treatments received 18 kg N/ha and 40 kg P/ha. In the minus sulphur treatment, P was provided as triple super. Because farmers tend to vary the rate of sulphur applied to crops depending on the cost of the source, rate of S was not kept uniform in this trial either, rates varying from 16 kg S/ha in sulphate of ammonia to 45 kg S/ha in gypsum. Each treatment was replicated six times.

Phosphorus: Rates were 0, 10, 20, 30 and 40 kg P/ha, each replicated six times.

Results:

During the growing season, there appeared to be no visual difference in vegetative growth between the nil sulphur treatment and any of the treatments providing sulphur, neither with red wheat nor with canola. A soil sample taken from the raised beds in July gave a KCl sulphur level of 16 mg/kg.

Grain yields from harvest in December were as follows:

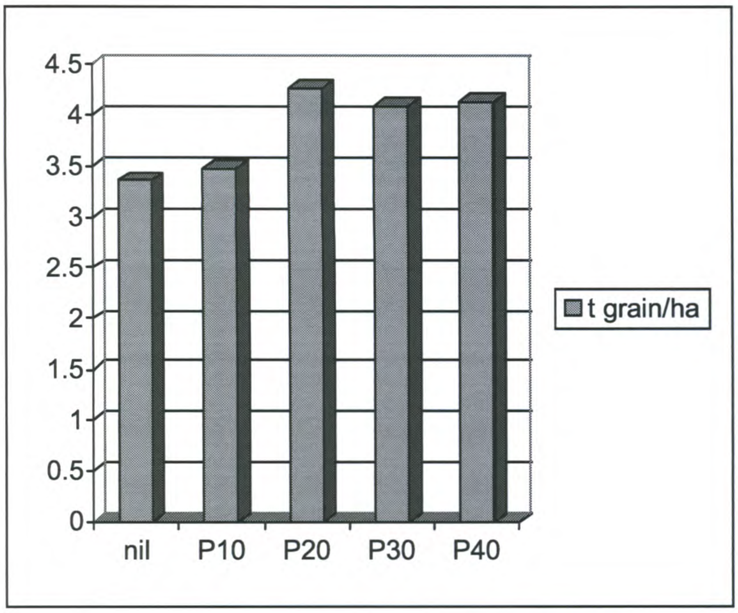
Sulphur treatments:

Source of sulphur	Canola yield (t/ha)	Wheat yield (t/ha)
Nil	2.95	4.19
Sulphate of ammonia	2.98	4.13
Gypsum	3.01	3.71
Sulphur coated MAP	3.08	4.01
MAP + SulFer-95	3.12	3.66

There were no significant differences in grain yield between any of the sulphur treatments with either crop. In the case of canola, in particular, yields were very uniform between treatments, all being very close to 3 t/ha. In other words, there was no response to sulphur.

Phosphorus treatments (red wheat):

Figure 7: Grain Yields at 20, 30 and 40 kg P/ha were Significantly ($p<0.05$) Higher than at 0 and 10 kg P/ha.



Economics: Extra grain yield from using 20 kg P/ha was (4.26-3.36) = 0.9 t/ha. Even if we value this conservatively at 2001/02 prices, it's still worth $200/ha, approximately five times the cost of the phosphorus in the fertiliser at about $40/ha.

Discussion:
It was not surprising that no response to sulphur was obtained, when we consider that the KCl sulphur level in the soil rose from 5-7 mg/kg before bed forming to 16 mg/kg after bed forming. Cultivation is known to stimulate mineralisation of sulphur by soil bacteria from organic matter and that is what appears to have happened in this trial. The organic carbon level of 2.3%, which is relatively high by crop paddock standards, indicates that enough organic matter was present to enable this effect.

The fact that 30-40 kg P/ha produced no more wheat grain than did 20 kg P/ha could be explained by low rainfall limiting yield. This year's maximum wheat yield of about 4 t/ha in Pivot's trials with Southern Farming Systems compares with 6 t/ha in last year's trials.