PHOSPHORUS REQUIREMENTS FOR WHEAT POST DROUGHT

Bob Thompson
District Agronomist, West Wyalong.

Many wheat crops which failed in the 2002 drought would have 10kg/ha to 20kg/ha phosphorus applied at sowing. In 2003, the common question being asked by farmers was, “How much of last year’s super will be available to my crop this year?” This question is being asked again in 2007.

There was no local data available in 2002 regarding the availability of the residual phosphorus, so we referred to the trial work done by Col Mullen, District Agronomist, Dubbo at Trangie and Gulargambone on this question following the 1972 drought. In 1972, wheat trials were established to evaluate a range of phosphorus rates on low to medium phosphate soils. These trials were not harvested because there were no worthwhile yields to be recovered due to the drought.

In 1973, the sites were oversown with wheat and Triphos to determine if the 1972 phosphate had any residual benefits to the following wheat crop. Normal pre-sowing cultivation preparation with tined equipment was carried out in 1973. The same range of phosphorus rates used in 1972 was again applied to two of these trial sites. Note: 25kg/ha Trifos = 5kg P/ha. The soil types involved were medium clay loam and light red clay loam (pine and box country).

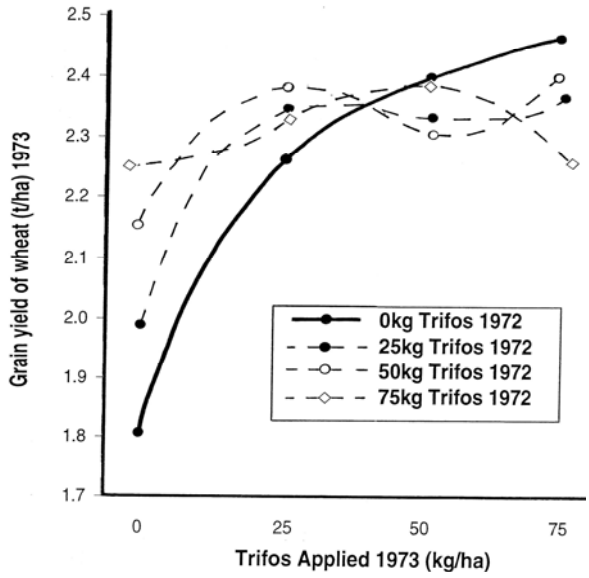

Figure 1. Averaged Wheat Yields in 1973 with Varying Rates of Trifos.

The mean yield harvested from trials in 1973 was 2.35t/ha. Unfortunately Mr Mullen has not supplied water use efficiency data. At Trangie ARC there was 353mm for 1973, between 1 May and 30 October. The plant available water was 243mm. Wheat yields in Mr Mullen's trial may have been a little limited by nitrogen. After all a site low in phosphorus prior to 1972 would be likely to have a history of poor clover growth. The bottom solid black line in figure 1 (with filled circles), had no phosphorus applied in 1972 and four rates were applied in 1973. This zero P for 1972 (or solid black line), has a nice yield increase response, as the rate of Trifos applied in 1973 increases, so does the yield increase – showing that this is a phosphorus responsive site.

Looking at the top three dotted lines, these had 25kg, 50kg or 75kg of Trifos applied in 1972. Where no Trifos was applied in 1973, (the four points on the left-hand side of the graph), the 1973 wheat yields are significantly higher for the plots that had some Trifos in 1972 compared to the point at which no Trifos (1.8t/ha) was applied in both years.

Where the Trifos was applied at 75kg/ha in 1972 but no Trifos in 1973; the yield was 96% of the 1973 mean yield. Therefore most of the Trifos applied in the drought was still available to the 1973 wheat crops. Very little phosphorus is locked up in soils with low exchangeable aluminium levels. This was also reported by many local farmers sowing wheat in 1995 without applying any MAP.

As you follow the three top dotted Trifos lines across, they bounce around a bit. Please note; these results are average from two sites, 100km apart and the data is off smallish sub-plots, so there is a bit of noise in the numbers. Observe the trend and not the specifics.

Applying a minimum of 25kg Trifos to the previously fertilised plots in 1972, at sowing in 1973 attained the mean yield (2.35t/ha). Applying more Trifos did not increase yield, as yield is limited by available rainfall and nitrogen. Applying 25kg Trifos in 1973 assisted the wheat plants early root development to seek out the Trifos applied in 1972 and subsequently attained the potential yield. Compared to the same treatment rates when no additional Trifos was applied in 1973, yields are 4% to 15% lower.

In 2003 GRDC funded trials across the southern wheatbelt to revisit the availability of residual phosphorus following drought. Unfortunately the break was too late to sow trials in 2003. The trial was eventually sown as Weethalle on 17 June, 2004, using Janz.

Figure 2. Wheat Yield Response to Varying Rates of Trifos Following Drought in 2004.

Rainfall: June 37mm, July 18mm, Aug 26½mm, Sept 8½mm, Oct 21mm. Total ICR = 111mm

Treatment	Yield t/ha	% Yield	% Protein	% Screenings
Nil	1.632	87.6	15.4	8.2
5kg/ha Phosphorus	2.193	117.7	15.3	6.8
10kg/ha Phosphorus	1.777	95.4	15.9	6.7
15kg/ha Phosphorus	1.924	103.3	15.5	6.8
20kg/ha Phosphorus	1.807	97.0	15.6	7.3
25kg/ha Phosphorus	1.980	106.3	15.5	7.2
30kg/ha Phosphorus	1.796	96.4	16.0	8.3

The trial site was located in a paddock which had a good lucerne history from 1995 to 2000; the paddock was long fallowed in July 2001; the paddock was then sown to wheat in 2002 with 100kg of MAP/ha and yielded 0.8t/ha due to drought.

It was estimated there was at least 16kg per hectare of residual phosphorus in the soil from the 2002 planting. Trifos was used in preference to MAP to eliminate the effects of nitrogen.

The wheat yield response in 2004 as seen in figure 2, was very much in line with expectations. The yield data for the 5kg P/ha treatment is above the expected average range, as the plot in the first rep had a 133% yield result and the statistical analysis has not smoothed the bump out.

The mean potential yield for the trial was 1.857t/ha. 2004 was a particularly low rainfall season with only 111mm of in-crop rainfall (ICR) on site and this was also reflected in higher than average proteins and screenings. Grain production at this site had a high dependence on fallow stored moisture. Many nearby crops totally dependant on in-crop rainfall failed in September. The Nil P treatment yield was 88% of the mean treatment result. Therefore, applying a small amount of phosphorus at sowing ensured maximum potential was obtainable.

Summary

In this district and in reference to the soils that are low in exchangeable aluminium – that is to say the soils where barley, canola and lucerne can realise their water limited yield potentials without the need for the application of lime, that negligible quantities of phosphorus are lost to the soil pool. The principle constraint to utilising residual phosphorus is the placement of the seed near last season's phosphorus band in the following year. Acidic granite soils with exchangeable aluminium levels above 10% Al (triticale soils), may have a very high proportion of the phosphorus absorbed into the unavailable soil pool.

Wheat yields were economically increased when at least 25kg/ha of Trifos (5kg of phosphorus) was applied with the post-drought crop, provided the paddock is cultivated prior to sowing and the seeding rows are less than 23cm apart. Higher post-drought Trifos rate did not necessarily produce high yields and profits were often reduced. The application of at least 25kg/ha of Trifos/MAP is strongly recommended to wheat growers for 2007 plantings.

Those farmers sowing with an airseeder with tine spacings greater than 23cm (9 inches), or direct drill wheat should apply a minimum of 50kg/ha of MAP when sowing to encourage early root growth, to ensure maximising yield potentials.

When there is no stored subsoil moisture, the crops are totally dependant upon in-crop rainfall, so yield potentials are likely to be very constrained in this district. With an average ICR of 224mm the likely yield potential range is 1.7 to 2.3t/ha, which requires 8.5 to 11.5kg of P/ha ~ or 42 to 46kg MAP/ha.

Historically, when a drought breaks there is an increase in wheat plantings in most districts of eastern Australia, particularly on the 5.0t/ha plus country of the slopes and in Victoria. As a consequence of a larger than usual crop with high yields usually results in a significant correction in grain prices by the post-drought spring; as it was in 2005. Keep an eye on the wheat market and spend your pennies wisely to maximum returns.

2006 depleted many peoples' cash reserves, so it is important to examine the options that are available to maximise the financial return on each dollar invested this season. It may be better to invest in nitrogen or Strip rust fungicides than phosphorus? There may be better returns in investing in pasture improvement for a fat lamb enterprise? Take some time to consider your options, maybe discuss them with your financial advisor.

Finally, it is stressed that after 2007 you should apply at least the usual recommended phosphate rate to your 2008 wheat crops to achieve their water-limited yield potential.

Acknowledgement

Col Mullen, District Agronomist, NSW Agriculture, Dubbo who trials were conducted on the properties of Messrs A. Gordon, "Fairview", Trangie and the late R.K. Shepherd, "Wyuna", Gulargambone and were supported by the NSW Wheat Industry Research Committee.

Also Rodney Tait and Paul McKinnon, "Labertouche", Weethalle and GRDC.