Will there be benefits on our soil types?

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Calcareous and acid soils are widespread in Australia and their agricultural use accounts for a significant fraction of the crop production nationwide. However, these soils provide significant challenges for management of crop P nutrition due to rapid fixation of P (reactions which “lock up” fertiliser P into forms that are not available to crops). Fluid fertilisers have produced significant yield increases over and above those achieved with conventional granular products. However, to date, trials have only been undertaken on a narrow range of alkaline soils. Fluid fertilisers need to be trialed on a wider range of soil types so that farmers can predict whether fluid fertilisers will benefit their own farming enterprises.

We conducted pot experiments on 29 soils from Victoria, South Australia and Western Australia, to compare their responsiveness to fluid and granular P. The P fertilisers tested were triple superphosphate (TSP), phosphoric acid (H_3PO_4), ammonium polyphosphate (APP) and a control of no P fertiliser. The amount of P applied to each pot was the equivalent of 12 kg P per hectare.

Table 1: Dry matter response (grams per pot) to fertiliser type. N is the number of soils tested, control is no P fertiliser, APP is ammonium polyphosphate, H_3PO_4 is phosphoric acid and Triple P is triple superphosphate . Values in the same row denoted by the same letter are not significantly different (P d” 0.05).

Soil type	N.	Control	APP	H_3PO_4	TSP
Acid	3	0.40 c	1.22 a	1.14 a	0.89 b
Neutral pH	7	1.06 b	1.55 a	1.59 a	1.48 a
Alkaline	12	0.87 c	1.54 a	1.57 a	1.25 b
Calcareous	7	0.54 b	1.03 a	1.06 a	0.60 b

Among the soil properties, soil pH and calcium carbonate content were the key soil characteristics that controlled crop response to fluid P fertilisers (Figure 1). Surprisingly, fluid formulations also performed well in some acidic soils.

The greater cost of fluids, and equipment issues, need to be assessed against any possible yield advantages, although there may be general logistical advantages with the use of fluid fertilisers.

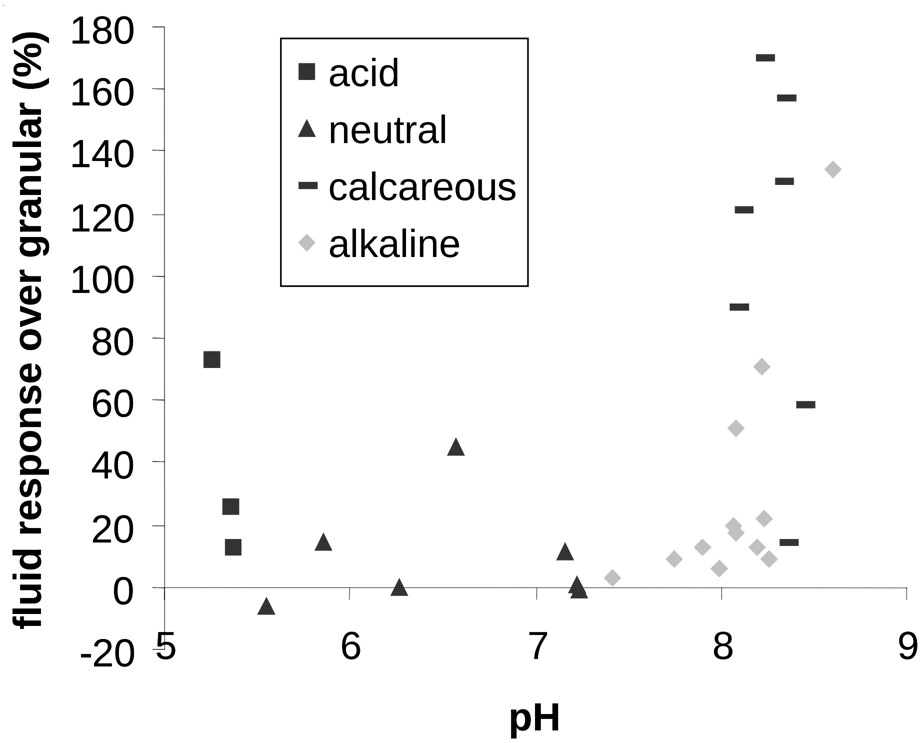

Figure 1. Dry matter response of wheat to fluid fertilisers (APP and phosphoric acid), expressed as a percentage benefit over granular P fertiliser (TSP).

In field experiments conducted by our group on Eyre Peninsula, responses to ammonium polyphosphates have generally been most reliable, possibly because of their ability to chelate micronutrients in the soil. However, most farmers who have changed to fluid fertilisers on Eyre Peninsula are using phosphoric acid as the base product because of price.

Our research has shown that in most cases, a positive response to phosphoric acid compared with MAP or DAP requires the addition of urea (NOT UAN) and micronutrients, particularly zinc, in the solution.

Some farmers are now applying granular urea pre-sowing, with a mixture of phosphoric acid, urea and micronutrients at sowing with considerable success.

We have also had good results with applying fluid nitrogen to barley crops using high-pressure injection during the growing season. Obviously, these techniques will need to be tested locally.

Conclusions

Highly alkaline and calcareous soils are very likely to respond to use of fluid P fertilisers (i.e. fluids are likely to be more effective than granular formulations).

Our future research will investigate crop response to fluid fertilisers on acidic soils.