



SA Graingrowing

Suspension fertilisers

An SA Grain Industry Trust-supported project

The application of fertiliser held in suspension has produced very promising dry matter and yield responses in wheat in Eyre Peninsula trials conducted by the Plant Nutrition Group at Minnipa Agriculture Centre.

The suspensions are being tested as alternatives to clear fluid and granular fertilisers on highly calcareous, alkaline soils.

In 2002, the first year of the trials, yields produced following applications of suspensions were from 19 to 39 per cent higher than those where granular fertilisers were applied.

In 2003, suspension fertilisers again performed well compared with clear fluid and granular fertilisers at three sites on Eyre Peninsula (see overleaf).

Background

These trials follow research which has shown that highly calcareous alkaline soils, such as those found in large areas on Eyre Peninsula, and in other parts of Australia, have a high capacity to fix phosphorus, and trace elements such as zinc, so making these nutrients less available to crops.

Field trials have demonstrated that fluid fertilisers, such as ammonium polyphosphate, are more effective on these soils than granular fertilisers, such as MAP and DAP.

In these trials on Eyre Peninsula, at similar rates of P application, fluid fertiliser forms increased grain yields of wheat by an average over six years of 20 per cent on grey calcareous soils (range 2 to 47 per cent) and 13 per cent (range 5 to 26 per cent) on red calcareous soils, compared to granular forms.

There was a trend for the fluid forms to be more efficient than the granular forms in dry years. In the case of acid-based fluid fertilisers, the best results were almost always obtained when micro-nutrients were mixed with the nitrogen and phosphorus in solution.

Ammonium polyphosphates appear to be less dependent on the application of micro-nutrients in the solution at sowing.

In preliminary trials in Victoria, greater efficiencies have been observed in fluid fertilisers compared to granular fertilisers on a range of soils.

The mechanisms which make fluid fertilisers more effective in some circumstances are under further investigation but are thought to include greater diffusion and less fixation of phosphorus, compared to granular forms.



While clear fluid fertiliser, such as ammonium polyphosphate, has been shown to increase yields on phosphorus-responsive soils, it is more expensive than granular fertiliser and this cost is a barrier to the wider use of fluid fertilisers.

As well, the mixing of other nutrients in clear fluids can result in precipitation and application difficulties.

Suspension fertilisers

These are used in the US where they are based on powdered, or even granular MAP or DAP, mixed in water. Nutrients are held in suspension by the addition of attapulgite or bentonite clay.

Specialised pumps are needed to shear the clay particles so that they remain in suspension instead of flocculating and settling out over time.

In the Eyre Peninsula trial work to date, suspensions have been applied without filtration, being "dribbled out" under the seed at sowing in a continuous stream.

An advantage of suspension fertilisers over clear fluid fertilisers includes the ability to add other nutrients to the mix without precipitation problems arising – virtually any combination of nutrients is possible. Suspension fertilisers may prove more difficult to transport, store and apply on farm but they may also be cheaper than clear fluid fertilisers. Ammonium polyphosphate fluid fertilisers are not manufactured in Australia and must be imported.

Research results

2002

At Yandra on a grey highly calcareous soil, wheat treated with a suspension providing the same quantity of phosphorus and nitrogen as ammonium polyphosphate, out-yielded the polyphosphate treatment by 29 per cent and the MAP granular treatment by 38 per cent.

At Emerald Rise on a red soil, a different suspension produced 6 per cent less grain than the ammonium polyphosphate treatment but still out-yielded the MAP granular-treated plots by 19 per cent.

At Streaky Bay on a grey, highly calcareous sandy loam, two suspension mixes and ammonium polyphosphate produced higher yields than DAP.

Among the trace element-enriched fertilisers only one suspension fertiliser produced higher yields than DAP plus zinc.



This new suspension batch mixing plant, funded by SAGIT, will be used to produce experimental suspension fertilisers for testing on EP and other areas of SA.

Further information:

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Acknowledgements:

Personal communication, Dr Bob Holloway

'Suspension Fertilisers – an alternative to clear fluids' – Eyre Peninsula Farming Systems 2002 summary, authors B. Holloway, A. Frischke and D. Brace.

'Fluid fertilisers – the next step towards raising yield potential' – authors M. McLaughlin, B. Holloway, D. Brace, E. Lombi, R. Armstrong and T. McBeath – 2003 Cropping Systems Update

2003

In 2003 there were three sites at which comparisons were made between granular (DAP), clear fluid ammonium polyphosphate (APP) and suspension fertilisers.

At each site 10 kg P/ha; 20 kg of N/ha and 1.3 kg of Zn/ha were applied. In the case of APP, zinc was applied separately but it was mixed with the suspension treatment. The sites were:

- Elliston – a grey calcareous soil with about 70 pc calcium carbonate.
- Warrambo – a grey calcareous soil with about 64 pc calcium carbonate.
- Karcultaby – a red brown calcareous sandy loam (about 15 pc calcium carbonate) with the area having a dry year.

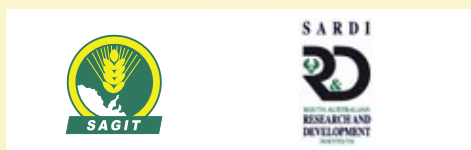
At both Elliston and Warrambo the suspension treatments out-yielded the APP and the granular DAP treatments. The biggest difference recorded was at Warrambo where the average wheat yield from an experimental commercially-produced suspension fertiliser was 2939 kg/ha compared with 2745 kg/ha for APP and 2512 kg/ha for DAP.

At Karcultaby the APP produced yields slightly higher than two suspension fertilisers which in turn produced slightly higher yields than the DAP.

Future work

Trial work comparing the performance of suspension, clear fluid and granular fertilisers continues on Eyre Peninsula under the auspices of the Minnipa Agriculture Centre.

Research is also being directed at product compatibility; the availability of macro and micro-nutrients in various mixtures to plants; ratios of ingredients, including clay and water; storage and transport issues; the need for dilution with water at sowing; placement effects; on-farm storage and handling; and distribution to individual tines using material that cannot be filtered.



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