

Fluid versus granular P

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Spiralling fertiliser prices have encouraged growers to seek out alternative products and much interest has focused on the use of fluid P at seeding. If the market is to move to fluid P more information on how it performs in different soil types is required.

Leighton Wilksch, Landmarks Product Development Agronomist in SA explains how he is using in-crop sensing to quantify in-crop responses to different forms of phosphorus at seeding. Photo: Emma Leonard

In response to growers' enquiries regarding the use of fluid phosphorus (P) as an efficient form of applying P at seeding, Landmark's Product Development Group established an extensive replicated trial plot program. The GreenSeeker® active sensor is playing a key part in quantifying in-crop variation between treatments.

In collaboration with liquid fertiliser specialists SprayGro, an extensive trial program was established across a range of soil types. The objective of the program was to evaluate the fluid forms of phosphorus against the commonly used granular form. All phosphorus treatments were applied at seeding. The fluids were injected as a continuous stream under the wheat seed and the granular MAP was delivered with the seed into the furrow. At the same time in-furrow and foliar trace element applications were evaluated. During the season biomass was measured using a hand-held GreenSeeker®.

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Five trials were sown in SA, one in Victoria and two in NSW on soil types ranging from a highly calcareous grey sandy loam near Minlaton on Yorke Peninsula SA, to an acidic red earth at Temora, Central West NSW. Treatments include granular MAP as the control and various combinations of 'Tech grade' MAP in fluid form (Tables 1a and b). This product has a nitrogen to phosphorus ratio of 9:15, while the MAP has 10:22.

In order to be cost competitive with the granular fertiliser, most of the fluid fertiliser treatments were applied at a rate that provided half as much phosphorus as the granular treatment, while maintaining an equivalent dose of nitrogen (N),

through the addition of a small amount of liquid nitrogen in the form of UAN (6L/ha). Whereas a granular MAP treatment at 80kg/ha provided approximately 8kg N/ha and 18kg P/ha, the standard fluid fertiliser treatments provided 8kg N/ha and only 9kg P/ha.

To maintain trial integrity and to see if a rate response was forthcoming a fluid fertiliser treatment (T2) that provided 8kg N/ha and 18kg P/ha was included, although the commercial cost of this would be restrictive. In addition, trace elements were applied both in-furrow at seeding and as foliar applications at the five leaf stage.

The fluid starter fertiliser (9:15) went in the tank at 60L, the UAN went in at 6L, and 54L of water was added to make the total mix up to 120L/ha for all fluid treatments except T4 which received extra water (107L) and an increased output rate (180L/ha).

Active sensors

Tables 1a and b. Details of the seven phosphorus and trace element treatments applied at eight trial sites to assess the impact of phosphorus applied in the fluid (rather than granular) form. Trace element (TE) treatments were also included.

| Trt. No. | Starter Treatment | Rate /ha | N:P kg/ha |
|----------|--|-----------------|-----------|
| T1 | MAP (10:22) | 80kg | 8:18 |
| T2 | Fluid 9:15 | 120L | 10:18 |
| T3 | Fluid 9:15 + UAN | 60L + 6L | 8:9 |
| T4 | Fluid 9:15 + UAN + Water | 60L + 6L + 107L | 8:9 |
| T5 | Fluid 9:15ZMC + UAN | 60L + 6L | 8:9 |
| T6 | Fluid 9:15 + UAN followed by Smartrace ZMC | 60L + 6L fb 4L | 8:9 |

All treatments have added water (54L/ha) to ensure 120L/ha total fluid application rate, except T4 which received extra added water making the total fluid rate 180L/ha.

| | |
|----|---|
| T1 | Standard practice MAP, control treatment |
| T2 | Fluid fert with equivalent rate of P as T1. Has 2kg/ha of N more than T1 but this is negligible. |
| T3 | Fluid fert with ½ rate of P as T1. UAN is added to make N the same as T1. Standard fluid treatment. |
| T4 | Fluid fert with increased water rate – ½ again as much as T3, same N & P as T3. |
| T5 | Fluid fert + trace elements in chelate form in-furrow (Zn 0.6kg Mn 0.6kg Cu 0.1kg/ha). |
| T6 | Fluid fert + trace elements in chelate form foliar (Zn 0.6kg Mn 0.6kg Cu 0.1kg/ha). |



Photo: Leighton Wilksch/Landmark

Biomass scanning

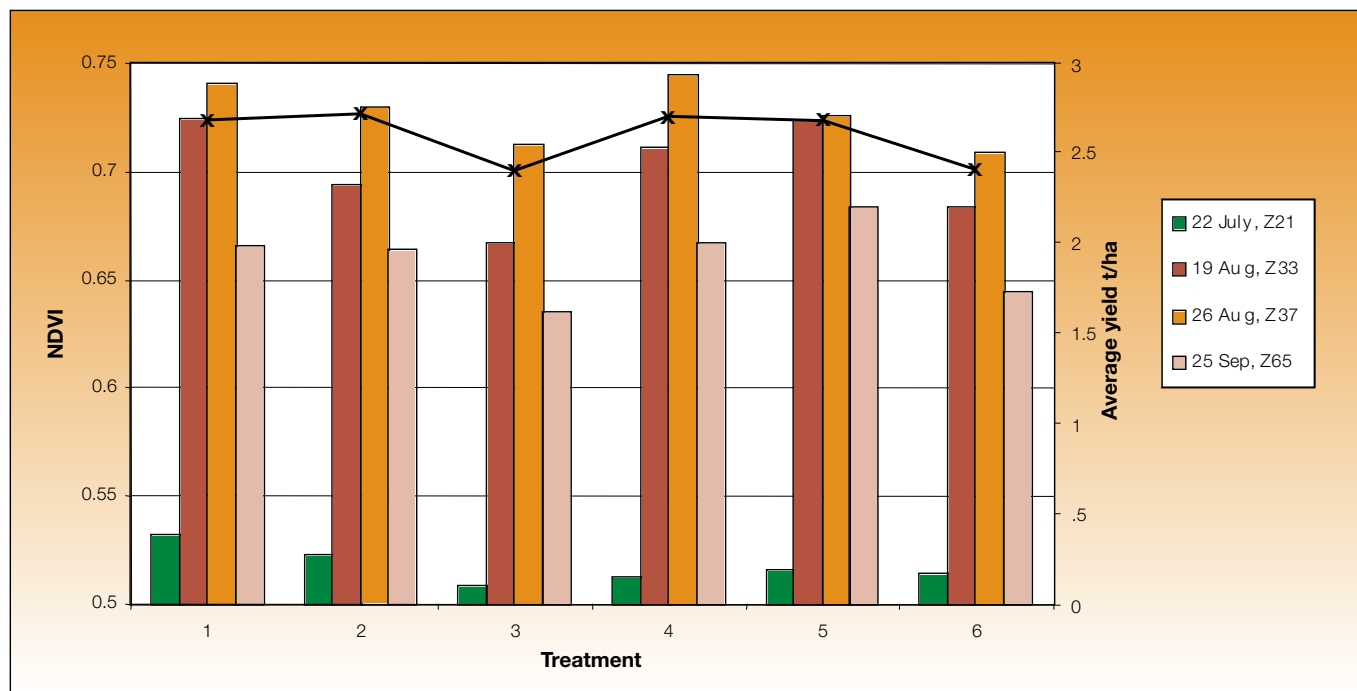
The trials were scanned fortnightly from the early tillering stage with a GreenSeeker® crop sensor to quantify the biomass of each treatment. Biomass is expressed as the Normalised Vegetation Differential Index (NDVI).

NDVI is a measure of plant greenness and biomass, so the more vigorous, healthier plots typically have a higher NDVI.

When observed visually and with the GreenSeeker®, the control treatment of granular MAP at 80kg/ha (T1) stood out as the best treatment at all trial sites, well into tillering. After that time, some of the fluid fertiliser treatments caught up with this treatment although none appears to be significantly better than the granular MAP.

Figure 1 provides an overview of results from the trial site at Callington, SA. This site was the least effected by the dry spring.

Figure 1. Biomass readings and final yield for each of the six fertiliser treatments taken at four periods during the growing season at Callington, SA. This site was the least effected by the dry spring but here the T4 treatment did not show the same early growth.



Across the majority of trial sites, the fluid treatment (T4), which received the increased water rate, produced the most early biomass. This result indicates that the dispersion of the stream and placement of the nutrients can be enhanced by increasing the carrier liquid. It is interesting that in most of the eight trials, increasing the water carrier rate has a better effect on biomass than increasing the rate of phosphorus by upping the rate of the fluid fertiliser.

In this season only treatments T2 and T6 produced significantly different yields to the control treatment T1 (Figure 1).

In-furrow injection use and VRT

The use of in-furrow injection systems and variable rate technology (VRT) at seeding time has many synergies.

Fluids are generally easier to measure accurately and therefore, more finite control can be obtained when rates are varied on-the go. Variable rate trace element applications are

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much simpler with fluids than with granular products because the more sophisticated fluid injection systems are able to add a dose of a product, such as a zinc, copper, manganese trace element mix to the constant stream of fluid starter fertiliser.

Fungicides and new fluid inoculants for pulses can also be mixed with some liquid fertilisers.

Liquid fertilisers are widely used in the USA and it is likely that there will be a significant uptake of

in-furrow injection of fluid fertilisers by Australian grain growers in the next decade. This uptake is likely to be driven by the ease of handling products, the versatility of their use and increasing availability of VR equipment for their delivery. However, trial work will be required to demonstrate how the best results can be gained with liquid fertilisers in different soil types, especially if VR applications of fluids are to be adopted.

For more details on the use of fluid fertilisers visit www.fluidfertilisers.com.au/

For more information

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