Effect of fertiliser sown with wheat seed on Mallee soils

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Peer review:

Key Messages

- Just 50 kg DAP/ha knife point drilled with 70 kg/ha wheat seed is enough to reduce wheat plant establishment
- Wheat fertilised with DAP with seed yielded 0.5 t/ha (20%) less than wheat with DAP placed below seed in 2016.
- The addition of 35 kg urea/ha below the seed overcame the yield penalty in the DAP-with-seed plots, suggesting access to N was a driver.

Why was the trial done?

In 2015 we noticed that wheat plant establishment was significantly better on non-wetting sand (crest and dune) plots that received no fertiliser with the seed compared with those that received 50 kg DAP/ha. Similar effects were measured in trials established by Jack Desbiolles at Moorlands in 2015 (McBeath et al. 2016).

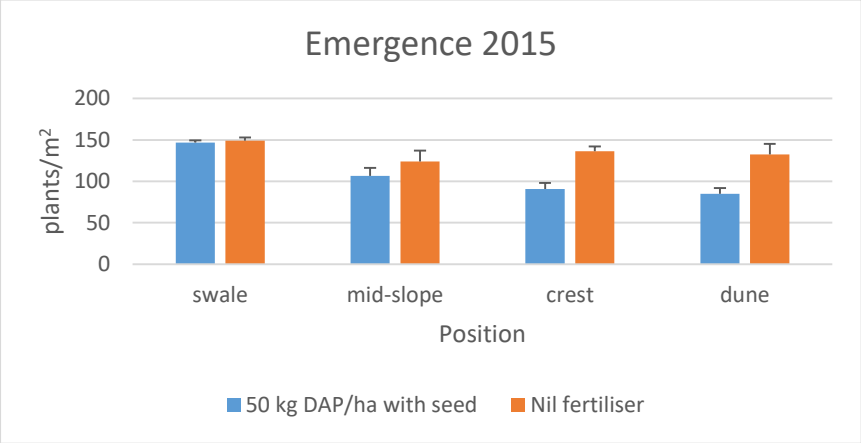

Figure 1. Effect of DAP applied with seed on wheat emergence at Karoonda across multiple soil types in 2015

How was the trial done?

In 2016 we established a more targeted plot trial on non-wetting sand at Karoonda to test the effect of DAP with wheat seed on establishment and to measure whether a difference in establishment was yield limiting.

Acknowledgements

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Background

There are major opportunities to improve crop performance on Mallee sands. As well as opportunities to invest in transformation of poor sands there are also opportunities to improve yield through more targeted agronomy for sandy soils. In 2015 we noticed that wheat plant establishment was significantly better on non-wetting sand (crest and dune) plots that received no fertiliser with the seed compared with those that received 50 kg DAP/ha. Similar effects were measured in trials established by Jack Desbiolles at Moorlands in 2015 (McBeath et al. 2016).

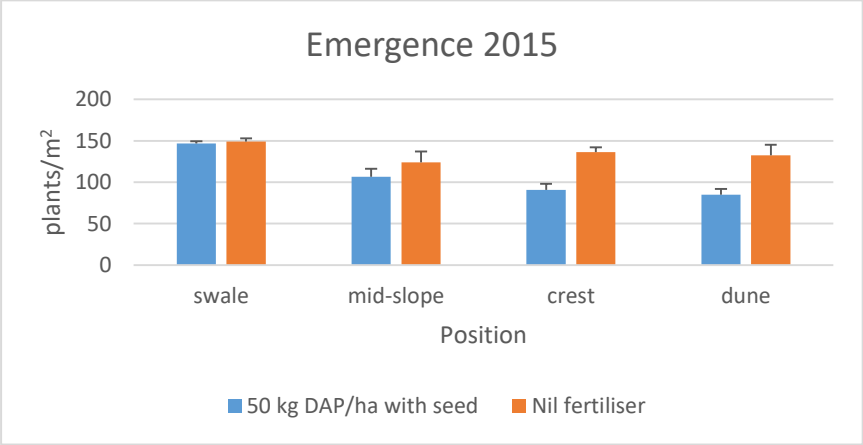

Figure 1. Effect of DAP applied with seed on wheat emergence at Karoonda across multiple soil types in 2015

About the trial

Plots were sown at Karoonda with Scepter wheat on the 2nd of June into wheat stubble with 28 cm row spacing with 1.5 L/ha of trifluralin pre-sowing. All plots received a pre-sowing application of 33 kg/ha of potassium sulfate to eliminate K and S as confounding issues with an in-crop foliar application of Zn, Cu and Mn. The trial was established using knife points and a dual shoot system. Fertiliser placed below the seed was approximately 5cm below seeding depth.

Table 1. Fertiliser Treatments Applied

Fertiliser with seed	Fertiliser below seed
Nil	50 kg DAP/ha
50 kg DAP/ha	Nil
50 kg DAP/ha	35 kg Urea/ha

Results

Establishment of wheat in 2016 was affected by fertiliser placement with a 16% penalty in establishment where 50 kg DAP/ha was placed with the seed. However, all plant numbers were in excess of 90 plants/m^2 and the early biomass differences were not significant (Table 2). Importantly there was a yield effect with wheat fertilised with DAP with the seed yielding 0.5 t/ha less than DAP below the seed. The addition of a further 35 kg Urea/ha below the seed when using 50 kg DAP/ha with the seed overcame this effect and was the best yielding treatment (Table 2).

Table 2. Establishment and biomass response to fertiliser placement

Fertiliser with seed	Fertiliser deep	Establishment (plants/m^2)	GS31 biomass (t/ha)	Grain yield (t/ha)
Nil	50 kg DAP/ha	117a	1.26	3.94ab
50 kg DAP/ha	35 kg Urea/ha	92b	1.33	4.16a
50 kg DAP/ha	Nil	97b	1.02	3.44b

Given the reasonable plant numbers across all treatments and the obvious effect of nitrogen as a yield limiting factor, it is more likely that the access to nitrogen in soil that is moist for a greater period of time (remembering that these soils often wet up from below after water infiltrates root pathways) is the driver of the higher yield for DAP placed below compared to with seed.

Implications for commercial practice

Poor crop density and addressing nitrogen deficiency are often major factors on non-wetting sand, so it is worth considering the effect of fertiliser placement depth when fertilising non-wetting sands.

Links and references

McBeath et al. (2016) Sowing strategies to improve the productivity of crops in low rainfall sandy soils, GRDC Adviser Updates, Adelaide.

Desbiolles et al. (2016) Select a seeding system for your soil. GRDC https://grdc.com.au/Media-Centre/Media-News/South/2016/03/Select-a-seeding-system-for-your-soil