

Wheat variety response to P on grey calcareous soil

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RESEARCH

Searching for Answers

Location:

Nunjikompita

Tim Howard

Rainfall

Av. Annual: 306 mm

Av. GSR: 212 mm

2011 Total: 345 mm

2011 GSR: 221 mm

Yield

Potential: 2.8 t/ha (W)

Actual: 1.6 t/ha (Yipti - 4 units P/ha)

Paddock History

2010: Pasture

2009: Wheat

2008: Wheat

Soil Type

Grey calcareous sandy loam

Soil Test

Cowell P, mineral N

Plot Size

12 m x 4 reps

Yield Limiting Factors

Grass weed competition

Dry spell Aug - Sept

This trial has been repeated in 2011 to explore the variation of PUE among varieties of wheat across a range of seasons in order to provide farmers with better knowledge of their current varieties. This information can be used to select varieties which have a lesser requirement for P fertiliser addition or to develop fertiliser management plans that respond to the P fertiliser requirement of different varieties.

How was it done?

A replicated trial was established at Nunjikompita on 6 May on a grey calcareous sandy loam. Six varieties of wheat were grown at 2 rates of phosphoric acid (4 and 10 kg P/ha) and 2 rates of granular fertiliser (7 and 14 kg P/ha). Nil P was used as a control treatment and N was balanced at 15 kg N/ha on all treatments. All varieties were sown at a calculated density of 150 seeds/m².

Measurements taken during the year included; soil chemical analysis, plant establishment, dry matter at GS 31 and anthesis (flowering), grain yield and grain quality. All plots received standard weed management.

What happened?

Soil tests taken before sowing showed Colwell P level of 38 mg/kg, a pH of 8.5 (in H₂O) and mineral N levels of 55 kg/ha (0-60 cm). All varieties showed a dry matter response to P at GS 31 (Figure 1), with Axe showing the greatest response. Axe continued to show a greater response to applied P at anthesis (Figure 2) and Gladius and Scout had increased biomass in response to increased P.

Axe, Gladius and Wyalkatchem all showed a yield increase to added P (Figure 3), while Scout was not responsive to the addition of P

fertiliser. The addition of P did not make any difference to grain quality with test weights, protein and screenings percentages all similar within each variety (not reported).

What does this mean?

The response to P shown by all varieties supports the findings from the 2009 trials that there is significant variation between varieties in terms of PUE. The interpretation of these results will depend on how PUE is defined. If you define PUE as a crop being able to maintain yield when no P is added, Scout would be the variety of choice. Conversely if PUE is defined as the ability of the crop to respond to added P, then Axe followed by Wyalkatchem and Gladius are the more phosphorus efficient varieties.

More work is needed to fully understand the reasons for the differences in PUE, which would allow more specific characteristics of plant growth to be targeted by plant breeders going forward.

Acknowledgements

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Key messages

- **Axe, Wyalkatchem and Gladius appear to be the wheat varieties that use added P efficiently.**
- **Scout is able to maintain yield when no P is added.**

Why do the trial?

Previous research has shown that there is considerable variation in the phosphorus use efficiency (PUE) among varieties of wheat (EPFS Summary 2009, pp 37-38). In trials conducted last year at Mudamuckla (EPFS Summary 2010, pp 117-119) there was no response to the addition of P fertiliser in any of the wheat varieties tested.

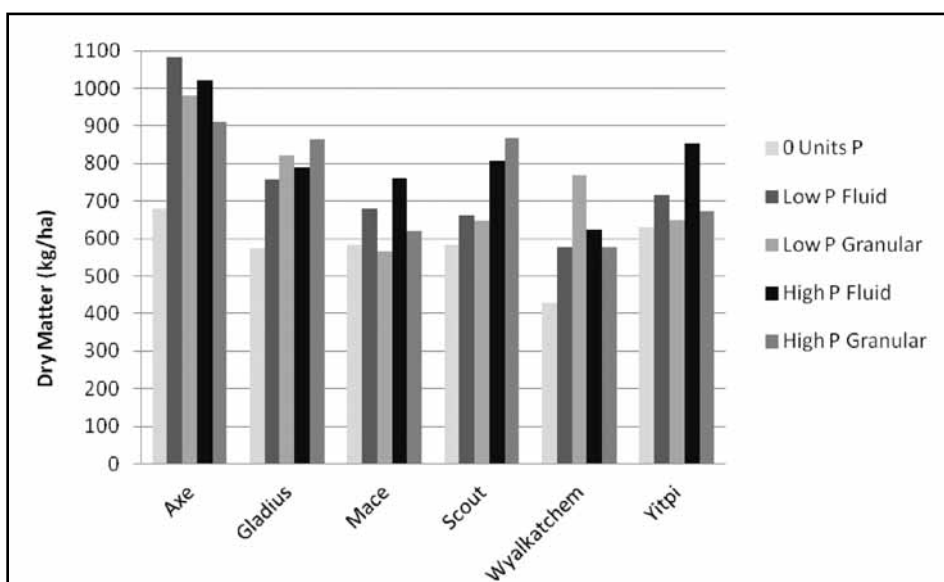


Figure 1 Wheat dry matter response to P at GS 31, 2011

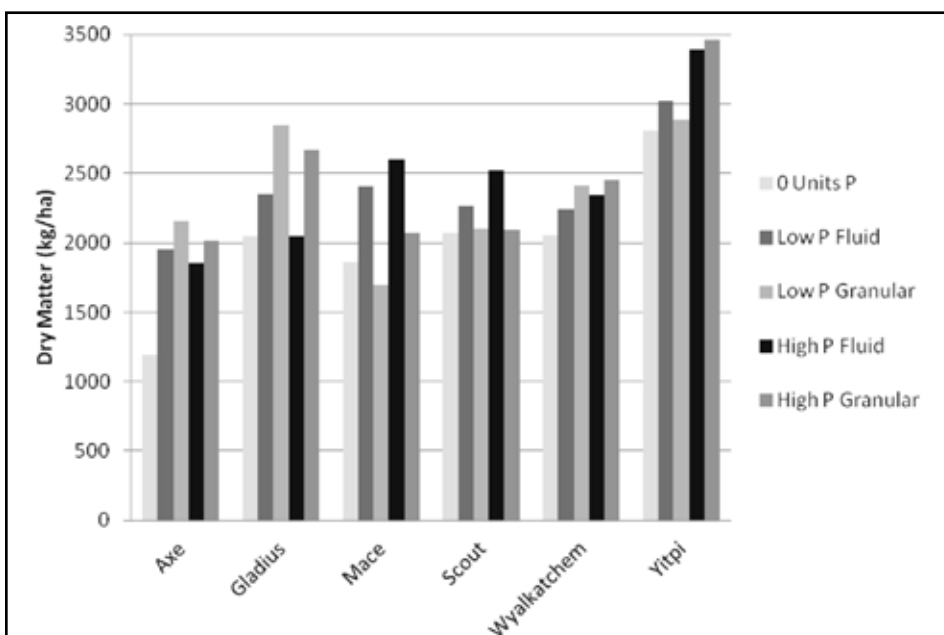


Figure 2. Wheat dry matter response to P at anthesis, 2011

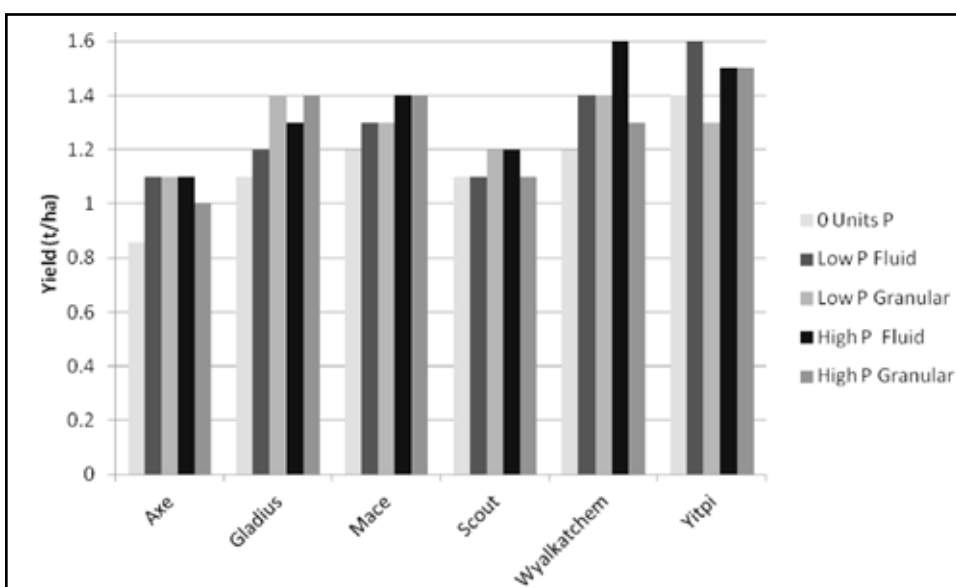


Figure 3. Wheat yield response (t/ha) to P, 2011