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Micronutrient Availability Improved With Fluids

Australian trials show 11 to 17 percent increase in grain yields when using fluids.

SUMMARY

Adding granular micronutrients separately at sowing had no effect on wheat shoot growth or grain yield. At the lower rainfall site, adding micronutrients as a coating of granular fertilizers had no effect on grain yield. Adding micronutrients to the basal DAP/urea suspension increased grain yield by 11 percent and increased yield above that of the coated granular treatment by 17 percent. At the higher rainfall site, the coated granular product yielded 5 percent higher than a DAP/urea blend without micronutrients. The suspension made from coated granules increased grain yield by 14 percent above the basal suspension and by 15 percent above the coated granular application. Applying micronutrients with an NP suspension increased their effectiveness.

Australia's old, eroded landscape is generally low in micronutrients. Vast tracts of previously unproductive land were made arable and able to support healthy crop and pasture growth by the addition of the micronutrients Zn, Cu, Mn, and Mo between 1940 and 1960. A large part of southeastern South Australia, extending into western Victoria, was referred to as the "90 mile desert" until application of superphosphate, Cu, and Zn produced spectacular increases in crop and pasture growth just before 1942.

Western Australia and South Australia represent the major areas of potentially low soil micronutrient status and are most liable to suffer yield loss through sub-clinical or unrecognized deficiencies. An area of over 20 million acres (8 million hectares) of contiguous Zn deficient soil in Western Australia has been described as the largest in the world. This area includes lateritic podsolic sands, podsolic sands, yellow earths, and calcareous sands. Some estimates suggest that 70 to 80 percent of South Australia's cropping area is potentially subject to Zn deficiency.

On South Australian soils with high concentrations of calcium carbonate (>80%), agricultural development was limited until Mn fertilizers were introduced. Today, farmers at the bottom of the Yorke Peninsula soak seeds in manganese solution before sowing, apply Mn fertilizer at sowing, use Mn foliar sprays during the season, and reap their seed from selected areas that have been sprayed with Mn at the heading stage, all to overcome the endemic Mn deficiency problem on these soils.

In 2004, an experiment was conducted at Cungena, South Australia, on a grey highly calcareous soil to compare the performance of wheat grown with a range of granular fertilizers and with the same fertilizers converted

to suspensions. In this experiment, basal nutrients (N, Zn, and Mn) were applied. The highest yielding plot was treated with a suspension made from a mixture of Zn and Mn. To investigate the possibility that the key factor in the performance of this suspension was the presence of micronutrients within the suspension, experiments were conducted in 2005 at Cungena and Port Kenny. The mean annual rainfall at Cugena is 11 inches and at Port Kenny 15 inches.

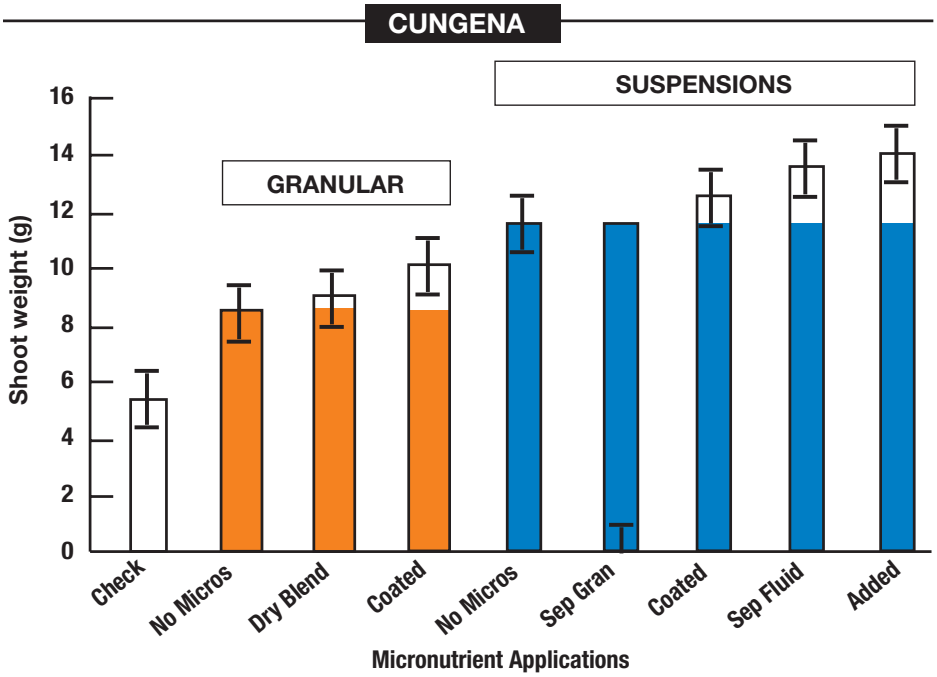

Figure 1. Response of Yitpi wheat shoot growth at early tillering. Color bars show response in shoot growth to granular and suspension fertilizer, with micronutrient response added as the clear top portion of the bar.Cungena, 2005.

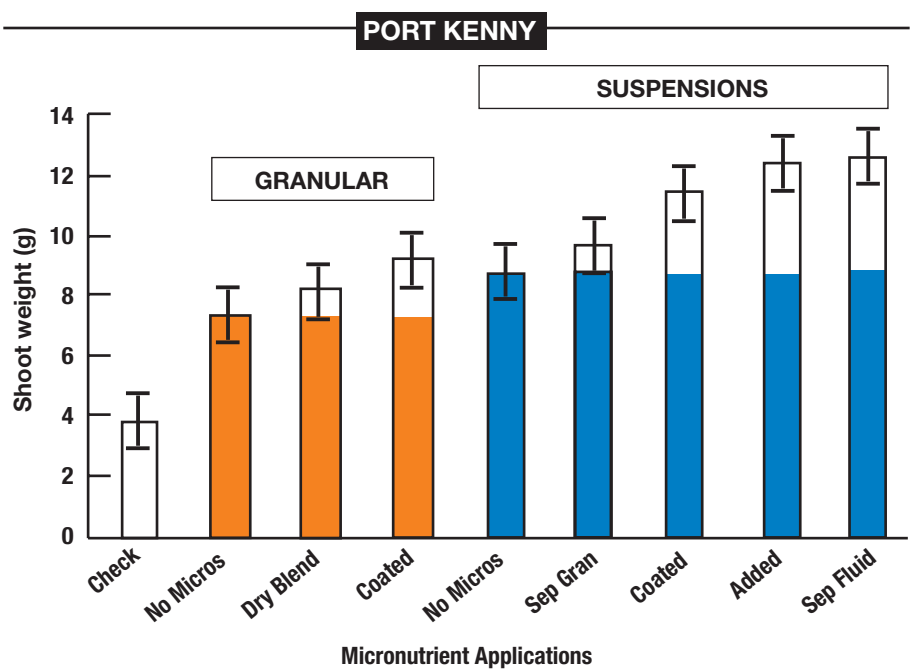

Figure 2. Response of Yitpi wheat shoot growth at early tillering. Color bars show response in shoot growth to granular and suspension fertilizer, with micronutrient response added as the clear top portion of the bar. Port Kenny, 2005.

Shoot growth

Cungena. There was a 38 percent increase in shoot growth at early tillering with suspension fertilizer compared with granular, in the absence of micronutrients (Figure 1). When micronutrients were added, the greatest response in shoot growth occurred when they were mixed with the suspension (in the case of fluids) or coated on the granule (in the case of granular). However, the relative response to micronutrients was 40 percent greater when they were added to the suspension than when applied as a granular coating. The overall combined increase in shoot growth from suspension plus micronutrients, compared with coated granules, was 39 percent.

Port Kenny. The increase in growth due to basal suspension above basal granular (both without micronutrients) was not significant. The relative response to micronutrients was 81 percent greater when they were mixed with the suspension or applied as a separate solution in combination with the suspension than when applied as a granular coating (Figure 2). The overall combined increase in shoot growth through suspension with fluid micronutrients compared with coated granules was 35 percent. The relative influence of micronutrients was higher at Port Kenny than at Cungena. At both sites, adding micronutrients separately to the soil in granular form was ineffective in promoting shoot growth.

Grain yield

Cungena. There was no significant increase in grain yield with the base suspension compared with the base granular fertilizer (Figure 3). Adding micronutrients to the granular fertilizer separately or by coating produced no grain yield response. Including micronutrients in the suspension increased grain yield by 11 percent above the base suspension. There was a 17 percent difference in grain yield between the suspension mixed with micronutrients and the coated granular treatments.

Port Kenny. The addition of micronutrients had no effect on grain yields in the granular treatments. In the suspension group, the addition of micronutrients as coated granules (converted to suspension) increased grain yield above the basal (non-micronutrient) suspension by 14 percent (Figure 4). The overall grain yield response between the best suspension and granular treatments was 15 percent.

Conclusion

The results support our conclusion in the 2005 issue of the Fluid Forum Proceedings, which shows that the best practice for cereal production on the highly calcareous soils of South Australia should involve the use of NP fluid fertilizers containing micronutrients—principally Zn, Mn, and Cu, although Cu was not used in these experiments.

In the future, it may be possible to investigate the possibility of combining fluid fertilizers with fluid fungicides to help control the endemic root disease problem on these soils and bring grain yields closer to the water limiting potential.

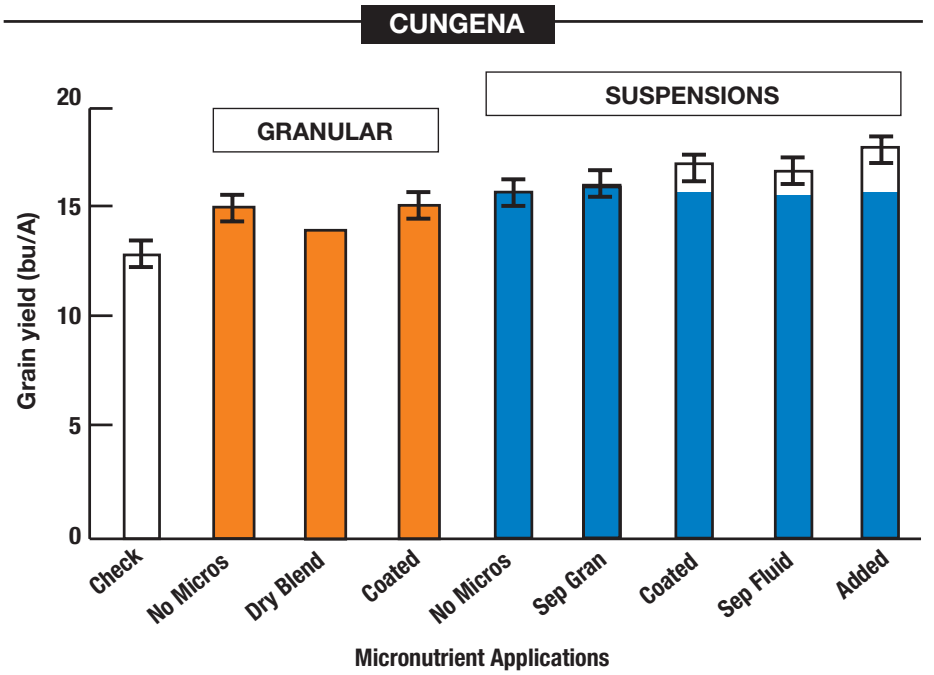

Figure 3. Grain yield response of Yitpi wheat to dry granular and suspension fertilizers with and without micronutrients. Color bars show response to granular and suspensions, with micronutrient response added as clear top portion of bar. Cungena, 2005.

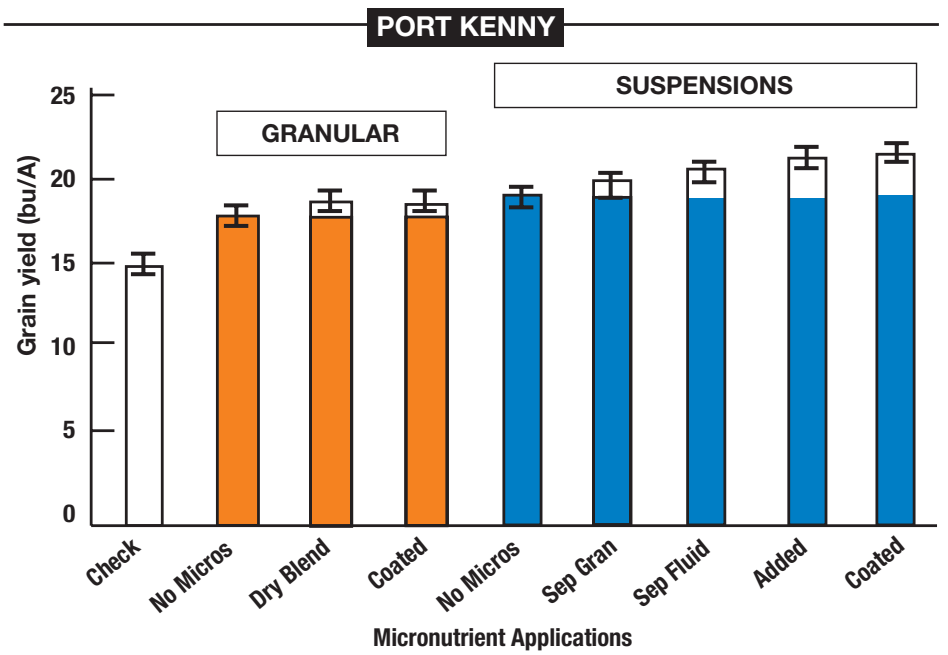

Figure 4. Grain yield response of Yitpi wheat to dry granular and suspension fertilizers with and without micronutrients. Color bars show response to granular and suspensions, with micronutrient response added as clear top portion of bar. Port Kenny, 2005.

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