

Some zinc-enriched fertilizers are not effective at correcting zinc deficiency

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Zinc deficiency is widespread in crops and pastures throughout the cereal belts of Western Australia, South Australia and western Victoria. A field experiment was conducted to test the relative effectiveness of a zinc spray to the soil surface compared to zinc-enriched fertilizers for correcting zinc deficiency in wheat.

Methods

The experiment was located at Yeelanna (southern Eyre Peninsula, South Australia) on a red light calcareous clay over red sandy clay loam profile. The area has an average annual rainfall of 400 mm. The design of the experiment was a complete factorial combination of 3 application types, 5 rates of zinc and 4 replications. The 3 application types were soil spray of zinc sulphate (applied to soil surface and incorporated with a tined implement pre-sowing); homogeneous fertilizer (every macronutrient granule coated with zinc and drilled with the seed); and heterogeneous fertilizer (zinc oxysulphate granules separate to macronutrient granules and drilled with the seed). Zinc was applied at 0, 0.625, 1.25, 2.5 or 5 kg/ha. The treatments were randomized into blocks and plots (8 rows x 20 m) were sown with wheat, *Trilicum* cv. Spear, and high rates of basal fertilizers to ensure zinc was the only limiting nutrient. Plots were sampled for dry matter production at mid-tillering and shoots analyzed for zinc concentration. All plots were harvested at maturity for grain yield. Plots were re-sown with wheat (cv. Machete) and basal fertilizer only (no zinc) in the following year and similar measurements taken.

Results and discussion

At the recommended rate of application of zinc (2.5 kg/ha), both the homogeneous fertilizer and soil spray increased the zinc content of whole shoots (compared to nil zinc) by similar amounts (by 36 and 48% respectively) in the year of application. However, the heterogeneous fertilizer did not increase the zinc content of whole shoots. In the second year of the experiment grain yield was similarly affected by treatments: the soil spray and homogeneous fertilizer increased yield by 27 and 16% respectively, but the heterogeneous fertilizer did not increase yield. Grain yield and tissue concentrations of zinc in the first year of the experiment showed similar trends to the second year but the interactions between *zinc* rate and application technique were not statistically significant. These results suggest that zinc-enriched fertilizers which are of a heterogeneous nature will not be effective at correcting zinc deficiency in the year of application, or in the following year. Both soil sprays of zinc pre-sowing and zinc-enriched fertilizers drilled with the seed of a homogeneous nature are effective at correcting zinc deficiency.

The ineffectiveness of the heterogeneous fertilizer was most likely due to low zinc granule distribution which meant that some roots may not have intercepted a zinc source.

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