

Plain English Summary - GRDC Project No: SOK00001

Increasing crop-uptake of fertiliser by improving soil pH/health with prilled liming agents, prilled humate and VAM seed dressing.

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Objective:

That prilled carbonate products (CALCIPRILL & MAGPRILL), with or without prilled humate and a VAM microbe seed dressing, banded with fertilizer in the seed furrow, will raise sub-soil pH and enhance nutrient uptake and grain yield of crop more efficiently than standard soil pH management (e.g. top-dressed lime-sand).

Background:

Sub-soil acidity is a major constraint to crop productivity in the Kent Shire district area and greater Wheatbelt. Traditional top-dressed lime-sand applications have not proven effective in raising sub-soil pH. Consequently there is growing interest in prilled lime products that can be banded in the seed. There has also been interest and on-farm experimentation with humate and fulvate products for improved yields through enhanced nutrient uptake. It is believed the humate/fulvate products work best in combination with lime and beneficial microbes.

Research:

A field trial consisting of three randomized blocks (of ten treatments) was established to evaluate different combinations of lime products with and without humate and beneficial microbes (VAM). All plots were monitored for the key agronomic indicators of, germination density, anthesis biomass, yield and grain protein. Plots were also sampled for plant nutrient status after stem elongation and at anthesis. A post-harvest assessment of soil quality was undertaken across all plots by assessing soil collected both off and on the furrow.

Outcomes:

Agronomic assessments of the treatments were severely confounded by an exceptionally dry season that saw just over half the typical growing season rainfall. The site was also found to have hostile acidic sub-soil, with toxic levels of plant available aluminum.

No significant treatment effects were observed in crop productivity, which across all plots was most strongly associated with plant aluminum concentrations at both samplings (inversely correlated, $P > 0.001$). However beneficial trends in plant responses were recorded, namely calciprill alone (treatment 7) produced (at anthesis) the highest dry matter and mass uptake of Zn, Ca and Mg and highest grain protein. Also, differences recorded between treatments 5 and 6 suggest that VAM alone (without prilled humates) could produce higher crop performance.

A post-harvest soil quality evaluation showed no significant change in sub-soil pH. However again beneficial trends in soil parameters were observed, including: an increase in soil pH from both magprill alone (treatment 9) and top-dressed limesand (treatment 3); and an increase in soil nitrogen supply at 10-20cm in calciprill alone (treatment 7).

Implications:

The rate of banded lime prill was only an eighth of the effective rate of that top dressed, and will need to be increased considerably in future evaluations if sub-soil acidity is to be appreciably ameliorated. The treatments (excluding prilled humate, which produced negative crop impacts) should be repeated (with VAM) at a site with more even sub-soil conditions. CALCIPRILL and VAM seed dressing showed particular potential for quality grain production and MAGPRILL showed particular potential as an effect agent for increasing soil pH.

Publications:

Nil.