COMPARISON OF PRE-SEEDING APPLICATIONS OF GYPSUM/DOLOMITE, HIGH-CAL AND LIME

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AIM

To investigate the effect on wheat yield between applications of a gypsum/dolomite mix, high-cal product and lime, and also to compare the long term effects the three products have on soil acidity.

BACKGROUND

This trial is a grower demonstration for the Liebe Group's GRDC funded adoption project '**Growers critically analysing new technologies for improved farming systems**'. The site is a typical 'wodjil' soil with inherent subsurface acidity. In WA soils, subsurface acidity results in aluminum toxicity often occurring in the 10-35cm zone of soil. The site was chosen for its soil characteristics, as they are thought to have the greatest response to the three products being trialed, namely lime, gypsum/dolomite and hi-cal products, all of which aim to increase soil pH. This demonstration was designed and implemented by the grower as lime, gypsum/dolomite and hi-cal products had been purchased to apply to other areas throughout his farming enterprise. The grower therefore, wanted to determine if there were significant differences between the products for improving subsoil and surface acidity and also whether the differences persisted over a long term period.

Acidification and degraded structure of agricultural soils in the Western Australian wheatbelt are ongoing problems for growers. Products used to improve soil composition within this trial are lime, gypsum/dolomite and hi-cal products all of which will be evaluated over a long-term period to accurately record the potential for each treatment in a wodjil soil. Set rates have been allocated according to the recommended rates associated with individual products within this trial.

Liming is a management practice commonly adopted to reduce soil acidity in many agricultural soil types. Lime is also thought to increase fertiliser efficiency. When an acid soil is limed, the soil pH is raised, the

levels of calcium and magnesium are raised, micro-biological activity is accelerated and the rate of release from the soil of organic matter and nutrient elements is increased, therefore increasing production (Gazey *et al*, 1998). Generally, unless large amounts of lime are applied, rainfall is high (> 750 mm/p.a.), soil textures are light and considerable time is allowed for neutralization of soil acidity, surface application of lime will have little benefit (Vimpany, 1981).

Dolomite is effective on acid soils where supplies of calcium and magnesium are low, however if used continuously may cause a nutrient imbalance, because the mix is two parts calcium to one part magnesium (2:1), whereas the soil ratio should be around 5:1 (this ratio can be achieved by mixing dolomite with other substances such as lime and gypsum) (Anon, 2002). Gypsum is classified by the Fertiliser Act as a liming material, but is commonly not considered significant by farmers as it does not reduce soil acidity. It is used mainly to improve the structure of sodic clay soils. Gypsum is used as a soil amendment or for an economical source of calcium and sulphur (Anon, 2002).

Hi-Cal is a blend of BioLime (crushed limestone), calcium hydroxide and calcium solubilising agents. It is designed for use where soil pH management is needed with the added benefit of plant-available calcium. As quoted by Optima Agriculture, producers of Hi-Cal; the calcium hydroxide in Hi-Cal has a higher neutralising value than calcium carbonate and can therefore change pH faster. The calcium hydroxide and calcium carbonate are mixed with a solubilising agent which enhances the plant-available calcium. Calcium will replace excess hydrogen ions on the cation exchange complex and assist in reducing soil acidity (Optima Agriculture, brochure 2006). Hi-Cal is not tested under the Lime WA inc guidelines.

TRIAL DETAILS

Property	Brian and Rowan McCreery
Plot size & replication	20m x 100m plot size, 3 replicates
Soil type	Wodjil
Sowing date	Spreading of treatments 6/4/06, seeding 29/5/06
Seeding rate	55 kg/ha Wyalkatchem wheat
Fertiliser (kg/ha)	Legume special 80 kg/ha, 35 kg/ha Urea banded
Paddock rotation	2003 Wheat, 2004 Pasture, 2005 Pasture, 2006 Wheat.
Herbicides	1.2 L/ha Treflan, 800 mL/ha Roundup Powermax, 15g Logran, and 20g Logran B.
Growing Season Rainfall	146mm (April–October)

RESULTS

Table 1: Yield, quality and gross income of Wyalkatchem wheat sown on 29/5/06.

Treatment	Yield (t/ha)	Protein (%)	Screenings (%)	Hectolitre (g)	Grade
Lime (1.5 t/ha)	0.60a	12.6	4.62	400.01	APW
Gypsum/Dolomite mix (1 t/ha)	0.82a	12.2	5.35	404.18	APW
Control	**0.76a**	**12.5**	**5.98**	**405.92**	**APW**
High Cal (600 kg/ha)	0.75a	12.6	4.32	405.32	APW
LSD (5%)	0.29				

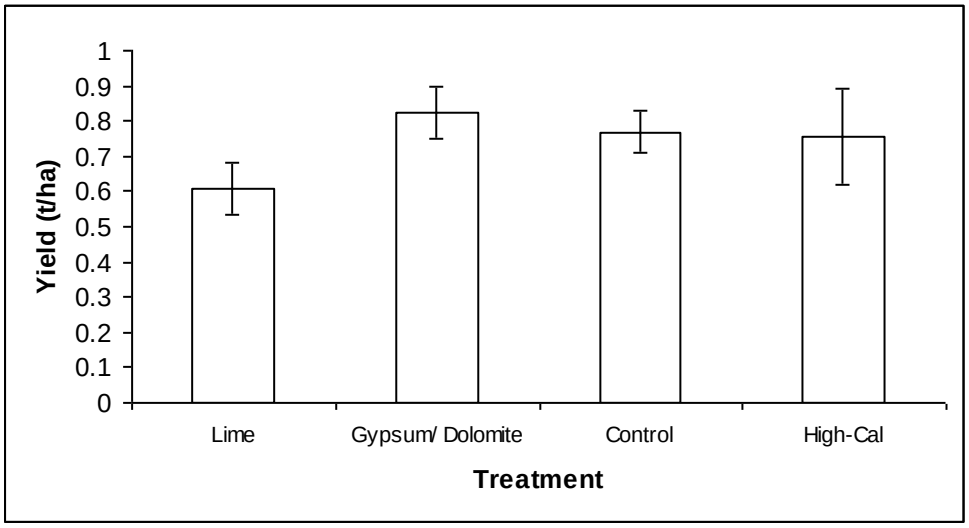

Figure 1: Mean yield and standard errors of each soil additive treatment.

ECONOMIC ANALYSIS

Table 2: Economic Analysis ($/ha)

Treatment	Yield (t/ha)	Gross Return	Variable Costs	Gross Margin
Lime (1.5 t/ha)	0.60	185.8	137.52	48.28
Gypsum/Dolomite mix (1 t/ha)	0.82	189.5	140.52	48.98
Control	0.76	190.0	125.52	65.05
High Cal (600 kg/ha)	0.75	185.8	135.12	50.68

Based on EPR for 21/12/2006 APW Base Price $191/tonne

It is too early to see any benefits from the associated products, however at this stage the control treatment is the most cost effective management practice, with Hi-Cal being $2.40/ha cheaper than lime and $1.70/ha cheaper than Gypsum/dolomite.

There are no significant differences in yield between all the treatments, however the trial will continue in 2007 and the following years to further investigate any potential yield differences between treatments.

To observe noticeable effects of lime through yield responses or increased soil pH is a slow process. This may be the most obvious reason for the lack of responsiveness between treatments. Application of lime sand with particles too large for rapid dissolution is perhaps the most common reason for failure to obtain the expected response to liming the effectiveness of lime depends on reaction with acid components in the soil to make the lime soluble. The low rainfall season for 2006 may have also influenced the low responsiveness observed from all treatments.

ACKNOWLEDGEMENTS

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