

# Soil Testing / Fertiliser Workshop Notes, 14<sup>th</sup> February 2013

Presenters: Damian Jones and Dean Harrington

Notes Summary:

***A refresher on soil sample test parameters and some examples of how the information was used includes the following;***

**Cation Exchange Capacity (CEC)** is a sum of all the exchangeable cations, i.e. Aluminium + calcium + magnesium + potassium + sodium. The target for the CEC is greater than 20%.

**Exchangeable Sodium Percent (ESP).** This is percentage of sodium to the other cations. The ESP for one sample on the night was 7.09%. This was calculated by adding up all the cations (which totalled 20.73% - as per the CEC calculation above) and divide the sodium level by the sum. For this example, the sodium was 1.47 (meq/100g). So this is  $1.47 / 20.73 * 100$  (to get %) = 7.09%.

The general classification for soils with less than 6% ESP is called non sodic, for soils 6-10% is classed as sodic, 10-15% is moderately sodic and 15-25% is strongly sodic. Adding gypsum (calcium sulphate) will displace the sodium ions in favour of calcium ions, improving the ESP (i.e. reducing sodicity), and increase the CEC (as the total sum of all the cations would increase).

***“Think of a book placed in water when thinking about how gypsum works. All the pages in the book will open under water. When the water is removed the pages stick together and become hard and resist moisture penetration. Gypsum helps to hold the soil (or pages) together when wet, and helps to maintain a good soil structure (or book) when the soil is dry” – Damian Jones***

The higher the CEC the better the soil structure. Gypsum also improves the calcium to magnesium ratio (all soils should have a calcium to mg ratio of greater than 1:1).

When the soil structure and chemical balance improves, the cycling of nutrients improves.

**Calcium:** Ca should be >5 meq/100g and 65-80% of the total cations present.

**sulphur:** sulphur is essential for nitrogen fixation by legumes. S Levels should be greater than 4mg/kg.

**Magnesium:** Mg should be >1.6meq/100g and in the range of 10-20% of total cations present. If >20% it may result in potassium deficiency.

**Potassium:** K should be >0.5meq/100g and in the range of 3-8% of total cations present. If >10% it may cause mg deficiency.

**Aluminium:** Al may be toxic to plants in low pH soils. Al should be <1% of the CEC.

**Other key points made were;**

Soil Testing: Don't sample too deep. This is one of the biggest mistakes people make. The ideal depth is 10cm. Making up a sample from multiple sub samples avoids the risk of getting an erroneous result from a fresh urine patch for example.

Soil test before lasering ground. There may be boron at depth which can then make contact with plant root zone. boron levels should not be over 2%, as it will affect plant growth and you will be limited to species that are more tolerant to elevated boron levels. Boron cannot be removed from the soil.

Sodium may also be at depth, especially if it has already moved lower into the soil profile via gypsum application. Again lasering might intercept this saline layer.

It takes several years for gypsum to displace sodium. A lot of water is needed to displace the calcium into the soil profile. 2.5tn/ha gypsum applied will need 3ML/ha water to shift. Any more will need more water.

Don't incorporate gypsum. Let the sodium ions attach to the calcium as it moves through the soil naturally.

Liquid lime (calcium carbonate) is a waste of money. Calcium ions are larger than the plant stomata pore, so it is not readily absorbed by the plant via the leaf.

**Nitrate Nitrogen:** If there is high nitrate nitrogen in the soil test. you need to look out carefully for nitrate poisoning of stock. Firstly confirm the high nitrate level is not from a sampling error by doing a deep N to check the levels at depth to determine if there is any potential toxicity issues.

Oats is particularly affected. In winter, or on cloudy and foggy days the plant doesn't cycle nitrates, so you need to consider the withholding period after nitrogen is applied. Normally the withholding period is 30 days, but you will need to add another day to this for each cloudy day to be safe.

**Phosphorus:** Need to convert Super / Phosphorus products to \$/Kg P. For example single super at \$325/tn = \$4.06/Kg P. MAP at \$620/tn = \$2.90/kg P and the freight bills are less.

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