Chapter B6. Does my soil need gypsum?

PURPOSE OF THIS CHAPTER

To describe how to determine whether your soil needs gypsum

CHAPTER CONTENTS

- behaviour of sodic soil

ASSOCIATED CHAPTERS

- B8 'Dispersion'
- D4 'Slaking and dispersion'

DOES MY SOIL NEED GYPSUM?

Gypsum is often promoted as a 'clay breaker'. It does, indeed, improve the structure of sodic clays (clays with more than 5% exchangeable sodium, and low salinity). However, it does little to improve the structure of clays that are not sodic, soils where there is little or no clay dispersion, or the structure of soils containing only small amounts of clay.

BEHAVIOUR OF SODIC CLAYS

Sodic clay surface soils disperse in water (Figure B6–1). Dispersion of surface soil causes crusting. Sodicity also causes excessive swelling with water. The excessive swelling of a sodic subsoil closes large pores and reduces infiltration and drainage. Waterlogging may result.

Sodicity is most obvious in the soil surface, when clay dispersion leads to crusting. If your soil is prone to crusting, it could be dispersive, and could respond to gypsum. Subsoil sodicity is harder to detect by eye, but sodic subsoil exposed by erosion or earthworks will show dispersion. Such exposed subsoil is very prone to erosion, and the gypsum application should complement other erosion-control measures.

Deep tillage may bring sodic subsoil up to the surface, where it will disperse on wetting by rain. Gypsum is needed to treat the newly created crusting surface.

Subsoil that is not exposed is very difficult to treat with gypsum: the problem lies in getting gypsum down to the sodic layer. Such treatments may not be economic, but new technology is promising.

RATES OF GYPSUM APPLICATION

Broadcasting fine grade gypsum at a rate as low as 2.5 t/ha usually prevents clay dispersion in the short term in marginally sodic to sodic clay soils, assuming a water application rate of up to 10 mm/h (equivalent to moderately intense rain). Higher application rates are needed to prevent clay dispersion under the following circumstances:

- coarse grade gypsum is being used, or
- a longer term effect is required, or

- the soil is highly sodic, or
- the water application rate is greater than 10 mm/h (increasing the water application rate decreases the time available for dissolving gypsum).

Broadcast rates of 2.5–5 t/ha usually give successful results, although higher rates can be economic, particularly for high value crops or where cheap gypsum is available from a local source.

If gypsum is applied in the irrigation water, a practical rate is 850 kg/ML. At this rate an irrigation of 100 mm of water applies 0.85 t/ha. A gypsum concentration of 850 kg/ML is approximately equivalent to that obtained from broadcasting fine-grade gypsum at 2.5 t/ha, and applying water at a rate of 10 mm/h. Therefore, it should be sufficient to prevent clay dispersion in marginally sodic to sodic soils. For highly sodic soils a gypsum concentration higher than 850 kg/ML is needed to prevent clay dispersion.

Although it is possible to calculate the theoretical amount of gypsum required to reduce the sodicity (as measured by the ESP) of a given depth of soil from its present value to about zero, this is usually of little practical value. The calculated rate is frequently very high (exceeding 10 t/ha) and therefore unlikely to be economically viable. Also, this approach ignores the value of the electrolyte effect in reducing swelling and preventing clay dispersion.

Figure B6–1. Dispersion in a Petri dish. (M. Hill)