AGRONOMIC Spotlight
Technology Development by MONSANTO

Application of Gypsum for Crop Production - OH IN IL

There has been increased interest in the use of gypsum as a soil amendment for crop production throughout the Midwest. Most are familiar with gypsum as a main component in building materials such as sheet rock or gypsum board. When applied to soil, gypsum dissolves and separates into calcium (Ca^{++}) and sulfur (SO_4^-) ions. It is important to understand what gypsum is and how it may benefit the soil and crop production.

Gypsum Sources

There are several sources of gypsum that can be used for agricultural purposes, these include: naturally mined gypsum, recycled casting gypsum from manufacturing, synthetic gypsum or flue gas desulfurization (FGD) gypsum, a by-product of coal combustion and recycled gypsum from drywall.

Physical Properties of Gypsum

The cost and ease of gypsum application depend on the products water content, particle size and purity. Application of naturally mined gypsum may be challenging depending on the form of the product. When applying recycled drywall material even coverage is dependent upon good paper removal and uniform grind particle sizing. Synthetic gypsum normally has high purity and provides a consistent particle size. When using synthetic gypsum it is important to make sure the product is washed within the production process to remove high levels of boron. High levels of boron can result in toxicity to corn[1].

Depending on the gypsum source, the compound may contain other chemicals, such as manganese, iron, magnesium, and phosphorus or trace amounts of metals such as molybdenum, arsenic, copper, selenium, lead, mercury, nickel and chromium[1]. Samples of the gypsum product should be analyzed prior to field application.

Gypsum as a Calcium Source

Calcium is a secondary plant macronutrient that is essential for proper cell wall structure. Adequate calcium aids in plant transport and retension of nutrients and can help support strength in the plant, but also acts in signal transduction in the cell. Calcium in gypsum can readily be absorbed by plants[2]. The percentage of calcium in gypsum can vary by source but is approximately 19%[3]. Gypsum is an excellent source of calcium for plant uptake; however, most soils are naturally high in calcium.

Gypsum as a Sulfur Source

Gypsum has been used as a sulfur source for many years, as it contains approximately 17.5%. Plants need sulfur for production and structure of proteins. Sulfur also helps to promote activity of enzymes, improve root growth and seed production and can aide in chlorophyll formation. In recent years, some soils have become deficient in sulfur due to a reduction in atmospheric sulfur deposition and a decrease use of pesticides containing sulfur. Also high-yielding crops will require additional sulfur from the soil. Sandy textured soils low in organic matter are more apt to be deficient in sulfur. Application of gypsum can have a positive effect on crop yield potential when applied to soil with sulfur deficiency.

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Gypsum and pH

Even though gypsum contains calcium, it is not a liming agent and will not raise soil pH, as the compound does not contain carbonate or bicarbonate[4]. Certain crops that demand higher levels of calcium, such as potatoes or peanuts, may benefit greatly from gypsum as calcium can be supplied while still maintaining a lower pH level.

Gypsum as a Soil Amendment

Gypsum is hydrated calcium sulfate and is often marketed as a soil conditioner for improving soil tilth. Gypsum is water soluble and this solubility allows for a quick release of calcium and sulfate ions into the soil when incorporated or applied to the soil surface. Application of gypsum will have the greatest benefit on structure in sodic (> 15% sodium, Na, of total cation exchange capacity or CEC; pH > 8.5) and saline (high soluble salt content, > 4.0 dS m^{-1} pH < 8.5) soils that are not typical to much of the corn belt, but can be problematic in Colorado and other areas of US agriculture. In soils with high magnesium content (> 50% of total CEC), calcium application from gypsum may replace the magnesium on exchange sites of clay particles ultimately increasing soil particle aggregation[4]. High rates of magnesium on exchange sites can lead to reduced water infiltration, increasing soil erosion. In certain environmental situations the presence of calcium in clay can enhance aggregation of the soil and stabilize the structure, in an effort to reduce crusting.

Conclusion

Gypsum can be used as a source of calcium or sulfur if a field is found to be deficient. A soil nutrient test should be conducted prior to gypsum application to ensure either nutrient is needed.

Sources;

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[4] Rehm, G. Is there a role for gypsum in Midwest agriculture? University of Minnesota. Department of Soil, Water and Climate. http://www.extension.umn.edu (verified 2/14/10).