USING HYDROXIDE FOR LIME INCUBATION STUDIES AND MOISTURE EFFECTS ON LIMING CALCIUM

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ABSTRACT

Plant health and productivity are negatively affected by soil acidity. Soil physical properties such as soil texture, soil organic matter, and nutrient content help soils resist changes in their acidity (buffering capacity). Soils have different buffering capacities; agricultural producers need to know how responsive a soil is to lime and how much lime is required to modify a soil to a certain pH (lime requirement). One method to evaluate soil liming requirements and buffering capacity is to add varying levels of calcium carbonate ($CaCO_3$) to soil and incubate it for 90 days. This incubation method does not allow laboratories to provide timely feedback to agricultural producers. A shorter lab incubation method would be ideal. This experiment was conducted to investigate the possible use of calcium hydroxide {$Ca(OH)_2$} as a replacement for $CaCO_3$ for incubation studies. Calcium hydroxide is more water soluble and should react more quickly with the soil to neutralize soil acidity. The first study objective was to evaluate the response of $Ca(OH)_2$ to a 90-day $CaCO_3$ incubation.

While pure $CaCO_3$ allows researchers to compare lime requirement incubations across studies, Southern Idaho agricultural producers often use precipitated $CaCO_3$ (PCC), a byproduct from sugar beet sugar processing, as their lime source. The second objective was to evaluate if PCC had the same neutralizing capacity as pure $CaCO_3$ when applied at the same $CaCO_3$ rate. Finally, because soil moisture moderates soil chemical reactions, the third objective was to evaluate changes in soil pH when $CaCO_3$, PCC, and $Ca(OH)_2$ were incubated in air-dry soils, at 50% field capacity, or 90% field capacity.

To evaluate these objectives, a Marystown-Robinlee-Rexburg silt loam soil was collected in Ashton, Idaho, dried, and homogenized. 100 grams of soil was weighed out into cups and $CaCO_3$, $Ca(OH)_2$, and PCC were added at rates of 0, 1, 2, or 4 tons $CaCO_3$ equivalent per acre. Deionized water was added to bring the soil moisture to 90% field capacity. Soils were incubated for 3 days, 7 days, 2 weeks, 1 month, 2 months, and 3 months. Additional treatments were done by adding $CaCO_3$, $Ca(OH)_2$, and PCC at rates of 0, 1, 2, and 4 tons $CaCO_3$ equivalent per acre. Soil moisture content was either air dry, 50%, or 90% of field capacity and soils were incubated for 90 days.