

Use of Ground Eggshells as a Lime Source

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Introduction

It is common to see large-scale, egg-laying units in many parts of Iowa. Although most plants ship the eggs intact, some facilities have begun to ship liquid eggs. The eggshells, at locations that ship liquid eggs, are ground, stockpiled, and applied to farm fields. Farmers want to know if the eggshells have value as a lime source, and if so, at what application rate.

This experiment evaluated the usefulness of ground eggshells as a lime source. The study compared soil pH change and crop yield attained at multiple ECCE rates for traditional agricultural lime and ground eggshells.

Materials and Methods

The experiment site has Clarion loam soil that has a natural pH of 5.6–7.3. Eggshell samples were collected from stockpiles prior to application and analyzed for effective calcium carbonate equivalent (ECCE) (Table 1). Equal ECCE rates of agricultural lime and ground eggshells were applied in April 2002. Treatment rates were CHECK, 500, 1,000, 2,000, 4,000, and 8,000 lb/acre ECCE. Plot size was 20 ft × 50 ft. Treatments were replicated five times. Liming materials were incorporated prior to planting. Plots were planted to corn or soybeans annually. Soil samples (0–6 in. depth) were collected prior to application and following harvest annually. Plots were machine harvested and grain yield calculated using 15% moisture for corn and 13% moisture for soybeans. Adequate rates of N, P, and K were applied across the entire study area to alleviate any potential yield responses from eggshells or soil test differences. Soil pH change was calculated by subtracting the soil pH determined from a set of soil samples from the initial soil pH.

Results and Discussion

Traditional agricultural lime appeared to change soil pH more quickly, and to a greater degree, six months following application. The responses to the material (ag lime vs. eggshells) and to the ECCE rate were statistically significant. Eighteen months after application, the soil pH changes from the eggshell treatments seemed to plateau at 2,000 lb ECCE/acre (Figure 1). The pH increase was approximately 0.9 pH units for the 2,000 lb ECCE/acre and higher rates. The soil pH change for the lower ECCE rates of eggshells surpassed the agricultural lime treatments 18 months after application. This suggests that the ECCE of the eggshells was actually more than the analysis reported.

Thirty months after application the soil pH change from the eggshell treatments remained relatively constant for the 2,000 lb ECCE and higher rates. The soil pH change was approximately 1.0 pH unit—slightly more than a year earlier. This trend continued through October 2006, 54 months after application, however, the pH change has increased to approximately 1.2 pH units for the 2,000 lb ECCE and higher rates (Figure 2). Fifty-four months after application there continued to be a statistically significant response to liming material, ECCE rate, and the interaction of material × rate (Table 2).

Also, 54 months after application, soil pH change from the 500 lb ECCE/acre eggshell treatment was not different from the check in October 2006 (Figure 2). This indicates that the liming effect from the 500 lb ECCE eggshell treatment was no longer occurring.

Ground eggshells are an effective lime source. The standard procedure used to determine ECCE underestimates the lime ability of eggshells to modify soil pH.

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Table 1. Complete analysis of liming materials.

	Moisture	N	P (ppm)	K (ppm)	ECCE (lb/T)
Lime	5%	BDL	<2.5	186	1871
Eggshells	16%	1.16 %	939	959	400

Table 2. Statistical analysis of eggshell-lime study, October 2006.

Material	1	44	34.6	<.0001
Rate	5	44	26.9	<.0001
Material * Rate	5	44	3.4	0.011

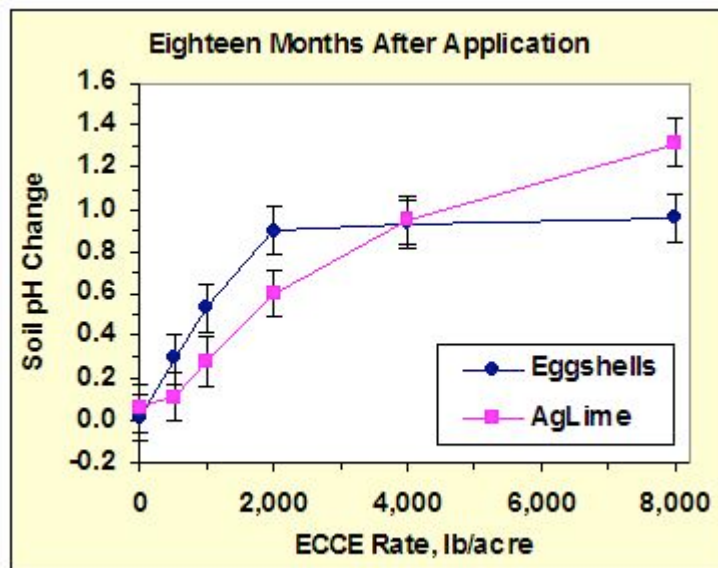


Figure 1. Soil pH changes, October 2003.

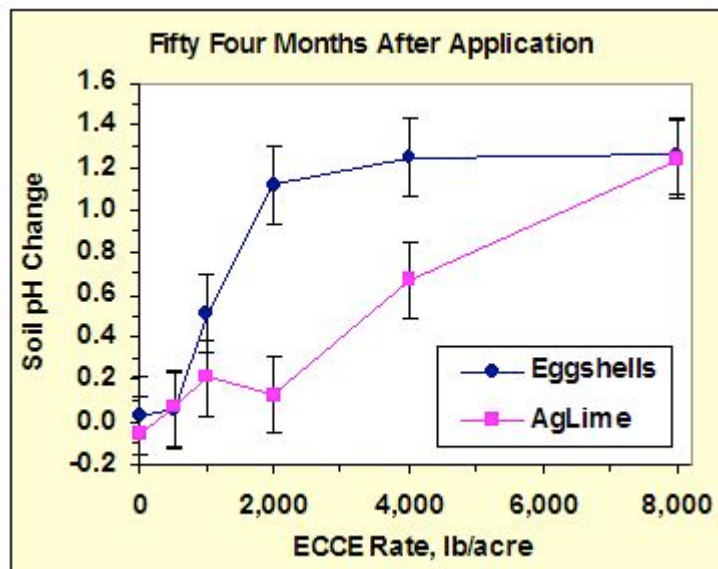


Figure 2. Soil pH change, October 2006.