Effectiveness and Economic Feasibility of Two Liquid Alkalizers in a Bermudagrass Hay Pasture

Robert A. Lane, Ph.D., Foy D. Mills, Jr., Ph.D. and Mark J. Anderson, Ph.D., Sam Houston State University
Department of Agricultural and Industrial Sciences

Introduction

Manufacturers and marketers of liquid lime products frequently claim the benefit of fast neutralizing power due to ultra-fine (<5 microns) calcium carbonate particle sizes, contributing to high solubility and soil mobility, allowing producers to obtain rapid pH increases and buffering effects lasting from 3-18 months. According to one nationally prominent liquid lime provider's marketing materials, a 2.5 gallon application of their product will provide results similar to those produced by the application of one ton of dry lime per acre.

Objectives

The primary objective of this study was to determine the effectiveness of two liquid lime treatments on soil pH modification across soil depth compared to an untreated control and a dry lime treatment on a Jiggs bermudagrass pasture in Huntsville, Texas.

Methods

- Initial soil pH of the Falba fine sandy loam pasture site was 5.5.
- The two liquid lime products, Mojo Lime and Mojo K2O (64% CCE in product), were applied on March 11, 2013 at a rate of 28.125 l ha^{-1} in 76 l of water in a randomized complete block experiment with three replications (Table 1).
- The standard ground agricultural lime treatment (85% CCE) was applied (broadcast) on March 13, 2013 at a rate of 2242 kg ha^{-1}.
- The first rain following treatment application (1.27 cm) occurred on March 26, 2013 and the first soil samples from treatment plots were collected on March 28, 2013. Subsequent samples were collected on April 5, following a 3.8 cm rain on April 3 and on May 10, 2013 following a 12.7 cm rain on May 5.
- Soil samples were collected by bulking 10 random samples from each treatment replication at depths of 2.5 cm, 2.5-7.6 cm, and 7.6-12.7 cm on each date.
- Soil pH determinations were made using a 1:1 soil:distilled water mixture.
- Differences among treatments and across depth and time were determined using the PROC GLM procedure in SAS. Means were separated using the LSMEANS option.

Table 1. Guaranteed Analysis from Mojo Lime Specifications

Calcium	25%
Magnesium	0.37%
Calcium Oxide Equivalent	35%
Calcium Carbonate	62%
Magnesium Carbonate	1.29%
Inert Ingredients	30%
Calcium Carbonate Equivalent	64%
Effective Neutralizing Value	64%
Suspended Solids	+70%
Percent solids passing a 325 mesh screen	100%

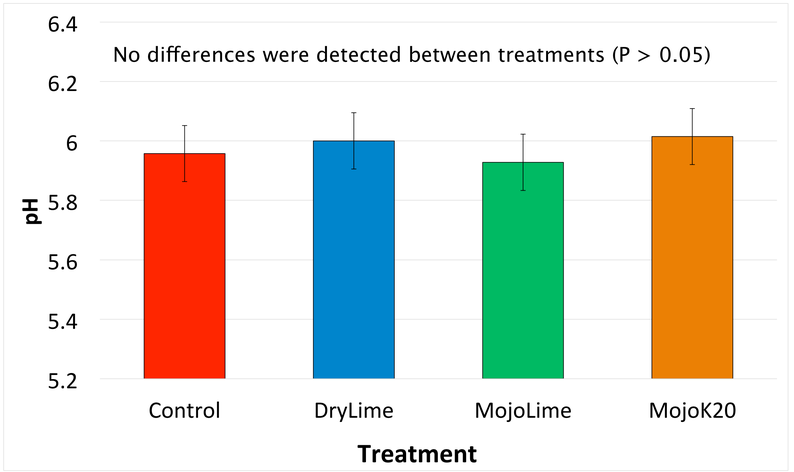

Figure 1. Mean soil pH values for lime treatments across varying soil depths.

Table 2. Discounted Cash Flow Approach to Lime Application in Jiggs Bermudagrass Pasture, Huntsville, Texas[1]

Comparison of Standard Lime, Mojo Lime and Mojo K_2O			
Annual Cost of Materials and Application[2]			
Year	Standard Lime	Mojo Lime	Mojo K_2O
		ha^{-1} basis	
Initial Application Outlay- Year 1	$100.00	$74.00	$74.00
Year 2	$0.00	$74.00	$74.00
Year 3	$0.00	$74.00	$74.00
Present Value- Real Investment (Cost of Various Treatments)			
Discount Rate	Standard Lime	Mojo Lime	Mojo K_2O
		ha^{-1} basis	
5%	$100.00	$211.60	$211.60
10%	$100.00	$202.43	$202.43
15%	$100.00	$194.30	$194.30

[1]Yield effects were not measured. Only a comparison of costs was evaluated.
[2]A residual effect occurs from the application of standard lime resulting in a subsequent budget impact. Assume standard lime increases soil pH for three years compared to the need for annual applications of Mojo materials, which are advertised to have a 3-12 month residual effect.

Results

Analyses of variance indicated no significant differences between lime treatments across varying soil depths (Figure 1) while soil pH did increase significantly with depth across all lime treatments (data not shown). However, the increase in pH with increasing depth is apparently unrelated to treatment since a similar increase was observed in all treatments, including control.

When considering the costs associated with liming materials and their application, previous research shows that benefits from an application of standard lime will persist in the soil for a number of years. Conversely, the Mojo product is advertised to have a 3-12 month residual impact. Therefore, since there is no significant difference between treatments in this research project, does it make a difference if the farmer applying a lime product is dealing with a short-duration land-lease (i.e., one year of less with no guarantee of lease continuation), or has a long-term lease or actually owns the land? The answer is yes (see Table 2).

Conclusions

The claim that liquid lime treatments cause a rapid increase in surface soil pH, improving performance of crops with a high root density near the soil surface, was not supported by this research.

The calculation of present value, using various discount rates, accounts for the time value of money. If a producer has an annual lease with no guarantee of renewal, it is cheaper and as effective to apply either of the Mojo products. However, if the farmer has a long-term lease or owns the property, it is much more economical to apply the standard lime based on present value calculations.

References

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Robinson, R.R. and W.H. Pierre. 1938. Response of permanent pastures to lime and fertilizers (1930-1936). West Virginia Agricultural Experiment Station Technical Bulletin 289.