FIELD DAY REPORT - 1992

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EFFECT OF FINE LIMESTONE ON pH CHANGE IN TWO SOILS

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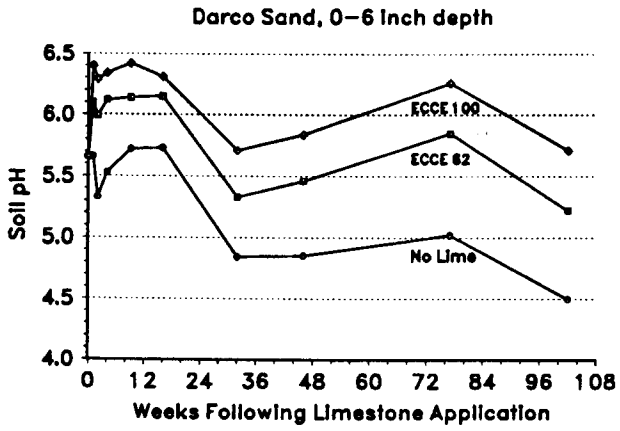
Background. Acid soils are an increasing problem in Texas. Economics of ryegrass response to limestone at Overton showed annual livestock production losses exceed $200 per acre on soils having pH less than 5. Recently, 16% of the acid soils tested by the Texas Agricultural Extension Service Soil, Water, and Forage Testing Lab in College Station were below pH 5. This research is evaluating the effectiveness of a finer limestone (ECCE 100) compared to a common ag-grade limestone (ECCE 62) for neutralizing soil acidity. The term ECCE refers to the effective calcium carbonate equivalence and is an estimate of the effectiveness of limestone for neutralizing soil acidity. Finer limestone has a higher ECCE than coarser limestone.

Research Findings. Limestone treatments include 0, 1, 2, and 3 ton/acre rates of calcitic limestone and 3 particle size ranges of this limestone rated as 62, 81, and 100% ECCE. These treatments were applied to 3 Coastal bermudagrass-based forage systems: (1) bermudagrass only, (2) bermudagrass-annual ryegrass, and (3) bermudagrass-annual clovers. Soil samples were analyzed for pH. On the Darco soil in Smith County (Fig. 1), pH declined rapidly during the summers of 1990 and 1991 (weeks 16 to 30 and 76 to 100, respectively). Soil pH in fall 1991 (week 104) samples from plots treated with ECCE 62 and 100 limestone approximates that of samples collected about 30 weeks after treatment. These depressions in soil pH are largely the result of the acidifying effect of nitrogen (N) fertilizers applied for grass production. The soil pH in plots that were unlimed has decreased from 5.65 to 4.5 in two years of fertilization. The spread between the soil pH values represented by the ECCE 62 and 100 limestone materials is widening with time after application. The ECCE 100 material is maintaining a higher soil pH but even this finer material cannot withstand the acidifying effect of in-season N fertilization on the Darco soil.

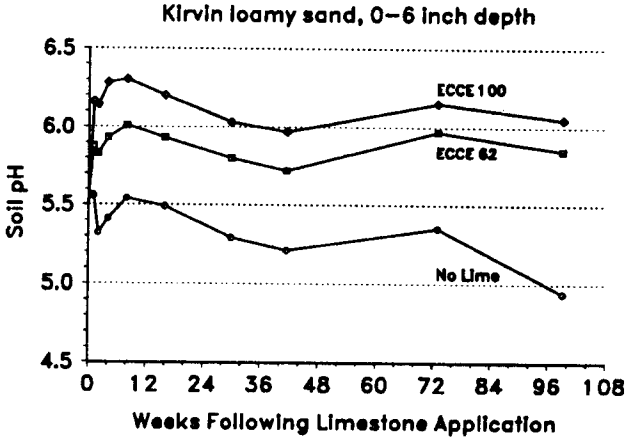
Figure 1



The Kirvin soil in Rusk County shows less drastic fluctuations in pH from spring to fall

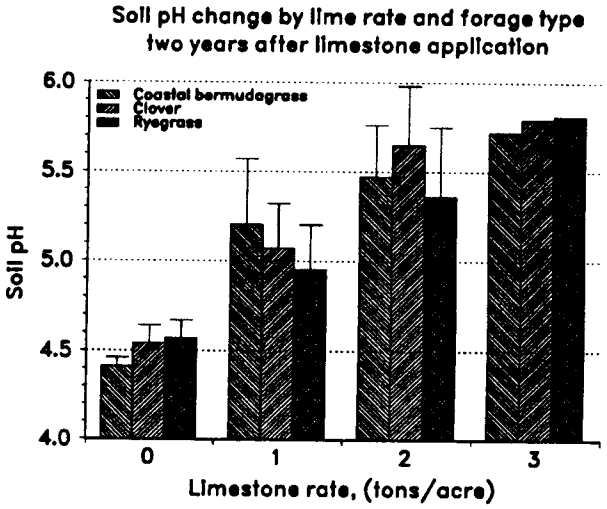
sampling (Fig. 2). The ECCE 100 limestone material maintained soil pH above 6.0 in the fall of 1991 (week 94) after N treatment of the bermudagrass the previous season. Soil pH in plots treated with ECCE 62 limestone is 5.8. Soil samples from the zero lime treatment tested below pH 5.

Figure 2



The bars in Fig. 3 show Darco soil pH due to limestone application rate, over source, for each forage system two years after treatment. At the 1 ton lime/acre rate, the bermudagrass-ryegrass system shows a lower soil pH than the bermudagrass monoculture system. The 2 and 3 ton/acre limestone rates provided sufficient limestone to prevent a soil pH change in any forage system 2 years after treatment.

Figure 3.



Application. Two years following limestone treatment, the finer limestone (ECCE 100) is maintaining soil pH at a higher level than the ECCE 62 material. The difference between these two treatments is expanding with time. Higher rates of fertilizer N are lowering soil pH more rapidly in the bermudagrass-ryegrass system on the Darco soil. If this trend holds, higher ECCE limestone should be the choice for low buffer capacity sand soils as long as the price differential between the two products remains favorable.

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