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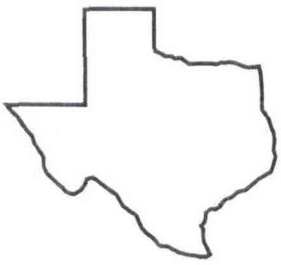
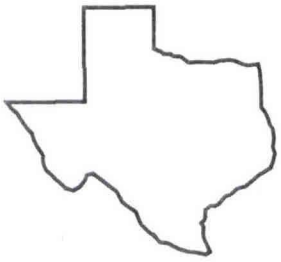
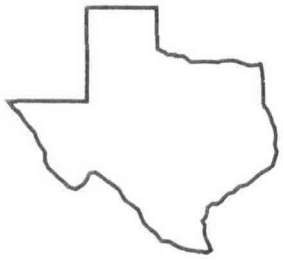
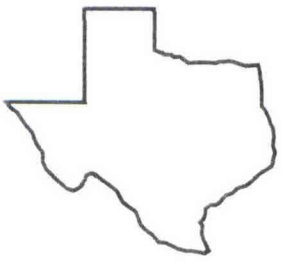




Overton Field Day Report - 1994





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ROSE CLOVER RESPONSE TO BORON AND LIMESTONE

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Background. Concern about the slow reactivity of limestones with low effective calcium carbonate equivalence (ECCE) led to increased demand for use of finer limestone to speed the neutralization of soil acidity. Forage legume crops growing in Ultisols (sandy, acid soils) in eastern Texas have responded to boron treatment. Past research showed that as soil pH increased from strongly acid toward 7.0, B adsorption on clays and amorphous (noncrystalline) aluminum oxides increased. This study evaluated the interactive effects of limestone and B on clover production.

Limestones with ECCE values of 62 and 100 were applied at zero, 1, and 2 tons/ac to a Darco loamy sand. Boron rates were 0, 1, and 2 lb/ac applied to the limestone treatments. The experiment was fertilized each fall with 120 lb P_2O_5 and 175 lb K_2O/ac. Rose clover was seeded each fall for three years at 20 lb seed/ac. Forage was harvested the following winter and spring.

Research Findings. Increasing the rate of limestone raised extractable soil calcium, magnesium, phosphorus, and boron. Increasing limestone fineness to ECCE 100 doubled extractable calcium, increased magnesium and phosphorus, and lowered soluble B compared to ECCE 62 limestone. The 2 t/ac rate of ECCE 100 limestone held soil pH above 6.0, 2.5 years after treatment (Fig. 1). At 1 ton of ECCE 100 limestone/ac, soil pH was 5.8 compared to 5.7 at 2 tons of ECCE 62 limestone/ac.

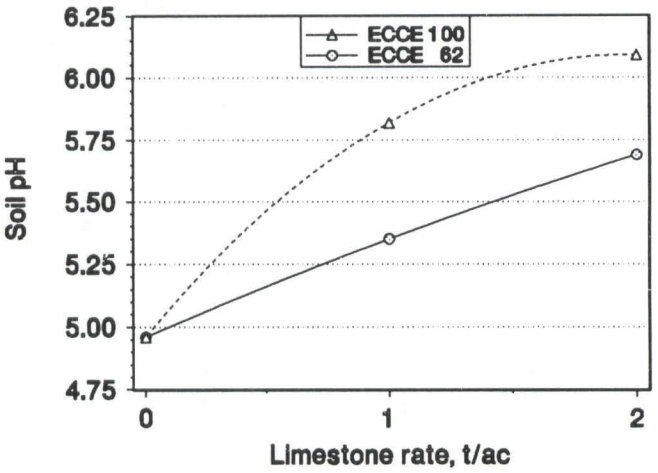

Figure 1. Effect of limestone rate and ECCE on pH of the 0-6 in. soil depth in 1991, 2.5 yr following treatment.

Without limestone, clover yields were not increased by B treatment (Table 1). When limestone was applied, adding B increased clover yields in 1989 and 1991. Yields of clover were consistently increased by limestone except where no B was applied in 1989. Increased limestone and B rates raised clover yields in 1991. Except in 1989 at the high B rate, the magnitude of the

yield increase due to limestone was greater at the high rate of limestone when B was applied. Clover yield was decreased by ECCE 100 limestone at zero B in 1989. Application of 2 lb of B/ac at the ECCE 62 limestone treatment lowered clover yield in 1989. Added boron had no effect on clover production in 1990. The average daily maximum and minimum air temperatures in Feb. 1990 were 11°F higher than in Feb. 1989 and Feb. 1991. Warmer soils may have increased soil microbial activity and release of B through mineralization from organic matter.

Application. Results indicate that fertilization with B for clover production should be a definite consideration after application of ECCE 100 limestone to neutralize soil acidity. This conclusion is supported by results from laboratory studies of the effect of soil pH on B adsorption and retention. At higher soil pH, greater amounts of B are adsorbed and held by the soil against leaching. Soils testing marginal or lower in B will need B fertilization for clover production after application of a high ECCE limestone.

Table 1. The effect of rate of applied limestone, ECCE, and rate of applied boron on rose clover dry matter yield for each of three seasons.

	Clover dry matter yield by year and boron rate								
	Boron rate, lb/ac								
Limestone	1989[a]			1990[b]			1991[c]		
rate	0	1.0	2.0	0	1.0	2.0	0	1.0	2.0
t/ac	lb/ac								
0	3434	3480	3309	998	903	888	262	363	227
1.0	3735	3995	4181	1650	1850	1951	834	1088	1177
2.0	3411	4422	4221	2274	2662	2381	1222	1744	1601
ECCE									
62	3853	4196	3625	1831	2079	1989	976	1427	1334
100	3293	4221	4304	2093	2433	2342	1080	1405	1444

[a] In 1989, clover yields were significantly affected (P = 0.05) by rate of limestone, rate of boron, and by the interaction of limestone ECCE with boron.

[b] In 1990, clover yields were significantly affected (P = 0.05) by rate of limestone and by limestone ECCE.

[c] In 1991, clover yields were significantly affected by rates of limestone and boron (P = 0.01) and by the interactions of limestone rate with ECCE and limestone rate with ECCE and with boron (P = 0.05).