PUBLICATIONS
1992

FIELD DAY REPORT - 1992

Texas A&M University Agricultural Research and Extension Center at Overton

Texas Agricultural Experiment Station
Texas Agricultural Extension Service

Overton, Texas

April 30, 1992

Research Center Technical Report 92-1

SWEETPOTATO RESPONSE TO LIMESTONE, NITROGEN, AND POTASSIUM

V. A. Haby, D. R. Earhart, J. V. Davis, and A. T. Leonard

Background. Sweetpotatoes are grown primarily on acid soils. Excess acidity limits yields. Similarly, excessively liming the soil can cause problems with disease in the sweetpotato. This research was initiated to study the effect of limestone application on yield of sweetpotato, to probe the interaction of limestone with nitrogen (N) and potassium (K) and the effect on yield, and to calibrate a limestone requirement soil test with the sweetpotato response to limestone.

Research Findings. This study was conducted on a Bowie loamy fine sand that was treated with elemental sulfur to lower the soil pH. Limestone rates ranged from 0 to 2 tons/ac. Nitrogen fertilizer rates varied from 0 to 120 lb/ac and potash treatments increased from 0 to 200 lb/ac. A central composite experimental design was used to develop response regressions. A two year rotation of plots was conducted on duplicate, adjacent sites over a three year period. The 3 crop sequence included sweetpotatoes followed by winter wheat. Sorghum sudan followed the wheat. Yields discussed in this report are from 1991.

Soil pH the previous year varied from 4.1 to 3.9 in the unlimed plots. At the 200 lb/ac potash (K_2O) level, the increase in sweetpotato yield due to 2 tons limestone/ac was 250, 50 lb boxes in soil that received no N (Fig. 1). The 120 lb N/ac treatment increased yield by 56 boxes when no lime was applied. At the higher rates of limestone, N fertilizer application lowered production of marketable tubers. In an extremely acid soil, N mineralization is low due to inactivity of necessary micro-organisms. Raising the soil pH with limestone application created a more favorable environment for N mineralization and increased nutrient utilization efficiency by the sweetpotato plants.

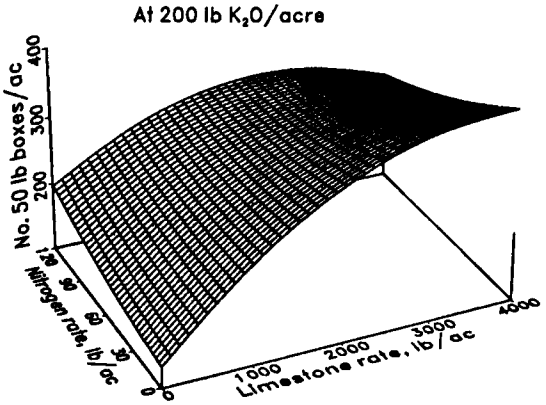

Fig. 1. Effect of limestone and nitrogen on total marketable sweetpotato yields.

At the 60 lb/ac N rate, increasing the lime rate from zero to 3000 lb/ac increased sweetpotato yield by 168, 50 lb boxes/ac at the 200 lb/ac potash rate (Fig. 2). Yield declined at

the 4000 lb/ac lime treatment at all levels of potash application. At the zero limestone treatment potash only slightly increased yield.

At the 3000 lb/ac lime rate, increasing N application steadily decreased sweetpotato production at all levels of potash application (Fig. 3). At the zero N rate, there was no yield response to increasing potash application. As the N rate was increased, response to potash increased, but yield was lower than that obtained with zero N and K_2O. Yield decrease due to high N rates was less at increased potash rates.

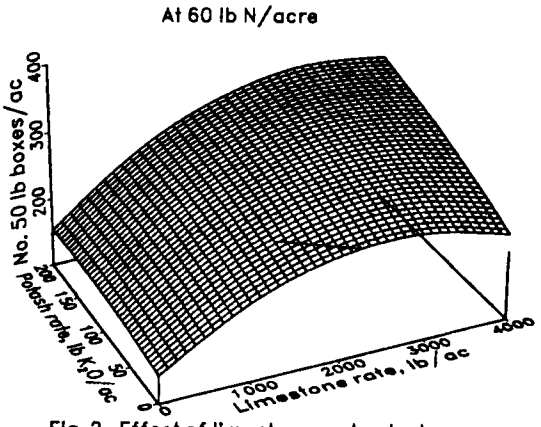

Fig. 2. Effect of limestone and potash on yield of marketable sweetpotatoes.

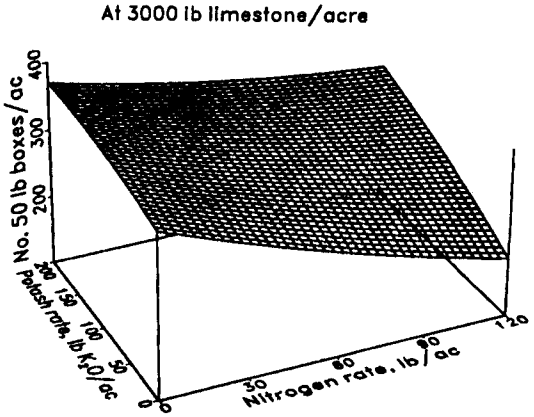

Fig. 3. Effect of nitrogen and potash on yield of marketable sweetpotatoes

Application. Results of this study show the delicate balance that must be maintained between soil acidity and limestone rate, nitrogen, and potash. Limestone is needed at reasonable levels to optimize sweetpotato yields. Nitrogen lowered yield when applied to an adequately limed soil. Limestone raised soil pH to a favorable level for microorganism decomposition of organic matter and the subsequent mineralization of N. Over time, mineralizable N will decrease and sweetpotatos should respond to low rates of N fertilizer. Potash applied with adequate lime rates increased yield of sweetpotatoes. Application of more than 3000 lb limestone/ac without addition of potash lowered sweetpotato yield. When this soil was adequately limed, yield loss due to increasing N rate was less as the potash rate was increased. Application of excess limestone increases the potential for disease.