NITROGEN FERTILIZER REQUIREMENTS FOR GRAIN SORGHUM FOLLOWING WINTER LEGUMES IN CONVENTIONAL AND NO-TILLAGE SYSTEMS

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Introduction

Legumes have been utilized as a green manure or mulch and N source in cropping systems for tliousands of years. Frequent mention of winter-cropping legumes, particularly hairy vetch (Vicia villosa Roth) and Crimson clover (Trifolium incarnatum L.), started to appear in the literature in the U.S. in the 1890's and by 1920 almost every agricultural extension office in the southeastern U.S. was recommending winter legumes for erosion control and soil building. The practice declined drasticallv in the post World-War II era with the advent of inexpensive N fertilizers; however, the change in economics of inorganic N useage and growing concern over soil erosion losses have sparked a comeback for green-mulching winter legumes in rotation with summer grains in the southeastern United States.

Materials and Methods

The experiment was conducted in 1982 and 1983 on an Arredondo fine sand, a member of the loamy silicious hyperthermic family of the Grossarenic Paleudults. The study examined a crimson clover/grain sorghun (Sorghum bicolor L. Moench) system. Four management systems were employed and included 1) no-tillage into clover for a mulch; 2) no-tillage into stubble of harvested clover; 3) conventional-tillage using the clover for green manure; and 4) conventional-tillage, after the clover was harvested. Subtreatments consisted of seven rates of N fertilizer; 0, 25, 50, 75, 100, 150, and 200 kg N/ha.

Results

Crimson clover dry matter yield averaged 5,000 kg/ha and had an average N content of 140 kg/ha for the two years. Using the clover as a mulch resulted in greater sorghum grain yield and higher N in leaf tissue (Figure 1). Critical leaf N levels were about 3.9 % when sampled at early bloom. Leaving clover as a mulch would require 25 kg inorganic N/ha and removing the clover would require 75 kg inorganic N/ha to maximize sorghum grain yield in these systems. At low rates of inorganic N, clover mulch under no-tillage conditions gave higher yields than removing the mulch (Figures 1 and 2). Data indicate that not only does the clover mineralize N from the mulch in equal quantities to green manure treatments but it also better utilizes the N at lower inorganic N rates, likely due to better moisture conservation.

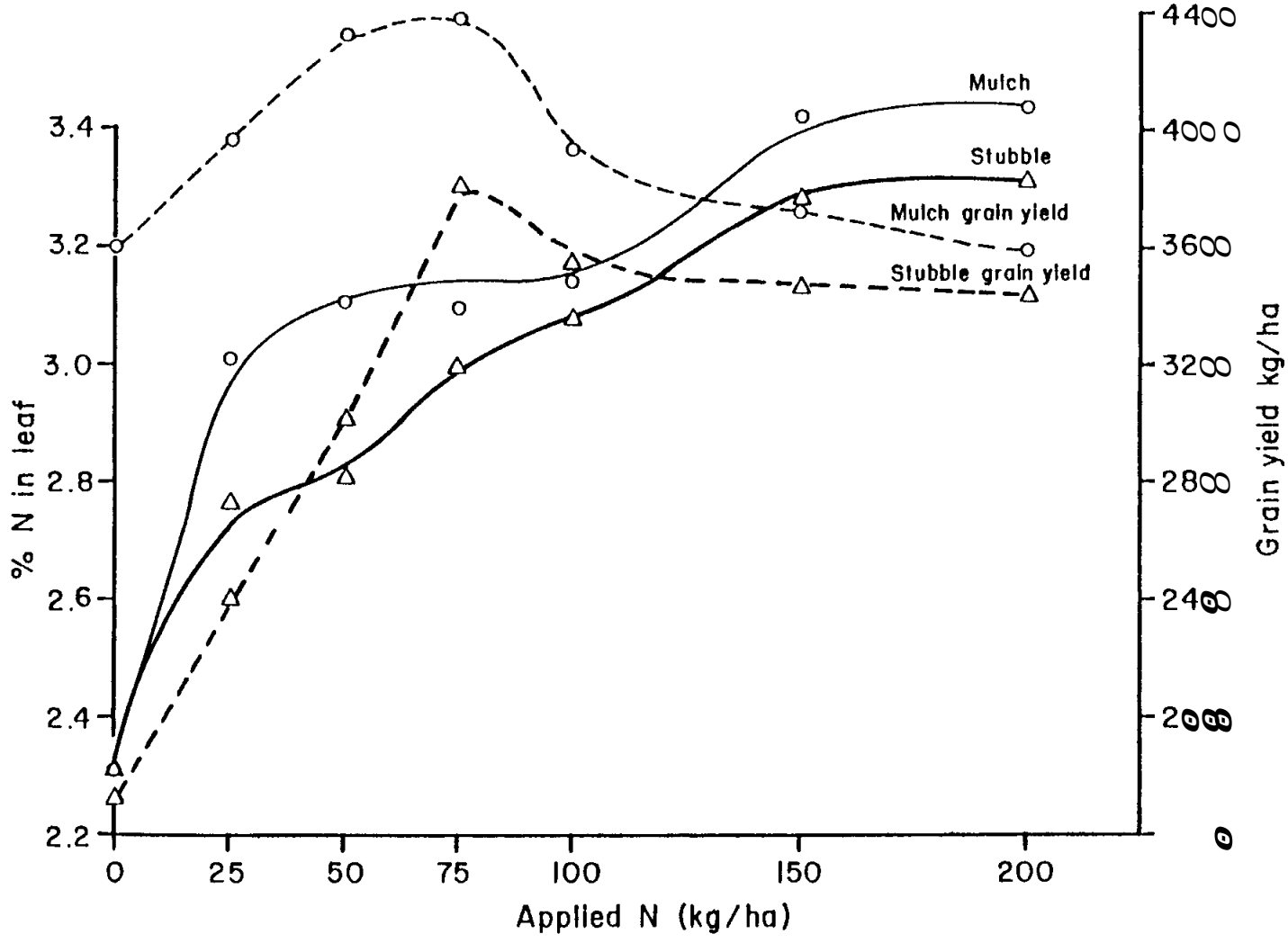

Fig. 1. Grain yield and leaf nitrogen of grain sorghum following crimson clover.

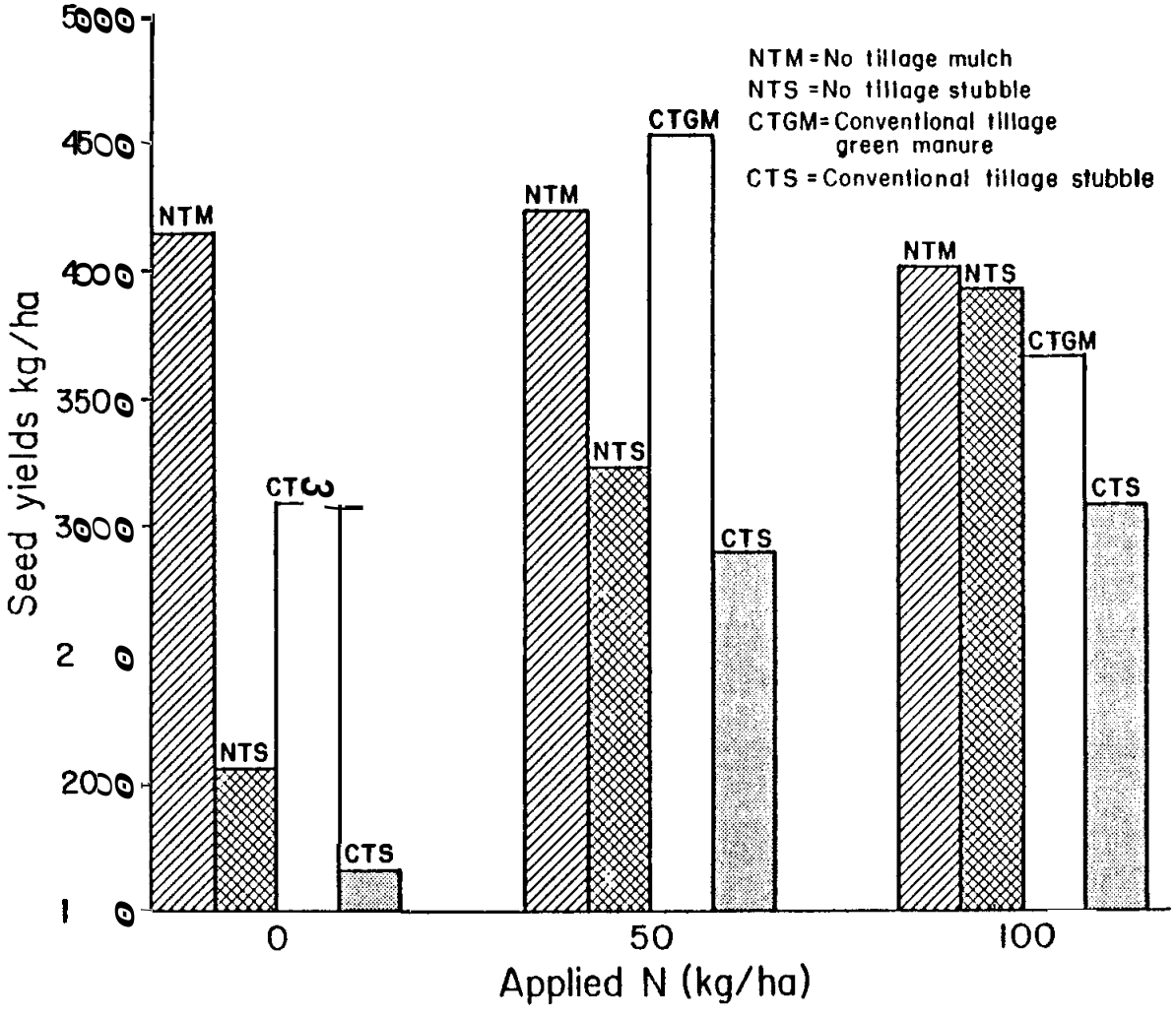

Fig 2 Grain sorghum seed yields as affected by tillage and N rate when following crimson clover.