RELATION OF FERTILIZERS, CROP RESIDUES, AND TILLAGE TO YIELDS OF COTTON AND INCIDENCE OF ROOT-ROT

H. V. JORDAN, H. A. NELSON, AND J. E. ADAMS

THE Division of Soil Fertility Investigations, Bureau of Plant Industry, U. S. Dept. of Agriculture, has studied for a number of years the relation of fertilizers, crop residues, and tillage to the incidence of cotton root-rot, a disease caused by the fungus, Phymatotrichum omnivorum (Shear) Duggar. These experiments have been conducted at several widely distributed locations in the Blackland prairie section of Texas, where the disease is a limiting factor in the production of cotton and other crops. Adequate summaries of the literature of studies on cotton root-rot have been presented by Streets (9) and by Rea (6).

The Blackland prairie section of Texas is an important agricultural area of approximately 11,000,000 acres, extending from the northeastern to the south-central part of the state. The soils of the Houston series are dominant. These are highly colloidal, calcareous clays of friable structure; the majority of these soils are infested with root-rot. Soils of the Wilson and Crockett series form a band along the eastern edge of the section. They range from clays to very fine sandy loams, and are non-calcareous in the surface horizon. The subsoils of the heavier types are dense and intractible. Root-rot is less abundant on these lighter soils. The soils of the Wilson and Houston series differ in their response to fertilizers so the experimental data are presented separately.

FERTILIZER EXPERIMENTS ON SOILS OF THE WILSON SERIES

The early fertility tests were conducted at several widely separated points, using the triangle system as adapted to fertilizer investigations by Schreiner and Skinner (7). From these experiments (5) it was found that the 0—15—0, 3—9—3, 9—3—3, and 15—0—0 ratios covered the range in analyses indicated for most intensive study of these soils. Since 1935 experiments have been designed as Latin squares to test these ratios under root-rot conditions.

The results of seven experiments conducted on Wilson clay loam and very fine sandy loam under an almost continuous-cotton sequence are summarized in Table 1. The most consistent relation between fertilizer treatment and the incidence of root-rot is found for the tests of 1936, 1937, and 1939 conducted on the one field of Wilson very fine sandy loam soil, near Caddo Mills, Hunt County, Texas. Rates of application were 900 pounds per acre in 1936 and 600 in 1937 and 1939. Highly significant increases in mortality were associated with the phosphate fertilizer, 0—15—0, and highly significant correlations with all-nitrogen, 15—0—0, in all three of this field. The mixed fertilizers show intermediate results. The 9—3—3 ratio gave results comparable to those for the 15—0—0 fertilizer. The 3—9—3 in 1936, when 900 pounds per acre was applied, showed a highly significant reduction in the percentage of dead plants, but no difference was found in 1939 when 600 pounds was used. Fig. 1 graphically the data at five dates of record for the 1939 season. This experiment included a 9—3—3 fertilizer applied at the rate of 750 pounds per acre in addition to the four fertilizers used in the other tests. At the earliest date of record, July 5, the 0—15—0 carried more, and the 9—3—0, 9—3—3, and 15—0—0 fewer, dead plants than the unfertilized check. The 3—9—3 treatment showed no differences. Percentages dead cotton for the three high-nitrogen fertilizers were small throughout the season. The average spread was rather uniform on the unfertilized but was somewhat accelerated on the 0—15—0 after July 20. These differences in the rate of spread resulted in increasingly greater differences between the phosphate alone, 0—15—0, and the check as the season progressed. This is also true for the differences associated with the other ratios were not significant at any date of record, but the differences associated with the other ratios were not significant at any date of record.