RECENT INVESTIGATIONS OF THE RESPONSE OF OATS TO FERTILIZER IN IOWA

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In Iowa the acreage planted to oats is second only to that planted to corn and has averaged 5½ million acres annually during the past 10 years. Since the yield of oats for this period averaged only 33.4 bushels per acre, it is important that means of raising the acre yield should receive consideration. Outstanding progress is being made by plant breeders in developing new varieties which are superior with respect to disease resistance, yield, stiffness of straw, and resistance to lodging (3). Apparently as a result of the above characteristics, the newer varieties are capable of giving a greater response to fertilizers than are the older varieties (2).

During 1944 and 1945 a comprehensive investigation has been in progress to determine the effect of nitrogen, phosphorus, and potassium fertilizers on the yields of oats, largely of the Tama and Boone varieties, on various soils of Iowa. It is the purpose of this paper to summarize the data obtained from these experiments.

EXPERIMENTAL

Seven replicated field experiments were conducted in 1944 on soils of western and northeastern Iowa. In these tests, nitrogen, phosphorus, and potassium fertilizers were used singly and in combinations in a factorial design. The acre rates of fertilization employed were 20 pounds of nitrogen, 40 pounds of P₂O₅, and 20 pounds of K₂O. Ammonium sulfate, 20% superphosphate, and 60% muriate of potash were used as sources of these materials. The fertilizers were applied broadcast and were disked into the soil before the oats were seeded.

During 1945, studies were made at 22 locations scattered over the principal soil areas of the state. One rate of nitrogen, two rates of phosphorus, and two rates of potassium were compared singly and in combinations in a factorial design. Acre rates of application were 40 pounds of nitrogen, 40 and 120 pounds of P₂O₅, and 20 and 60 pounds of K₂O. The sources of these materials and the method of application were the same as used in 1944.

The weather during the spring of both 1944 and 1945 was relatively cold and wet. During March and April the temperature was below normal and the precipitation above normal. Temperature and precipitation during May and June were above normal, followed by sub-normal temperature in July. During March, April, and May of 1944 the temperature was below normal and the rainfall below normal, and during June and July the temperature was below normal.

Brief descriptions of the soil series upon which the experiments were located are given in Table 1.

RESULTS OF 1944 EXPERIMENTS

The effect of fertilizers on the yield of oats is shown in seven experiments conducted in 1944 is presented in Table 2. These data show that the use of phosphorus alone, potassium alone, or phosphorus and potassium together increased the yield an average of 1.4, 2.5, and 3.9 bushels per acre, respectively. Twenty pounds of nitrogen increased the yield 7.9 bushels per acre.

Since these experiments are of factorial design, it is possible to make a more accurate determination of the effect of each of the three fertilizer ingredients than is apparent in Table 2. For example, replication four plots received nitrogen and did not, thus the replication of nitrogen vs. no-nitrogen comparisons is actually increased four times over single comparisons. Increased replication...