Studies on the Effect of Nitrogen, Phosphorus, and Potash on the Yield of Corn and Wheat in Mexico

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Corn is the most important single crop in Mexico. For the 5-year period of 1940-44, 55% of the arable land was devoted to it. In value, the corn produced in Mexico is approximately equal to that of the following ten crops combined: Wheat, beans, potatoes, sweet potatoes, rice chili, chickpeas, peanuts, barley, and alfalfa. For the 5-year period of 1939-43, its value was more than that of cotton and sugar cane combined. But far more important than its monetary value is the role it plays in the nutrition of the people. It is the basic food crop for nearly 20 million people, who, from it, prepare a wide variety of dishes, such as tortilla, atole, pozole, tamales, and elotes cocidos.

Each year a tremendous amount of energy goes into producing Mexico's 8½ million acres of corn. In spite of this, however, Mexico is on an import basis, for the average yield is only 9.6 bushels per acre (1, 2). To raise the corn yield of Mexico is to raise the level of nutrition of these 20 million people whose well-being depends quite largely upon the season's corn crop.

Wheat is also of major importance as a food crop. Since Mexico imports roughly 30% of the total consumed in the Republic (around 190,000 tons annually), any program designed to raise the level of production of this crop might well be expected to affect not only the diets of some 20 million people but also the national economy as well. For the 5-year period 1940-44, Mexico spent, for the purpose of importing wheat, an amount of money greater than the value of all Mexican-grown beans, one of the crops for which she is world famous (1, 2).

Wheat is almost entirely an irrigated crop. Relatively speaking cultural practices are poorer than they are for corn. Well-planned crop rotations and commercial fertilizer are the exception. Average yields are very low.

In an attempt to develop practical methods useful in raising the level of corn and of wheat production in Mexico, the Secretary of Agriculture of that Republic, in an agricultural research program supported in part by the Rockefeller Foundation, is developing improvement programs. In it are presented the first year's results from the use of commercial nitrogen, phosphorus, and potassium in field experiments. The study was based on certain established facts concerning this phase of the corn and wheat culture, and its objective was that of applying these principles to Mexican agriculture rather than that of studying fertilization of those crops per se. Experiments were conducted in cooperation with private farmers and on lands under the control of the Secretary of Agriculture during the 1944-45 season. The text employed, as well as the results obtained, are presented in subsequent sections of this paper.

CORN

EXPERIMENTAL PROCEDURE

Materials and methods.—Nitrogen was supplied in the form of ammonium sulfate, phosphorus from superphosphate, and potassium from muriate of potash. The usual method of application was to apply 17.8 pounds of nitrogen per acre in the bottom of the row before planting, and the same amount as side-dressing when the corn was approximately 6 weeks old. Attention is called to exceptions to this procedure.

Phosphate and potash were added in the row at the time of planting.

Rows were spaced at 90 or 92 centimeters apart. In the experiments the hills were spaced 90 centimeters apart. An attempt was made to maintain three plants per hill. The row varied in size from four rows 8 meters long to five rows 10 meters long. In all cases the center rows were used for yield data. All yields were converted to the air-dry basis, 85% of the actual yield. The weight of the shelled corn was considered the shelling percentage, and this was converted to bushels per acre.

The experiments were laid out in a randomized block design with four replications, with the exceptions Nos. C2, C4, C5, and C6, in which case a split block design was used. Locally adapted corn varieties were used in all experiments.

Location of experiments.—An attempt was made to locate the experiments in a number of the most important producing areas of the Republic. However, the areas chosen varied in size from four rows 8 meters long to five rows 10 meters long. The center rows were used for yield data. All yields were converted to the air-dry basis, 85% of the actual yield. The weight of the shelled corn was considered the shelling percentage, and this was converted to bushels per acre.

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