A COMPARISON OF CERTAIN METHODS FOR DETERMINING READILY SOLUBLE PHOSPHORUS IN SOILS

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THERE are few data available which compare the amounts of readily soluble phosphorus extracted by the commoner methods from highly fertilized soils of the eastern seaboard. The purpose of this investigation was to show whether the relative information arrived at by the use of one method on these soils materially differed from that by another.

MATERIALS AND METHODS

The 33 soils selected for this study were from Aroostook County, Maine, and the trucking section of New Jersey. For the most part, these soils were paired, an intensively cropped, highly fertilized soil being paired with an uncultivated soil. Some of the Maine soils were from selected plots of a permanent fertility experiment (1).

The methods for determining readily soluble phosphorus which were selected for use are listed and briefly described below. Except as otherwise indicated the methods as originally proposed were rigidly followed.

Truog (9).—Two grams of soil were extracted by shaking for 1/4 hour with 400 ml of 0.002 N H₂SO₄ buffered with ammonium sulfate at pH 3. The colorimetric method was adapted for use with a photoelectric colorimeter. Each reading was made exactly 7 minutes after adding the stannous chloride.

Modified Truog.¹—Two grams of soil were extracted by shaking for 1/4 hour with 200 ml of 0.002 N H₂SO₄ at pH 3. The phosphorus in the extract was determined by the method of Gerritz (4). This modified method is well adapted to soils having high amounts of readily soluble phosphorus. The color developed is stable and provisions are also made to prevent interference from iron and arsenic.

Modified Morgan (6).—Ten grams of soil were extracted by shaking for 1/4 hour with 50 ml of Morgan’s solution (sodium acetate + acetic acid at pH 4.8). The colorimetric method was adapted for use with a photoelectric colorimeter, each reading being made exactly 7 minutes after adding the stannous oxalate.

Hester method (5).—Twenty grams of soil and 50 ml of extracting solution (sodium acetate + acetic acid at pH 5) were shaken in an end-over-end shaking machine for 1/4 hour. The phosphorus in the extract was determined by the method of Truog and Meyer (8) adapted for use with a photoelectric colorimeter.

Egner’s lactate method (2).—Five grams of soil were extracted by shaking for 2 hours with 250 ml of a solution at pH 3.7, 0.02 N in respect to calcium lactate and 0.01 N in respect to hydrochloric acid.

Two- and one half per cent acetic acid method (10).—Ten grams of soil were shaken for 2 hours with 400 cc of 2½% acetic acid, pH 2.8. The phosphorus in the extract was determined by the method of Truog and Meyer (8) adapted for use with a photoelectric colorimeter.

Neubauer method.—The Neubauer values were determined with rye seedlings grown for 17 days by a technique similar to that developed by Thornton (7). Neubauer² values were obtained on only 12 selected soils from the group of 33.

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²Associate and Senior Soil Scientist, respectively.

³Figures in parenthesis refer to “Literature Cited”, p. 822.

⁴These modifications of the Truog method were developed and suggested by Dr. Michael Peech, Agronomy Department, Cornell University.

⁵The authors are indebted to Mrs. L. W. Klipp for determining the Neubauer values.