A CHEMICAL STUDY OF QUICK-TEST TECHNICS
FOR POTASSIUM AND CALCIUM

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THE use of quick chemical tests as an aid in determining fertilizer needs of a soil is today an accepted procedure. The expressions "quick-tests" and "rapid soil tests" are generally accepted as referring to semi-quantitative colorimetric or turbidimetric tests made on a single soil extract. That many of these quick-tests fall short of their expected goal is not surprising when one considers the variety of procedures proposed by various workers. The details of these various methods, as well as comparisons of their practical value, are reviewed by Anderson and Noble (1), Reed and Sturgis (9), Bray (3), Goss and Owens (5), and others. Although attempts have been made to correlate the results of these methods with field responses, few attempts have been made to correlate them with the more accurate laboratory methods of soil analysis.

In general, all quick tests for replaceable bases can be classified into three groups on the basis of the extracting solutions used as follows: First, the weak salt acid extracting solution as used by Morgan (8), Hester (6), Spurway (11), Merkle (7), and others; second, the strong mineral acid extracting solutions as used by Baver and Bruner (2); and third, the strong neutral salt solution as used by Bray (4). As it was not feasible to make a detailed study of all of the quick tests in use today, Morgan's 10% sodium acetate in 3% acetic acid was chosen to represent the first group, Baver and Bruner's 0.3 N hydrochloric acid for the second group, and Bray's 22% sodium perchlorate solution as a representative of the third group. Two other extracting solutions, Merkle's 0.25 M sodium acetate and an acid sodium perchlorate solution were also considered to illustrate points in technic.

It is the purpose of this paper to evaluate the technics from a chemical point of view rather than to compare the usefulness of these methods in any specific region. Therefore, all results reported in this paper are based on the quantitatively determined amounts of the ions removed by the extracting solutions used and are not based on any suggested calibrations for field use.

SOIL EXTRACTIONS

It is obvious that the accuracy of any quick test depends in the first place on the quantitativenss with which the extracting solution removes the form of nutrient concerned from the soil. It has been shown that in the case of the cations K, Ca, and Mg plants can use that which is held in the replaceable form as well as that present in

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3Figures in parenthesis refer to "Literature Cited", p. 543.