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Recommended Citation
"W229-Interpreting Mehlich 1 and 3 Soil Test Extractant Results for P and K in Tennessee," The University of Tennessee Agricultural Extension Service, W229 08/09 10-0043, http://trace.tennessee.edu/utk_agexcrop/63

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UT Extension
W229

Interpreting Mehlich 1 and 3 Soil Test Extractant Results for P and K in Tennessee

Hubert Savoy, Associate Professor
Biosystems Engineering and Soil Science

Introduction

The Mehlich 1 and 3 soil test extractants are the most widely used in laboratories of the southern United States today. Tennessee began using the Mehlich 1 extractant in December, 1981. Existing soil test calibration data in Tennessee are based on the Mehlich 1 soil test extractant,[1,2] which became available in 1953.

P and K Soil Test Calibrations by Mehlich 1 in Tennessee

A general soil test calibration derived from this existing Mehlich 1 data and calibration data from the previously used soil test extractant is shown in Table 1, as it is used by the laboratory program today. A separate calibration for cotton is given, because more recent soil test calibration information with that crop[3] suggests that separate break points were needed to accurately make a potassium recommendation.

These calibrations are used to develop fertilizer recommendations for P and K using guidelines published in the University of Tennessee's Biosystems Engineering and Soil Science (BESS) Information Sheet # 100[4], "Lime and Fertilizer Recommendations for the Various Crops of Tennessee."

Table 1. Soil Test Calibrations for Mehlich 1 Extractable Phosphorus and Potassium in Tennessee

Rating	Phosphorus, lbs/acre (All crops)	Potassium, lbs/acre (All crops but cotton)	Potassium, lbs/acre (Cotton)
Low (L)	0-18	0-90	0-140
Medium (M)	19-30	91-160	141-280
High (H)	31-119	161-319	281-319
Very High (VH)	120 and above	320 and above	320 and above

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P and K Soil Test Calibrations by Mehlich 3 in Tennessee

The Mehlich 3 soil test extractant[5,6] was developed in 1984 and was thought to be more of a universal soil test extractant. Because it does not correlate well with uptake of some nutrients such as P in specific soils, and other factors such as difficulties in calibrating a new extractant and not being as user-or instrument-friendly as Mehlich 1, many laboratories did not switch to using the new extractant.

As a result, laboratories in the South are split in using one or the other of the Mehlich extractants in their programs today[7]. This can cause difficulties when farmers in Tennessee or other states using Mehlich 1 have soil test results from a Mehlich 3 extractant but need interpretation of those results into a land-grant university fertilizer recommendation.

It takes many years of research efforts to acquire a significant amount of calibration data for a new extractant based on the predominant agricultural soils of a state. A shortcut usually taken by state land-grant universities changing extractants or wanting an interpretation of a new extractant from the currently used calibration is to run a correlation of the results from the two extractants across the range of soils and soil test values found in the state. Kentucky did this when their university laboratory switched from Mehlich 1 to Mehlich 3 and published this information in a regional soil testing bulletin[8]. They then switched to the Mehlich 3 extractant.

Since the soils, extractants and nutrient ranges used in the Kentucky study are essentially the same as those in Tennessee, this information can be used to convert Tennessee Mehlich 1 P and K soil test calibrations into initial Mehlich 3 soil test P and K calibrations.

These converted P and K calibrations for the Mehlich 3 soil test extractant (as derived from the Kentucky correlations and current Mehlich 1 calibrations at the University of Tennessee) are listed in Table 2. They can be used with the current University of Tennessee fertilization guidelines found in Tennessee's BESS Information Sheet # 100[4] to obtain an appropriate land-grant university-based fertilizer recommendation for low, medium, high and very high testing soils (P and K).

It is important to note that these are initial calibrations that will be adjusted as actual calibration data become available. Calibration studies with corn, soybeans, cotton and bermudagrass are currently ongoing. With additional funding, actual Mehlich 3 calibration data can be obtained. There are no plans to switch extractants at the UT's Soil, Plant and Pest Center, but additional evaluation of the two extractants will be conducted as funding becomes available.

Table 2. Soil Test Calibrations for Mehlich 3 Extractable Phosphorus and Potassium in Tennessee

Rating	Phosphorus, lbs/acre (All crops)	Potassium, lbs/acre (All crops but cotton)	Potassium, lbs/acre (Cotton)
Low (L)	0-30	0-114	0-178
Medium (M)	31- 60	115-203	179-356
High (H)	61-210	204-405	357-405
Very High (VH)	211 and above	406 and above	406 and above

Definitions of Tennessee P and K Soil Test Ratings

Soil test ratings are associated with a probability of response to additions of the nutrient. The actual definitions commonly accepted and used in Tennessee are as follows:

Tennessee Soil Test Ratings – Phosphorus and Potassium

LOW (L): In most cases, plants will respond to the application of that nutrient. If the nutrient is not applied, deficiency symptoms may occur and crops usually yield less than 75 percent of their potential.

MEDIUM (M): Plants may or may not respond to the application of that nutrient. Deficiency symptoms are not likely and soils can be expected to produce 75 percent or more of their potential without the application of the nutrient.

HIGH (H): The soil will produce at or near 100 percent of its potential without the addition of the nutrient. Any amounts recommended are primarily to maintain present soil test levels.

VERY HIGH (VH): Supply of the nutrient in the soil is well in excess of the amount needed to produce 100 percent of the soil's potential. Application of the nutrient is not recommended, since further additions may create nutrient imbalances.

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