A Comparison of the Glass Electrode and Indicator
Methods for Determining the pH of Organic Soils
and Effect of Time, Soil-water Ratio, and
Air-drying on Glass Electrode Results

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THE use of a set of several single indicators has been the accepted
method (LaMotte-Morgan) for testing the reaction of muck soils
for a number of years by members of the Soil Science Department of
the Michigan Experiment Station. Recommendations regarding fer-
tility practices on muck soils have been based on data obtained by
this method which has proved to be a very accurate and valuable
means of diagnosing problems pertaining to muck soils of the state.
Recently, glass electrode assemblies in which the source of current is
obtained from an electrical outlet rather than from the conventional
battery type equipment has become available. It is the purpose of this
paper to present the results obtained in a study relating to a compari-
son of the indicator and glass electrode methods of obtaining the pH
of muck samples.

PROCEDURE

Fifty muck samples were collected at random in a series of muck soil extension
meetings held during February and March. These samples were brought to the
meetings by farmers for testing and subsequent soil treatment recommendations
for crops to be grown. The samples ranged from well-decomposed mucks to those
that were quite peaty in nature; and in moisture content they varied from those
which were well dried to those which were brought in as a frozen mass directly
from the field. The LaMotte-Morgan indicators were used for making the pH
determinations at the meetings. The samples selected for further study were
placed in cellophane bags, assigned a number, and taken to the soil testing
laboratory for pH determination by use of the glass electrode.

The following procedure was used in the work. A level tablespoon of soil
(15 ml) was placed in a 50-ml beaker and 15 ml of distilled water added. The
sample was then stirred for 1 minute and the pH determined immediately. A pH
reading was again made on the same sample at the end of 15 minutes and at the
end of 60 minutes, with thorough stirring prior to the time of taking each reading.
From the 50 samples, 15 were selected for a study of the effect of soil-water ratios
on the pH. Soil-water ratios of 1.5, 1.4, and 1.25 were investigated. In addition,
15 samples were air-dried and then the effect of this air-drying was investigated
on the pH determined at the end of 1 minute and 15 minutes.

A 1:1 soil-water ratio was first used for the air-dry samples, but it was very
difficult with some samples to get a consistency of the muck mixture mechanically
suitable for reading with the glass electrode. In some cases the muck absorbed
enough of the water so that the soil paste was actually too dry for efficient opera-
tion of the electrode. The apparent dryness of the sample increased with time,
indicating that thorough wetting was not obtained after 1 minute. For this
reason a 1:2 soil-water was used for the 15-minute reading of the air-dry samples.

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3 Phenol red (7.0-8.6), brom thymol blue (6.1-7.7), chlor phenol red (5.1-6.7),
brom cresol green (3.8-5.4), brom phenol blue (3.1-4.7).