Solubility of Iron in Submerged Soils

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While studying the water-soluble ions in the Brookston and similar soils from the vicinity of Chatham, Canada, an interesting phenomenon was observed that undoubtedly has a bearing upon the growth of certain crops in some seasons. On August 25, 1947, 24 samples of Brookston silty clay loam soil, A_p and B horizons, were used in the study of the water-soluble ions. The procedure (Fig. 1) consisted of placing 50 grams of soil inside a collodion bag in a 150-ml. extraction flask. Then 50 ml. of distilled water was added to the soil inside the bag, and another 50 ml. was placed on the outside of the bag. The bag was lifted slightly and held in suspension by stoppering the flask.

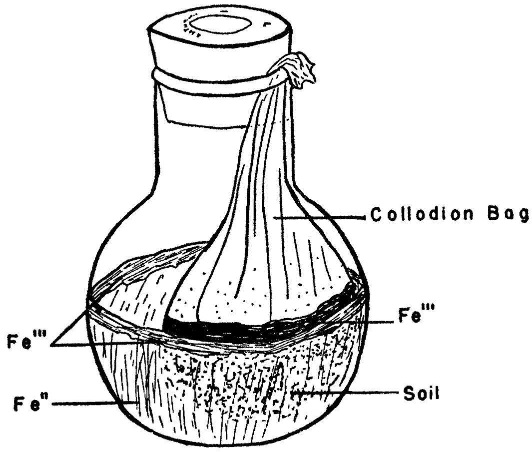

Fig. 1. Dialysis of soil in collodion bags.

TABLE 1
WATER-SOLUBLE IRON* IN BROOKSTON CLAY LOAMS

Soil horizon	Ferric iron	Ferrous iron
A_p	12 ± 5	24 ± 9
B	6 ± 1	21 ± 9

* Parts per million in the soil (mean of 24 samples, pH 6.7–7.2).

After the first analyses of the solution outside of the bag were made, the flasks were allowed to remain stoppered tightly, undoubtedly creating anaerobic conditions. After about one week a brown iron stain began to accumulate on the surface of the soil. On September 6, analyses of the water outside of the bag were made for ferrous and ferric iron.

The results in Table 1 show that considerable ferric iron was in solution, and an even larger amount of ferrous iron. Since the top soil had more soluble iron than the subsoil, undoubtedly the breakdown of the organic matter was influencing the solubility of iron. The pH value of the soils was near 7.0. By October 11 all of the ferrous iron had been oxidized to ferric iron, had collected on the flask and bag at the water level, and had precipitated in a gelatinous mass in the bottom of the flask.

Phosphates were not found in solution. Iron phosphates are of low availability to tomatoes (*1*) and other vegetable crops, particularly at a pH value near neutral. In at least two of the last 10 years, phosphorus deficiency on tomatoes has been exceptionally noticeable in the Chatham area in Canada and in the Toledo, Ohio, area. This occurred after a cold, wet spring. It is believed that the above phenomenon offers an explanation of the extreme phosphorus deficiency. In other words, once these heavy soils are packed down and water remains on them for several days, a suboxidation condition similar to that described above is set up. When wet, cold springs occur, early, deep, and thorough cultivation should help to prevent the purpling (phosphorus deficiency) of the tomato crop.

Reference

1. HESTER, J. B., BLUME, J. M., and SHELTON, F. A. *Va. truck exp. Sta Bull. 95*, 1937.

A Simple Calculator for Certain Types of Instrumental Data[1]

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Employing the nomographic principle of similar triangles, we have produced a simply constructed device which is of considerable value in converting the deflections recorded by optical manometers into their equivalent pressure measurements. Extensions of the underlying principle permit ready application of this apparatus to a number of other types of instrumental data.

In many situations, an instrumental reading, y, bears the following relation to the quantity, x, being measured:

$$y = k \cdot f(x), \qquad (1)$$

k being a proportionality factor. In some instruments, such as optical manometers, k may vary with the age and the con-

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