It is obvious that plants are materially affected by the nature of the soil in which they grow. It is well known that crops grown under similar climatic conditions on different soil types vary not only with respect to yield but also in quality or flavor, color, nutritive value, and other qualities. Farmers may be found who recognize some pastures to be more nutritious than others, and the hay from certain fields to be more valuable for feed than that from other fields. The so-called malnutrition of animals is reported to be rather local in occurrence, and appears to be correlated with certain soil types. Yet it seems that more information on the relationships between soil type and plant is needed.

When attempts are made to follow up the soil surveys with experiments on soil types to determine their crop adaptations and fertilizer requirements, and to ascertain whether or not the soil types may be grouped with respect to their requirements for satisfactory crop production, some interesting problems arise. This is to be expected, especially if cognizance is taken of the complexity of soils, and also of the fact that we are dealing with biological processes in such undertakings.

Early in the work in Michigan we met up with some things which were not as might have been predicted. The following questions have arisen in connection with our investigations: Are the amounts of each of the several mineral plant nutrients in circulation or in the juice of a given crop grown on different soils similar or widely different? Do the amounts vary in juice from different parts of the same plant? Does there appear to be a minimum amount of each nutrient for proper plant growth? To what extent, if any, does the application of fertilizers to the soil affect these relations? Is there any relation between the soil reaction and the calcium content of the juice? These questions, together with the development of microchemical tests and their use in the study of the soil solution led us to take up a study of the amount of certain elements in the expressed sap of crops grown under widely different soil conditions. Some

---

1Paper read as part of the symposium on "Soil Solution" at the meeting of the Society held in Chicago, Ill., Nov. 18, 1927. Contribution from the Soils Department, Michigan State College, East Lansing, Mich.

~Professor of Soils and Research Assistant in Soils, respectively.

Published August, 1928