PREAMBLE TO CHAPTER 3

Knowledge of mineral nutrition of plants owes much to the study of microorganisms. Bacteria, fungi, and some algae can be grown in pure cultures of genetically pure lines, and they may produce rapidly a relative large crop from the minute inoculum which is added to an otherwise purified medium. Thus it is understandably easier to demonstrate limitingly low concentrations of one or another of the essential nutrients in the medium than it is by the growth of seed plants.

Although the microorganisms are thus well adapted to the demonstration and proof of essentiality of a given element, the various criteria by which the symptoms may be described must rely heavily upon total growth or upon chemical and metabolic characteristics, for the morphogenetic responses of the Thallophyta are apt to be so inconspicuous that they do not result in very visible symptoms. This is especially true of bacteria, or if the test organism is a member of the Fungi Imperfecti, or even if it is only the imperfect stage of a fungus for which the sexual stage is known. Thus, for the role of essential elements in differentiation and in morphogenesis, one should still turn to studies on higher plants (Chapter 2).

One of the earliest beneficial and conscious additions of zinc to a plant culture medium was that made to the medium prescribed by Raulin (1869) for the growth of fungi, and this antedated by nearly 70 years the recognition of the essentiality of zinc for angiosperms (cf. Chapter 2). Similarly, the molybdenum requirement for fungi was known (Steinberg, 1937) before the critical demonstration of its role in flowering plants by Arnon and Stout (1939). Early work of Hopkins and Wann on iron (1927) and by Hopkins on manganese requirement (1930) used *Chlorella* as the test organism, and this paved the way for the role of pure cultures of this plant in the investigation of inorganic nutrition which ranks with its adoption as an experimental object in the study of photosynthesis. Furthermore, the nutrition of certain microorganisms which fix elementary nitrogen is so important that it warrants a separate chapter which deals with biological nitrogen fixation (Chapter 5).

It is appropriate, therefore, to devote a special chapter of this treatise to the inorganic nutrition of microorganisms, even though in most cases the demonstrated metabolic role of the essential nutrient may prove to be the same as in higher plants.