

PREAMBLE TO CHAPTER 1

It is appropriate to begin the inorganic nutrition of plants by reference to the media from which they draw their nutrients (cf. also Volume II, Chapter 4). For land plants—whether natural vegetation, agricultural crops, or forest trees—this concerns the soil; for aquatic plants and many microorganisms it is an ambient solution; and for experimental plants it is often an artificial culture medium.

The plant nutritional considerations that flow from the study of the soil are first historical, for it was here that the subject began; they are physical and physicochemical because the soil is a complex system in which the structure and properties of its minerals and organic matter determine its supplying powers for ions; they are biological because in the intimate association of soil and root, i.e., the rhizosphere, and in its support of the soil flora the soil is a complex biological and microbiological system. (Soil microbiological aspects of mineral nutrition are also taken up in Chapters 5 and 6.) Statistical considerations also arise, because the investigation of growth and nutrition of plants in the field only became precise through special field plot design and through the application of statistical methods to the interpretation of the data. These various concepts, which form the basis of an understanding of plant and soil interrelationships, are, therefore, appropriately introduced in Part 1 of Chapter 1 in their special relation to plant physiology; they may, of course, be pursued much further with respect to crop plants through the literature of agronomy and in relation to natural vegetation through the study of ecology.

Although the soil looms large in the nutrition of plants in their natural environment, the understanding of inorganic plant nutrition as a branch of plant physiology awaited the means by which it could be investigated without the complications which growth of plants in the field or in soil so obviously presents. This area of plant physiology also presents its own special considerations. Even the first experimental usage of plants with their roots out of contact with soil yielded a major but first level of new knowledge, notably the nineteenth century discovery of the ten essential, or so-called macronutrient, elements. However, an understanding of the scope of inorganic plant nutrition necessarily awaited the recognition that even the culture methods were not as simple as at first supposed, and an awareness of the role of the essential micronutrients in plant nutrition. It is, therefore, appropriate also

to develop the general considerations which flow from the growth of plants in culture media as Part 2 of Chapter 1.

Although this division of Chapter 1 between growth in soil and growth in defined culture media is convenient, a philosophy of plant nutrition combines all points of view; this is implied by their organization as parts of a single introductory chapter. Significantly, therefore, Part 2 which deals with soil-free culture media contains references to edaphic factors even as Part 1, which deals primarily with soil, concludes by reference to the direct supply of plant nutrients through foliage applications.