Book review

Growth and Mineral Nutrition of Field Crops

‘Growth and mineral nutrition of field crops’ deals with plants that constitute the basic staple food for most of the world population, and with some plants that are important as livestock feed or provide raw material for industrial processes. As stated by the authors in their Preface, the book takes an applied approach, and is supported in great part by experimental results obtained in Brazil, although examples are cited from other regions of the world.

The book is organized in 18 chapters, the first seven contain brief descriptions of particular topics, and each of the others is dedicated to one or two crops, with the exception of the last chapter that refers to several forages. Each chapter closes with a brief summary that constitutes a synopsis of subjects discussed in the main text, but frequently also provides additional information. References cited in the text are brought together at the end of each chapter.

The first chapter ‘Field crops and mineral nutrition’ introduces the most important field crops, the elements that are essential or beneficial to plants, and the roles they play in plant metabolism. It is a short chapter that does not pretend to elaborate on the function of each element, but to provide the background information for a reader not familiar with this area of research.

The second chapter ‘Factors affecting production of field crops’ explains how environmental, plant, and socio-economic factors determine yield. The influence of temperature, solar radiation, water supply, and that of physical, chemical and biotic characteristics of soils, is discussed. A few considerations on the maintenance of soil organic matter and tillage are also included. Plant factors considered include genetic variability, in particular pertaining to tolerance to stress, photosynthetic efficiency, plant architecture, plant density, and harvest index. The chapter ends with a discussion on how markets, prices, and the quality of extension services can also influence crop production.

The next chapter ‘Nutrient flux in soil–plant system’ describes the processes of nutrient transport in the soil and absorption by plants. It includes a description of root morphology and membrane structure. The mechanisms of active and passive transport of ions across membranes are approached. Ion channels are not considered and on the whole, I consider this the weakest chapter of the book. It is a complex subject, and the gaps in our knowledge are still very large. Furthermore, the information given is for the most part not essential to comprehend the main chapters. On balance it would appear that at present this subject is best left to more specialized books on plant nutrition.

The chapter ‘Diagnostic techniques for nutritional disorders’ reverts to the applied spirit of the book. It supplies information on soil and plant analyses as tools to evaluate crop nutrient status, and permit fertilizer recommendations to be made. It describes in some detail how to obtain a representative soil sample, and the most common analyses carried out. The need to interpret the data obtained and calibrate tests against the results of field experiments is stressed. Some examples of fertilizer recommendations are presented. The authors describe the care that should be put into the preparation of plant samples. Useful references to factors that affect nutrient concentration in plants, including plant age and nutrient interactions, are followed by descriptions of the most common visual symptoms of nutrient deficiency and toxicity.

‘Nutrient management of degraded soils’ was introduced in this new edition. Though compact, this
chapter gives an overall view on the causes of soil degradation and the measures that can be adopted to sustain soil fertility or to remediate degraded soils. Topics mentioned include drought, deforestation, overgrazing, soil acidification, and loss of soil organic matter.

The sixth chapter ‘The role of essential nutrients on plant diseases’ compiles information on how nutrients can modify plant susceptibility to pathogens.

‘Simulation of crop growth and management’ introduces the reader to the recent developments in crop simulation models. It provides some examples of models’ applications, such as the prediction of adaptation of new crops to local environmental conditions, or the important role models can play in improving decision making processes in crop management, as related for instance to sowing date, fertilization and irrigation.

The next 11 chapters have a similar organization and constitute the core of this work. They provide information on the origin and distribution of each crop, and its requirements in terms of soils and climate. The growth and development of each crop is analyzed and supported by frequent illustrations of growth stages. The physiological parameters that determine yield are referred. Nutrient uptake and distribution as well as normal concentrations in the plant are discussed in relation to the different growth stages and plant response to fertilization. Crops covered in the book include wheat, barley, rice, corn, sorghum, soybeans, bean, cowpea, peanut, sugarcane, cassava, potato, cotton and several forages. It is clear that the authors feel more at home writing about applied subjects and these chapters are stronger than those dealing with more fundamental aspects.

I enjoyed reading the book. I found the chapters on the different crops useful for undergraduate students studying crop production, or for people in extension services.

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