Humic Substances in the Environment


The purpose of this treatise is to present the most recent advance in the chemistry and reaction of humic substances. The book consists of eight chapters, an author index and a subject index.

Chapter 1 introduces humic substances by describing very briefly their historical background, classification, distribution, synthesis, and uses. The chapter is followed by a list of six references. Chapter 2 describes methods for extraction, fractionation, and purification of humic substances. Most commonly used extractants such as dilute aqueous NaOH, neutral salts of mineral or organic acids, dilute sodium pyrophosphate with sodium hydroxide, sequent extraction using sulfuric acid and organic solvents, and ultrasonic vibrations are described.

The classical method of fractionation of humic substances based on chemical and physical methods is discussed. Some novel approaches are discussed. It is pointed out that in spite of the tremendous effort invested by researchers throughout the world in devising the most efficient methods for the extraction of references for the last 3 chapters is 120.

More important, although very little studied, are the interactions with metal ions and hydrous oxides. These complexes could either reduce, the authors conclude that "methods involving oxidative degradation appear to be more suitable for the purpose of assessing and fractionation of these materials, the molecularly homogeneous fraction is yet to be prepared. Chapter 2 concludes with a list of 114 references.

Chapters 3 and 4 treat characterization of humic substances by chemical and physical methods. The chemical characterisation is based essentially upon ultimate and functional group analyses. In fact, these two analyzes are used to assess the distribution of major elements in different functional groups. The distribution of nitrogen- and oxygen-containing functional groups appears to be of major importance. In chapter 4 the authors imply that a complete characterization of humic substances could be achieved if chemical methods are coupled with physical methods, such as spectroscopy, electrometric titrations, molecular weight measurements, radioactive carbon methods and thermal methods. Chapters 3 and 4 are followed by 58 and 137 references, respectively.

Chapter 5 presents a comprehensive review of the chemical structure of humic substances. Specific interest is the treatment of the reader that some of the metals involved in such complexes are toxic and that an understanding of their complexing with humic substances is highly important both from academic and practical points of view. Furthermore, humic substances react with heavy metals to form complexes of differing stabilities and characteristics. These complexes, however, are highly beneficial as their contribution to the soil structural properties, particularly as pertaining to the formation of water stable soil aggregates. Penetration of plant roots, and the movement of air and water through the soil mass are influenced indirectly by these complexes.

The last three chapters discuss reactions of humic substances with metal ions, hydrous oxides, clays, and N-containing compounds. It has been known for quite some time that humic substances form complexes with metals, and hydrous oxides. These complexes might either be water-soluble or water-insoluble. The water-soluble complexes are not as stable as those formed between humic substances and EDTA. The authors deduce that depending upon the pH of the soil, the metallic complexes should be more readily available to plant roots and soil microorganisms. The authors call to the attention of the reader that some of the metals involved in such complexes are toxic and that an understanding of their complexing with humic substances is highly important both from academic and practical points of view. Furthermore, humic substances react with heavy metals to form complexes of differing stabilities and characteristics. These complexes, however, are highly beneficial as their contribution to the soil structural properties, particularly as pertaining to the formation of water stable soil aggregates. Penetration of plant roots, and the movement of air and water through the soil mass are influenced indirectly by these complexes.

The scientific considerations necessary for the development of valid methods to determine toxicity of chemicals to target organisms are treated in some depth with respect to fungicides and insecticides. The volume is well-written and the material is presented clearly, concisely, and in logical sequence. The authors have done a commendable job in their review of the literature, specifically of references pertaining to methodology. The book is interspersed with graphs, tables, and chemical formulae to illustrate the respective subjects discussed. Of course, one should not expect to find a whole of information concerning to pesticides application substances with many man-made organic molecules which find their way into the soil, nor on the microbiological processes involved in synthesis and transformations between humic substances and other synthetic organic molecules.

The subject matter is approached almost entirely from the chemical point of view, and, in fact, a more appropriate title of this treatise would have been "Science of Humic Substances". Even though the book is aimed at a wide audience conceivably only soil chemists, microbiologists, and possibly wood scientists would find it a very valuable addition to their library. Any environmentalist interested in the chemistry of organic residues in soils and who can afford it should have a copy of this book. Advanced knowledge of soils, organic chemistry and microbiology is mandatory. B. J. STOJANOVIC, Professor of Soil Microbiology, Mississippi State University, Mississippi State, Miss.

The Scientific Principles of Crop Protection

Sixth Edition


The author introduces this sixth edition of the book by recapitulating briefly the intent and purpose of the earlier editions and relating these to the present edition. It is not surprising to those experienced in crop protection that cooperation among all of the respective scientists is necessary for the development of control measures that produce minimum stress in the environments of man, plants, and animals. The need for integrated management is becoming increasingly apparent to those experienced in crop protection. We can visualize that presently developing interest in research in integrated pest management programs will make major contributions in controlling environmental hazards resulting from the use of agricultural pest control methods.

The author proceeds from this firm foundation to build a notably coherent historical structure of the science and practice of crop protection. He traces the history of the various phases of crop protection, cites the facts and numerous sources, and intersperses throughout the book a philosophy of moderation and understanding. Students and practitioners alike will enjoy owning this book for study and reference.

The author emphasizes the need to know the whole pest organism in all its facets including taxonomy, life history, morphology, physiology, and ecological relationships. This knowledge is essential in the development of control measures that produce minimum stress in the environments of man, plants, and animals.

The discussion of the various biological, cultural, and chemical methods of control and the history and theory related to each method is presented in separate chapters arranged in a systematic and logical sequence. Thus, the formulation of sprays and dusts includes a discussion of the function of stickers, spreaders, and emulsifying agents. The author has however omitted reference to the research on the effective use of surfactants in the formulation of some herbicides. The need for separating agents in certain formulations for "hard water" areas is not mentioned. Inclusion of these items would help to round out an otherwise excellent treatment of the subject for the weed scientist.

The considerations necessary for the development of valid methods to determine toxicity of chemicals to target organisms are treated in some depth with respect to fungicides and insecticides. Literature citations are sufficient in number and scope to provide...