SOIL MICROBIOLOGY

SINGH, PUROHIT, PARIHAR

Soil Microbiology

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Preface

Soil is nature's gift to mankind let us nurture it. The soil performs a variety of key functions: (i) provides food, fuel, and fiber needs of the world's population, (ii) regulates the quality of the air and water, (iii) decomposes organic wastes, (iv) recycles nutrients, and (v) acts as a sink for pollutants (including global gases), etc. A soil usually containing more than 20 per cent of organic matter, or have more than half of the upper 80 cm as organic material. Also, if organic soil material of any thickness rests on rock or fragmental (rocky or gravelly) material, it is considered as organic soil. The organic residues of plants and animals (both macro and micro), decay with time and become an integral part of the soil. The main source of soil organic matter is the plant tissue. The animals consume the plants, excrete their waste products and contribute their own bodies after death. Thus they are subsidary source of soil organic matter. The decomposed organic residues present in soil are called humus. It is amorphous and dark coloured fraction of soil organic matter which remains after the major portion of added residues have decomposed.

The soil is a complex environment colonized by an immense diversity of microorganisms. Soil microbiology focuses on the soil viruses, bacteria, actinomycetes, fungi, algae and protozoa, but it has traditionally also included investigations of the soil animals such as the nematodes, mites, and other microarthropods. These organisms, collectively referred to as the soil biota, function in a belowground ecosystem based on plant roots and litter as food sources. Modern soil microbiology represents an integration of microbiology with the concepts of soil science, chemistry, and ecology to understand the functions of microorganisms in the soil environment. The surface layers of soil contain the highest numbers and variety of microorganisms, because these layers receive the largest amounts of potential food sources from plants and animals. The soil biota form a belowground system based on the energy and nutrients that they receive from the decomposition of plant and animal tissues. The primary decomposers are the bacteria and fungi.

Microorganisms help soil development by slowly decomposing organic matter and forming weak acids that dissolve minerals faster than pure water. Some of the first plants to grow on weathering rocks are crust like lichens, which are a beneficial (symbiotic) combination of algae and fungi.

Soil microorganisms play key roles in the nitrogen cycle. The atmosphere is approximately 80% nitrogen gas (N_2), a form of nitrogen that is available to plants only when it is transformed to ammonia (NH_3) by either soil bacteria (N_2 fixation) or by humans (manufacture of fertilizers). Soil bacteria also mediate denitrification, which returns nitrogen to the atmosphere by transforming NO_3^- to N_2 or nitrous oxide (N_2O)

gas. Microorganisms are crucial to the cycling of sulfur, phosphorus, iron, and many micronutrient trace elements.

Present book has been designed to provide overall information to the readers about soil, soil microflora and their activities in chapters like, The Soil, Soil ecosystem and soil microbes, Taxonomy of Microorganisms, Microbial Biodiversity: The Natural Biological Capital of the Earth, Growth patterns of mixed population, Bacteria, Archaeobacteria and Actinomycetes, Actinoplanetes, Fungi, Algae, Nematodes, Protozoa in soil, The Rhizosphere, Chemical Interactions in Soil of biological origin, The Biofilm, Humus and Humic Substances, Soil microbes and Nitrogen fixation, Carbon Cycle and Microbes, Sulphur Cycle and Microbes, Iron cycle, Microbal Inoculants for Nitrogen Fixation, *Rhizobium* Biofertilizer, Application of Microbial Biofertilizers in Field Crops, Production of *Rhizobium* Biofertilizer, *Azospirillum* Biofertilizer, *Azotobacter* Biofertilizer, Blue Green Algae and *Azolla* as Biofertilizer, Estimation of Nitrogen Fixation, Biological Mobilization of Phosphorus, Vesicular-Arbuscular Mycorrhizae (VAM), The Cyclic System of Nutrient Management, Laboratory Culture of Microbial Biofertilizers, Mass Production of Biofertilizers, Quality Control in Bioinoculants, Perspectives and Selected Bibliography.

We hope that the information in this book would be valuable to all those concerned with the soil and its microbiology. We deeply value the efforts made by Dr. Updesh Purohit, Agrobios (India) to publish this book in time.

We express our gratitude to the researchers who have done tremendous job to develop the concepts of soil microbiology with new applications. Healthy criticisms for further improvement of the book are solicited.

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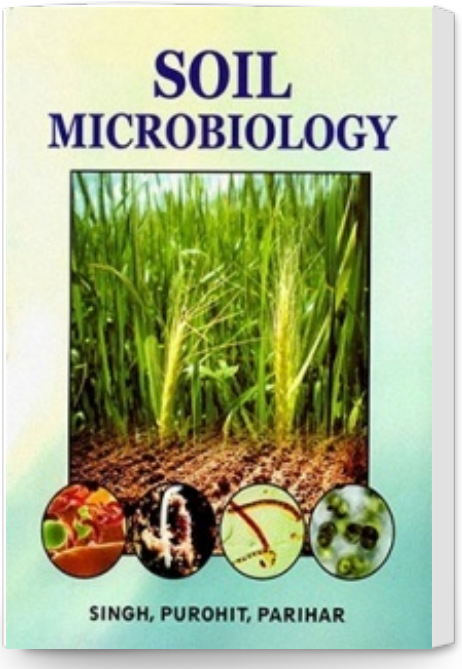

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