Preface

Forest trees and shrubs play a vital role as important sources of our daily needs; and they also serve as a life-saver by their capture of CO_2, thereby reducing the atmospheric carbon load. At the same time, they use CO_2 in the process of photosynthesis and they store carbon in their biomass and wood as a source of energy. However, adverse climatic conditions, increasing global warming associated with constant emission of greenhouse gases, illegal logging, human activities, burning fossil fuels, expanding agriculture, high temperatures, global warming, cyclones, water and cold stress affect the growth of trees and shrubs in the forests prevailing in different regions of the world.

Forests save our lives by absorbing and reducing the CO_2 load liberated in the lower horizon of the atmosphere through the process of photosynthesis, liberating oxygen for our respiration and storing carbon in their wood, important for the wood industry. This situation in turn endangers the security of mankind and animals, reduces crop productivity and enhances hunger and poverty in the world. There is a great necessity for protecting forest resources against all these untoward menaces. Concerted research activities in multidisciplinary facets need to be directed to protect our forest treasures.

At this juncture, there is a great necessity to study the autoecology and ecophysiology of tree species in the forest ecosystem. Autoecology deals with all aspects of the dynamism of populations, the physiological traits of trees, their light requirements, their life history pattern and their physiological and morphological characters (Fetcher et al., 1994). On the other hand, ecophysiology is defined by growth in terms of various plant parameters, such as leaf traits, xylem water potential, plant height, basal diameter, crown architecture and so on, which are influenced by several physiological traits and the environmental conditions of the forest ecosystem. This also involves various functional, physiological, biochemical and biophysical aspects of woody trees for plant productivity. In this regard, there is a great necessity to determine the variability of physiological functions among tree species and their adaptation to the prevailing environmental conditions. A clear understanding of different facets of autoecology and ecophysiology will help forest scientists and foresters in the efficient management and protection of trees in a forest ecosystem.

The main objectives are to provide various aspects of autoecology and ecophysiology. In both cases, we discuss and present research advances obtained in all of the major forests of the Planet: temperate, tropical and alpine regions of the world, with supporting literature on all aspects of autoecology and ecophysiology mentioned herein. With respect to autoecology, we

describe the branching patterns and crown architecture necessary for the capture of solar radiation, the variability in leaf traits, leaf anatomy, wood anatomy, phenological events related to the growth, development and maintenance of the life cycle and the seed characteristics and plant traits related to plant productivity.

With respect to ecophysiology we report results on leaf pigments, leaf nutrients, carbon sequestration (carbon fixation), plant–water relations and factors affecting plant productivity. As mentioned earlier, we provide published research advances and original research results in various topics. These used different approaches in their research: physiological, population and ecosystem approaches. A global integrated approach is complemented by modern methods and statistical data analysis. In a nutshell, this book contains research advances on various aspects of woody plants required by forest scientists and foresters to manage and protect forest trees and to plan future research. Besides, it is expected that this book will find a place among researchers, academic scholars, undergraduate and graduate students in disciplines related to agronomy, biology, forest science and range management. It will also be useful for policy makers as a ready reference as well as for retrieving detailed information on the plant species documented which support forest and range ecosystems for different uses and purposes such as forage, timber, charcoal, shelter, reforestation and soil erosion prevention.

Bibliography

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