



Biomass-Based Green Technology for Circular Economy

Edited by

Riti Thapar Kapoor and Mika Sillanpää



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This book provides up-to-date information on advanced technologies and future directions for management of waste biomass for carbon neutrality and development of circular economy. It addresses critical environmental issues and challenges related to agro-waste management. It provides practical solutions to the readers on how to meet these challenges.

Features:

- Summarizes the application of waste biomass for development of value-added products for sustainable development using green technologies.
- Provides detailed work on biomass-based green technology.
- Highlights biofuel production with wastewater remediation simultaneously with microbial fuel cell.
- Offers a substantial contribution for solving the problem of biomass waste which can be used as a feedstock for valuable biofuel and fine chemicals production.
- Explores different aspects of biological methods and use of nanomaterials for removal of contaminants, recycling, and reusing.

The book is aimed to provide wide information to researchers and professionals on state-of-art of biotechnology, circular economy, and waste treatment.

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Transforming Ecological Burden into Economic Opportunities:

Biochemical Conversion of *Parthenium hysterophorus* Waste into Bio-Fertilizers and Valuable Byproducts

Aliya Firdaus, Snober S. Mir and Uzma Afaq

ABSTRACT

Parthenium hysterophorus Linnaeus also known as congress grass is an invasive plant with a rapid rate of development that causes serious problems for agricultural and ecological systems around the world. Despite the problems it causes, this weed's biomass is a great unexplored opportunity for biochemical potential into useful goods. Recent studies suggest the potential avenues for converting this biomass into valuable products through biochemical processes. Multiple methods, including composting, vermicomposting, anaerobic digestion, and enzymatic breakdown, can be used to convert weeds into bio-fertilizers, biofuels, and other biochemicals. The weed's biomass was converted into compost and biochar by utilizing microbial and enzymatic activities, which are rich in nutrients and can be used to improve soil quality. The composting has shown encouraging effects in terms of nutrient stabilization and pathogen reduction, leading to the development of a highly efficient bio-fertilizer. Vermicomposting, aided by certain types of earthworms improves the nutrient composition and makes it easier to incorporate into the soil. In addition, the application of cellulase and xylanase enzymes facilitates the conversion of cellulose and hemicellulose present in the weed into sugars that may be readily fermented. These sugars are subsequently utilized in the manufacturing of bioethanol. These biochemical processes not only reduce the environmental effects of *P. hysterophorus* but also support sustainable agricultural methods by producing affordable, high-quality bio-fertilizers and generating extra income from by-products such as bioethanol. This chapter aims to provide insights knowledge of effective management of *P. hysterophorus* waste, transforming an ecological burden into an economic opportunity.