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Research Publication and Awards

Arsenic in Rice

A Global Menace

Garima Awasthi | Sudhakar Srivastava | Mahipal Singh Sankhla
Editors

CRC Press
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APPLE ACADEMIC PRESS

CHAPTER 6

Translocation and Accumulation of Arsenic in Rice Grains: Role of Transporters in Tolerance and Its Incorporation in the Food Chain

JYOTIRMAY KALITA,[1] AMIT KUMAR PRADHAN,[2] SABNOOR YEASRIN JYOTI,[3] BIKASH KALITA,[3] SAUROV JYOTI ROY,[3] INDRAJIT KALITA,[3] MAHESH DAS,[3] HUNMILY TERONPI,[1] PREETOM REGON,[3] and BHABEN TANTI[3]

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ABSTRACT

Arsenic (As), a widespread hazardous metalloid enters rice plants through several transport routes that are present inside plants for the intake and translocation of other important minerals. Inside the plants, As induces toxic reactions that hinder various physiological processes, bringing down plant growth and grain yield. Moreover, the entry of As through the various transport channels into rice grains also marks its entry into the human food chain and is an undesired phenomenon because of its wide range of toxic reactions in humans, including cancer. The existing mechanism of As detoxification, immobilization, and efflux in rice plants results in a decrease in As accumulation and influx into the grains, as well as a decrease in toxic effects. Additionally, the uptake, influx, and deposition of As inside the rice plant being a genotypically controlled character, there are prospects of exploring rice germplasm worldwide to generate rice varieties with decreased As accumulations for cultivation in As-contaminated rice-growing regions of the world.

Arsenic in Rice: A Global Menace. Garima Awasthi, Sudhakar Shrivastava, and Mahipal Singh Sankhla, (Eds.)

Molecular Breeding

for Rice Abiotic Stress Tolerance and Nutritional Quality

Edited by
Mohammad Anwar Hossain • Lutful Hassan
Khandakar Md. Iftekharuddaula
Arvind Kumar • Robert Henry

WILEY Blackwell

Chapter 13

Dissecting the Molecular Basis of Drought-Induced Oxidative Stress Tolerance in Rice

Amit K. Pradhan, Sabnoor Y. Jyoti, Zina M. Shandilya, Mehzabin Rehman, Debanjali Saikia, Junu Poudel, Jyotirmay Kalita, Kongkona Borborah, Uma K. Chowra, Jnandabhiram Chutia ... See all authors

Book Editor(s):Mohammad Anwar Hossain, Lutful Hassan, Khandakar Md. Ifterkharuddaula, Arvind Kumar, Robert Henry

First published: 02 April 2021 | https://doi.org/10.1002/9781119633174.ch13 | Citations: 1

Summary

Drought is one of the major abiotic stresses that limit rice productivity worldwide. An in-depth understanding of the mechanisms involved against drought stress is vital for determining the process of tolerance. Rice plants undergo various morpho-physiological changes under drought, but the major factor associated with it is the increase in the level of reactive oxygen species (ROS), that leads to oxidative stress. To cope with drought-induced oxidative stress, rice plants have developed various mechanisms of tolerance, such as osmotic-adjustment or increase in antioxidant activity leading to structural rearrangements. The mechanisms often vary among species that result in variation of drought-tolerance capacity. Recent developments of various high-throughput technologies like RNA-Seq, genome-wide SNP analysis, and different "OMICS" technologies, such as functional genomics, transcriptomics, metabolomics, have opened up new ways to identify the mechanisms possessed by tolerant genotypes. The identification of candidate gene or metabolites against drought tolerance has promoted the development of drought-tolerant cultivars with increased quality and yield. In this chapter, we describe the effects and regulatory molecular network associated with drought-induced oxidative-stress tolerance in rice.

Molecular Breeding

for Rice Abiotic Stress Tolerance and Nutritional Quality

Edited by
Mohammad Anwar Hossain • Lutful Hassan
Khandakar Md. Iftekharuddaula
Arvind Kumar • Robert Henry

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Chapter 18

Aromatic Rices: Evolution, Genetics and Improvement through Conventional Breeding and Biotechnological Methods

Lakshminarayana R. Vemireddy, Bhaben Tanti, Lipika Lahkar, Zina M. Shandilya

Book Editor(s):Mohammad Anwar Hossain, Lutful Hassan, Khandakar Md. Ifterkharuddaula, Arvind Kumar, Robert Henry

First published: 02 April 2021 | https://doi.org/10.1002/9781119633174.ch18

Summary

Rice (*Oryza sativa* L.) possesses incredible genetic diversity, largely consisting of five sub-species, namely, *indica, japonica, javanica, aus,* and *aromatic* groups. Of them, aromatic rices fetch premium prices in the domestic as well as overseas markets owing to their unique quality features, especially exquisite aroma. Among aromatic rices, the long grain basmati and jasmine varieties and the short-grain Northeast India–specific types occupy a special place in the market. The remarkable features of aromatic varieties have prompted many researchers worldwide to explore the genetic, biochemical, and molecular mechanisms involved in aroma. Genetic studies reveal that aroma is controlled by a single recessive gene (*fgr*) while molecular studies have uncovered the underlying candidate gene as *betaine aldehyde dehydrogenase (Badh2)*. Biochemical studies reveal that the major compound contributing to the aroma is 2-Acetyl pyrroline. The aromatic rices are found to have originated from the Indian subcontinent by hybridization between a local and wild population as revealed by the genome-wide diversity analysis. Here, an attempt has been made to comprehensively review the latest findings pertaining to aromatic rices.

EASTERN

Diseases of Fruits and Vegetables

Integrated Management Practices

Editor
Phatik Tamuli

4

Integrated Management Practices for Controlling Major Cabbage Diseases

Barbi Bhuyan, Subham Saha
Anindita Sarma, Kumananda Tayung

Abstract

Cabbage is being cultivated from ancient times and is a rich source of vitamins and minerals. Diseases of the vegetable crops cause serious loss in the economy. Cabbage diseases are chief limiting factors in its profitable commercial cultivation. The cultivars of cabbage are very much susceptible to pathogen attack which is a great threat to profitable cultivation. These disease causing microorganisms are mainly Fungi, Bacteria, Viruses and Nematodes etc. Sustainable and durable management strategies are required to control these diseases. Various approaches like controlling of vectors, avoiding the source of infection, modified cultural practices, using transgenic crop etc. can be used to suppressing the pathogen to cause the diseases. For applying the correct method of integrated management practice requires a good knowledge about the disease epidemiology and hence, this chapter focuses on the major diseases of cabbage and management practices to control the diseases resulting in higher production of the crop.

Keywords: Cabbage diseases, Integrated management practices, Disease control.

Annual Bioscience Communication
Vol-1, 2021

EASTERN

Biological Spectrum of Northeast India

Editor
Hemen Chandra Majumdar

6

Endophytic microbes associated with medicinal herbaceous plants and their bioactive secondary metabolites: Present and future prospect for NE India

Sanjib Kalita
Anindita Sarma
Kumanand Tayung

Abstract

About 80% of the world total population residing in developing countries, especially in rural areas are still depending upon herbal medicines.The main problem associated with use of plants as medicine is due to insufficient production of medicinally active compounds as required to our needs.Medicinal plants are often colonized by endophytic microbes. These microbes produce bioactive secondary metabolites and sometime similar to their respective host. Thus, studying endophytic microbes from such plant resources may result into harvesting of the bioactive metabolites more effectively and sustainable way. This review highlights the endophytic microbes of some medicinal herbaceous plant and elucidated their secondary metabolites.NE India is one of the great treasures of medicinal plants. Many herbaceous plants of this region are used as medicine. Exploring endophytic microbes of these plant species might result into isolation of potent endophytic strains with wide therapeutic applications.

Keywords: *Endophytic microbes, Herbaceous medicinal plants, Secondary metabolites.*

BIORESOURCE UTILIZATION and MANAGEMENT

Applications in Therapeutics, Biofuels, Agriculture, and Environmental Science

Hrudayanath Thatoi • Swagat Kumar Das • Sonali Mohapatra
Editors

CRC Press

CHAPTER 1

Antifungal Drugs from Endophytic Microbes: Present and Future Prospects

RAJREEPA TALUKDAR, SUSHMITA PAUL, and KUMANANDA TAYUNG*

Mycology and Plant Pathology Laboratory, Department of Botany, Guwahati University, Guwahati 781014, Assam, India

**Corresponding author. E-mail. kumanand@gauhati.ac.in*

ABSTRACT

Endophytes are microbes colonizing inner plant tissues without causing any disease symptoms. They have been recognized as repository of novel bioactive metabolites. The bioactive secondary metabolites isolated from endophytic fungi include compounds with antimicrobial, anti-inflammatory, antiproliferative, or cytotoxic activity toward human cancer cell lines, and activity against plant pathogens or plant insect pests. The prevalence of invasive fungal infections has increased significantly among populations and also during medical procedures such as organ transplantation, cancer chemotherapy, and bone marrow transplantation. Moreover, the incidence of fungal infection has also increased as phytopathogens. Plants have also started developing newer fungal diseases due to the developing resistant strains. However, only a limited number of antifungal agents are currently available for the treatment of life-threatening fungal infections as well as phytopathogens. In the recent years, endophytic microbes isolated from medicinal plants have been reported to produce several interesting and effective antifungal metabolites. Thus, the exploration of endophytic microbes from medicinally important plants could be good candidate for obtaining antifungal metabolites to solve growing invasive fungal infection. This assumption becomes more significant considering the myriads of medicinal plants with antifungal activities, and few of these plants have been investigated from endophytic microbes so far.

Ravindra H. Patil
Vijay L. Maheshwari *Editors*

Endophytes

Potential Source of Compounds of Commercial and Therapeutic Applications

Springer

Endophytic Fungi of Wild and Domesticated Crop Plants and Their Prospect for Applications in Sustainable Agriculture

2

Chiranjib Mili, Subham Roy, and Kumanand Tayung

Abstract

Wild relatives of domesticated plants are an important genetic resource for breeding desired plant traits into related crop cultivars. Many traditional or indigenous vegetables and their wild relatives are characterized by a high nutritional value as compared to domesticated crops. Apart from their commercial, nutritional, medicinal and cultural value, traditionally used wild plants and vegetables are also considered important for sustainable food production as they reduce the impact of production systems on the environment. Moreover, these wild relatives have been increasingly valued and exploited for the genes that provide increased biotic resistance, tolerance to abiotic stress, yield and quality. It is believed that such plants may be colonized by distinct endophytic microbes which might have given those special traits for adaptability and survival in adverse environmental conditions. There are several instances which show that endophytic microbes isolated from such plants introduced as bio-inoculants in their close cultivars suppress plant pathogens, reduce biotic stress, help crop to grow successfully in nutrient-deficit soil and provide resistance against aphids. Thus, it has been hypothesized that endophytes that are recoverable from crop wild relatives would be more compatible with the related crop for both inoculation and colonization purposes. This book chapter will therefore highlight endophytic fungal diversity of wild and domesticated crop plants and applications as plant growth promoter and biological control agents.

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Ravindra H. Patil
Vijay L. Maheshwari *Editors*

Endophytes

Potential Source of Compounds of Commercial and Therapeutic Applications

Springer

Antimicrobial Activity of Endophytic Fungi Isolated from Some Selected Ethnomedicinal Plants of Assam, India

6

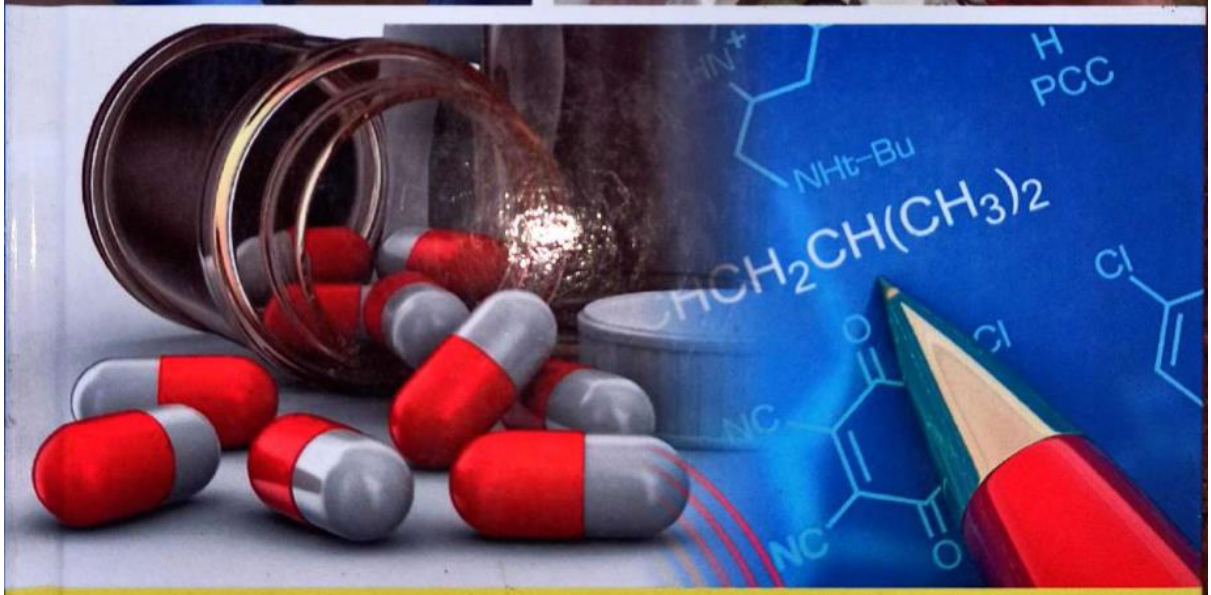
Rajreepa Talukdar, Sudem Wary, Rashmeeta Hajowary, Anindita Sarma, and Kumanand Tayung

Abstract

The north-eastern region (NER) has been in spotlight for its high biodiversity and traditional knowledge, and this region has been a priority for leading conservation agencies of the world. Among the north-eastern states, Assam is very rich in medicinal herbs and plants, epiphytic orchids and wild edible leafy vegetables. The state is also home to a large number of ethnic people or tribes with vast traditional knowledge on effective herbal medicines for treatment of various ailments. Some of these plant resources have been used as ethnomedicine by the tribal communities since time immemorial. In the recent times, there has been an increasing demand for novel and effective antimicrobial compounds to combat the emergence of several new diseases and multidrugs-resistant pathogenic microbes. Recently, endophytic microbes have been identified as important candidates for discovery of novel and effective bioactive metabolites. Several bioactive metabolites with wide therapeutic applications have been reported from endophytic microbes. Currently, there is growing interest to study microbial endophytes harbouring in medicinal plants as many of them have been reported to produce bioactive molecules similar to their respective hosts. Therefore, this book chapter will highlight the endophytic fungi harbouring in some ethnomedicinal plants of Assam and their potential for applications as antimicrobial agents. Some of the metabolites obtained from few endophytic fungi isolated from selected ethnomedicinal plants of Assam will also be projected and discussed.

Natural Products

– Drug Development



K Tayung
A Puratchikody
S Ramakrishnan

4

Endolichenic Fungi as A Source of Novel Bioactive Metabolites: Present and Future Prospects

SRICHANDAN PADHI AND KUMANANDA TAYUNG*

ABSTRACT

Lichens are complex symbiotic associations between a fungus (mycobiont) and an alga (photobiont) with unique characteristics in plant kingdom. They have been recognized as repository of novel bioactive metabolites. Lichen compounds have been used since time immemorial for use as dyes, perfumes and for treatment various ailments. Lichens also host numerous fungal species, in addition to the mycobiont, such as lichenicolous fungi and endolichenic fungi. In the recent years several endolichenic fungi have been isolated from lichen thalli and most of these fungi have been reported to produce new and interesting metabolites with therapeutic potentials. Isolation and separation of active metabolites from endolichenic fungi needs different cultural, solvent extraction and analytical techniques. Several bioactive metabolites such as Amburic acid, Altenusin, Alternariol and Dehydroherbarin with antimicrobial, antioxidant, anticancer and antiviral properties have been isolated and characterized from endolichenic fungi. One of the challenging tasks to obtain novel metabolites from lichen associated fungi is diminishing lichen diversity which holds the greatest possible resources for endolichenic fungi. Therefore, research priority should be directed to study endolichenic fungi from lichens around the world so that new and effective therapeutic agents could be developed.

***Key words*:** Lichen, Endolichenic fungi, Bioactive metabolites

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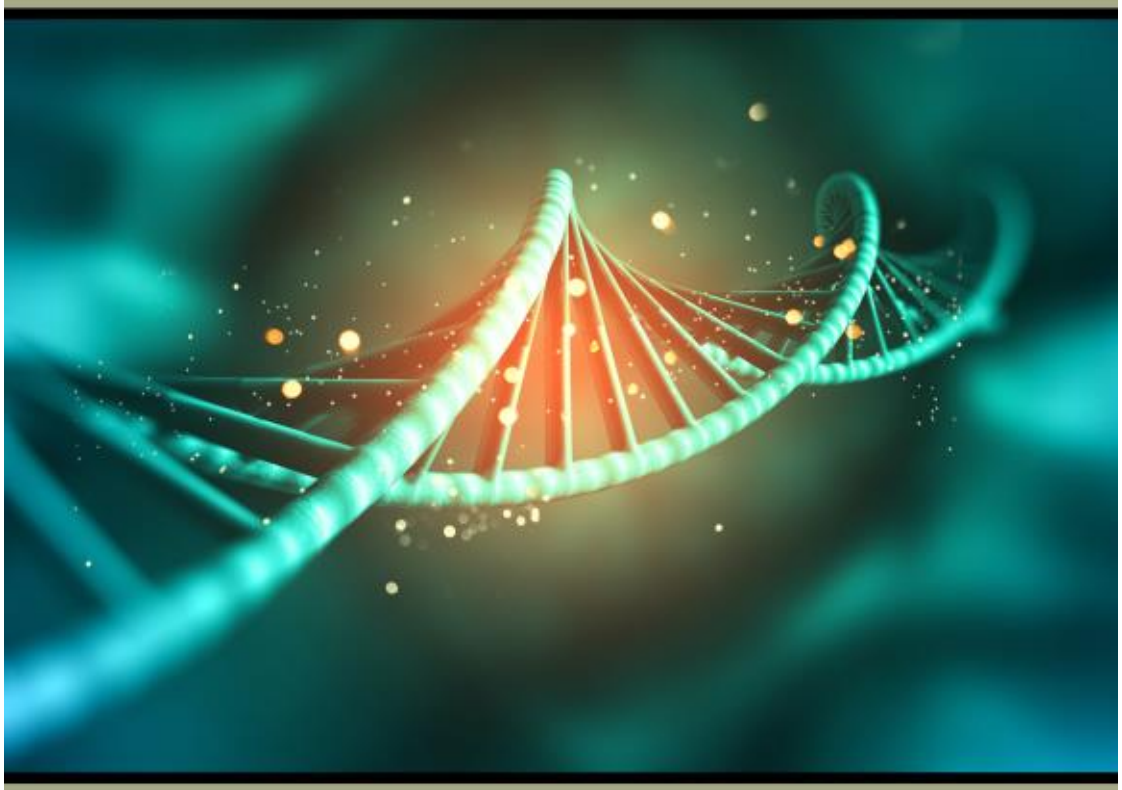

B P International

Chapter 4
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Analyzing Copper Dependent Growth Behaviors in *Anabaena azollae* Strasburger, an Autochthonous Cyanobacterial Species of Assam

Nilamjyoti Kalita [a*], Bishmita Boruah [a], Shaswatee Bhattacharjee [a], Himamani Kalita [a], Garima Bora [a] and Partha Pratim Baruah [a]

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ABSTRACT

Copper (Cu) is considered as an essential micronutrient that is required in minute quantity for proper functioning of physiochemical reactions in the body of an organism. This microelement plays a significant role during growth and development in plants through different cellular processes. Although, if present in higher quantities can result in toxic effects. Current study was undertaken to view the effect of different ppm concentrations of Cu (II) ions upon the growth and biochemical parameters of *Anabaena azollae*. Results have disclosed that exposure to a high concentration of Cu causes an evidential effect in growth and biochemical parameters in the test organism.

Keywords: Anabaena azollae; heavy metal; copper; tolerance capacity.

Research Trends in Medicinal Plant Sciences

Volume - 9

Chief Editor

Dr. Manzoor Hussain
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Mansehra, Khyber, Pakhtunkhwa, Pakistan

AkiNik Publications
New Delhi

Chapter - 5

Cymbopogon khasianus (Hack.) Stapf ex Bor: Future Prospects for Commercial Cultivation of a Medicinal Plant

Sukriti Dutta, Mohan Lal and Nilakshee Devi

Abstract

Medicinal plants have been playing a major role in human life since ancient time. *Cymbopogon khasianus* (Hack.) Stapf. ex Bor. is a medicinal, aromatic and economically important grass native to Bhutan, Bangladesh, India, Myanmar and Thailand and widely distributed in Northeast India. It has many ethno medicinal and pharmaceutical properties owing a great importance. It shows anticancer properties against several human cancer cell lines. Due to the presence of phytoconstituents in the essential oil of *C. khasianus* make the plant commercially viable. This grass is utilized mainly in perfumery, confectionary and non-alcoholic beverages also. Till now there three chemotypes have been identified *viz*., methyl eugenol-rich, geraniol-rich and elemicin-rich. Among these, two novel strains of *C. khasianus* named as Jor Lab L-9 and Jor Lab L-10 have been released by CSIR-NEIST, Jorhat, Assam. CSIR-CIMAP, Lucknow also released 'CIM-SUWARNA' of *C. khasianus* with high number of tillers and long leaves suitable for rainfed area. Since, it is a globally accepted medicinal and aromatic plant of wide range of industrial applications; therefore, mutation breeding can be suggested for development of superior plant varieties with high essential oil yield containing high value of elemicin as well as methyl eugenol content.

Keywords: *Cymbopogon khasianus*, Northeast India, chemotype, medicinal value, variety

Introduction

Knowledge of utilizing herbs in human welfare has been acquiring since Vedic time (Bown, 1995). The herbs are the best gift of nature for the synthesis of medicinal compounds (Mirghani *et al*., 2012). Medicinal plants occupy a major role in human life care system. As per the report of World Health Organization, 80% of the rural population in developing Asian and African countries utilizes locally available medicinal plants for their primary


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Current State and Future Impacts of Climate Change on Biodiversity

Chapter 8
A Short Review on *Gynocardia odorata R. Br*: A Potent Medicinal Plant of Assam

Dipjyoti Kalita
Department of Botany, Gauhati University, India

Nilakshee Devi
Department of Botany, Gauhati University, India

ABSTRACT

Gynocardia odorata R. Br (Achariaceae) is an important medicinal plant. It is indigenous to Indian subcontinent and grows extensively in the tropical forests of Western Ghats and Hilly regions of North Eastern India. The plant has long been used in the traditional system of medicine to treat various cutaneous and subcutaneous diseases. The chapter deals with the different scientific studies and reports available in different aspects of this plant in the areas like morpho-taxonomy, ethnobotany, phytochemistry, and pharmacognosy.

INTRODUCTION

Commonly known as Chaulmoogra, *Gynocardia odorata* Robert Brown is one of the most important tree plants under Flacourtiaceae (currently Achariaceae) (Lemke, 1988; Santos, 2007). The generic name *Gynocardia* comes from the ancient Greek words *Gyne* means female or woman and *Kardia* means heart (directly referring to ovary), indicating the heart shaped ovary (Quattrocchi, 1999; Patil, 2007). In this context, the meaning of the genus is more or less heart shaped ovary or heart shaped fruit. The tree is commonly known under different names in different parts of the world *e.g. ma dan guo* or *ta feng tzu* in Chinese (Quattrochi, 1999), *Tulkung* in Lepcha, *Gandare*, *Koliori*, *Bandray* or *Gantay* in Nepali. In India, this tree is known in a variety of names in different dialects, such as *Salmogra*, *Lemtem* or *Bonsha* in Assamese, *Gaab*, *Deshi Gaub* or *Chaulmogra* in Bengali, *Chhalmogra* in Hindi, *Surantaeil* in

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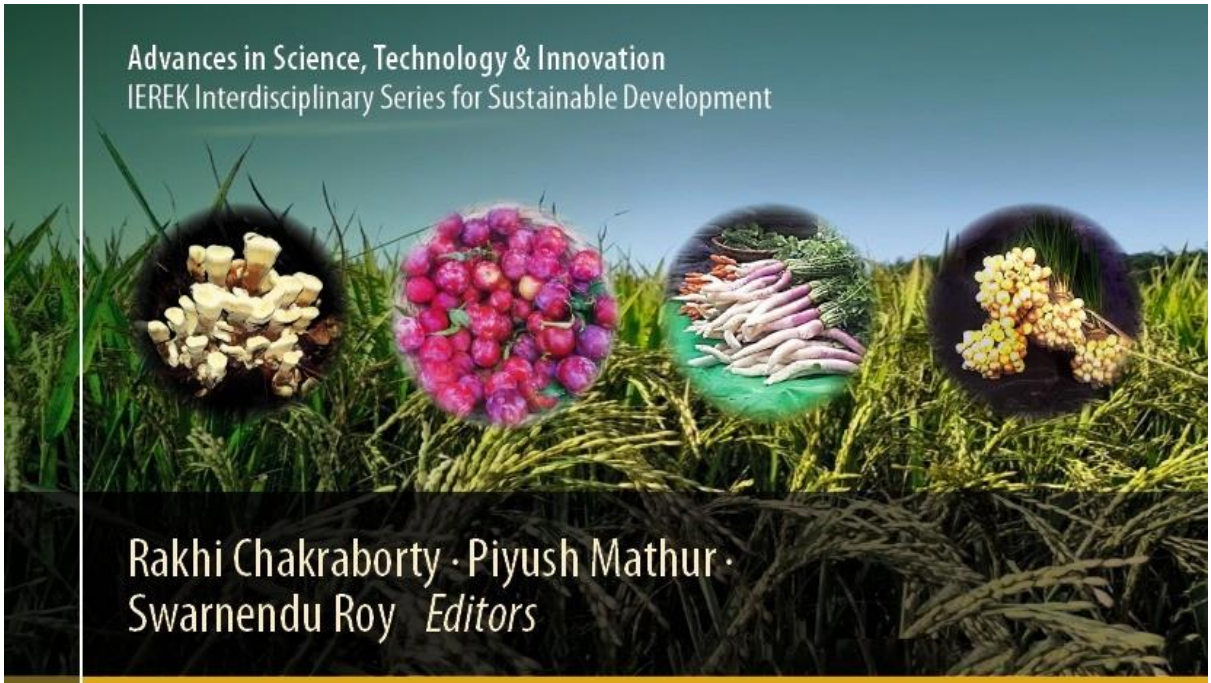

Rakhi Chakraborty · Piyush Mathur ·
Swarnendu Roy *Editors*

Food Production, Diversity, and Safety Under Climate Change

Springer

Eri Silkworm Pupae: An Alternative Source of Protein in Changing Climate

Deepika Borah, Mrigendra Narayan Kumar, Ritima Mishra, Mahananda Chutia & Nabanita Bhattacharyya

Chapter | First Online: 02 April 2024

Part of the book series: Advances in Science, Technology & Innovation ((ASTI))

Abstract

Abstract

Climate change affects food security by creating a range of inconveniences including loss of crop productivity, reduction in the quality of crops, and disruption of the supply chain. Increasing demand for food with the current trend in population explosion along with increasing temperature and CO_2 concentration are potential threats to ecosystem sustainability. Degradation in the quantity and quality of protein in conventional foods is also linked with climate change. Consumption of diets having adequate protein content is necessary for good health and longevity of people and protein-deficient diets are the main causes of malnutrition across the globe. However, there are many conflicts of interest regarding the best choice of the source of protein. Conventionally, people rely on both plant and animal sources for dietary proteins. Plant-based products are more sustainable sources of protein as processes for obtaining animal-based products emit more greenhouse gases than those for plant-based products. Nevertheless, animal-based products are better sources of essential amino acids and play a significant role in the restoration of human health. Hence a sustainable protein source is needed to fill the protein gap and combat the climatic change circumstances. Edible insects, including silkworm pupae, can be an exciting alternative food to satisfy the nutrient requirements of the ever-growing global population. Eri silkworm pupae, the by-products of eri silk industry, are considered to be very healthy insect food with high nutritional as well as therapeutic values that have been consumed traditionally as delicious food by different communities of the world. Here, we thoroughly discuss the potential and feasibility of eri silkworm pupae as an alternative protein-rich food to combat malnutrition and hunger, in the light of the current global food scenario and changing climate.

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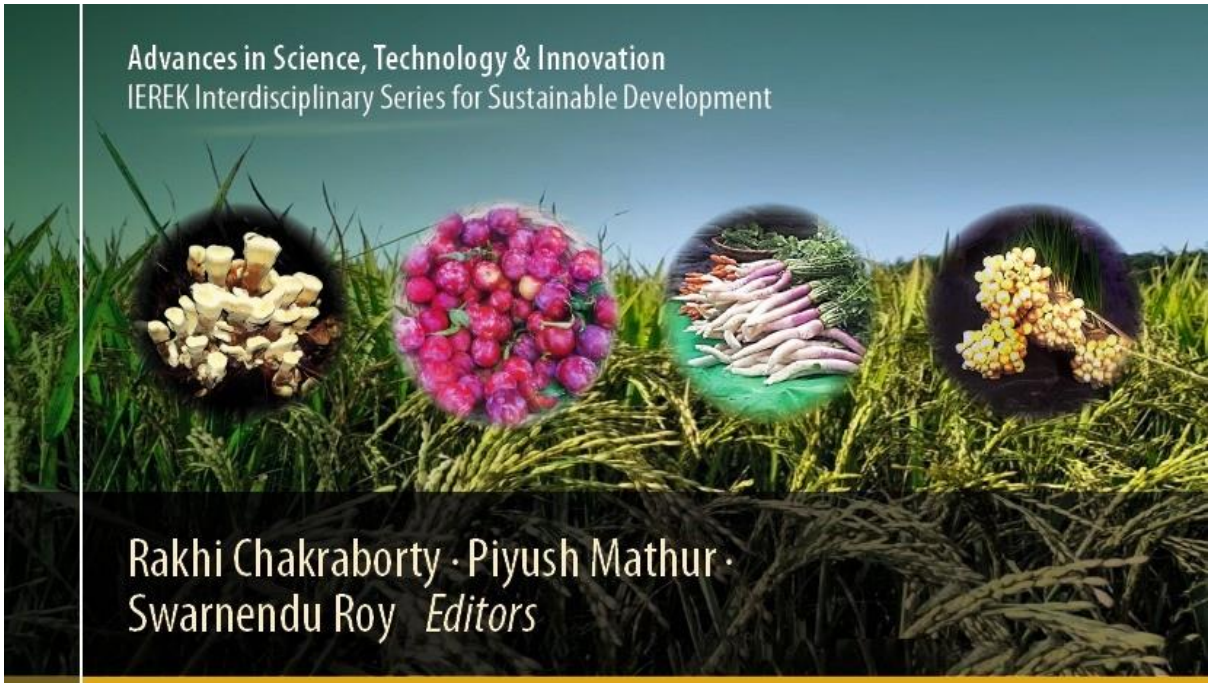


Rakhi Chakraborty · Piyush Mathur ·
Swarnendu Roy *Editors*

Food Production, Diversity, and Safety Under Climate Change

Springer

Subsistence Agriculture—An Approach Towards Food Security in Changing Climate

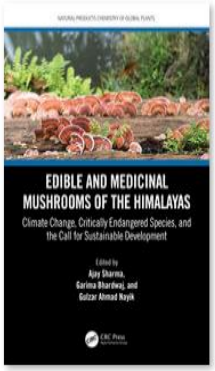
Barsha Devi, Jupitora Devi & Nabanita Bhattacharyya

Chapter | First Online: 02 April 2024

Part of the book series: Advances in Science, Technology & Innovation ((ASTI))

Abstract

Food systems are affected by climate change in a number of ways, from direct effects on crop production to changes in markets, food prices, and infrastructure. The major objective of agriculturists is to meet food demand and guarantee food security for the growing population of the globe while reducing the production gap of major food grains. Hence, the impact of climate change on farming is one of the ongoing research areas in agriculture. Subsistence farming of climate-resilient crops can be an answer to ensure food security for masses of underprivileged regions of the globe under changing climate scenarios. In most of the food-insecure regions of the world these crops can provide options for adaptation and livelihood when other major food crops face challenges and food supply chains collapse due to future climate change-related inconveniences. In this chapter, the potential of different climate-resilient subsistence crops has been discussed, which strategically can be a part of food security policies in the near future.



Chapter

95Grifola frondosa (Dicks.) Gray

By Barsha Devi, Nabanita Bhattacharyya

Book Edible and Medicinal Mushrooms of the Himalayas

Edition	1st Edition
First Published	2023
Imprint	CRC Press
Pages	15
eBook ISBN	9781003259763

ABSTRACT

Grifola frondosa (commonly known as Maitake) is highly recognized for its nutritional and dramatic health-promoting potential. In addition to being low in calories, maitake is rich in antioxidants, beta-glucans, minerals, vitamins, fiber, and amino acids. A number of bioactive polysaccharides, proteins, glycoproteins, lipids and other small molecules isolated from G. frondosa have shown antitumor, antidiabetic, antimicrobial, immunomodulatory, and other activities. This chapter summarizes the outlooks and recent advances with reference to the nutraceutical properties, dietary value and purification, characterization, and pharmacological evaluation of pharmaceutically active compounds from the mushroom.

Advances in Science, Technology & Innovation
IEREK Interdisciplinary Series for Sustainable Development

Swarnendu Roy · Piyush Mathur · Arka Pratim Chakraborty · Shyama Prasad Saha *Editors*

Plant Stress: Challenges and Management in the New Decade

Springer

Naturally Growing Native Plants of Wastelands: Their Stress Management Strategies and Prospects in Changing Climate

Nabanita Bhattacharyya

Chapter | First Online: 01 April 2022

Part of the book series: Advances in Science, Technology & Innovation ((ASTI))

Abstract

Industrial and mining waste dumping is among the most concerning anthropogenic causes of the formation of stress-laden wastelands, which are characterized by loss of plant cover and subsequent land degradation. Under the pressure of changing climate, the revival of the degraded wastelands into productive lands becomes a sustainable option to meet the basic survival demands of the increasing human population. Restoration of vegetation cover is a widely accepted eco-friendly approach for remediation of degraded wastelands over physical or chemical strategies. However, the successful establishment of plants in wastelands is a difficult process due to the phytotoxic nature of the wasteland soils. Therefore, the use of naturally growing native plants, which thrive well in the adverse soil properties of degraded lands with little or no agronomical effort, is an effective option. Some of these plants might have phytoremediation potential, which is a sustainable technology for the remediation of contaminants including heavy metals from soil and water by using plants. Documentation of such stress-tolerant naturally growing plants of various wastelands and studying their mechanism of tolerance are among the major emerging areas of research in recent times. Such efforts may help in finding novel plant species that are more stress-tolerant with greater potential of creating vegetation cover on degraded wastelands. Therefore, for the benefit of interested researchers and policymakers, an attempt has been made to review and comprehensively document the discrete information, from available sources, on naturally growing native plants of various industrial and mining wastelands, their stress management strategies and phytoremediation prospects in changing climate.

Research Trends in Crop and Weed

Volume - 3

Chief Editor

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ND University of Agriculture and Technology, Kumarganj, Faizabad,
Uttar Pradesh, India

AkiNik Publications
New Delhi

Chapter - 5

Chromolaena odorata: A Versatile Weed with Manifold Prospective

B. Devi and N. Bhattacharyya

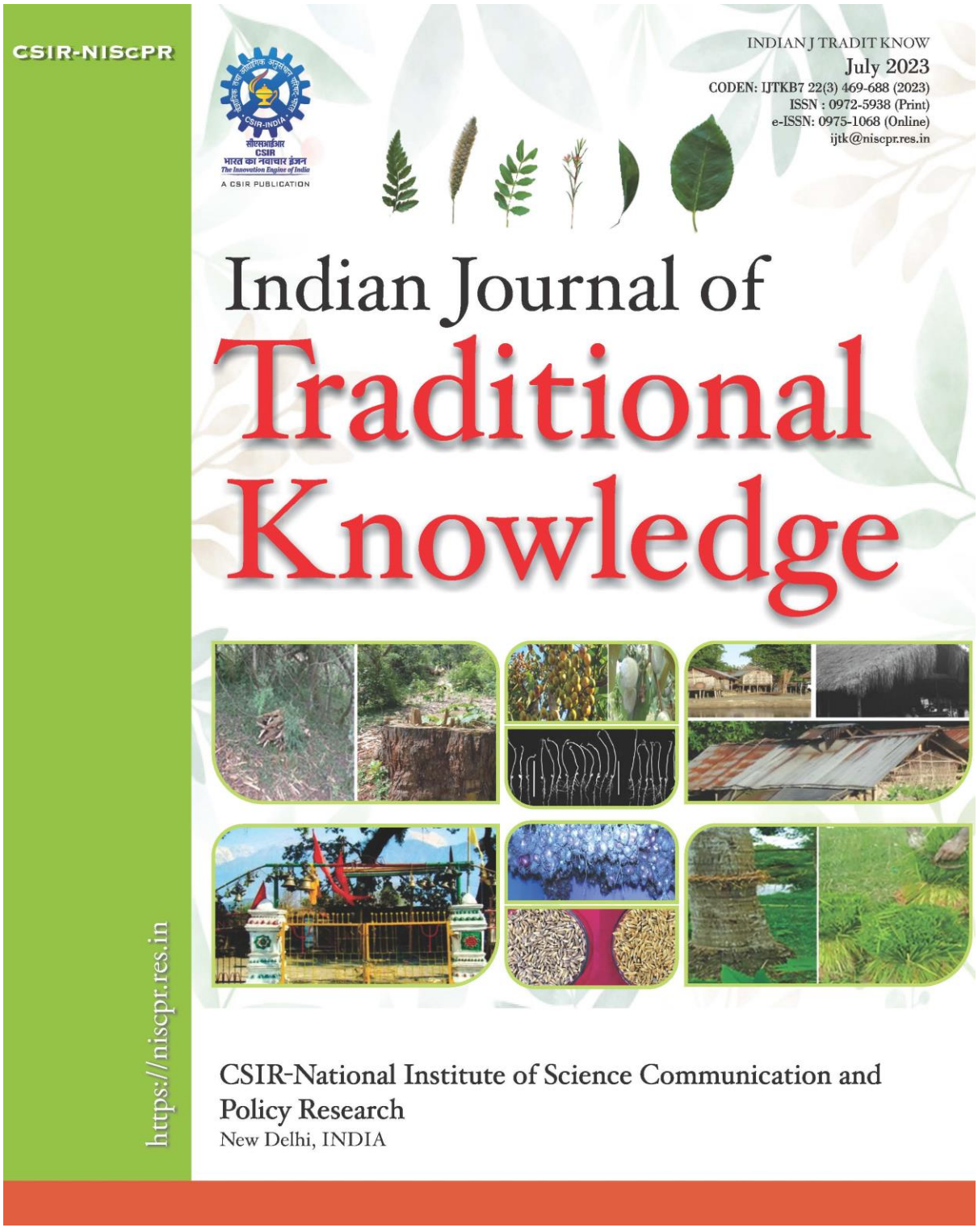
Abstract

Chromolaena odorata has been known to be one of the notorious weeds due to its highly invasive and allelopathic nature. Though several efforts have been made for pulling down this plant, it has several beneficial aspects too which are often ignored due to its infamous impression as one of the worst weeds of the world. Its contribution in traditional as well as modern health care system is well established. It can serve as an alternative to synthetic pesticide thus contributing in pest management. Being a hyperaccumulator, it is employed in improvement of contaminated soil through phytoremediation approach. Although there are numerous reports obtainable on various aspects of the plant in discrete sources, we are making an attempt to gather all those information in a single platform in this review.

Keywords: *Chromolaena odorata*, invasive weed, allelochemicals, medicine, phytoremediation

Namita Nath

01



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DOI: 10.56042/ijtk.v22i3.5744

Study on folk remedies using medicinal plants by Karbi tribe of West Karbi Anglong District, Assam, India

Barnali Das[a,b,*], Gulapi Tissopi[a], Nilakshee Devi[a] & Namita Nath[a]

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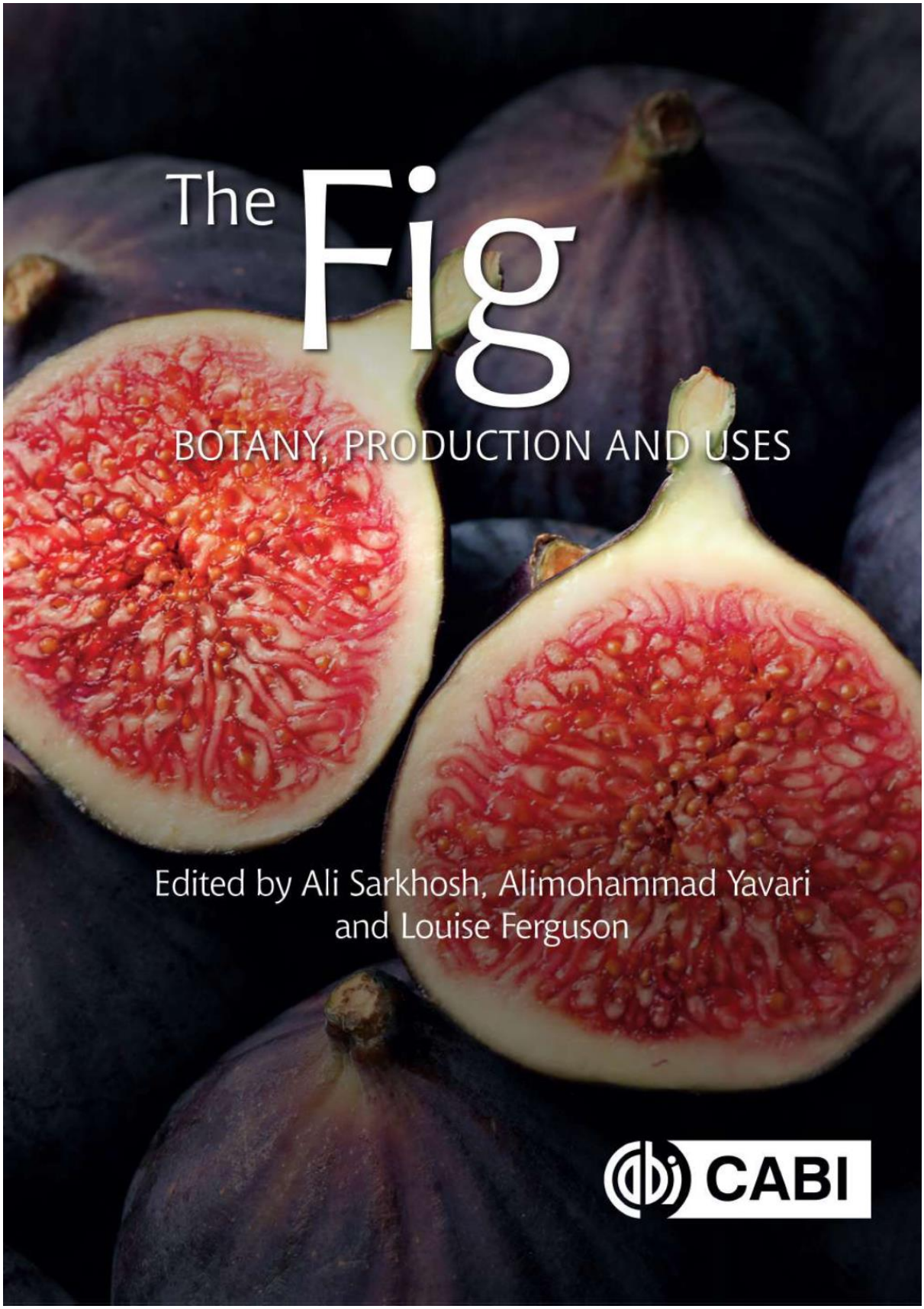
The present study was conducted to document the indigenous knowledge on folk medicines of the Karbi tribe in three remote villages of West Karbi Anglong district, Assam. A total of 80 ethnomedicinal plants recorded were used in treatment of 31 different ailments. Data were collected through restructured questionnaire and quantitative analysis was done. Herbaceous plants occupied the maximum numbers and leaves were the most used plant part among the other parts. The F_{ic} value ranged from 0.74-1, and the used value (UV) ranged from 0.02-1.2; *Azadirachta indica* was found to be have the highest UV. The study has revealed the pattern of people-plant interactions in the region and the importance of plant medicines playing a vital role in the health care practices and survival of the forest dwellers. There is utmost need of documenting the ethnomedicinal practices of Karbi tribe as they are passing those knowledge generations after generations only by means of practical utilizations without proper pharmacopoeia.


The Fig
BOTANY, PRODUCTION AND USES
Edited by Ali Sarkhosh, Alimohammad Yavari
and Louise Ferguson
CABI

2 Taxonomy, Botany and Physiology

B. Gaaliche[1]*, D. Narzary[2], M. Ben Mimoun[3] and A. Sarkhosh[4]
[1]*Laboratory of Horticulture, National Agricultural Research Institute of Tunisia (INRAT), Tunis, Tunisia;* [2]*Department of Botany, Gauhati University, Assam, India;* [3]*University of Carthage, National Agronomic Institute of Tunisia (INAT), Laboratory GREEN-TEAM (LR17AGR01), Tunis, Tunisia;* [4]*Horticultural Sciences Department, University of Florida, Gainesville, USA*

This chapter focuses on the botany and physiology of the horticulturally important fig (Ficus carica) species. Through understanding of its reproductive complexity and developmental biology, complete genome sequencing could place the fig as a model plant in horticulture and evolutionary biology. And, in Mediterranean regions and Western Asia, where both cultivated and semiwild figs are found, a systematic germplasm collection of the traditional fig cultivars and wild relatives is imperative for proper germplasm management and conservation.

Advances in Science, Technology & Innovation
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Swarnendu Roy · Piyush Mathur · Arka Pratim Chakraborty · Shyama Prasad Saha *Editors*

Plant Stress: Challenges and Management in the New Decade

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Harnessing the Power of Microbes to Overcome Heavy Metal Stress in Crop Plants

Khomdram Niren Singh & Diganta Narzary

Chapter | First Online: 01 April 2022

Part of the book series: Advances in Science, Technology & Innovation ((ASTI))

Abstract

The declining of crop productions due to various biotic and abiotic factors is evident these days. Among the various factors, heavy metal stress is one of the major abiotic factors which is responsible for lower crop productivity that needs to be addressed and resolved. There are a few ways to overcome heavy metal stress in crop plants, which require appropriate selection for effective results. Many strains of microbes (bacteria, fungi, algae) have intrinsic properties to either absorb, uptake, or change the chemical properties of metals available to the plants. There are several reports that claim the effective use of microbes in mitigation/bioremediation of heavy metal contamination in soil and water. Being microbial treatment of the heavy metal contaminated soil is one of the best options available in terms of their cost-effectiveness and environmental friendliness in overcoming metal stress in crop plants. Therefore, in this chapter, we have highlighted and discussed the various sources of heavy metal contamination in crop fields, their toxic effects on crop plants, the various mechanism adopted by plants to resist the toxic effects of heavy metals, and the microbial potential in bioremediation of heavy metals that include the heavy metal resistance and uptake mechanism in microbes, their effective use in bioremediation, and finally, we have discussed the application of advanced technologies such as genetic engineering and omics technology in the field of microbiology for their potential use in the bioremediation of heavy metals.

Advances in Science, Technology & Innovation
IEREK Interdisciplinary Series for Sustainable Development

Swarnendu Roy · Piyush Mathur · Arka Pratim Chakraborty · Shyama Prasad Saha *Editors*

Plant Stress: Challenges and Management in the New Decade

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Plant–Microbe Interactions in Combating Abiotic Stresses

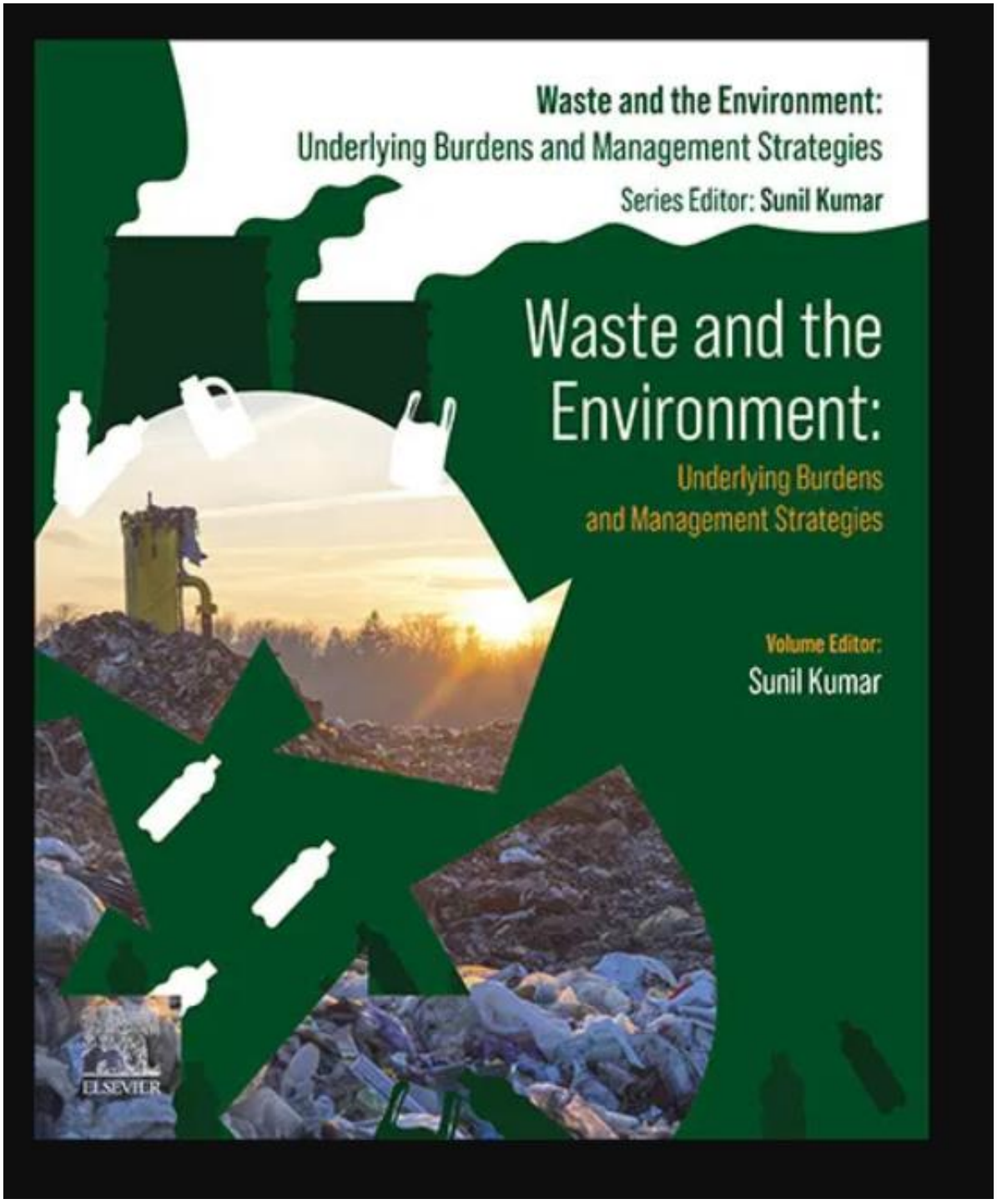
Namrata Konwar, Khomdram Niren Singh & Diganta Narzary

Chapter | First Online: 01 April 2022

Part of the book series: Advances in Science, Technology & Innovation ((ASTI))

Abstract

There is a significant decline in crop yield, quality of crops and soil fertility worldwide due to increased biotic and abiotic stresses that are either induced naturally or due to anthropogenic factors such as rapid urbanization and industrialization. Interaction of plants with several beneficiary microbes such as Plant Growth-Promoting Microbes (PGPM) comprising of actinomycetes, rhizospheric bacteria, and fungi help the plants to survive during abiotic stress conditions such as extreme temperatures (very low or very high temperature), flood or drought conditions, high salinity stress, heavy metal stress, nutrient deficiency and oxidative damages. Abiotic stresses harm plant growth, cellular morphology and physiology through obstruction in cellular pathways or gene regulation inside the cell. These microbes employ stress tolerance mechanisms in plants, such as the production of anti-oxidants, exopolysaccharides (EPS), phytohormones, osmolytes, formation of biofilms and siderophores, through various biosynthetic pathways. Here, in this chapter, we review recent findings in successful employment of microbial inoculation that induce abiotic stress tolerance in crop plants and study the role of bioactive metabolites liberated by microbes in association with plants which may help design strategies and tools for the development of improved and efficient microbial inoculant for optimizing plant growth in crop fields under adverse abiotic stressed conditions.


Waste and the Environment:
Underlying Burdens and Management Strategies
Series Editor: Sunil Kumar
Waste and the Environment:
Underlying Burdens and Management Strategies
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ELSEVIER

Earthworm Technology in Organic Waste Management
Recent Trends and Advances

Waste And The Environment: Underlying Burdens and Managment Strategies

2024, Pages 231-255

Chapter 11 - Instrumental characterization of matured vermicompost produced from organic waste

W James Singha, Hemen Deka

https://doi.org/10.1016/B978-0-443-16050-9.00017-7

Abstract

The applications of vermicompost in agricultural and horticultural sectors have attracted worldwide attention as it is environmentally friendly and contains plant growth-promoting substances/microbes and does not cause any negative effects in the soil. However, prior to use in agriculture and horticulture, proper characterization of the vermicomposting end product is necessary as immature vermicompost may lead to severe damage in crop/plant productivity. Traditionally, several methods have been in use for understanding the maturity of vermicomposted products. However, in many cases, a traditional method that includes physical, chemical, and biologic characterization of the vermicomposting end products shows several limitations. In this context, proper characterization techniques and methods are required to evaluate the maturity of vermicompost and its quality before field applications. Recently, instrument characterization has been receiving interest in assessing the maturity and stability of finished vermicompost. Instrumentation techniques like Fourier transform infrared spectroscopy, thermogravimetry, scanning electron microscopy, and ultraviolet–visible spectroscopy can be used to determine the changes in texture and structure of mature vermicompost. Moreover, sophisticated instruments like atomic absorption spectroscopy, gas chromatography–mass spectrometry, and liquid chromatography–mass spectrometry may be employed to evaluate mature vermicompost quality. Besides, advancements in technology have strengthened the instruments to produce rapid and reliable results. Hence, the determination of mature vermicompost using instrumental techniques is crucial to track the organic waste degradation and fertilizing potential of the end product.

BENEFICIAL MICROBES IN AGRO-ECOLOGY

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ACADEMIC PRESS

Beneficial Microbes in Agro-Ecology

Bacteria and Fungi

2020, Pages 339-361

Chapter 17 - *Paenibacillus*

Rupshikha Patowary [1], Hemen Deka [2]

https://doi.org/10.1016/B978-0-12-823414-3.00017-4

Abstract

Paenibacillus are rod shaped, Gram-positive, motile, facultative anaerobic or strictly aerobic bacteria which mostly show optimum growth at neutral pH within the temperature range of 28–40°C. The members of *Paenibacillus* initially included under *Bacillus*; however, latter developments of 16S rRNA sequencing technology have provided a tool for placing morphologically similar entities in different groups and thus *Paenibacillus* was separated as a new genus. Several species of *Paenibacillus* has been reclassified as equivalent immediately after discovery of the genus.

Soil-beneficial microorganisms play an important role in determining the fate of plant growth and development. In the rhizosphere region, several species of *Paenibacillus* have been reported to involve in atmospheric nitrogen fixation, phosphate and potassium solubilization, production of phytohormones and antimicrobial metabolites, and plant's micronutrients uptake. Besides, several species of *Paenibacillus* isolated from various environments are also reported to possess potentiality for bioremediation of xenobiotics in adverse environmental condition. This chapter provides knowledge about the origin of *Paenibacillus*, its isolation, and identification. It elaborates the application of *Paenibacillus* in agroecology comprising its role in plant growth promotion, phytohormone production, as biocontrol agents, rehabilitation of soil properties, and fortification of nutrients for optimum plant growth.

Value-Addition in Agri-Food Industry Waste Through Enzyme Technology

Edited by
Mohammed Kuddus
Pramod Ramteke

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Value-Addition in Agri-food Industry Waste Through Enzyme Technology

2023, Pages 37-64

Chapter 3 - Microbial conversion of biomass to value-added chemicals

Jintu Rabha, Sashi Prava Devi, Sukanya Das, Niranjan Roy, Dhruva Kumar Jha

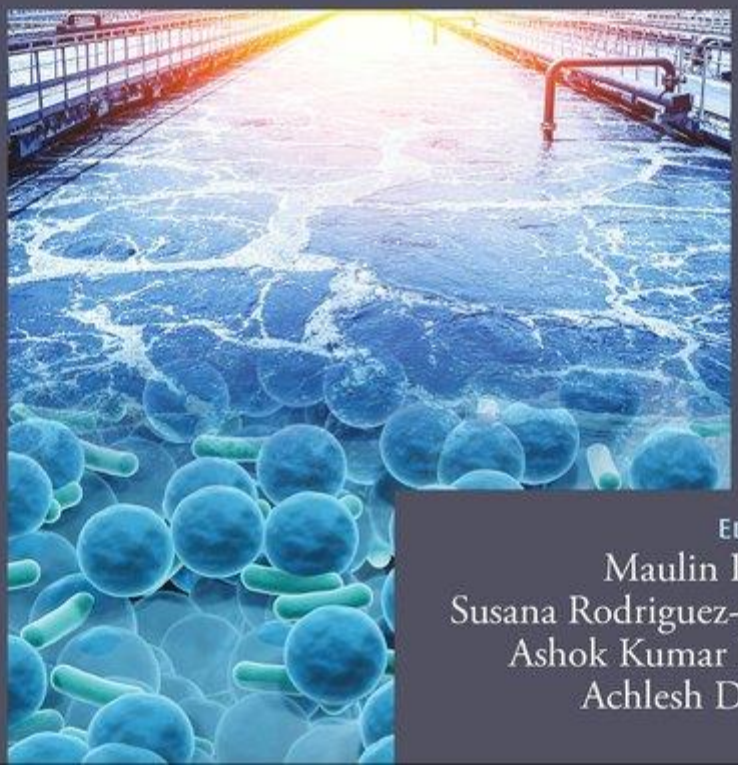
https://doi.org/10.1016/B978-0-323-89928-4.00018-3

Abstract

Plant biomass refers to dry matter generated by plants utilizing atmospheric carbon dioxide and water in the presence of sunlight through the process of photosynthesis. Structurally, biomass is made up of a complex matrix, composed of cellulose wrapped around by a dense structure consisting of other polymers like hemicellulose, lignin, pectin, proteins, glycerides, etc. The lignocellulosic wastes mainly include residues generated by agricultural, industrial, and forest sectors. An approximate 140 Gt of biomass wastes are generated annually throughout the world. However, only a small amount of this biomass is valorized as feedstock for industrial applications and energy generation (in developed countries). In developing countries, however, a significant portion of this resource is not utilized but left to decompose or are burnt. Nonetheless, because of its abundance, renewability, and cost-effective characteristics, the lignocellulosic biomass is recognized as an effective alternative substrate for the production of fuels and industrially important products. Structural complexity of the lignocellulose makes it inaccessible for processing and thus, the release of fermentable sugars is difficult. Innovative valorization of the naturally abundant and renewable biomass is of great importance in the pursuit of a biobased economy and sustainable goals. The biodegradation of lignocellulose is a characteristic of many aerobic, facultatively anaerobic, and obligately anaerobic bacteria and fungi. These organisms can be utilized for developing promising alternative enzyme-based techniques for biomass conversion into industrially important biochemicals owing to their higher efficacy and discerning chemistry. This chapter reviews recent developments in microbe-mediated production of several value-added products, that is, fuels (such as biodiesel, bioalcohol, and biogas) and chemicals like enzymes, amino acids, organic acids, compounds of pharmaceutical importance, etc.

DEVELOPMENT IN WASTEWATER TREATMENT RESEARCH AND PROCESSES

Bioelectrochemical Systems for Wastewater Management



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Development in Wastewater Treatment Research and Processes
Microbial Ecology, Diversity, and Functions of Ammonia-Oxidizing Bacteria
2022, Pages 371-392

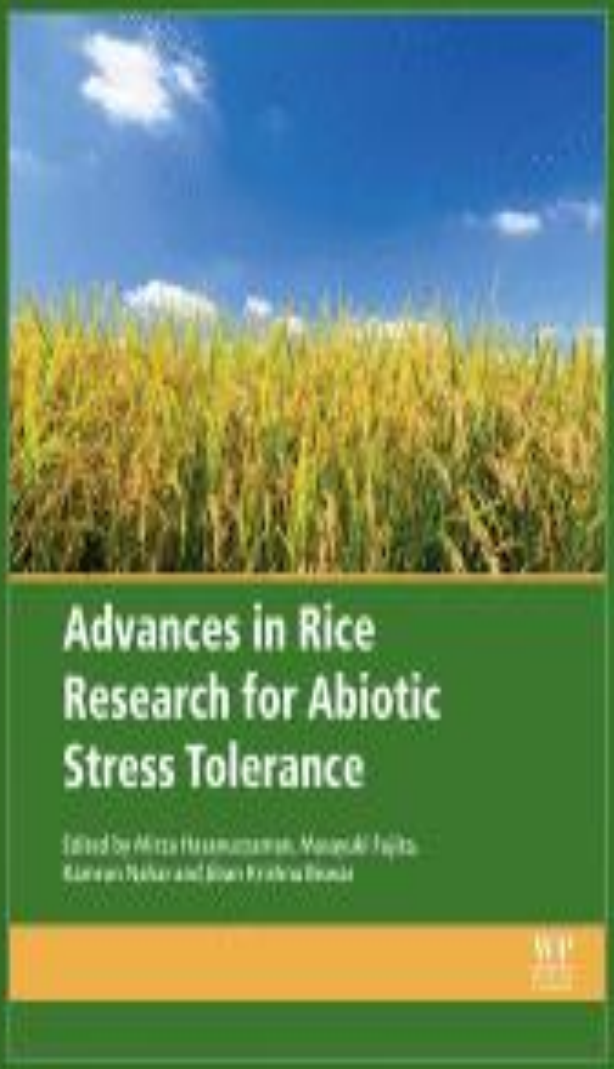
Chapter 18 - Diversity and functional role of ammonia-oxidizing bacteria in soil microcosms

Jintu Rabha, Sashi Prava Devi, Sukanya Das, Amrit Kumar, Dhruva Kumar Jha

https://doi.org/10.1016/B978-0-323-91901-2.00004-8

Abstract

Nitrogen is one of the most common limiting nutrients in both natural soil ecosystems and agriculture. Nitrification is the biological oxidation of ammonia to nitrite followed by the oxidation of nitrite to nitrate which comprises an important step in the soil nitrogen cycle. Nitrification rates in soils can be considered as an important indicator for sustainable use and soil ecosystem functioning, playing important role in controlling losses of soil nitrogen through leaching and denitrification. Ammonium derived from ammonia is of high importance as the base product of this process for plant nutrition and biomass formation. Ammonia-oxidizing bacteria (AOB) are the key drivers responsible for the conversion of nitrogen into plant usable forms. Due to the importance of ammonia oxidizers (AOs), factors affecting their abundance and activity have been a major research focus over the years. The reason for this strong focus on ammonia oxidation is mainly related to several studies from the last century where the oxidation of ammonia has been considered as rate limiting for the whole process of nitrification. The present chapter focuses on the diversity and functions of ammonia-oxidizing bacteria in the soil.



Edited by:

Mirza Hasanuzzaman, Masayuki Fujita, ... Jiban Krishna Biswas

Advances in Rice Research for Abiotic Stress Tolerance

2019, Pages 537-550

Chapter 26 - Comparative Metabolomics Approach Towards Understanding Chemical Variation in Rice Under Abiotic Stress

Amit Kumar Pradhan, Zina Moni Shandilya, Lipika Lahkar, Sneha Hasnu, Jyotirmay Kalita, Dharitri Borgohain, Bhaben Tanti

Show more

https://doi.org/10.1016/B978-0-12-814332-2.00026-5

Abstract

Abiotic stress significantly affects the productivity of almost all crop plants including rice, thus, understanding the metabolomics is a challenge for improving the important crops in order for them to be able to cope with various abiotic stresses. Metabolomics provides a biochemical snapshot of a phenotype that integrates transcriptional, post-transcriptional, translational, post-translational, and allosteric regulatory processes and, thus, can offer critical insights into the biological mechanisms of crop plants against abiotic stress. However, very little is known about the genome-scale metabolite profiles that contribute to tolerance against abiotic stress in rice. Therefore, the comparative metabolomics approach will be a boon to understand the chemical variations in rice against different abiotic stresses. Here, an effort has been made to uncover comparative metabolic features clearly associated with abiotic stress tolerance in rice, which could serve as markers in metabolite-assisted breeding to develop abiotic stress-tolerant rice varieties.

Mirza Hasanuzzaman
Vasileios Fotopoulos *Editors*

Priming and Pretreatment of Seeds and Seedlings

Implication in Plant Stress Tolerance and Enhancing Productivity in Crop Plants

Springer

Contents

Seed Priming and Seedling Pre-treatment Induced Tolerance to Drought and Salt Stress: Recent Advances

Smita Sahoo, Pankaj Borgohain, Bedabrata Saha, Debojyoti Moulick, Bhaben Tanti, and Sanjib Kumar Panda

Contents

Abstract Plants are sessile entities and hence have to face the environmental havocs without any chance of avoiding it. Abiotic stress like drought and salinity encumbers plant growth and developmental activities rendering drastic drop in crop yields. Though plants have evolved stress response mechanisms, many a times it doesn't suffice, and the plant succumbs to stress intensity and duration. But sometimes priming and pretreatment with exogenous agents (selenium, silicon, zinc, copper, etc.) enhance the inherent tolerance capability of plants to some extent. These priming and pretreatment technologies (using sodium nitroprusside, hydrogen peroxide, etc.) are cost-effective and user-friendly for stress alleviation in various plants. This chapter centre rounds these ameliorating agents and the mechanisms involved in enhancing the tolerance capability. Various reports suggested different techniques and treatments in combinations while using variety of agents. This chapter aims to compare and summarise the technologies used. Though we mainly represent the mitigations reported in the past decade or so, this chapter is divided into two sections, with a glimpse of various inorganic and organic amendments used to alleviate salinity and drought stresses in wide range of plants.

The authors Smita Sahoo, Pankaj Borgohain, Bedabrata Saha and Debojyoti Moulick have contributed equally to this chapter.

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Plant Molecular Biotechnology Laboratory, Department of Life Science and Bioinformatics, Assam University, Silchar, Assam, India

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Department of Botany, Gauhati University, Guwahati, Assam, India

M. Hasanuzzaman, V. Fotopoulos (eds.), *Priming and Pretreatment of Seeds and Seedlings*, https://doi.org/10.1007/978-981-13-8625-1_12

Advances in Heavy Metal-Induced Stress Alleviation with Respect to Exogenous Amendments in Crop Plants

Bedabrata Saha, Bhaben Chowardhara, Saradia Kar, Sanjenbam Sanjibia Devi, Jay Prakash Awasthi, Debojyoti Moulick, Bhaben Tanti, and Sanjib Kumar Panda

Contents

Abstract Heavy metal contamination of soil due to rapid industrialization and urbanization is an exponentially increasing menace, rendering hectares of arable land barren. Adding to the problem is the global climate change which sums up to the challenge of providing food security and meeting the global sustainability goals. Heavy metals like Cd, Pb, Hg, and As (non essential) and Fe, Mn, Zn, Cr, Cu, and Ni (essential) when present in abnormal amounts in the environment pose a serious threat to growth and yield of crop plants. Various stress factors including heavy metals result in exaggerated synthesis of reactive oxygen species (ROS) causing immense metabolic imbalance in plants. Plants possess both enzymatic and non-enzymatic processes to reduce the load of oxidative stress, but many times, it doesn't suffice. The scope of this chapter centers around the recent strives made in the field of heavy metal-induced heavy metal stress mitigation in crop plants. This chapter specially focuses on exogenous amendments (organic, inorganic, and microbial) to induce stress adaptation in crop plants.

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M. Hasanuzzaman, V. Fotopoulos (eds.), *Priming and Pretreatment of Seeds and Seedlings*, https://doi.org/10.1007/978-981-13-8625-1_15

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Sustainable Agriculture in the Era of Climate Change

Editors: Rajib Roychowdhury, Shuvasish Choudhury, Mirza Hasanuzzaman, Sangeeta Srivastava

Chapters address present day hot topics on stress management of crops in changing climate by international reputed scientists/researchers

Incorporates fast-moving agricultural research themes based on crop improvement through the stress management

Written for a wide range of readers with easy-to-understand tables and diagrams

Chapter 29
Biochemical and Molecular Mechanism of Abiotic Stress Tolerance in Plants

Amit Kumar Pradhan, Mehzabin Rehman, Debanjali Saikia, Shabnoor Yeasrin Jyoti, Junu Poudel, and Bhaben Tanti

Contents

Abstract Plants need to acclimatize with sudden changing environment for their adaptation. Plant community, as a whole, is the primary producer in our ecosystem, therefore versatile in nature. In its differential habitats, plants need to cope up with environmental (abiotic) stresses like heavy metals, heat, cold, drought, acidic soil, and various nutrient deficiencies. Plants have their genetic ability to overcome the challenges of different environmental stresses through complex metabolic processes. There are numerous reports in connection with biochemical and molecular mechanisms in response to abiotic stresses. However, it is difficult to correlate the different molecular mechanisms involved pertaining to abiotic stresses in plants. Therefore, in this article, an attempt has been made to draw a systematic relationships of different biochemical and molecular processes involved in plant system during environmental stresses.

A. K. Pradhan · M. Rehman · D. Saikia · S. Y. Jyoti · J. Poudel · B. Tanti (✉)
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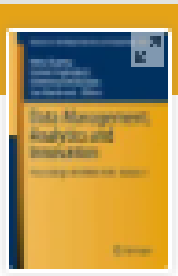
M. Hasanuzzaman (ed.), *Plant Ecophysiology and Adaptation under Climate Change: Mechanisms and Perspectives I*,
https://doi.org/10.1007/978-981-15-2156-0_29

Genetic Variability, Coefficient of Variance, Heritability and Genetic Advance of Some Traditional Rice Cultivars of Assam

Chutia, Jnandabhiram and Borah, S. P. and Tanti, Bhaben (2020) *Genetic Variability, Coefficient of Variance, Heritability and Genetic Advance of Some Traditional Rice Cultivars of Assam.* In: Current Research Trends in Biological Science Vol. 4. B P International, pp. 97-105. ISBN 978-93-90206-34-6

Abstract

Rice is the staple food crop for India as well as entire Asia Pacific region. But this crop has been constantly exposed to various biotic and abiotic stresses effecting the yield pattern. The prominent among the abiotic stress is water stress. This paper tries to evaluate the effect of drought stress on the various physiological parameters taken under consideration during the study. The results has been validated using methods to understand the impact of the drought sustaining characters on the Genetic Variability, Coefficient of Variance, Heritability and Genetic Advance.



Data Management, Analytics and Innovation pp 179–200 | Cite as

Analytics for In Silico Development of Inhibitors from Neem (*Azadirachta Indica*) Against Pantothenate Synthetase of *Mycobacterium Tuberculosis*

Saurov Mahanta ✉, Bhaskarjyoti Gogoi & Bhaben Tanti

Conference paper | First Online: 19 September 2020

Part of the book series: Advances in Intelligent Systems and Computing ((AISC,volume 1175))

Abstract

Tuberculosis is the disease which is caused due to the infection of *Mycobacterium tuberculosis*. The multidrug resistance *Mycobacterium tuberculosis* is the main problem in the treatment of this worldwide health threats. So there is an urgent need for the development of new drug for tuberculosis. Pantothenate synthase (PS) is a valid target for rational drug designing against *Mycobacterium tuberculosis* as it is absent in animal system. Neem (*Azadirachta indica*) has been used as traditional Indian medicine since the ancient era. Preparations of this plat or the whole extract of the same are widely reported to put forth, pesticidal, insecticidal, and agrochemical properties. In this study, we have modeled binding modes of selected known anti-tubercular compounds and different compounds of Neem plant against pantothenate synthase (PS) using advanced docking program AutoDock Vina. From that result, we have identified a few potential compounds from Neem plant having affinity toward pantothenate synthase (PS). The selected compounds or derivatives of the compounds could be of biological significance in inhibition of growth of *Mycobacterium tuberculosis* in human system. This study can result in the development of novel natural origin anti-tubercular drugs.

Analytics for In Silico Development of Inhibitors from Neem (*Azadirachta Indica*) Against Pantothenate Synthetase of *Mycobacterium Tuberculosis*

Saurov Mahanta, Bhaskarjyoti Gogoi, and Bhaben Tanti

Abstract Tuberculosis is the disease which is caused due to the infection of *Mycobacterium tuberculosis*. The multidrug resistance *Mycobacterium tuberculosis* is the main problem in the treatment of this worldwide health threats. So there is an urgent need for the development of new drug for tuberculosis. Pantothenate synthase (PS) is a valid target for rational drug designing against *Mycobacterium tuberculosis* as it is absent in animal system. Neem (*Azadirachta indica*) has been used as traditional Indian medicine since the ancient era. Preparations of this plat or the whole extract of the same are widely reported to put forth, pesticidal, insecticidal, and agrochemical properties. In this study, we have modeled binding modes of selected known anti-tubercular compounds and different compounds of Neem plant against pantothenate synthase (PS) using advanced docking program AutoDock Vina. From that result, we have identified a few potential compounds from Neem plant having affinity toward pantothenate synthase (PS). The selected compounds or derivatives of the compounds could be of biological significance in inhibition of growth of *Mycobacterium tuberculosis* in human system. This study can result in the development of novel natural origin anti-tubercular drugs.

Keywords *Neem Azadirachta indica* · Pantothenate synthase · *Mycobacterium tuberculosis* · Docking

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Molecular Breeding for Rice Abiotic Stress Tolerance and Nutritional Quality

Editor(s): Mohammad Anwar Hossain, Lutful Hassan, Khandakar Md. Ifterkharuddaula, Arvind Kumar, Robert Henry

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Aromatic Rices: Evolution, Genetics and Improvement through Conventional Breeding and Biotechnological Methods

Lakshminarayana R. Vemireddy[1], Bhaben Tanti[2], Lipika Lahkar[2] and Zina M. Shandilya[2]

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Aromatic Rices: Background

Throughout the world rice (*Oryza sativa* L.) is one of the oldest staple crops, endowed with phenomenal genetic resources. During the course of evolution, rice's genetic resources have diverged into a handful of sub-groups, with specific traits, which are largely cultivated and nurtured by the different ethnic groups in specific regions. The aromatic or scented or fragrant rice varieties are a special group, which carved out its niche owing to their unique aroma and other cooking quality traits. The first reference to the existence of aromatic rice can be traced to the documents of Susrutha (c. 400 BC), the great Indian pioneer in medicine and surgery (Siddiq et al. 2012). The scented rice genotypes are largely grouped into three categories: the basmati, jasmine, and other scented rice group. The basmati types of rice cultivars originated in India and Pakistan and are characterized by exquisite aroma and extra-long elongation after cooking (Siddiq et al. 2012). Jasmine rice has a slightly larger kernel length than basmati and originated in Thailand (Juliano and Villarreal 1993). Jasmine rice, also known as "Thai Hom Mali Rice." was collected from Chachoengsao, a central province of Thailand, and after pure-line selection was officially named Khao Dawk Mali 105, (KDML105). Because of its superb fragrance and cooking quality, KDML105 has been a model variety for studying genes controlling grain quality and aroma. In addition to these two large aromatic groups, many more small aromatic groups can be found that are specific to particular regions in the world, including Sadri from Iran and Della from the United States, to name a few (Table 18.1).

The aromatic rices occupy a special place among the diverse subspecies of rice owing to their exquisite aroma. Aromatic rice includes basmati from India and Pakistan, jasmine from Thailand and sadri from Iran (Figure 18.1). Aromatic rices fetch a premium price in the domestic as well as overseas markets due to their unique special quality characteristics and their being a rich source of nutrients. The basmati varieties, often described as the "prince of rice" are reported to have low glycemic index and be a rich source of Fe and Zn.

Molecular Breeding for Rice Abiotic Stress Tolerance and Nutritional Quality, First Edition.
Edited by Mohammad Anwar Hossain, Lutful Hassan, Khandakar Md. Iftekharuddaula, Arvind Kumar and Robert Henry.

29 Endophytes: The Immune System Modulators of Rice Plants Under Abiotic Stresses

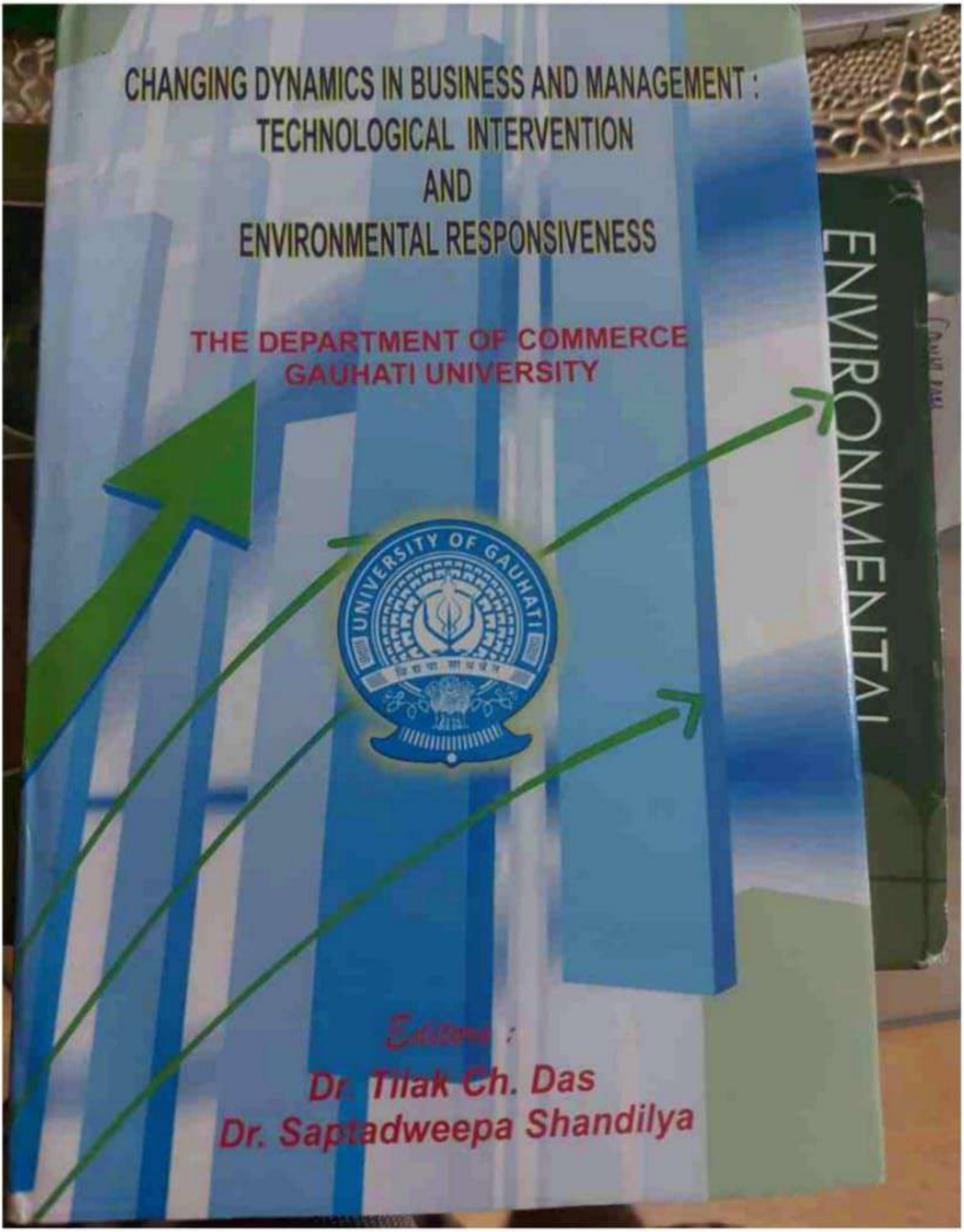
Deepanwita Deka[1,*], Jnandabhiram Chutia[2] and Bhaben Tanti[3]
[1]*Department of Botany, S.B. Deorah College, Gauhati University, Guwahati, Assam, India;* [2,3]*Department of Botany, Gauhati University, Guwahati, Assam, India*

Abstract

Endophytes are the microorganisms, including bacteria and fungi, that reside within healthy plant tissues and promote plant growth under favorable as well as unfavorable conditions. Endophytes are present in all the plant species examined to date. They can enhance growth of a plant, stimulate defense responses against different pathogens and can act as immune system modulators for plants in abiotic stresses. Rice plants (*Oryza glaberrima* [or African rice] and *O. sativa* [or Asian rice]) are one of the major cereal grains that is the most widely consumed staple food for a large human population throughout the world. Therefore, it is very important to increase the production by controlling diseases, increasing growth in abiotic stresses, etc. of rice in order to feed the growing population worldwide, especially Asian and African people. This chapter focuses on the potential of endophytic microbes that induce abiotic stress tolerance in rice crops by improving the immune system of the plant. This chapter also discusses how endophytic microbes can be used for biotechnological applications in rice crop growth promotion and improvement under abiotic stress conditions.

29.1 Introduction

Rice is the seed of a plant species Oryza glaberrima (African rice) or Oryza sativa (Asian rice) belonging to the family Poaceae. It is the highest agricultural sectors for its successful production. Different types of chemical fertilizers and pesticides are being utilized (Wang *et al.*, 2019). However, the use of chemical growth stimulants leads to a hazardous impact on human health as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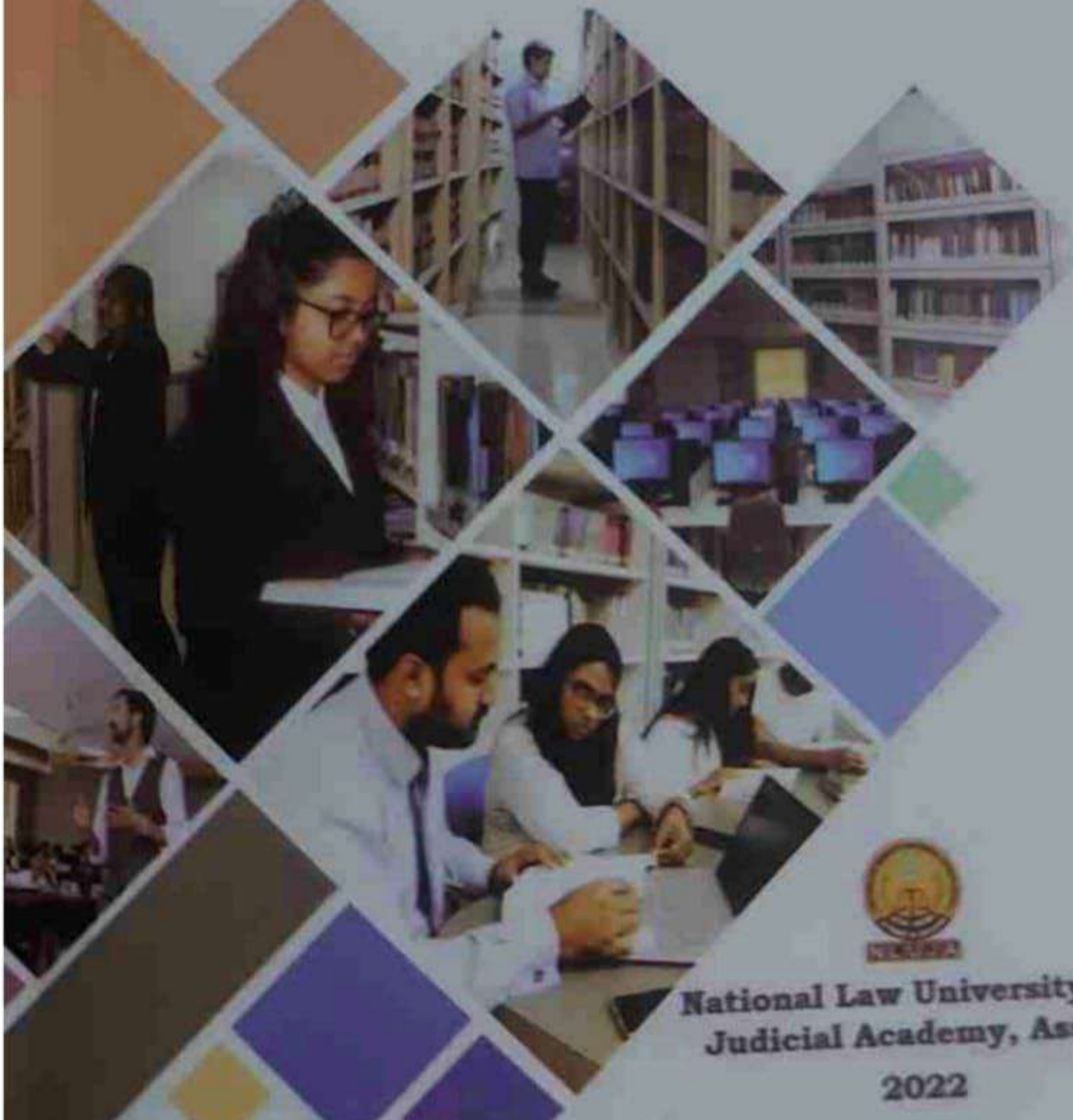

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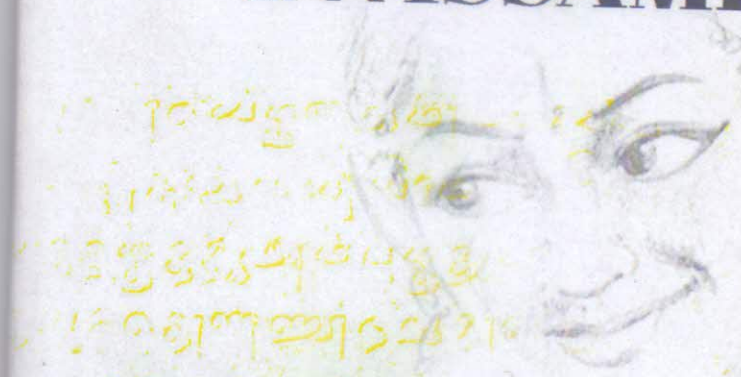

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Nationalism and Literature

The Assamese and Tamil Contexts

Edited by
Prof. Dilip Borah
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A book of articles on "Nationalism and Literature: The Assamese and Tamil Contexts", published on the occasion of the national seminar on the same topic organised by Jyotibharati Institute of Education and Research, Alokdham and the Dept. of Modern Indian Languages & Literary Studies, Gauhati University on 27 & 28 January 2022.

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Writer in Context

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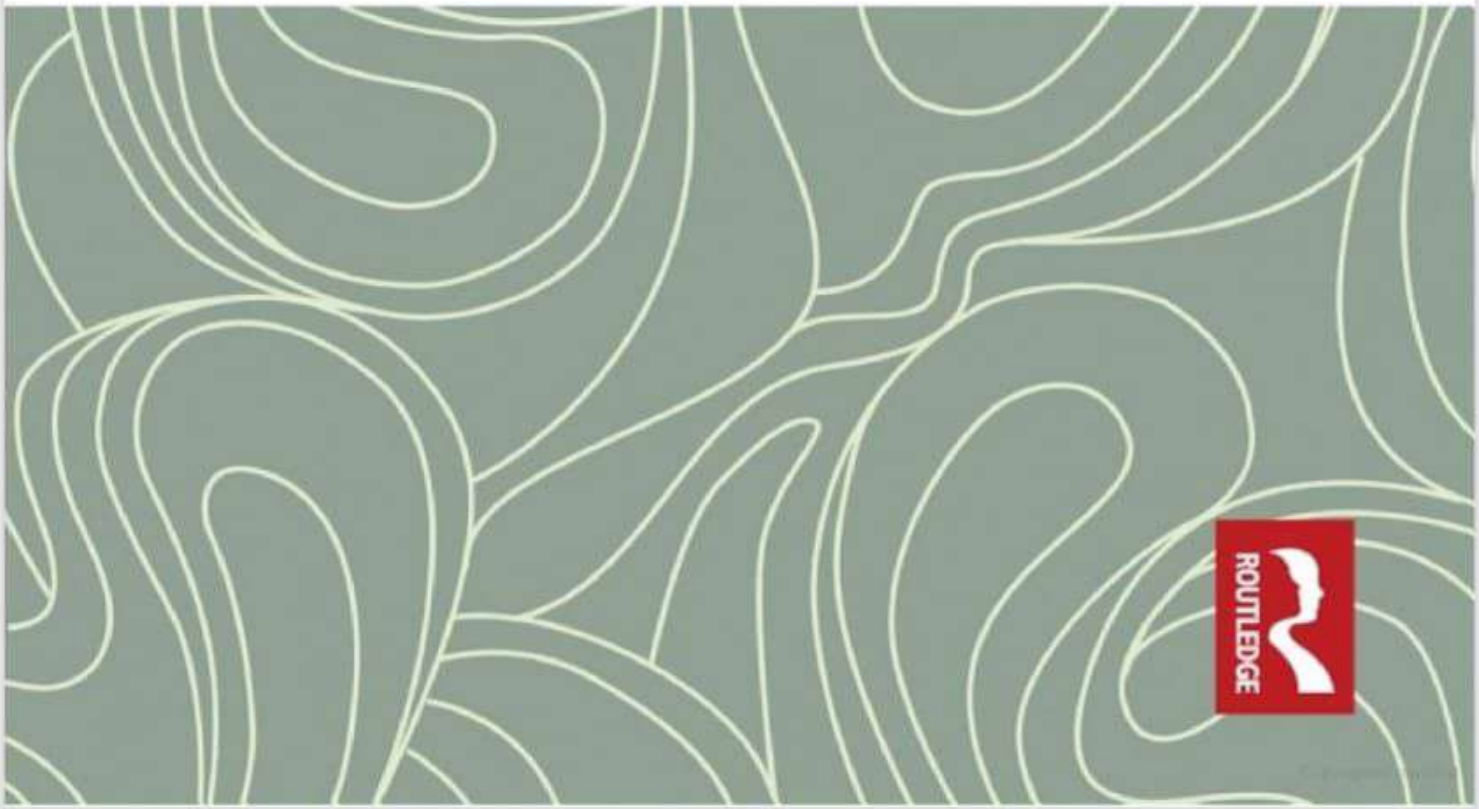

22 The Story of Rama in the Critical-Intellectual Imagination of Indira Goswami

Dhurjjati Sarma

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Introduction

Ramkatha, or the story of Rama, has been an important component of creative and critical writings within the larger domain of Indian literature, particularly the continuing practice of retelling or refashioning the Sanskrit epic narrative in the vernacular languages of the country. The scope and expanse of the Rama story has astonishingly extended beyond the boundaries of India to encompass regions in South and Southeast Asia over the past 2500 years or so. A.K. Ramanujan made note of a wide variety of languages, namely, Annamese, Balinese, Bengali, Cambodian, Chinese, Gujarati, Javanese, Kannada, Kashmiri, Khotanese, Laotian, Malaysian, Marathi, Oriya, Prakrit, Sanskrit, Santali, Sinhalese, Tamil, Telugu, Thai and Tibetan (1994:24). Most of these languages contained more than one version of the Rama story manifested through various narrative genres like the vernacular epic, Kavya, or the Purana. Apart from the textual tradition, the narrative of *Ramayana* is also represented through the oral and performative genres belonging to both classical and folk traditions of India. The Bhakti Movement, beginning in South India and later extending all over the northern plains of the country, provided a fertile ground for the refashioning of the prime protagonists of the epics into characters that fitted into the didactic paradigm representative of the whole devotional discourse propagated by it. However, more importantly, the various retellings of the epic narrative in various Indian languages gave primacy to the expressive resources of the local imagination in the vernacular refashioning of the Sanskrit narratives.

As far as Assamese is concerned, the first retelling/refashioning of the Rama story happened as early as in the 14th century when Madhav Kandali, a Brahmin scholar, composed the *Saptakanda Ramayana* (*Ramayana in Seven Cantos*) under the patronage of Mahamanikya, the Kachari king of Jayantapura. The Brahmaputra Valley of Assam, as the space that connected East and Southeast Asia with South Asia, was the hub of diverse literary and cultural activities since the beginning of the 2nd millennium AD, among which the indigenised retellings of *Ramayana* and Mahabharata acquired great significance so far as the development of the Assamese language was concerned. Madhav Kandali's *Saptakanda Ramayana* happens to be the earliest translation of the Rama story into a vernacular language of North India. However, it is a matter of great pity and concern that Kandali's work has not yet been able to attain the acclaim and popularity as enjoyed by the similar vernacular retellings in Awadhi (Tulsidas) and Bengali (Krittivas). It is within this contextual position of Ramkatha studies in Assamese vis-à-vis the pan-Indian situation that the present chapter shall critically examine the role played by Indira Goswami not only in carrying out one of the earliest research works on Kandali's *Ramayana* but also, in the process, juxtaposing the narrative with its Awadhi and Bengali counterparts. Her research and subsequent interventions in the study of Ramkatha are also significant from the critical perspectives of comparative Indian literature.

LITERARY RESONANCE

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Bankim Chandra Chatterjee's *Rajmohan's Wife*: India's First English Novel

Dr. Dhurjjati Sarma
dhurjjati.sarma@gmail.com

The body of writings collectively referred to as the "Indian English Fiction" is part of a larger history of Indian Writings in English that traces its origin to the last decade of the eighteenth century. As Vinay Dharwadker notes, the first ever text in English written by an Indian author was entitled *The Travels of Dean Mahomet, A Native of Patna in Bengal, Through Several Parts of India, While in the Service of The Honourable The East India Company, Written by Himself, In a Series of Letters to a Friend* and published in two volumes from Ireland in 1794 (199). The author Din Muhammad had left India a decade earlier and was settled in Ireland after having converted to Protestant Christianity and marrying an Anglo-Irish woman. The earliest Indian speakers of the English language from India were the *dubhasi*s who emerged in the small Europeans trading towns in the seventeenth and eighteenth centuries. Some of them worked as multilingual interpreters between the English trader and the Indians, while there were others who served a Company official as a manager or a personal agent. It must be kept in mind that these *dubhasi*s were in existence at a time when English education had not yet begun in the country.

After Din Muhammad, we witness the emergence of two writers who carried forth the legacy of early Indian practitioners of the English language. They were, namely, Cavelli Venkata Boriah (around the first decade of the nineteenth century) and Rammohun Roy (1772–1833) (Dharwadker 218). With respect to their use of

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KOLKATA IN INDIAN LITERATURE

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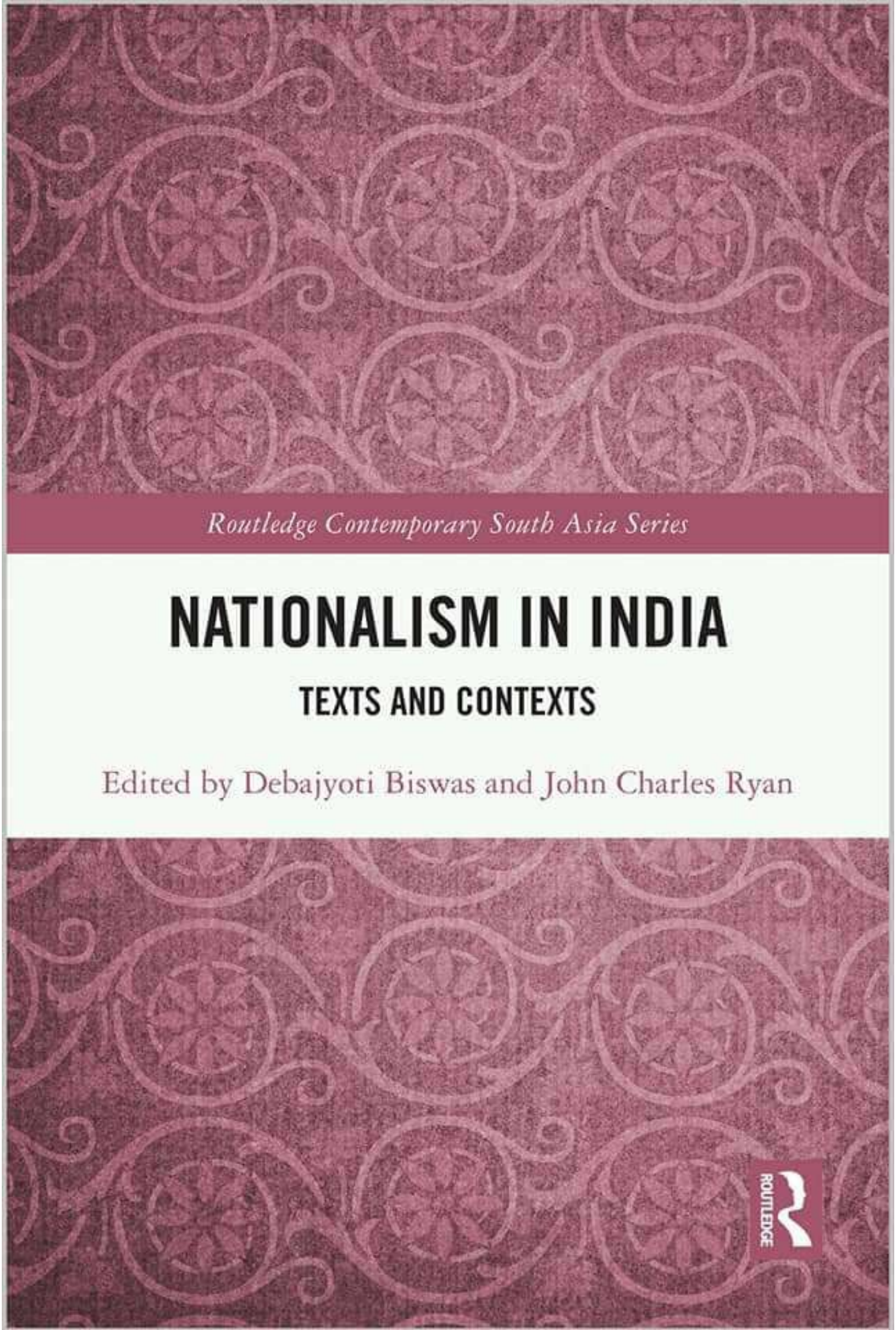
Sayantan Dasgupta

A 'Home' away from Home: The Enduring Presence of Calcutta in Asamiya Writings

Dhurjjati Sarma

The colonial subjugation of India and the consequent dawning of a new modern sensibility had, as its prime hotspot, the city of Calcutta (now Kolkata) from about the fourth quarter of the eighteenth century and extending throughout the nineteenth century till the beginning of the twentieth century. This was the time when Calcutta was the capital of British India and commanded attention from all other major centres of social-political and intellectual operations across the country, namely, Delhi, Bombay (now Mumbai), and Madras (now Chennai). More specifically, the allure and sense of wonder that Calcutta evoked was evident in the manner in which writers from other parts of the country—from both metropolitan and mofussil regions—made the city a subject of creative-intellectual discourse within their respective vernacular literary cultures. The responses ranged from pure admiration to critical examination of various aspects related to the history and culture of Calcutta, and were conveyed through a variety of forms like the autobiography, essay, travelogue, and also poetry. Proximity was also a determining factor in the formation of multiple discourses on and around the city. For some languages like Marathi and Tamil, Calcutta and the Bengali literary culture that developed within it provided a comparative vision for the writers to introspect and analyse vis-à-vis their own spatial-temporal locations. However, for literary cultures like Asamiya and Odia, the city of Calcutta provided the gateway towards the experience and internalisation of colonial modernity, as was evident from the actual testimonies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TEXTS AND CONTEXTS
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ROUTLEDGE

5 From revolt to rustication

Urdu and the Indian national imagination (1857–1947)

Dhurjjati Sarma

Introduction

Perhaps no other Indian language has attracted so much interest and apathy as seen in the case of Urdu, the perpetual *bête noire* to the proponents of linguistic nationalism. For a language that was born and brought up in undivided India, the increasing tendency towards the "foreignisation"[1] of Urdu is the culmination of a protracted series of events that had its genesis around 1800 with the establishment of the Fort William College in Calcutta. While it is seen as erroneous to entirely put the onus of executing a split between Hindi and Urdu on the Fort William College, the early decades of the nineteenth century were nevertheless marked by the beginning of efforts to crystallise specific linguistic identities along communal lines (Dalmia 1997; Faruqi 2001; Rai 2001; Orsini 2009; Safadi 2012). The gradual expansion of the printing press also aided the process of ascertaining the standard script for a particular language. Despite significant overlaps, Devanagari and Perso-Arabic scripts came to be used for Hindi and Urdu, respectively; a process that was later significantly boosted by the establishment of the Nagari Pracharini Sabha in 1893 (Orsini 2009). However, the essentially social-political nature of the events that took place across the nineteenth century led to Urdu being increasingly defamiliarised and estranged from the very linguistic-cultural geography of its growth and sustenance. A language that had once belonged to the whole of India soon seemed to belong nowhere.[2] The two significant social-political events that actually perpetuated and also stood witness to the changed fortunes of Urdu were, namely, the revolt of 1857 and the Partition of 1947. Occurring almost a 100 years apart, each of these events signified a crucial moment in the history of Urdu literary culture, particularly evident from the life and writings of Mirza Ghalib (1797–1869) and Saadat Hasan Manto (1912–55), who stood at either ends of the period and witnessed at first hand the horrors and disenchantment accompanying the unfolding of the these events (Sarma 2020).

This chapter attempts to locate, map and understand the journey of Urdu from 1857 to 1947, from being the widely preferred language of communication across north India in the years following the revolt to being branded as

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Unmasking Silence

Voices Heard and Unheard

Mukuta Borah

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8

Reimagining 'Kamarupa' as a Literary-Cultural Geography in Modern Assam

Dr. Dhurjjati Sarma

At the outset of this study, I would like to explain the particular context within which I am dealing with the terms, namely, 'Kamarupa', 'literary-cultural geography', and 'modern Assam'. By 'Kamarupa' here, I am referring not exactly to the mythical or the historical landscape that came subsequently to be known as 'Assam' in the present context; but, more precisely, to the existence of the idea or the concept that determined its imaginative reconstruction towards the close of the nineteenth and the initial decades of the twentieth century. The proponents of this concept were the colonial officers and the emergent Assamese intelligentsia alike who were, mostly under government supervision, tirelessly digging out (literally!) stone and copper-plate inscriptions over a thousand years old along with hunting down remnants of textual evidence in the nook and corner of Assam. For these enthusiasts of 'Kamarupa', the very imagination of the place was akin to recreating a lost civilisation, one that provided testimony to the region's age-old connection with the Aryavrata. I am using the term 'literary-cultural geography' as a conceptual description with respect to this reconstruction of 'Kamarupa' in twentieth-century Assam under the three-fold impulses of colonial modernity, nationality, and regional identities. It goes without saying that this was a momentous project of socio-cultural refashioning that was taking place simultaneously with the frequent realignments of internal political boundaries, particularly between Assam and Bengal, at the turn of the century. For my study here, I shall be focussing on those aspects of language and literary history that had to be addressed in the process of consolidating one's identity with respect to both the 'nation' and the 'region' at the same time.

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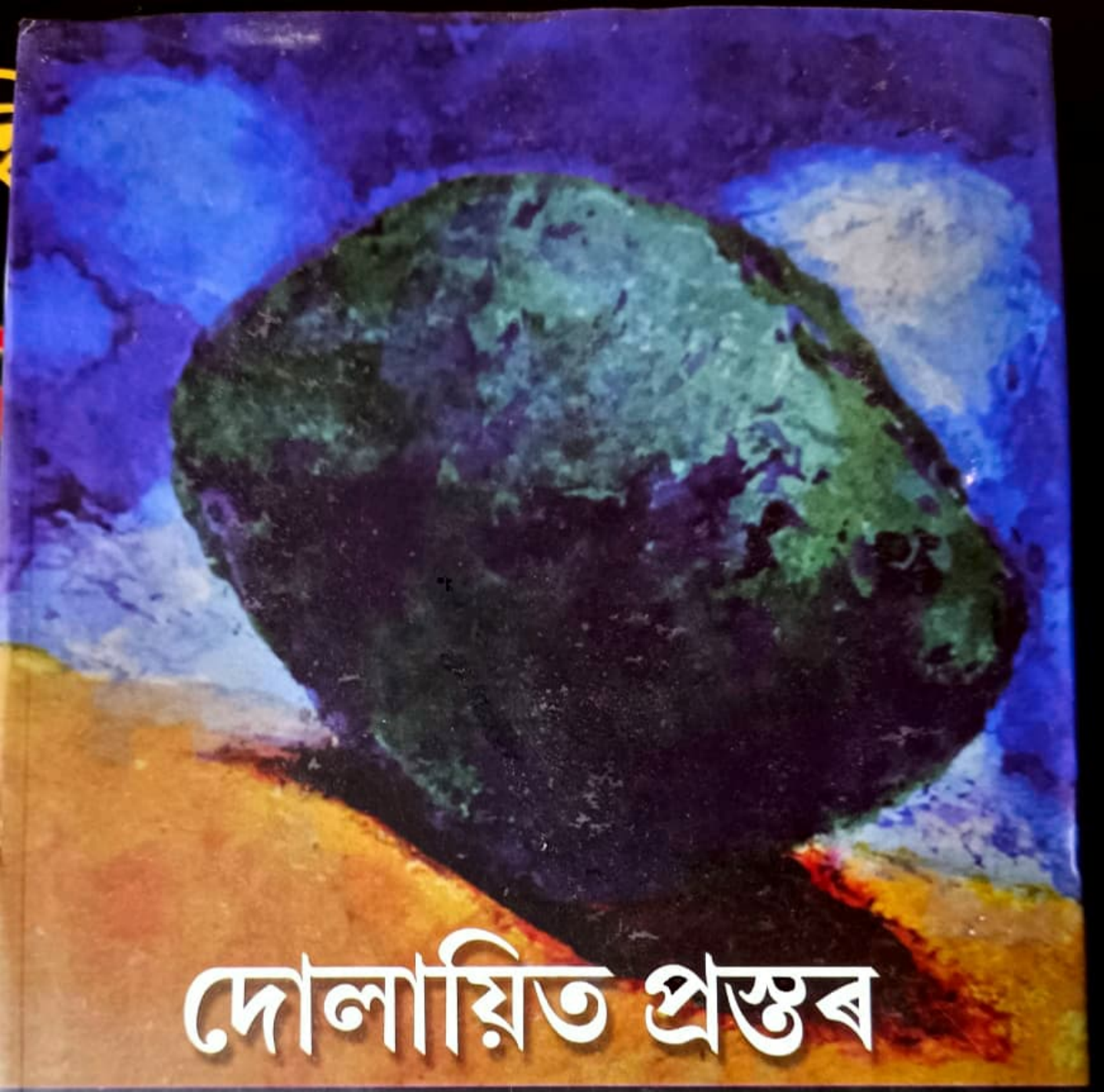

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10

Aping in Colonial Assam: A Reading of Bezbaroa's 'Mullock Gwyn-Gwyn' and 'Bhokendra Boroah'

Dr. Pranjal Sharma Bashishtha

Lakshminath Bezbaroa (1864-1938), the father of Assamese short stories, had sixty-four stories to his credit. Many of these stories used the nineteenth-century Assamese society as their backdrop. A few of them, such as 'Dhowakhowa', 'Bapiram', and 'Mr. Fipson', included criticism of the British and the British administration. A few others like 'Mullock Gwyn-Gwyn', 'Bhokendra Boroah', and 'Jagara Mandalar Premabhinay' criticized that section of the newly established middle class which, with their English education and/or power and regular income ensured by their jobs under the British administration, aped the British lifestyle to the extent of forgetting their language, culture, and family background. The present chapter reads Bezbaroa's 'Mullock Gwyn-Gwyn' and 'Bhokendra Boroah' to see how Bezbaroa ridiculed the native imitators of the British colonizers in the nineteenth century with his subtle artistry of characterization and language use. While doing so, insights from Homi K. Bhabha's concept of 'mimicry' will be used when necessary.

Lakshminath Bezbaroa (1864-1938), the doyen of Romantic Assamese literature (1889-1938), is worthily known in Assam as the *Sahityarathi* ("Charioteer of Literature") as he drove Assamese literature along the path of progress into different areas. These areas included, among many, the short story, novel, drama, criticism, biography, autobiography, poetry, and cartoon. He was a pioneer in many domains, including the short story. In the words

EDUCATION DURING COVID-19 AND ITS IMPACT ON MENTAL HEALTH OF STUDENTS

Dr. Pranjal Sharma Bashishtha*

EDUCATION DURING COVID 19 AND ITS IMPACT ON MENTAL HEALTH AMONG TEENAGERS

INTRODUCTION

The Covid-19 pandemic has hit the globe hard during its existence for nearly one and a half years. The social, economic, health and education and many other sectors of most of the countries including India have been affected gravely by the pandemic.

The education institutes all over the world have been closed most of the times during these one and a half years. They have been compelled by the situation to shift to the online mode of teaching. This is a new mode, and therefore its effects on the students, especially on their mental health, are not much known.

There are apprehensions that online classes have exerted negative impacts on the mental health of students during the times of the Covid-19 pandemic. The present paper makes a study on such impacts, exemplified in the prevalence of depression, anxiety and stress among the students, especially the teen-age students.

Objectives:

The study has the following objectives:

1. To analyse the causes and the states of the mental impairments of students of online classes during the Covid-19 pandemic, and

2. To put forward some remedial measures in order to contribute to a strategic removal of such impairments.

Samples:

A total of 15 samples were chosen for the study. The samples were randomly selected from the undivided Kamrup district of Assam, a north-eastern state of India. Four of these students belonged to the under 13 age-group, four others were in the above 19 age-group, and seven of them belonged to the teenage (age 13-19) group.

Impact of Interpersonal Relationships on the Imagists

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Abstract

In the second decade of the twentieth century, London, the capital of the United Kingdom and the metropolis of the British colonies, was of course a city, but not a very big one as it is today. The literary circles in the city were familiar to one another; and persons involved in those circles, despite their colonial or colonized or immigrant identities (Richard Aldington, William Butler Yeats, and Ezra Pound are relatable respectively), developed interpersonal relationships among them. These relationships had a profound influence on the high modernists. For example, the relationship between Richard Aldington and Hilda Doolittle had a great impact on Imagism. Their break-up was a major reason (in addition to that of World War I) why this literary movement came to an abrupt end. British modern poetry would have certainly been different if the movement could continue for a few more years. The present paper examines how interpersonal relationships influenced Imagism. For this purpose, the historical development of the literary movement has been taken into account in the paper.

Keywords: Imagism, World War II, interpersonal relationships, London, Colonialism

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An age of discovery followed the onset of the Renaissance in Europe in the fifteenth century and it is since this age that Europe came to know about many non-European countries. In the seventeenth and eighteenth centuries, many nations in Europe tried to exert trade influence over these distant lands. The eighteenth century witnessed the beginning of the European nexus of colonies there. Colonialism reached its peak in the nineteenth century. Meanwhile, the Enlightenment Movement and the Industrial Revolution took place, which made the already rich cities of Europe dense with migrants like the intellectuals and the labourers.

The United Kingdom was one of the brightest examples of colonizer. In the Victorian era (1837-1901), its colonial projects flourished, making it one of the wealthiest countries of the contemporary world (Ireland 564-72). London,

প্রযুক্তি আৰু ভাষা পৰিৱৰ্তন
ৰোমান লিপিৰে লিখা অসমীয়া ভাষা

ড° দীপামণি হালৈ মহন্ত

অসমীয়া ভাষাৰ ঐতিহ্য হাজাৰ বছৰ পুৰণি। এই ভাষাৰ নিজস্ব লিপি আছে, সাহিত্য আছে। ভাৰতবর্ষৰ উত্তৰ-পূব প্রান্তত প্রচলিত এই ভাষাৰ স্বকীয়তা খৃষ্টীয় সপ্তম শতিকাতে তেজিয়াৰ কামৰূপলৈ অহা চীন পৰিব্রাজক হিউৱেন চাঙে উপলব্ধি কৰিছিল। খৃষ্টীয় অষ্টম শতিকাৰ পৰা দ্বাদশ শতিকাৰ ভিতৰত ৰচিত বৌদ্ধ সহজযান পন্থাৰ ধর্মীয় গীতৰূপে পৰিচিত' চর্যাপদ'সমূহত আংশিকভাৱে ভাষাটোৰ প্রাচীনতম নির্দশন পোৱা যায়। চতুর্দশ শতিকাত হেম সৰস্বতীৰ দ্বাৰা ৰচিত 'প্রহ্লাদ চৰিত' ভাষাটোৰ প্রথম পূর্ণাংগ কাব্য। লিপিৰ ইতিহাস তাতোকৈও পুৰণি - খৃষ্টীয় পঞ্চম শতিকাৰ নগাজৰী খনিকৰ গাঁৱৰ প্রস্তৰখণ্ড লিপিৰ পৰাই অসমীয়া লিপিৰ বিকাশৰ ৰূপৰেখা প্রস্তুত কৰিব পাৰি আৰু ত্রয়োদশ শতিকাৰ উত্তৰ গুৱাহাটীত প্রাপ্ত 'কানাই বৰশী বোৱা' শিলালিপিত তাৰ পূর্ণ ৰূপ এটা লক্ষ্য কৰিব পাৰি। মন কৰা ভাল এই শিলালিপিত সংস্কৃত ভাষা লিখিবলৈ অসমীয়া লিপি ব্যৱহাৰ কৰা হৈছে। এক কথাত লিপি সাহিত্যৰ দিশত ভাষাটোৱে দীঘলীয়া পথ পৰিক্রমা অতিক্রম কৰি আহি সম্প্রতি একবিংশ শতিকাৰ দ্বিতীয় দশকৰ শেষ বর্ষ পাইছেহি। ভাষা এটাৰ বাবে সহস্র বছৰৰ পৰিক্রমা বৰ গুৰুত্বপূর্ণ। কাৰণ ভাষা স্থিতিশীল নহয়। চমস্কিয়ে কোৱাৰ দৰে ভাষা আহৰণৰ ক্ষমতা মানুহৰ সহজাত হ'লেও ভাষা- আচৰণ পিছে সামাজিক-সাংস্কৃতিক পৰিঘটনা। সমাজত থাকিহে মানুহে ভাষা ব্যৱহাৰ কৰে; ভাষা-আচৰণ

হেং দাং

বীৰ লাচিত সেনা, অসম, কেন্দ্রীয় সমিতিৰ

উদ্যোগত কেন্দ্রীয় লাচিত দিৱস উপলক্ষে প্রকাশিত স্মাৰক গ্রন্থ।

(২৩, ২৪ নৱেম্বৰ, ২০২১) ঃঃ স্থান ঃ ত্যাগ ক্ষেত্র, উত্তৰ লক্ষীমপুৰ, অসম

সম্পাদক	ঃ	মুকুট শর্মা
প্রকাশক	ঃ	বীৰ লাচিত সেনা, অসমৰ হৈ- ৰণ্টু পানীফুকন, মুখ্য সচিব, বীৰ লাচিত সেনা, অসম (কেন্দ্রীয় সমিতি)
প্রকাশ কাল	ঃ	২৪ নৱেম্বৰ, ২০২১
প্রচ্ছদ	ঃ	মনজিৎ ৰাজখোৱা
প্রাপ্তি স্থান	ঃ	ভাষা পাব্লিকেচন, গুৱাহাটী-০৩ ফোন-৭৮৯৬৮২৪৩২২
মূল্য	ঃ	৮০০.০০ টকা
ডিটিপি আৰু অঙ্গসজ্জা	ঃ	দীপাংকৰ বড়ো
বর্ণাশুদ্ধি	ঃ	চন্দন কলিতা
সহযোগী	ঃ	মাতু কুকুৰাজোৱা

মুদ্রণ ঃ অমৰজ্যোতি প্রিন্টাছ, চানমাৰি, গুৱাহাটী-৩

ভাষাৰ প্রশ্ন ঃ শংকা আৰু সংশয়—

বিষয় ঃ হিন্দু-বাঙালী—

প্রসংগ ঃ দেশী-বিদেশী —

বীৰ লাচিত সেনা, অসমৰ
কেন্দ্রীয় সমিতিৰ লাচিত দিৱসৰ স্মাৰক গ্ৰন্থ

হেঙদাঙ

সম্পাদনা
মুকুট শর্মা

ড° দীপামণি হাজৰিকা মহন্ত

প্ৰসংগাৰ্থ-বিজ্ঞানৰ দৃষ্টিকোণেৰে অসমীয়া ভাষাৰ বাক্-কাৰ্য

আৰু বাক্-কাৰ্য নিৰ্দেশক কাৰক বিচাৰ

যোগাযোগৰ মাধ্যম হিচাপে মানুহে ব্যৱহাৰ কৰা ভাষা বুজিবলৈ শুনোতাজনে (Listener) কেৱল কওঁতাৰ (Speaker) ধ্বনি, ৰূপ, বাক্যৰ পোনপটীয়া বা আভিধানিক অৰ্থ (Lexical Meaning) জানিলে নহ'ব; কওঁতাজনে কি পৰিবেশত কোন সময়ত কি স্থানত কাৰ লগত কেনেদৰে কৈছে ইত্যাদি বিষয়সমূহো জানিব লাগিব। মানুহৰ কথাৰ লগত জড়িত এনে বিষয়সমূহেই হৈছে কথনৰ প্ৰসংগ। মানুহে ভাষাক ভাষা ব্যৱহাৰৰ স্থান-পাত্ৰ-সময়ৰ লগত সম্বন্ধযুক্ত কৰিহে কথাৰ অৰ্থ উদ্ধাৰ কৰে। কোনো কথাক তাৰ সংলগ্ন পৰিবেশবপৰা নিলগাই চাই খুজিলে সেই কথাৰ কোনো অৰ্থ প্ৰকাশ নাপায়। গতিকে ধাৰণা কৰিব পাৰি, ব্যক্তিৰ ভাষা-ব্যৱহাৰৰ লগত প্ৰসংগ ওতঃপ্ৰোতভাবে জড়িত। সেয়ে প্ৰসংগত ব্যক্তৰ ভাষা-ব্যৱহাৰ সম্বন্ধে ভাষাবিজ্ঞানত গুৰুত্ব সহকাৰে বিচাৰ-বিশ্লেষণ কৰা হয়। প্ৰসংগ আৰু ব্যক্তিৰ ভাষা-ব্যৱহাৰৰ মাজৰ সম্বন্ধৰ আলোচনাক কেন্দ্ৰ কৰিয়ে 'প্ৰসংগাৰ্থ বিজ্ঞান' (Pragmatics) নামৰ বিদ্যায়তনিক শাখাটো গঢ় লৈ উঠিছে। জৰ্জ য়ুলে (George Yule) ইয়াৰ সংজ্ঞা এনেদৰে দিছে ঃ ভাষাগত ৰূপ আৰু সেই ৰূপ ব্যৱহাৰকাৰীৰ মাজৰ সম্বন্ধৰ অধ্যয়নেই হৈছে প্ৰসংগাৰ্থ বিজ্ঞান। লেভিন্সন (Lavinsion)ৰ মতেও প্ৰসংগাৰ্থ বিজ্ঞান হ'ল ভাষা আৰু প্ৰসংগৰ সম্বন্ধৰ অধ্যয়ন। অৰ্থ উদ্ধাৰৰ প্ৰসংগটি আধাৰ বা বুনিয়াদ হিচাপে কাম কৰে।২ পিচ্চেই (Peccei) কৈছে, কেৱল ভাষাজ্ঞানৰ জৰিয়তে অৰ্থ উদ্ধাৰ কৰিব নোৱাৰি। বস্তুজগত আৰু সামাজিক জগতৰ জ্ঞানো অৰ্থ উদ্ধাৰৰ বাবে প্ৰয়োজনীয়। প্ৰসংগাৰ্থ বিজ্ঞানে অৰ্থৰ লগত জড়িত এনেবোৰ জ্ঞান সম্বন্ধেও অধ্যয়ন কৰে।

গতিকে দেখা যায়, আমি কোৱা শব্দবোৰে নিজকৈ কোনো অৰ্থ প্ৰকাশ কৰিব নোৱাৰে। পৰিস্থিতি,

বিষয়

নলবাৰী