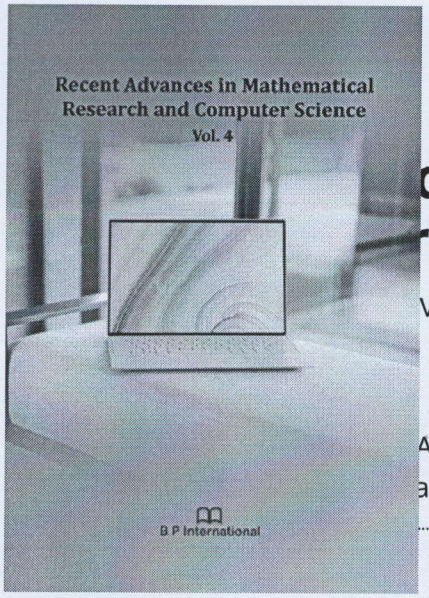


ces in Mathematical Research
r Science Vol. 4

V4/index)

AMRCS-V4/index) / Books
atical Research and Computer Science Vol. 4

(https://stm.bookpi.org/RAMRCS-V4/issue/view/462)

(https://stm.bookpi.org/RAMRCS-V4/issue/view/462)

Editor(s)
Dr. Manuel Alberto M. Ferreira
Professor,
Department of Mathematics, ISTA-School of Technology and Architecture, Lisbon University, Portugal.

ISBN 978-93-5547-214-4 (Print)
ISBN 978-93-5547-219-9 (eBook)
DOI: 10.9734/bpi/ramrcs/v4 (https://doi.org/10.9734/bpi/ramrcs/v4)

This book covers key areas of Mathematical Research and Computer Science. The contributions by the authors include model assistance, model calibration, semiparametric model, penalized splines, Gambler's ruin, random walks, Brownian motions, reserves, pensions fund, Two dimensional wave equation, one dimensional heat equation, unsteady motion, Navier Stoke's equation, incompressible flow, Auxiliary attribute, mean square error, Fixed effects, random effects, coefficient of determination, panel data and Hausman test, space-action, Dual bi-directional heuristic, heuristic, global optimum solution, bi-directional heuristic, optimum solution, multi-start heuristic, Gaussian distribution, channel capacity, directed divergence, information theory, uniform distribution,

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Chapter 4
Print ISBN: 978-93-5547-214-4, eBook ISBN: 978-93-5547-219-9

Study on Generalized Exponential Type Estimators for Ratio of Two Population Means Using Auxiliary Attribute in the Presence of Non-response

Kamlesh Kumar[1*], Sunit Kumar[1] and Anupam Kumar[2]

DOI: 10.9734/bpi/ramrcs/v4/4664F

Abstract

In this paper, generalized exponential type estimators for the ratio of two population means using auxiliary attribute in the presence of non-response, have been proposed. The expressions for the mean square error of the proposed estimators are obtained up to the first order of approximation. Some particular cases of the proposed estimators are also given. The conditions, under which the proposed estimators do better in comparison to the relevant estimators, are obtained. An empirical study using a real data set is also given to judge the performance of the proposed estimators. The aim of this paper is to find the estimators which are more efficient than the conventional estimator and exponential type estimators for ratio of two population means in the presence of non-response.

Keywords: Auxiliary attribute; mean square error; non-response; study characters.

1 Introduction

In sample surveys, the information on auxiliary character is generally used for estimation of the ratio of two populations. Using the information on auxiliary character, many research works for estimation of the ratio of two population means, have been developed by Singh [1,2], Shah and Shah [3], Tripathi [4], Singh [5], Birader and Singh [6], Upadhayay et al. [7] and Kumar and Srivastava [8].

Sometimes information on auxiliary character is not available but the information on auxiliary attribute is available. In such situations, Naik and Gupta [9], Jhajj et al. [10], Singh et al. [11], Shabbir and Gupta [12] and Singh and Solanki [13] proposed various estimators for population mean in sample surveys.

The problem of non-response was first introduced by Hansen and Hurwitz [14]. Further, using Hansen and Hurwitz [14] techniques of sub-sampling from the non-responding units, various research works for estimation of ratio of two population means using auxiliary character(s) in the presence of non-response, have been done by Khare and Pandey [15], Khare and Sinha [16-19], Singh and Kumar [20], Khare et al. [21,22], Kumar [23] and Ahmad et al. [24].

In this paper, we have proposed generalized exponential type estimators for the ratio of two population means using auxiliary attribute in the presence of non-response. The expressions for the mean square error of the proposed estimators are obtained up to the first order of approximation. Some particular cases of the proposed estimators are also given. The conditions, under which the proposed estimators do better in comparison to the relevant estimators, are obtained. An empirical study using a real data set is also given to judge the performance of the proposed estimators. The aim of this paper is to find the estimators which are more efficient than the conventional estimator and exponential type estimators for ratio of two population means in the presence of non-response.

[1]*Department of Statistics, Central University of South Bihar, Gaya, Bihar, India.*
[2]*Department of Statistics, PUC, Mizoram University, Aizawl, Mizoram, India.*
**Corresponding author: E-mail: kamalbhu03@gmail.com;*

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Vikas Srivastava
Shakti Mehrotra
Sonal Mishra *Editors*

Tropane Alkaloids

Pathways, Potential and Biotechnological Applications

Springer

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE

Principal
Pachhunga University College
Aizawl : Mizoram

Editors
Vikas Srivastava
Department of Botany
Central University of Jammu
Samba, Jammu and Kashmir, India

Shakti Mehrotra
Department of Biotechnology
Institute of Engineering and Technology
Lucknow, Uttar Pradesh, India

Sonal Mishra
School of Biotechnology
University of Jammu
Jammu, Jammu and Kashmir, India

ISBN 978-981-33-4534-8 ISBN 978-981-33-4535-5 (eBook)
https://doi.org/10.1007/978-981-33-4535-5

© Springer Nature Singapore Pte Ltd. 2021
This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE

Principal
Pachhunga University College
Aizawl : Mizoram

Contents

Part I Tropane Alkaloids: Diversity, Biosynthesis and Significance

1 **Plant Tropane Alkaloids (TAs): Chemotaxonomic Significance, Biogenesis, and Biotechnological Interventions** 3
Savita, Anju Srivastava, Reena Jain, Avinash Kaur Nagpal, and Pratap Kumar Pati

2 **Structure and Function of Enzymes Involved in the Biosynthesis of Tropane Alkaloids** 21
Neill Kim, Benjamin Chavez, Charles Stewart Jr., and John C. D'Auria

3 **Plant Tropane Alkaloids: Commercial Stature and Production Developments** 51
Shakti Mehrotra, Sonal Mishra, and Vikas Srivastava

Part II Tropane Alkaloids: In Vitro and Allied Interventions

4 **Involvement of Various Biotechnological Contrivances for Tropane Alkaloid Biosynthesis and Applications of Tropane Alkaloid-Bearing In Vitro Cultures** 69
Vikas Srivastava, Sonal Mishra, Skalzang Lhamo, Aksar Ali Chowdhary, and Shakti Mehrotra

5 **Hairy Root Cultures and Plant Tropane Alkaloids: Production Matrix and Product in Biotechnological Perspective** 89
Shital K. Sharma and Adarsh K. Agnihotri

6 **Production of Tropane Alkaloids (TAs) in Plants and In Vitro Cultures of Different Ploidy Levels** 105
Ishmael Dehghan and Elnaz Ghotbi

7 **Current Progress in Tropane Alkaloid Production by Transgenic and Heterologous Gene Expression Approaches** 113
Neeraj Kumar Dubey, Prashant Singh, Ankita Singh, and Satyendra Kumar Yadav

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE

Principal
Pachhunga University College
Aizawl : Mizoram

8 **Tropane Alkaloid Biosynthesis in Plants: Insights from Transcriptome Analysis** 133
Asosii Paul, Bendangchuchang Longchar, and Jeremy Dkhar

9 **Transcription Factor and MicroRNA-Mediated Manipulation of Tropane Alkaloid Biosynthesis** 157
Pravin Prakash, Rakesh Srivastava, and Praveen Chandra Verma

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

HHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Tropane Alkaloid Biosynthesis in Plants: Insights from Transcriptome Analysis

8

Asosii Paul, Bendangchuchang Longchar, and Jeremy Dkhar

Abstract

Tropane alkaloids (TAs) are a special class of alkaloids found naturally in a diverse group of flowering plant families. To date, about 200 TAs are known, the most prominent being hyoscyamine, scopolamine, calystegine, and cocaine. These compounds possess pharmacological properties and are used in medicine as anticholinergic agents and stimulants. Because of their medicinal value, tropane alkaloids have been the subject of study for several years now. Over the years, research has been directed at elucidating the biosynthetic pathways leading to the production of pharmacologically active TAs. The present chapter discusses recent developments in the understanding of TA biosynthesis with emphasis on the genes involved in the TA biosynthetic pathways and the role transcriptome profiling played in their identification. In recent years, mining of the transcriptome data of TA-producing plants, such as *Atropa belladonna*, has led to a near-complete elucidation of the biosynthesis of hyoscyamine and scopolamine. Advances in gene elucidation made through such studies can be potentially used for metabolic engineering in transgenic plant systems or microbial platforms to sustainably meet the global demand of pharmaceutically important TAs.

A. Paul (✉)
Department of Botany, Nagaland University, Lumami, Nagaland, India
e-mail: apaul@nagalanduniversity.ac.in

B. Longchar
Department of Life Science, Pachhunga University College, Mizoram University, Aizawl, Mizoram, India
e-mail: blongchar@pucollege.edu.in

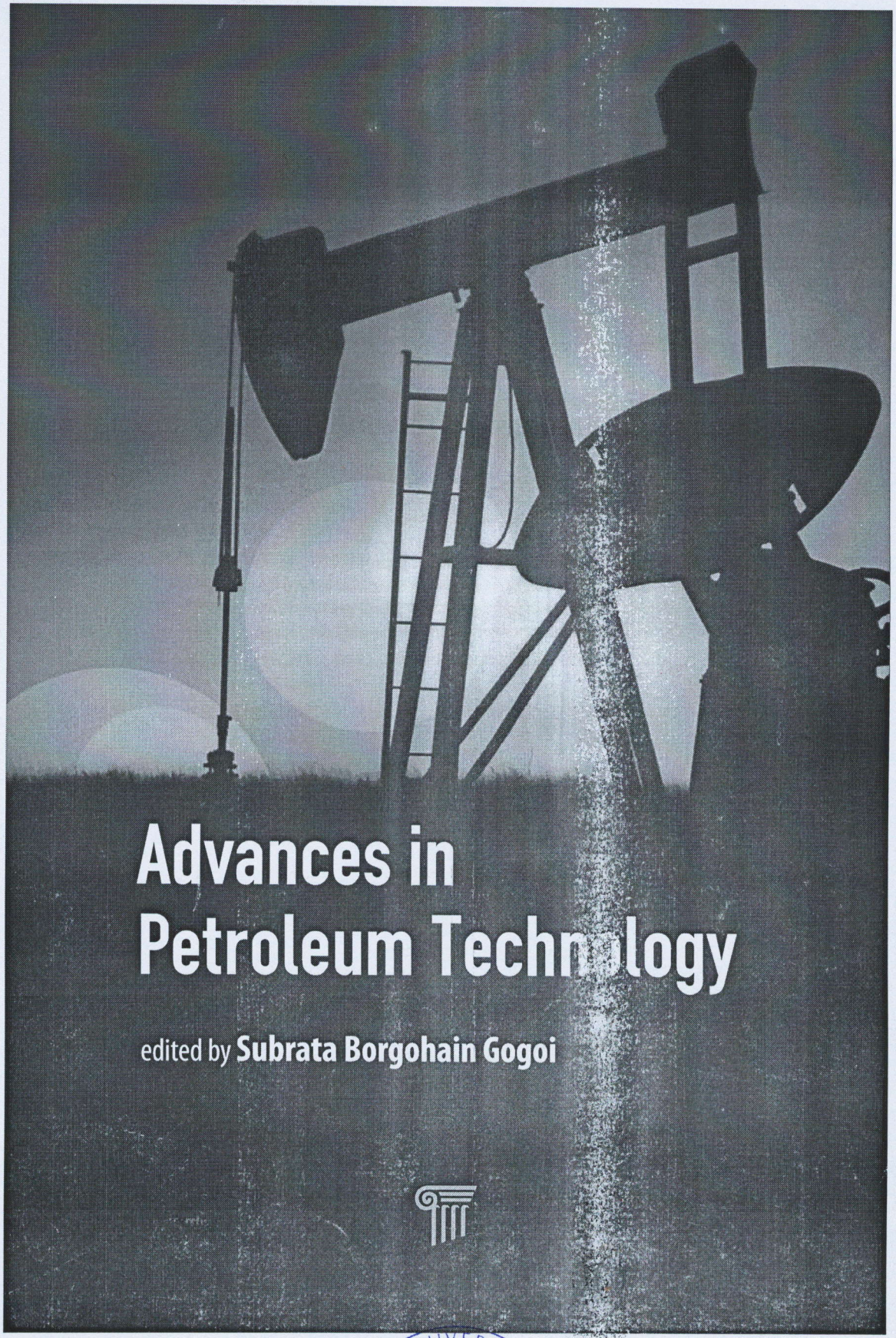
J. Dkhar
AMACIP Division, CSIR-Institute of Himalayan Bioresource Technology, Palampur, Himachal Pradesh, India
e-mail: jeremydkhar@ihbt.res.in

© Springer Nature Singapore Pte Ltd. 2021
V. Srivastava et al. (eds.), *Tropane Alkaloids*,
https://doi.org/10.1007/978-981-33-4535-5_8

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE

Principal
Pachhunga University College
Aizawl : Mizoram



Advances in Petroleum Technology

edited by **Subrata Borgohain Gogoi**

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Published by

Jenny Stanford Publishing Pte. Ltd.
Level 34, Centennial Tower
3 Temasek Avenue
Singapore 039190

Email: editorial@jennystanford.com
Web: www.jennystanford.com

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library.

Advances in Petroleum Technology

Copyright © 2021 Jenny Stanford Publishing Pte. Ltd.

All rights reserved. This book, or parts thereof, may not be reproduced in any form or by any means, electronic or mechanical, including photocopying, recording or any information storage and retrieval system now known or to be invented, without written permission from the publisher.

For photocopying of material in this volume, please pay a copying fee through the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, USA. In this case permission to photocopy is not required from the publisher.

ISBN 978-981-4877-19-0 (Hardcover)
ISBN 978-1-003-04993-7 (eBook)

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

3 Characterisation of Barail Sandstones of Mizoram: A Sedimentological Approach 49
Parakh Protim Phukan, Pradip Borgohain, Bubul Bharali and Devojit Bezbaruah
3.1 Introduction 50
3.2 Field Characteristics 53
3.3 Methodology 55
3.3.1 Depositional Environment 57
3.3.1.1 Lithofacies analysis 57
3.3.1.2 Granulometric analysis 59
3.3.2 Porosity Determination 62
3.3.3 Petrography 63
3.3.3.1 Observations 63
3.3.3.2 Porosity 68
3.4 Conclusion 75

4 Chemical Enhanced Oil Recovery with Special Reference to the Upper Assam Basin 77
Kalpajit Hazarika and Subrata Borgohain Gogoi
4.1 Introduction 78
4.2 Experimental 79
4.2.1 Material 79
4.2.2 Methodology 80
4.2.2.1 Core flooding 80
4.2.2.2 Selection of a CEOR slug 81
4.2.2.3 Recovery η 81
4.2.2.4 Areal displacement efficiency (E_d) 81
4.2.2.5 Areal sweep efficiency (E_a) 82
4.2.2.6 Overall efficiency (E_o) 82
4.2.2.7 Thermogravimetric analysis 82
4.3 Results and Discussion 83
4.3.1 Core Flooding 83
4.3.2 Mobility Ratio 86
4.3.3 Effect of Polymer on the CEOR Slug 88
4.3.4 Effect of Alkali on the CEOR Slug 88
4.3.5 Stability of ASP Slugs 90
4.4 Conclusion 90

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Contents

Preface xxiii

1 A Preliminary Study on Grain Size Analyses of Reservoir Rocks of the Upper Assam Basin **1**
Pranab Boral, Subrata Borgohain Gogoi, Tapan Jyoti Gogoi and Arunabh Borpatra Gohain

1.1 Introduction 2
1.2 Study Area 3
1.3 Methodology 4
1.4 Results and Discussion 9
1.5 Conclusion 28

2 Depositional Environment and Hydrocarbon Source Potential of the Barail and Disang Groups of Rocks along the Tuli–Mokokchung Road Section, Nagaland **29**
Manash Pratim Gogoi, Yadav Krishna Gogoi, Devojit Bezbaruah and Pradip Borgohain

2.1 Introduction 30
2.2 Geology of the Area 33
2.3 Geological Mapping 35
2.4 Depositional Environment 38
2.4.1 Granulometric Analysis 38
2.4.1.1 Cumulative curves 38
2.4.2 Relationship between Textural Parameters 39
2.4.2.1 Kurtosis (K_G) vs. skewness (S_K) 39
2.5 Evaluation of the Hydrocarbon Source Potential 42
2.5.1 Elemental Analysis 42
2.5.2 Rock-Eval Analysis 44
2.6 Conclusion 47

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE ★ AIZAWL ★

Principal
Pachhunga University College
Aizawl : Mizoram

Chapter 3

Characterisation of Barail Sandstones of Mizoram: A Sedimentological Approach

Parakh Protim Phukan,[a] Pradip Borgohain,[a] Bubul Bharali[b] and Devojit Bezbaruah[c]

[a] *Department of Petroleum Technology, Dibrugarh University, Assam, India*
[b] *Pacchunga University College, Mizoram, Assam, India*
[c] *Department of Applied Geology, Dibrugarh University, Assam, India*
pcube92@gmail.com

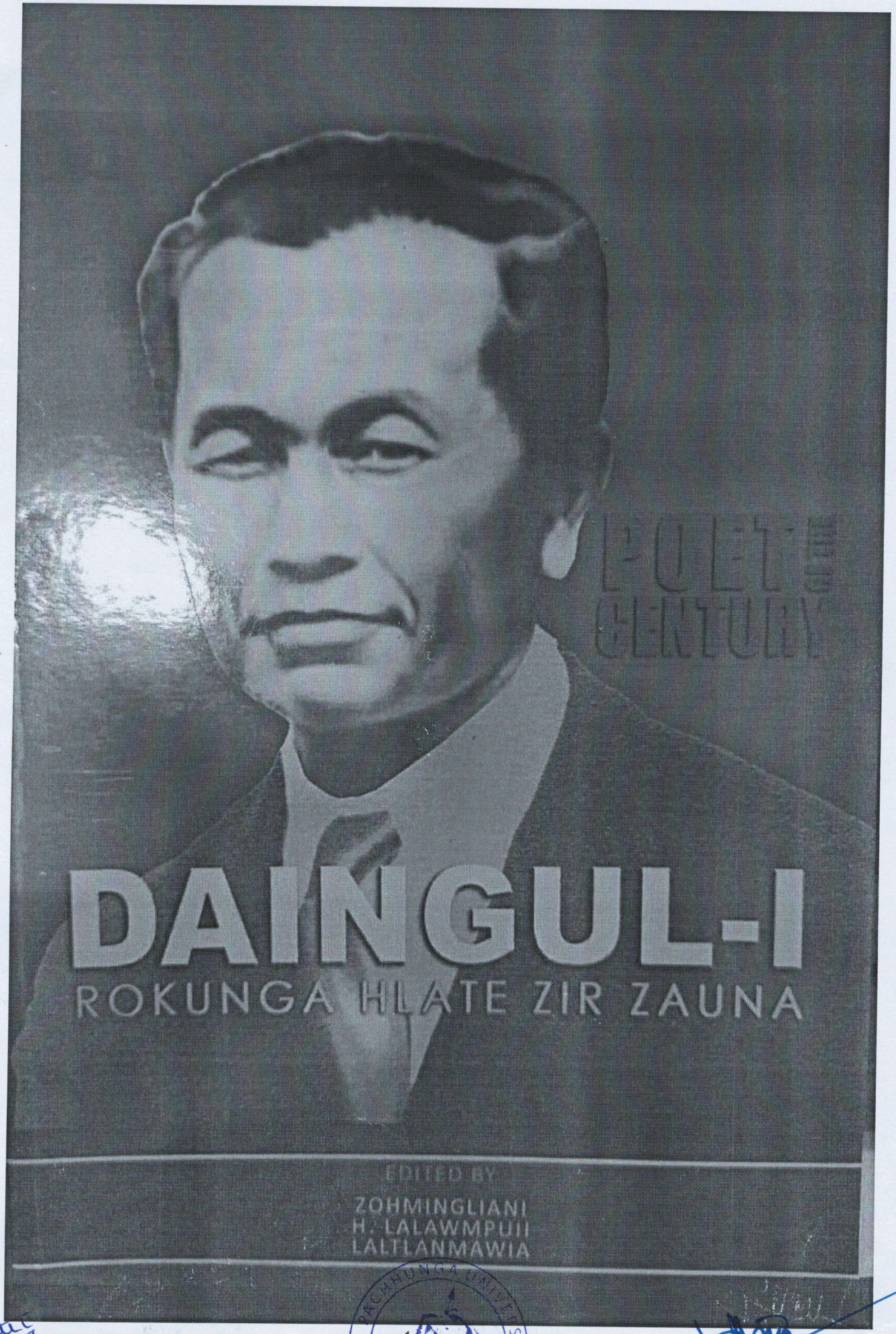
Mizoram is situated in the centre salient of the Chittagong–Mizoram–Tripura fold thrust belt of India. In the same belt prolific hydrocarbon (HC) prospects have been identified in Tripura but with very poor results in Mizoram. The present chapter is confined to the lithofacies analysis, granulometry, petrograpHy and porosity determination of the Barail sandstones exposed along the Champhai–Zokhawthar Road section (N23°28.435′, E93°20.007′ and N23°21.792′, E093°23.284′) of Mizoram. In the study area, the Barail sandstone represents alternate beds of sandstone with shale and siltstone. The sandstones are light grey to brown in colour. The lithofacies is characterised by a coarsening upward sequence, which suggests regressive effects of the sea during the deposition of the sediments. Granulometric analysis including various bivariate plots of statistical size parameters suggests

Advances in Petroleum Technology
Edited by Subrata Borgohain Gogoi
Copyright © 2021 Jenny Stanford Publishing Pte. Ltd.
ISBN 978-981-4877-19-0 (Hardcover), 978-1-003-04993-7 (eBook)
www.jennystanford.com

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram



Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

DAINGUL-I
(ROKUNGA HLATE ZIR ZAUNA)

A Compilation of Webinar Papers of
Five Days International Webinar on
Twentieth Century Mizo Literature
(With Special References to the Works of Writer of the Century and Poe
of the Century)

Organized by
Department of Mizo and Research & Consultancy Cell,
Government Hrangbana College
Aizawl-2021

Prize : Rs. 250.00

ISBN :978-81-951935-5-4

9 788195 193554

Published by
Mizo Department
Govt. Hrangbana College

Printed at
KL Offset Printers
MG Road, Upper Khatla
Aizawl, Mizoram
Phone : 0389-2311260/9862725123
email : kloffsetprinters@gmail.com

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A Constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Pachhunga University College
Aizawl : Mizoram

Rokunga Hlaa
Suangtuahna Khawvel Hlimthla
(The Hermeneutics of Symbolical Imagery in Rokunga's Poetry)

Dr. H. Laldinmawia
Asst. Professor, Pachhunga University College

Hlaa mihring suangtuahna khawvel hlimthla lo lang hi *'Poetic Imagery'* chu a ni mai awm e. Hla thu kan chhiar rual a, thil engemaw kan mitthla a lo lang nghal tlat thei te, kan benga a ri hria anga kan inngaih theihna te, a rim ni awm tak min hriat chhuahtir thei te, kan chil tiput a, ei leh in chakna min siam thei te, mi ti mur ur ur thei te hi 'poetic imagery' chu a ni vek mai.

'Image' tih hi Latin thumal *'imago'* tih aṭanga lak a ni a, chu chu mihring emaw thil siam dang emaw entawn a tarchhuah nawn (immitation or reproduction) tihna a ni a. Darthlalang hmaah kan han ding a, keimahni ang chiah, keimahni tak tak ni tawh si lo kan va hmu a, chu chu image chu a ni. Chutiang chiah chuan thu leh hla huangah hian, a tak tak ang maia thil nihna tarlan dan hi *'imagery'* tia sawi mai a ni ṭhin. Chu *imagery* chuan mihringa hriatna chi hrang hrang - mita hmuh theihna te, khawih theihna te, ri hriat theihna te, rim hriat theihna te chu hmanruaah a rawn hmang thei a ni.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

8. Rokunga Hla leh Nature
- *Lalzarzovi, Asst. Professor, GHC* - 121-130

9. Khuarel Mawina Thlirtu Ram Rohlu Rokunga
- *Thang Sian Thuang, Guest Faculty, PUC* - 131-147

10. Rokunga Hla 'Harh La, Harh La"
- *Sangrozami, Asso. Professor, GJTC* - 148-158

11. Rokunga Krismas Hla
- *F. Lalrinzuala, Guest Faculty, GHBC* - 159-171

12. Rokunga leh Mizo Culture
- *Sangkima, Lamka, Churachanpur* - 172-203

13. Rokunga leh Mizo
- *Daniel Vanlaldampuia, Guest Faculty, GAC* - 204-211

14. Rokunga Ram Hmangaihna Hlate Thlirna
- *Lalnunpuia, Guest Faculty, GAC* - 212-221

15. INDEX 222-225

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

ISBN: 978-81-951935-5-4

Khuarel Mawina Thlirtu Ram Rohlu Rokunga

(An eco-critical analysis of Rokunga Selected Poems)

Thang Sian Tluang
Guest Faculty, Pachhunga University College

Thu leh hla zirchikna huangah hian thil siam dangte chungchang zirna hi zirchikna huangah hian a lo lar tawh hle a. Kum zabi 18-na hun lai pawh khan thil siam dangte chungchang hi an thu leh hlaah hian an lo phuah nasa tawh hle a. Mahse, heng hun lai hi chuan *"thil siam dangtea kir lehna (return to nature)"* hi an thupui langsar ber a ni a. Hei vang hian *Donald Worster* phei chuan, *"Romantic literature* chuan min hual veltute chungchanga kan buai lai chauh a tarlang a, a chhan chu *romantic literature*-in a tum berte zing ami chu thil siam dangte laka mihring mihrinna danglam dan leh mi tin damna pek emaw kan hmuh theih leh kan hriat theihna sawm khawm a... thil siam dangte nena inring tawn a, mihring chhungril ṭhatna leh khuarel chu chhungril lama inring tawn zela khawvel siam ṭhat tumna lam hi a ni," (Worster 82) tiin a sawi hial a ni.

Romantic hun lai kha chuan nungchate dikna (rights of animals) chungchang ziah hi an uar hle a; nungcha -hunga hlei lenna ang chi ran talhna in te, ei siamna hmun

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

DIFFERENTIAL EQUATION — Dr. J. Lalvohbika & Dr. R. Lianngenga

PUC PUBLICATION

978-81-951732-0-4

BNZ OFFSET

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga Unive
Aizawl : M

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

$$4\frac{d^2x}{dt^2} - 4\frac{dy}{dt} - 8x = 8t$$

$$\frac{dx}{dt} + 4\frac{dy}{dt} = 3y$$

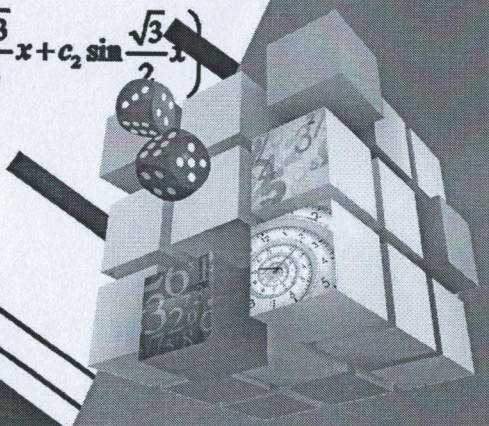
$$\frac{1}{2}d\left(\frac{e^x}{y^2}\right)$$

$$\frac{\partial z}{\partial x} = p = (y + b)$$

$$r = \partial^2 z / \partial x^2, \quad s = \partial^2 z / \partial x \partial y$$

DIFFERENTIAL EQUATION

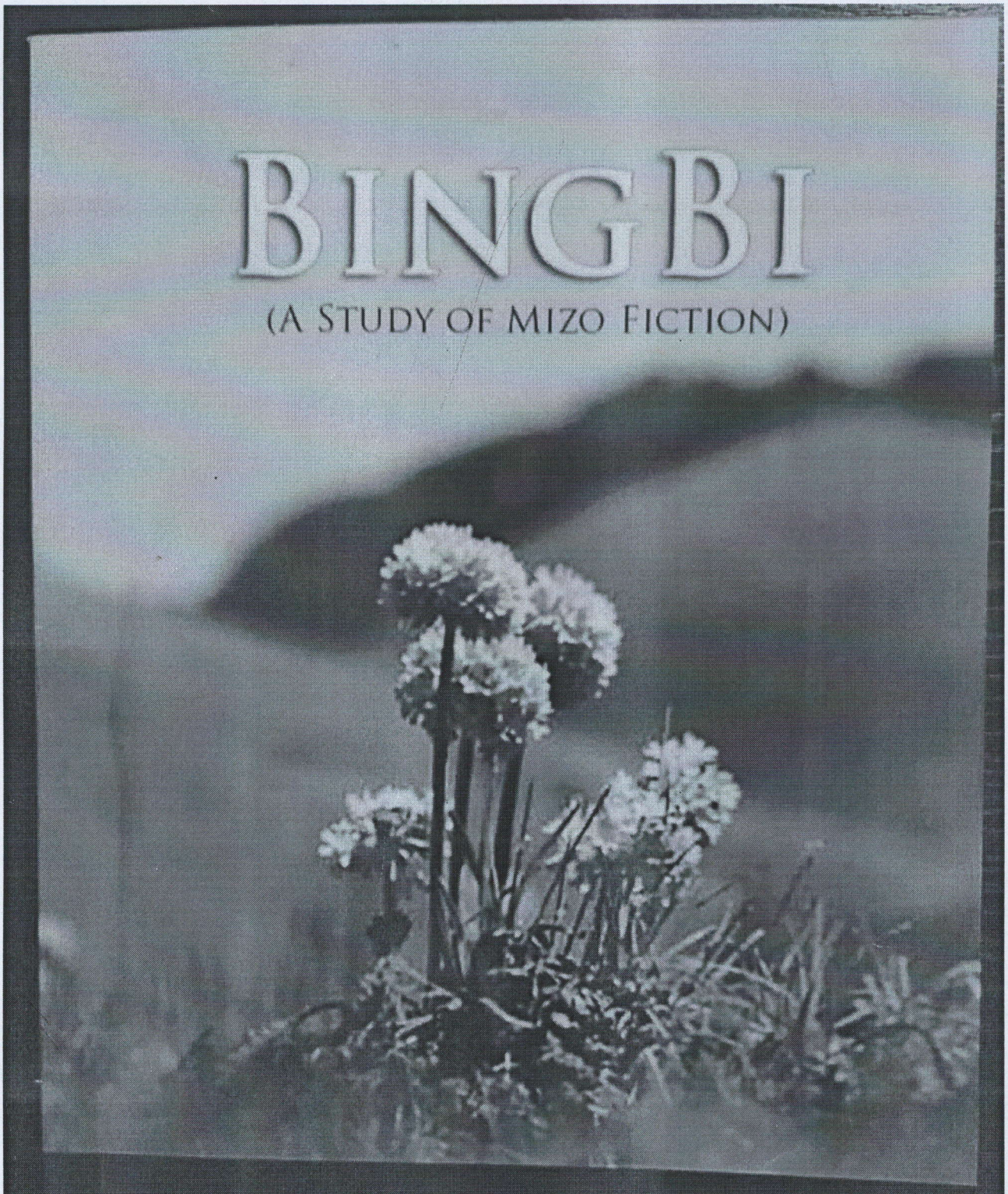
$$\therefore C.F. = e^{\frac{1}{2}x}\left(c_1 \cos\frac{\sqrt{3}}{2}x + c_2 \sin\frac{\sqrt{3}}{2}x\right)$$



Dr. J. LALVOHBIKA
Dr. R. LIANNGENGA

BINGBI

(A STUDY OF MIZO FICTION)



Department of Mizo
Government Khawzawl College

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

BINGBI
(A Study of Mizo Fiction)

Edited by

Lalrinchami Khiangte
H.Lalthanpuii
Rochharzela

Published by

Department of Mizo,
Government Khawzawl College

Edition : 2021

Price : Rs. 250/-

ISBN : 978-81-947253-5-0

©Copyright Reserved

Cover Design : T.S Khupchong

Printed at

TM OFFSET PRINTING PRESS
Canteen Square, Dawrpui, Aizawl
Ph. : 0389 2312796 / 9862536084

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

i)
ii)

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

THU AWMTE

i) Thuhmahruai.....
ii) Principal Message.....6
.....9

ṪHEN KHATNA - MIZO THAWNTHU ZIR CHIANNA

1. Generation Alpha Leh Mizo Novel
– Dr. H.Laldinmawia.....12
2. 'Hawilopari' Thawnthua Mizo Hnamzia Leh
Khawtlang Nunphung Lo Lang Thenkhatte
– Laksangpuii.....21
3. 'Pu Hanga Leilet Veng'-a C.Ṭhuamhuaia Thuthla
– R.D. Lalsanglura.....28
4. Re-Reading 'Nunna Kawngthuam Puiah'
From Postcolonial Perspective
– Dorothy Zonunsangi.....35
5. Representing Tribal Identity of Mizo
In The Novel - 'Ram Leh I Tan Chauh'
– Dr. Zoramdinthara.....46
6. 'Silvarthangi' Behchhana Zikpuii Pa Thawnthua
Poetic Justice Chhuina
– Lalthanmawia.....57
7. 'Chalkunga Leh Thanghmiangi'
Thawnthua Ṭhian Ṭhatna
– Vl.Muanpuia Chawngthu.....64
8. Mizo Hnam Lung Phum a Nghing
(Zikpuii-Pa 'C.C. Coy No. 27' Zir Chianna)
– Lalrammuana Sailo.....75
9. An Individual Story of Loss In 'Maymyo Sanapui'
– Lalrinkimi.....85
10. Psychoanalytical Approach on 'Chhingpuii'
– Lalzuithuanga.....95

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

11. Interracial Relationship In C. Thuamluaia's 'Sialton Official'
– H.Lalawmpuia.....103
12. Queer Reading On 'Engtin Awm Ta Zel Ang Maw?'
– C.Lallianzuala.....114
13. 'Aukhawk Lasi' Thawnthu Behchhana Mizoten Lasi An Hriat Dan Leh Ngaih Dan Thlirna
– B.Lalruatpuia.....121
14. A Study Of Folk Beliefs With The Reference Of 'Khawkil Bung Huai'
– Vanlalṭana Khiangte.....134
15. Thlarau Khuaah Rauthlain A Leng (R. Zuala 'Rauthla Leng' Thlirna)
– Malsawmdawngzuala.....143
16. James Dokhuma 'Khawhar In' Thawnthua Hmeichhiate
– V. Lalberkhawpuimawia.....153
17. 'Khawhar In' Thawnthu Aṭanga A Hunlai Nula Leh Tlangval Nun Zir Zauna
– K.Lalnunzama.....164
18. Treatment Of Women In The Selected Fictions Of James Dokhuma
– H.D.Lalrinkimi.....171

ṬHEN HNIHNA - MIZO THAWNTHU THLIRNA

19. 'Damlai Thlan Thim' Leh Social Reform
– Dr Lalnunpuia Renthlei.....182
20. 'Omnus' – As A Science Fiction
– Vanlalhmangaihsanga.....195
21. 'Ka Hmangaih Tlat Che' As A Christian Fiction
– Lalzarzovi.....203

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Pachhunga University College
Aizawl : Mizoram

8

MIZO HNAM LUNG PHUM A NGHING (ZIKPUII-PA *C.C. COY NO. 27* ZIR CHIANNA)

Lalrammuana Sailo

Assistant Professor, Department of Mizo
Pachhunga University College

Thuhmahruai:

Zikpuii-pa thawnthu tawi *C.C. Coy. No. 27*-ah hian Mizo pi pute nun fir leh khawthlang mite nun-zia, British-ho rawn ken luh chu Mizo nuna a insual dan a tar lang a, a bik takin Ralkapzauva nun kal tlangin chu chu tar lan a ni zual a ni.

He thawnthu hi mahni chanchin ziah dan (autobiographical narrative) a ziah a ni a, thawnthu sawitu Ralkapzauva chu a changtupa ber niin, ani chuan, "Mawlna leh atna ram ata lo chhuak tura ka beih dan erawh ka han ziak chhuah hian thawnthu a lo chang ta a ni," (Zikpuii pa 15) a ti a ni. He ram 'mawlna leh atna ram' tia a sawi hian Ralkapzauva lo chhuahna ram mite mizia, khawtlang nun leh hnam zia (culture) te a kawk a: ram pakhat zawk,

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

19

DAMLAI THLAN THIM LEH SOCIAL REFORM

Dr Lalnunpuia Renthlei*

Assistant Professor; Department of Mizo
Pachhunga University College

1. *Damlai Thlan Thim* Thawnthu Tlangpui

Thingtlang khaw pakhat, Mualnuamah chuan chhungkaw pakhat hi an awm a, nupa, fapa pakhat nei an ni. Pa ber Pu Muana chu tun hma lamin fel ṭhin viau mah se, zu in a chin tâk hnuah chuan a hna aṭanga bàn a ni a, zu a in nasat luat avangin an retheih phah hle a. Chutih lai kârah nu ber Pi Biaki beidawng chu a lo uire ve mek a, pa ber chuan a hnawt chhuak ta a. Pa berin a awm dàn a bansan hlei thei si lo va, a fapa Lalchhuanawma beidawng chu tlema a'n lei kàn deuh hnu chuan a pa hriat lohvin Aizawl lamah a vâk lût ve ta ringawt a. Veng pakhata awm, chhungkaw fel tak, Pu Thandangate inah a khawsa chho a.

**** Dr.Lalnunpuia Renthlei tih leh 'Nununa Renthlei' tih hi mi pakhat/ mi thuhmun a ni e.***

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

ISBN-978-81-947253-5-0 243
978-81-9517

25

RZUALA 'RAUTHLALENG' BIH CHIANNA

Remlalthlamuanpuia

Assistant Professor, Department of Mizo
Pachhunga University College

R.Zuala '*Rauthlaleng*' Thawnthu Tlangpui:

Rauthlaleng thawnthu hi Hrangkhuma, Khuma tia an kohin mun buai hmaa a thil tawn a sawina thawnthu a ni a. Khuma hi Hualtu khua a ni a; Hualtu chu Ṭawi tlang siper, chhim thlang ep deuha awm a ni a, in 180 vel an ni bawk. Khuma sawi dan chuan Ṭawi tlang kar biru fahran maiah hian dil ṭha tak a awm a, hmuh fuh a har hle niin an sawi ṭhin a. Kum 1950 vel khan Sap pakhat hian a tawn finfiah bawk a; mahse, amah Khuma ber pawh hian a la hmu lo thung.

Zan khat chu a mumangah chuan dil chu a hmu a; dil tui fim tak a ni a, a han insil vel a, a tui chu a vawt hle niin a sawi a. Chu dil chuan hmar pawh a nei lo a, luan chhuah lehna pawh a neih chhunah pawh a dir ker ker chauh niin a sawi bawk. Dil mawng lam, a luan chhuahna bulah chuan lungpher zau tak a awm a, chuta a awm lai

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

PACHHUNGA UNIVERSITY COLLEGE

ROTHÛL

A CRITICAL STUDY ON DRAMA FROM
UG & PG (MIZO COURSES) UNDER MZU & ICFAI UNIVERSITY

DEPARTMENT OF MIZO
GOVT. AIZAWL COLLEGE

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Compiled and Published by
Department of Mizo
Govt. Aizawl College

ROTHÛL: A Critical Study on Drama from UG & PG (Mizo Courses) Under MZU & ICFAI University

Edition : 2021

Price : ₹ 200/-

ISBN : 978-81-951732-5-9

Copyright© by Department of Mizo, Govt. Aizawl College
All rights reserved. No part of this book may be reproduced in any form or by any electronic, mechanical, photocopying, recording, or by any information storage and retrieval systems, without the prior permission in writing from the copyright holder.

Printed at:
EBENEZER Offset
Luangmual, Tlangnuam
☎ 9436393775, 8974382373

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Pachhunga University College
Aizawl, Mizoram

17. 'As you like it' thuruk
— *C. Lallianzuala* ---------- 133

18. Duhmanga leh Dardini
— *Vanhlupuii Ralte* ---------- 142

19. Darlalpuii
— *Lalnunpuia* ---------- 159

20. Julius Caesar
— *Vanlalduata* ---------- 165

21. Lalnu Ropuiliani
— *Dr. Lalnunpuia Renthlei* ---------- 178

22. Nationalism in 'Lungrualma tlang'
— *Remlalthlamuanpuia* ---------- 196

23. Hausakna nun dik tak
— *Lalrinkimi* ---------- 208

24. Ramthanga te chhung
— *Vanlalhmangaihsangi & Khawpuimawii* --- 218

25. Thu a tawp e Lumâm!
— *Laltlanmawia* ---------- 223

26. Beiseina kawl eng
— *Daniel Vanlaldampuia* ---------- 231

27. Unau hmel hai
— *Lalrothuanga* ---------- 237

28. Hmeichhe hmasawnna
— *V.L Muanpuia Chawngthu* ---------- 246

29. Lalngaihawmi
— *Lalrammuana Sailo* ---------- 256

30. Chhingpuii
— *Lalsangpuii* ---------- 262

31. A va pawi tak em!
— *Lalzarzovi* ---------- 270

32. Lawm a kim
— *K. Zochungnunga* ---------- 280

33. Shylock-a leh Venice sumdawng
— *J.H Lalrinzuala* ---------- 289

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE ★ AIZAWL ★

Principal
Pachhunga University College
Aizawl : Mizoram

"LALNU ROPUILIANI" LEMCHAN THAWNTHU THLIR ZAUNA

Dr Lalnunpuia Renthlei
Assistant Professor
Pachhunga University College

1. A Lemchan Thawnthu Chhehvel (Context):

Laltluangliana Khiangte lemchan thawnthu ziah, "Lalnu Ropuiliani" hi kum 1990 bâwr vêla ziah a ni a. Hemi kuma Mizoram sawrkar hnuaia Art & Culture Department buatsaih, Mizoram Open Drama Writing Competition-ah chuan a ziaktupa hian he lemchan hi a theh lût ve a, lawmman pakhatna a dawng nghe nghe a ni.

Kum 1994-ah a vawi khat nan khâwla chhut chhuah a ni a, a bu hmingah *Lemchan Khawvel I: Lalnu Ropuiliani* tiin dah a ni a. He lehkhabuah hian lemchan thawnthu dang pahnih, "Darlalpuii" leh "Thawmvunga" pawh dah tel niin, "Darlalpuii" hi Lalchungnunga buatsaih a ni a, "Thawmvunga" hi Laltluangliana Khiangte ziah a ni leh bawk.

He lemchan thawnthu hi Mizo hnam chanchina thil thleng ngei chanchin tàr lanna a ni a, phuah chawp thawnthu mai a ni lo. Ropuiliani leh a laizâwnnu Laltherite hian chanchin ngaihnawm tak leh chhinchhiah tlâk tak an nei a ni.

A ziaktu, Dr Laltluangliana Khiangte hi Mizo lemchan lam zir bingna huanga *doctorate degree* nei hmasa ber a ni a. Lemchan lam hi a tuipui em em a, Mizo zingah pawh lemchan thawnthu ziak tam berte zinga mi a ni a. A lemchan thawnthu ziah pakhat, *Pasaltha Khuangchera* phei chu Mizo Academy of Letters (MAL) 'Book of the Year - 1997' lawmman dawngtu a ni nghe nghe a. Mizo

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE ★ AIZAWL ★

Principal
Pachhunga University College
Aizawl : Mizoram

'LALNGAIHAWMI' LEMCHAN THLIRNA

Lalrammuana Sailo
Assistant professor
Pachhunga University College

Thu hmahruai :

R.L. Thanmawia ziak Lalngaihawmi lemchan thawnthu hi kum 2009 a tih chhuah niin a kum leh 2010-ah chhut nawn leh nghal a ni a, phek 201-a chhah a ni. He lemchan hi romantic drama huangah kan khung thei ang a, plot kalhmangah chuan simple aiin complex rawng a kai zawk a. Changtute zinga langsar bik pakua awmin Sanga, Vawra, Dina, Lalngaihawmi, Puii, Chhingi, Dr. Ropuia, Dr. Zuala leh Luri te an ni a. Heng zingah hian Sanga hi changtupa ber (protagonist) niin ṭhenkhat chuan hero ang pawhin an sawi thei ang. Misual, buaina leh harsatna chawk chhuaktu (antagonist) zingah Dr. Zuala leh Luri te an tel thung a. He thawnthu-a harsatna lo irh chhuahna hnukpui ber (main conflict) erawh dawt thu thang, fiah mai si loh vang a ni a. Chu dawt thu thang chu fiaha a awm a, thu thang chu phuah chawp a nih a lan chhuah hnuah thawnthu chu thihna karah boruak zangkhai zawk tawng chho turin tih tawp a ni.

Lemchan thawnthu ruangam bih chianna :

Aristotle-an lemchan kulmuk (tragedy) atana thawnthu ruangam (plot) pawimawhzia a sawi kan hre awm e. Plot hi E.M. Forster-an a sawi fiah dan han belh hlek ila: Forster-a chuan *Aspect of Novel* lehkhabuah plot (thawnthu ruangam) leh story (thil thleng) danglamna heti hian a sawi a. "Lalpa chu a thi a, Lalnu pawh a thi ve ta a," (The king died and then the queen died) tih chu story a ni a. "Lalpa chu a thi a, Lalnu pawh Lalpa thi a sun em avanga lungngaiin a thi ve ta a," (The king died and then the queen died because of

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

ISBN-978-81-951732-59

NATIONALISM IN 'LUNGRUALNA TLANG'

Remlalthlamuanpuia
Assistant Professor
Pachhunga University College

Rozama Chawngthu lemchan ziah *Lungrualna Tlang* tih hi Chan 3-ah then a ni a. Chan khatna aṭanga chan thumna thleng hian hian chan khatah Lan 3 zel a awm a. He lemchan thawnthu hi *performing drama* tiin a sawi theih awm e. Hetiang drama-ah hi chuan, *"lemchan chu a chan a chan chhuah,"* (Laldinmawia 115) a ni ṭhin a ni.

He lemchan thawnthu *Lungrualna Tlang* tihah hian changtu mi sawmhnih vel an awm a. He lemchana a changtu berte zing a mi Mawia hi tlangval fel tak, Mizote hi India rama cheng an nih avangin *Indian* an ni a, inla hrang thei an ni lo tih ngaih dan nei mi a ni a. Vai leh Mizote inunauna mai ni lo, Zohnahthlak inpumkhatna pawh a vei em em a, a theih ang angin hma a la ṭhin. Hetiaṇga hma a lakna kawngah hian vai thawhpui pakhat a nei a, a hming chu *Sharma* a ni a. Ani hi Mizoramah kum hnih vel a awm tawh a, Mizote nun dan a hmuh hian an khaw tlangvalte chuan Mizote nun dan zir ve se a duh em em a, thawhpui atan Mawia chu a rawn sawm a ni.

Mawia chuan vai rama kal tur chuan Liana, Kunga leh Mapuia te chu a sawm a; Mapuia tih loh zawng chu an kal thei a. Mapuia aiah Zova an hruai tel bawk. Vai ram aṭanga an lo haw leh hnu chuan vaiho nun dan ṭha tam tak an hriatte chu an sawi a. An vai thianho pawhin Mizoram rawn tlawh an tum avangin theihtawp chhuaha tan lo lak an tum thu an sawi bawk a. Vai rama an kal khan football leh *cricket* an khel ho a, an innel phah hle a. Mizora[illegible] an lo kal hunah erawh chuan hrain lam leh vai thlenga lantir an t[illegible]

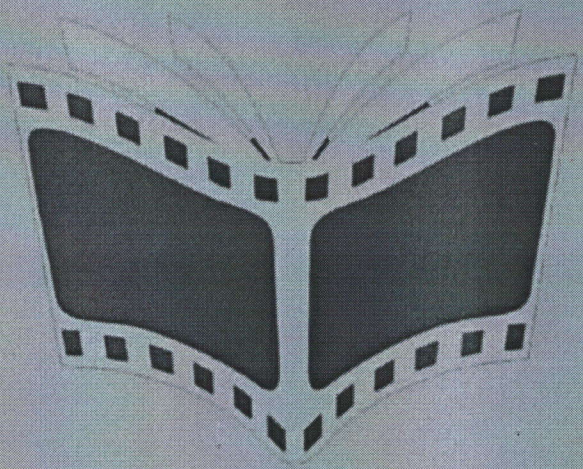
Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

MIZO SCREENPLAY

Essays on Screenplay and Film Studies



Edited by

Nununa Renthlei

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
1
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Published in Mizoram (India) by
Songbird Publication
Copyright © Nununa Renthlei 2021

First edition : 2021
ISBN : 978-93-5473-242-3

₹300.00

The views and opinions expressed in this book are the author's own and the facts are as reported by him, and the publisher is not in any way liable for the same.

All rights reserved.
No part of this book may be reproduced,
or transmitted in any form or by any means, electronic, mechanical, photocospying, recording, or by any information storage and retrieval system, without the prior permission in writing from the copyright holder.

Published by
Songbird Publication
A-45/3, Electric Veng, Aizawl
email: songbirdpub21@gmail.com
Mobile: 9612124760/9863179962

Printed and bound at
Gilzom Offset
A-54, Electric Veng, Aizawl
Ph. 2321950/2325216/9436151950

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

A CHHUNGA THU AWMTE

Foreword iii
Editor Thuhma iv
Seminar Chanchin Tawi v
Mizo Drama Society vii

Chapter - I
INTRODUCTION TO SCREENPLAY

1. Screenplay Writing: A Kalhmang leh Hriat Tur Pawimawhte 3
   – Dr Zarzosanga
2. Kan Tualzal Lemchan 33
   – Vanneihtluanga

Chapter - II
THE CREATION OF SCREENPLAY

3. Original Screenplay 39
   – Dr Lalfakawmi
4. Film Adaptation 52
   – Vanlalṭana Khiangte
5. Screenwriting Softwares 71
   – R. Ramdinmawii

Chapter - III
THE FOUNDATIONS OF SCREENWRITING

6. The Art and Craft of Story in Screenplay 83
   – H. Lalduhzuala
7. The Art And Craft of Characters in Screenplay 93
   – RD Lalsanglura
8. Screenplay-a Antagonist-te Dinhmun leh Pawimawhna 100
   – Gabriel Lalmuankima
9. The Art and Craft of Plot in Screenplay 111
   – R. Lalngaihawma

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

22. Film Lehlin Chanchin leh Film Lehlinin Mizote A Nghawng Dan — 242
– Thang Sian Tluang
23. Film Lehlin Pawimawhna — 249
– Lalchhanhima Mizo

Chapter - VIII
FILM INDUSTRY

24. Origin and Development of Mizo Film — 255
– Vanlalhrilha
25. Khawvel Film Industry Hrang Hrangte Chanchin — 276
– Esther Malsawmkimi

Chapter - IX
LAW AND THEATRE

26. Copyright: An Appraisal for Mizo Screenplay — 287
– Dr Maria Lalrinmawii
27. Copyright Infringement and Remedies with Special Reference to Pirated Movies — 295
– P. Lalremruati

Chapter - X
PROSPECTS OF MIZO FILM INDUSTRY

28. Mizo Film Tun Dinhmun — 305
– Lalzuitluanga
29. Mizo Film Hmakhua leh Hmathlir — 312
– Lalzarzovi
30. Mizo Screenplay Tun Dinhmun leh Hmathlir — 324
– PC Lalnunmawii
31. Mizo Film Dinhmun: Tlakchham leh Mamawhte — 331
– G. Lalnuntluanga

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL
2

Principal
Pachhunga University College
Aizawl : Mizoram

ISBN: 978-93-5473-242-3

MIZO FILM TUN DINHMUN

– Lalzuitluanga

1. *Film Sawi Fiahna*

Film tih hi Mizo ṭawng ang maia kan hman tawh a ni a. Sawi fiah leh chuan pawh ngai lo hial tura ngaih theih a ni. Amaherawhchu, he *paper*-ah hi chuan han sawi fiah hram ila a ṭha awm e. *Film* chu a awlsam zawnga sawi chuan milem che thei han tih mai tur a ni a. Amaherawhchu, milem che thei tih ringawt hi chu a fiah tawk lo thei. Mihring nunchan, TV-ah emaw, *cinema*-ah emaw en tura chhuah tiin sawi ta ila, a fiah deuh thei awm e. Chuti chuan, *film* siam tur chuan a *script* a awm a ngai a, a changtute (*actors*) an awm a ngai a, *film* hmuhnawm tak a nih theihna tura a changtute lo hui khawm leh ṭul dang ngaihtuahtu, *director* an awm a ngai bawk a. Hêng kan sawi pathum bâk pawh hi sawi tur dang a la awm. Hêng kan sawi chin hi chu ngei ngeia awm tur thil a ni.

2. *Mizote leh Film*

Mizovin *film* kan neih hmasa ber nia lang chu kum 1983-a *Phuba* tih *film*, Youngster Film Company-in a siam hi niin a lang (Biakthansanga n.pag). Mizo *film* bul ṭan hun hi 1983 vel daih tawh ni mah se la, kan uar chhoh hun tak tak hi chu kum 2000 chho vel kha a ni. Kum 2000 hnu lamah phei chuan a chhuak chho ve zut zut reng tawh a. Tun hnai deuh kum thum, kum li vel liam ta aṭang phei kha chuan Mizo hian *film* en tur kan ngah hle tawh a. Tunah chuan Youtube-ah en theih a dah luh a ni zel tawh bawk a. Chu vangin, Mizo *film* pawh duh duha hmeh chhuah tur a awm tawh a ni.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

ISBN: 978-93-5473-242-3

FILM LEHLIN CHANCHIN LEH FILM LEHLININ MIZOTE A NGHAWNG DAN

– Thang Sian Tluang

CVL Ruata chuan, "Kum 1989 kum tawp lam leh 1990 kumah Mizoramah *cable* TV a lo lut ṭan a," tiin a sawi a. Mizorama *cable* TV hmasa ber chu Skylinkṣ niin, anni hian July 1990 khan an din a, tunah erawh a tawp tawh a. Zonet hian dawtin, November 2004-ah din a ni a. A pathumna chu LPS Vision Productions Private limited niin, anni hian an *official website*-ah ni August ni 29, 2011-ah an din nia tar lan a ni.

Mizo Programme Cable TV *local channel*-a pek chhuah hmasak ber erawh chu March ni 17, 1991 niin, a pe chhuaktu chu 'Best Vision' an ni a (Zofa 124). Chumi hnuah Mizo-te ngei pawhin *film* puitling an siam chho zel a, Mizo *film* hmasa ber chu *Ka Nu Khawnge I Awm*? tih niin Lalhmachhuana Zofa chuan a sawi bawk (Ibid 124).

Mizorama *cable* TV a lo luh hnuah hian Mizote hian *film* lamah nasa takin hma an sawn a. Mizo thawnthu ziakte pawh hnam dangin an chang ta hial a, Mizo thawnthu ziak hnam dangin an chan hmasak ber chu *Hmangaih Zoramthangi* tih thawnthu Dr H. Lallungmuana ziah a ni a. Mizo thawnthu mai ni lo, a tak taka mihring awmte ngei behchhana hnam dangin Mizo pa chanchin *film*-a an siam hmasak ber erawh chu HT Sangliana chanchin hi a ni.

Cable TV a lo luh aṭang hian mahni hnam ṭawnga *film* en châkna a pung zel a, mi thiamte pawhin chu lamah an rilru sengin *film* lehlin bul ṭan châkna an nei chho zel a. Chu chuan rah ṭha

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

MIZO RAP MUSIC
ZIR CHIANNA

(A Critical Study of Mizo Rap Music)



Edited by

ZOMUANI CHERPOOT
LALTLANMAWIA

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

A CHHUNGA THU AWMTE

Thu Ziak Thawhtute - 5
Principal Thu Hmá - 7
Coordinator Thu Hmá - 9

BUNG KHATNA - RAP MUSIC BIH CHIANNA

1. Webinar on Mizo Rap Music Kha! - 15
   -Lalrammawia Ngente
2. Mizo Rap Music: A Ṭobul leh a Ṭhan Chhoh Zel Dan - 17
   - Dustin Lalkulhpuia
3. Styles and Techniques of Mizo Rap Music - 32
   - Dr Lalnunpuia Renthlei
4. Mizo Hip Hop Culture and The Growing Influence of Mizo Rap Music - 52
   - Zorinsangi
5. Rap Culture-in Mizo Nun A Nghawng Dan - 67
   - Vanlalṭana Khiangte
6. Mizo Battle Rap History - 80
   - Zonunmawia Fanai (G'nie)
7. An Analysis of Mizo Rap Songs: Linguistic Perspectives - 90
   – R. Ramdinmawii
8. Rap Music As A Confessional Music - 105
   - Ellis F. Zadingliana
9. Mizo Rapper-te Hlutna - 119
   - C. Lallianzuala
10. Sakhuana Leh Rap Music - 133
    - K. Vanlalneihpuia
11. Mizo Poetry Leh Mizo Rap Khaikhinna - 140
    - Zawra Ralte

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

3

STYLES AND TECHNIQUES OF MIZO RAP MUSIC

Dr Lalnunpuia Renthlei
(Nununa Renthlei / Dr Zaiva)
Assistant Professor, Department of Mizo, PUC

1. RAP CHU ENG NGE NI?

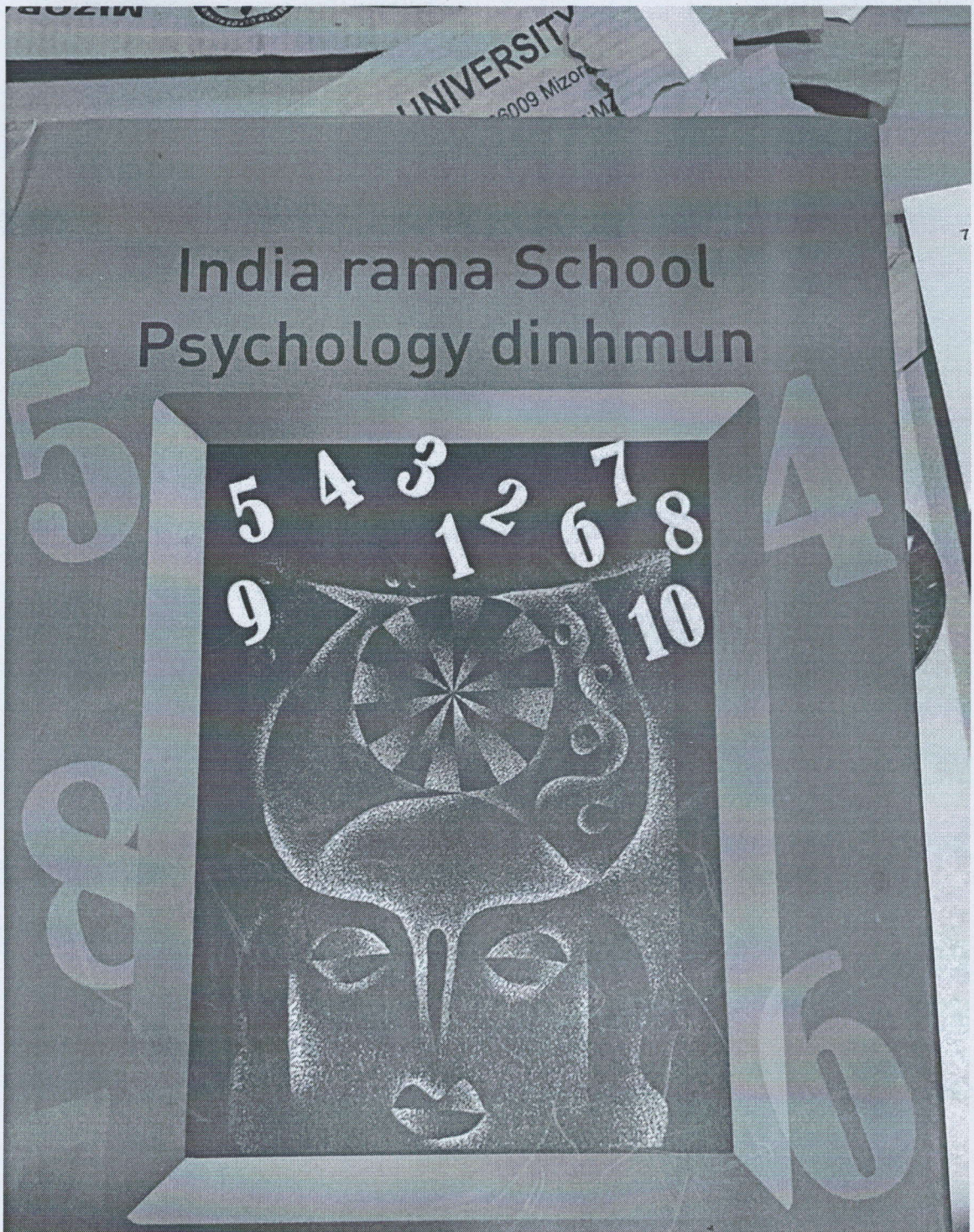
Kan thu kamkeu nan 'rap' awmzia tāwi têin lo saw dâwn teh ang.

- *Rap* awmzia hi tun laiah chuan kan hre tlanglawn si viau. Rimawi khawvel huangah hmun pawimawh tak a chan tawh avangin ṭhangtharte chuan an tuipui hle
- 'Rhythm and Poetry' tiin *rap* lam pum hi an sawi fo Ṭhenkhat chuan 'Rhythmically Acentuated Poetry' t te pawhin an sawi bawk. Mahse, lam tawi nei a ni khe em tih hi a chiang vak lo.
- Kum 1970 chhoah USA khawpui pakhat, New York aṭanga inṭan niin, African-American-ho hi a bul ṭann leh a tilartu an ni.
- Hip hop music a ni.
- Zai pangngai nen a danglam deuh. Rap karlakah erawh zai chu a awm thei tho va; tin, zai leh chham hi inpawlh thei bawk.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
3
AIZAWL

Pachhunga University College
Aizawl : Mizoram



Dr. Panch Ramaligam
Dr. Rinpari Ralte

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

InSPA Publication No. 0006/2021

India rama School Psychology dinhmun
(School Psychology in the Indian Contex)t

Published by
Indian School Psychology Association (Regd.)
17, 14th Street, Krishna Nagar,
Puducherry - 605 008, India.
Web : www.inspa.org Email : inspaindia@gmail.com

Author
Dr. Panch. Ramalingam
Pondicherry University
panchramalingam@gmail.com

Translated by
Dr. Rinpari Ralte
Pachhunga University College

ISBN : 978-93-916901-0-6

First Edition : August 2021

Price : Rs. 450/-

Pages : xxvi + 254

Typesetting at
M/s Platinum Graphics, Pondicherry - 605 001.

Printed at
M/s Print Process, Chennai - 600 014.

© All rights reserved. No part of this book may be reproduced retrieved or photocopied in any form without prior permission of the author except for reference or research.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Lehkhabu Chungchang

India ramah hian School Psychology hi Psychology huang chhunga zirna peng pakhat a ni tih hriat a la hlawh lo hle mai a. Hetih mek lai hian khawthlang ram changkang zawkah chuan zirna in hrang hrangah te he School psychology zirna hi ngai pawimawhin kum engemaw zat an lo kalpui tawh thung a ni. Zirna bu zawl, University tam takah School Psychology zirna hi kalpui mek a ni bawk. He zirna hian a tum ber chu naupang leh tleirawlte'n zirna leh rilru lama hmasawnna an neih theihna tura ṭan lak a ni. School Psychologist te hi rilru hriselna lama mithiam an nih avangin leh psychology leh education lama thawk thei tura zirtir an nih avangin mi bik an ni. Heng rilru kaihhnawih enfiah te, zirna leh rilru inkungkaihna chungchang zirchian te, hmasawnna tur kawng ngaihtuah te leh mimal/chhungkua harsatna chhawk zangkhai tura enkawlna pe thei tura zirtir niin an hnain a ken tel dan leh a kaihhnawih zawng zawng zawm tlat tura beisei an ni bawk.

He lehkhabu-ah hian School Psychology nih dan phung, a huam chin leh a chanchin pawimawh chin te tarlangin, India ram tana ṭangkai tur chhawpchhuah a ni a. A bu thu tlangban ṭhen sawm (10) ah hian psychology zir te tan mai bakah sikul zirtirtu zawng zawng te tana hriat tur pawimawh kimchang taka tarlan a ni. School Psychology hi eng nge a nih chiah tih te, a lo chawrchhuah dan te, zirna leh zirna lama harsatna chi hrang hrang awm te, India ram zirna chungchang te, rilru hriselna leh nun damna te leh School Psychology chhawr theih dan te dah a ni.

ISBN 939169010-6

9 789391 690106

தமிழ்ப் புதுவை

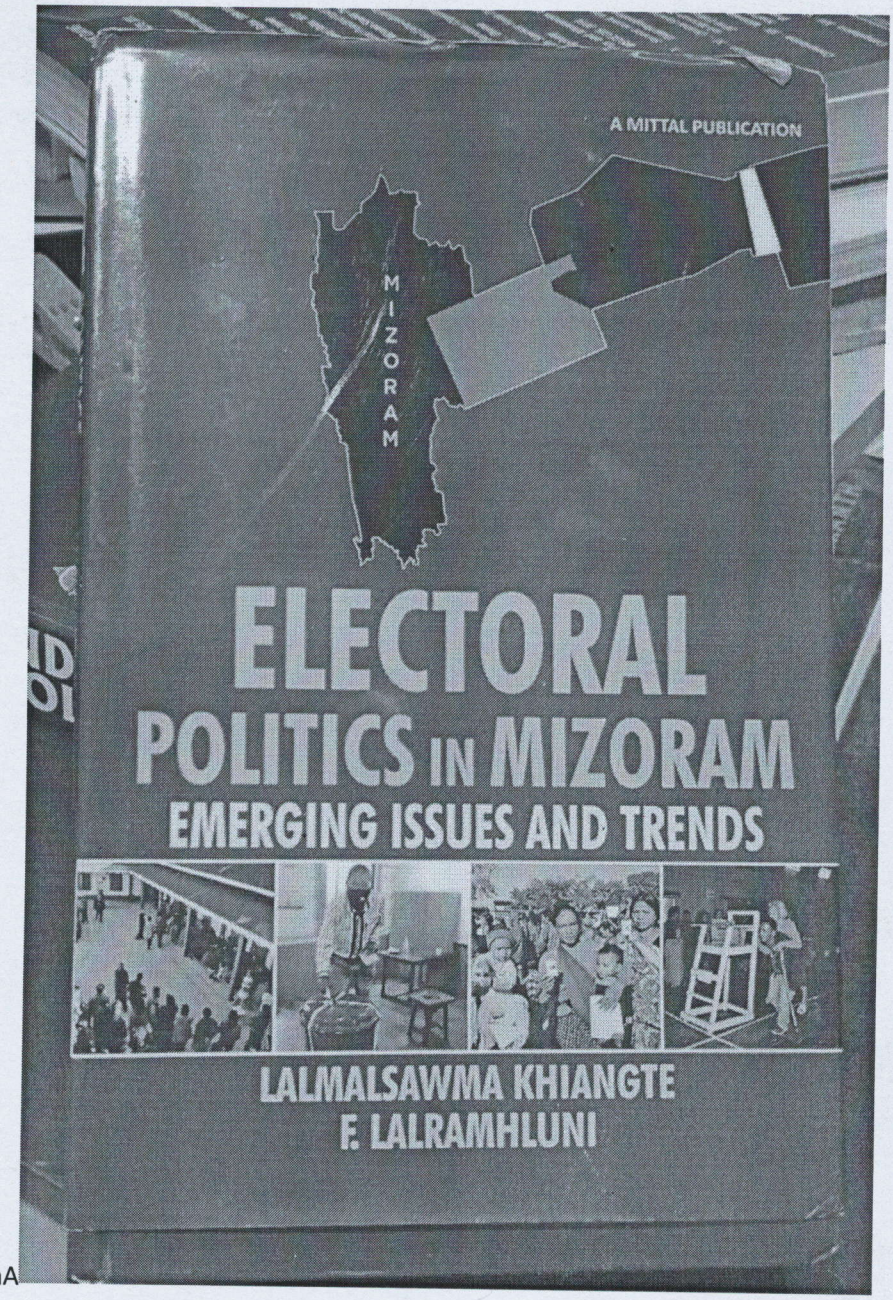
₹450

August 2021

Internal Coordinator
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram



Dr. ZonunmA

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

ELECTORAL POLITICS IN MIZORAM

Emerging Issues and Trends

Edited by

LALMALSAWMA KHIANGTE
F. LALRAMHLUNI

Contributors include

Alex Zorammawii Khiangte
Dr. C. Lalhmanmawia
C. Lalremsiami
C.V. Lalmalsawmi
C. Zonunmawia
F. Lalramhluni
Dr. H. Laldinmawia
Jonathan Zodintluanga
K.C. Lalmalsawmzauva
K. Laldingliani
Lalengkima
Lallawmzuala Khiangte
Lalmalsawma Khiangte
Lalnundika Hnamte
Nancy Zosangliani
R. Vanlalhmangaihsanga
Dr. Robert Sanglora Khawbung
Dr. Roluahpuia
Ruatdiki Hmar
Dr.Smitana Saikia
T. Lianhmingsanga
Dr. Vanlalremruata Tonson
Dr. Zarzosanga
Dr. Zonunmawia
Zoramthanga

Mittal Publications
PUBLISHERS OF SCHOLARLY BOOKS
4594/9 Daryaganj, New Delhi - 110002 (India)
Phone : +91-11-23250398, Fax : 41564398
E-mail : info@mittalbooks.com Website : www.mittalbooks.com

ISBN 978-93-90692-10-1
₹ 900

PACHHUNGA UNIVERSITY COLLEGE
Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)
Aizawl, Mizoram

10. BJP's Limited Mandate in Ethno-Politics of Mizoram 99
– Dr. Smitana Saikia

11. Policies on Employment: A Comparative Study of Political Parties' Manifestos 109
– Dr. Zonunmawia

12. Church-State Relationship in Contemporary State of Mizoram 119
– Dr. Robert Sanglora Khawbung

13. Voting Behaviour of Urban Youth of Aizawl District in the Seventh Legislative Assembly Elections: 2013 137
– Zoramthanga

14. Behavioural Study of Voters in the Elections of Mizoram 149
– Dr. H. Laldinmawia & K.Laldingliani

15. Determinants of Voting Behaviour in Eighth Mizoram Legislative Assembly Elections, 2018 157
– Nancy Zosangliani

16. Which Political Party is Where: Voting Behaviour in Aizawl City 165
– KC Lalmalsawmzauva Ph.D

17. Analysis of Voting Behaviour of Lunglei West Constituency: 8th Mizoram Legislative Assembly Elections 179
– Jonathan Zodintluanga

18. Poll Prediction: An Analysis of Tuichang Constituency in the Eight Mizoram Legislative Assembly Elections, 2018 189
– Lalengkima

19. Mizoram State Legislative Assembly Elections 2018: Issues and Challenges 199
– R. Vanlalhmangaihsanga

20. Contesting Policies on Liquor 211– A Study of Mizoram Legislative Assembly 2018 211
– T Lianhmingsanga

21. Factors Influencing Elections: With Special Reference to the Eight Mizoram Legislative Assembly Elections 2018 219
– Lallawmzuala Khiangte

22. Interrogating Indian Electoral Democracy: Some Reflections from Mizoram Assembly Elections 227
– C. Zonunmawia

Index 235

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

11

POLICIES ON EMPLOYMENT: A Comparative Study of Political Parties' Manifestos

DR. ZONUNMAWIA

Introduction

The paper is divided into five sections. Section I introduces the paper and highlights the concept of employment, unemployment and Youth in the context of Mizoram. Section II explains the employment scenario and its statistical record based on the record taken from Statistical Handbook of Mizoram and Census of India, Mizoram. Section III discusses the perspectives of Mizoram State Legislative Assembly Election 2018. Section IV analyzes the manifestos the political parties in the context of employment. Section V concludes the paper with suggestion.

According to Census of India 2011, workers pertain to two categories, such as, workers and marginal workers. Workers refer to those who have economic activity and who spent much of their time for their own economic activities. Marginal workers refer to those who work on part time but not on a permanent basis.[1] Apart from these two categories, non-workers comprise children's, students etc. The term employment refers to the state of having paid workers National Sample Survey Organization (NSO) defines unemployment or unemployed persons as persons who are able and desiring to work, who seek job but remain jobless. Further, National Sample Survey Organization (NSO) defines that there are different types of Unemployment in India, such as-

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

ROTHÛL

A CRITICAL STUDY ON DRAMA FROM UG & PG (MIZO COURSES) UNDER MZU & ICFAI UNIVERSITY

DEPARTMENT OF MIZO
GOVT. AIZAWL COLLEGE

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Compiled and Published by
Department of Mizo
Govt. Aizawl College

ROTHÛL: A Critical Study on Drama from UG & PG (Mizo Courses) Under MZU & ICFAI University

Edition : 2021

Price : ₹ 200/-

ISBN : 978-81-951732-5-9

Copyright© by Department of Mizo, Govt. Aizawl Colle
All rights reserved. No part of this book may be reproduc
any form or by any electronic, mechanical, photocopy
recording, or by any information storage and retrieval syst
without the prior permission in writing from the copyright ho

Printed at:
EBENEZER Offset
Luangmual Vengthlang

Message
Thuhmathe
Thuhmahr

1. Drama zial — *Da*
2. Lemchan — *La*
3. Drama le — *P*
4. Lemchar — *I*
5. Hmasav —
6. Shakes —
7. Pasalt —
8. Docto —
9. Than —
10. Char
11. Tha
12. Hm
13. Ch
14. Sa
15. L
16. I

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

A CHHUNGA THU AWM

Message	----------	*v*
Thuhmatheh	----------	*vi*
Thuhmahruai	----------	*vii*
1. Drama ziak tura hriat ngai te — *Darchuailova Renthlei*	----------	1
2. Lemchan i zir dawn chuan — *Lalsangzuala*	----------	17
3. Drama lehlin chungchang — *P.L Liandinga*	----------	22
4. Lemchan chan chhuah nana pawimawh — *H Rotluanga*	----------	26
5. Hmasawnna rahbi (One act play) — *P.C Lalrinpuia*	----------	30
6. Shakespeare-a Twelfth Night — *Prof. R Thangvunga*	----------	35
7. Pasaltha Khuangchera — *Enid H Lalrammuani*	----------	42
8. Doctor Fautus : Psychoanalytic tukverh atanga thlirna — *Lalzuitluanga*	----------	52
9. Thangthar nun thlirna — *RD Lalsanglura*	----------	59
10. Chan loh khan lemchan bih chianna — *R Lalrinfela*	----------	67
11. Thawmvunga — *Vanlaltana Khiangte*	----------	80
12. Hmasawnna rahbi : Morality Play — *F. Lalnunpuii*	----------	94
13. Chharmawia — *Vanlalrova Varte*	----------	100
14. Salam — *G. Lalnuntluanga*	----------	109
15. Liandova te unau — *Lalrammawia Ngente*	----------	118
16. Lalber Oedipus tlukchhiatna — *F. Lalzuithanga*	----------	125

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Pachhunga University College
Aizawl : Mizoram

PASALṬHA KHUANGCHERA LEMCHAN ZIR CHIANNA

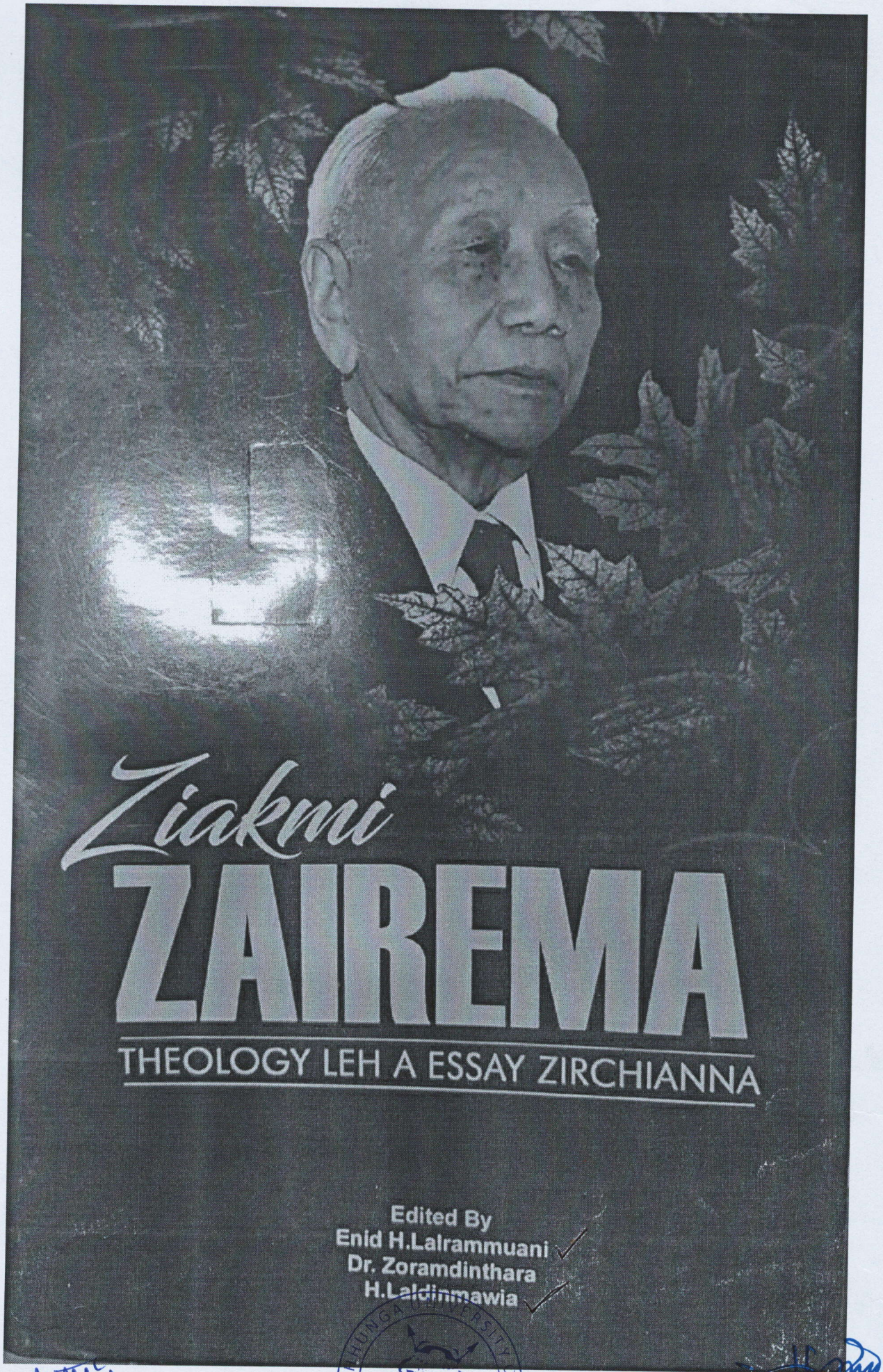
Enid H Lalrammuani
Assistant Professor
Pachunga University College

Pasalṭha Khuangchera lemchan hi Laltluangliana Khiangte ziak, kum 1997-a chhuah a ni. A ziaktu hi Mizo zinga lemchan lama doctor of Philosophy kan neih tlemte zinga mi a ni a, Pasalṭha Khuangchera lemchan hi lemchan tluantling ṭha tawk tak leh belhchian dawl tak a ni a, Mizo Historical play ṭha leh chhuanawm tak a ni.

History/Historical play awmzia chu hnam chanchina thil thleng emaw, a tak behchhana ziak lemchan emaw tihna a ni mai awm e. History a mi hmingthangte chanchin behchhan emaw, hnam chanchin a thil thleng emaw behchhana lemchan ziak pawh hi History play huangah a khung theih bawk. Laltluangliana Khiangte chuan "Tragedy emaw, comedy emaw a ni thei a, a tum ber erawh chu hmanlai thilte hmuhnawm tak tura cheibawl a ni ber. Chronicle play tih nen thuhmun reng a ni....Episodic play ti a sawi chang a awm bawk," tiin History play chungchang hi a sawi fiah a. (Theory of Literature 75)

H.Laldinmawia pawhin, "*Historical drama hi hun kal tawh a thil thleng tak tak (historical fact) behchhana ziak, a ngaihnawm tura phuah belh a ni. A changtu (characters) te chu history-a mihring awm ngei te an ni a, mahse an thuneihna te, an ropuina te, an rorel dan te, an ṭawngka chhuak te erawh chu a ziaktuin a phuah belh ṭhin. A awmzia takah chuan history-a mitthi tawh (dry bones) chu lemchan tual zawlah a rawn nung leh a ni ber mai. History tak tak anga ziak a ni lova.*

PACHHUNGA UNIVERSITY
AIZAWL
Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)
Principal
Pachhunga University College
Aizawl : Mizoram



Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Published By
Department of Mizo
Pachhunga University College
(A Constituent College of Mizoram University)
Academic Block III, 2nd Floor, Room No 10&11
Aizawl : Mizoram - 796001, India
Fax No : (0389) 2322257
Email : mizo.puc@gmail.com
Website : www.pucollege.in

Ziakmi Zairema (An in-depth study of his theological and prose writings)
ISBN : 978-81-944202-8-6
2021@KL Offset Printers
Price : ₹400

Copyright© 2021 by Department of Mizo
All rights reserved. No part of this book may be reproduced in any form or by any electronic or mechanical means, including information storage and retrieval systems, without written permission from the publisher or author, except in the case of a reviewer, who may quote brief passages embodied in critical articles or in a review.

Printed at:
KL Offset Printers
C-40, MG Road, Aizawl - 796005,
Mizoram, India
Mobile : 919862566195
Phone : (0389)-2311260
Email: kloffsetprinters@gmail.com

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl, Mizoram

31. Zairema as a Translator — Dr. Lalnunpuia Renthlei 381

32. Looking into the characteristics of Revd.Zairema and a critical analysis of his approach in translation — Lawmsangzuali 393

33. Retelling the Mizo story: A Postcolonial reading of Zairema's select English essays — Dr. Phillia Khiangte 401

34. Tlawmngaihna and Its Process of Discovery in the Mizo Society — Elizabeth Lalchhandami 414

35. A Glimpse of societal conditions through the autobiographical work of Rev. Dr. Zairema's I Ni Min Pek Hi — F. Lalmuanpuii 423

THEN 4-NA : ZAIREMA CHUNGCHANG ZIRLAITE ZIAK

36. Zairema chanchin leh a hnathawh — Thang Sian Tluang 431

37. Ziaktu ropui Zairema — Lalrinfela 437

38. Zairema essay 'Tawrhna' zirchianna — Vanlalhrilha 444

39. Zairema'n Mizo Pi pute biak a hmuh dan — Lalthansanga 450

40. Zairema thil thlir dan — R. Zothanliana 464

41. Thubelh/Appendices

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Ziakmi Zairema
Department of Mizo, Pachhunga University College
2020, ISBN : 978-81-944202-8-8

13 Zairema Theology leh Mizo Sakhua

Lalrotluanga •

Bible kan chhiar chuan Genesis-ah " A tirin Pathianin lei leh van a siam a. Tin, lei hi a chhia a, a ruak ngawt a ni; tui thuk tak chung chu a thim mup a, Pathian thlarau chuan tui chungte chu a awp reng a (Genesis: 1,2). Pathian thilsiam van thengreng kan tih zawng zawng universe hi engtia zau nge tih leh thilsiam engzat nge awm ang tih hi mihring hian kan hre chhuak zo lo. Solar system engtia zau leh engzata tam nge awm tih phei chu mihring finna hian tun thleng hian a chhui fiah zo lo a ni. "He kan universe bik hi kan en chik chuan, a quantum level-ah chuan atom structure hi kan universe structure chu a ni mai a, chu chu a laiah neutron leh proton an awm a, chu chu electron ten an vir hual vel a ni, chu chu kan element hriattheih zawng zawng basic structure chu an ni bawk" (Thil Bul Inthup Hai Hawnna). Sakhaw dang leh Kristian rin dan atang pawhin siamtu hi awm ngeia rinna a awm a, chu chuan mihring hi a kaihruai thui hle. Kristian kan nih hma Mizo Sakhua pawh khan an chunga roreltu leh thu neitu awm ngeia rinna an neia chu chuan sakhaw kawngkal leh Pathian engkim siamtu, thuneitu an zawn dan pawh thui takin a kaihruai

• Asst. Professor, Department of Mizo, Pachhunga University College

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Ziakmi Zairema
Department of Mizo, Pachhunga University College
2020, ISBN : 978-81-944202-8-6

18 Essay Ziaktu Zairema : A thuziak Pathum aṭanga Zir Chianna

Enid H.Lalrammuani *

Zairema hi Mizo literature-ah a thawhhlawk viau mai. Mizo essay ziaktu hmasa zinga mi a ni a, Bible lehlin kawngah a khaipa ber Chief Translator hun eng emaw chen a ni nghe nghe. Mizo [illegible]ng a thiamin a chik peih a, Mizo ṭawng dik humhalhtu [illegible]mawh tak a ni. Pathian thu zira pastor hna thawk a ni bawk a, [illegible]hian thu lam hawi lehkhabu pawh a chhuah nual a ni. Mithiam [illegible] thil chik mi a ni a, a thuziak te hi belhchian dawl leh zir tham [illegible] an ni hlawm. He paper hian Zairema essay ziak te zinga pathum [illegible] No Ber Mai No Ber Mai!, Dul Pen leh Zun hmangin Zairema hi [illegible] ziaktu angin zirchian kan tum dawn a ni.

Essay chu tawi fel taka ziaktuin a rilru chhungrila a vei [illegible]ng thil leh a ngaih dan a puanchhuahna a ni. Ziak dan hmang [illegible]ah fel tak a awm lem lova, a sei zawng leh ziak dan hmang [illegible]-ah a ziaktu a zalen hle. Essais (tihchhinna/enchhinna) tih hming [illegible]ha French mi Montaigne-a thuziak te kha a ṭobula ngaih a ni [illegible] ṭhin a. Mizo essay ziaktu hmasate kha lehkhathiam hmasate [illegible] ni hlawm a, ngun thluk taka ngaihtuahna sen ngai, midangte [illegible]na ngaihtuah zui tur thuril leh fing hnut chhiah a, mi rilru

* Head and Asssistant Professor, Department of Mizo, Pachhunga University College

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Ziakmi Zairema
Department of Mizo, Pachhunga University College
2020, ISBN: 978-81-944202-8-6

19 Thufing tawi hmanga Essay Ziaktu Zairema

H. Laldinmawia *

Mizo zinga pastor hmingthang, Pathian thu thiam, mi huaisen leh mi thiam hmasa, '*Kan Bible*' hi tih a ziak hmanga '*Book of the year 2013*' pawh lo dawng ngat tawh Rev. Dr.Zairema hi Zofate zingah hre lo an tlem viau awm e. Amah kan hriatna ber chu Mizo tawnga Bible lehlin leh Pathian thu a ziakna lehkhabu te vang a ni ber. Thu tluang/Thu rimawi (essay) a ziak tlemte zingah '*A no ber mai, a no ber mai*' tih leh '*Dul pen*' tih te hi miten an hriat lama pakhat a ni bawk ang.

Hmunhmelṭha khuaa Pu Doliana leh Aibuaii te fa, Rev. Dr. Zairema ni ta hi Mizo zinga BSc (hons) pass hmasa ber leh Serampore College-a BD zirchhuak hmasa ber, a mark hmuh pawh '*Serampore Record*' tling khawpa sang fal ni hial khawpa lehkha thiam a ni a. A certificate leh a mark lamah chang a hmu sangin a thiam a ni lova, a thuziak leh a kutchhuak atang hian '*mithiam*' leh '*miril*' a ni tih hi hai rual a ni lo. A ngaituahna tladarh leh vak vel hian thil a chhui a chhui a, a chhan leh a chheh velte a suangtuah kual a, chu chu midangte ti bengvartu thuziak ṭha takah a chhuah ṭhin a ni.

* Assistant Professor, Department of Mizo, Pachhunga University College

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Ziakmi Zairema
Department of Mizo, Pachhunga University College
2020, ISBN : 978-81-944202-8-6

20 A Essay Ziaka Zairema 'Style'

Lalzuitluanga *

Rev.Zairema hian Zofate tan thu ṭha tak tak min hnutchhiah a, a lehkhabu ziakte hi rotling tak tak, nakin zel atan pawha ṭhangtharte mamawh tur leh la hlu zual zel tur a ni hlawm. Zairema hian essay pawh a lo ziak nual a, a essay ziak te ngawt pawh hi zir tlak leh nung reng tur an ni hlawm. Tun ṭumah pawh hian a essay ziak te chauh hi kan thlir dawn a, chutah pawh a essay ziaka a style chungchang chauh hi kan thlir tur chu a ni. Heng a essay ziak dan style aṭang hian Zairema hi eng ang ziak mi nge a nih a, a thuziakah hian eng nge a ngaih pawimawh leh a rilrua lian ber tih te kan hre thei dawn a ni.

B.Lalthangliana chuan a lehkhabu "Rev.Dr.Zairema leh Capt.C.Khuma Hnuhma" tihah chuan Zairema essay a lo lakkhawm te chu sawmpanga (15) lai a lo dah a. Tun ṭumah pawh hian chu lehkhabua Zairema thuziak kan hmuhte chu kan inghahna tur ber a ni.

Kan sawi tak ang khan "Rev.Dr.Zairema leh Capt.C.Khuma Hnuhma" tihah hian Zairema thuziak sawmpanga (15) kan hmu a. Heng a thuziak 15 kan hmuhte hi B.Lalthangliana sawi angin hlawm

* *Guest Faculty, Department of Mizo, Pachhunga University College*

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Ziakmi Zairema
Department of Mizo, Pachhunga University College
2020, ISBN : 978-81-944202-8-6

31 Zairema as a Translator

Dr. Lalnunpuia Renthlei *

1. Introduction:

Rev. Dr.Zairema (1917-2008), a full-time worker in the Synod Church of Mizoram, contributed much to the non-secular literature of Mizo. He was the first to obtain the degrees of BSc and Bachelor of Divinity (BD) among the Mizo. He died of cardiac problem on the morning of 17 December 2008 at his residence in Zarkawt, Aizawl, at the age of 91. He is best remembered as the father of Mizoram Synod.

He wrote more than 80 literary essays inMizo and about 40 in English. Some of his well-known articles in English are*The Drum, Origin of Tlawmngaihna, What Made the Mizos Tick*,and *Introducing Bombay Fantasies*.His well-known articles and essays in Mizoinclude*Thukhuh, Zûn, Tawrhna, Mai Mai Fakna, Mal, Sakhua leh Culture, A No Ber Mai, Dul Pen, Mizo Tawng Kan Hman Dan Thenkhat, A Eng Zawk NgeUpa?, Inthawina, Hmeichhia Nge Minu* and *Mizoten Hrisel An Tum Dan*.

His theological memoire, *Kan Bible Hi*, was awarded 'Book of the Year 2003' by Mizo Academy of Letters (MAL). His posthumous book *Pipute Biak Hi* was also a runner-up of the Book of

* Assistant Professor, Department of Mizo, Pachhunga University College

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Ziakmi Zairema
Department of Mizo, Pachhunga University College
2020, ISBN : 978-81-944202-8-6

36 Zairema chanchin leh a hnathawh

Thang Sian Tluang *

Rev Zairema hi Mizo zingah chuan hre lo kan awm awm lo ve. Amah hi pa chhuanawm tak leh entawn tlak, sakhaw thar lo lut tana thawh hlawk tak a ni a. A thiamna leh theihna mai bakah a rem hriatna leh a taimakna te avang hian kan hriat lar hle bakah Mizo ṭawnga bible lehlin vawihnihna kawnga a thathawh ropui tak avangin kan hre lar hle a, Mizo zingah chuan a hming thang leh lar berte zing ami a ni ngei ang.

Pian leh murna :

Rev. Dr. Zairema hi Mizoram khawchhak lam Hmunhmeltha, Champhai District-ah kum 1917, March ni 4-ah Pu Doliana leh Pi Aibuani inkarah a lo piang a, unau pathum an ni a, an unau hi mipa hlir an ni. A nuapan tet aṭanga kristian chhungkua aṭanga sei lian a ni a, naupang fel leh ngainatawm tak a ni a, September ni 2, 1917-ah Pastor Vanchhunga'n baptisma a chantir a. Pastor aṭana Ordain an nih hnu kum 1947, March ni 4-ah an compounder Chawnga fanu Thangdailovi nen an innei a, fapa 3 leh fanu 4 an nei a ni.

Rev Zairema pa Pu Doliana hi zirtirtu a ni a, Sandy sap kal hruaina hnuaiah solfa alo zir hman bawk avangin a khaw tlangval

* PG Student, Department of Mizo, Pachhunga University College

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

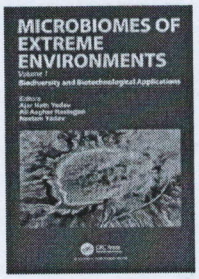
Search for keywords, authors, titles, ISBN

Advanced Search (/search/advance-search?context=ubx)

< Biodiversity (https://www.taylorfrancis.com/search?subject=SCAG1505&context=ubx)

Show Path

Book



Microbiomes of Extreme Environments

Biodiversity and Biotechnological Applications

Edited By Ajar Nath Yadav, Ali Asghar Rastegari, Neelam Yadav

Edition	1st Edition
First Published	2021
eBook Published	22 March 2021
Pub. Location	Boca Raton
Imprint	CRC Press
DOI	https://doi.org/10.1201/9780429328633 (https://doi.org/10.1201/9780429328633)
Pages	302
eBook ISBN	9780429328633
Subjects	Bioscience, Engineering & Technology, Environment & Agriculture, Environment and Sustainability

Share Citation

ABSTRACT

TABLE OF CONTENTS

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Close this message to accept cookies and our Terms and Conditions. (/terms-and-conditions) We use cookies to distinguish you from other users and to provide you with a better experience on our websites. Find out how to manage your cookie settings here. (/cookie-policy)

Chapter Chapter 12 | 12 pages

Extremophilic Microbes

Blooms the Biological Synthesis of Nanoparticles

By Aathira Sreevalsan, Jamseel Moopantakath, Ranjith Kumavath

GET ACCESS

Abstract

Chapter Chapter 13 | 13 pages

Biocontrol Potential and Applications of Extremophiles for Sustainable Agriculture

By Gajanan Mehetre, Vincent Vineeth Leo, Garima Singh, Prashant Dhawre, Igor Maksimov, Mukesh Yadav, Kalidas Upadhyaya, Bhim Pratap Singh

GET ACCESS

Abstract

Chapter Chapter 14 | 9 pages

Bioalcohol and Biohydrogen Production by Hyperthermophiles

By Kesen Ma, Sarah Danielle Kim, Vivian Serena Chu

GET ACCESS

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Pachhunga University College
Aizawl : Mizoram

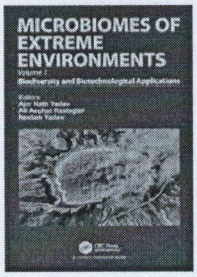
Search for keywords, authors, titles, ISBN

Advanced Search (/search/advance-search?context=ubx)

< Microbiomes of Extreme Environments (https://www.taylorfrancis.com/books/mono/10.1201/9780429328633/microbiomes-extreme-environments?refId=a1a8af60-516a-48f0-b0dc-f0773bac003e&context=ubx)

Show Path

Chapter



Biocontrol Potential and Applications of Extremophiles for Sustainable Agriculture

By Gajanan Mehetre, Vincent Vineeth Leo, Garima Singh, Prashant Dhawre, Igor Maksimov, Mukesh Yadav, Kalidas Upadhyaya, Bhim Pratap Singh

Book Microbiomes of Extreme Environments (https://www.taylorfrancis.com/books/mono/10.1201/9780429328633/microbiomes-extreme-environments?refId=a1a8af60-516a-48f0-b0dc-f0773bac003e&context=ubx)

Edition	1st Edition
First Published	2021
Imprint	CRC Press
Pages	13
eBook ISBN	9780429328633

Share

ABSTRACT

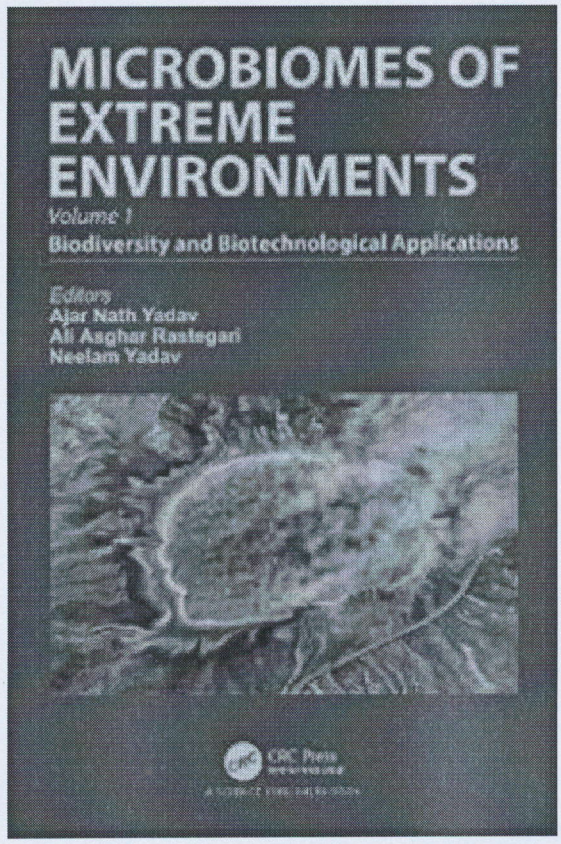
< Previous Chapter (chapters/edit/10.1201/9780429328633-12/extremophilic-microbes-aathira-sreevalsan-jamseel-moopantakath-ranjith-kumavath?context=ubx)

Next Chapter > (chapters/edit/10.1201/9780429328633-14/bioalcohol-biohydrogen-production-hyperthermophiles-kesen-ma-sarah-danielle-kim-vivian-serena-chu?context=ubx)

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram



Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

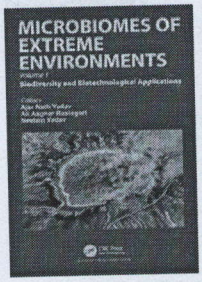
Search for keywords, authors, titles, ISBN

Advanced Search (/search/advance-search?context=ubx)

Show Path

< Biodiversity (https://www.taylorfrancis.com/search?subject=SCAG1505&context=ubx)

Book



Microbiomes of Extreme Environments

Biodiversity and Biotechnological Applications

Edited By Ajar Nath Yadav, Ali Asghar Rastegari, Neelam Yadav

Edition	1st Edition
First Published	2021
eBook Published	22 March 2021
Pub. Location	Boca Raton
Imprint	CRC Press
DOI	https://doi.org/10.1201/9780429328633 (https://doi.org/10.1201/9780429328633)
Pages	302
eBook ISBN	9780429328633
Subjects	Bioscience, Engineering & Technology, Environment & Agriculture, Environment and Sustainability

Share Citation

ABSTRACT

TABLE OF CONTENTS

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

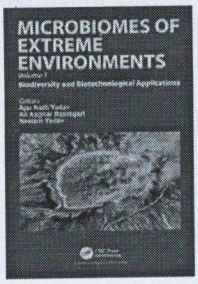
Search for keywords, authors, titles, ISBN

Advanced Search (/search/advance-search?context=ubx)

< Microbiomes of Extreme Environments (https://www.taylorfrancis.com/books/mono/10.1201/9780429328633/microbiomes-extreme-environments?refId=5e34b40d-1fcb-4e3f-9191-3d2b3d741a2d&context=ubx)

Show Path

Chapter



Biocontrol Potential and Applications of Extremophiles for Sustainable Agriculture

By Gajanan Mehetre, Vincent Vineeth Leo, Garima Singh, Prashant Dhawre, Igor Maksimov, Mukesh Yadav, Kalidas Upadhyaya, Bhim Pratap Singh

Book Microbiomes of Extreme Environments (https://www.taylorfrancis.com/books/mono/10.1201/9780429328633/microbiomes-extreme-environments?refId=5e34b40d-1fcb-4e3f-9191-3d2b3d741a2d&context=ubx)

Edition	1st Edition
First Published	2021
Imprint	CRC Press
Pages	13
eBook ISBN	9780429328633

Share

ABSTRACT

< Previous Chapter (chapters/edit/10.1201/9780429328633-12/extremophilic-microbes-aathira-sreevalsan-jamseel-moopantakath-ranjith-kumavath?context=ubx)
Next Chapter > (chapters/edit/10.1201/9780429328633-14/bioalcohol-biohydrogen-production-hyperthermophiles-kesen-ma-sarah-danielle-kim-vivian-serena-chu?context=ubx)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

Chapter 13

Biocontrol Potential and Applications of Extremophiles for Sustainable Agriculture

Gajanan Mehetre,[1] *Vincent Vineeth Leo,*[1] *Garima Singh,*[2] *Prashant Dhawre,*[1] *Igor Maksimov,*[4] *Mukesh Yadav,*[5] *Kalidas Upadhyaya*[6] and *Bhim Pratap Singh*[3,*]

Introduction

Agriculture forms the base of human survival and remains the mainstay of the livelihood for the world. A major workforce in many countries including India is mostly dependent on agriculture and its related activities (Bruinsma 2017). Apart from providing food, agriculture is the main source of raw materials for various industries including textile and fibres, sugar and beverages and many others (Boehlje and Bröring 2011). Although in modern agricultural practices, different techniques are being used to increase crop productivity, plant pest and pathogens are the major biotic agents responsible for significant loss of crop productivity and damage to the plant. To manage pathogens and plant pests, several strategies are being used in agriculture. The most extensive and effective is the use of chemical pesticides. However, the widespread use of chemical pesticides and fertilizers in agriculture is a major health concern due to the potentially harmful effects of various chemical compounds on humans, other living organisms and the environment (Nicolopoulou-Stamati et al. 2016). Plant pathogens such as bacteria, fungi and viruses cause plant diseases resulting in a significant loss to crop productivity (Flood 2010; Oerke et al. 2012).

The use of chemical pesticides is also a matter of controversy, as their excessive use may lead to the development of resistance among pathogenic microorganisms and some of the chemicals also possess carcinogenic effects (Edgerton 2009; Damalas and Eleftherohorinos 2011). Some of the chemical compounds of pesticide formulations are also absorbed by most crops and their consumption may lead to systematic disorders in animals as well as in humans (Aktar et al. 2009; Alavanja et al. 2013). As a consequence, there is a need to implicate more environmentally friendly methods in agriculture without compromising on the economic viability of the crop (Tracy 2015). Biological control of phytopathogens has been considered the most viable option to confront plant

[1] Department of Biotechnology, Aizawl, Mizoram University, Mizoram 796004, India.
[2] Department of Botany, Pachhunga University College, College Veng, Mizoram 796001, India.
[3] Department of Agriculture and Environmental Sciences, National Institute of Food Technology Entrepreneurship & Management (NIFTEM), Industrial Estate, Kundli 131028, Sonepat, Haryana, India.
[4] Institute of Biochemistry and Genetics, Ufa Scientific Center, Russian Academy of Sciences, pr. Oktyabrya 71, 450054 Ufa, Russia.
[5] Department of Forestry, Mizoram University, Mizoram 796004, India.
[6] Department of Biotechnology, Pachhunga University College, College Veng, Mizoram 796001, India.
* Corresponding author: bhimpratap@gmail.com

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Zofate Zirna Chawisangtu

PACHHUNGA

(THE ARCHITECT OF THE NATION'S TREASURE)

EDITOR

H.Laldinmawia
Assistant Professor, Department of Mizo

ASSOCIATE EDITORS

Dr. Vanlalremruata Tonson
Assistant Professor, Department of History

Remlalthlamuanpuia
Assistant Professor, Department of Mizo

Dr. Zonunmawia
Assistant Professor, Department of Political Science

Dr. Daniel Lalawmpuia
Assistant Professor, Department of Economics

Dr. Laldinpuii
Assistant Professor, Department of English



Copyright@ 2021 by Pachhunga University College

Published by
Dr. Tawnenga
Principal, Pachhunga University College
(A Constituent College of Mizoram University)
Aizawl, Mizoram - 796001, India
Phones: (Office) (0389) 2315212/2322257/2327095
FAX : (0389) 2315212
Website : www.pucollege.edu.in
Email : pachhungauniversitycollege@gmail.com

ISBN : 978-81-947674-6-6



Price : Rs. 200

Printed at:
K.L. Offset Printers
T-40, M.G. Road, Aizawl - 796005
Mizoram, India
Mobile : +919862725123
Phone : (0389)-2311200
Email : kloffsetprinters@gmail.com

Coordinator
Internal Quality Assurance Cell
Pachhunga University College

Editor
Pachhunga University College
Aizawl : Mizoram
Aizawl



GENDER SENSITIZATION IN CONTEMPORARY MIZO SOCIETY

Edited by
Lalnunpuii Ralte & Vanlalringa Bawitlung

About the Book

This book contains papers presented by scholars at a Seminar on Gender Sensitization in Contemporary Mizo Society. It is a collection of studies and observations on various aspects of gender issues that addresses the significance of gender sensitization in Mizo society. The importance of gender sensitization spans across the globe throughout history. From an exploration into the dynamics of gender and cultural stereotypes, the authors cover a wide range of topic focusing on society, politics, religion, classrooms and entrepreneurship. They offer valuable insights into the gendered practices from historical to contemporary times, raised an increased awareness on the issue, highlighting significant strategies to attain positive gender equity and change.

About the Editors

Dr Lalnunpuii Ralte is an Assistant Professor in the Department of History, Government Aizawl College. She completed her M.A. in History from University of Hyderabad and M.Phil., Ph.D. from the Centre for Historical Studies, Jawaharlal Nehru University, New Delhi.

Prof. Vanlalringa Bawitlung is a Professor in the Department of History at Government Aizawl College. He has completed his M.A., M.Phil. and Ph.D. from the Department of History, North Eastern Hill University, Meghalaya.

ISBN 978-81-950141-3-2



₹200

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Aizawl : Mizoram

CONTENTS

Preface ---------- iii
Acknowledgements ---------- ix
Message from Head ---------- xi
Editors ---------- xii
Contributors ---------- xii

1. Gender Roles in Mizoram:
   A feminist perspective ---------- 1
   Lalthansangi Fanai

2. Voices from the margins: Revealing the
   marginalization of women in society
   (With Special Reference to Mizo Society) ---------- 14
   C. Sangluaii

3. Trends in political participation: Mizo women ---- 27
   Ruatdiki Hmar & Lalsangzuala Khiangte

4. Positioning 'non-normative' gender and
   sexual subjects in Mizo society ---------- 38
   Lalhmingmawii

5. Gender issues in the classroom:
   Implications for a teacher ---------- 55
   Zairemmawia Renthlei

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

POSITIONING 'NON-NORMATIVE' GENDER AND SEXUAL SUBJECTS IN MIZO SOCIETY

Lalhmingmawii

Same sex sexuality and transgression of one's given gender have existed since ancient times in different societies. Though it had occurred in the past, the issue has not captured attention as much as it has in our times. This paper delineates the position of 'non conforming gender and sexual subjects in traditional Mizo society through review of literature. It further centred attention on contemporary Mizo society to highlight an increasing diversity and visibility of such subjects. It also traces the marginalisation enshrined upon them in a deeply embedded heteronormative structure.

SEXUALITIES, desires, and orientations which are considered non-normative have been subjected to marginalisation and oppression for a long time in India. In 1860 while India was under the British colonial administration, "voluntary carnal intercourse against the order of nature..."[1] was criminalised under Section 377 of the Indian Penal Code. Henceforth this law was used to suppress and harass homoerotic subjects

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

A MITTAL PUBLICATION

THE MIZO SOCIETY

CONTINUITY AND CHANGE

J. Zorema • B.Lalrinchhani



Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

No part of this work may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical photocopying, recording or otherwise, without the prior written permission of the copyright owner and the publisher.

First Published 2021

© J. Zorema and B. Lalrinchhani

All rights reserved

ISBN 978-81-949360-9-1

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

Published and printed by Krishan Mittal for Mittal Publications
4594/9, Daryaganj, New Delhi - 110002, India.
Phone: 23250398, Telefax: 91-11-41564398
e-mail : info@mittalbooks.com

CONTENTS

Introduction v
Acknowledgements xi
List of Contributors xv

SECTION-I
SOCIETY, BELIEF AND SUPERSTITIONS IN MIZO SOCIETY

1. Society, Beliefs and Superstitions in Mizo Society 3
   – BENJAMIN LALNUNFIMA
2. Beliefs and Superstitions in Mizo Society 17
   – VANLALREMRUATI KHIANGTE
3. The Methods of Mizo War: Traditional Warfare and Strategies 23
   – DR. LALCHHUANAWMA
4. Songs of Laltheri (Laltheri Zai) as Reflection of Liberation for Social Bondage in Mizo Society 45
   – DR. ZORAMDINTHARA & ENID H. LALRAMMUANI

SECTION II
TRADITION AND MODERN INTERFACE IN MIZO SOCIETY

5. Menstrual Knowledge and Practices among female adolescents in Lunglei, Mizoram 53
   – K.LALHMANGAIHKIMI & RTC.LALREMRUATA
6. Understanding Knowledge and Power: Revisiting the Role of Zu in the Traditional Mizo Society 63
   – LAL LAWMZUALI

SECTION III
POLITICAL MODERNIZATION AND MIZO

7. Mara Freedom Party: Their Contribution in the Movement for Autonomy among the Maras 69
   – V.R.NORHA AZYU

Co-ordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

6

UNDERSTANDING KNOWLEDGE AND POWER:

Revisiting the Role of *Zu* in the Traditional Mizo Society

LAL LAWMZUALI

Zu is a local name given to the common and local drink of the Mizos spoken in reference to beer or any fermented liquor[1]. The beer is made of fermented rice, millet, maize etc. mixed with yeast. *Zu* was consumed with admirable temperance back then. It occupied central position in the age old traditional set-up. The temperance of its consumption in rituals can be said to be admirable, whereas the temperance by which it was consumed during festivities and socialization was what left the door open for its negative impact. Today the term *zu* for the Mizos has come to be inclusive of not just the ones that are locally brewed but also those Indian Manufactured Foreign Liquor (IMFL) available in the markets elsewhere in India.

A recollection of the old Mizo society was one which was simple, with almost all abled body engaged in agriculture with the hope of producing enough rice for the year. Festivities invited the participation of young and old into singing and dancing accompanied by the consumption of *zu*. It is believed that Mizos use *zu* (liquor in local language) as early as AD 800 to AD 950[2]. Locally brewed by the people *zu* were of different types such as Tinzu, Rakzu, Zufang, and Zupui. Infact *zu* had occupied such

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

ELECTORAL POLITICS IN MIZORAM

Emerging Issues and Trends

Edited by

LALMALSAWMA KHIANGTE
F. LALRAMHLUNI

Contributors include

Alex Zorammawii Khiangte
Dr. C. Lalhmanmawia
C. Lalremsiami
C.V. Lalmalsawmi
C. Zonunmawia
F. Lalramhluni
Dr. H. Laldinmawia
Jonathan Zodintluanga
K.C. Lalmalsawmzauva
K. Laldingliani
Lalengkima
Lallawmzuala Khiangte
Lalmalsawma Khiangte
Lalnundika Hnamte
Nancy Zosangliani
R. Vanlalhmangaihsanga
Dr. Robert Sanglora Khawbung
Dr. Roluahpula
Ruatdiki Hmar
Dr.Smitana Saikia
T. Lianhmingsanga
Dr. Vanlalremruata Tonson
Dr. Zarzosanga
Dr. Zonunmawia
Zoramthanga

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Mittal Publications
PUBLISHERS OF SCHOLARLY BOOKS
4594/9 Daryaganj, New Delhi - 110002 (India)
Phone : +91-11-23250398, Fax : 41564398
Website : www.mittalbooks.com

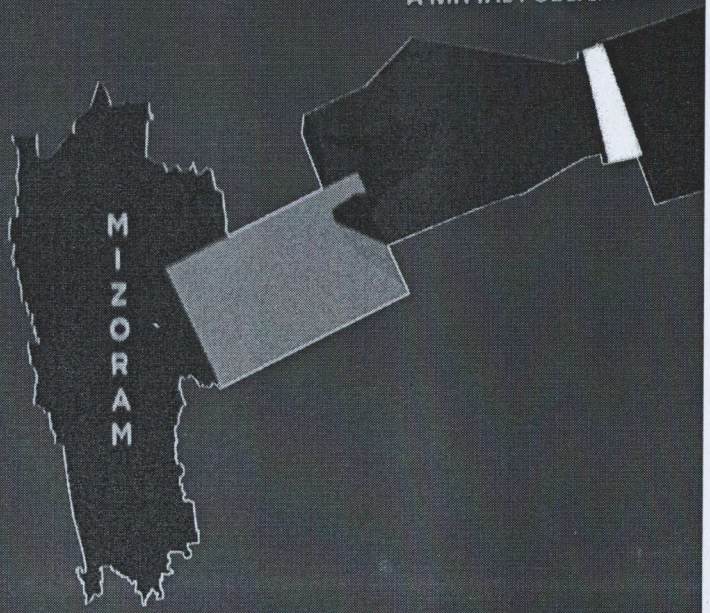
ISBN 978-93-90692-10-1
9 789390 692101
₹ 900

ELECTORAL POLITICS IN MIZORAM

LALMALSAWMA KHIANGTE
F. LALRAMHLUNI

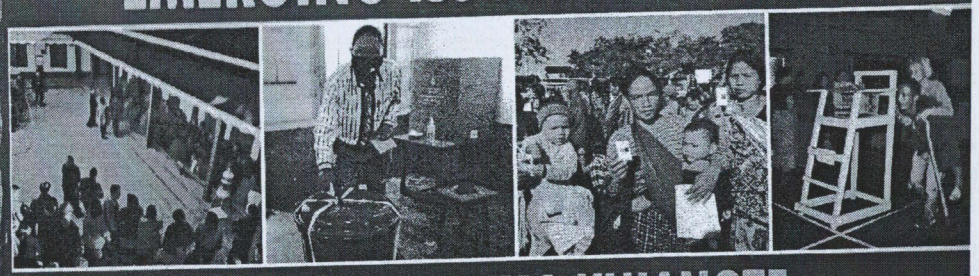
MITTAL PUBLICATIONS

A MITTAL PUBLICATION



ELECTORAL POLITICS IN MIZORAM

EMERGING ISSUES AND TRENDS



LALMALSAWMA KHIANGTE
F. LALRAMHLUNI

CONTENTS

Foreword *v*

Preface and Acknowledgement *vii*

List of Tables *xi*

List of Contributors *xiii*

1. Rich Rulers, Poor Electorates?: Elections and Electoral Politics in Mizoram 1
   – DR. ROLUAHPUIA
2. Politics of Charging Alliances: Rethinking the Pre-Poll '*Politricks*' during the Mizoram Assembly Elections of 2018 11
   – LALNUNDIKA HNAMTE
3. Alternative Fronts in Mizoram Elections 23
   – DR. VANLALREMRUATA TONSON
4. Mizoram Legislative Assembly Elections 2018: An Overview 33
   – C.LALREMSIAMI & DR. C. LALHMANMAWIA
5. Mizoram State Assembly Elections 2018: A Legal Analysis 41
   – ALEX ZORAMMAWII KHIANGTE
6. The Mizoram State Legislative Assembly Elections 2018: A Study in Retrospection 55
   – DR. ZARZOSANGA
7. Analysis of Manifestos of Political Parties in Mizoram State Legislative Assembly Elections 2018 65
   – F. LALRAMHLUNI
8. Interrogating the Gender Imbalance in Mizoram Electoral Politics: Barriers and Contradictions 75
   – C.V. LALMALSAWMI
9. Political Participation of Women in Mizo Society: A Comparative Analysis of the 2013 and 2018 Mizoram Legislative Assembly Elections 87
   – RUATDIKI HMAR & LALMALSAWMA KHIANGTE

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Pachhunga Univ
Aizawl : Mi

3

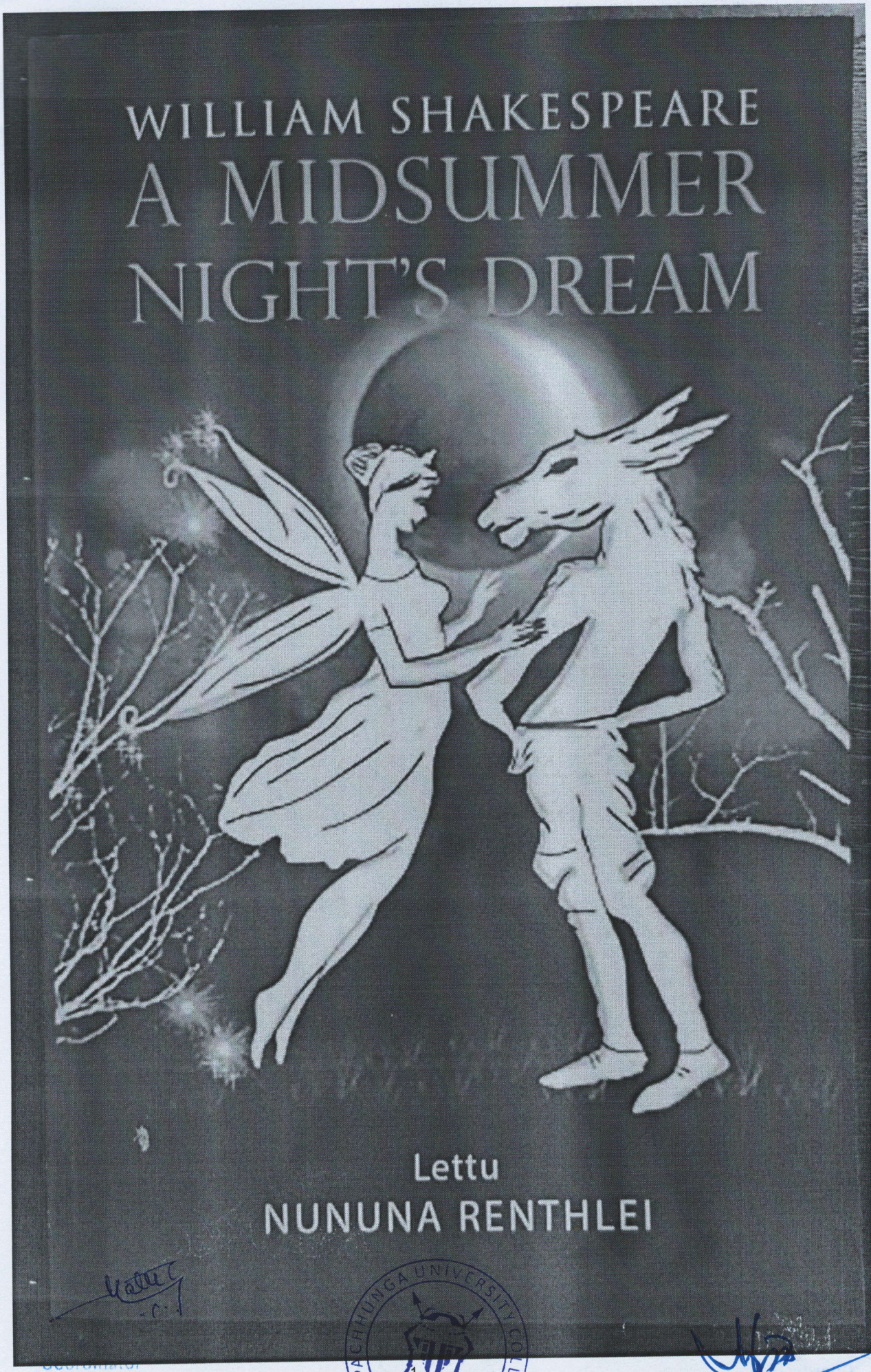
ALTERNATIVE FRONTS IN MIZORAM ELECTIONS

Dr. Vanlalremruata Tonson

Elections of Mizoram assembly, from Union Territory (UT) to State, had usually been contests between Indian National Congress (INC, commonly known as Congress by Mizo)[1] and regional parties. In the Union Territory assembly elections, the contests were between the Congress on one side and Mizo Union (MU) or People's Conference (PC) on the other side. The MU was soon assimilated by the Congress and the PC was supplanted by the assertion movement which was turned into a political party, the Mizo National Front (MNF) in the state assembly elections. Pre-poll electoral alliances were known in the Mizoram elections but only three attempts were made for alternative front such as in 1998, 2003 and 2018. In the other elections, smaller parties allied either with Congress or MNF. The attempts for alternative front did not achieve significant result as most of the alliance could not stand through the post-poll political scenarios. In 2018, the pre-poll alliance called Zoram People's Movement (ZPM) provided an alternative front by overtaking the Congress and became the main opposition in the state assembly.[2]

In Mizoram politics, there is a well-established and efficiently organised political party, Congress which either formed the government or be the largest opposition party until the election of 2018. Congress made its first appearance in the elections of Mizoram in 1962 when it was still Mizo District Council and failed to win even a single seat but rose to win the next election of Mizo District Council which was in 1970. In that election, Congress won 10 seats, the then ruling party MU won 9 seats and independent

PACHHUNGA UNIVERSITY COLLEGE AIZAWL
Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)
Principal
Pachhunga University College
Aizawl : Mizoram



Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

A Midsummer Night's Dream
William Shakespeare
Lettu: Nununa Renthlei
(Lalnunpuia Renthlei)
Mobile : +91 9612124760
email: nununa123@gmail.com
Facebook: Zaiva Nununa Renthlei
Instagram: dr_zaiva
Bualte : Lunglei

First edition : 2021

₹100.00

© Nununa Renthlei
All rights reserved. No part of this book may be reproduced or transmitted in any form or by any means, electronic, mechanical, photocospying, recording, or by any information storage and retrieval system, without the prior permission in writing from the copyright holder.

He lehkhabu chungchanga in ngaih dân leh thurâwnte chu zalên takin min hrilh thei u la, ka lâwm hle ang.

Typeset & Layout : Nununa Renthlei
Cover Design : LB Vanchhawng

Published by Lalnunpuia Renthlei
@ **Songbird Publication**

Printed at:
K.L. Offset Printers
M.G. Road, Upper Khatla
Aizawl - 796 001, Mizoram
Ph : 0389-2311260/9862725123
Email : kloffsetprinters@gmail.com

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl Mizoram

A MIDSUMMER NIGHT'S DREAM
(*Nipui Vànglai Zantiang Tawnmang*)

William Shakespeare

Lettu
Nununa Renthlei
(Dr Lalnunpuia Renthlei)

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

LEHLIN NANA THUZIAK RÀWNTE

He lemchan thawnthu lehlin nan hian a hnuaia lehkhabu leh thuziak ka tàr lan pathumte hi ṭangkai takin ka hmang a ni:

1. *Shakespeare: The Complete Works*. Wilco Publishing House, 2013.

2. "A Midsummer Night's Dream Translation." *No Fear Shakespeare, SparkNotes*. SparkNotes LLC, 01 October 2013.

3. Florman, Ben. "A Midsummer Night's Dream Translation." *LitCharts*. LitCharts LLC, 11 May 2014. Web. 21 Apr 2020.

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

AINAWN ENGLISH PROSE GUIDE

Buatsaihtu

Nununa Renthlei



Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Ainawn English Prose Guide
From *Paper XII (B): English Prose*
Nununa Renthlei
(Dr Lalnunpuia Renthlei)
Assistant Professor
Dept of Mizo, PUC

₹ 200.00

First edition – 2021

Published by
Nununa Renthlei (Dr Lalnunpuia Renthlei)
@ Songbird Publication

© Copyright reserved by
Nununa Renthlei (Dr Lalnunpuia Renthlei)
Ph. 9612124760

Published by and Printed at:
K.L. Offset Printers
M.G. Road, Upper Khatla
Aizawl - 796 001, Mizoram
Ph : 0389-2311260/9862725123
Email : kloffsetprinters@gmail.com

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

A CHHUNGA AWMTE

1.	Of Studies	- Francis Bacon	- 1
2.	Principles of Good Writing	- L.A. Hill	- 12
3.	Miseries of the Rich	- G.B. Shaw	- 27
4.	A Simple Philosophy	- Seathl	- 39
5.	Shakespeare and Others	- John Dryden	- 54
6.	The Weather: An Explanation	- Robert Lynd	- 68
7.	Happiness	- Oliver Goldsmith	- 81
8.	What is Courage?	- William Slim	- 95
9.	What is Culture?	- Jawaharlal Nehru	- 112
10.	A Pilgrimage to Tawang	- Verrier Elwin	- 126
11.	The Other Side of the Hedge	- E.M. Forster	- 140
12.	Vanishing Animals	- Gerald Durrell	- 160

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Aizawl : Mizoram

THE TEMPEST

WILLIAM SHAKESPEARE



LETTU
NUNUNA RENTHLEI

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

The Tempest
William Shakespeare
Lettu: Nununa Renthlei
(Lalnunpuia Renthlei)
Mobile : +91 9612124760
email: nununa123@gmail.com
Facebook: Zaiva Nununa Renthlei
Instagram: dr_zaiva
Bualte : Lunglei

First Edition : 2021

₹100.00

© Nununa Renthlei
All rights reserved. No part of this book may be reproduced or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without the prior permission in writing from the copyright holder.

He lehkhabu chungchanga in ngaih dân leh thurâwnte chu zalên takin min hrilh thei u la, ka lâwm hle ang.

Typeset & Layout : Nununa Renthlei
Cover Design : LB Vanchhawng

Published by Lalnunpuia Renthlei
@ ***Songbird Publication***

Printed at:
K.L. Offset Printers
M.G. Road, Upper Khatla
Aizawl - 796 001, Mizoram
Ph : 0389-2311260, 9862725123
Email : kloffsetprinters@gmail.com

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

LEHLIN NANA THUZIAK RÀWNTE

He lemchan thawnthu lehlin nan hian a hnuaia lehkhabu leh thuziak ka tàr lan pathumte hi ṭangkai takin ka hmang a ni:

1. *Shakespeare: The Complete Works.* Wilco Publishing House, 2013.

2. "The Tempest." *No Fear Shakespeare, SparkNotes.* SparkNotes LLC, 09 May 2020.

3. Florman, Ben. "The Tempest: A Shakespeare Translation." LitCharts. LitCharts LLC, 11 May 2014. Web. 9 May 2020.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

CHAN - I

LAN - I. *Tuifinriata lawng chhûng. Khawpui rî leh ṭêk tla rî a rawn ri tuar tuar a.*

Lawng Hotu leh Bungraw Hotu an lo lang a.

LAWNG HOTU. Bungraw hotu!

BUNGRAW HOTU. Heta hi ka awm e, ka pu. Eng nge ni ta?

LAWNG HOTU. A ṭha e. Lawngpuho hnenah zu kal thuai la, a aia nasain han ti zung zung hlawm rawh se, kan lawng a chhe mai dâwn tlat! Hmanhmawh rawh, hmanhmawh rawh!

A chhuak a.

Lawngpuho an lo lang a.

BUNGRAW HOTU. Khai aw le, naute u. Ti zung zung r'u le. Hmanhmawhin! Hmanhmawhin! Puanzàr chung ber khi la thla rawh u. Kan hotupa thu chhuak ngaichâng r'u aw. Thlipui, chêtna tur hmun âwl min la zuah chhûng chuan, a lehpek awm tawh lo lêkin han che law law rawh le!

Alonso-a te, Sebastian-a te, Antonio-a te, Ferdinand-a te, Gonzalo-a te, leh mi dangte an lo lang a.

ALONSO. Bungraw hotu, fimkhur rawh aw! Khaw nge kan hotupa ber hi? Hna thawkho hi han tur deuh rawh aw.

BUNGRAW HOTU. Ka ngèn a che u, lawng chhûng lamah lo zuk tawmim rawh u.

ANTONIO. Khaw nge hotu ber hi a awm, bungraw hotu?

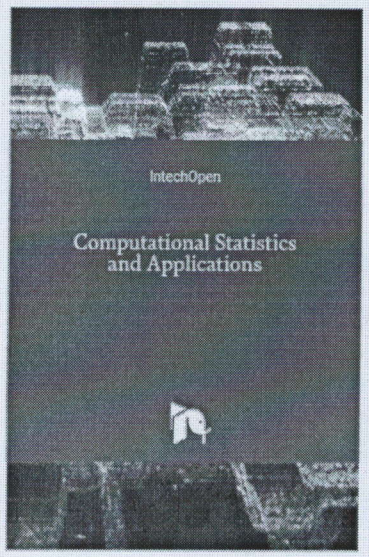
BUNGRAW HOTU. A ṭawng lâwng lâwng rî pawh in hre lo em ni? Kan hna thawk lai min rawn tibuai a nia. Lawng pindan chhûngah zu tawm mai mai teh u, thlipui thin thawk in rawn tizualkâi tlat.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Computational Statistics and Applications



COMPUTATIONAL STATISTICS AND APPLICATIONS

ISBN 978-1-83969-783-8

Book edited by:

Prof. Ricardo López-Ruiz

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Chapter

Modeling Heterogeneity Using Lindley Distribution

Arvind Pandey and Lalpawimawha ✓

IntechOpen

Abstract

Frailty models are intended for use in survival analysis to explain unobserved heterogeneity in an individual caused by various hereditary variables or environmental influences. A shared frailty model was utilized to examine the data. It is based on the idea that frailty affects the hazard rate in a multiplicative manner. In this manuscript, we introduce a new frailty model called the Lindley shared frailty model with exponential power and generalized Rayleigh as baseline distributions. The The Bayesian method of the Monte Carlo method of the Markov chain is used to estimate the parameters used in the model; simulation studies are also carried out to compare the actual and calculated values of the parameters; the proposed model is compared with the Bayesian comparison method Compare and propose the best model of infectious disease data.

Keywords: Bayesian technique, exponential power distribution, generalized Rayleigh distribution, Lindley frailty, MCMC

1. Introduction

The term frailty was coined by Vaupel et al. [1]. The frailty model is typically represented as an unobservable random variable that multiplies the risk function, with the frailty random variable supposed to be one of the parameter distributions, such as gamma, log-normal, positive stable, inverse Gaussian, power variance function, and so on. Let Y be a continuous random variable of lifetime of an individual and the frailty random variable (RV) be V. The conditional hazard function (CHF) for a given frailty variable $V = v$ at time $y > 0$ is

$$m(y|v) = vh_0(y)e^{X'\beta}, \tag{1}$$

where $m_0(y)$ is a baseline hazard function (BHF) at time $y > 0$, X is a covariate and β is a regression coefficient, these are in vector form. The CHF for given frailty at time $y > 0$ is

$$S(y|v) = e^{-\int_0^y m(x|v)dx} = e^{-vM_0(y)e^{X'\beta}}, \tag{2}$$

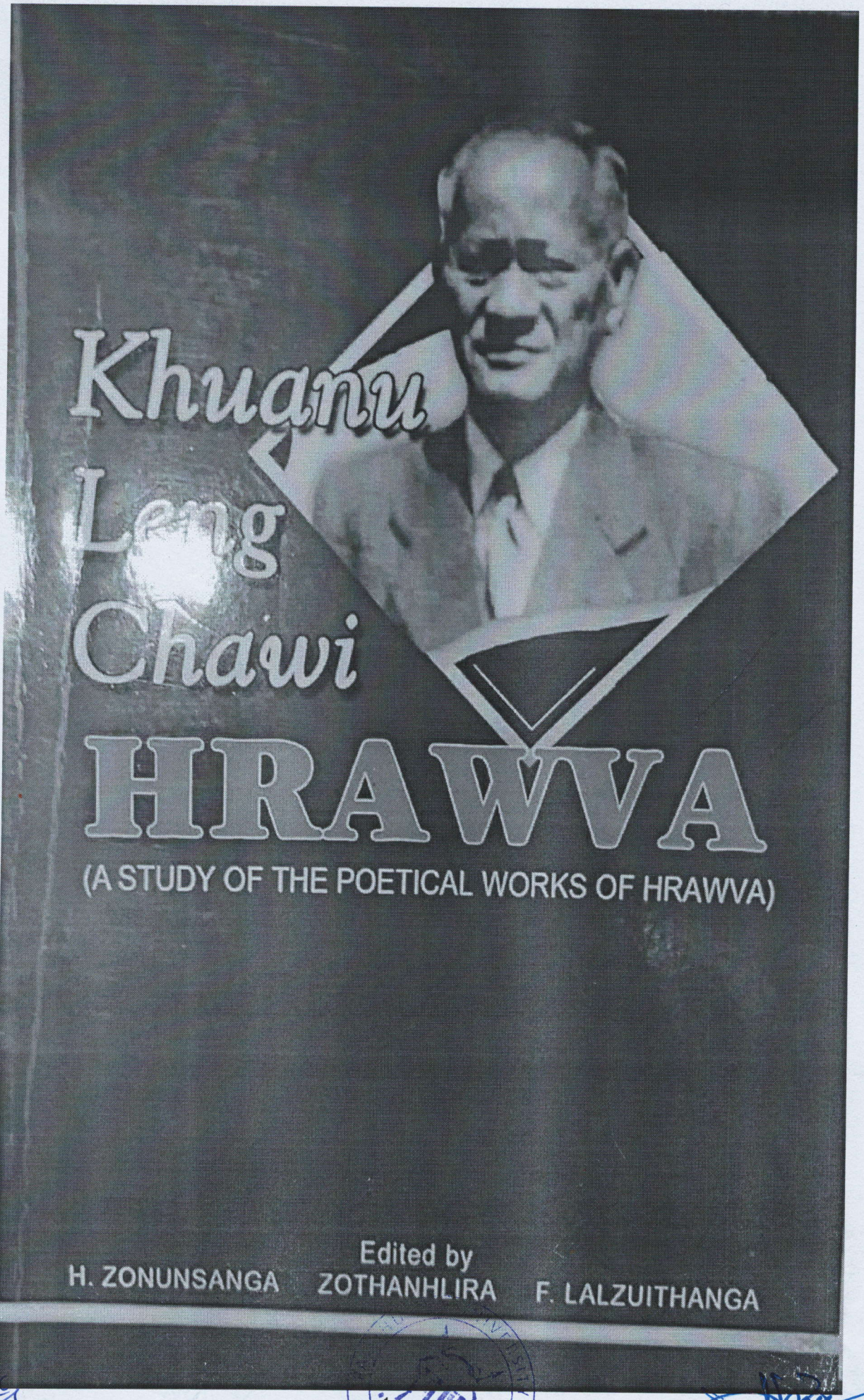
where $M_0(y)$ is cumulative baseline hazard function (CBHF) at time $y > 0$. Integrating over the range of frailty variable V having density $f(v)$, we get marginal survival function as

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

IntechOpen

Principal
Pachhunga University College
Aizawl : Mizoram



Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

Khuanu Leng Chawi Hrawva
(*A Study of the Poetical Works of Hrawva*)

Edited by

H.Zonunsanga, Zothanhlira & F.Lalzuithanga

Published by

Mizo Department
Govt Aizawl North College, Aizawl.

Edition: 2020

Price: ₹ 200 $ 3

ISBN : 978-81-945490-5-5

Cover Design

LB Vanchhawng & Zama Khiangte

©Copyright Reserved

Printed at

KL Offset Printers
MG Road, Upper Khatla, Aizawl
Ph-0389-2311260/9862725123
Email: kloffsetprinter@mail.com

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl, Mizoram

12. *Psychoanalytic* Hnuhma Hrawva Hlaah
by Debbie Lalrinawmi..... 136
13. *Confessionalism in* Hrawva*'s Poetry*
by Joseph Lalramnghaka..... 147
14. Hrawva Hlaa Tawrhna
by Lalzarzovi..... 155
15. *Theme of Death in* Hrawva's *Poetry*
by Lalzarzova..... 164
16. Khuanu Leng Chawi Hrawva
by V.Lalberkhawpuimawia..... 178
17. *Aspect of Reality in* Hrawva's *'Rairahtea'*
by Lalrinkimi..... 185
18. *'Rairahtea'* Hla leh Mizo Khawtlang Nuna Fahrahte Dinhmun Thlirna
by Lalrammuana Sailo..... 192
19. *Treatment of Orphan in* Mizo *Society with Special Reference to* Hrawva's *Poem 'Rairahtea and Khuanu Leng Chawi'*
by Thang Sian Tluang..... 202
20. Tu Nge Mi Ropui?
by Sangrozami..... 217
21. Mi Pahnih
by F.Vanlalrochana..... 225
22. *Of Poetics and Praise: The Romantic & Sacramental Imagination of* Hrawva *and* Lalmama
by Lalawmpuii Sailo..... 230

Thubelh Huang

Seminar Hun Hman Dan & Hlimthla..... 237

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

18

'Rairahtea' Hla leh Mizo Thu leh Hlaa Fahrah Dinhmun Thlirna

Lalrammuana Sailo
Asst. Professor, Department of Mizo
Pachhunga University College

Mizo thufing pakhatah chuan 'Fahrah leh vantlang an ṭang rual' tih a nih laiin Mizo nun hluia fahrahte dinhmun tarlanna thu leh hla dangte kan zir chuan fahrahte dinhmun chu a hniamin a chhe hle thung si. 'Thu fahrah' chu thu lak tlak vak loh, pawimawhna nei em em lo sawina a ni a. 'Fahrah puan hlai' tih ṭawngkam te chu pawng hlai satliah, zau duai ringawt sawina a ni a. A lo chhuah dan chu James Dokhuman heti hian a sawi a; "Fahrah chuan lainattu tak a neih loh avangin puan an tahsak pawhin thuah nghal theih tur si khawlaiah pawh ven theih tur chi siin an tahsak ṭhin a. Puan nei tam ve zo hek lo, ren tin daih tura an tah hlaisak avangin, chu chu tehkhinin pawng hlai duai mai tehkhinah an hmang a ni" (Dokhuma 169) a ti. Falak phei chu fahrah aiin an dinhmun a hniam lehzual a, 'Falak ṭawng leh chhum kar ni a na' an tih chhan pawh falak chu mi tin hmuhsit leh zuam an nih avangin an ṭawng chu huata lak a awl thu sawina a ni. Chutianga 'khawtlanga dinhmun chhia an nih avang chuan fahrah te chu sakei hian a khawngaih em em a, fahrahte hmuh leh hlauh tura lo awm ai chuan di zai khat phenah pawh bihruk a inhuam' niin an sawi ṭhin (Lalbiakliana 23).

REDMI NOTE 9
AI QUAD CAMERA

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

19

ISBN : 978-81-9454190-5-5

Treatment of Orphan in Mizo Society with special refrences to HRAWVA's Poem *Rairahtea* and *Khuanu Leng Chawi*.

Thang Sian Tluang

Student, PG Section, PUC

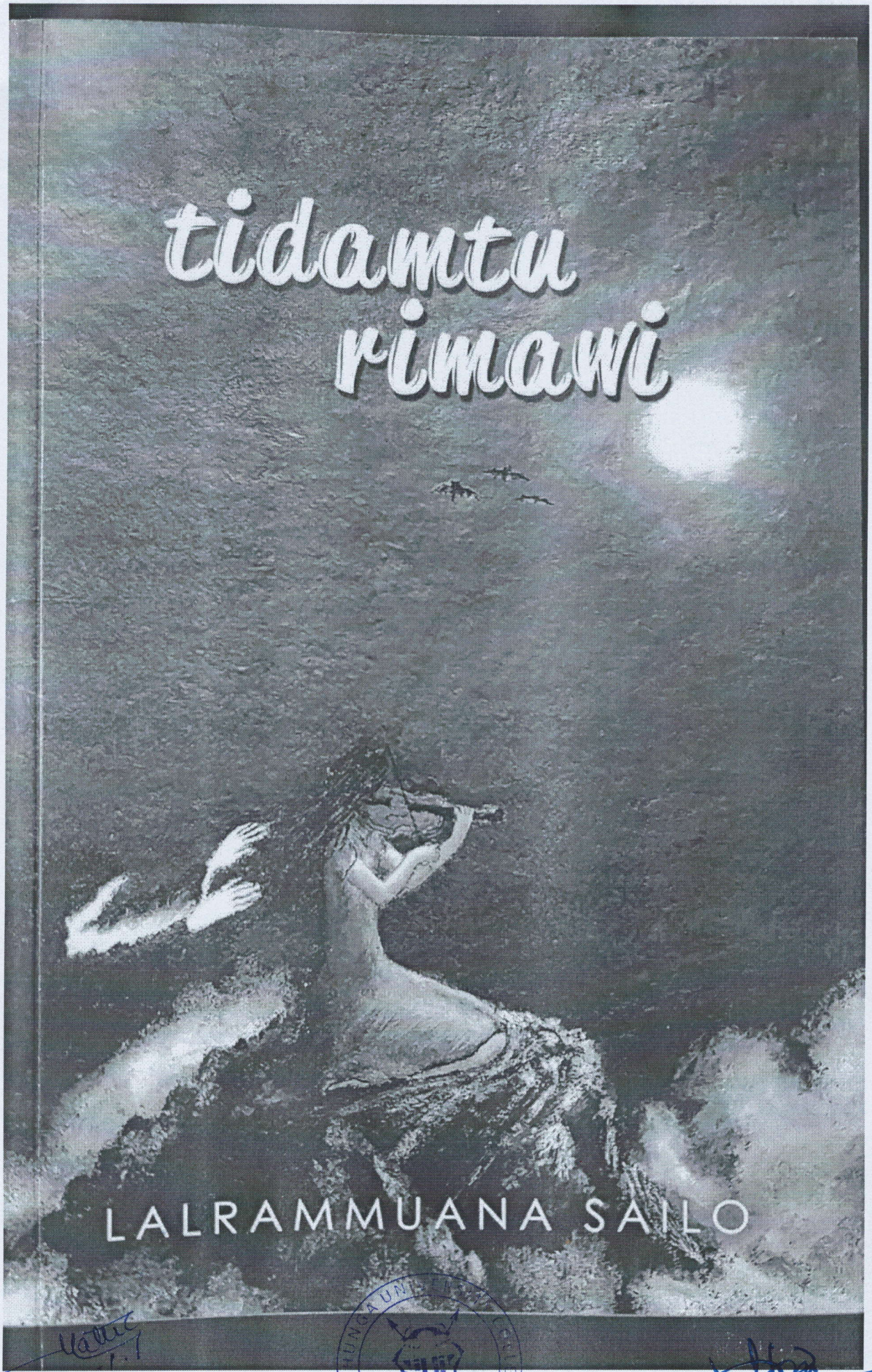
Khawvela hnam chi hrang hrangte nunah hian fahrahte hian an nunah harsatna an tawk ṭheuh a, a ṭhen chu society aṭanga harsatna an tawh a nih theih laiin a ṭhenah chuan fahrahte hian an dinhmun an inhriat lutukna avanga an inkiltawihna chuan anmahni leh mahni chungah harsatna an insiamchawp ṭhin ni pawhin a lang. Chung fahrahte tawrhna leh harsatna an tawh dan te, *society*-a fahrahte dinhmun leh *society*-in fahrahte an lo enkawla an lo hmuh dan nia langte chu Hrawva hla pahnih 'Rairahtea' leh 'Khuanu Leng Chawi' tih hla aṭangte hian zir chian kan tum dawn a ni. Chumi hma chuan '*Society*' awmzia han sawi hmasa ila.

Cambridge Advanced Learners' Dictionary chuan '*Society*' chu, "Mipui tam tak a huhova cheng, thil tihtur leh tih loh tur thlenga pawm dan inang nei an ni a. Ram khata cheng mipui zawng zawng te, khaw hrang hranga awmte sawina pawh a ni thei a ni," (*Cambrigde Andvanced Learners' Dictionary*, 1481) tiin a hrilhfiah a.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL 3

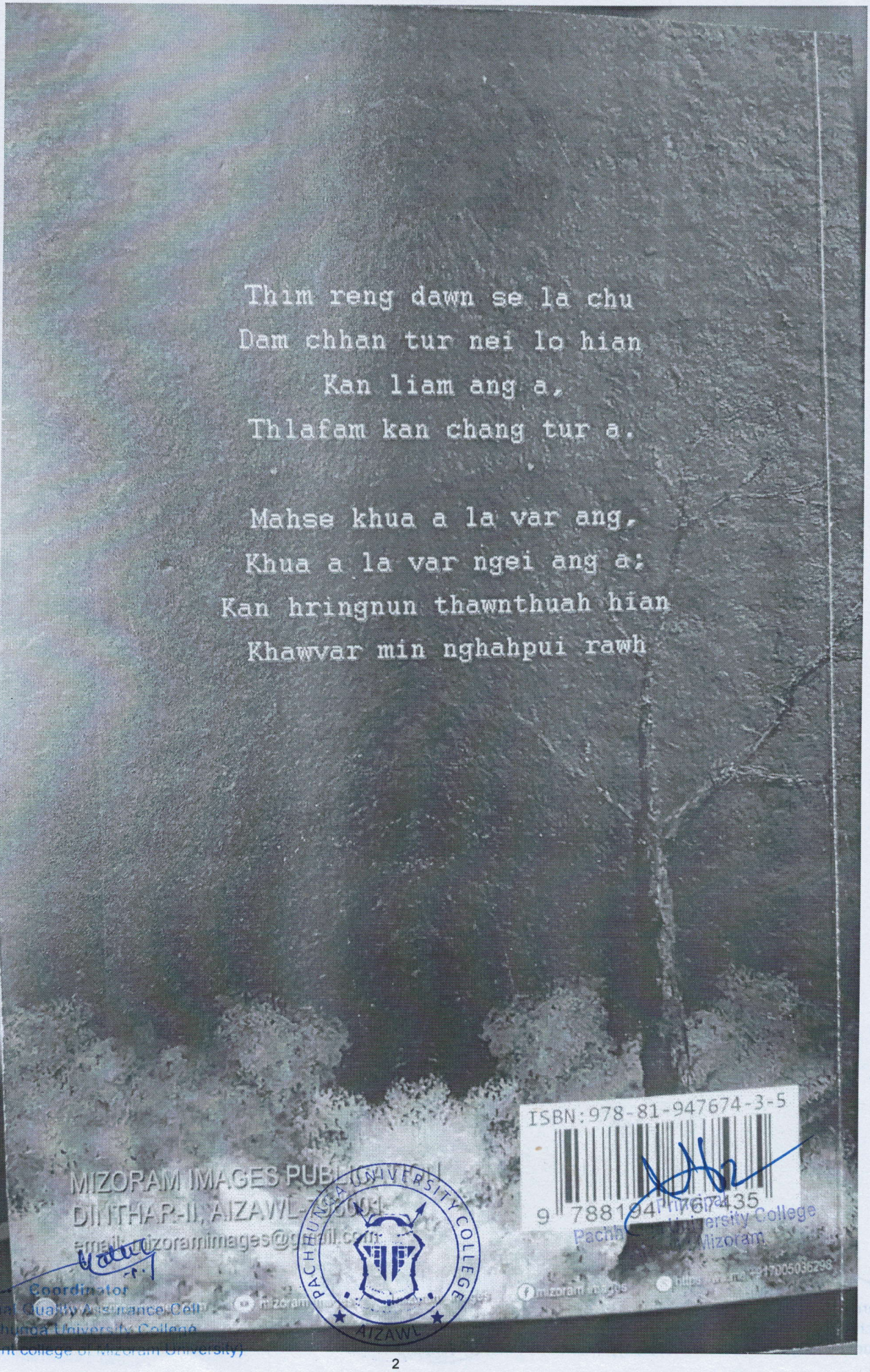
Principal
Pachhunga University College
Aizawl : Mizoram



Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram



ISBN:978-81-947674-3-5

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

ZIRTIRTU LALMAMA

(The Works & Contributions of Lalmama)

Edited by

K.Vanlalawia
Rohmingthanga Ralte
F.Lalzuithanga

MIZO DEPARTMENT
GOVT AIZAWL NORTH COLLEGE

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

ZIRTIRTU LALMAMA

(The Works & Contributions of Lalmama)

Edited by

K.Vanlalawia, Rohmingthanga Ralte &
F.Lalzuithanga

Published by

Mizo Department
Govt Aizawl North College, Aizawl.

Edition: 2021

Price : ₹ 250 $ 4

ISBN : 978-81-945490-9-3

Cover Design

V.Lalberkhawpuimawia

©Copyright Reserved

Printed at:

KL Offset Printers
MG Road, Upper Khatla, Aizawl
Ph-0389-2311260/9862725123
Email: kloffsetprinter@mail.com

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

11. Lalmama Hla Lenglawnga Mizona
by Lalsangliana..... 119
12. Lalmama Lunglenna: A Hla Aṭanga A Lan Dan
by Dr. Zoramdinthara..... 128
13. *Nature and Poetry: An Ecocritical Study of Selected Poems of* Lalmama
by V. Lalrinsangi..... 137
14. *An Ecocritical Analysis of* Lalmama's *Poetry- 'Nghilh ni a awm lo vang' & 'Kawlhawk Mual Liam'*
by Lalrinfela..... 145
15. Lalmama Hlaa Sava
by Lalzuitluanga..... 154
16. Serkawn Lalmama 'Khuarel Hla' (Nature) leh 'Thawnthu Hla' (Ballad) Zir Chianna
by HC Lalramnghaka..... 160
17. Lalmama leh Shelly-a 'Virthli leng' Vir Vel
by H.Laldinmawia..... 175
18. Lalmama leh A Pathian Fakna Hlate
by David Lalchhuanawma, Laldampuii & Lalchhanhima Tlau..... 184
19. Lalmama *'Mizo Titi'*
by Vanlalchanchinṭhahrilmawia..... 192
20. Lalmama *and* Serkawn *School*
by Lalrotluanga..... 199
21. Mi Pahnih
by F.Vanlalrochana..... 206

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

20

LALMAMA AND SERKAWN SCHOOL

Lalrotluanga
Assistant Professor, Mizo Department
Pachhunga University College

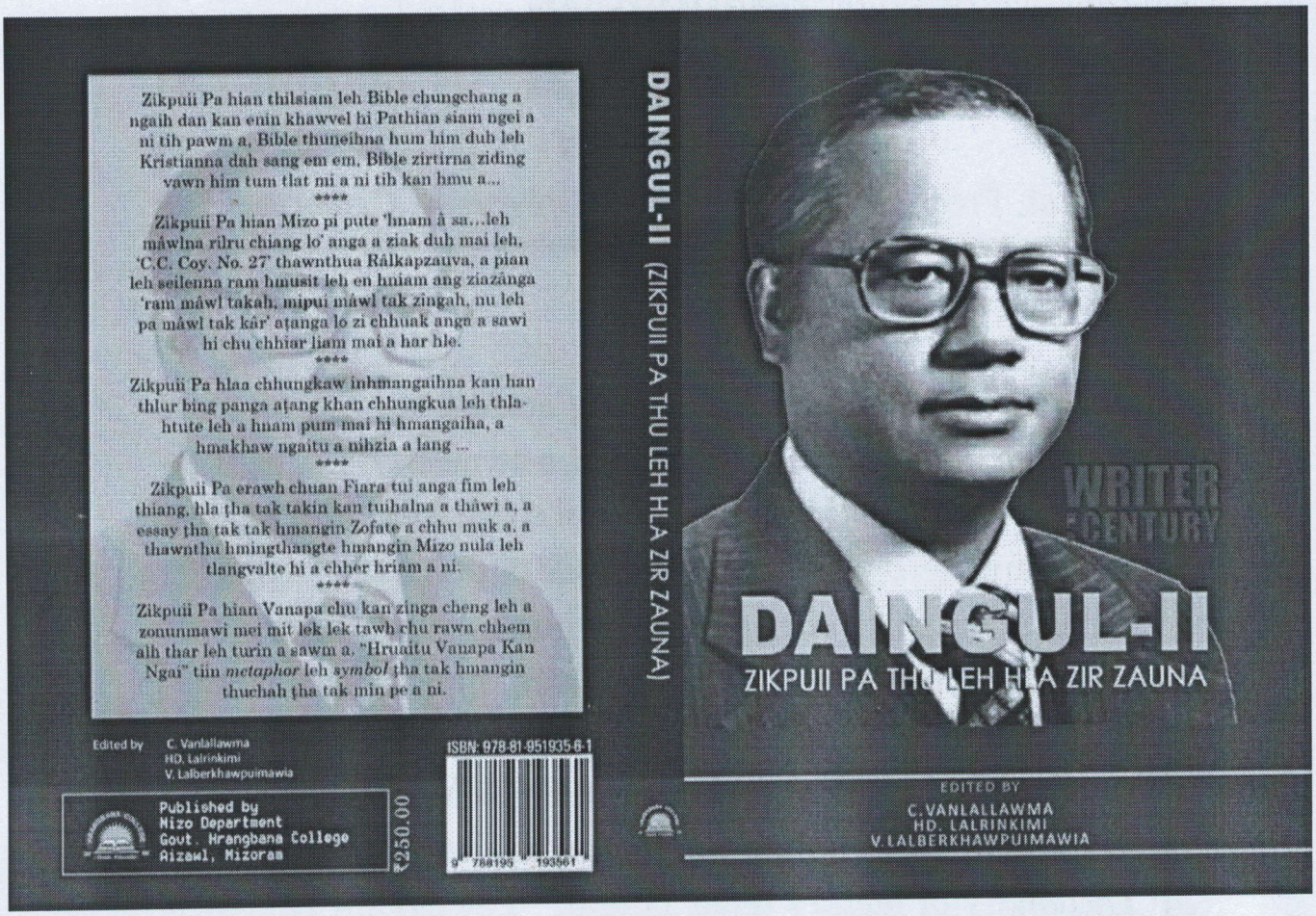
In 1918, Lalmama became a regular worker and assisted the missionaries. He was the Head Master of Serkawn Middle School from 1938 to 8th August, 1959 till his death. Sap Upa and Rev. H.W.Carter recorded Lalmama to be among the forefront Mizo people who could speak fluent English. In 1947, he travelled to England and Norway and was the theme speaker at one of the conference programme. Lalmama was a good singer and ascertained to tonic solfa. He had taught a solfa to numbers of students.

Lalmama was one of the greatest contributors at Serkawn concert. His songs were very relevant till today and had high value for the Mizo nation. His literary pieces of works were deemed highly esteem by the Guwahati University. The Government of India handed Lalmama Rs. 500 for the appreciation of his compositions. "*KristianHlabu* No. 2, 11, 27, 91, 64, 295, 453, 527 and No. 526, the christian family song were his translations and compositions" (*Serkawn Centenary Souvenir*, 151). He was the proof reader of the works of the missionaries and other Mizo books published. He had translated *Robinson Crusoe*, *Mizo Idioms andPhrases* and various numbers of books. We can assume clearly, from the comment of Upa

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram



Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Metaphor and Symbolical Poetic Techniques: "Hruaitu Vana Pa Kan Ngai" by Zikpuii Pa

Lalrotluanga
Asst. Professor, Pachhunga University College

Metaphor tih hi Greek ṭawng aṭanga lak a ni a, *meta* leh *phero* tih ṭawngkam aṭanga lak a ni, a awmzia chu 'hmehbel-tehkhinna' tihna a ni ber. Tehkhin a ni chiah lo va, thil pakhat chu thil dang nena hmehbel a ni. *Simile* chuan a lang a pauvin a tehkhin a, *metaphor* chuan thinlung buklungah kan buk turin a dah thung. Entirnan: *Rumna thlaler, sual thlipui, damlai luidung, thlafam buantual etc. Metaphor* hi hla thu tihausatu, hla tihlutu leh timawitu pawimawh tak a ni. Mizo hlaah chuan sakhaw lam hlaah a ṭhahnem a, lengzemah a tlem deuh thung. *FP Dictionary of literary terms* chuan, "Ṭawngkam pakhat a nihna anga sawi tlang tawp lova ṭawngkam danga sawi fiahna (Dictionary of Literary Terms 38)," tiin a hrilh fiah thung. Lallianmawia Pachuau hla sak 'Di fuhte' tih hlaah chuan,

Hawivelin sakhmel tawnni awm thei lo
Zawlkhawpui kan lenna laitual an maw
Thinlai rukah i hlui thei si lo
Khawian nge maw i tuan bik ṭhin le
Mate ka ngai em che Valmawian

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

Geochemical Constraints on the Petrogenesis of the Metasedimentary Rocks Forming the Basement of the Shillong Plateau, Northeast India

M. Faruque Hussain, V. Vanthangliana and M. E. A. Mondal

Abstract Granite gneisses, cordierite bearing granulitic gneisses (pelitic gneisses) and quartz-sillimanite schists (pelitic schists) comprise the Precambrian metamorphic basement complex of the Shillong plateau. Pelitic gneisses and pelitic schists were geochemically studied to determine the paleoweathering conditions and provenance characteristics of their precursor sediments. The chemical indices of alteration and weathering (CIA and CIW) values of the pelitic gneisses vary from 62 to 84 and from 74 to 96 respectively, which indicate a moderate to extremely weathered precursor that was formed probably in a warm and humid climate. The pelitic schists are characterized by CIA and CIW values that range from 99.2 to 99.6 indicating the schists probably had extremely weathered precursor(s). Chondrite normalized rare earth elements (REE) patterns of the rock suites display highly fractionated REE patterns along with prominent negative Eu anomaly [pelitic gneisses: La_N/Yb_N = 19.7 − 81.7, Eu/Eu* = 0.17 − 0.68; pelitic schist: La_N/Yb_N = 27.4 − 43.7, Eu/Eu* = 0.15 − 0.32]. Post-Archean Australian Shale (PAAS) normalized multi-element diagram for the pelitic gneisses exhibits enrichment of Nb, Th, Ce, La, Ba, K, Rb with strong depletion of Zr and Sr., suggesting precursor sediments were rich in clay fractions. The pelitic schists however exhibit a highly fractionated trend with enrichment of Zr, Th, Ce and La and depletion of P, Nb, Ti, Y, Sr, Ba, K and Rb relative to PAAS. The geochemical characteristics of both the rock types thus suggest that the precursor sediments were derived from felsic sources; however, those for the schists were derived from a recycled felsic source.

M. Faruque Hussain (✉)
Department of Earth Science, Assam University, Silchar 788011, Assam, India
e-mail: faruque_geo@yahoo.co.in

V. Vanthangliana
Pachhunga University College, Mizoram University, Aizawl 796004, Mizoram, India

M. E. A. Mondal
Department of Geology, Aligarh Muslim University, Aligarh 202002, U.P., India

© Springer International Publishing AG, part of Springer Nature 2019

M. E. A. Mondal (ed.), *Geological Evolution of the Precambrian Indian Shield*,
Society of Earth Scientists Series, https://doi.org/10.1007/978-3-319-89698-4_16

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE ★ AIZAWL ★

Principal
Pachhunga University College
Aizawl : Mizoram

Author's Proof

Tailoring Disease Resilience Crops through CRISPR/Cas

7

Mukesh Kumar Yadav, Poonam Patel, Ajay Kumar, Arpan Modi, Punuri Jayasekhar Babu, Zothanpuia, Liansangmawii Chhakchhuak, Kaushlendra, Garima Singh, Amit Kumar Mishra, Bendangchuchang Longchar, and Prashant Kumar Singh

Abstract

Recent developments in *c*lustered *r*egularly *i*nterspaced *s*hort *p*alindromic *r*epeats (CRISPR)-associated protein (CRISPR/Cas) enable scientists to add critical agronomic traits in crop plants such as plant disease management and tolerance to abiotic stresses. CRISPR-based editing technology not only improved the genetic studies but also shortened out various breeding technologies in an environmentally friendly manner. CRISPR/Cas has overhauled additional genome editing technologies (GETs), for instance, transcription activator-like effector nucleases (TALENs), zinc finger nucleases (ZFNs) and mega-nucleases, because of its simplicity, higher success, robustness and being economical. However, although

M. K. Yadav · P. J. Babu · Zothanpuia · L. Chhakchhuak · P. K. Singh (✉)
Department of Biotechnology, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl, Mizoram, India

P. Patel
Department of Biotechnology, Anand Agricultural University, Anand, India

A. Kumar · A. Modi
Agriculture Research Organization (ARO)-The Volcani Centre, Rishon LeZion, Israel

Kaushlendra
Department of Zoology, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl, Mizoram, India

G. Singh
Department of Botany, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl, Mizoram, India

A. K. Mishra
Department of Botany, Mizoram University (A Central University), Aizawl, Mizoram, India

B. Longchar
Department of Life Science, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl, Mizoram, India

© The Author(s), under exclusive license to Springer Nature Switzerland AG 2022
A. Kumar (ed.), *Microbial Biocontrol: Food Security and Post Harvest Management*, https://doi.org/10.1007/978-3-030-87289-2_7

Uncorrected Proof

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College



FIXED BORDERS, FLUID BOUNDARIES

Identity, Resources and Mobility in Northeast India

Edited by
Chandan Kumar Sharma
and Reshmi Banerjee

SOUTH ASIA EDITION
A Routledge India Original

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

MIZORAM UNIVERSITY
AIZAWL

Complimentary Copy
Not For Sale

First South Asia edition 2021

First published 2021
by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

and by Routledge
52 Vanderbilt Avenue, New York, NY 10017

Routledge is an imprint of the Taylor & Francis Group, an informa business

© 2021 selection and editorial matter, Chandan Kumar Sharma and Reshmi Banerjee; individual chapters, the contributors

The right of Chandan Kumar Sharma and Reshmi Banerjee to be identified as the authors of the editorial material, and of the authors for their individual chapters, has been asserted in accordance with sections 77 and 78 of the Copyright, Designs and Patents Act 1988.

All rights reserved. No part of this book may be reprinted or reproduced or utilised in any form or by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying and recording, or in any information storage or retrieval system, without permission in writing from the publishers.

Trademark notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record for this book has been requested

ISBN: 978-0-367-67452-6 (hbk)
ISBN: 978-1-003-00003-7 (ebk)

Typeset in Sabon
by Apex CoVantage, LLC

Digitally Printed at Replika Press Pvt. Ltd.

For sale in India, Pakistan, Nepal, Bhutan, Bangladesh and Sri Lanka only.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

6 Ethnicity, immigration and conflict: the case of Bodoland Territorial Area Districts (BTAD) 81
CHINNITA BARUAH

7 "Outsiders" in Bodoland: categories of narratives and practice 97
SABA SHARMA

8 Politics of land and citizenship in the Chittagong Hill Tracts of Bangladesh 111
FARIBA ALAMGIR

PART 3
Borders and beyond 131

9 Accusations and belonging in the southwestern borderland of Mizoram 133
N. WILLIAM SINGH

10 Ethnography in the Assam–Nagaland border: narratives of conflict 150
PRAFULLA KR. NATH

11 Ambiguity, conflict and compliance: Myanmar's woes meet Northeast India 170
RESHMI BANERJEE

12 Crossing over the Patkai mountains: ethnographic memoirs as ruptures and flows 188
KAUSTUBH DEKA

Glossary 200
Index 206

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

9 Accusations and belonging in the southwestern borderland of Mizoram

N. William Singh

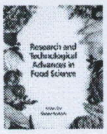
On 13 April 2015, Amit Shah, the Bharatiya Janata Party (BJP) leader, visited Mizoram. During the visit, the Mizoram Zirlai Pawl (MZP) submitted a memorandum, which revealed the abnormal increase of Chakma population in the southwestern borderland of Mizoram. According to the students' body, population increase is due to the influx of illegal immigrants from Chittagong Hill Tracts (CHT), the border is porous and the unfinished project of border fencing escalated the influx.[1] The Chakma population figure in the memorandum is based on the registrar of headcounts[2] maintained by the MZP and the Young Mizo Association (YMA). The figures are not based on the figures as per the Census of India. The memorandum mentioned:

> From 1901 till date, the Chakma population has increased by 44,004%, which is not a possible normal human reproduction. During the British rule, the Lushai hills (Mizoram) colonial administrators issued several orders – time after time – to control Chakma migrants in those orders.[3] During the second Census in 1911, there were 302 Chakmas in Mizoram. The population increased to 680 (225% growth) in 1921, then further to 836 (122.94% increase) in 1931. In the 1941 Census, their population skyrocketed to 5,088 (608% increase), then further to 15,297 (300.64% growth) in 1951. In 1961 Census, the figure rose to 19,327, and again to 22,392 in 1971, to 39,905 in 1981 and jumped to 80,000 in 1991. It is certain that they are roughly around 1,50,000. Mizoram has a little more than 10 lakhs [100,000] as per the 2011 Census. The population of Chakmas, who are not the indigenous people of Mizoram, has increased from a mere 198 in the first ever Census in 1901 to 80,000 in the 1991 Census".[4]

The Mizo society claims that there is a big difference between the total number of Chakma population as per the official figures [Census 2001 and the Chakma Autonomous District Council (CADC) Demographic Registrar 2015] and the actual headcounts of Chakmas conducted by the Mizo civil society groups. The dominant society is of the opinion that the total number of the minority population as per the official figure (Census 2001

Coordinator
Internal Quality Assurance Cell
PACHHUNGA UNIVERSITY COLLEGE
AIZAWL
Pachhunga University College
Aizawl : Mizoram

ScienceDirect



Research and Technological Advances in Food Science

Book • 2022

Edited by:

Bhanu Prakash

☐ Browse book content

☐ About the book

☐ Search in this book

Search in this book

Table of contents

○ Full text access

Front Matter, Copyright, Contributors, Preface

Book chapter ○ Abstract only

Chapter 1 - Food and human health: An outlook of the journey of food from hunger satisfaction to health-promoting agent

Bhanu Prakash, Prem Pratap Singh, ... Vishal Gupta

Pages 1-30

Purchase View abstract

Book chapter ○ Abstract only

Chapter 2 - Advances in personalized food and nutrition

Moorthy Karthika Selvi, B. Sowmya, ... P. Vijayaraj

Pages 31-60

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

FEEDBACK

Download PDF

About the book

Description

The reduction in nutritional quality of food due to microbial contamination is a problem faced by much of the developing world. To address contamination-related hunger and malnutrition, it is crucial to enforce quantitative and qualitative protection of agri-food commodities after harvesting, as well as to create low

Show more

Key Features

Includes information about different natural sources of food (microbes, plants and animal origin), and their health benefits

Highlights current research and technological advances in food science related to health

Show more

Details

ISBN

978-0-12-824369-5

Language

English

Published

2022

Copyright

Copyright © 2022 Elsevier Inc. All rights reserved.

Imprint

Principal
Pachhunga University College
Aizawl : Mizoram

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

FEEDBACK

Academic Press

DOI

https://doi.org/10.1016/C2020-0-01552-5

You currently don't have access to this book, however you can purchase separate chapters directly from the table of contents or buy the full version.

Purchase the book ↗

Editors

Bhanu Prakash

Copyright © 2022 Elsevier B.V. or its licensors or contributors.
ScienceDirect ® is a registered trademark of Elsevier B.V.

ELSEVIER

RELX™

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

FEEDBACK

Book chapter ○ Abstract only

Chapter 8 - Prospects for food applications of products from microorganisms

Nohemí Soto-Reyes, Mónica Dávila-Rodríguez, ... Aurelio López-Malo

Pages 195-229

Purchase View abstract

Book chapter ○ Abstract only

Chapter 9 - Development of prebiotic and probiotic nondairy products

Jackline Freitas Brilhante de São José, Bárbara Santos Valiati, ... Mariana de Souza Vieira

Pages 231-242

Purchase View abstract

Book chapter ○ Abstract only

Chapter 10 - Prospects of dairy and vegetables-based food products in human health: Current status and future directions

Sebastián Torres, Luciana Contreras, ... María Inés Isla

Pages 243-267

Purchase View abstract

Book chapter ○ Abstract only

Chapter 11 - Edible mushrooms: Nutritional composition and medicinal benefits for improvement in quality life

Somenath Das and Bhanu Prakash

Pages 269-300

Purchase View abstract

Book chapter ○ Abstract only

Chapter 12 - Extraction of bioactive compounds from plants by means of new environmentally friendly solvents

Elizabeth Lainez-Cerón, Nelly Ramírez-Corona, ... Aurelio López-Malo

Pages 301-332

Purchase View abstract

Book chapter ○ Abstract only

Chapter 13 - Microbial antagonists in postharvest management of fruit

Sandeep Kumar Singh, Vipin Kumar Singh, ... Ajay Kumar

FEEDBACK

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

These proofs may contain colour figures. Those figures may print black and white in the final printed book if a colour print product has not been planned. The colour figures will appear in colour in all electronic versions of this book.

B978-0-12-824369-5.00005-1, 00005

CHAPTER

c0025

13

Microbial antagonistic in postharvest management of fruit

Sandeep Kumar Singh[a], *Vipin Kumar Singh*[a], *Prashant Kumar Singh*[b], *Arpan Modi*[c], *and Ajay Kumar*[c]

[a]Centre of Advanced Study in Botany, Institute of Science, Banaras Hindu University, Varanasi, India [b]Department of Biotechnology, Centre of Advanced Study in Botany, Institute of Science, Pachhunga University College Campus, Aizawl, Mizoram, India [c]Agricultural Research Organization—The Volcani Centre, Rishon LeZion, Israel

Q4

Introduction

s0010

p0010 In the recent past, postharvest loss of agro-food products is among the most emerging challenges throughout the world. It has been estimated that nearly 50% of agricultural fruit production has been lost every year during postharvest storage due to attack of the fungal pathogens (Carmona-Hernandez et al., 2019; Zhang, Mahunu, Castoria, Apaliya, & Yang, 2017). In current practice, various chemical fungicides are being used to control postharvest loss caused by fungal pathogens. However, the frequent improper utilization of chemical fungicides led to the adverse effects on environment and consumers health (Nunes, 2012). Besides this, the rising concern of chemical residues and pesticide-resistant pathogenic strains has led the agri-industries in search for an alternative control method for the postharvest disease management and to enhance the shelf life of fresh products. In addition, the application of fungicides, effective doses and concentration are varying from pest to pest and are governed by the regulatory authority of different countries.

Q6

Q7

p0015 In this context, microbial antagonism appears as a suitable alternative over the chemical fungicides for the management of phytopathogens during pre- and postharvest storage conditions. A range of microbial antagonistic agents has already been successfully utilized in the management of fresh products against the pathogenic attack (Sharma, Singh, & Singh, 2009; Singh et al., 2020, 2021). These antagonistic microorganism includes various types of strains including bacteria (Droby, Wisniewski, Macarisin, & Wilson, 2009), yeast (Spadaro & Droby, 2016), and fungi (Droby, Wisniewski, Teixidó, Spadaro, & Jijakli, 2016; Nicosia et al., 2016). The low cost of formulation, application, and environment-friendly nature make the

Copyright © 2022 Elsevier Inc. All rights reserved.

Prakash, 978-0-12-824369-5

To protect the rights of the author(s) and publisher we inform you that this PDF is an uncorrected proof for internal business use only by the author(s), editor(s), reviewer(s), Elsevier and typesetter SPi. It is not allowed to publish this proof online or in print. This proof copy is the copyright property of the publisher and is confidential until formal publication.

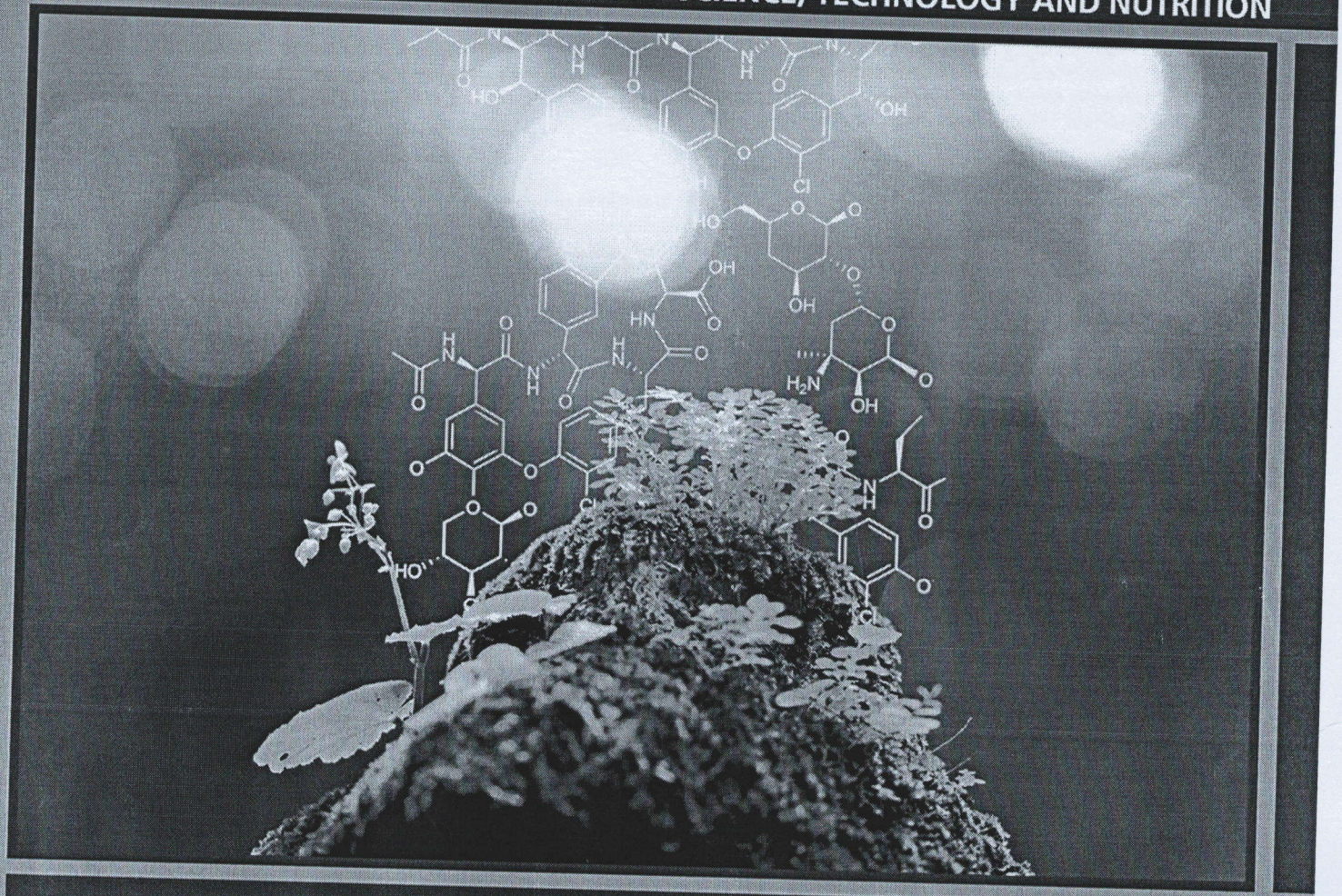
Comp. by: Sathish Stage: Proof Chapter No.: 13 Title Name: Prakash
Page Number: 1 Date: 14/08/2021 Time: 07:18:09

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

WOODHEAD PUBLISHING SERIES IN FOOD SCIENCE, TECHNOLOGY AND NUTRITION



STRESS TOLERANCE IN HORTICULTURAL CROPS

CHALLENGES AND MITIGATION STRATEGIES

Edited by
AVINASH CHANDRA RAI,
ASHUTOSH RAI, KRISHNA KUMAR RAI,
VED PRAKASH RAI, AJAY KUMAR

ELSEVIER

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Woodhead Publishing is an imprint of Elsevier
The Officers' Mess Business Centre, Royston Road, Duxford, CB22 4QH, United Kingdom
50 Hampshire Street, 5th Floor, Cambridge, MA 02139, United States
The Boulevard, Langford Lane, Kidlington, OX5 1GB, United Kingdom

Copyright © 2021 Elsevier Inc. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publisher. Details on how to seek permission, further information about the Publisher's permissions policies and our arrangements with organizations such as the Copyright Clearance Center and the Copyright Licensing Agency, can be found at our website: www.elsevier.com/permissions.

This book and the individual contributions contained in it are protected under copyright by the Publisher (other than as may be noted herein).

Notices

Knowledge and best practice in this field are constantly changing. As new research and experience broaden our understanding, changes in research methods, professional practices, or medical treatment may become necessary.

Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds, or experiments described herein. In using such information or methods they should be mindful of their own safety and the safety of others, including parties for whom they have a professional responsibility.

To the fullest extent of the law, neither the Publisher nor the authors, contributors, or editors, assume any liability for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions, or ideas contained in the material herein.

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record for this book is available from the Library of Congress

ISBN: 978-0-12-822849-4 (print)

ISBN: 978-0-323-85363-7 (online)

For information on all Woodhead Publishing publications
visit our website at https://www.elsevier.com/books-and-journals

Publisher: Charlotte Cockle
Acquisition Editor: Nancy Maragioglio
Editorial Project Manager: Chris Hockaday
Production Project Manager: Anitha Sivaraj
Cover Designer: Miles Hitchen

Typeset by MPS Limited, Chennai, India

Working together to grow libraries in developing countries
www.elsevier.com • www.bookaid.org

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

4.4 Advances in the optimization of conditions for speed breeding 53
4.4.1 Acceleration of plant growth 56
4.4.2 Induction of early flowering 56
4.4.3 Induction of early seed ripening 56
4.5 Abiotic stresses: where speed breeding can be implemented 56
4.5.1 Drought 57
4.5.2 Salinity 57
4.5.3 Temperature 57
4.6 Integration of speed breeding with advance breeding technologies for abiotic-stress tolerance 57
4.6.1 Combining speed breeding with marker-assisted breeding and genomic selection 58
4.6.2 Combining speed breeding with genome editing and transgenic pipelines 59
4.7 Challenges ahead 59
References 59

5. Marker-assisted breeding for abiotic stress tolerance in horticultural crops 63

Sanjay Kumar Rai, Apoorva and Shashi Pandey-Rai

5.1 Introduction 63
5.2 Marker-assisted selection 64
5.2.1 Marker-assisted selection for abiotic stress—tolerance breeding program 64
5.2.2 DNA/molecular marker development for linked traits 65
5.3 Classification of molecular markers 65
5.3.1 First generation low-throughput hybridization-based markers 65
5.3.2 Second generation medium-throughput polymerase chain reaction—based markers 67
5.3.3 Third generation high-throughput sequence-based markers 67
5.4 Mapping populations for identification of genetic linkage, gene tagging, and quantitative trait loci mapping 68
5.5 Marker-assisted gene pyramiding 70
5.6 Horticultural development using marker-assisted selection 71
5.7 Conclusion 73
Acknowledgments 73
References 73

6. Epigenetics in horticultural crops: consequences and applications in abiotic stress tolerance 75

Michal Lieberman-Lazarovich, Taehoon Kim, Prashant Kumar Singh and Kevin Begcy

6.1 Introduction 75
6.2 Epigenetic changes related to temperature stress 77
6.2.1 Transcriptional response of the epigenetic machinery to temperature stress 77
6.2.2 Changes in DNA methylation related to cold or heat stress 78
6.2.3 Changes in chromatin and histone modification patterns under temperature stress 78
6.3 Epigenetic changes related to drought and water deficit stress 79
6.3.1 Transcriptional response of the epigenetic machinery to drought or water-deficit conditions 79
6.3.2 Changes in DNA methylation related to drought or water-deficit stress 80
6.3.3 Changes in chromatin and histone modification patterns under drought and water deficit stress 80
6.4 Epigenetic changes related to salinity and osmotic stress 81
6.4.1 Transcriptional response of the epigenetic machinery to salinity or osmotic stress 81
6.4.2 Changes in DNA methylation related to salinity and osmotic stress 82
6.4.3 Changes in chromatin and histone modification patterns under salinity and osmotic stress 83
6.5 Perspectives for epigenetics in breeding for abiotic stress—resilient crops 83
6.6 Summary 85
References 86

7. Genomic-assisted breeding for abiotic stress tolerance in horticultural crops 91

Rajneesh Paliwal, Gagandeep Singh, Reyazul Rouf Mir and Badara Gueye

7.1 Introduction 91
7.2 Abiotic constraints in horticultural crops production 92

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

11. Transcription factors: a tool box for countering the effect of abiotic stresses 169

Anil Kumar, Chunoti Changwal, Banashree Thapa, Rahul S. Tanpure, Alkesh Hada, Prashant Kumar Singh and Sandip A Ghuge

11.1 Introduction 169
11.2 Possible molecular mechanisms of TFs in countering abiotic stress 170
11.2.1 Binding of TFs *cis*-element in the promoter 170
11.2.2 Protein–protein interactions 170
11.2.3 Reactive Oxygen Species (ROS) signal transduction regulation by TFs to counter abiotic stress in plants 170
11.3 NAC transcription factor 171
11.3.1 Structure of NAC transcription factor 171
11.4 Function of NAC transcription factor in horticultural crops under various abiotic stresses 171
11.5 MYB transcription factor 173
11.5.1 Structure of MYB transcription factor 173
11.5.2 Function of MYB transcription factor in horticultural crops under various abiotic stresses 174
11.6 Heat-shock factors 175
11.6.1 Structure of HSP transcription factor 175
11.6.2 Function of HSP transcription factor in horticultural crops under various abiotic stresses 176
11.7 DoF transcription factor 178
11.7.1 Structure of DoF transcription factor 178
11.7.2 Function of DoF transcription factor in horticultural crops under various abiotic stresses 178
11.8 WRKY transcription factor 180
11.8.1 Structure of WRKY transcription factor 180
11.8.2 Function of WRKY transcription factor in horticultural crops under abiotic stresses 180
11.9 bZIP transcription factor 182
11.9.1 Structure of bZIP transcription factor 182
11.9.2 Function of bZIP transcription factor in horticultural crops under various abiotic stresses 182
11.10 Conclusion and future perspective 183
Reference 184

12. Physiological, biochemical, and morphological approaches to mitigate the effects of abiotic stress in plants 193

Vikrant Hari Kashyap, Isha Kohli, Abhinav Singh, Aishi Bhattacharya, Prashant Kumar Singh, Ajit Varma and Naveen Chandra Joshi

12.1 Introduction 193
12.2 Physiological mitigation strategies against abiotic stress conditions 195
12.2.1 Modification of stomatal functioning as an adaptation to abiotic stress 195
12.2.2 Alteration of photosynthetic parameters as an adaptation to abiotic stress 197
12.3 Biochemical strategies employed to combat abiotic stress 199
12.3.1 Phytohormone-mediated regulation of abiotic stress adaptive response 199
12.3.2 Antioxidant and ROS scavenging strategy to combat abiotic stress 201
12.4 Morphological mitigation strategies against abiotic stress conditions 202
12.4.1 Root/shoot architectural changes in response to abiotic stress condition 202
12.4.2 Changes in leaf morphology as an adaptation to abiotic stress 203
12.5 Concluding remarks and future prospect 204
References 206

13. Current approaches in horticultural crops to mitigate the effect of drought stress 213

Rahul Kaldate, Sushil Kumar Singh, Gunjan Guleria, Anjali Soni, Dharmendra Naikwad, Neeraj Kumar, Swapnilkumar Meshram and Maneet Rana

13.1 Introduction 213
13.2 Different approaches used to mitigate drought stress 214
13.2.1 Improved agronomic practice management 214
13.2.2 Advanced breeding and genomics approaches 219

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Chapter 6

Epigenetics in horticultural crops: consequences and applications in abiotic stress tolerance

Michal Lieberman-Lazarovich[1,*], Taehoon Kim[2], Prashant Kumar Singh[3] and Kevin Begcy[2]

[1]*Institute of Plant Sciences, Agricultural Research Organization, Volcani Center, Rishon LeZion, Israel,* [2]*Environmental Horticulture Department, University of Florida, Gainesville, FL, United States,* [3]*Department of Biotechnology, Mizoram University (A Central University), Pachhunga University College Campus, India*

**Corresponding author. Email: michall@volcani.agri.gov.il*

6.1 Introduction

The term "epigenetics" refers to heritable changes in gene expression (which may include changes in the magnitude, the temporal and/or spatial expression pattern of a gene) that are not caused by alterations in the DNA sequence. Epigenetic marks associated with gene expression are DNA methylation, histone modifications, and histone variants, all of which affect chromatin structure and accessibility. Genetic and genomic studies mainly in *Arabidopsis thaliana* have generated valuable information on the functions of these epigenetic marks, and many of the factors involved in the regulation of epigenetic marks have been identified (Pikaard and Mittelsten Scheid, 2014; Law and Jacobsen, 2010).

DNA methylation occurs on carbon number five of a cytosine base, resulting in 5-methylcytosine (5mC), whereas mammalian 5mC was observed predominantly at CG sites, in plants, cytosine methylation is found in any sequence context, functionally divided into CG, CHG, and CHH methylation (where H is A, T, or G) (Pikaard and Mittelsten Scheid, 2014; Law and Jacobsen, 2010). DNA methylation is deposited by DNA methyltransferases (MTases) that are divided into three types: MET (DNA METhyltransferase), DRM (Domains-Rearranged Methyltransferase), and the plant-specific CMT (ChromoMeThylase) (Pikaard and Mittelsten Scheid, 2014). Genome-wide identification of DNA methyltransferases was conducted in rice (Teerawanichpan et al., 2009), maize (Qian et al., 2014a,b), wheat (Theiss et al., 1987), tomato, pepper, and potato (Kumar et al., 2016). DNA methylation patterns can be maintained during DNA replication by MET1 in the case of CG methylation or by CMT2, CMT3, and DRM2 in the case of non-CG methylation (i.e., CHG and CHH). De novo synthesis of DNA methylation is mediated by small RNA and DRM2 methyltransferase through the RNA-dependent DNA methylation (RdDM) pathway (Maeji and Nishimura, 2018). The RdDM pathway has been well characterized and includes several key enzymes: RNA-Dependent RNA polymerase2 (RDR2), Dicer like 3 (DCL3), and Argonaute (AGO) proteins as well as the plant-specific RNA polymerases Pol IV and Pol V. siRNAs are loaded into AGO proteins, guiding the methylation machinery to the target DNA to be methylated. The removal of DNA methylation marks, that is, DNA demethylation, can be achieved by either passive or active mechanisms. Passive mechanisms involve repression of DNA methylation activities, causing genome-wide reductions in DNA methylation levels during DNA replication. Active demethylation occurs through the DNA glycosylation activity of Demeter (DME), Repressor Of Silencing 1 (ROS1), Demeter like 2 (DML2), and DML3 enzymes (Maeji and Nishimura, 2018).

Histone modifications include methylation, acetylation, phosphorylation, and ubiquitination of specific amino acid residues in the N-terminal tails of the histone core proteins H2A, H2B, H3, and H4. They are important for gene regulation and were shown to play a role in plant response to abiotic stresses (Begcy and Dresselhaus, 2018; Zhao and Zhou, 2012). Genome-wide distribution of histone modification patterns and concomitant transcriptional alteration in response to environmental stresses have been extensively studied in cereal crops (Zong et al., 2013; Zhao et al., 2014; Wang et al., 2015a,b; Xue et al., 2018; Zheng et al., 2019a,b). In addition, several studies link histone modifications with

Stress Tolerance in Horticultural Crops. DOI: https://doi.org/10.1016/B978-0-12-822849-4.00016-4
© 2021 Elsevier Inc. All rights reserved.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Chapter 11

Transcription factors: a tool box for countering the effect of abiotic stresses

Anil Kumar[1], Chunoti Changwal[2], Banashree Thapa[3], Rahul S. Tanpure[4], Alkesh Hada[5], Prashant Kumar Singh[6] and Sandip A Ghuge[7,*]

[1]*Department of Entomology, Nematology and Chemistry Units, Agricultural Research Organization (ARO), The Volcani Center, Rishon LeZion, Israel,* [2]*Plant Physiology, ICAR-Indian Agricultural Research Institute, New Delhi, India,* [3]*Department of Botany, University of Delhi, New Delhi, India,* [4]*Division of Biochemical Sciences, CSIR-National Chemical Laboratory, Pune, India,* [5]*Department of Biotechnology & Microbiology, National College (Autonomous), Tiruchirappalli, India,* [6]*Department of Biotechnology, Mizoram University (A Central University), Pachhunga University College Campus, India,* [7]*Institute of Plant Sciences, Agricultural Research Organization, Rishon LeZion, Israel*

**Corresponding author. Email: sandip.ghuge.biotech@gmail.com*

11.1 Introduction

In nature, plants are constantly exposed to diverse array of abiotic stresses, majority of which includes salt, drought, heat, and cold. These stress factors adversely affect the productivity of plants, causing yield loss greater than 50% (Calanca, 2017). Since plants are sessile in nature, they have to develop complex response strategies to tolerate and resist adverse abiotic stress conditions (Chu et al., 2015).

It is of utmost importance to understand how plants recognize stress signals and pass on to cellular machinery to generate stress defense responses. Identification of candidate genes and/or a cascade of genes is a crucial step in engineering crop plants (Sanchez et al., 2011). Various groups have made significant progress in this aspect that have led to the identification of several stress-responsive genes that are accumulated under various abiotic stress conditions and are broadly divided into two groups, namely, functional and regulatory proteins (Shinozaki et al., 2003).

Functional proteins include antioxidants, ion transporters, water channels, and heat-shock protein (HSP), whereas regulatory protein consists of kinases, phosphatases, and most importantly transcription factors (TFs). Since abiotic stress is a complex trait and many genes are involved in its response regulation, limited success has been achieved by using functional protein alone to create abiotic stress–tolerant crops (Varshney et al., 2011). This situation has generated huge interest in the plant scientific community to identify regulatory genes, particularly TFs, to create abiotic stress–tolerant plants by tailoring downstream genes associated with abiotic stress tolerance (Chen and Zhu, 2004; Xu et al., 2008).

Several distinct responses were generated by plants to counter abiotic stresses at the biochemical and physiological levels. Stress-signaling pathways play key roles in deciphering abiotic stress signals at the molecular and cellular levels. Broadly, a pathway for stress signal transduction consists of the following important steps: (1) signal recognition, (2) signal transduction, and (3) response against stress. After stress perception and signal transduction, stress response triggers through phosphorylation/dephosphorylation of TFs (Asai et al., 2002; D'Autréaux and Toledano, 2007), leading to either functional genes expression required for protection at cellular level or regulatory genes expression involved in signaling cascades and (Hu et al., 2013; Liu et al., 2014).

TF regulates transcription process under the control of developmental and environmental factors via coordinated interactions between TFs and *cis*-acting elements from the promoter of gene. By such coordinated interactions, TF regulates key plant functions, like responses to environmental factors such as abiotic stresses (Nath et al., 2019).

TFs exert their function upon binding to specific promoter, which in turn activates or suppresses transcription of specific set of genes (Wray et al., 2003). TFs contain transcriptional regulation, DNA-binding, and protein–protein interaction domains (Yanagisawa, 1998). Therefore TFs are promising candidates for horticultural crop improvement in stress tolerance and resistance by manipulating the expression of TF genes.

Stress Tolerance in Horticultural Crops. DOI: https://doi.org/10.1016/B978-0-12-822849-4.00019-X
© 2021 Elsevier Inc. All rights reserved.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Chapter 12

Physiological, biochemical, and morphological approaches to mitigate the effects of abiotic stress in plants

Vikrant Hari Kashyap[1], Isha Kohli[1], Abhinav Singh[1], Aishi Bhattacharya[1], Prashant Kumar Singh[2], Ajit Varma[1] and Naveen Chandra Joshi[1,*]

[1]*Amity Institute of Microbial Technology, Amity University, Noida, India,* [2]*Department of Biotechnology, Mizoram University (A Central University), Pachhunga University College Campus, India*

**Corresponding author. Email: naveen.joshi.jnu@gmail.com*

12.1 Introduction

Abiotic stresses are one of the prominent reasons, which induce limitation to the growth of plants across different ecosystems and lead to the reduction of agricultural productivity. Plants in response to abiotic stress adopt various physiological, biochemical, and morphological adaptations (Lamaoui et al., 2018). Along with these adaptations, numerous other resources such as microorganisms also play an essential role in the growth and development of plants by mitigating the effects of environmental stress through different plant–microbe interactions (Ali and Kim, 2018; Remans et al., 2012). Recent reports from the Intergovernmental Panel on Climate Control (IPCC) and other data have shown a subsequent increase in the global climatic temperature with an increase in concentrations of greenhouse gases in the atmosphere such as carbon dioxide (CO_2), nitric oxide (NO_2), methane (CH_4), and chlorofluorocarbons (Gideon Onyekachi et al., 2019; IPCC, 2014; Stocker et al., 2013). Increased utilization of fossil fuels, rapid industrialization, and deforestation activities play significant roles in the accumulation of carbon dioxide in the atmosphere (Raza et al., 2019). Changes in the physicochemical nature of the environment may induce stressful conditions leading to alterations in drought/rainfall patterns, temperature, the intensity of UV radiation (sunlight), flooding (waterlogging), pH of soil/water, heavy metal toxicity, oxidative stress, etc. (Fig. 12.1). Abiotic stress in total affects almost 96.5% of the global rural land area and is one of the leading factors to more than 50% loss of crop worldwide (Cramer et al., 2011; Minhas et al., 2017; Wasaya et al., 2018).

Environmental fluctuations could disrupt the internal homeostatic environment of the plants, thereby triggering intrinsic abilities in terms of various physiological, biochemical, and morphological adaptations to mitigate the effect of stress conditions. Physiological adaptation includes stomatal conductance, regulation of photosynthetic efficiency, transpiration rates, osmoregulation, cuticular wax biosynthesis, and turbidity maintenance in leaves (Chen et al., 2019; Goufo et al., 2017; Khan et al., 2016), whereas biochemical adaptation includes the production of soluble enzymatic and nonenzymatic antioxidative agents that maintain ionic homeostasis by scavenging reactive oxygen species (ROS) generated by different plant intracellular organelles, secretions of stress hormones (phytohormones) and their interconnected hormone signaling networks that work in a coordinated manner in response to abiotic stress cues, molecular chaperons or stress-response proteins, and compatible solutes maintaining tissue hydrostatic pressure through osmotic adjustments augmented inside the plant's body, thereby instigating different responsive behaviors to mitigate the stress as imposed by the surrounding environment (Bari and Jones, 2009; Blum, 2017; Khaket et al., 2014; Stroiński, 1999; Suo et al., 2017).

As a result of various stress-generated physiological and biochemical changes, plants go through certain morphological adaptations, including changing root architecture, shoot architecture, and leaf morphology (i.e., rolling and folding of leaves to reduce evapotranspiration, reduced stomatal number) (Klem et al., 2019; Sicher et al., 2012). Understanding all these physiological and biochemical activities that mediate stress responses in plants is also essential

Stress Tolerance in Horticultural Crops. DOI: https://doi.org/10.1016/B978-0-12-822849-4.00011-5
© 2021 Elsevier Inc. All rights reserved.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Naveen Kumar Vishvakarma
Ganji Purnachandra Nagaraju
Dhananjay Shukla *Editors*

Colon Cancer Diagnosis and Therapy

Volume 2

MyCopy powered by Springer Link

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Editors
Naveen Kumar Vishvakarma
Department of Biotechnology
Guru Ghasidas Vishwavidyalaya
Bilaspur, India

Dhananjay Shukla
Department of Biotechnology
Guru Ghasidas Vishwavidyalaya
Bilaspur, India

Ganji Purnachandra Nagaraju
Department of Hematology
and Medical Oncology
Emory University
Atlanta, GA, USA

ISBN 978-3-030-64667-7 ISBN 978-3-030-64668-4 (eBook)
https://doi.org/10.1007/978-3-030-64668-4

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2021
This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Contents

1 **Application of Single Cell Technology in Colorectal Cancer** 1
Begum Dariya and Ganji Purnachandra Nagaraju

2 **Dietary Habits and Global Incidence of Colon Cancer**..... 15
Sapnita Shinde, Vibha Sinha, Vineeta Dixit, Mrigendra Dwivedi, Naveen Kumar Vishwakarma, Atul Kumar Tiwari, Sanjay Kumar Pandey, and Dhananjay Shukla

3 **Diet and Colon Cancer: A Comprehensive Review** 53
Rewa Kulshrestha and Soumitra Tiwari

4 **Recent Therapeutic Strategies for the Treatment of Colon Cancer**..... 73
Vinita Sharma, Priya Chouhan, Rajan Kumar Pandey, and Vijay Kumar Prajapati

5 **Role of Bacteria in the Development of Cancer**..... 91
Archana Mishra and Vibhay Nath Tripathi

6 **Role of Bacterial Infection (*H. pylori*) in Colon Carcinogenesis and Therapeutic Approaches**..... 109
Prabhakar Singh, Shree Prakash Tiwari, Mohammad Murtaza Mehdi, and Rajesh Sharma

7 **Diagnosis of Colorectal Cancer Using Molecular Techniques** 143
Unnati Bhalerao, Aishwarya Bhalerao, Suryabhan Bhalerao, Manjita Srivastava, Meenakshi Singh, Sai Tejaswi Lavuri, Muneesh Kumar Barman, Ananth Prasad Burada, Subash C. Sonkar, and Prudhvi Lal Bhukya

8 **Nanotechnology Approaches for Colorectal Cancer Diagnosis and Therapy** 171
T. R. Reshmitha, V. S. Shini, and P. Nisha

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

9 **Natural Products as Immunomodulatory and Chemosensitizing Agents in Colon Cancer Treatment** 187
Sandeep Kumar, Abhishek Goel, and Yogendra S. Padwad

10 **Role of DNA Mismatch Repair Genes in Colorectal Cancer** 209
Sonal Gupta, Manisha Mathur, Beiping Miao, Prashanth Suravajhala, and Obul Reddy Bandapalli

11 **Targeting of Aerobic Glycolysis: An Emerging Therapeutic Approach Against Colon Cancer** 225
Pradip Kumar Jaiswara, Vishal Kumar Gupta, Shiv Govind Rawat, Rajan Kumar Tiwari, Pratishtha Sonker, Rajendra Prakash Maurya, and Ajay Kumar

12 **An Insight into the Therapeutic Potential of Phytochemicals for Colorectal Cancer: Latest Perspective** 245
M. Sri Durgambica, K. Parimala, M. Sri Krishna Jayadev, Pothana Shanmukha Anand, and Tantravahi Srinivasan

13 **Seaweeds: Potential Candidates in Human Colon Cancer Therapy** 269
Raghvendra Pandey, Prashant Kumar Singh, and Alok Kumar Shrivastava

14 **Recent Update on Nanomedicine-Based Drug Targeting on Colon Cancer** 303
Vijay Kumar Singh, Veena Singh, and Vishal Tyagi

15 **Therapeutic Targeting of Glutamine Metabolism in Colorectal Cancer** 333
Yashwant Kumar Ratre, Henu Kumar Verma, Arundhati Mehta, Vivek Kumar Soni, Subash Chandra Sonkar, Dhananjay Shukla, Alka Ekka, Santosh Kumar Prajapati, Shakuntala Mahilkar, and Naveen Kumar Vishvakarma

16 **Preventive Effect of Indian Food on Colorectal Cancer** 357
Iffath Badsha, R. Renjith Kumar, Swetha Sunkar, Jayshree Nellore, M. Bavanilatha, Sujatha Peela, and Valli C. Nachiyar

17 **Extracellular Vesicles in Colorectal Cancer Progression, Metastasis, Diagnosis, and Therapy** 401
Mercy Merlin, Pranav Kumar Prabhakar, Dhananjay Shukla, Atul Kumar Tiwari, and Saurabh Saxena

18 **Probiotics in Colon Cancer: A Therapeutic Approach** 421
Anaga Nair, Eveline M. Anto, and Jayamurthy Purushothaman

Index 435

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Chapter 13
Seaweeds: Potential Candidates in Human Colon Cancer Therapy

Raghvendra Pandey, Prashant Kumar Singh, and Alok Kumar Shrivastava

Abstract Seaweeds represent some of the most important reservoirs of new remedial compounds for humans. The natural products obtained from seaweeds have received extensive consideration on account of their extraordinary dietary and pharmacology applications, having such antiviral, antifungal, antibacterial, and anticancer properties and so on. Above all, there are a number of natural products that have demonstrated attractive value for the development of novel anticancer agents. This book chapter draws attention on colorectal cancer which is one of the main causes of cancer-related demise of human beings. This chapter also illustrates a range of active natural products extracted from seaweeds that have shown to eliminate or slow the progression of cancer. This also covers the mechanism through which these compounds can induce apoptosis in vitro and in vivo. By considering the ability of compounds present in seaweeds to act against colorectal cancers, this chapter highlights the potential use of seaweeds as anticancer agents.

Keywords Anticancer · Capecitabine · Colon cancer · Marine algae · Seaweeds · 5-FU

13.1 Introduction

Seaweeds or macroalgae are photosynthetic organisms that play a key role in ocean biodiversity and productivity and comprise green algae (Chlorophyta), brown algae (Phaeophyta), and red algae (Rhodophyta). It is the common name for countless

R. Pandey · A. K. Shrivastava (✉)
Department of Botany, Mahatma Gandhi Central University, Motihari, India
e-mail: alokshrivastava@mgcub.ac.in

P. K. Singh
Department of Biotechnology, Pachhunga University College, Mizoram Central University, Aizawl, India

© The Author(s), under exclusive license to Springer Nature Switzerland AG 2021

N. K. Vishvakarma et al. (eds.), *Colon Cancer Diagnosis and Therapy*,
https://doi.org/10.1007/978-3-030-64668-4_13

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram



CYANOBACTERIAL LIFESTYLE AND ITS APPLICATIONS IN BIOTECHNOLOGY

EDITED BY
PRASHANT KUMAR SINGH
MARÍA F. FILLAT
AJAY KUMAR

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

CYANOBACTERIAL LIFESTYLE AND ITS APPLICATIONS IN BIOTECHNOLOGY

Edited by

PRASHANT KUMAR SINGH
Department of Biotechnology, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl, Mizoram, India

MARÍA F. FILLAT
Departamento de Bioquímica y Biología Molecular y Celular, Universidad de Zaragoza, Zaragoza, Spain

AJAY KUMAR
Agriculture Research Organization (ARO), The Volcani Center, Rishon-Lezion, Israel





ACADEMIC PRESS
An imprint of Elsevier
elsevier.com/books-and-journals



Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

Academic Press is an imprint of Elsevier
125 London Wall, London EC2Y 5AS, United Kingdom
525 B Street, Suite 1650, San Diego, CA 92101, United States
50 Hampshire Street, 5th Floor, Cambridge, MA 02139, United States
The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, United Kingdom

Copyright © 2022 Elsevier Inc. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publisher. Details on how to seek permission, further information about the Publisher's permissions policies and our arrangements with organizations such as the Copyright Clearance Center and the Copyright Licensing Agency, can be found at our website: www.elsevier.com/permissions.

This book and the individual contributions contained in it are protected under copyright by the Publisher (other than as may be noted herein).

Notices
Knowledge and best practice in this field are constantly changing. As new research and experience broaden our understanding, changes in research methods, professional practices, or medical treatment may become necessary.

Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds, or experiments described herein. In using such information or methods they should be mindful of their own safety and the safety of others, including parties for whom they have a professional responsibility.

To the fullest extent of the law, neither the Publisher nor the authors, contributors, or editors, assume any liability for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions, or ideas contained in the material herein.

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging-in-Publication Data
A catalog record for this book is available from the Library of Congress

ISBN: 978-0-323-90634-0

For Information on all Academic Press publications visit our website at
https://www.elsevier.com/books-and-journals

Publisher: Andre G. Wolff
Acquisitions Editor: Glyn Jones
Editorial Project Manager: Barbara Makinster
Production Project Manager: Swapna Srinivasan
Cover Designer: Matthew Limbert

Typeset by Aptara, New Delhi, India

Working together to grow libraries in developing countries
www.elsevier.com • www.bookaid.org

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Contents

Contributors ix
About the editors xiii
Preface xv

1. Cyanobacterial diversity concerning the extreme environment and their bioprospecting
Arun Kumar Kashyap, Sumit Kumar Dubey, Buddhi Prakash Jain

1.1 Introduction 1
1.2 Systematic study of extremophiles cyanobacteria 4
1.3 Application of extremophile cyanobacteria 10
1.4 Conclusions 15
References 16

2. Cyanobacterial nanoparticles: application in agriculture and allied sectors
Vaishali Gupta, Naveen Kumar Verma, Kaushal Kishore Choudhary

2.1 Introduction 23
2.2 Nanobiotechnology 23
2.3 Nanoparticles 24
2.4 Cyanobacterial NPs 25
2.5 Synthesis of NPs 26
2.6 Characterization of NPs 31
2.7 Mode of action 31
2.8 Applications of cyanobacterial-based NPs 32
2.9 Future projections of cyanobacteria-based NPs 34
2.10 Limitations of NPs 35
2.11 Conclusion 36
References 36

3. Cyanobacterial photosynthetic reaction center in wobbly light: Modulation of light energy by orange carotenoid proteins (OCPs)
Rahul Prasad Singh, Sandeep Kumar Singh, Ajay Kumar, Arpan Modi, Mukesh Kumar Yadav, Punuri Jayasekhar Babu, Garima Singh, Kaushalendra, Naveen Chandra Joshi, Avinash Chandra Rai, Sandip Ghuge, Anil Kumar, Avinash Singh, Prashant Kumar Singh, Wenjing Wang

3.1 Introduction 42
3.2 Fates of light energy absorbed by pigments 44
3.3 Light-harvesting complex organization in cyanobacteria 46

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE ★ AIZAWL ★

Principal
Pachhunga University College
Aizawl : Mizoram

3.4 Modulation of light energy in cyanobacteria (photoprotective mechanism) 48
3.5 Mechanism of OCP-mediated light modulation in cyanobacteria 53
3.6 Conclusions 56
Acknowledgment 56
References 56

4. Back to the past: improving photosynthesis with cyanobacterial genes
Rocío C. Arce, Paula Vicino, Mariana Demarchi, Anabella F. Lodeyro

4.1 Introduction 61
4.2 Engineering cyanobacterial genes not related to photosynthesis 63
4.3 Manipulation of cyanobacterial genes related to photosynthesis in plants 68
4.4 Concluding remarks 88
Acknowledgments 89
References 89

5. Promises and challenges for expanding the use of N_2-fixing cyanobacteria as a fertilizer for sustainable agriculture
Rafael Ambrosio, Lara Sanchez Rizza, Mauro Do Nascimiento, Hugo Guillermo Pacheco Jimenez, Lilia Mary Miranda Ramos, Jose A. Hernandez, Leonardo Curatti

5.1 Food security, sustainable agriculture, and N-fertilizers 99
5.2 Biological nitrogen fixation 103
5.3 Cyanobacterial BNF 104
5.4 Cyanobacteria as biofertilizers 115
5.5 Cyanobacteria and microalgae mass culture technology 124
5.6 Use of wastewater for cyanobacteria culture 129
5.7 Downstream process: harvesting and drying processes 133
5.8 Large-scale project for cyanobacterial- or microalgal biomass–based fertilizers 134
Acknowledgments 140
References 140

6. Thermophilic and thermotolerant cyanobacteria: environmental and biotechnological perspectives
Gajanan T. Mehetre, Zothanpuia, Purbajyoti Deka, William Carrie, Lalrokimi, Bhim Pratap Singh

6.1 Introduction 159
6.2 Thermophilic cyanobacteria diversity 161
6.3 Temperature stress responses in thermophiles cyanobacteria 165
6.4 Biotechnological application of thermophilic cyanobacteria 167
6.5 Metabolic engineering in cyanobacteria 172
6.6 Conclusion 173
Acknowledgments 174
References 174

7. Exploring the ability of cyanobacterial ferric uptake regulator (FUR) proteins to increase yeast tolerance to abiotic stresses
Violeta C. Sein-Echaluce, José Miguel Mulet, María V. Barja, M. Luisa Peleato, María F. Fillat

7.1 Introduction 179
7.2 Materials and methods 181

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

7.3 Results 184
7.4 Discussion 189
References 192

8. Exploring ecological diversity and biosynthetic potential of cyanobacteria for biofuel production
Galyna Kufryk

8.1 The biosynthetic potential of cyanobacteria 202
8.2 Genomic diversity and genetic tools for cyanobacteria 205
8.3 Cyanobacterial biofuels 210
8.4 Hydrogen biofuel 212
References 221

9. Cyanobacterial availability for CRISPR-based genome editing: current and future challenges
Sandeep Kumar Singh, Ajay Kumar, Mukesh Kumar Yadav, Garima Singh, Punuri Jayasekhar Babu, Zothanpuia, Liansangmawii Chhakchhuak, Naveen Chandra Joshi, Avinash Chandra Rai, Avinash Singh, Kaushlendra, Rosie Lalmuanpuii, Esther Lalnunmawii, Bendangchuchang Longchar, Prashant Kumar Singh

9.1 Introduction 232
9.2 CRISPR/Cas9-based genome editing in cyanobacteria 233
9.3 CRISPR/Cas9-mediated cyanobacterial genome editing 234
9.4 CRISPR/Cas12a-mediated genome editing in cyanobacteria 239
9.5 Dead Cas9 (dCas9) and cyanobacterial gene expression 241
9.6 dCas9 offers an alternative approach for cyanobacterial metabolic engineering 242
9.7 Cyanobacterial genome editing offers markerless selection and gene multiplexing 243
9.8 Cyanobacterial genome editing: key challenges 243
9.9 Conclusion and prospects 245
Acknowledgments 247
References 247

10. Cyanobacteria and salinity stress tolerance
Rahul Prasad Singh, Priya Yadav, Reena Kujur, Kapil Deo Pandey, Rajan Kumar Gupta

10.1 Introduction 253
10.2 Distribution of cyanobacteria in the saline ecosystem 254
10.3 Sensing salinity by cyanobacterial cell 259
10.4 Physiological and biochemical responses 261
10.5 Accumulation of compatible solutes 265
10.6 Mechanism of salt tolerance 270
10.7 Role of cyanobacteria in the remediation of salt-affected soil 271
10.8 Conclusion 273
Acknowledgments 273
References 273

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

11. Cyanobacteria as biostimulants in the paddy fields
Prashant Kumar Singh, Ajay Kumar, Mukesh Kumar Yadav, Kushlendra, Savita Singh

11.1 Introduction 281
11.2 Cyanobacterial biostimulants and plant growth–promoting potential 283
11.3 Cyanobacteria and their extracts: impacts on crops' productivity 283
11.4 Cyanobacteria as biostimulants in agriculture 295
11.5 Other biostimulants and their role in plant growth stimulations 297
11.6 Challenges involved in using cyanobacteria as biostimulants 299
11.7 Prospects and conclusion 299
Acknowledgments 299
References 300

12. Molecular characterization of local cyanobacterial isolates using *16S rRNA*, *rpo*B, and *nif*H biomarkers
Nidhi Kumari, Lal Chand Rai

12.1 Introduction 307
12.2 Molecular markers used to assess cyanobacterial biodiversity 311
12.3 Biodiversity documentation 313
12.4 Molecular characterization of local cyanobacterial isolates 314
12.5 Phylogenetic analysis of local cyanobacterial isolates using three different biomarkers 320
12.6 Concluding remarks 326
Acknowledgments 327
References 327

13. Cyanobacteria-mediated heavy metal and xenobiotics bioremediation
Shweta Pandey, Sumit Kumar Dubey, Arun Kumar Kashyap, Buddhi Prakash Jain

13.1 Introduction 335
13.2 Cyanobacteria and heavy metals 337
13.3 Cyanobacteria and xenobiotics 342
13.4 Conclusion 345
References 345

14. Cyanobacteria: as a promising candidate for nanoparticles synthesis
Dnyaneshwar K. Kulal, Dinesh N. Navale, Santosh W. Zote, Prasanna B. Ranade, Pramod K. Kalambate

14.1 Introduction 351
14.2 Synthesis of nanoparticles using cyanobacteria 353
14.3 Advantages and disadvantages of cyanobacteria used in nanoparticle synthesis 355
14.4 Conclusion 357
Acknowledgment 358
References 358

Index **361**

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

To protect the rights of the author(s) and publisher we inform you that this PDF is an uncorrected proof for internal business use only by the author(s), editor(s), reviewer(s), Elsevier and typesetter Aptara. It is not allowed to publish this proof online or in print. This proof copy is the copyright property of the publisher and is confidential until formal publication.

CHAPTER

3

Cyanobacterial photosynthetic reaction center in wobbly light: modulation light energy by orange carotenoid proteins (OCPs)

Rahul Prasad Singh[a], *Sandeep Kumar Singh*[a], *Ajay Kumar*[b], *Arpan Modi*[b], *Mukesh Kumar Yadav*[c], *Punuri Jayasekhar Babu*[c], *Garima Singh*[d], *Kaushlendra*[e], *Naveen Chandra Joshi*[f], *Avinash Chandra Rai*[b], *Sandip Ghuge*[b], *Anil Kumar*[b], *Avinash Singh*[g], *Prashant Kumar Singh*[c], *Wenjing Wang*[h]

[a]Department of Botany, Institute of Science, Banaras Hindu University, Varanasi, Uttar Pradesh, India

[b]Agriculture Research Organization, The Volcani Center, Rishon-Lezion, Israel

[c]Department of Biotechnology, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl, Mizoram, India

[d]Department of Botany, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl, Mizoram, India

[e]Department of Zoology, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl, Mizoram, India

[f]Amity Institute of Microbial Technology (AIMT), Amity University, Noida, Uttar Pradesh, India

[g]Department of Biochemistry and Molecular Pharmacology, New York University, New York, USA

[h]Department of Biology and Food Science, Shangqiu Normal University, Shangqiu, The People Republic of China

Cyanobacterial Lifestyle and its Applications in Biotechnology.
DOI: 10.1016/C2020-0-04449-X

Copyright © 2021 Elsevier Inc. All rights reserved.

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

00007- 9780323906340

These proofs may contain color figures. Those figures may print black and white in the final printed book if a color print product has not been planned. The color figures will appear in color in all electronic versions of this book.

CHAPTER

6

Thermophilic and thermotolerant cyanobacteria: Environmental and biotechnological perspectives

Gajanan T. Mehetre[a], *Zothanpuia*[b], *Purbajyoti Deka*[a], *William Carrie*[a], *Lalrokimi*[a], *Bhim Pratap Singh*[c]

[a]Department of Biotechnology, Mizoram University, Mizoram, India
[b]Department of Biotechnology/Life sciences, Mizoram University, Pachhunga University College, Aizawl, Mizoram, India
[c]Department of Agriculture and Environmental Sciences, National Institute of Food Technology Entrepreneurship & Management (NIFTEM), Sonepat, Haryana, India

6.1 Introduction

Microbial communities inhabiting extreme environments perform a very crucial role in energy metabolism and matter cycling. Cyanobacteria are one of the ecological diversifications reflecting their capacity to acclimate to various extreme environments. They carry out an extremely significant role in sustaining the productivity of such extreme ecosystems through photosynthesis, nitrogen fixation, and accumulation of phosphorus (Seckbach et al., 2007). Therefore, they remain ideal microbial systems to investigate processes such as photosynthesis, respiration, circadian rhythm, photoregulation of gene expression, developmental gene rearrangements. In addition, most cyanobacteria possess various mechanisms to acclimatize to extreme conditions of diverse environments (Wilde and Dienst, 2011). Various cyanobacterial groups demonstrate adaptive abilities to

Cyanobacterial Lifestyle and its Applications in Biotechnology.
DOI: https://doi.org/10.1016/B978-0-323-90634-0.00014-7

Copyright © 2022 Elsevier Inc. All rights reserved.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

CHAPTER

9

Cyanobacterial availability for CRISPR-based genome editing: Current and future challenges

Sandeep Kumar Singh[i], *Ajay Kumar*[b], *Mukesh Kumar Yadav*[a], *Garima Singh*[d], *Punuri Jayasekhar Babu*[a], *Zothanpuia*[a], *Liansangmawii Chhakchhuak*[a], *Naveen Chandra Joshi*[e], *Avinash Chandra Rai*[b], *Avinash Singh*[c], *Kaushalendra*[f], *Rosie Lalmuanpuii*[g], *Esther Lalnunmawii*[h], *Bendangchuchang Longchar*[j], *Prashant Kumar Singh*[a]

[a]Department of Biotechnology, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl, Mizoram, India
[b]Agriculture Research Organization (ARO), The Volcani Center, Rishon-Lezion, Israel
[c]Department of Biochemistry and Molecular Pharmacology, New York University, New York, USA
[d]Department of Botany, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl, Mizoram, India
[e]Amity Institute of Microbial Technology (AIMT), Amity University, Noida, Uttar Pradesh, India
[f]Department of Zoology, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl, Mizoram, India
[g]Department of Botany, Mizoram University, (A Central University), Aizawl, Mizoram, India
[h]Department of Botany, Mizoram University, (A Central University), Aizawl, Mizoram, India
[i]Department of Botany, Banaras Hindu University, Varanasi, Uttar Pradesh, India
[j]Department of Life Science, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl, Mizoram, India

Cyanobacterial Lifestyle and its Applications in Biotechnology.
DOI: https://doi.org/10.1016/B978-0-323-90684-0.00009-3

Copyright © 2022 Elsevier Inc. All rights reserved.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE ★ AIZAWL ★

Principal
Pachhunga University College
Aizawl : Mizoram

CHAPTER

11

Cyanobacteria as biostimulants in the paddy fields

Prashant Kumar Singh[a], *Ajay Kumar*[b], *Mukesh Kumar Yadav*[a], *Kaushalendra*[d], *Savita Singh*[c]

[a]Department of Biotechnology, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl, Mizoram, India
[b]Agriculture Research Organization (ARO), The Volcani Center, Rishon-Lezion, Israel
[c]Department of Botany, Babu Shivnath Agrawal College, Mathura, Uttar Pradesh, India
[d]Department of Zoology, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl, Mizoram, India

11.1 Introduction

The increasing world population poses severe pressure on land for increased crop production worldwide (Lutz et al., 2008; York et al., 2003). On the other hand, this flooding population has contributed significantly to (1) reduced availability of cultivated land, (2) scarcity and degradation of water resources, (3) soil xenobiotic accumulation, and (4) soil fertility and quality degradation. To overcome the challenges combined with rising global population and anthropogenic pressure and encounter the food surplus, there is an urgent need to improve crop productivity practices in hand with sustainability (Pathak et al., 2018). Higher productions can be accomplished either by boosting crops' yields or reducing agricultural productivity losses due to various stresses (both abiotic and biotic). The scientific school is flooded with approaches to expand and take crop production to the next level. In this regard, various solutions are coming up to boost agricultural production. Though there are many techniques for barring any ill effects, the most scientific community relies on sustainable means of increasing crop production. Sustainable agriculture focuses on using biological means

Cyanobacterial Lifestyle and its Applications in Biotechnology.
DOI: https://doi.org/10.1016/B978-0-323-90634-9.00005-6

Copyright © 2022 Elsevier Inc. All rights reserved.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Earth and Environmental Sciences Library

Praveen Kumar Rai
Prafull Singh
Varun Narayan Mishra *Editors*

Recent Technologies for Disaster Management and Risk Reduction

Sustainable Community Resilience & Responses



Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Springer

Editors
Praveen Kumar Rai
Department of Geography
Khwaja Moinuddin Chishti Language University
Lucknow, Uttar Pradesh, India

Varun Narayan Mishra
Centre for Climate Change and Water Research
Suresh Gyan Vihar University
Jaipur, Rajasthan, India

Prafull Singh
Department of Geology
School of Earth
Biological and Environmental Science
Central University of South Bihar
Gaya, Bihar, India

ISSN 2730-6674 ISSN 2730-6682 (electronic)
Earth and Environmental Sciences Library
ISBN 978-3-030-76115-8 ISBN 978-3-030-76116-5 (eBook)
https://doi.org/10.1007/978-3-030-76116-5

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2021
This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Contents

Geophysical Disasters

Glacial Lake Outflow Hazard and Risk Probability in Sikkim 3
Arunima Chanda and Brototi Biswas

Earthquake Hazards and Monitoring of Seismo-ionospheric Precursor 27
Sanjay Kumar and A. K. Singh

Seismic Hazard Zonation Mapping of Gangtok Block, Sikkim, India ... 41
Brototi Biswas, Aneesah Rahaman, and Ashutosh Singh

Rockfall Hazard Assessment Using RAMMS for the SE Facing Escarpment of Manikaran, Himachal Pradesh, India 57
Raj Kiran Dhiman and Mahesh Thakur

Surface Displacement Analysis of Road-Cut Slopes in the Vicinity of Koteshwar Area, Uttarakhand, India 75
Swati Sharma, Har Amrit Singh Sandhu, and Manoj K. Arora

Seismic Vulnerability Assessment in the Built-Up Environment of Rispana River Catchment, Dehradun, Indian Himalayas 91
Himani Bisht and D. C. Pandey

Hydrological Disasters

Flood Mapping and Vulnerability Assessment Using Geospatial Techniques: A Case Study of Lower Periyar River Basin, Kerala 107
S. Suresh Kumar and K. Jayarajan

RS-GIS Based Constructive Measures for Flood Prone Agricultural Land of Sabour Block of Bhagalpur District, Bihar 121
Binod Kumar Vimal, Neeraj Bagoria, Rajkishore Kumar, Y. K. Singh, and Ragini Kumari

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Seismic Hazard Zonation Mapping of Gangtok Block, Sikkim, India

Brototi Biswas, Aneesah Rahaman, and Ashutosh Singh

Abstract Earthquake are the common disastrous events in the study area, Gangtok Block, Sikkim; it shows a historical record in the study area. The heavy loadings of slopes by the residential as well as commercial buildings, construction work leads seismic activities, resulting in great loss of human lives and properties due to collapse building which is mainly constructed in local materials such as wood, bricks, and stone. Communication network is also disrupted due to these seismic activities. Therefore, it is necessary to prepare the seismic hazard or earthquake hazard zonation map of the study area to mitigate or manage the loss and damages. The objective of this present study is to prepare a seismic hazard zonation map. The present study has been carried out by using secondary sources of data. A total of 14 earthquake location since 1985–2015 have been collected from the Geological Survey of India. In this study, the four most causative parameters have been taken such as land-use/land-cover, slope, soil and geology. The hazard zonation map has been done with the technique of frequency ratio model. Application of GIS techniques allowed to insert, extract, handle, and analyze the data for the zoning of seismic map. The end-product consists of information layers such as maps of earthquake intensity, the expected damage, and hazard involved, as well as numerical tables associated to maps. The seismic hazard zonation map was developed using ARC GIS 10.4 software and is structured in thematic vector and raster layers. Therefore, the results of this study also reveal that the final map of hazard zonation can be useful for mitigating the hazard and is very helpful to planners and engineers for determining the safe and suitable locations to continue the developmental works. The present study may focus on the changes of landscape which is a part of man-made activities. The changes of land-use/land-cover can bring the stress, and it is related to the magnitude of earthquake

B. Biswas
Department of Geography of RM, Mizoram University (A Central University), Aizawl, India

A. Rahaman
University of Madras, Chennai 600025, India

A. Singh (✉)
Department of Geography, Mizoram University, Pachhunga University College Campus, Aizawl, India

© The Author(s), under exclusive licence to Springer Nature Switzerland AG 2021

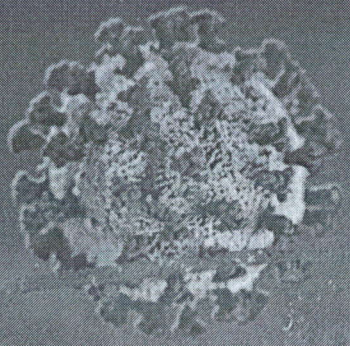
P. K. Rai et al. (eds.), *Recent Technologies for Disaster Management and Risk Reduction*, Earth and Environmental Sciences Library,
https://doi.org/10.1007/978-3-030-76196-5_3

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

MIZORAM *leh* CORONA VIRUS - 1



Mizoram Covid-19 Analysis Group

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Mizoram leh Corona Virus - 1
Mizoram Covid -19 Analysis Group

Published by
Vanlalthlana
Prop. T.M Offset Printing Press

Copyright Reserved

ISBN : 978-81-951732-3-5

Price Rs. 300/-

Printed at
TM Offset Printing Press
Canteen Square, Dawrpui, Aizawl
Ph. : 0389 2312796 / 9862563084

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

MIZORAM LEH CORONA VIRUS-19

Chief Editor
Rev. Dr. Lalhmachhuana

Editor
Prof. Lalbiakdiki Hnamte
Upa R. Lallianzuala
Upa Dr. Samuel V.L. Thlanga

MIZORAM COVID - 19 ANALYSIS GROUP

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

7. Zoram Mipui leh Corona Hripui
– Lalrinliana Colney 113
8. Lockdown : A Tha lam Zar
– K. Lalrinchhana 118

SECTION C : KIL HRANG HRANG ATANGA HRIPUI THLIRNA

1. Covid-19 leh Civic Sense – K. Lalremruata
2. Hripuiin Mizote Rilru a Nghawng Dan : Counselling Thlirna Atangin – Rev Ropuia 127
3. Hripui : Mihringte Cho Chhuah
– Dr. David C. Vanlalfakawma 144
4. Covid19- Leilung Damna Thlentu
– Rev. Lalfakzuala 150
5. Hripui leh hripui - Rev. V.L. Hruaia Khiangte 160
6. Covid 19 leh rawngbawltute
- Commr Lalzamlova (L) 171

SECTION D : RESEARCH BASED ARTICLE

1. Covid leh Chhungkua
– Samuela VL Thlanga 177
2. Covid19 leh Naupangte
- Dr. Rohmingmawii 190
3. Covid19 in Mizote Rilru leh Nunphung a Nghawng Dan
– Prof. Rinpari Ralte, Dr. C. Zothanmawia & Dr. Mary Ann Haliday 203
4. Covid19 in Mizoram Agriculture Sector a Nghawng Dan
– K.C. Lalmalsawmzauva 217
5. Hripui (Covid19) leh Mizo Khawtlang Nun
– Upa Prof. C. Nunthara 225

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

COVID-19 IN MIZOTE RILRU LEH NUNPHUNG A NGHAWNG DAN

Prof. Rinpari Ralte[1],
Dr C.Zothanmawia[2]&
Dr. MaryAnn Halliday[3]

Thuhmahruai :

Kum 2019 tawp lama kan hmelhriat tan coronavirus natna hrik (Covid-19) hi khawvel pum huapa public health crisis lian a ni a. Tun hmalama hripui leng te nena a danglam em em na pakhat chu mipui zingah mamawh neih khawploh hlauhna lian em em hi a ni. He natna hrikin a kentel, hmalam huna khawsak dan tur chianglo hian mipui zingah mamawh lei chhekkhawl duhna a thlen nasa. Hei hian mipui zingah thlamuanna eng emaw chen a pe ve thin bawk a ni. He thil thlen fo thinnachhan chu hlauhna leh manganna (anxiety) laka inven nan nia ngaih a ni. Damkhawchhuah duhna (survival) kan nei theuh a, hemi atana inpuahchah a ni ti ila, kan sawisual thui lovin a rinawm.

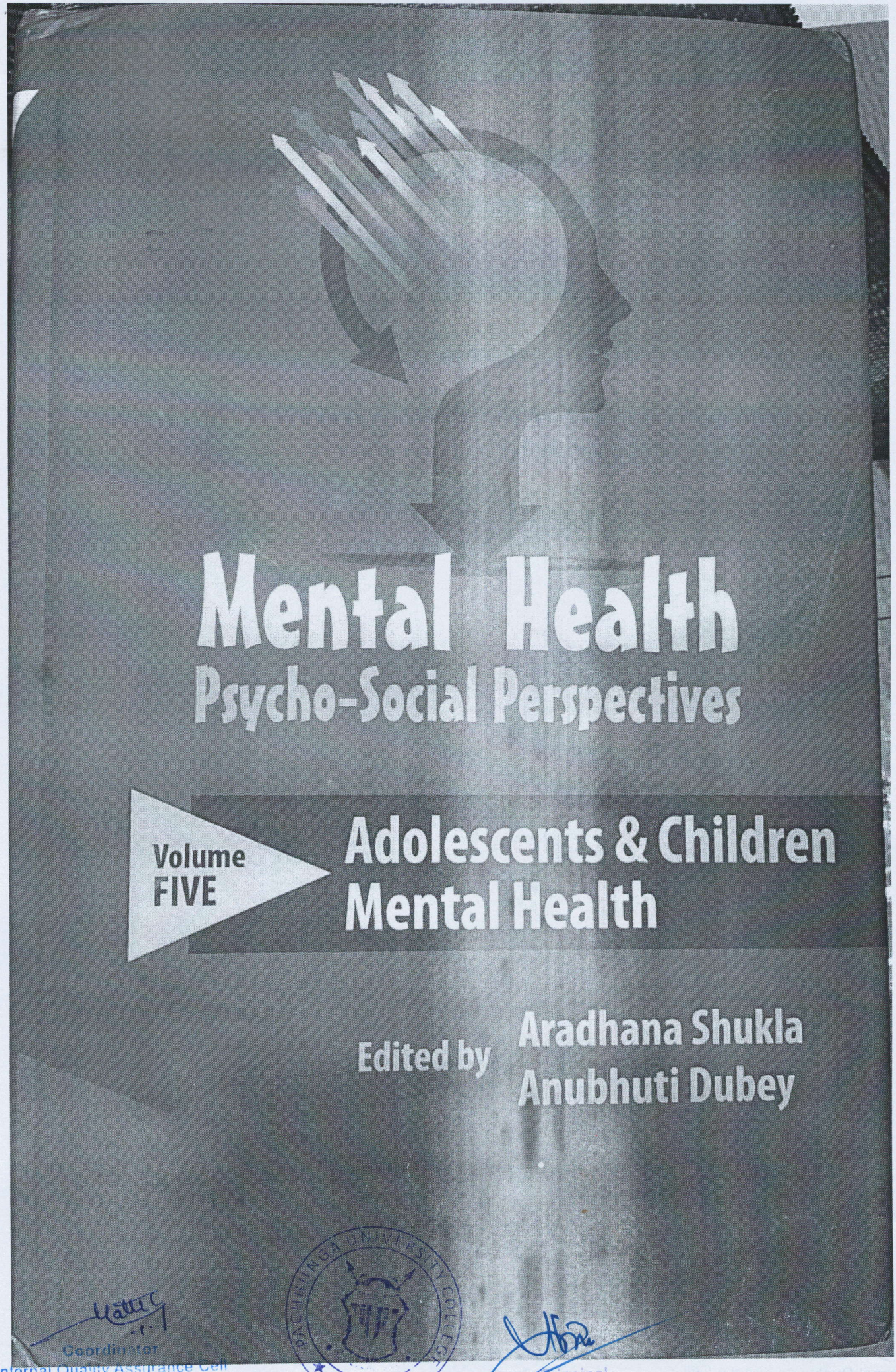
Kum 20 liam ta atang khan hripui leng hian mihring rilru hriselna a nghawng nasa tih hi hmuhchhuah a ni a. Tun hripui lengah (Covid-19) pawh hian he thil hi hmuh a ni ta reng bawk a ni. Depression, anxiety, rimtawngna (stress), zuk leh hmuam hman nasat leh khawharna te'n mipui a nghawng dan hi anlo zir nasa tawh hle. Frontline workers, chenna tur neilo (homeless), kum lama upa te leh naupai te a nghawng dan hi nasa lehzuala zir a ni bawk.

Mithiam te lo zir tawhnaah chuan Covid-19 lockdown laiin India mipui tam tak zingah depression, anxiety leh

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram



Mental Health
Psycho-Social Perspectives

Volume FIVE

Adolescents & Children Mental Health

Edited by Aradhana Shukla
Anubhuti Dubey

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

© Editors

All rights reserved. No part of this work may be reproduced, stored, adapted, or transmitted in any form or by any means, electronic, mechanical, photocopying, micro-filming recording or otherwise, or translated in any language, without the prior written permission of the copyright owner and the publisher. The book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, resold, hired out, or otherwise circulated without the prior publisher's written consent in any form of binding or cover other than that in which it is published.

The views and opinions expressed in this book are author(s) own and the facts reported by him/her have been verified to the extent possible, and the publishers are not in anyway liable for the same.

ISBN: 978-93-5125-173-6 (Series)
ISBN: 978-93-5439-017-3 (Vol. V)

First Published 2021

Published and Printed by

Concept Since 1974

Concept Publishing Company Pvt. Ltd.
A/15-16, Commercial Block, Mohan Garden,
New Delhi-110059 (India)
T: 91 11 41101460, 91 11 25351460, 91 11 25351794
E: publishing@conceptpub.com, *W*: www.conceptpub.com

Cataloging in Publication Data--Courtesy: D.K. Agencies (P) Ltd. <docinfo@dkagencies.com>

Mental health : psycho-social perspectives / edited by Aradhana Shukla, Anubhuti Dubey.
volumes cm
Contributed articles.
Includes bibliographical references and index.
Contents: volume 5. Adolescents & childrens' mental health — volume 6. Women mental health
Volumes 5-6 received now.
ISBN 9789351251736 (series)
ISBN 9789354390173 (vol. V)
ISBN 9789354390258 (vol. VI)

1. Teenagers—Mental health—India. 2. Child mental health—India. 3. Women—Mental health—India. I. Shukla, Aradhana, editor. II. Dubey, Anubhuti, editor.

LCC RA790.7.I5M46 2021 | DDC 362.20954 23

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

Contents

Preface v

Acknowledgements ix

Our Contributors xv

1. Introduction 1
   Aradhana Shukla and *Anubhuti Dubey*
2. Family and Parenting: Promotion of Mental Health in Adolescents and Children 4
   Aradhana Shukla and *Anubhuti Dubey*
3. Children with Intellectual Disability: Parents' Perceived Stress and Coping Strategies 20
   Archana Shukla and *Shivani Pandey*
4. Children and Adolescents Mental Health in the Era of Globalization 34
   Nishant Goyal and *Velprashanth Venkateshan*
5. Bullying and Budding Minds: The Psychological Bearings 53
   Neelam Verma
6. Adolescents' Attitude towards Substance Use in Mizoram 71
   Manoj Kr. Pandey, Lalawmpuia, Rinpari Ralte and *Loisi Vanlalnguri*
7. Teenagers, Adolescents and Children in Schools: Peer Group Pressure and Mental Health 98
   Aradhana Shukla

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

6

Adolescents' Attitude towards Substance Use in Mizoram

Manoj Kr. Pandey, Lalawmpuia, Rinpari Ralte and *Loisi Vanlalnguri*

Introduction

Alcohol and Drug Abuse

National Institute on Drug Abuse (2009) defines drug addiction as a condition of intense and, at times, uncontrollable drug craving, along with compulsive drug seeking and use that persists even in the face of devastating consequences.

It further clarifies that addiction is something beyond an impulsive drug taking, which can likewise deliver enduring adverse outcomes. For instance, drug abuse and addiction can lead into a risk of mental and physical illnesses. Furthermore, a wide scope of dysfunctional behaviours due to abuse interferes with typical working in family, the occupation, and the more extensive network such as community.

Drugs appear to play a crucial role in "group culture" of children and adolescents. They create their "group identity" which brings them proximate to the group, where such activities are normal and it feels them a sense of adulthood. In addition it decreases their anxiety, inhibition, promotes enjoyment and results in an enhanced shared experience among the group. Unfortunately, when these drugs are taken in small amount, damage health and adversely affect socio-occupational functioning. But when these drugs are taken into large amount they can cause remarkable physical and/or social impairment and sometimes can causes death (Turk, Graham, & Verhulst, 2007).

Keane, Reaper-Reynolds, Williams and Wolfe (2005) define the drug is any substance which changes the way the body functions mentally,

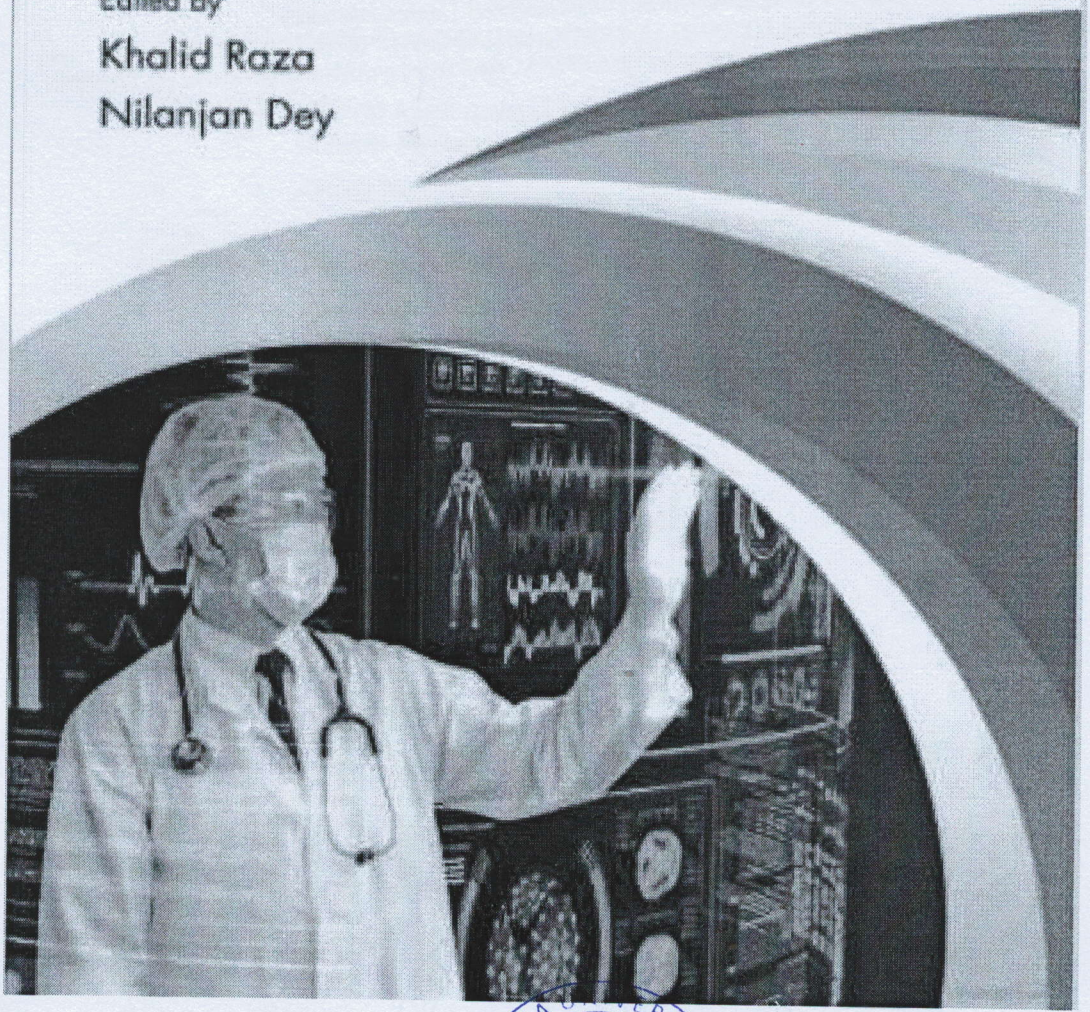
Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)
PACHHUNGA UNIVERSITY COLLEGE AIZAWL
Principal
Pachhunga University College
Aizawl : Mizoram

Intelligent Signal Processing and Data Analysis

CRC Press
Taylor & Francis Group

TRANSLATIONAL BIOINFORMATICS APPLICATIONS IN HEALTHCARE

Edited by
Khalid Raza
Nilanjan Dey



Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

For permission to photocopy or use material electronically from this work, access www.copyright.com or contact the Copyright Clearance Center, Inc. (CCC),222 Rosewood Drive, Danvers, MA 01923, 978-750-8400. For works that are not available on CCC please contact mpkbookspermissions@tandf.co.uk

Trademark notice: Product or corporate names may be trademarks or registered trademarks and are used only for identification and explanation without intent to infringe.

Library of Congress Cataloging-in-Publication Data
Names: Raza, Khalid, editor. | Dey, Nilanjan, editor.
Title: Translational bioinformatics applications in healthcare / edited by Khalid Raza and Nilanjan Dey.
Description: First edition. | Boca Raton, FL: CRC Press, 2021. |
Series: Intelligent signal processing and data analysis | Includes bibliographical references and index. |
Summary: "Translational bioinformatics (TBI) involves development of storage, analytics and advanced computational methods to harvest knowledge from voluminous biomedical and genomic data into 4P healthcare (proactive, predictive, preventive and participatory). This book offers a detailed overview and concepts of TBI, biological and clinical databases, clinical informatics, and pertinent real-case applications. It further illustrates recent advancements, tools, techniques, and applications of TBI in healthcare including IoT potential, toxin databases, medical image analysis and telemedicine applications, analytics of COVID-19 CT-images, viroinformatics and viral diseases, COVID-19 related research" — Provided by publisher.
Identifiers: LCCN 2020049426 (print) | LCCN 2020049427 (ebook) | ISBN 9780367705701 (hardback) | ISBN 9781003146988 (ebook)
Subjects: LCSH: Bioinformatics. | Drug development. | Medical informatics.
Classification: LCC QH324.2 .T734 2021 (print) | LCC QH324.2 (ebook) | DDC 610.285—dc23 LC record available at https://lccn.loc.gov/2020049426 LC ebook record available at https://lccn.loc.gov/2020049427

ISBN: 978-0-367-70570-1 (hbk)
ISBN: 978-1-000-37523-7 (pbk)
ISBN: 978-1-003-14698-8 (ebk)

Typeset in Times LT Std
by codeMantra

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Contents

Preface vii
Editors ix
Contributors xi

PART I ***Translational Healthcare, Next-Generation Sequence Analysis, and Drug Repurposing***

Chapter 1 Translational Healthcare System through Bioinformatics 3
Mrinal Kumar Sarma, Rina Ningthoujam, Manasa Kumar Panda, Punuri Jayasekhar Babu, Ankit Srivastava, Maohinikanti Das and Yengkhom Disco Singh

Chapter 2 Next-Generation Sequence Analysis for Clinical Applications 23
Agnik Haldar and Ajay Kumar Singh

Chapter 3 Clinical Applications of Next-Generation Sequence Analysis in Acute Myelogenous Leukemia 41
Fatima Nazish Khan, Shaban Ahmad and Khalid Raza

Chapter 4 Translational Bioinformatics Methods for Drug Repurposing 67
Jyoti Rani, Urmi Bajpai and Srinivasan Ramachandran

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

1 Translational Healthcare System through Bioinformatics

Mrinal Kumar Sarma
The Energy and Resources Institute

Rina Ningthoujam
Central Agricultural University

Manasa Kumar Panda
CSIR-Institute of Minerals and Materials Technology

Punuri Jayasekhar Babu
Mizoram University

Ankit Srivastava
Banaras Hindu University

Maohinikanti Das
Odisha University of Agriculture and Technology

Yengkhom Disco Singh
Central Agricultural University

T&F Proofs - Not for Distribution

CONTENTS

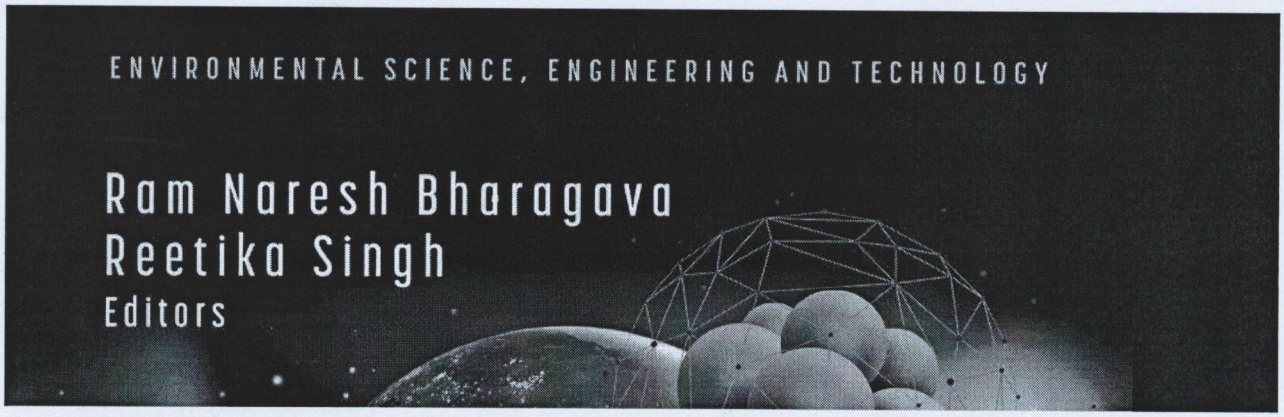
1.1 Introduction 4
1.2 Data and Biomedicine 5
1.3 Genomics and Bioinformatics 6
1.4 Pharmacogenomics 8
1.5 Mechanism of PG 9
1.5.1 Pharmacokinetics 9
1.5.2 Pharmacodynamics 10
1.6 PG in Drug Discovery 10
1.7 Drug Discovery and Development through Omics Technologies 11
1.7.1 Omics Technology 11

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

9780367705701_C001.indd 3 12/01/21 10:26 PM







Nano-Biotechnological Advancements in Environmental Issues: Applications and Challenges

$195.00

Ram Naresh Bharagava, PhD (Editor) – Assistant Professor, Laboratory of Bioremediation and Metagenomics Research (LBMR), Department of Environmental Microbiology (DEM), Babasaheb Bhimrao Ambedkar University (A Central University), Uttar Pradesh, India
Reetika Singh, PhD (Editor) – National-Post Doctoral Fellow, Department of Biochemistry, University of Allahabad, Uttar Pradesh, India

Series: Environmental Science, Engineering and Technology

BISAC: SCI013080; SCI026000

Target Audience: Under graduate, post graduate students, research scholars, scientists and academicians engaged in microbiology, biotechnology, environmental sciences with the

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)
Principal
Pachhunga University College
Aizawl : Mizoram

policy makers.

Description:

This book provides detailed knowledge on different types of pollutants and their hazardous effects on the environment, humans, animals, and plants. It also describes various modern nano-remediation approaches utilizing different nanomaterials for treatment/management of different wastes, such as nanomaterial-mediated degradation of pharmaceutical and personal care products, nanomaterial-mediated wastewater treatment, nano-biotechnology in solid waste management, nanotechnology in biohydrogen and biodiesel production, and nano-biotechnology in e-waste management. This is an urgent matter for the safety of the environment and for human and animal health.

Binding

Hardcover Clear

Publication Date: August 18, 2021

Status: AV

Pages: 269

$195.00

Pre-Order

1 Pre-Order Now

Add to Wishlist

ISBN: 978-1-53619-975-8

Categories: **2021, Books, Chemical and Environmental Health and Safety, Chemistry, Chemistry, Chemistry, Environment & Energy, Environmental Science, Engineering and Technology, Environmental Sciences, Nanotechnology Science and Technology, Nova, Science and Technology, Toxic and Hazardous Substances, Upcoming Publications**

Table of Contents Additional information Help

PACHHUNGA UNIVERSITY AIZAWL

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

Chapter 1. Nano-Materials in Pharmaceutical and Personal Care Product Degradation in Water
(Anupma Thakur, Rishabh Jain and Pooja Devi – Academy of Scientific and Innovative Research, Ghaziabad, India, et al.)

Chapter 2. Nanomaterials Mediated Water Treatment
(Berfin Eda Elcik and Tugba Ozdal – Department of Food Engineering, Faculty of Engineering and Architecture, Istanbul Okan Univesity, Tuzla, Istanbul TR, Turkey)

Chapter 3. Nanomaterials Mediated Wastewater Treatment
(Punuri Jayasekhar Babu, Rina Ningthoujam, Yengkhom Disco Singh, Mrinal Kumar Sarma and Manasa Kumar Panda – Biomaterials and Bioengineering Research Laboratory, Department of Biotechnology, Mizoram University, Pachhunga University College Campus, Mizoram, India, et al.)

Chapter 4. Transgenic Plants in Phytoremediation: A Biotechnological Approach
(Mayanglambam Chandrakumar Singh, Athikho Kayia Alice, Naorem Bidyaleima Chanu, Ngathem Taibangnganbi Chanu, Aatish Kumar Sahu, Amit Kumar Singh, Siddhartha Singh, Lukram Shantikumar, Yengkhom Disco Singh, Mahesh Kumar and Thejangulie Angami – Department of Basic Sciences and Humanities, College of Horticulture and Forestry, Central Agricultural University, Pasighat, A. P., et al.)

Chapter 5. Nanotechnology in Biodiesel Production
(Rina Ningthoujam, Barsarani Jena, Sabita Pattanayak, Pratigyan Priyadarsini, Manasa Kumar Panda, Punabati Heisnam, Mayanglambam Chandrakumar Singh, Punuri Jayasekhar Babu, Mohinikanti Das and Yengkhom Disco Singh – Department of Vegetable Science, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh, India, et al.)

Chapter 6. Phycoremediation: A Synergistic Approach for Bioremediation and Biomass Production
(Neha Mishra, Bechan Sharma and Neetu Mishra – Department of Food, Nutrition and Public Health, ECHS, SHUATS, Prayagraj, India)

Chapter 7. Waste Valorization by Composting: Microbial Diversity and Kinetics
(Anjali Singhal, D. K. Chauhan and Pawan Kumar Jha – Department of Botany, University of Allahabad, Prayagraj, India, et al.)

Chapter 8. Nano Bioremediation Using Gold, Silver, and Copper: An Ecofriendly Approach
(Department of Chemistry, College of Sciences, University of Sharjah, United Arab Emirates)

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Chapter 3

NANOMATERIALS MEDIATED WASTEWATER TREATMENT

Punuri Jayasekhar Babu[1,*], Rina Ningthoujam[2], Yengkhom Disco Singh[3], Mrinal Kumar Sarma[4] and Manasa Kumar Panda[5]

[1]Biomaterials and Bioengineering Research laboratory, Department of Biotechnology, Mizoram University (A Central University), Pachhunga University College Campus, Aizawl- 796001, Mizoram, India

[2]Department of Vegetable Science, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh-791102, India

[3]Department of Post-harvest Technology, College of Horticulture and Forestry, Central Agricultural University, Pasighat-791102, Arunachal Pradesh, India

[4]Advance Biofuel Division, The Energy and Resources Institute, Lodhi Road, New Delhi, 110003, India

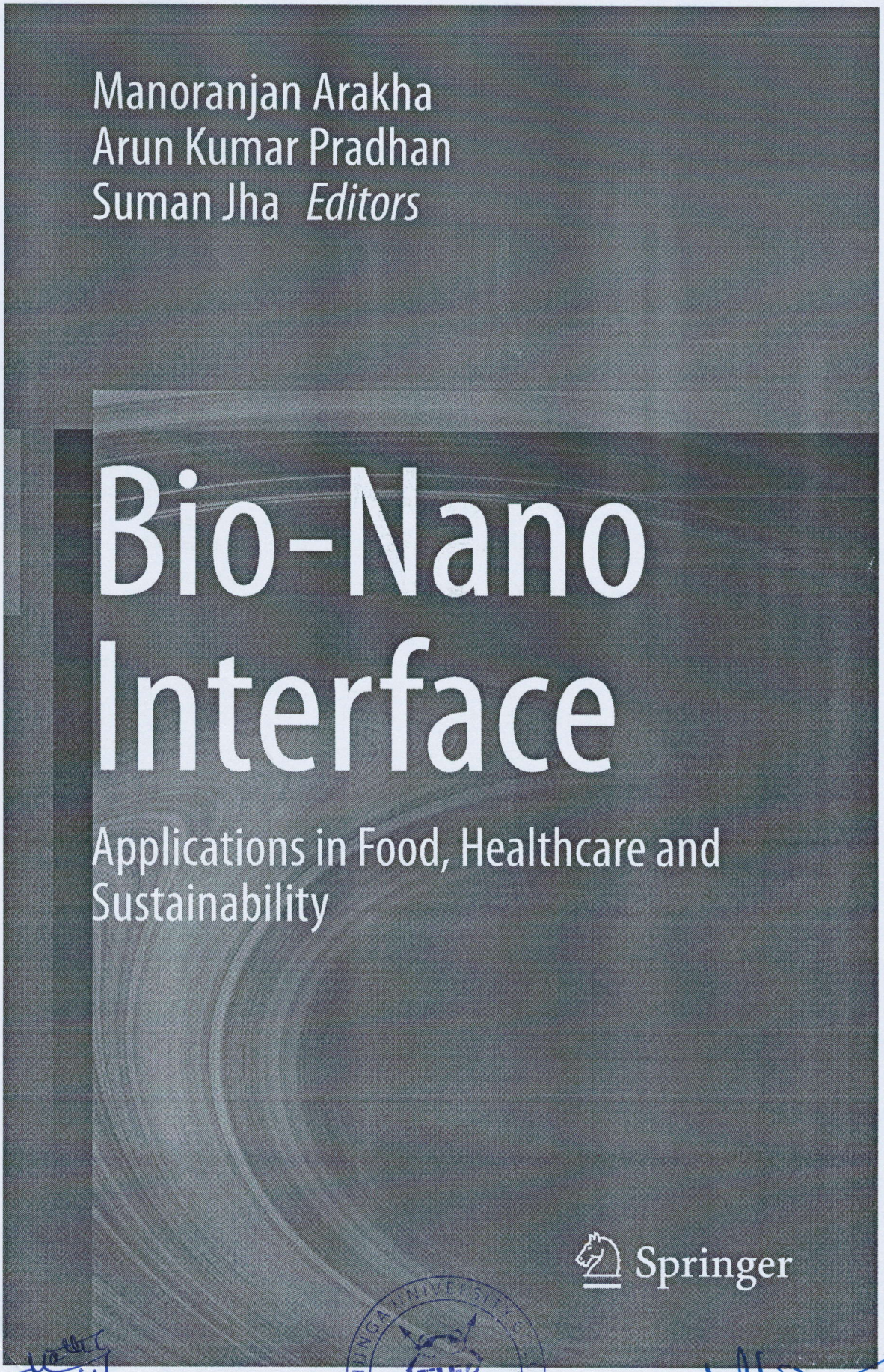
[5]Environment & Sustainability Dept. CSIR-Institute of Minerals and Materials Technology, Bhubaneswar-751013

* Corresponding Author's Email: jayasekhar.punuri@gmail.com, punuribabu@pucollege.edu.in.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram



Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Editors
Manoranjan Arakha
Centre for Biotechnology
Siksha 'O' Anusandhan
(Deemed to be University)
Bhubaneswar, Odisha, India

Arun Kumar Pradhan
Centre for Biotechnology
Siksha 'O' Anusandhan
(Deemed to be University)
Bhubaneswar, Odisha, India

Suman Jha
Department of Life Science
National Institute of Technology Rourkela
Rourkela, Odisha, India

ISBN 978-981-16-2515-2 ISBN 978-981-16-2516-9 (eBook)
https://doi.org/10.1007/978-981-16-2516-9

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2022
This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

9 **Phytoplankton Mediated Nanoparticles for Cancer Therapy** 143
Priyadarshini Padhi, Manasa Kumar Panda, Yengkhom Disco Singh, Kaushik Kumar Bharadwaj, Kausika Kumar Malik, and Binata Nayak

10 **Nanotechnology and Its Potential Implications in Ovary Cancer** . . . 161
Bimal Prasad Jit, Biswajita Padhan, and Ashok Sharma

11 **Nanotechnology: An Emerging Field in Protein Aggregation and Cancer Therapeutics** 177
Sonali Jena, Sonali Mohanty, Monalisha Ojha, Kumari Subham, and Suman Jha

12 **Bio-nano Interface and Its Potential Application in Alzheimer's Disease** 209
Biswajita Pradhan, Bimal Prasad Jit, Sairendri Maharana, Shankar Ramchandani, and Mrutyunjay Jena

13 **Potential of Curcumin Nanoparticles in Tuberculosis Management** 225
Bhabani Shankar Das, Ashirbad Sarangi, and Debapriya Bhattacharya

14 **Application of Nanobiosensor in Health Care Sector** 251
Subham Preetam, Lipsa Dash, Suman Sudha Sarangi, Mitali Madhusmita Sahoo, and Arun Kumar Pradhan

15 **Bioactive Nanoparticles: A Next Generation Smart Nanomaterials for Pollution Abatement and Ecological Sustainability** 271
Showkat Mir, Nirius Jenan Ekka, Binata Nayak, and Iswar Baitharu

16 **Smart Nanomaterials for Bioimaging Applications: An Overview** . . 287
Kunal Biswas, Avik Sett, Debashis De, Jaya Bandyopadhyay, and Yugal Kishore Mohanta

17 **Biology of Earthworm in the World of Nanomaterials: New Room, Challenges, and Future Perspectives** 307
Jayanta Kumar Sahu, Rajendra Kumar Behera, Iswar Baitharu, and Prajna Paramita Naik

18 **Bioethanol Production from Agricultural Wastes with the Aid of Nanotechnology** 329
Manisha Mahapatra and Arun Kumar Pradhan

19 **Nanotechnology for Sustainable Bioenergy Production** 339
Yengkhom Disco Singh, Manasa Kumar Panda, Mrinal Kumar Sarma, Rina Ningthoujam, Punuri Jayasekhar Babu, Mohinikanti Das, and Jyoshnamayee Patra

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Nanotechnology for Sustainable Bioenergy Production

19

Yengkhom Disco Singh, Manasa Kumar Panda, Mrinal Kumar Sarma, Rina Ningthoujam, Punuri Jayasekhar Babu, Mohinikanti Das, and Jyoshnamayee Patra

Abstract

Fossil fuel is going to be exhausted in the near future and the emission products of these fuels have been causing serious environmental pollution; therefore, the world is looking for alternate fuel that can be a replacement fuel for fossil fuel. In this context, nanotechnology as multidisciplinary approach can play a major role in improving biofuel production. Nanoparticles like silver, gold and other metallic nanoparticles have been reported to have potential effect in biofuel production. This fuel is more eco-friendly and renewable energy sources and

Y. D. Singh (✉)
Biomaterials and Bioprocessing Research Laboratory, Department of Post Harvest Technology, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh, India

M. K. Panda · J. Patra
Environment and Sustainability Department, CSIR-Institute of Minerals and Materials Technology, Bhubaneswar, Odisha, India

M. K. Sarma
Advance Biofuel Division, The Energy and Resources Institute, New Delhi, India

R. Ningthoujam
Department of Vegetable Science, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh, India

P. J. Babu
Biomaterials and Bioengineering Research Laboratory, Department of Biotechnology, Pachhunga University College, Mizoram University (A Central University), Aizawl, Mizoram, India

M. Das
Department of Botany, College of Basic Science and Humanities, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India

© The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2022

M. Arakha et al. (eds.), *Bio-Nano Interface*,
https://doi.org/10.1007/978-981-16-2516-9_19

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

CHERCHĬNGKÎM

HNAM ZAI LEH LAM ZIR ZAUNA



Edited by
Darchuailova Renthlei
V. Lalberkhawpuimawia

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

CHERCHĬNGKÎM

HNAM ZAI LEH LAM ZIRZAUNA

A compilation of Seminar papers of
Two-Day National Seminar on
Rewriting Folk Song & Dance
Organized by
Sahitya Akademi, Mizo Department, GHBC and
Art & Culture Dept., Government of Mizoram
2020

Edited by
Darchuailova Renthlei
V. Lalberkhawpuimawia

Published by
Mizo Department
Government Hrangbana College
Aizawl, Mizoram

A man - ₹250

ISBN: 078-81-944202-5-5



Printed at:
KL Offset Printer
MG Road, Peter Street
Tuikhuahtlang, Aizawl-796001
Contact : 9862725126, 0389-2311260
Email : klofsetprinters@gmail.com

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

Principal
Pachhunga University College
Aizawl : Mizoram

6. Chawngchen Zai Nihphung Zirna
- *Vanlaltana Khiangte* 117
7. Mizo Hla Hluia Khawl Thil Lo Langte
- *Remlalthlamuanpuia & Thang Sian Tluang* 127
8. Darpawngi Zai: Portrait Gallery
- *Lalhlimpuii* 135
9. Darlenglehi Zai: Hmangaihna leh Lunglenna
- *Rohmingthanga Ralte*..... 147
10. Lalvunga Zai
- *Lalrinkimi* 156
11. Mizo Hla Hluia Naupang Hlate
- *H. Lalawmpuii* 166
12. Mizo Hla Hluia Satire Ziarang
- *V. Lalberkhawpuimawia* 173
13. Awithangpa Lunglenna
- *Laltlanmawia* 182
14. Awithangpa Khawtlang Nun Sawhkhawk
- *PC. Lalngaihzuala* 198
15. Hausiampa Zai
- *Lalzarzova* 205
16. Hrangchhawni Zai
- *Lalrammuana Sailo* 215
17. Ral Run Zai
- *F. Lalzuithanga* 222
18. Hausiampa Zai Ziarang leh Kalhmang
- *VL Muanpuia Chawngthu* 237
19. Puma Zai leh A Nghawng
- *Sangkima* 247
20. Chai Hla Pahnih
- *Lalrammawia* 256

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

ISBN- 978- 81- 944120- 25-5

Mizo Hla Hluia 'Khawl Thil' Lo Langte Bih Chianna

(Techno-critical reading of Mizo Folksong)

Remlalthlamuanpuia & Thang Sian Tluang***

Techno-criticism

Techno-criticism chu zirchikna chi peng pakhat, tun hnai 21st *century* aṭanga lo irh chhuak a ni a; *techno-criticism* chu thumal pahnih- *technology* tih leh *criticism* tih aṭanga lo piang a ni a (https://www.yourdictionary.com/technocriticism). *Technology* chu "*thil siamna khawl lam chanchin zirna*" (English-Lushai Dictionary 500) tiin JF Laldailova chuan a hrilhfiah a; *criticism* chu "*chik taka thil zirna*" (English-Lushai Dictionary 126) tiin a hrilhfiah bawk. MH *Abrams* chuan Criticism chu "*sawifiahna, thliarhranna, endikna, thil awmze sawina, a hlutzia chhutna*" (A Glossary of Literary Terms 70) tiin a hrilhfiah a; H.Laldinmawia chuan, "*Thu leh hla zirchikna*" (Literature Lamtluang 234) tiin a hrilhfiah bawk.

Techno-criticism chu khawl thilin khawtlang leh mi mala hmasawnna, awlsamna leh danglamna a thlen theih leh a nghawng chungchang thu leh hlaa lo lang zirchianna a ni ber . Thu leh hlaa khawl thil lo lang hi chi hnihin a ṭhen theih a; chungte chu - descriptive leh prescriptive te an ni .

"*Descriptive* chuan khawl thil lo pian dan leh hmasawn chhoh dan te, *internet*-in mihring nun a khawih dan (*cyber-culture*) leh *technology* hmanga thuril puanchhuahte a sawi fiah

* Asst. *Professor, Dept. of Mizo, PUC*
** PG *Student, Dept. of Mizo, PUC*

PACHHUNGA UNIVERSITY COLLEGE AIZAWL
Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)
Principal
Pachhunga University College
Aizawl : Mizoram

Chhawm Nun Tlak 'Chawnglaizawn'

*H. Laldinmawia**

Hnam làm (folk dance):

Mihring awm tirh aṭangin lâm hi mihring nunah a bet ve nghal a; mihring nun ṭhan chhoh dan ang zelin lam pawh hi a danglam ṭhin. 'Lâm hi arts zawng zawng hringchhuaktu a ni' *(dance is the mother of all arts)* tih a ni nghe nghe (Sachs iii). Pipute nunphung, an chet vel dan emaw, hmanlai mite nunphung chhuina (folklore) hi 'mipui marphu' (pulse of the people) emaw 'khawtlang nun hausakna' (wealth of society) tiin an sawi a ṭhin (Reddy 288). Folklore zinga pawimawh tak hnam lâm (folk dance) hi mipuiin inneih lawmna te, kut ni vangthlaah te, buhbal thar avanga lawmthu sawina te leh thihna leh lusunna entir nan te an hmang ṭhin.

Hetih rual hian ramchhuak hlawhtlinna avang te, indonnaa hnehtu nih lawmna atan te, sik leh sa her vel lawmna atan te, chhiatna leh ramhuai hlauh tlawnna atan te lam hi entir a ni ṭhin . Folk dance hi mipui lâm *(folk dance is a dance done by the folk)* an ti. (Dinmawia 228). Chuvang chuan a zirchhuak te chauh leh eizawnna atana hmangte chauh lamna ni lovin, mipui vangtlang lamna a ni a, chawimawina leh lawmman uma lamna a ni ngai lem bawk lo. A tlangpui thuin mipuiin an lawmna leh hlimna, lungngaihna leh manganna, lawmthu sawina leh ṭawngtaina atana an hman ṭhin a ni (Khokar 8).

Hnam khat emaw ram bung khat emaw chhunga mipuiin awmze kalhmang neia lam an entir ṭhin hi 'folk dance'

*Asst. Professor, Department of Mizo, PUC

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE 2 AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Hrangchhawni Zai

*Lalrammuana Sailo**

1.Hrangchhawni chanchin Tlangpui

John Milton-a epic poem ropui tak pakhat Paradise Lost-a character pakhat Setana chuan 'Vanrama hna thawktu leh mi naran nih ai chuan Hremhmuna roreltu nih pawh a hlu zawk(tlar 263) tiin larna leh ropuina hlutzia a lo sawimawi a; mi lar nih duh vangin mi ṭhenkhat chu an a der a, ṭhenkhatin mi mit fukna nih tum vangin tuai nih an thlang bawk. Hrangchhawni erawh larna leh hming thanna a duh hrim hrim vang pawh ni lovin a zai thiamna leh a lam thiamnate chuan mi thinlung a khawih a; a hunlaia mi nawlpui lam dan leh awm dan ang ni loa a awm ngam chu thu leh hla leh rimawi khawvelah kan hriatrengnaa a cham chhan pakhat a ni.

Hrangchhawni hi Mizoten Kristian sakhua an hmelhriat ṭan lai, Puma zai leh a siperten mi tam tak a sawi nghin lai bawr aṭangaa zai thiam leh a lam thiam vanga tlang hriat a ni. Kum 1884 velah Hmawngkawn khuaa piang nia hriat a ni a; a pa Thangchhuahzova leh a nu Zakhụmi te an inṭhen avangin fahrah nun retheihthlak tak chu a naupanlai hun ticheptu pakhat nia sawi a ni.

Hla ṭhenkhat chu a phuahtu sawi tel miah lo pawha fiah, ngaihnawm leh thui taka zir theih a awm laiin, Hrangchhawni zai erawh a phuahtu damlai nunte sawi tel loh chuan a kalh a kim lo. Hla phuah thiam a nihna te, a zai thiam te, a zah loh theihna te, rual kawm a thiamna te hi a larpui hle. A hun lai hmeichhe dangte ang lo taka zu hmun sa hmuna

* Asst. Professor, Mizo Department, PUC

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

ENCOUNTER AND INTERVENTIONS

Christian Missionaries in Colonial North-East India

Edited by
SAJAL NAG
M. SATISH KUMAR

MANOHAR
2021

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

First published 2021

© Sajal Nag anfd M. Satish Kumar, 2021

All rights reserved. No part of this publications may be reproduced or transmitted, in any form or by any means, without prior permission of the editors and the publisher

ISBN 978-81-

Published by
Ajay Kumar Jain *for*
Manohar Publishers & Distributors
4753/23 Ansari Road, Daryaganj
New Delhi 110002

Typeset by
Ravi Shanker
Delhi 110095

Printed at
Replika Press Pvt. Ltd.

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Contents

Preface ix

Introduction 1

1. The Christian Missionaries and the Transformation of Lotha Nagas 23
   ADANI NGULLIE

2. Christian Missionaries in the Plains of Barak Valley 45
   AMOL SINHA

3. Missionaries as Stimulus: Interrogating Political Mobilization in Colonial North-East India 81
   BINAYAK DUTTA

4. The Coming of the Grace of the Christ: The Christian Baptist Missionaries and the Construction of Hindu Identity in Assam: *c.* 1840-1900 97
   BIPUL CHAUDHURY

5. Colonialism and Christian Missions in North-East India 109
   DAVID REID SYIEMLIEH

6. Reading the Open Book: Missionary Print as Hermeneutical and Material Texts 135
   DAVID VUMLIAN ZOU

7. Christian Missionaries among the Karbis 165
   DONALD TERON

8. Nationalist Discourse, Christianity and Tribal Religion: The Tani Tribes of Arunachal Pradesh 183
   JAGDISH LAL DAWAR

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

20. Early Response to Christianity in Mizoram 547
ROHMINGMAWII

21. Tribulations of the Catholic Mission in Mizoram: 1925-46 565
SANGKIMA

22. Colonial State, Christian Missionaries and the Politics of Persuasion in Early Nineteenth Century Bengal 579
SANTANU SARKAR

23. Socio-Cultural Re-Invention: A Study of Christianity in Arunachal Pradesh 595
SARAH HILALY

24. An Analysis of the American Baptist Missionary Sources for the Construction of Gender History in North-East India 605
SHIELA BORA

25. Naga Conversions to Christianity in Manipur in the Twentieth Century 625
TH. R. TIBA

26. Gendered Mission: The *Zenana* Work of the American Baptist Mission in Assam (1836-1950) 645
TEJIMALA GURUNG

Contributors

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

CHAPTER 20

Early Response to Christianity in Mizoram

ROHMINGMAWII

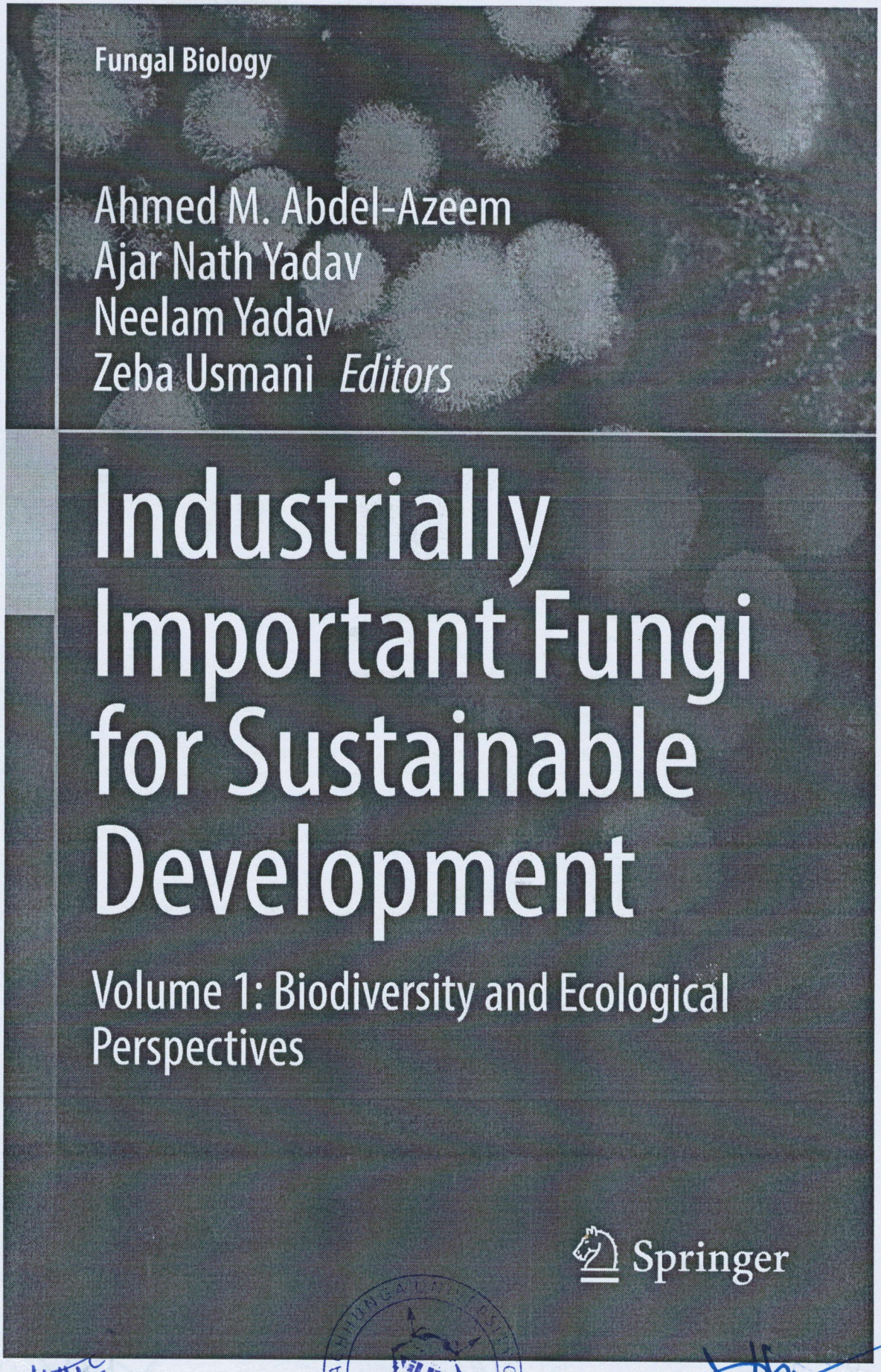
Introduction

The Mizos, who were then known as the Lushais or Chins, or sometimes mentioned as Kukis, were the people living in the hills of the north-eastern part of India, on the southern border of the plains of Cachar. Though they had been fighting constantly among themselves, the Mizos remained outside the domination of any sovereign states for centuries; they lived a politically independent life, even from each other in their own village sites. However, when the British rule extended to the north-eastern part of India, and especially after Cachar was annexed, the Lushais were disturbed because they perceived that the British intruded upon their territorial claim and thus, constant raids were carried out to the plains of Cachar. The earliest tribal raid was in 1826 when a party of woodcutters from Sylhet was massacred by some Kukis. The first ever British expedition to the Lushai Hills was sent in 1844 led by Captain Blackwood. From this time onwards, punitive expeditions had been sent time and again to the Lushai Hills against the tribal raids to the British territory to intimidate the Lushais. But there was no measure to occupy the area permanently until the end of the nineteenth century. A strong expedition was sent to the Lushai Hills in 1889-90, known as the Chin-Lushai Expedition, and permanent posts were established, two in South Lushai Hills (Fort Lunglei and Fort Tregear) and two in North Lushai Hills (Fort Aizawl and Changsil). Capt. H.R. Browne, who was personal assistant to the Chief Commissioner of Assam, was appointed as the political officer in the North Lushai Hills which became a district of Assam. In April 1891, the South Lushai Hills

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram



Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl, Mizoram

Editors
Ahmed M. Abdel-Azeem
Botany and Microbiology Department
Faculty of Science
University of Suez Canal
Ismailia, Egypt

Ajar Nath Yadav
Department of Biotechnology
Dr. Khem Singh Gill Akal College
of Agriculture
Eternal University
Baru Sahib Sirmour
Himachal Pradesh, India

Neelam Yadav
Gopi Nath P.G. College
Veer Bahadur Singh Purvanchal
University
Ghazipur, Uttar Pradesh, India

Zeba Usmani
Laboratory of Lignin Biochemistry
Department of Chemistry and Biotechnology
Tallinn University of Technology
Tallinn, Estonia

ISSN 2198-7777 ISSN 2198-7785 (electronic)
Fungal Biology
ISBN 978-3-030-67560-8 ISBN 978-3-030-67561-5 (eBook)
https://doi.org/10.1007/978-3-030-67561-5

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2021
This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

Chapter 12
Saccharomyces and Their Potential Applications in Food and Food Processing Industries

Vincent Vineeth Leo, Vinod Viswanath, Purbajyoti Deka, Zothanpuia, Dwivedi Rohini Ramji, Lallawmsangi Pachuau, William Carrie, Yogesh Malvi, Garima Singh, and Bhim Pratap Singh

Contents

12.1 Introduction 394
12.2 The Nutrient Capability of *Saccharomyces* 395
12.3 *Saccharomyces* Applications in Food Processing 396
12.3.1 *Saccharomyces*: Role in Food Fortification 397
12.3.2 *Saccharomyces*: Role in Liquid Food (Beverages) 398
12.3.3 *Saccharomyces*' Role in Dairy Products 403
12.3.4 *Saccharomyces*' Role in Baking Industry Processing 405
12.3.5 *Saccharomyces*: Role in Development of Traditional Food Products 406
12.3.6 *Saccharomyces*: Role in Meat and Fish Processing 409
12.4 *Saccharomyces*: Role as Probiotic 410
12.5 Genetically Modified *Saccharomyces* Applications in the Food Industry 413
12.6 Applications of *Saccharomyces* in Development of Value-Added Products 414
12.7 Conclusion and Future Prospective 415
References 416

V. V. Leo · P. Deka · D. R. Ramji · L. Pachuau · W. Carrie · Y. Malvi
Department of Biotechnology, Mizoram University, Aizawl, Mizoram, India

V. Viswanath
Department of Dairy Microbiology, College of Dairy Science & Technology, Kerala Veterinary and Animal Science University, Thrissur, Kerala, India

Zothanpuia
Department of Biotechnology, Mizoram University (a Central University), Pachhunga University College, Aizawl, Mizoram, India

G. Singh
Department of Botany, Pachhunga University College, Aizawl, Mizoram, India

B. P. Singh (✉)
Department of Agriculture and Environmental Sciences (AES), National Institute of Food Technology Entrepreneurship & Management (NIFTEM), Sonepat, Haryana, India

© The Author(s), under exclusive license to Springer Nature Switzerland AG 2021

A. M. Abdel-Azeem et al. (eds.), *Industrially Important Fungi for Sustainable Development*, Fungal Biology, https://doi.org/10.1007/978-3-030-67561-5_12

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram

7 **Exploring Fungal Biodiversity of Genus *Epicoccum* and Their Biotechnological Potential** 237
Rabab Majead Abed

8 **Molecular Taxonomy, Diversity, and Potential Applications of Genus *Fusarium*** 277
Samiksha and Sanjeev Kumar

9 ***Ganoderma*: Diversity, Ecological Significances, and Potential Applications in Industry and Allied Sectors** 295
Marieka Gryzenhout, Soumya Ghosh, James Michel Tchotet Tchoumi, Marcele Vermeulen, and Tonjock Rosemary Kinge

10 **Diversity, Phylogenetic Profiling of Genus *Penicillium*, and Their Potential Applications** 335
Guillermo Fernandez-Bunster

11 ***Piriformospora indica*: Biodiversity, Ecological Significances, and Biotechnological Applications for Agriculture and Allied Sectors** 363
Yachana Jha and Ajar Nath Yadav

12 ***Saccharomyces* and Their Potential Applications in Food and Food Processing Industries** 393
Vincent Vineeth Leo, Vinod Viswanath, Purbajyoti Deka, Zothanpuia, Dwivedi Rohini Ramji, Lallawmsangi Pachuau, William Carrie, Yogesh Malvi, Garima Singh, and Bhim Pratap Singh

13 **Biodiversity of Genus *Trichoderma* and Their Potential Applications** 429
Adel Kamel Madbouly

14 **Role of Fungi in Bioremediation of Soil Contaminated with Persistent Organic Compounds** 461
Zeba Usmani, Minaxi Sharma, Tiit Lukk, and Vijai Kumar Gupta

15 **Fungal Biopesticides for Agro-Environmental Sustainability** 479
Rajesh Ramdas Waghunde, Chandrashekhar U. Shinde, Puja Pandey, and Chandrakant Singh

16 **Role of Fungi in Bioremediation of Soil Contaminated with Heavy Metals** 509
Maha Refaey, Ahmed M. Abdel-Azeem, Hebatallah H. Abo Nahas, Mohamed A. Abdel-Azeem, and Abeer A. El-Saharty

Coordinator
Internal Quality Assurance Cell
Pachhunga University College
(A constituent college of Mizoram University)

PACHHUNGA UNIVERSITY COLLEGE
AIZAWL

Principal
Pachhunga University College
Aizawl : Mizoram