

# **Biotechnologies towards Sustainable Development in Malaysia**

**Zarina Zainuddin**

**IIUM PRESS  
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA**



# **Biotechnologies towards Sustainable Development in Malaysia**

*Zarina Zainuddin*



HUM Press

Published by:  
IIUM Press  
International Islamic University Malaysia

First Edition, 2011  
©IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

Zarina Zainuddin

Biotechnologies towards Sustainable Development in Malaysia

Zarina Zainuddin

Include index

Bibliography: p. 149

ISBN: 978-967-418-200-7

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM  
(Malaysian Scholarly Publishing Council)

Printed by :  
**IIUM PRINTING SDN. BHD.**  
No. 1, Jalan Industri Batu Caves 1/3  
Taman Perindustrian Batu Caves  
Batu Caves Centre Point  
68100 Batu Caves  
Selangor Darul Ehsan

## Table of Contents

|                                                                                                                        |            |
|------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Chapter 1 Bioethics and biotechnology: A holistic approach in Islamic perspectives</b>                              | <b>1</b>   |
| Ahmed Jalal Khan Chowdhury, Zaima Azira Zainal Abidin, Zarina Zainuddin and Suzannah Abdul Rahman                      |            |
| <b>Chapter 2 Malaysia's Sea Cucumber (Echinodermata: Holothuroidea) Database</b>                                       | <b>16</b>  |
| Kamarul Rahim Kamarudin                                                                                                |            |
| <b>Chapter 3 Diversity and Exploitation of Sea Cucumbers in Malaysia and Its Neighbouring Countries</b>                | <b>25</b>  |
| Kamarul Rahim Kamarudin                                                                                                |            |
| <b>Chapter 4 <i>Holothuria (Mertensiothuria) leucospilota</i> (Brandt, 1835) in the Marine Environment of Malaysia</b> | <b>36</b>  |
| Kamarul Rahim Kamarudin                                                                                                |            |
| <b>Chapter 5 Genetic manipulation for better bioremediation processes</b>                                              | <b>50</b>  |
| Noor Faizul Hadry Nordin                                                                                               |            |
| <b>Chapter 6 Microbial bioremediation and sustainable development</b>                                                  | <b>64</b>  |
| Noor Faizul Hadry Nordin                                                                                               |            |
| <b>Chapter 7 Heavy metal uptakes by plants</b>                                                                         | <b>74</b>  |
| Phang Ing Chia                                                                                                         |            |
| <b>Chapter 8 Mechanisms of heavy metal tolerance in plants (I) – Avoidance mechanisms</b>                              | <b>84</b>  |
| Phang Ing Chia                                                                                                         |            |
| <b>Chapter 9 Mechanisms of heavy metal tolerance in plants (I) – Tolerance mechanisms</b>                              | <b>89</b>  |
| Phang Ing Chia                                                                                                         |            |
| <b>Chapter 10 Identifying catalytic residues for peptidases: <i>in silico</i> perspective</b>                          | <b>97</b>  |
| Noraslinda Muhamad Bunnori                                                                                             |            |
| <b>Chapter 11 Important considerations in qRT-PCR</b>                                                                  | <b>103</b> |
| Phang Ing Chia                                                                                                         |            |

|                                                                                                                                                     |            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Chapter 12 Molecular approach of macroinvertebrates in tropical wetland, Lake Bera, Malaysia: Towards the assessment of ecosystem health</b>     | <b>113</b> |
| Nurhidayati Abdul Aziz, Ahmed Jalal Khan Chowdhury, Kamarul Rahim Kamarudin, Mohd Azmi Ambak and Najiah Musa                                        |            |
| <b>Chapter 13 Probiotic for sustainability protein source in Malaysia</b>                                                                           | <b>126</b> |
| Tengku Haziya Amin Tengku Abdul Hamid                                                                                                               |            |
| <b>Chapter 14 Bacteriocin as safe antimicrobial agent</b>                                                                                           | <b>133</b> |
| Tengku Haziya Amin Tengku Abdul Hamid                                                                                                               |            |
| <b>Chapter 15 Review on marine actinomycetes</b>                                                                                                    | <b>141</b> |
| Zaima Azira Zainal Abidin                                                                                                                           |            |
| <b>Chapter 16 Biotechnology potential tropical mangrove plant with special emphasis on <i>Avicennia alba</i> in Tanjung Lumpur, Pahang Malaysia</b> | <b>154</b> |
| Ahmed Jalal Khan Chowdhury., Deny Susanti, and Nur Sazwi Binti Nordin                                                                               |            |
| <b>Chapter 17 Studies on agronomy, breeding and genetics of <i>Stevia rebaudiana</i> (Bertoni) in Malaysia</b>                                      | <b>168</b> |
| Raji Akintunde Abdullateef and Mohamad bin Osman                                                                                                    |            |
| <b>Chapter 18 Identification and characterization of <i>Burkholderia pseudomallei</i> serine and metallopeptidases</b>                              | <b>191</b> |
| Noraslinda Muhamad Bunnori                                                                                                                          |            |
| <b>Chapter 19 Analysis of xylene degradation by bacteria isolated from petroleum contaminated sites</b>                                             | <b>203</b> |
| Noor Faizul Hadry Nordin and Marni Farhani Mansor                                                                                                   |            |
| <b>Chapter 20 Bioadsorption of heavy metals from synthetic waste water by tropical rambutan seed</b>                                                | <b>208</b> |
| Ahmed Jalal Khan Chowdhury, Abul Bashir Mohammed Helal Uddin, Mohd Sufian Mohamad Shukri, Kamaruzzaman Yunus                                        |            |
| <b>Chapter 21 Chitin and chitosan from fresh water fish tilapia (<i>Oreochromis niloticus</i>) scale</b>                                            | <b>223</b> |
| Ahmed Jalal Khan Chowdhury, Nor Hafizah Zakaria, Tengku Haziya Amin Tengku Abdul Hamid and Deny Susanti                                             |            |
| <b>Chapter 22 Chitin and chitosan from potential shrimps and crabs of Malaysia</b>                                                                  | <b>236</b> |
| Ahmed Jalal Khan Chowdhury, Suffi Nurul Husna, Deny Susanti, Akbar John and Kamaruzzaman Yunus                                                      |            |

|                                                                                                                                                                               |            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Chapter 23 Extraction of chitin and chitosan from Malaysian cephalopods “Sotong mengaban” (<i>Sepioteuthis lessoniana</i>) and “Sotong jarum” (<i>Loligo vulgaris</i>)</b> | <b>244</b> |
| Ahmed Jalal Khan Chowdhury, Mohd Hazman Mohd Salleh, Deny Susanti, Akbar John and Jamaluddin Daud                                                                             |            |
| <b>Chapter 24 <i>In Planta Agrobacterium tumefaciens</i> transformation of MR 219 rice</b>                                                                                    | <b>258</b> |
| Zaima Azira Zainal Abidin and Rabiah Abdul Wahab                                                                                                                              |            |
| <b>Chapter 25 Optimisation of transformation system for chilli embryo (<i>Capsicum annuum</i> variety Kulai) using particle bombardment</b>                                   | <b>268</b> |
| Zarina Zainuddin and Rozilawati Mohamad Achil                                                                                                                                 |            |
| <b>Chapter 26 Screening of mangrove plants for gram negative antibacterial activity</b>                                                                                       | <b>275</b> |
| Zarina Zainuddin and ‘Izzati Akmal Hasan                                                                                                                                      |            |
| <b>Chapter 27 Antibacterial activities of green and ripens banana peel (<i>Musa</i>, AA cv. Sucrier) in Malaysia</b>                                                          | <b>284</b> |
| Ahmed Jalal Khan Chowdhury, Dina Fuad, Md. Tariqur Rahman and Akbar John                                                                                                      |            |
| <b>Chapter 28 Agglutinin and antibacterial activities in oyster, <i>Chama pacifica</i> plasma</b>                                                                             | <b>298</b> |
| Najiah Musa, Arief Izzairy Zamani, Ahmed Jalal Khan Chowdhury and Muhamad Hazwan Mat Tar, Nadirah Musa                                                                        |            |
| <b>Chapter 29 The effect of cooking methods on meat samples using PCR-RFLP analysis</b>                                                                                       | <b>305</b> |
| Zaima Azira Zainal Abidin and Haryati Ithnin                                                                                                                                  |            |

## Chapter 24

### *In Planta Agrobacterium tumefaciens* transformation of MR 219 rice

\*Zaima Azira Zainal Abidin and Rabiah Abdul Wahab

\*Corresponding author: zzaima@iium.edu.my

#### **Introduction**

Rice is the most important staple food for a large part of the world's human population, especially in East Asia, Southeast Asia, South Asia, the Middle East, and the West Indies. As rice is of a great importance, improvement in rice varieties with increased resistance towards pests such as striped stem borers and yellow stem borers; and plant pathogens as well as enhanced tolerance to salt and cold stresses, will certainly help in the mass rice production. Significant advances have been made in rice biotechnology since the first transgenic rice plantlets were successfully generated in 1988 through PEG and electroporation method (Tyagi and Mohanty, 2000). Nevertheless, successful transformation of rice using *Agrobacterium* remained controversial until Hiei and co-workers (1994) reported an efficient *Agrobacterium*-mediated transformation protocol for japonica cultivars - Tsukinohikari, Asanohikari and Koshihikari. Since then, tremendous progress has been made in rice transformation technologies with efficient transformation protocols for rice (Yookongkaew *et al.*, 2007; Bajaj and Mohanty 2005; Roy *et al.*, 2000).