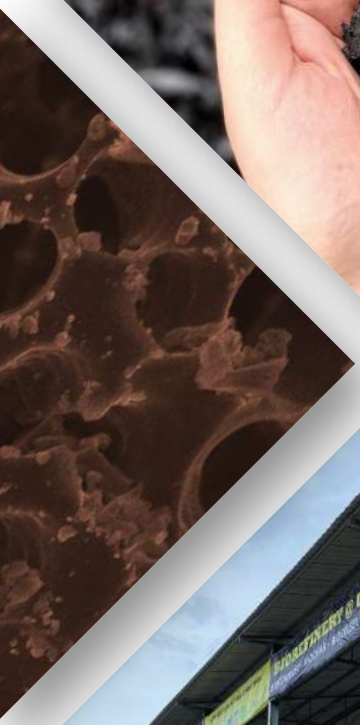


UNIVERSITI PUTRA MALAYSIA
BERILMU BERBAKTI

ENVIRONMENTAL BIOTECHNOLOGY RESEARCH REPORT 2019

FACULTY OF BIOTECHNOLOGY AND BIOMOLECULAR SCIENCES

TABLE OF CONTENTS

EB Group @ Biorefinery UPM 2019

EB GROUP MEMBERS

RESEARCHERS

- 9 Principle Researchers
- 2 Postdoctoral Researchers
- 2 Research Assistants

STUDENTS

- 17 PhD Students
- 14 MSc Students

RESEARCH INTERESTS

- AGRICULTURAL WASTE
- SEWAGE SLUDGE
- LIFESTOCK MANURE

VALUE ADDED PRODUCTS

- USED COOKING OIL
- MUNICIPAL SOLID WASTE
- LANDSCAPING WASTE

PEOPLE

PROFIT

3P's

PLANET

SUSTAINABILITY

NATIONAL COLLABORATORS

AM PM, FELDA, FGV, IndahWater, Invest Selangor, MABIC, NEXTGREEN GLOBAL BERHAD, novozymes, SWCorp, Universiti Teknologi MARA, Universiti Malaysia Pahang, UMS, Universiti Pendidikan Sultan Idris, UTM, WORLDWIDE HOLDINGS, MPOB, TDM, UniKL, UPJ

INTERNATIONAL COLLABORATORS

Kyutech, MITSUBISHI HEAVY INDUSTRIES ASIA PACIFIC PTE. LTD. Our Technologies. Your Tomorrow, KOREA UNIVERSITY, 九州大学, UNIVERSITAS INDONESIA, KIT Kanazawa Institute of Technology

EB FACILITIES

INTRODUCTION

Biorefinery Complex of Environmental Biotechnology (EB) group is the first pilot processing in UPM that incorporates a holistic approach in exploiting solid biomass into value added products through green technology approaches.
EB group has two main facilities which are:

1 **BIOREFINERY COMPLEX**

2 **EB LABORATORY AT BIOTECH 3**

1 BIOREFINERY COMPLEX

Biorefinery Complex is located near University Agricultural Park (TPU) and UPM golf course, it was first operated in January, 2014. The whole area of Biorefinery Complex covers a parameter of approximately 1075 m^2. The facilities in Biorefinery Complex include :

PILOT PLANT

Pilot plant consists of 4 projects (biocompost, biochar, biogas and biodiesel) which are developed based on our extensive research for 25 years in environmental biotechnology. It is majorly equipped with solid biomass and biocompost machineries.

BIOMASS TECHNOLOGY LABORATORY

The general facilities in BTL include postgraduate students room which can accommodate around 30 students, researcher rooms, meeting room and seminar room (can accommodate a maximum of 100 people at a time).

The laboratory comprises of a chemical room, a culture room, a bioreactor room, an analysis room and a cold room. It is also fully equipped with instruments for environmental biotechnology research.

EB BIOTECH 3 LABORATORY

2 EB LABORATORY AT BIOTECH 3

Environmental Biotechnology (EB) Research Group has two laboratories located in Biotech 3 - **Environmental Biotechnology Laboratory and Environmental Molecular Laboratory**

There are about 10 students (postgraduates and undergraduates) currently working in these laboratories. Environmental Biotechnology Laboratory is a general laboratory mainly focusing on research related to biopolymers, biomaterials and biochemicals. While for the molecular laboratory, it is mainly focusing on genetic and molecular work.

EQUIPMENT IN GENERAL LABORATORY

- Gas-chromatography with Flame Ionization Detector (GC-FID)
- Gel permeation chromatography (GPC) with UV and RI detectors
- High performance liquid chromatography (HPLC)
- Thermogravimetric Analyzer (TGA)
- Freeze dryer

EQUIPMENT IN MOLECULAR LABORATORY

- PCR and RT-PCR thermal cycler
- Denaturing Gradient Gel Electrophoresis (DGGE)
- Flow cytometer
- NanoDrop spectrophotometer
- Gel Documentation Systems

MESSAGE FROM THE EB GROUP LEADER

PROFESSOR DATO' DR. MOHD ALI HASSAN, FASc.

EB Group research covers a full spectrum of Environmental Biotechnology topics but is focused on issues that significantly affect the sustainability of the environment, especially in improving the treatment system of solid and organic wastes, with the aim of reducing pollution, and producing high value-added biotechnogical and bio-based products.

Adopting green technology coupled with zero emission concept, our group has collaborated with many institutions locally and internationally for various projects, such as with Ministry of Housing and Local Government (KPKT), Subang Jaya Municipal Council (MPSJ), Malaysian Agricultural Research and Development Institute (MARDI), Federal Land Development Authority (FELDA), SWCorp Malaysia, YPJ Holdings, Worldwide Landfill, Indah Water Consortium, Nextgreen Pulp & Paper Sdn Bhd (NgPP), AMPM Sdn Bhd, Mitsubishi Heavy Industries and Materials, Universitas Indonesia, CJ Bio Malaysia Sdn Bhd, Novozymes Malaysia, Korea University, Kyushu Institute of Technology (Kyutech) and Kanazawa Institute of Technology, Japan.

Our researchers also mentor many of the best and brightest students from Universiti Putra Malaysia (UPM) and across the country. I anticipate that the many strong collaborations formed between EB researchers and other institutions across Malaysia and internationally, with public and private agencies, will drive important research discoveries and help translate them from the bench top into industrial practice. The emphasis has been on developing appropriate technology and innovation, as well as on translational research.

It is a privilege for me to lead the innovative and dedicated team of researchers in EB Group UPM. I am constantly impressed with their passion and devotion to the mission of improving the environmental biotechnology research area in Malaysia. May Allah SWT continue to give us the strength and wisdom to contribute to the development of the university, the ummah and the nation.

> "TODAY'S DISCOVERIES FOR TOMORROW'S SUSTAINABILITY"

EB BIG PICTURE

WASTE TO WEALTH
THROUGH BIOTECHNOLOGY

WASTE

TECHNOLOGY

PRODUCTS AND APPLICATIONS

BIOMASS


Agricultural Waste


Domestic Sewage


Municipal Solid Waste

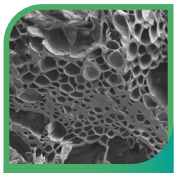

Animal Manure


Industrial Discharge


Landscaping Waste

PHYSICAL AND BIOLOGICAL TRANSFORMATION


Biosugar


Biochar & Bioadsorbent


Biogas


Nanocellullose & Biocomposite


Biocompost

Enzyme

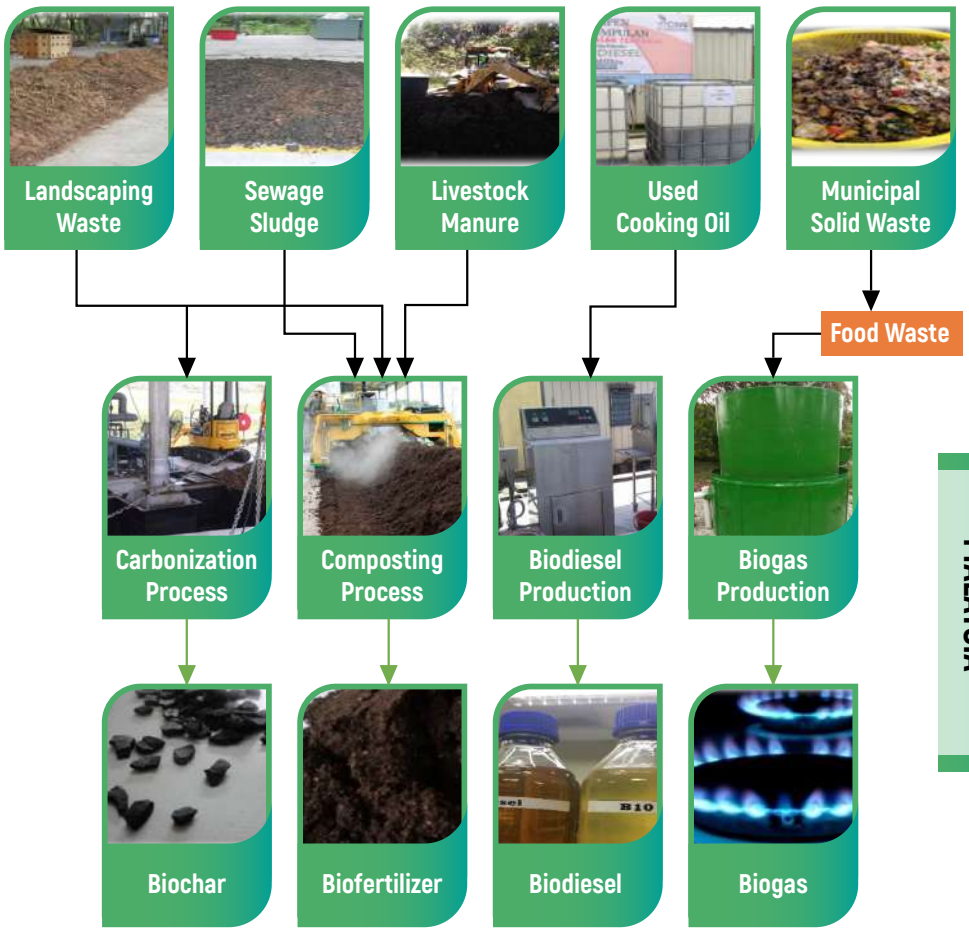

Bioalcohol


Biosurfactant


Biolubricant & Biodiesel

BIOCHAR – BIOFERTILIZER – BIODIESEL - BIOGAS

BIOREFINERY COMPLEX



BIOREFINERY COMPLEX AT UNIVERSITI PUTRA MALAYSIA

IN COLLABORATION WITH :

ENVIRONMENTAL BIOTECHNOLOGY GROUP RESEARCHERS

PROFESSOR DATO' DR. MOHD ALI HASSAN

Selected Publications:

- Hassan, M. A., Ahmad Farid, M. A., Shirai, Y., Ariffin, H., Othman, M. R., Samsudin, M. H., & Hasan, M. Y. (2019). Oil Palm Biomass Biorefinery for Sustainable Production of Renewable Materials. Biotechnology Journal, 1800394.
- Samsudin, M. H., Hassan, M. A., Idris, J., Ramli, N., Mohd Yusoff, M. Z., Ibrahim, I., Othman, M. R., Ali, A. A. M. and Shirai, Y. (2019). A one-step self-sustained low temperature carbonization of coconut shell biomass produced a high specific surface area biochar-derived nano-adsorbent. Waste Management and Research, 37(5), 551–555.
- Farid, M. A. A., Hassan, M. A., Taufiq-Yap, Y. H., Ibrahim, M. L., Hasan, M. Y., Ali, A. A. M., Othman, M.R. & Shirai, Y. (2018). Kinetic and thermodynamic of heterogeneously K_3PO_4/AC-catalysed transesterification via pseudo-first order mechanism and Eyring-Polanyi equation. Fuel, 232, 653-658.
- Hasan, M. Y., Hassan, M. A., Mokhtar, M. N., Idris, A., Shirai, Y., Dzulkarnain, Z., Samsudin, M. H. and Zainudin, M. H. M. (2018). Periodic addition of anaerobic sludge enhanced the lignocellulosic degradation rate during co-composting of oil palm biomass. Asia-Pacific Journal of Molecular Biology and Biotechnology, 26(3), 1–10.
- Farid, M. A. A., Hassan, M. A., Taufiq-Yap, Y. H., Shirai, Y., Hasan, M. Y., & Zakaria, M. R. (2017). Waterless purification using oil palm biomass-derived bioadsorbent improved the quality of biodiesel from waste cooking oil. Journal of cleaner production, 165, 262-272.
- Dzulkurnain, Z., Hassan, M. A., Zakaria, M. R., Wahab, P. E. M., Hasan, M. Y., & Shirai, Y. (2017). Co-composting of municipal sewage sludge and landscaping waste: a pilot scale study. Waste and biomass valorization, 8(3), 695-705.
- Ibrahim, I., Hassan, M. A., Abd-Aziz, S., Shirai, Y., Andou, Y., Othman, M. R., Ali, A.A.M. & Zakaria, M. R. (2017). Reduction of residual pollutants from biologically treated palm oil mill effluent final discharge by steam activated bioadsorbent from oil palm biomass. Journal of cleaner production, 141, 122-127.

Specialization:

- Bioprocess Engineering
- Environmental Biotechnology

Current research interest:

Treatment and utilization of biomass for the production of bio-based products, bioremediation and reduction of greenhouse gases.

h-index: 39
Citation: 4670

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alihas@upm.edu.my

Academic Qualification:

- PhD (Environmental Biotechnology), University of Okayama, Japan (1997)
- MPhil. (Chemical Engineering), University of Birmingham, U.K. (1990)
- MSc. (Food Engineering), University of Leeds, U.K. (1982)
- BSc. (Honours) (Chemical Engineering), University of Leeds, U.K. (1980)
- 'A' Levels (Math., Chem., Physics), Oxford College Further Edu., U.K. (1977)
- Post-graduate Diploma (Islamic Studies), University Kebangsaan Malaysia (1985)

ENVIRONMENTAL BIOTECHNOLOGY GROUP RESEARCHERS

PROFESSOR DR. SURAINI ABD-AZIZ

Selected Publications:

- Ariff, I. N. M., Bahrin, E. K., Ramli, N., & Abd-Aziz, S. (2019). Direct Use of Spent Mushroom Substrate from ***Pleurotus pulmonarius*** as a Readily Delignified Feedstock for Cellulase Production. Waste and biomass valorization, 10(4), 839-850.
- Jenol, M. A., Ibrahim, M. F., Kamal Bahrin, E., Kim, S. W., & Abd-Aziz, S. (2019). Direct Bioelectricity Generation from Sago Hampas by ***Clostridium beijerinckii*** SR1 Using Microbial Fuel Cell. Molecules, 24(13), 2397.
- Hisham, M. B., Hanisah, N., Ibrahim, M. F., Ramli, N., & Abd-Aziz, S. (2019). Production of Biosurfactant Produced from Used Cooking Oil by ***Bacillus sp***. HIP3 for Heavy Metals Removal. Molecules, 24(14), 2617.
- Nik-Pa, N. I. M., Abd-Aziz, S., Ibrahim, M. F., Alitheen N. B. M.and Ramli, N. (2019). Improved extracellular secretion of β-cyclodextrin glycosyl-transferase from ***Escherichia coli*** by glycine supplementation without apparent cell lysis. AsPac J. Mol. Biol. Biotechnol. Vol. 27 (2): 93-102.
- Zulkarnain, A., Bahrin, E. K., Ramli, N., Lai Yee, P. and Abd-Aziz, S. (2018). Alkaline hydrolysate of oil palm empty fruit bunch as potential substrate for biovanillin production via two-step bioconversion. Waste and Biomass Valorization. 9(1): 13-23.
- Zainal, N.H., Abdul Aziz, A., Idris, J., Jalani, N.F., Mamat, R., Ibrahim, M.F., Hassan, M.A. and Abd-Aziz, S. (2018). Double insulated reactor of carbonisation-activation steam system for improved yield and surface area of palm kernel shell activated carbon. Journal of Cleaner Production. 182: 830-837.
- Md Razali, N.A.A., Ibrahim, M.F., Bahrin, E.K. and Abd-Aziz, S. (2018). Optimisation of simultaneous saccharification and fermentation (SSF) for biobutanol production using pretreated oil palm empty fruit bunch. Molecules. 23, 1944;

Specialization:

- Biochemical Engineering
- Enzyme Technology

Current research interest:

Bioenergy and bio-based chemicals from agricultural wastes.

h-index: 28
Citation: 2291

Contacts:

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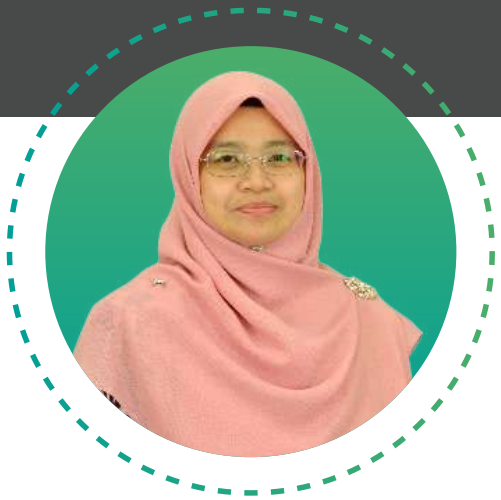
suraini@upm.edu.my

Academic Qualification:

- PhD (Biochemical Engineering), University of Wales, Swansea, United Kingdom (1997)
- MSc. (Biochemical Engineering), University of Wales, Swansea, United Kingdom (1994)
- BSc. (Hons) (Clinical Biochemistry), Universiti Kebangsaan Malaysia (1992)

ENVIRONMENTAL BIOTECHNOLOGY GROUP RESEARCHERS

ASSOCIATE PROFESSOR DR. HIDAYAH ARIFFIN



Selected Publications:

- Yasim-Anuar, T. A. T., Ariffin, H., Norrrahim, M. N. F., Hassan, M. A., Tsukegi, T., & Nishida, H. (2019). Sustainable one-pot process for the production of cellulose nanofiber and polyethylene/cellulose nanofiber composites. Journal of cleaner production, 207, 590-599.
- Norrahim, M. N. F., Ariffin, H., Yasim-Anuar, T. A. T., Ghaemi, F., Hassan, M. A., Ibrahim, N. A., Ngee, J.L.H. and Yunus, W. M. Z. W. (2018). Superheated steam pretreatment of cellulose affects its electrospinnability for microfibrillated cellulose production. Cellulose, 25(7), 3853–3859.
- Kian, L. K., Jawaid, M., Ariffin, H., & Karim, Z. (2018). Isolation and characterization of nanocrystalline cellulose from roselle-derived microcrystalline cellulose. International Journal of Biological Macromolecules, 114, 54–63.
- Rajaratanam, D. D., Ariffin, H., Hassan, M. A., Abd Rahman, N. M. A. N., & Nishida, H. (2018). In vitro cytotoxicity of superheated steam hydrolyzed oligo((R)-3-hydroxybutyrate-co-(R)-3-hydroxyhexanoate) and characteristics of its blend with poly(L-lactic acid) for biomaterial applications. PLoS ONE, 13(6).
- Megashah, L. N., Ariffin, H., Zakaria, M. R., & Hassan, M. A. (2018). Multi-step pretreatment as an eco-efficient pretreatment method for the production of cellulose nanofiber from oil palm empty fruit bunch. Asia-Pacific Journal of Molecular Biology and Biotechnology, 26(2), 1–8.
- Nordin, N. I. A. A., Ariffin, H., Hassan, M. A., Shirai, Y., Ando, Y., Ibrahim, N. A., & Yunus, W. M. Z. W. (2017). Superheated steam treatment of oil palm mesocarp fiber improved the properties of fiber-polypropylene biocomposite. BioResources, 12(1), 68–81.
- Eksiler, K., Andou, Y., Yilmaz, F., Shirai, Y., Ariffin, H., & Hassan, M. A. (2017). Dynamically controlled fibrillation under combination of ionic liquid with mechanical grinding. Journal of Applied Polymer Science, 134(7).

Specialization:

- Bioprocess Engineering
- Biomaterials

Current research interest:

- Nanocellulose and nanocomposites.
- Utilisation of plant biomass for the production of biobased chemicals, biopolymers and biocomposites.

h-index: 19
Citation: 987

Contacts:

+603-9769 1781
hidayah@upm.edu.my

Academic Qualification:

- PhD (Environmental Engineering) Kyushu Institute of Technology, Japan (2009)
- MSc. (Bioprocess Engineering) Universiti Putra Malaysia (2006)
- Bachelor of Engineering (Process and Food) Universiti Putra Malaysia (2004)

ENVIRONMENTAL BIOTECHNOLOGY GROUP RESEARCHERS

ASSOCIATE PROFESSOR DR. MOHD RAFEIN ZAKARIA

Selected Publications:

- Farid, M.A.A., Zakaria, M.R., Hassan, M.A., Ali, A.A., Othman, M.R., Ibrahim, I., Samsudin, M.H. and Shirai, Y., 2019. A holistic treatment system for palm oil mill effluent by incorporating the anaerobic-aerobic-wetland sequential system and a convective sludge dryer. Chemical Engineering Journal.
- Yusof, S. J. H. M., Zakaria, M. R., Roslan, A. M., Ali, A. A. M., Shirai, Y., Ariffin, H., & Hassan, M. A. (2019). Oil Palm Biomass Biorefinery for Future Bioeconomy in Malaysia. In Lignocellulose for Future Bioeconomy (pp. 265-285). Elsevier.
- Ahmad, N., Zakaria, M., Mohd Yusoff, M., Fujimoto, S., Inoue, H., Ariffin, H., Hassan, M. and Shirai, Y. (2018). Subcritical Water-Carbon Dioxide Pretreatment of Oil Palm Mesocarp Fiber for Xylooligosaccharide and Glucose Production. Molecules, 23(6), 1310.
- Dzulkurnain, Z., Hassan, M. A., Zakaria, M. R., Wahab, P. E. M., Hasan, M. Y., & Shirai, Y. (2017). Co-composting of municipal sewage sludge and landscaping waste: a pilot scale study. Waste and biomass valorization, 8(3), 695-705.
- Taifor, A. F., Zakaria, M. R., Yusoff, M. Z. M., Toshinari, M., Hassan, M. A., & Shirai, Y. (2017). Elucidating substrate utilization in biohydrogen production from palm oil mill effluent by ***Escherichia coli***. International Journal of Hydrogen Energy, 42(9), 5812-5819.
- Zakaria, M. R., Hirata, S., Fujimoto, S., Ibrahim, I., & Hassan, M. A. (2016). Soluble inhibitors generated during hydrothermal pretreatment of oil palm mesocarp fiber suppressed the catalytic activity of Acremonium cellulase. Bioresource technology, 200, 541-547.
- Zakaria, M. R., Norrrahim, M. N. F., Hirata, S., & Hassan, M. A. (2015). Hydrothermal and wet disk milling pretreatment for high conversion of biosugars from oil palm mesocarp fiber. Bioresource Technology, 181, 263–269.

Specialization:

- Environmental biotechnology
- Biomass valorisation
- Hydrothermal pretreatment
- Polyhydroxyalkanoates

Current research interest:

Biomass valorisation in biorefinery concept.

h-index: 13
Citation: 495

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Academic Qualification:

- PhD (Environmental Biotechnology), Universiti Putra Malaysia (2012)
- MSc. (Environmental Biotechnology), Universiti Putra Malaysia (2008)
- BSc. (Hons) Biotechnology, Universiti Putra Malaysia (2003)

ENVIRONMENTAL BIOTECHNOLOGY GROUP RESEARCHERS

ASSOCIATE PROFESSOR DR. NORHAYATI RAMLI

Selected Publications:

- Mohd-Nor, D., Ramli, N., Sharuddin, S. S., Hassan, M. A., Mustapha, N. A., Ariffin, H., Sakai, K., Tashiro, Y., Shirai, Y. and and Maeda, T. (2019). Dynamics of Microbial Populations Responsible for Biodegradation during the Full-Scale Treatment of Palm Oil Mill Effluent. Microbes and environments, ME18104.
- Nik Ida Mardiana Nik-Pa, Suraini Abd-Aziz, Mohamad Faizal Ibrahim, Noorjahan Banu Mohamed Alitheen, Norhayati Ramli,. Improved extracellular secretion of β-cyclodextrin glycosyltransferase from ***Escherichia coli*** by glycine supplementation without apparent cell lysis. AsPac J. Molecular Biology Biotechnology. 2019 Vol. 27 (2) : 93-102.
- Sharuddin, S. S., Ramli, N., Mohd-Nor, D., Hassan, M. A., Maeda, T., Shirai, Y., Sakai, K. and Tashiro, Y. (2018). Shift of low to high nucleic acid bacteria as a potential bioindicator for the screening of anthropogenic effects in a receiving river due to palm oil mill effluent final discharge. Ecological indicators, 85, 79-84.
- Mustapha, N. A., Hu, A., Yu, C. P., Sharuddin, S. S., Ramli, N., Shirai, Y. and Maeda, T. (2018). Seeking key microorganisms for enhancing methane production in anaerobic digestion of waste sewage sludge. Applied microbiology and biotechnology, 102(12), 5323-5334.
- Mohd-Nor, D., Ramli, N., Sharuddin, S. S., Hassan, M. A., Mustapha, N. A., Amran, A., Sakai, K., Shirai, Y. and Maeda, T. (2018). ***Alcaligenaceae*** and ***Chromatiaceae*** as reliable bioindicators present in palm oil mill effluent final discharge treated by different biotreatment processes. Ecological indicators, 95, 468-473.
- Mohd Huzairi Mohd Zainudin, Norhayati Ramli, Mohd Ali Hassan, Yoshihito Shirai, Kosuke Tashiro, Kenji Sakai and Yukihiro Tashiro (2017). Bacterial community shift for monitoring the co-composting of oil palm empty fruit bunch and palm oil mill effluent an aerobic sludge. Journal of Industrial Microbiology and Biotechnology. 44:869-877.
- Sharuddin, S. S., Ramli, N., Hassan, M. A., Mustapha, N. A., Amran, A., Mohd-Nor, D., Sakai, K., Tashiro, Y., Shirai, Y. and Maeda, T. (2017). Bacterial community shift revealed ***Chromatiaceae*** and ***Alcaligenaceae*** as potential bioindicators in the receiving river due to palm oil mill effluent final discharge. Ecological indicators, 82, 526-529.

Specialization:

- Microbial Biotechnology
- Environmental Microbiology

Current research interest:

- Diversity and ecology of microbial community in waste and wastewater.
- Strain improvement and utilization of biomass for the production of enzymes and biobased products.

h-index: 6
Citation: 71

Contacts:

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yatiramli@upm.edu.my

Academic Qualification:

- PhD (Microbial Biotechnology), Universiti Putra Malaysia (2012)
- BSc. (Biotechnology), Universiti Putra Malaysia (2008)

ENVIRONMENTAL BIOTECHNOLOGY GROUP RESEARCHERS

ASSOCIATE PROFESSOR DR. MOHAMAD FAIZAL IBRAHIM

Selected Publications:

- Salleh, M. S. M., Ibrahim, M. F., Roslan, A. M., & Abd-Aziz, S. (2019). Improved Biobutanol Production in 2-L Simultaneous Saccharification and Fermentation with Delayed Yeast Extract Feeding and in-situ Recovery. Scientific reports, 9(1), 7443.
- Husin, H., Ibrahim, M. F., Kamal Bahrin, E., & Abd-Aziz, S. (2019). Simultaneous saccharification and fermentation of sago hampas into biobutanol by Clostridium acetobutylicum ATCC 824. Energy Science & Engineering, 7(1), 66-75.
- Md Razali, N., Ibrahim, M. F., Kamal Bahrin, E., & Abd-Aziz, S. (2018). Optimisation of Simultaneous Saccharification and Fermentation (SSF) for Biobutanol Production Using Pretreated Oil Palm Empty Fruit Bunch. Molecules, 23(8), 1944.
- Zainal, N. H., Aziz, A. A., Ibrahim, M. F., Idris, J., Hassan, M. A., Bahrin, E. K., Jalani, N. F., Wafti, N. S. A. and Abd-Aziz, S. (2018). Carbonisation-activation of oil palm kernel shell to produce activated carbon and methylene blue adsorption kinetics. Journal of Oil Palm Research, 30(3), 495–502.
- Rizal, N. F. A. A., Ibrahim, M. F., Zakaria, M. R., Abd-Aziz, S., Yee, P. L., & Hassan, M. A. (2018). Pre-treatment of Oil Palm Biomass for Fermentable Sugars Production. Molecules (Basel, Switzerland).
- Ibrahim, M. F., Kim, S. W., & Abd-Aziz, S. (2018). Advanced bioprocessing strategies for biobutanol production from biomass. Renewable and Sustainable Energy Reviews.
- Rizal, N. F. A. A., Ibrahim, M. F., Zakaria, M. R., Bahrin, E. K., Abd-Aziz, S., & Hassan, M. A. (2018). Combination of superheated steam with laccase pretreatment together with size reduction to enhance enzymatic hydrolysis of oil palm biomass. Molecules, 23(4).
- Ibrahim, M. F., Ramli, N., Kamal Bahrin, E., & Abd-Aziz, S. (2017). Cellulosic biobutanol by Clostridia: Challenges and improvements. Renewable and Sustainable Energy Reviews.

Specialization:

- Bioprocess technology
- Fermentation technology
- Enzyme technology

Current research interest:

Biomass utilisation and conversion into biofuels, biocatalyst, and bio-based chemicals through biotechnology approaches.

h-index: 9
Citation: 276

Contacts:

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faizal_ibrahim@upm.edu.my

Academic Qualification:

- PhD (Environmental Biotechnology), Universiti Putra Malaysia (2013)
- BSc. (Biotechnology), Universiti Putra Malaysia (2009)
- Diploma in Science, Universiti Teknologi MARA (2006)

ENVIRONMENTAL BIOTECHNOLOGY GROUP RESEARCHERS

DR. MOHD ZULKHAIRI MOHD YUSOFF

Selected Publications:

- Mokhtar, M., Yusoff, M. Z. M., Ali, M. S. M., Mustapha, N. A., Wood, T. K. & Maeda, T. (2019). Pseudogene YdfW in ***Escherichia coli*** decreases hydrogen production through nitrate respiration pathways. International Journal of Hydrogen Energy.
- Akita, H., Kimura, Z. I., Yusoff, M. Z. M., Nakashima, N., & Hoshino, T. (2016). Draft genome sequence of ***Burkholderia*** sp. strain CCA53, isolated from leaf soil. Genome Announc., 4(4), e00630-16.
- Zulkifli, A. A., Yusoff, M., Zulkhairi, M., Abd Manaf, L., Zakaria, M. R., Roslan, A. M., Ariffin, H., Shirai, Y. & Hassan, M. A. (2019). Assessment of Municipal Solid Waste Generation in Universiti Putra Malaysia and Its Potential for Green Energy Production. Sustainability, 11(14), 3909.
- Zakaria, M. A., Yusoff, M. Z. M., Zakaria, M. R., Hassan, M. A., Wood, T. K. & Maeda, T. (2018). Pseudogene product YqiG is important for pflB expression and biohydrogen production in ***Escherichia coli*** BW25113. 3 Biotech, 8(10), 435.
- Saad, M. F. M., Rahman, N. A. A., & Yusoff, M. Z. M. (2019). Hydrogen and Methane Production from Co-digestion of Food Waste and Chicken Manure. Polish Journal of Environmental Studies, 28(4), 2805-2814.
- Akita, H., Kimura, Z. I., Yusoff, M. Z. M., Nakashima, N. & Hoshino, T. (2017). Identification and characterization of ***Burkholderia*** multivorans CCA53. BMC research notes, 10(1), 249.
- Yusoff, M. Z. M., Akita, H., Hassan, M. A., Fujimoto, S., Yoshida, M., Nakashima, N. & Hoshino, T. (2017). Production of acetoin from hydrothermally pretreated oil mesocarp fiber using metabolically engineered ***Escherichia coli*** in a bioreactor system. Bioresource technology, 245, 1040-1048.

Specialization:

- Environmental biotechnology
- Bioprocess technology
- Molecular biotechnology

Current research interest:

- Biomass utilization
- Biohydrogen production
- Bioenergy
- Biocomposting
- Microbial fuel cells
- Molecular biotechnology applications
- Metabolic engineering of E.coli

h-index: 9
Citation: 280

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Academic Qualification:

- PhD (Environmental Biotechnology), Kyushu Institute of Technology, Japan (2013)
- MSc. (Environmental Biotechnology), Universiti Putra Malaysia (2010)
- BSc. (Biotechnology), Universiti Putra Malaysia (2006)

ENVIRONMENTAL BIOTECHNOLOGY GROUP RESEARCHERS

DR. EZYANA KAMAL BAHRIN

Selected Publications:

- Ariff, I. N. M., Bahrin, E. K., Ramli, N., & Abd-Aziz, S. (2019). Direct Use of Spent Mushroom Substrate from ***Pleurotus pulmonarius*** as a Readily Delignified Feedstock for Cellulase Production. Waste and biomass valorization, 10(4), 839-850.
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Specialization:

- Biomass
- Bioenergy

Current research interest:

- Lignocellulosic biomass
- Enzyme technology
- Biomass and bioenergy

h-index: 8
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- Hidayat, N., Alamsyah, R., Roslan, A. M., Hermansyah, H., & Gozan, M. (2019). Production of polyhydroxybutyrate from oil palm empty fruit bunch (OPEFB) hydrolysates by Bacillus cereus suaeda B-001. Biocatalysis and agricultural biotechnology, 18, 101019.
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- Roslan, A.M., M.A. Hassan Shirai, Y. (2016). Superheated steam as a cheap and appropriate treatment to improve fermentable biosugars yield from oil palm frond petiole. Sejong University-UPM Biotechnology Joint Symposium, Sejong University, Korea.

Specialization:

- Bioenergy
- Biobased chemicals
- Environmental biotechnology
- Microbiology

Current research interest:

- Appropriate technology for the conversion of biomass into energy
- Utilisation of palm biomass for the production of value added products

h-index: 3
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Chemical Engineering Journal 369 (2019) 195–204

Contents lists available at ScienceDirect

Chemical Engineering Journal

journal homepage: www.elsevier.com/locate/cej

A holistic treatment system for palm oil mill effluent by incorporating the anaerobic-aerobic-wetland sequential system and a convective sludge dryer

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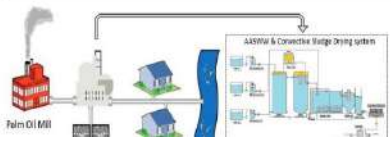
HIGHLIGHTS

- Hybrid treatment of palm oil mill effluent (POME) treatment was performed.
- Anaerobic-aerobic-wetland sequential system and drum drying treatment is proposed.
- Stepwise feeding of POME at 0.2 $m^3 day^{-1}$ resulted in > 80% removal of contaminant.
- After 360 days, the organic removals

GRAPHICAL ABSTRACT



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IMPACT FACTOR:
6.395 (Q1)

Journal of Cleaner Production 240 (2019) 117988

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Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Convective sludge drying by rotary drum dryer using waste steam for palm oil mill effluent treatment

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ABSTRACT

Achieving a more sustainable wastewater treatment plant has never been so important. Issues around energy consumption and pollutants removal efficiency are of growing importance in the context of production costs and pollution control. In the palm oil industry, more than 85% mills are managing their palm oil mill effluent (POME) via lagoons, yet the system considered less effective as the quality of the

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IMPACT FACTOR:
6.395 (Q1)

Journal of Cleaner Production 207 (2019) 590–599

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Journal of Cleaner Production

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Sustainable one-pot process for the production of cellulose nanofiber and polyethylene / cellulose nanofiber composites

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Article history:
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ABSTRACT

Conventional cellulose-based nanocomposites production requires two separate unit operations for the processing: (i) cellulose nanofibrillation unit, and (ii) polymer nanocomposites compounding unit. This two-unit process could be less efficient in terms of energy usage and material handling compared to a one-unit process. Moreover, the present of downtime in between the two steps may affect the overall productivity of the product. In this study, a one-pot process was adapted for nanofibrillation of oil palm mesocarp fiber (OPMF) cellulose and subsequently compounding of the cellulose nanofiber (CNF) with

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IMPACT FACTOR:
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SCIENTIFIC REPORTS

OPEN

Improved Biobutanol Production in 2-L Simultaneous Saccharification and Fermentation with Delayed Yeast Extract Feeding and *in-situ* Recovery

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Received: 1 February 2019
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Simultaneous saccharification and fermentation (SSF) with delayed yeast extract feeding (DYEF) was conducted in a 2-L bioreactor equipped with *in-situ* recovery using a gas stripping in order to enhance biobutanol production from lignocellulosic biomass of oil palm empty fruit bunch (OPEFB). This study showed that 2.88 g/L of biobutanol has been produced from SSF with a similar yield of 0.23 g/g as compared to separate hydrolysis and fermentation (SHF). An increase of 42% of biobutanol

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SCIENTIFIC REPORTS
nature research

OPEN

A highly thermostable crude endoglucanase produced by a newly isolated *Thermobifida fusca* strain UPMC 901

Received: 4 July 2019
Accepted: 6 September 2019
Published online: 19 September 2019

Mohd Huzairi Mohd Zainudin[1], Nurul Asyifah Mustapha[2], Mohd Ali Hassan[2], Ezyana Kamal Bahrin[3], Mitsunori Tokura[4], Hisashi Yasueda[4] & Yoshihito Shirai[2]

A thermophilic *Thermobifida fusca* strain UPMC 901, harboring highly thermostable cellulolytic activity, was successfully isolated from oil palm empty fruit bunch compost. Its endoglucanase had the highest activity at 24 hours of incubation in carboxymethyl-cellulose (CMC) and filter paper. A maximum endoglucanase activity of 0.9 U/mL was achieved at pH 5 and 60 °C using CMC as a carbon source. The endoglucanase properties were further characterized using crude enzyme preparations from the culture

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3.543 (Q1)

REVIEW

Biotechnology Journal
www.biotechnology-journal.com

Oil Palm Biomass Biorefinery for Sustainable Production of Renewable Materials

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Oil palm biomass is widely known for its potential as a renewable resource for various value-added products due to its lignocellulosic content and availability. Oil palm biomass biorefinery is an industry that comes with sociopolitical benefits through job opportunities, as well as potential environmental benefits. Many studies have been conducted on the technological advancements of oil-palm biomass-derived renewable materials, which are discussed com prehensively in this review. Recent technological developments have made it possible to bring new and innovative technologies to commercialization, such as compost, biocharcoal, biocomposites, and bioplastics.

the largest share of 38.7%, accounting for approximately 179.6 million ton of production annually. To meet the ever-growing demand for palm oil products, expansion of the plantation area is expected to go hand in hand. To put into perspective, development of the oil palm plantation in Malaysia has increased by 12% from 2005 to 2015,[5] and the sales made by the industry achieved 17.5 billion USD.[6]

Notwithstanding the exceptional economic growth that it helped to shape, the industry received considerable critical attention due to environmental dispute over the

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FOOD AND BIOPRODUCTS PROCESSING 118 (2019) 207–216

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Food and Bioproducts Processing

journal homepage: www.elsevier.com/locate/fbp

Chemical-free pretreatment of unwashed oil palm empty fruit bunch by using locally isolated fungus (*Schizophyllum commune* ENN1) for delignification

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ABSTRACT

Biological pretreatment of unwashed oil palm empty fruit bunch (OPEFB) by *Schizopyllum commune* ENN1 was carried out to obtain optimum conditions of delignification. Locally isolated fungus, *S. commune* ENN1, was grown on oily OPEFB and the biomass was simultaneously

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IMPACT FACTOR:
3.164 (Q1)

polymers

MDPI

Article

Effect of Superheated Steam Treatment on the Mechanical Properties and Dimensional Stability of PALF/PLA Biocomposite

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check for updates

Abstract: The effectiveness of superheated steam (SHS) as an alternative, eco-friendly treatment method to modify the surface of pineapple leaf fiber (PALF) for biocomposite applications was investigated. The aim of this treatment was to improve the interfacial adhesion between the fiber and

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INTERNATIONAL JOURNAL OF HYDROGEN ENERGY 44 (2019) 16212–16223

Available online at www.sciencedirect.com
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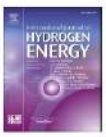
Journal homepage: www.elsevier.com/locate/he



Pseudogene YdfW in *Escherichia coli* decreases hydrogen production through nitrate respiration pathways

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ABSTRACT

Escherichia coli has approximately 4300 open reading frames and about 178 of them are annotated as pseudogenes. The existence of the pseudogenes in *E. coli* had raised the question of whether they contribute to any cell function. Recently, several pseudogenes

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IMPACT FACTOR:
3.060 (Q2)

molecules

MDPI

Article

Direct Bioelectricity Generation from Sago Hampas by *Clostridium beijerinckii* SR1 Using Microbial Fuel Cell

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Received: 30 April 2019; Accepted: 24 May 2019; Published: 28 June 2019

check for updates

Abstract: Microbial fuel cells offer a technology for simultaneous biomass degradation and biological electricity generation. Microbial fuel cells have the ability to utilize a wide range of biomass including carbohydrates, such as starch. Sago hampas is a starchy biomass that has 58% starch content. With this

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IMPACT FACTOR:
3.060 (Q2)

molecules

MDPI

Article

Production of Biosurfactant Produced from Used Cooking Oil by *Bacillus* sp. HIP3 for Heavy Metals Removal

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Academic Editors: Encarnación Ruiz Ramos and Francisco Espínola
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check for updates

Abstract: Heavy metals from industrial effluents and sewage contribute to serious water pollution in most developing countries. The constant penetration and contamination of heavy metals into natural water sources may substantially raise the chances of human exposure to these metals through

AHMAD AIMAN ZULKIFLI
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PUBLISHED

IMPACT FACTOR:
2.592 (Q2)

sustainability

MDPI

Article

Assessment of Municipal Solid Waste Generation in Universiti Putra Malaysia and Its Potential for Green Energy Production

Ahmad Aiman Zulkifli [1], Mohd Zulkhairi Mohd Yusoff [1,2,*], Latifah Abd Manaf [3], Mohd Rafein Zakaria [1,2], Ahmad Muhaimin Roslan [1,2], Hidayah Ariffin [1,2], Yoshihito Shirai [4] and Mohd Ali Hassan [1]

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Received: 14 May 2019; Accepted: 18 June 2019; Published: 18 July 2019

check for updates

Abstract: The global waste generation keeps increasing over the years and it requires innovative solutions to minimize its impacts on environmental quality and public health. A strategic plan must

DIANA MOHD NOR
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PUBLISHED

IMPACT FACTOR:
2.575 (Q2)

Microbes Environ. Vol. 34, No. 2, 121-128, 2019
https://www.jstage.jst.go.jp/browse/jsme2 doi:10.1264/jsme2.ME18104

MICROBES AND ENVIRONMENTS

Dynamics of Microbial Populations Responsible for Biodegradation during the Full-Scale Treatment of Palm Oil Mill Effluent

DIANA MOHD-NOR[1,2], NORHAYATI RAMLI[1]*, SITI SUHAILAH SHARUDDIN[1], MOHD ALI HASSAN[1], NURUL ASYIFAH MUSTAPHA[2], HIDAYAH ARIFFIN[1,3], KENJI SAKAI[4], YUKIHIRO TASHIRO[4], YOSHIHITO SHIRAI[2], and TOSHINARI MAEDA[2]

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(Received July 25, 2018—Accepted November 22, 2018—Published Online March 21, 2019)

Despite efforts to address the composition of the microbial community during the anaerobic treatment of palm oil mill effluent (POME), its composition in relation to biodegradation in the full-scale treatment system has not yet been extensively examined. Therefore, a thorough analysis of bacterial and archaeal communities was performed in the present study using

IFFAH NABILAH MOHD ARIFF
MASTER STUDENT

PUBLISHED

IMPACT FACTOR:
2.358 (Q2)

Waste Biomass Valor (2019) 10:839–850
DOI 10.1007/s12649-017-0106-8

CrossMark

SHORT COMMUNICATION

Direct Use of Spent Mushroom Substrate from *Pleurotus pulmonarius* as a Readily Delignified Feedstock for Cellulase Production

Iffah Nabilah Mohd Ariff[1] · Ezyana Kamal Bahrin[1] · Norhayati Ramli[1] · Suraini Abd-Aziz[1]

Received: 10 March 2017 / Accepted: 6 October 2017 / Published online: 20 October 2017

Abstract The feasibility of spent mushroom substrate (SMS) as an alternative fermentation feedstock for cellulase peroxidase from delignified SMS were found to be 3 and 1.4 U/g, respectively. Further to this, the cellulase production

PROFESSOR DR. SURAINI ABD AZIZ
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PUBLISHED

IMPACT FACTOR:
2.326 (Q2)

Waste and Biomass Valorization
https://doi.org/10.1007/s12649-019-00730-w

ORIGINAL PAPER

One-Step Conversion of Lemongrass Leaves Hydrolysate to Biovanillin by *Phanerochaete chrysosporium* ATCC 24725 in Batch Culture

Ahmed Ibrahim Galadima[2,6] · Madihah Md Salleh[1,2] · Huszalina Hussin[1,2] · Norulsazyani Mohd Safri[2] · Rohaya Mohd Noor[2] · Chun Shiong Chong[1,2] · Adibah Yahya[1,2] · Shaza Eva Mohamad[1,2] · Suraini Abd-Aziz[3] · Nor Nadiah Mohamad Yusof[4] · Muhammad Abu Naser[2] · Amir Feisal Merican Al-Junid[5]

Received: 4 June 2018 / Accepted: 25 June 2019

Abstract
One-step bioconversion of biovanillin using *Phanerochaete chrysosporium* ATCC 24725 with lemongrass leaves hydrolysates (LLH) was performed in batch culture. Initially, optimization of the lignocellulosic pretreatment practices using liquid hot-water with sodium bisulfite (0.5% w/v) towards the release of the ferulic acids was exhaustively investigated. The

ASSOCIATE PROFESSOR DR. HIDAYAH ARIFFIN
GROUP RESEARCHER

PUBLISHED

IMPACT FACTOR:
2.268 (Q2)

Polymer COMPOSITES

Mechanical, Dynamic, and Thermomechanical Properties of Coir/Pineapple Leaf Fiber Reinforced Polylactic Acid Hybrid Biocomposites

Ramengmawii Siakeng,[1] Mohammad Jawaid,[1] Hidayah Ariffin,[2] S. M. Sapuan[3]
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[3]*Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, Universiti Putra Malaysia, Selangor, 43400 UPM Serdang, Malaysia*

Natural fiber-based polymer composites have been widely studied to substitute synthetic materials. In this research, pineapple leaf fibers (PALF) and coir fibers reduce the environmental loads. POLYM. COMPOS., 40:2000–2011, 2019. © 2018 Society of Plastics Engineers

ASSOCIATE PROFESSOR DR. HIDAYAH ARIFFIN
GROUP RESEARCHER

PUBLISHED

IMPACT FACTOR:
2.268 (Q2)

Polymer COMPOSITES

Natural Fiber Reinforced Polylactic Acid Composites: A Review

Ramengmawii Siakeng,[1] Mohammad Jawaid,[1] Hidayah Ariffin,[2] S. M. Sapuan,[1] Mohammad Asim,[1] Naheed Saba[1]
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Biopolymer-based composites have attracted the attention of researchers and industries due to their eco-friendliness and environmental sustainability, as well as triggered current environmental concerns in terms of environmental contamination, greenhouse gas emissions and the diminution of fossil resources [1]. In this regard

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GROUP RESEARCHER

PUBLISHED

IMPACT FACTOR:
2.260 (Q2)

Biocatalysis and Agricultural Biotechnology 18 (2019) 101019

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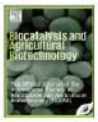
journal homepage: www.elsevier.com/locate/bab



Production of polyhydroxybutyrate from oil palm empty fruit bunch (OPEFB) hydrolysates by *Bacillus cereus suaeda* B-001

Yustinah[a,b], Nurul Hidayat[a], Rizal Alamsyah[c], Ahmad Muhaimin Roslan[d], Heri Hermansyah[a], Misri Gozan[a,*]

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ARTICLE INFO

Keywords:
Polyhydroxybutyrate
Oil palm empty fruit bunch

ABSTRACT

Polyhydroxybutyrate (PHB) is a biodegradable polymer accumulated in intracellular granules by numerous bacteria. Its physical and chemical characteristics are like those of petrochemical plastics. PHB is produced mainly by gram-negative bacteria such as *Ralstonia eutropha*, which have lipopolysaccharides that co-purify with

ENIS NATASHA NOOR ARBAIN
MASTER STUDENT

PUBLISHED

IMPACT FACTOR:
1.963 (Q2)

processes

MDPI

Communication

Biological Pretreatment of Oil Palm Empty Fruit Bunch by *Schizophyllum commune* ENN1 without Washing and Nutrient Addition

Enis Natasha Noor Arbaain [1], Ezyana Kamal Bahrin [1,2,*], Mohamad Faizal Ibrahim [1,2], Yoshito Ando [3] and Suraini Abd-Aziz [1]

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check for updates

Abstract: Washing and drying are common steps for oil palm empty fruit bunch (OPEFB) preparation prior to pretreatment. However, the mass balance of OPEFB preparation proved a major loss of OPEFB during the washing and drying steps. An indigenous fungus, *Schizophyllum commune*

HAZWANI HUSIN
MASTER STUDENT

PUBLISHED

IMPACT FACTOR:
2.893 (Q3)

Received: 16 May 2018 | Revised: 12 July 2018 | Accepted: 18 July 2018
DOI: 10.1002/ese3.226

IN THE FIELD

Energy Science & Engineering

Simultaneous saccharification and fermentation of sago hampas into biobutanol by *Clostridium acetobutylicum* ATCC 824

Hazwani Husin[1] | Mohamad Faizal Ibrahim[1,2] | Ezyana Kamal Bahrin[1,2] | Suraini Abd-Aziz[1]

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Abstract

Simultaneous saccharification and fermentation (SSF) by *Clostridium acetobutylicum* ATCC 824 was conducted to produce biobutanol from sago hampas. Sago hampas is a waste generated from the processing of sago starch. This waste is composed of 54.6% starch and 31.7% of cellulose and hemicellulose, with only 3.3% of lignin.

MOHD HAFIF SAMSUDIN
PhD STUDENT

PUBLISHED

IMPACT FACTOR:
2.015 (Q3)

Short Communication

WM&R

Waste Management & Research
1–5

DOI: 10.1177/0734242X18823953
journals.sagepub.com/home/wmr
SAGE

A one-step self-sustained low temperature carbonization of coconut shell biomass produced a high specific surface area biochar-derived nano-adsorbent

Mohd Hafif Samsudin[1], Mohd Ali Hassan[1,2], Juferi Idris[3,4], Norhayati Ramli[1], Mohd Zulkhairi Mohd Yusoff[1], Izzudin Ibrahim[1], Mohd Ridzuan Othman[1], Ahmad Amiruddin Mohd Ali[5] and Yoshihito Shirai[5]

Abstract

A one-step self-sustained carbonization of coconut shell biomass, carried out in a brick reactor at a relatively low temperature of 300–500°C, successfully produced a biochar-derived adsorbent with 308 m^2/g surface area, 2 nm pore diameter, and 0.15 cm^3/g total pore volume. The coconut shell biochar qualifies as a nano-adsorbent, supported by scanning electron microscope images, which

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MASTER STUDENT

PUBLISHED

IMPACT FACTOR:
1.786 (Q3)

3 Biotech (2019) 9:234
https://doi.org/10.1007/s13205-019-1767-8

ORIGINAL ARTICLE

Comparison of hydro-distillation, hydro-distillation with enzyme-assisted and supercritical fluid for the extraction of essential oil from pineapple peels

Nurshazana Mohamad[1] · Norhayati Ramli[1] · Suraini Abd-Aziz[1] · Mohamad Faizal Ibrahim[1,2]

Received: 20 September 2018 / Accepted: 16 May 2019 / Published online: 25 May 2019

Abstract

Pineapple peel is a potential feedstock for the extraction of essential oil due to the presence of aromatic compounds. To extract the essential oil from pineapple peels, three different methods were applied, i.e., (1) hydro-distillation (HD); (2) hydro-distillation with enzyme-assisted (HDEA); and (3) supercritical fluid extraction (SFE). SFE had successfully produced an

PROFESSOR DATO' DR. MOHD ALI HASSAN
GROUP RESEARCHER

PUBLISHED

IMPACT FACTOR
1.234 (Q3)

Desalination and Water Treatment
www.deswater.com
doi: 10.5004/dwt.2019.23529

144 (2019) 129–137
March

Response surface-based optimization of the biodegradation of a simulated vegetable oily ballast wastewater under temperate conditions using the Antarctic bacterium *Rhodococcus erythropolis* ADL36

Maryam Abubakar[a], Nur Muhamad Syahir Abdul Habib[a], Motharasan Manogaran[a], Nur Adeela Yasid[a], Siti Aisyah Alias[b], Siti Aqlima Ahmad[a,b], Jerzy Smykla[c], Mohd Ali Hassan[d], Mohd Yunus Abd Shukor[a,*]

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Received 24 November 2017; Accepted 26 November 2018

ABSTRACT

Discharge of vegetable oily ballast wastewater constitutes serious hazardous pollution to the environment due to its toxic effects on aquatic organisms and terrestrial animals consuming the waste.

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PUBLISHED

IMPACT FACTOR:
1.186 (Q4)

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DOI: *10.15244/pjoes/83670* ONLINE PUBLICATION DATE: 2019-03-25

Original Research

Hydrogen and Methane Production from Co-digestion of Food Waste and Chicken Manure

Mohd Faiz Mat Saad[1, 2], NorAini Abdul Rahman[1*], Mohd Zulkhairi Mohd Yusoff[1, 3]

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Received: 17 September 2017
Accepted: 20 January 2018

Abstract

The production of renewable energy from agro-food waste possesses a lot of advantages over conventional methods. This study aimed at enhancing the hydrogen and methane production from

DR. MOHD ZULKHAIRI MOHD YUSOFF
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PUBLISHED

IMPACT FACTOR:
1.130 (Q4)

BIOFUELS
https://doi.org/10.1080/17597269.2019.1652787

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Taylor & Francis Group

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Effect of photo-autotrophic cultural conditions on the biomass productivity and composition of *Chlorella vulgaris*

Norazela Nordin[a], Norjan Yusof[a], Syafiqah Md Nadzir[a], Mohd Zulkhairi Mohd Yusoff[b] and Mohd Ali Hassan[b]

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ABSTRACT
The study aims to investigate the effect of photo-autotrophic cultural conditions on the productivity and biomass composition of *Chlorella vulgaris*. The following five photo-autotrophic cultural conditions were investigated: light intensity (4000, 10,500, 17,000, 23,000, 30,000 lux), temperature

ARTICLE HISTORY
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Accepted 28 July 2019

ASSOCIATE PROFESSOR DR. HIDAYAH ARIFFIN
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BOOK CHAPTER

CHAPTER
2

Lignocellulose Structure and the Effect on Nanocellulose Production

Ferial Ghaemi, Luqman Chuah Abdullah and Hidayah Ariffin
Laboratory of Biopolymer and Derivatives, Institute of Tropical Forestry and Forest Products, Universiti Putra Malaysia, Serdang, Malaysia

INTRODUCTION

Lignocellulose biomass is the most available biopolymer, mainly consisting of cellulose, hemicellulose, and lignin as well as small amounts

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BOOK CHAPTER

CHAPTER
3

Multistep, Nonchlorinated Treatment for Cellulose Isolation From Oil Palm Fronds

Liana Noor Megashah[1], Hidayah Ariffin[1,2], Mohd Ali Hassan[1] and Farah Nadia Mohammad Padzil[2]

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INTRODUCTION

Cellulose is a complex carbohydrate polymer composed of a chain of polymers with unbranched β(1,4)-linked D-glucopyranosyl units.

ASSOCIATE PROFESSOR DR. HIDAYAH ARIFFIN
GROUP RESEARCHER

BOOK CHAPTER

CHAPTER
5

Characterization of Cellulose Nanofiber From Various Tropical Plant Resources

Hidayah Ariffin[1,2], Tengku Arisyah Tengku Yasim-Anuar[2], Nurfarah Izzati Amadi[1] and Farah Nadia Mohammad Padzil[2]

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INTRODUCTION

Recently, the demand for nanocellulose is increasing rapidly especially in composite industry as it is used as reinforcement material

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BOOK CHAPTER

CHAPTER

8

Oligosaccharide From Hemicellulose

Norlailiza Ahmad[1] *and Mohd Rafein Zakaria*[1,2]

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INTRODUCTION

For the past few years, an abundance of lignocellulosic biomass materials were produced worldwide on a daily basis from many industries

MOHAMMED ABDILLAH AHMAD FARID
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BOOK CHAPTER

CHAPTER

10

Sustainability of Oil Palm Biomass-Based Products

Mohammed Abdillah Ahmad Farid[1], *Mohd Ali Hassan*[1,2], *Mohd. Ridzuan Othman*[1], *Yoshihito Shirai*[3] *and Hidayah Ariffin*[1,4]

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INTRODUCTION

Palm oil-producing countries, especially in Southeast Asia, are set for the industry to grow in a way that it has never been before. Over the

SITI JAMILAH HANIM MOHD YUSOF
PhD STUDENT

BOOK CHAPTER

CHAPTER
12

Oil Palm Biomass Biorefinery for Future Bioeconomy in Malaysia

Siti Jamilah Hanim Mohd Yusof[1,2], *Mohd Rafein Zakaria*[1,3], *Ahmad Muhaimin Roslan*[1,3], *Ahmad Amiruddin Mohd Ali*[4], *Yoshihito Shirai*[4], *Hidayah Ariffin*[1,3] *and Mohd Ali Hassan*[1,5]

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INTRODUCTION

The palm oil industry is one of the key contributors to the Malaysian economy. Even though the industry is considered as finan-

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PhD STUDENT

BOOK CHAPTER

CHAPTER 19

Polymeric Composites for Joint Replacement

Nur Sharmila Sharip[1] and Hidayah Ariffin[1,2]

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19.1 Introduction

A polymeric material called ultrahigh-molecular-weight polyethylene (UHMWPE) is used in arthroplasty as an artificial joint component [1]. In the early years of its application, sterilization by gamma radiation led to the formation of an excess of free radicals causing a

SITI SULIZA SALAMAT
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CITED

AsPac J. Mol. Biol. Biotechnol. 2019
Vol. 27 (3) : 39-49

Application of compost in mixed media improved oil palm nursery's secondary root structure thereby reducing the fertilizer requirement for growth

Siti Suliza Salamat[a,b], Mohd Ali Hassan[a*], Yoshihito Shirai[b], Ahmad Husni Mohd Hanif[c], Izwanizam Arifin[d], Mohamad Shahkhirat Norizan[d]

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Received 13th November 2018 / Accepted 19th June 2019

NIK IDA MARDIANA NIK PA
PhD STUDENT

CITED

AsPac J. Mol. Biol. Biotechnol. 2019
Vol. 27 (2) : 93-102

Improved extracellular secretion of β-cyclodextrin glycosyltransferase from *Escherichia coli* by glycine supplementation without apparent cell lysis

Nik Ida Mardiana Nik-Pa[a,b], Suraini Abd-Aziz[a], Mohamad Faizal Ibrahim[a], Noorjahan Banu Mohamed Alitheen[c], Norhayati Ramli[a*]

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Received 25th January 2019 / Accepted 5th April 2019

Abstract. The use of an effective inducer feeding strategy without causing cell lysis presents significant advantage to enhance the secretion of an enzyme to the culture medium of *Escherichia coli*. The *cgt* gene encoding β-cyclodextrin glycosyltransferase (β-CGTase) was cloned into pQE30xa as an N-terminal His-

NUR SHARMILA SHARIP
PhD STUDENT

CITED

Available online at www.sciencedirect.com

ScienceDirect

Materials Today: Proceedings 16 (2019) 1959–1968

materialstoday: PROCEEDINGS

www.materialstoday.com/proceedings

Bio-CAM 2017

Cellulose nanofibrils for biomaterial applications

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Abstract

Cellulose nanofibrils (CNF) is a nature based materials bearing an excellent mechanical properties, good biocompatibility, tailorable surface chemistry, and interesting optical properties. Numerous studies have been done addressing CNF potentials and

MUHAMAD YUSUF HASAN
PhD STUDENT

CITED

AsPac J. Mol. Biol. Biotechnol. 2018
Vol. 26 (3) : 1-10

Periodic addition of anaerobic sludge enhanced the lignocellulosic degradation rate during co-composting of oil palm biomass

Muhamad Yusuf Hasan[a,d], Mohd Ali Hassan[a,e*], Mohd Noriznan Mokhtar[a], Azni Idris[b], Yoshihito Shirai[e], Zulnaim Dzulkarnain[c], Mohd Hafif Samsudin[c], Mohd Huzairi Mohd Zainudin[f]

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Received 15th September 2018 / Accepted 15th November 2018

Abstract. The main objective of this work was to investigate the effects of the controlled periodic addition of anaerobic sludge during composting to increase amount of microbial DNA, which appears to be correlated to soluble sugar content which may relate to rate of lignocellulosic degradation. In this study,

DR. AHMAD MUHAIMIN ROSLAN
GROUP RESEARCHER

CITED

International Conference on Green Energy and Environment 2019 IOP Publishing
IOP Conf. Series: Earth and Environmental Science 353 (2019) 012048 doi:10.1088/1755-1315/353/1/012048

Factors Affecting the Production of Biosurfactants and their Applications in Enhanced Oil Recovery (EOR). A Review

C N Sari[1], R Hertadi[2], M Gozan[1*] and A M Roslan[3]

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[3]Department of Bioprocess Technology, Universiti Putra Malaysia (UTM), Serdang Selangor, Malaysia

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Abstract. Biosurfactants are surface-active compounds synthesized by microbes. They have the ability to reduce the surface tension of a liquid and interfacial tension (IFT) between two different phases. Thus, they can be applied in water-oil emulsification. The development of

SITI JAMILAH HANIM MOHD YUSOF
PhD STUDENT

IN PRESS

sustainability MDPI

Article

Life Cycle Assessment for Bioethanol Production from Oil Palm Frond Juice in an Oil Palm Based Biorefinery

Siti Jamilah Hanim Mohd YUSOF [1,2], Ahmad Muhaimin Roslan [3,4,*], Khairul Nadiah Ibrahim [5], Sharifah Soplah Syed ABDULLAH [5], Mohd Rafein Zakaria [3,4], Mohd Ali Hassan [1,3] and Yoshihito Shirai [6]

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Abstract: A study was conducted to estimate the possible environmental impacts arising from the generation of bioethanol from oil palm frond sugar juice in a theoretical oil palm based biorefinery model. A life cycle assessment (LCA) with the gate-to-gate approach was performed with the

IMPACT FACTOR:
2.952 (Q2)

EB GROUP PUBLICATION STATUS 2019

Q1	Q2	Q3	Q4	CITED
8	11	4	2	5

38
TOTAL NUMBER OF PUBLICATIONS

30
TOTAL NUMBER OF PUBLISHED JOURNALS

78.256
PUBLISHED IMPACT FACTOR

2.952
IN PRESS IMPACT FACTOR

81.208
TOTAL IMPACT FACTOR

EB GROUP PUBLICATION STATUS 2019

OUTBOUND & INBOUND 2019

OUTBOUND

PARTICIPANTS	PROGRAM	RESEARCH THEME	HOST/LOCATION	DURATION	SPONSOR
NUR SHARMILA SHARIP	RESEARCH ATTACHMENT	UHMWPE/CNF BIOCOMPOSITE FABRICATION BY SOLVENT ASSISTED PROCESS	KYUSHU INSTITUTE OF TECHNOLOGY (WAKAMATSU CAMPUS)	11 MAY 2019 TO 1 JUNE 2019	-
NUR SHARMILA SHARIP	RESEARCH ATTACHMENT	CYTOTOXICITY EVALUATION OF UHMWPE/CNF BIOCOMPOSITE ON OSTEOBLAST CELL MG63	KYUSHU INSTITUTE OF TECHNOLOGY (TOBATA CAMPUS)	9 JUNE 2019 TO 31 AUGUST 2019	JASSO

INBOUND

PARTICIPANTS	PROGRAM	RESEARCH THEME	HOST/LOCATION	DURATION	SPONSOR
YUYA KIMURA	INTERNATIONAL INTERNSHIP	INVESTIGATING THE EFFECTS OF METAL IONS CONTAINED IN MII USING ZEBRAFISH	BIOMASS TECHNOLOGY LABORATORY, UPM	4 NOVEMBER TO 19 NOVEMBER 2019	-
SHUTO FUJIE	INTERNATIONAL INTERNSHIP	INVESTIGATION OF THE EFFECTS OF METALLIC SUBSTANCES ON ZEBRAFISH EMBRYOS AND JUVENILES	BIOMASS TECHNOLOGY LABORATORY, UPM	4 NOVEMBER TO 19 NOVEMBER 2019	-
SHOTAROTOYA	INTERNATIONAL INTERNSHIP	ENZYME ACTIVITY MEASUREMENT OF BACTERIA IN SLUDGE	BIOMASS TECHNOLOGY LABORATORY, UPM	4 NOVEMBER TO 19 NOVEMBER 2019	-
TOMONORI KAI	JASSO PROGRAM	INVESTIGATION OF CELL VIABILITY OF E.COLI BW25113 AND ITS MUTANTS AGAINST AMPICILLIN AND ACID TREATMENT UNDER AEROBIC CONDITIONS	BIOMASS TECHNOLOGY LABORATORY, UPM	1 OCTOBER TO 3 DECEMBER 2019	JASSO

CONSULTANCY PROJECTS 2019

NO	RESEARCH THEME	CLIENTS/INDUSTRIAL PARTNER
1	STUDY ON THE EFFECTIVENESS OF BIOFERTILIZER PELLETS FOR LANDSCAPE PLANT	NOVOZYME MALAYSIA SDN BHD
2	PRODUCTION AND CHARACTERIZATION OF CELLULOSE NANOFIBER FROM OIL PALM EMPTY FRUIT BUNCH	NEXTGREEN PULP & PAPER SDN BHD
3	THE FUTURE OF RENEWABLE ENERGY AND PALM OIL INDUSTRY IN MALAYSIA	MITSUBISHI HEAVY INDUSTRIES
4	COLLABORATIVE RESEARCH ON THE USE OF HYDROTHERMAL CARBONIZATION TECHNOLOGY FOR TREATMENT OF OIL PALM BIOMASS TO BE USED IN COMPOSTING	MITSUBISHI HEAVY INDUSTRIES

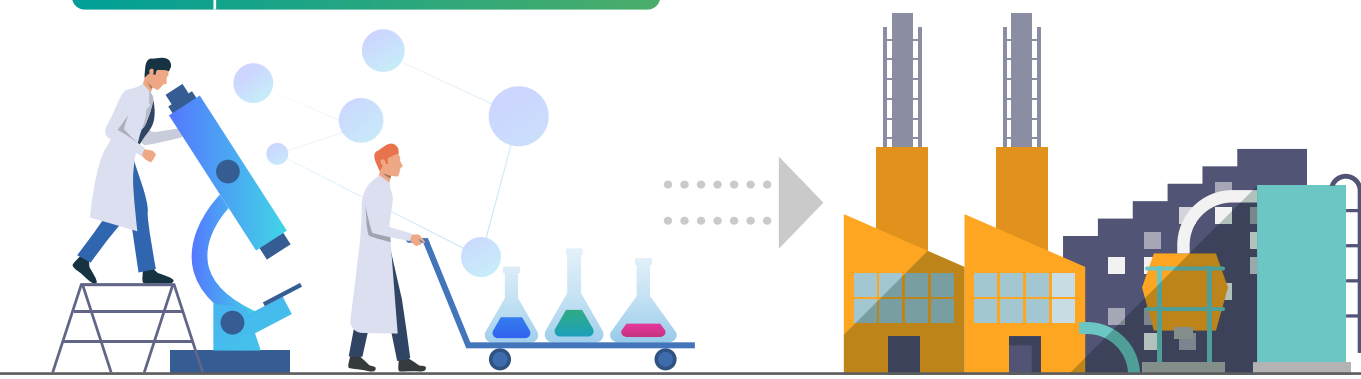
NO	RESEARCH THEME	CLIENTS/INDUSTRIAL PARTNER
5	UTILIZATION OF FOOD WASTE IN UPM FOR GREEN ENERGY	SWCORP SDN BHD
6	ONE-STEP SELF-SUSTAINED LOW-TEMPERATURE CARBONIZATION OF WOOD CHIPS TO PRODUCE A BIOCHAR-DERIVED BIOADSORBENT	WORLDWIDE LANDFILL SDN BHD
7	SELANGOR BIOTECHNOLOGY ACTION PLAN 2020 – 2030	INVEST SELANGOR SDN BHD, MALAYSIAN BIOTECHNOLOGY INFORMATION CENTRE, BIOECONOMY CORPORATION SDN. BHD.

INTELLECTUAL PROPERTY FILED, GRANTED AND LICENSED (PATENT AND COPYRIGTS)

FILED	1. TITLE: PRODUCTION OF BIODIESEL FROM WASTE COOKING OIL COPYRIGHTS NO : LY2018006905 2. TITLE: PRODUCTION OF BIOCHAR IN POOL TYPE REACTOR COPYRIGHTS NO : LY2018006905
GRANTED	TITLE: RENEWABLE SUGARS FROM OIL PALM WASTES PATENT NO.: MY-171076-A
LICENSED	1. BIODIESEL BY AMPM INTERNATIONAL SDN BHD 2. NANOCELLULOSE BY NEXTGREEN PULP & PAPER SDN BHD 3. NANOCELLULOSE BY ZOEPNANO SDN BHD 4. BIOFERTILIZER BY BIOMASS EB SDN BHD

COMMERCIALIZATION

1. NANOCELLULOSE BY ZOEPNANO SDN BHD
2. NANOCELLULOSE BY NEXTGREEN PULP & PAPER SDN BHD
3. BIOFERTILIZER BY BIOMASS EB SDN BHD
4. BIOSURFACTANT BY RANO TECH SDN BHD
5. BIODIESEL BY AMPM INTERNATIONAL SDN BHD



WORKSHOPS AND CONFERENCES 2019

NO	EVENTS	DATE	VENUE	PARTICIPANTS
1	EB WRITING WORKSHOP	20 FEBRUARY 2019	BIOREFINERY COMPLEX, UPM	• EB GROUP MEMBERS
2	ADVANCED CELL CULTURE WORKSHOP	20 MARCH 2019	INSTITUTE OF BIOSCIENCE, UPM	• NUR SHARMILA SHARIP
3	MINI COMMERCIALISATION WORKSHOP	21 MARCH 2019	MTDC, UPM	• ASSOCIATE PROFESSOR DR. HIDAYAH ARIFFIN
4	WORKSHOP ON MESTECC GRANT PROPOSAL PREPARATION	9 APRIL 2019	PUTRAJAYA MARRIOT HOTEL	• ASSOCIATE PROFESSOR DR. HIDAYAH ARIFFIN
5	MEET THE SCIENTIST TALK: THE FUTURE OF ENVIRONMENTAL BIOTECHNOLOGY IN MALAYSIA	30TH APRIL 2019	INTERNATIONAL ISLAMIC UNIVERSITY OF MALAYSIA (IIUM), KUANTAN	• PROFESSOR DATO' DR. MOHD ALI HASSAN
6	8TH INTERNATIONAL FORUM ON INDUSTRIAL BIOPROCESSING 2019 (IBA-IFIBIOP 2019) IN SARAWAK.	1 – 5 MAY 2019	IMPERIAL HOTEL MIRI, SARAWAK	• DR. MOHD ZULKHAIRI MOHD YUSOF • ASSOCIATE PROFESSOR DR. MOHD RAFEIN ZAKARIA
7	2019 INTERNATIONAL CONFERENCE ON NANOTECHNOLOGY FOR RENEWABLE MATERIALS	3 – 7 JUNE 2019	CHIBA, JAPAN	• ASSOCIATE PROFESSOR DR. HIDAYAH ARIFFIN
8	14TH ASIAN CONGRESS ON BIOTECHNOLOGY (ACB 2019)	1 - 4 JULY 2019	FULLON HOTEL TAMSUI FISHERMAN'S WHARF, NEW TAIPEI CITY, TAIWAN	• PROFESSOR. DATO' DR. MOHD ALI HASSAN • PROFESSOR DR. SURAINI ABD AZIZ
9	WORKSHOP INTRODUCTION IN PULP AND PAPER TECHNOLOGY	8-10 JULY 2019	FOREST RESEARCH INSTITUTE MALAYSIA (FRIM)	• ASSOCIATE PROFESSOR DR. HIDAYAH ARIFFIN • DR. TENGKU ARISYAH TENGKU YASIM ANUAR • LIANA NOOR MEGASHA • NORHANI JUSOH • FARAH NABILA

WORKSHOPS AND CONFERENCES 2019

NO	EVENTS	DATE	VENUE	PARTICIPANTS
10	1ST THAILAND BIOREFINERY CONFERENCE	25 - 26 JULY 2019	SURANAREE UNIVERSITY OF TECHNOLOGY, THAILAND	• PROFESSOR DATO' DR. MOHD ALI HASSAN
11	PROGRAM "EMPOWERING GOOD GOVERNANCE – LEADING THE WAY FOR HIGHER EDUCATION INSTITUTION IN MALAYSIA"	29 JULY 2019	PUTRAJAYA MARRIOTT HOTEL	• PROFESSOR DATO' DR. MOHD ALI HASSAN
12	WASTE MANAGEMENT ASSOCIATION OF MALAYSIA, ANNUAL CONFERENCE AND GALA DINNER " PLASTICS: THE GOOD, THE BAD AND THE UGLY"	31 JULY – 1 AUGUST 2019	ROYALE CHULAN, DAMANSARA, KUALA LUMPUR	• DR. MOHD ZULKHAIRI MOHD YUSOF • PROFESSOR DATO' DR. MOHD ALI HASSAN • AHMAD AIMAN ZULKIFLI
13	PROGRAM SESI PERKONGSIAN GERAN PENYELIDIKAN SWASTA/ ANTARABANGSA	2 AUGUST 2019	INSPEM, UPM	• PROFESSOR DATO' DR. MOHD ALI HASSAN
14	THE 13TH KOREA-ASEAN JOINT SYMPOSIUM ON BIOMASS UTILIZATION AND RENEWABLE ENERGY.	7 - 9 AUGUST 2019	SURABAYA, INDONESIA	• PROFESSOR DR. SURAINI ABD AZIZ • ASSOCIATE PROFESSOR DR. MOHAMAD FAIZAL IBRAHIM
15	SYMPOSIUM & NETWORKING ON BIOINDUSTRY	29 AUGUST 2019	ONE WORLD HOTEL, PETALING JAYA	• PROFESSOR DATO' DR. MOHD ALI HASSAN
16	THE INSTITUTION OF ENGINEERS MALAYSIA (IEM) TECHNICAL TALK	28 SEPTEMBER 2019	WISMA IEM, PETALING JAYA	• ASSOCIATE PROFESSOR DR. HIDAYAH ARIFFIN • DR. TENGKU ARISYAH TENGKU YASIM ANUAR • DR. FARAH NADIA MOHD PADZIL • NURSHARMILA SHARIP • LIANA NOOR MEGASHAH • NORHANI JUSOH • LAWRENCE NG YEE FOONG • SITI SHAZRA SHAZLEEN

WORKSHOPS AND CONFERENCES 2019

NO	EVENTS	DATE	VENUE	PARTICIPANTS
17	10TH INTERNATIONAL GREENTECH & ECO PRODUCTS EXHIBITION & CONFERENCE MALAYSIA	9 - 11 OCTOBER 2019	KUALA LUMPUR CONVENTION CENTRE (KLCC)	• ASSOCIATE PROFESSOR DR.HIDAYAH ARIFFIN • DR. TENGKU ARISYAH TENGKU YASIM ANUAR • DR. FARAH NADIA MOHD PADZIL • NURSHARMILA SHARIP • LIANA NOOR MEGASHAH • NORHANI JUSOH • LAWRENCE NG YEE FOONG • SITI SHAZRA SHAZLEEN • FARAH NABILA
18	SEMINAR ON NANOTECHNOLOGY IN FORESTRY AND NATURAL RESOURCES	10 OCTOBER 2019	MAGIC, CYBERJAYA	• ASSOCIATE PROFESSOR DR.HIDAYAH ARIFFIN • NORHANI JUSOH • LAWRENCE NG YEE FOONG • SITI SHAZRA SHAZLEEN • FARAH NABILAH • DR. FARAH NADIA MOHD PADZIL
19	FOCUS GROUP DISCUSSION (FGD), 1ST JAPAN-ASEAN MULTI-STAKEHOLDER STRATEGIC CONSULTANCY FORUM	12 OCTOBER 2019	BANGKOK, THAILAND	• ASSOCIATE PROFESSOR DR.HIDAYAH ARIFFIN • PROFESSOR DATO' DR. MOHD ALI HASSAN
20	AFOB MALAYSIA CHAPTER INTERNATIONAL SYMPOSIUM 2019	21 - 23 OCTOBER 2019	EVERLY HOTEL PUTRAJAYA	• EB GROUP MEMBERS
21	QUANTITATIVE REAL-TIME POLYMERASE CHAIN REACTION (QRT-PCR) FOR BIOPROCESS AND ENVIRONMENTAL BIOTECHNOLOGY APPLICATIONS	30 - 31 OCTOBER 2019	UNIVERSITI PUTRA MALAYSIA	• DR. MOHD ZULKHAIRI MOHD YUSOFF • ASSOCIATE PROFESSOR DR. MOHD RAFEIN ZAKARIA • ASSOCIATE PROFESSOR DR. NORHAYATI RAMLI
22	REVEALING THE MYSTERIES OF SOLID STATE MATERIALS WORKSHOP	5 - 6 NOVEMBER 2019	UNIVERSITI PUTRA MALAYSIA	• LAWRENCE NG YEE FOONG • SITI SHAZRA SHAZLEEN

WORKSHOPS AND CONFERENCES 2019

NO	EVENTS	DATE	VENUE	PARTICIPANTS
23	AFOB BIOECONOMY FORUM 2019	10 - 12 NOVEMBER 2019	DUANGJITT RESORT & SPA, PATONG BEACH, PHUKET, THAILAND	• PROFESSOR DATO' DR. MOHD ALI HASSAN
24	SYMPOSIUM ON APPLIED ENGINEERING AND SCIENCES (SAES2017)	11 - 12 NOVEMBER 2019	UNIVERSITI PUTRA MALAYSIA	• EB GROUP MEMBERS
25	INTERNATIONAL CONGRESS ON MALAYSIAN SOCIETY OF MICROBIOLOGY (ICMSM2019).	13 - 14 NOVEMBER 2019	ROYALE CHULAN SEREMBAN, NEGERI SEMBILAN	• DR. MOHD ZULKHAIRI MOHD YUSOFF • ASSOCIATE PROFESSOR DR. NORHAYATI RAMLI • ASSOCIATE PROFESSOR DR. HIDAYAH ARIFFIN • PROFESSOR DATO' DR. MOHD ALI HASSAN • MUHAMAD YUSUF HASAN • AHMAD AIMAN ZULKIFLI • NUR AINA NATASHA • SHOBANAH MENON BASKARAN
26	MPOB INTERNATIONAL PALM OIL CONGRESS & EXHIBITIONN (PIPOC) 2019	19 NOVEMBER 2019	KUALA LUMPUR CONVENTION CENTRE, KUALA LUMPUR	• PROFESSOR DATO' DR. MOHD ALI HASSAN
27	4TH WORLD CONGRESS ON BIOTECHNOLOGY AND BIOLOGICAL STUDIES 2019	25 NOVEMBER 2019	SAMA SAMA HOTEL, KLIA	• ASSOCIATE PROFESSOR DR. NORHAYATI RAMLI
28	SAFETY TALK BY MERCK	-	MALAYSIAN PALM OIL BOARD (MPOB)	• NURUL HAZIQAH ALIAS • IZZA NADIRA ABU BAKAR
29	MICROBE TRAINING	-	KEN MICROBES BIOTECH SDN BHD	• NURUL HAZIQAH ALIAS • IZZA NADIRA ABU BAKAR
30	WOOD AND BIOFIBRE INTERNATIONAL CONFERENCE	3 - 5 DECEMBER 2019	PROMENADE HOTEL, KOTA KINABALU, SABAH, MALAYSIA	• ASSOCIATE PROFESSOR DR. HIDAYAH ARIFFIN • DR. FARAH NADIA MOHD PADZIL • NURSHARMILA SHARIP • LIANA NOOR MEGASHAH

WORKSHOPS AND CONFERENCES 2019

NO	EVENTS	VENUE	PARTICIPANTS
31	SEMINAR ON CONFOCAL LASER SCANNING MICROSCOPY	UNIVERSITI PUTRA MALAYSIA	• LAWRENCE NG YEE FOONG • DR. TENGKU ARISYAH TENGKU YASIM ANUAR
32	FLAMMABILITY AND LIMITING OXYGEN INDEX ACCORDING TO UL-94	UNIVERSITI PUTRA MALAYSIA	• LAWRENCE NG YEE FOONG • DR. TENGKU ARISYAH TENGKU YASIM ANUAR
33	WRITING WORKSHOP MENTOR-MENTEE WITH PROFESSOR DR. SALIM HIZIROGLU FROM OKLAHOMA STATE UNIVERSITY	UNIVERSITI PUTRA MALAYSIA	• LIANA NOOR MEGASHAH • DR. TENGKU ARISYAH TENGKU YASIM ANUAR
34	SEMINAR ON ELEMENT OF THE THESIS	UNIVERSITI PUTRA MALAYSIA	• NURUL SABRENA HANAFI
35	SEMINAR ON DATA ANALYSIS AND DATA INTERPRETATION IN ELECTRON MICROSCOPY	UNIVERSITI PUTRA MALAYSIA	• LAWRENCE NG YEE FOONG • SITI SHAZRA SHAZLEEN • DR. TENGKU ARISYAH TENGKU YASIM ANUAR

UTUSAN MALAYSIA • KHAMIS 03 OKTOBER 2019

KETUA Pegawai Eksekutif Kumpulan Worldwide Holding, Datin Paduka Noradlina Zakaria (depan, empat dari kiri) dan Aini Ideris bergambar kenangan di kompleks Biorefineri UPM di Serdang, Selangor.

NORAZLINA ZAKARIA meneliti sampel biochar sambil diperhatikan oleh Aini Ideris.

Pengeluaran biochar untuk rawatan sisa air

Oleh INTAN SUHANA CHE OMAR
intan@utusan.com.my

PENGURUSAN sisa pepejal secara terancang dan memanfaatkannya dalam inovasi sangat penting bagi memacu persekitaran negara yang sihat dan berdaya maju.

Selari dengan usaha itu, Universiti Putra Malaysia (UPM) melalui UPM Consultancy Services Sdn. Bhd. mengadakan kerjasama dengan Worldwide Landfills Sdn. Bhd. dalam pengeluaran biochar daripada serpihan kayu.

Biochar ialah arang hitam khusus yang terhasil daripada pembakaran sisa organik pertanian, penternakan atau perhutanan.

Menurut Naib Canselor UPM, **Prof. Datin Paduka Dr. Aini Ideris**, perbincangan mengenai projek berkenaan dimulakan pada Mac 2018 apabila Worldwide Landfills, anak syarikat Worldwide Holdings melawat kompleks Biorefineri di universiti itu.

Selepas perbincangan lanjut antara Worldwide Landfills dan UPM yang diketuai oleh Dr. Mohd. Zulkhairi Mohd. Yusoff, kedua-dua pihak memutuskan untuk memulakan projek perundingan bernilai RM111,625 bagi tempoh enam bulan.

"Dalam projek ini bahan buangan iaitu serpihan kayu yang sedia ada di Worldwide Landfills akan digunakan sebagai bahan mentah untuk pengeluaran biochar.

"Serpihan kayu yang dibekalkan itu kemudiannya akan dihantar ke kompleks Biorefineri untuk dijalankan proses pengkarbonan bagi menghasilkan biochar menggunakan teknologi UPM dengan kerjasama Kyushu Institute of Technology, Jepun (Kyutech)," katanya.

Beliau berkata demikian ketika majlis menandatangani memorandum persefahaman (MoA) yang bertajuk *One-step self-sustained low-temperature carbonization of woodchips to produce a biochar-derived hoasdsorbent*."

> Serpihan kayu yang dibekalkan itu kemudiannya akan dihantar ke kompleks Biorefineri untuk dijalankan proses pengkarbonan bagi menghasilkan biochar menggunakan teknologi UPM dengan kerjasama Kyushu Institute of Technology, Jepun (Kyutech).

Teknologi yang digunakan ialah sistem bioreaktor jenis kolam dengan kapasiti tiga hingga empat tan bahan mentah setiap kelompok.

Biochar yang dihasilkan melalui proses ini akan digunakan sebagai bahan biopenjerap untuk rawatan sisa air terutama untuk penggilapan akhir proses rawatan bahan larut resap di tapak pelupusan.

Tambah Aini, matlamat utama projek ini adalah untuk menggunakan bahan buangan bagi menghasilkan produk nilai tambah yang dapat memberi manfaat kepada industri, manusia dan alam sekitar.

"Inisiatif Kementerian Pertanian dan Industri Asas Tani ini mencerminkan strategi UPM ke arah meningkatkan kerjasama penyelidikan bersama pemain industri.

"Saya percaya platform yang wujud melalui MoA ini akan menggalakkan pertukaran idea antara pemain industri iaitu Worldwide Landfills dengan penyelidik UPM," ujarnya lagi.

BIOCHAR kini dalam fasa pengkomersialan.

Komited galakkan inovasi

WORLDWIDE Holdings komited untuk menggalakkan inovasi melalui projek penyelidikan dan pembangunan (R&D) terutama dalam pengurusan sisa sampah.

Ketua Pegawai Eksekutif Kumpulannya, **Datin Paduka Noradlina Zakaria** berkata, kerjasama dengan institusi akademik dilihat sebagai laluan untuk meneruskan kelestarian alam sekitar demi menjaga kepentingan dan kebaikan generasi masa depan serta menyumbang kepada negara.

"Sebagai perintis tapak pelupusan sanitari di Malaysia, Worldwide Holdings terus meneraju penyelesaian pengurusan alam sekitar menggunakan teknologi baharu dan moden.

"Kami juga berbangga dengan melaksanakan projek -projek inovatif untuk mengembalikan sebahagian keuntungan kami kepada masyarakat melalui aktiviti pemuliharaan dan menaik taraf tapak pembuangan sampah terbuka," katanya.

Syarikat itu menerusi Bahagian Alam Sekitarnya sedang mengendalikan tiga tapak pelupusan kejuruteraan di Selangor iaitu Tapak Pelupusan Sanitari Tanjung Dualebas Kuala Langat, Jeram dan Sabak Bernam.

Selain itu, turut terlibat ialah tiga tapak pelupusan jenis bahan buangan kering atau dikenali sebagai sisa lengai di Dengkil, Gombak dan Rawang.

"Dalam projek ini kami memberi tumpuan kepada kaedah guna semula sisa kayu yang dihantar ke Tapak Pelupusan Sisa Lengai di Kuang, Selangor dengan kapasiti sekitar 20 peratus sehari daripada jumlah sisa buangan di tapak tersebut. Secara keseluruhan antara 500 hingga 600 tan sisa kayu sehari dihantar ke sana.

"Selain membiarkan bahan buangan kayu tersebut mengurai di tapak tupsan, kami percaya ia boleh diubah menjadi produk boleh guna seperti medium pembersihan air kumbahan yang boleh digunakan di loji-loji rawatan air larut resap kami," jelasnya.

Serdang

UPMH, WHB tandatangan MoA projek pengeluaran bioarang

UPM Holdings Sdn Bhd (UPMH) dengan kerjasama Worldwide Holdings Berhad (WHB) menandatangani memorandum perjanjian (MoA) untuk projek perundingan pengeluaran biochar (bioarang) daripada serpihan kayu.

Naib Canselor Universiti Putra Malaysia (UPM), Prof Datin Paduka Dr Aini Ideris berkata, perbincangan projek ini dimulakan pada Mac 2018 apabila Worldwide Landfills Sdn Bhd (WLSB), anak syarikat WHB melawat Kompleks Biorefineri di UPM.

Beliau berkata, kedua-dua pihak memutuskan untuk memulakan projek perundingan bernilai RM111,625 untuk tempoh enam bulan.

"Dalam projek ini, bahan buangan (serpihan kayu) yang sedia ada di WLSB akan digunakan sebagai bahan mentah untuk pengeluaran biochar. Serpihan kayu akan dibekalkan WLSB dan dihantar ke Kompleks Biorefineri.

"Proses pengkarbonan untuk menghasilkan biochar dijalankan menggunakan teknologi UPM dengan kerjasama Kyushu Institute of Technology, Jepun (Kyutech). Teknologi yang digunakan ialah sistem bioreaktor jenis kolam dengan kapasiti tiga hingga empat tan bahan mentah setiap kelompok.

"Biochar yang dihasilkan melalui proses ini akan digunakan sebagai biopenjerap untuk rawatan air sisa terutama untuk penggilapan akhir proses rawatan bahan larut resap di tapak pelupusan," katanya.

Beliau berkata demikian selepas Majlis MoA di Makmal Teknologi Biomas, Kompleks Biorefineri, UPM, di sini, semalam.

'Greener' packaging with oil palm biomass

NURHAFIZAH ABU KARIM
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PLASTIC is used extensively for food packaging due to its durability, flexibility and lightweight properties. Although convenient, many of the items are created for single use.

Poor handling of plastic packaging, where they are not recycled and discarded haphazardly, will cause a negative impact to the environment that affects wildlife and humans alike.

In addressing the issue, Universiti Putra Malaysia (UPM) recently signed a memorandum of agreement with Nextgreen Pulp and Paper Sdn Bhd to licence its oil palm biomass nanocellulose technology to produce greener paper packaging alternatives.

The 20-month licence involves a fee of RM50,000, paid by Nextgreen to UPM.

Nanocellulose from oil palm biomass has been developed by UPM researchers led by Associate Professor Dr Hidayah Ariffin from the Faculty of Biotechnology and Biomolecular Sciences, in collaboration with Kyushu Institute of Technology in Japan.

Nanocellulose is a natural material obtained from any cellulose matter, such as plant biomass, pulp and cotton, said Hidayah.

"The reason why I embarked on this research is because I have been working with bio-based polymers, cellulose and composite materials for some time. They are mainly derived from oil palm biomass."

Her research had won the gold medal for the "Most Commercial-Ready Project" at the 2017 Bioeconomy Innovation Award.

Hidayah added that nanotechnology is an emerging technology. She realised its role and potential, so she and her team decided to focus their research on nanocellulose.

"Mechanically, nanocellulose is strong with high specific surface area. It is also renewable and biodegradable. It is a versatile material that can be tailor-made to suit its application.

"Since Malaysia has many oil palm plantations with an abundance of biomass, why not capitalise on this readily-available resource. With about 25 million tonnes of oil palm waste produced by our country every year, this project will add value to the industry while reducing its disposal issue."

She said normal paper is less durable and can easily be broken down when it comes into contact with water.

"Paper food packaging that we often see today is actually coated with polyethylene, which provides a very strong moisture barrier. This type of packaging is extremely durable but not biodegradable.

"Our partnership with Nextgreen focuses on using nanocellulose as a reinforcement material to enhance the strength of paper packaging."

She said only three per cent of nanocellulose is needed to increase the paper's tensile and bending strength by about 50 and 300 per cent, respectively.

"It is also useful for food-bearing applications, such as lightweight bio-composites for interior components of cars and aeroplanes.

"Apart from these, nanocellulose is also used as material for water filtration and facemasks.

"Due to its nanodimension feature, nanocellulose has a large surface area for hydrogen bonding. This results in the formation of a gel-like structure, even at very low concentration of water, making it suitable as a thickening agent in food products."

Hidayah said to produce nanocellulose, her team extracts the cellulose from oil palm biomass. The cellulose is converted into nanocellulose using a milling method.

"Currently, we have obtained nanocellulose with an average diameter size of between 20 and 80 nanometres," she said, adding that nanocellulose technology in Malaysia is still in the research and development stage.

"It is difficult to compare our product with other nanocellulose produced in Malaysia. However, we see this opportunity as an advantage since our product is almost ready to be commercialised."

Hidayah said she believed that her research had met the OP concept — Profit, People and Planet — in developing a new product.

"In Malaysia, nanocellulose has started to receive interest from many parties. It is interesting to see that it has been recently listed as an emerging product in the 11th Malaysia Plan.

"In terms of profit, the manufacturing of new products from oil palm biomass is expected to generate a new income stream for mill and plantation owners as they could venture into a new business, or sell their biomass to the nanocellulose industry.

"Nanocellulose has the potential to contribute to the bioeconomy of Malaysia since the market is wide. Moreover, the technology can create more job opportunities for locals when it is commercialised."

Hidayah said the product can be considered environmentally-friendly as it is made of natural and renewable material.

"Our technology does not involve the use of hazardous or harsh chemicals."

Hidayah said the applications of nanocellulose technology would be of interest to the polymer and biocomposite plastic industry, healthcare and pharmaceutical sector, and food and beverage sector.

She added that her team has filed for a patent and copyright for their research technique and product.

UPM vice-chancellor Professor Datuk Dr Aini Ideris (second from left) and Nextgreen Pulp and Paper Sdn Bhd managing director Datuk Lim Thiam Huat (second from right) exchanging the memorandum of agreement on licencing for the company to use UPM's oil palm biomass nanocellulose technology to produce green paper packaging. With them are Kyushu Institute of Technology president Dr Tsuji Oki (left) and Nextgreen executive director Kelly Lim Bak Yin (right).

Associate Professor Dr Hidayah Ariffin showing a bottle of nanocellulose that can be used to enhance the strength of paper packaging.

AWARDS

ASSOCIATE PROFESSOR DR. NORHAYATI RAMLI RECEIVED ACADEMIC PUTRA AWARD DURING MAJLIS GEMILANG AKADEMIK PUTRA (MGAP) 2019

NUR SHARMILA SHARIP (LEFT) RECEIVED THE 1st RUNNER UP AWARD IN UPM THREE MINUTE THESIS (3MT) COMPETITION 2019 WITH THE PRESENTATION TITLE "NANOCELLULOSE COMPOSITE PROSTHETIC JOINT"

AFOB MALAYSIA CHAPTER INTERNATIONAL SYMPOSIUM (AFOBMCIS) 2019 AWARDS WINNER. FROM LEFT: NURHASLIZA ZOLKEFLI (BEST POSTER AWARD; SESSION 1), IZZA NADIRA ABU BAKAR (BEST ORAL PRESENTATION AWARD; SESSION 1) & NURUL SABRENA HANAFI (BEST POSTER AWARD; SESSION 2)

ABUBAKAR ABDULLAHI LAWAL
PhD (AGRICULTURAL WASTE ENGINEERING)

PhD STUDENT

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Optimisation-based production of biochar from oil palm frond and evaluation of its adsorption properties for removal of organic contaminants

The purpose of this study was to optimise the production of biochar from oil palm frond using steam pyrolysis and evaluate its adsorption performance for the treatment of organic wastewater. Oil palm fronds were carbonised in a steam pyrolysis system under different sets of production conditions to optimise the production of biochar suitable for wastewater treatment. With optimum production conditions of 500°C and 50 ml steam/min a biochar with BET surface area of 457.5 m^2/g was produced. Adsorption isotherm experiments were conducted using palm oil mill effluent final discharge for the evaluation of adsorption capacity, kinetics, and percentage removal of phenolic compounds. Low biochar dosage of 500 mg was enough to remove more than 90% total phenolic compounds in 1 L of palm oil mill effluent final discharge.

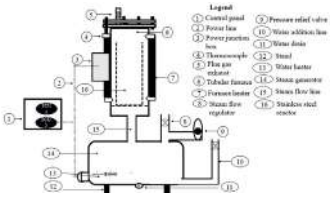

Figure 1: Steam pyrolysis system.

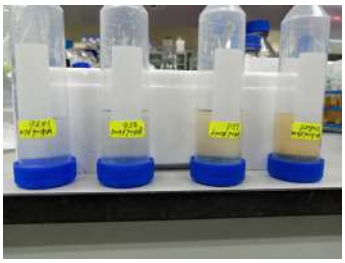

Figure 2: Treated POMEF

FATINI MAT ARISAH
PhD (ENVIRONMENTAL BIOTECHNOLOGY)

PhD STUDENT

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Bioremediation of hexavalent chromium by *Pseudomonas aeruginosa* RW 9: mechanisms and application contaminants

The present study is conducted to evaluate hexavalent chromium, Cr (VI), removal mechanisms by biosurfactant producing local strain, ***Pseudomonas aeruginosa*** RW 9 for bioremediation of hexavalent chromium contaminated wastewater. The Cr (VI) tolerance of the strain is assessed first by supplementing various concentration of Cr (VI) to the nutrient broth. Later, experiments are conducted to determine Cr (VI) removal mechanisms which are cell wall adsorption (extracellular), intracellular accumulation and biosurfactant production. To understand the role of cellular components and metabolite production in Cr (VI) removal in terms of metal complex formation, the distribution of Cr and its speciation are explored. In addition, the expression of several target genes responsible for biosurfactant synthesis is also determined in the presence of Cr (VI) and the result is compared to that of control. Finally, the strain is applied to selected Cr (VI) contaminated wastewater.

Figure 1: Remediation experiment

Figure 2: Extraction of biosurfactant

LAWRENCE NG YEE FOONG
PhD (MATERIAL SCIENCE)

PhD STUDENT

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Utilisation of nanobiochar and cellulose nanofibrils as nucleating agents in poly(3-hydroxybutyrate-co-hydroxyhexanoate) nanobiocomposite

This study was conducted to develop a hybrid nanocomposite of nanobiochar (NBC), cellulose nanofibril (CNF) and the biodegradable polymer, poly(3-hydroxybutyrate-co-3-hydroxyhexanoate) (PHBHHx) to improve the crystallisation properties of PHBHHx. Before combining the three components into a hybrid nanocomposite, preliminary testing was done to assess the compatibility of NBC and CNF individually as nucleating agents and fillers on PHBHHx. Next, a two-level factorial design was conducted to determine any significant factors that may affect the crystallisation properties of PHBHHx. The factors tested included internal mixing duration, internal mixer RPM, hot-press temperature, NBC content and CNF content. Once the significant factors have been determined, response surface methodology was applied using a central composite design to optimise the formulation and conditions to achieve the best possible crystallisation behavior based on the factors selected.

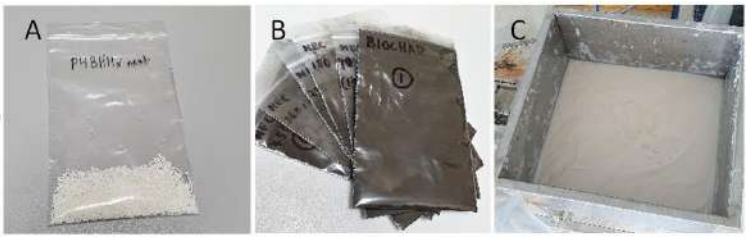

Figure 1:
A) Neat PHBHHx; B) Pure nanobiochar;
C) Pure cellulose nanofibrils

LIANA NOOR MEGASHAH
PhD (INDUSTRIAL BIOTECHNOLOGY)

PhD STUDENT

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Sustainable treatment methods for nanocellulose production from oil palm biomass

Nanocellulose has become of interest in many applications such as in biocomposites, textiles, 3D bio-printing, thickening agents, cosmetics and etc. In brief of this study, upstream process is the main focus in producing nanocellulose. Oil palm biomass (OPB) was used as raw material, and extraction of cellulose by non-halogenated chemical was conducted prior to the production of cellulose nanofiber (CNF). Cellulose was extracted from OPB by introducing sustainable pretreatments methods using the combination of superheated steam, enzyme and totally chlorine-free chemicals. The cellulose pulp produced was then ground using a wet disc mill (WDM) for CNF production. Improvement in CNF production was achieved by further treating the cellulose with superheated steam and cellulase enzyme pretreatments prior to CNF production, which resulted in higher productivity CNF processing. This improvement would be beneficial and useful in scale-up process.

Figure 1: Nanocellulose film obtained from oil palm biomass nanocellulose

MOHAMMED ABDILLAH AHMAD FARID
PhD (ENVIRONMENTAL BIOTECHNOLOGY)

PhD STUDENT

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Effects of residual lignin in oil palm empty fruit bunch cellulose nanofiber on dispersion, mechanical and thermal properties of polypropylene-based bionanocomposite

Nanocellulose has been well studied as reinforcement material in plastic composites. Normally, the production of nanocellulose requires bleaching process to remove the lignin but it is costly and environmentally unfriendly. Our earlier studies have shown that the presence of lignin in CNC improved the thermal and mechanical properties of the natural fiber reinforced plastics which it appears to act as a compatibilizer. Nevertheless, too much lignin will interfere with polymer matrix penetration. In this study, similar approach will be applied to CNF. The optimum lignin content in CNF for improving both the adhesion and thermal properties of bio-nanocomposites will be determined and compared with the commercial compatibilizer. Lignin-CNF (LCNF) samples with various lignin content will be prepared by manipulating the chemical bleaching process and using superheated steam (SHS). The surface potential of LCNF prepared will be determined by zeta potential and compared. SEM-EDX will be used to confirm the distribution of the LCNF in the polymer matrix. It is foreseen that lignin in the LCNF would assist in compatibility between PP and LCNF, and act as natural compatibilizer. Better dispersion of LCNF as compared to CNF within the polymer matrix at higher CNF loading is expected which will be an advantage to the flexural properties of the polymer composites.

Figure 1: Lignocellulose nanofibers

MOHD AZWAN JENOL
PhD (INDUSTRIAL BIOTECHNOLOGY)

PhD STUDENT

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Waste to watts: sago biomass as potential feedstock for bioelectricity generation

The present study was designed to generate the bioelectricity from sago hampas using microbial fuel cells (MFCs). The aim of this study is to exploit biomass as an alternative source in fuel cell as well as to provide the information of possible biomass handling management. The bioconversion of bioelectricity from sago hampas has two main sections; the evaluation of two main platforms (sugar and VFAs) from sago hampas, and direct generation of bioelectricity from solid sago hampas. Sago hampas was subjected to anaerobic digestion and hydrolysis for the production of VFA and fermentable sugar, respectively. These carbon sources produced were used as electron donor in bioelectricity generation. Further, direct biomass fuel cell was done by directly utilise the solid sago hampas as a carbon source in the MFCs. The bioconversion of sago biomass into bioelectricity in MFC is expected to give positive impact in the advancement of MFC field.

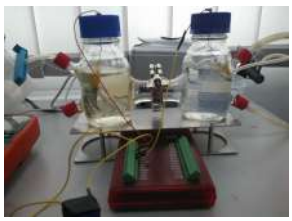

Figure 1: Dual chamber microbial fuel cells for bioelectricity generation

Figure 2: Current practice of waste management of sago hampas in sago starch processing mill

MOHD HAFIF SAMSUDIN
PhD (ENVIRONMENTAL BIOTECHNOLOGY)

PhD STUDENT

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The treatment of organic pollutant from leachate treatment plant (LTP) using biochar-derived bio-adsorbent from a one-step carbonisation

The present study was designed to develop a high surface area of biomass-derived bio-adsorbent from a one-step self-sustained pool-reactor carbonisation process. A normal carbonisation technique cannot achieve adsorbent-for-wastewater standard due to its surface chemistry (low BET surface area, pore size and pore diameter). It does not have enough adsorption capacity for organic pollutants because biochar usually possesses a nonpolar surface due to manufacturing conditions at high temperatures, which is a disadvantage for some applications because of a poor interaction with some polar adsorbates. A one-step self-sustained low temperature carbonisation would be significant progress in a development of biochar technology. High surface area with mesoporous structure can be achieved. It can be achieved by adjusting the moisture content of raw materials at range 20-30% to create a partial activation. Further surface modification step by using composite may improve the surface affinity that required for adsorption process.

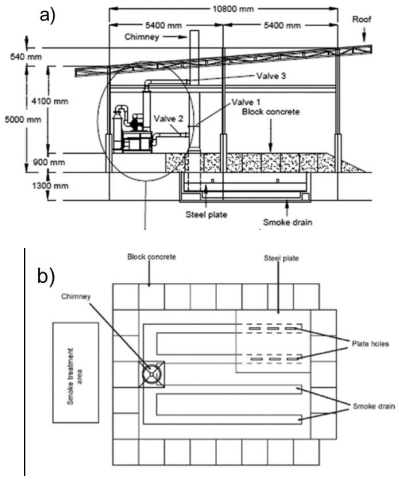

Figure 1: (a) Schematic diagram of pool type reactor, (b) plan view

MOHD IDHAM HAKIMI RAZALI
PhD (ENVIRONMENTAL BIOTECHNOLOGY)

PhD STUDENT

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Utilisation of oil palm trunk for wastewater treatment

The current study emphasised the production of biochar from oil palm trunk (OPT) using slow pyrolysis as the process before activation which later will be used as bioadsorbent for wastewater treatment. Prior carbonisation, the OPT sample was evaluated which the trunk divided into different parts, namely; whole trunk (OPTW), main part of the trunk which consist of peripheral part and core (OPTM), bark (OPTB), peripheral (OPTP) and core (OPTC) (Figure 1). Then, the samples were performed on the proximate and ultimate analysis such as extractives, ash, lignin, cellulose, hemicellulose content, TGA, CHNOS, and FTIR. Finally, the sample will be undergoes carbonisation and the production yield, surface area, pore volumes and size and functional group compounds were determined.

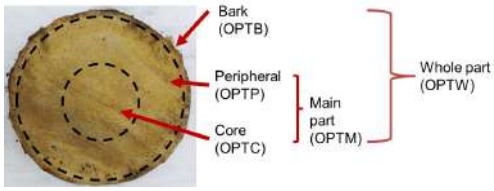

Figure 1: Oil palm trunk cross-section

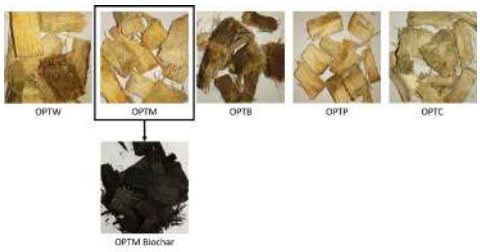

Figure 2: Oil palm trunk's parts and carbonised sample; OPTW (whole part), OPTM (main part), OPTB (bark), OPTP (peripheral), and OPTC (core)

MUHAMAD YUSUF HASAN
PhD (BIOPROCESS ENGINEERING)

PhD STUDENT

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Co-composting oil palm empty fruit bunch and anaerobic sludge palm oil mill effluent in closed system

Co-composting of oil palm empty fruit bunch and sludge palm oil mill effluent waste management in mill area. High lignocellulosic material slows down rate of degradation. Low level and inconsistent of aging sludge and different method of mill operations also contribute to inefficient compost process. Quantify microbes and lignocellulosic degradation to determine of compost stage process and estimates of compost performance to determine through modelling. Composting process factor commonly included in compost mathematical model are about six process factor has been applied in. A deterministic model example substrate degradation limiting process to imitate limitation of actual process. Knowledge of process factor limiting fusion and direct inclusion of the possible interactions between the process factor as part of the model's structure could comprehend composting process. Composting is a complex process hence incorporation factor limiting modeling could gain new insight and practicality which compensates understanding to first principle mathematical model.

Figure 1: Composter

Figure 2: Compost

NIK IDA MARDIANA NIK PA
PhD (ENVIRONMENTAL BIOTECHNOLOGY)

PhD STUDENT

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Expression of codon optimised recombinant *cyclodextrin glycosyltransferase* from *Escherichia coli*

Cyclodextrin glycosyltransferase (CGTase) (EC 2.4.1.19) represents one of the most important groups of microbial amylolytic enzymes, which forms circular α-(1,4)-linked oligosaccharide substrates via covalent intermediate. The production of CGTase has attracted increasing interest owing to the special characteristics of the cyclodextrin with the shape of hollow truncated cone, hence it can be used to encapsulate a variety of compounds. Currently, the production of CGTases from wild-type strains are relatively low at longer incubation time with the mixtures of α-, β- and γ-CDs produced in different ratio, hence contributed to the high cost for cyclodextrin production. Therefore, to tackle those problems, the over-expression of cgt gene in ***Escherichia coli*** expression system was carried out, by integrating the plasmid with His-tagged to ease the protein purification. Furthermore, to solve the issue of low enzyme expression by the recombinant strain, the optimisation of codon usage and inducer supplementation was carried out, hence higher enzyme expression can be achieved for the cyclodextrin production.

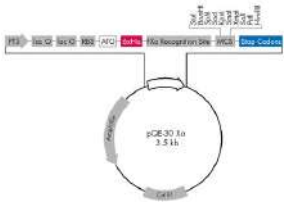

Figure 1: Schematic representation of the expression vector (pQE-30 Xa)

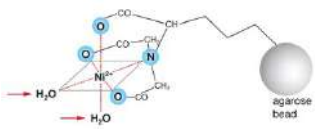

Figure 2: Structure of NTA in complex with Ni2+ for Ni NTA column

NORHANI JUSOH
PhD (INDUSTRIAL BIOTECHNOLOGY)

PhD STUDENT

norhanijusoh@gmail.com Supervisor: Associate Professor Dr. Hidayah Ariffin

Energy efficient and high productivity cellulose nanofibril production from oil palm empty fruit bunch by wet disc milling process

Nanocellulose is cellulosic materials with at least one dimension in the nanometer size and can be isolated from different types of lignocellulosic materials. The present work is designed to develop an energy efficient and high productivity sustainable CNF production by utilizing oil palm empty fruit bunch (OPEFB) as raw material. The study begins with investigation on the effect of feedstock and processing conditions on energy consumption during CNF production through wet disc milling process. Superheated steam is applied as alternative pre-treatment before nanofibrillation using wet disc milling with the aim to reduce the cellulose degree of polymerization (DP). The effect of lignin content on the characteristics and energy consumption during CNF production will also be evaluated. Furthermore, the research is proceeded with large scale simulation of CNF production based on processing conditions of the laboratory scale. The feasibility of large-scale CNF production using excess steam and OPEFB at the palm oil mill will be simulated by using SuperPro Designer software.

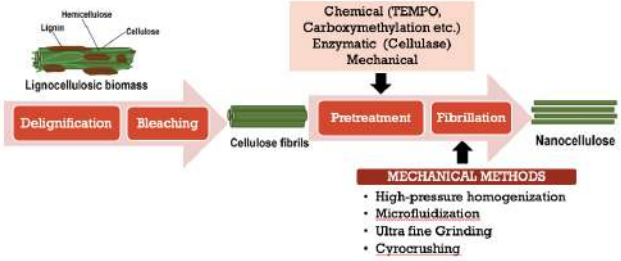

Figure 1: Conventional cellulose nanofibrils production from lignocellulose.

NUR FARIZA ABDUL RAHMAN
PhD (INDUSTRIAL BIOTECHNOLOGY)

PhD STUDENT

nfariza1985@gmail.com Supervisor: Professor Dr. Suraini Abd-Aziz

Lemongrass leaves as potential substrate for ferulic and p-coumaric acids extraction using ionic liquid

Agricultural biomass particularly lemongrass leaves is among one of the highest waste produced in Malaysia yet the report on the valorisation of the leaves is still limited. Lemongrass leaves is famously known for its extracted essential oil, however, information on the phenolic content of the leaves specifically ferulic acid and p-coumaric acid are still inadequate. Ferulic and p-coumaric acids display relevant properties in the food, health, cosmetic and pharmaceutical fields. Besides that, both acids are potential precursors in the biocatalytic production of aromatic natural products such as biovanillin and p-hydroxybenzaldehyde, which could be found in vanilla. Extraction of phenolic compounds from biomass are oftenly conducted using volatile and hazardous organic solvent. Based on this shortcoming, the use of ionic liquid (IL) which is a liquid salt at room temperature that consist of organic cation and organic/inorganic anion, is explored in this study as an alternative to organic solvent.

Figure 1: Unutilised lemongrass leaves at lemongrass farm in Beranang, Negeri Sembilan.

Figure 2: Extraction of phenolic acids from lemongrass leaves using ionic liquids.

NUR SHARMILA SHARIP
PhD (MATERIAL SCIENCE)

PhD STUDENT

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Nanocellulose for tibial inserts potential application

Ultra-high molecular weight polyethylene (UHMWPE) has been long used for components of artificial joint replacement (arthroplasty) such as tibial inserts. Yet the longevity of this material is limited by abrasion and fatigue due to rolling and sliding of metal components on its surface under external load. These wear effects cause generation of wear debris which in the end leads to inflammation, osteolysis and failure. Therefore, this research focuses on implementing cellulose nanofibrils (CNF) as filler in UHMWPE polymer matrix. Besides possessing good biocompatibility, CNF as a nature-based material bears an excellent mechanical properties, tailorable surface chemistry, good flexibility and elasticity. Considering higher aspect ratio materials can be more effective in improving hardness and modulus of UHMWPE, focus on research using CNF, a high aspect ratio organic materials would be beneficial to the field. Accordingly, the use of CNF in UHMWPE could produce a material with good biocompatibility as arthroplasty components.

Figure 1: UHMWPE as component of total knee arthroplasty.

Figure 2: The UHMWPE/CNF nanocomposite and neat UHMWPE

RUQAYYAH MASRAN
PhD (INDUSTRIAL BIOTECHNOLOGY)

PhD STUDENT

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Pretreatment of oil palm empty fruit bunch using lignocellulolytic enzymes for production of fermentable sugars

To date, Malaysia rank in the second place as a global palm oil producer. However, a non-systematic biomass management system despite the rapid growth of oil palm plantation in Malaysia contributes a lot to biomass accumulation in huge amount. Oil palm empty fruit bunch (OPEFB) was tough to be degraded naturally due to its complexity in structure. Common industrial practice used chemical and physical treatment to treat the OPEFB as it performs faster in hydrolysing the biomass than biological treatment does. However, as the world is moving towards green concept, chemical treatment is no longer suitable to be practiced because it produce harmful by-products and it give low yield of fermentable sugars. In this study, the OPEFB was treated biologically using lignocellulolytic enzymes due to environmental concern. The OPEFB is subjected to enzymatic hydrolysis by crude lignocellulolytic enzymes to produce fermentable sugars. Hence, the biological approach for pretreatment and saccharification process is expected to result in high lignin removal and consequently produces high fermentable sugars concentration.

Figure 1: ***Pycnoporus sanguineus*** UPM4

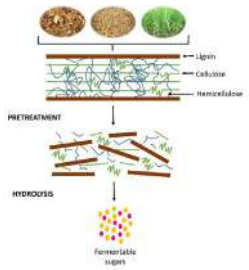

Figure 2: Overview of lignocellulosic biomass pretreatment and hydrolysis

SITI JAMILAH HANIM MOHD YUSOF
PhD (BIOCHEMICAL ENGINEERING)

PhD STUDENT

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Hydrothermal pretreatment for enhancing biosugars production from oil palm frond

Generation of dry solid biomass from the oil palm industry is predicted to increase up to 110 million tonnes in 2020. Oil palm frond is among the main oil palm wastes produced. The main concern in the application of lignocellulosic materials is that it requires aggressive pretreatment to break down the complex matrix formed by cellulose, hemicellulose and lignin. Among available pretreatment methods, hydrothermal pretreatment appeared to effectively improve the digestibility of lignocellulosic biomass which leads to higher sugar yield. This work investigates the performance of hydrothermal pretreatment in improving sugar recovery from oil palm frond. Findings from this study are expected to provide better understanding on hydrothermal hydrolysis and further highlight the potential of oil palm frond as a renewable carbon source.

Figure 1: Experimental apparatus

Figure 2: HPLC sample preparation

SITI SULIZA SALAMAT
PhD DUAL DEGREE (UPM & KYUTECH)

PhD STUDENT

siti_sayyidah@yahoo.com Supervisor: Professor Dato' Dr. Mohd Ali Hassan, Professor Dr. Yoshihito Shirai

The use of oil palm empty fruit bunch and palm oil mill effluent as compost in oil palm plantations: nutrients recycling system for oil palm industry

Fertilisers are used to enhance the growth and health plants. Frequent and long-term application of chemical fertiliser could affect soil biodiversity. Malaysia produces about 59 percent of the world's supply of palm oil and second largest produce after Indonesia. Excess fertiliser application to oil palm plantation may happen to increased consumption and excessive chemical fertiliser application that eventually led to environmental pollution. In Malaysia, one cycle of oil palm plantation need around 25 years. Many research on physical and chemical characteristic for short and long term done on plant and soil of oil palm plantation. By the way, effect on frequently application for long term used inorganic fertiliser still make question on affect on soil diversity has not been reported. So this research conduct for this investigated application base on physical characteristic, chemical composition, microbial diversity and oil palm production correlation.

Figure 1: Compost preparation at Biorefinery Complex, UPM.

Figure 2: Members of composting project
at Oil Palm Plantation, FELDA Serting Hilir, Negeri Sembilan.

YUYA HASHIGUCHI
PhD DUAL DEGREE (UPM & KYUTECH)

PhD STUDENT

adamyuya0702@gmail.com **Supervisor:** Associate Professor Dr. Mohd Rafein Zakaria

Identification and evaluation of toxicants in palm oil mill effluent final discharge in Malaysia

In this study, the toxicity effect of POME final discharge samples from three different palm oil mills were evaluated based on whole effluent toxicity (WET) and toxicity identification evaluation (TIE) using daphnia magna and zebrafish embryo. First, POME final discharge samples were characterised to know the basic parameters and minerals concentration. Second, the toxicity of POME final discharge was conducted by WET method to observe a LC50. Third, TIE procedure was conducted, which include three phases. At the beginning of the TIE, phase I was performed with pH adjustments, aeration, filter, solid phase extraction, EDTA and STS addition processes to categorize the group of toxicants. Then toxicity tests were conducted using the solutions after manipulated in TIE phase I. In TIE Phase II, the suspected toxicants were identified by GC-MS. Finally, in TIE Phase III, the suspected toxicants were confirmed with original these chemicals by GC-MS whether these chemicals were really toxic to test organisms.

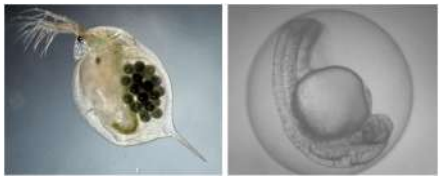


Figure 1: Daphnia magna and zebrafish embryo

ADRIANNA CONNIE LEE
MSc (INDUSTRIAL BIOTECHNOLOGY)

MASTER STUDENT

adrianalee1810@gmail.com **Supervisor:** Professor Dr. Suraini Abd-Aziz

Production of bacterial nanocellulose (BNC) from pineapple peels

Production of bacterial nanocellulose (BNC) is becoming popular owing to its environmentally friendly properties. It offers applications in a variety of contexts, such as in the food industry. However, culture medium to produce BNC occupies approximately 30% of the total cost. The challenge now is to identify a new cost-effective culture medium that can produce high yield of BNC within short periods of time. Since Malaysia is blessed with abundant agricultural wastes such as pineapple wastes, utilisation of this raw material could generate extra benefit to the related industries while at the same time developing new culture medium for BNC production. This study aims to utilise the pineapple peels as potential substrate for the production of BNC (prior to pretreatment for fermentable sugar release). The BNC produced were then subjected as raw materials for food specifically for the production of Nata de pina (from pineapple fruits).

Figure 1: Bacterial nanocellulose

AHMAD AIMAN ZULFKIFLI
MSc (ENVIRONMENTAL BIOTECHNOLOGY)

MASTER STUDENT

mankea89@gmail.com Supervisor: Professor Dato' Dr. Mohd Ali Hassan

Utilisation of food waste in UPM for biogas production

UPM generated about 5 - 6 tonnes of municipal solid waste (MSW) every day. Organic waste fraction contributes about 35% from the MSW generated. Organic waste which consists mostly of food waste has potential to be utilised as feedstock for biogas production. Biogas contains about 60% of methane (CH4) which can be used for cooking or conversion to electricity via gas engine. First, a survey on MSW generation and composition were conducted on different categories of consumer in UPM. Second, an experiment was performed at pilot plant scale. MSW obtained from the source is segregated, then the organic waste fraction is mixed with water (1:1 ratio) and grinded into a slurry form. The slurry will be transferred into anaerobic digester for biogas production. In order to increase the production of biogas and methane yield, parameters such as organic loading rate, hydraulic retention time, pH, temperature (mesophilic) of the anaerobic pH, temperature (mesophilic) of the anaerobic digester was optimised.

Figure 1: Pilot plant scale anaerobic digester

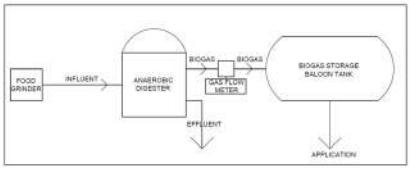


Figure 2: Flow diagram of biogas production

FARAH NABILA MOHD IDRIS
MSc (BIOPOLYMER, PULP & PAPER TECHNOLOGY)

MASTER STUDENT

GS52146@student.upm.edu.my Supervisor: Associate Professor Dr. Hidayah Ariffin

Evaluation on the use of lignocellulose nanofibers in papermaking process and characteristics

The present study was conducted to investigate the effect of lignin content in cellulose nanofibers from Oil Palm Empty Fruit Bunch (OPEFB) as filler on papermaking process and characteristics of paper with the aim to improve the drainage time and mechanical performance; tensile strength and tear resistance. Different lignin content was obtained through several bleaching stages of unbleached pulps and fibrillate into nanofibers. The lignocellulose nanofibers (LCNF) were then reinforced as filler into the base pulp for paper production. The runnability of the papermaking process was evaluated in term of drainage time while characteristics of the paper were evaluated in terms of physical and mechanical properties. Findings from this study are expected to provide better understanding on the presence of lignin in papermaking process and its effect on the performance of the paper.

Figure 1: Raw OPEFB

Figure 2: Unbleached Pulp (after pulping process)

IZZA NADIRA ABU BAKAR
MSc (ENVIRONMENTAL BIOTECHNOLOGY)

MASTER STUDENT

izzanadira@gmail.com Supervisor: Associate Professor Dr. Mohamad Faizal Ibrahim

Fortified biocompost to enhance bioactive compounds in pegaga (*Centella asiatica* L.)

The present study was designed to formulate the fortified biocompost from Oil Palm Empty Fruit Bunch (OPEFB) for the enhancement of bioactive compounds in Pegaga ***(Centella asiatica L.)***. Different formulation and ratio of biocompost will be formulated and fortified with biochar with the addition of fertilisers. The fortified biocompost will then be used as a medium to plant the Pegaga. Once the planting and cultivation is done, the Pegaga will be analysed to determine whether the fortified biocompost were able to enhance the bioactive compounds in Pegaga known for its medicinal, nutraceutical and pharmaceutical properties.

Figure 1: Planting pots of Pegaga with different ratios of fortified biocompost.

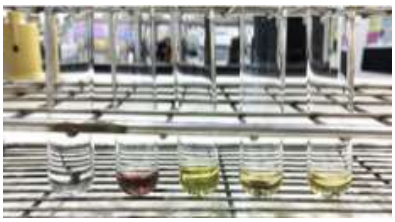
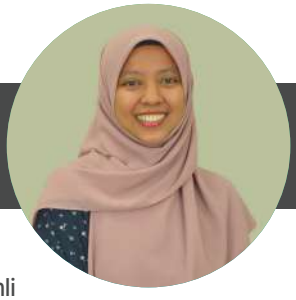


Figure 2: Total Phenolic Content Analysis



NOOR SHAIDATUL LYANA MOHAMAD ZAINAL
MSc (ENVIRONMENTAL BIOTECHNOLOGY)

MASTER STUDENT

lyanazainal.ansarullah@gmail.com Supervisor: Associate Professor Dr. Norhayati Ramli

Survivability of bacterial community in the river water induced by palm oil mill effluent (POME) final discharge and post-zero emission system

This study aimed to assess the factors that caused the bacterial community survivability, particularly ***Chromatiaceae*** and ***Alcaligenaceae*** in correlation with the changes of physicochemical properties of POME. Several factors will be tested including temperature, pH, concentration of total suspended solids and UV irradiation. In addition, a lab-scale river water system will be set up to assess the bacterial community shift after the implementation of zero-emission of POME final discharge system. The changes in functional status of bacteria including the total cell concentration, the viability of bacterial cells and the nucleic acid contents will be assessed by using nucleic acid double staining assay based on flow cytometry. Meanwhile, the changes on the composition of bacterial community will be analysed by using Illumina MiSeq.

Figure 1: Sampling point of POME Final Discharge

Figure 2: Bacterial community composition will be analysed using Illumina MiSeq machine

NOR FARHANA AZIZ UJANG
MSc (ENVIRONMENTAL BIOTECHNOLOGY)

MASTER STUDENT

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Treatment for POME final discharge using wetland system

Palm oil industries are the largest industries in Malaysia so there were more than 3.79 million hectares of land, occupying more than one-third of the total cultivated areas and 11% of the total land area, under palm oil cultivation in Malaysia in the year 2003. Malaysia produces a large amount of palm oil every year and resulting into production of more than 13 million tons of crude palm oil yearly also its cover 11% of Malaysian land for plantation area. The POME contains high COD, high BOD, soluble materials and some gases such as CH4, SO2 and NH3. It also contain halogens, low pH (acidic), large amount of solid, high oil and grease, it is hot, brownish colloidal suspension contain high concentration of organic matters and contain N, P, K, Mg, Ca, Al with low concentration of Pb that can cause a pollution if it is discharging without proper treatment. An average of about 53 million m3 POME is being produced per year in Malaysia. Therefore we need to treat this wastewater. For this experiment, POME will be treated using the wetland system. This wetland system is more compatible as compare to other system to treat the POME final discharge since it is more cost effective and fewer side effects to the environment.

Figure 1: Collection of POME final discharge.

Figure 2: Wetland system in biorefinery.

NUR AINA NATASHA MOHD ASMADI
MSc (ENVIRONMENTAL BIOTECHNOLOGY)

MASTER STUDENT

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Biosurfactant production from sludge pit oil by *Pseudomonas* strain

Most surfactants used are only partially and slowly biodegradable; hence it contributes to environmental pollution. Therefore, new approach in biotechnology research on the production of microbial surfactant or known as biosurfactants. It has high potential for becoming the next generation of biosurfactants. It contains of one or two sugar unit linked to one or two B-hydroxy fatty acids, which mainly known to be produced by ***Pseudomonas*** strain. This study was conducted to optimise and characterise the production biosurfactant grown on sludge pit oil as substrate. The bacterial strain ***Pseudomonas*** was inoculated in mineral salt medium with different types of carbon sources, concentrations of carbon source, types of nitrogen sources and concentration of nitrogen sources. The 1L fermentation was conducted supplemented with the optimised conditions. The biosurfactant were extracted and purified prior characterisation. Thus, these biologically produced molecules reported to have lower impact on the environmental and better in biodegradability and less toxicity as conventional surfactant.

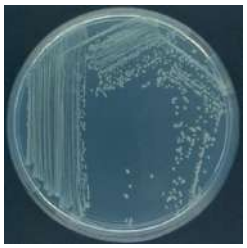

Figure 1: ***Pseudomonas*** strain for biosurfactant production

Figure 2: Fermentation for the production of biosurfactant

NURHANI FATIHAH JARIAH
MSc (ENVIRONMENTAL BIOTECHNOLOGY)

MASTER STUDENT

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Purification of biodiesel from grease trap waste using oil palm biomass derivatives

Recently, the global energy demand is increasing due to the fast industrialisation and population growth and also; the main energy resources like gas, oil and coal are decreasing from day to day. Biodiesel has attracted numerous researchers worldwide and it was found that it is the best alternative fuels that could reduce both energy and environmental deterioration. Biodiesel is a diesel fuel substitute derived from the transesterification reaction of triglycerides with alcohol in the presence of catalyst. In this study, grease trap waste will be used as feedstock for the biodiesel production and further purification to remove impurities will be achieved by using activated carbon derived from oil palm biomass. The purified biodiesel will be analysed for the methanol content, free fatty acid content, water content, free glycerine content, triglyceride and potassium content in order to meet the European Biodiesel Standards (EN 14214).

Figure 1: Waste oil was collected in the Schott bottle.

Figure 2: Mixture of oil, sulphuric acid and methanol was refluxed for 3 hours.

NURHASLIZA ZOLKEFLI
MSc (ENVIRONMENTAL BIOTECHNOLOGY)

MASTER STUDENT

hasliza.zolkefli@gmail.com Supervisor: Associate Professor Dr. Norhayati Ramli

Quantification of the functional gene amplification in palm oil mill effluent biodegradation for the development of molecular-based indicator

This research is attempted as a fundamental study to establish a complementary molecular based monitoring system for the currently adapted physicochemical evaluation in determining river pollution caused by palm oil mill effluent (POME). At the earlier stage of this study, metagenomics sequencing was done by Illumina MiSeq platform to confirm the unique presence of bacterial family/order in POME final discharge polluted rivers. In addition, the relationship between the presences of POME contaminants in the rivers with bacterial growth metabolisms were also quantitatively experimented through flow cytometry (FCM) analyses. From the understanding of POME biodegradation pathways, significant genes were conventionally screened by polymerase chain reactions (PCR). Further confirmation will be done by real-time PCR where the amplification of the selected functional genes are relatively quantified and compared between the POME source and the receiving waterway.

Figure 1: Palm oil mill effluent mixing pond.

Figure 2: Flow cytometry for bacterial cell quantitative analyses

NURUL ATIQAH OSMAN
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Bio-sugar production from napier grass grown on palm oil mill effluent final discharge

Napier grass ***(Pennisetum purpureum)***, also known as "elephant grass" was first introduced in Malaysia in the 1920's from East Africa. There are a few of Napier grass varieties, namely common Napier, red Napier, and Australian dwarf. Like every other biomass, Napier grass is made of lignocellulosic materials, which is a promising feedstock for renewable biofuel production. In a parallel study, Napier grass has shown the capability to phytoremediate polluted waters. However, the effect of those polluted waters towards the Napier grass and its further use is unknown. Therefore, this study attempts to evaluate the physical characteristic of Napier grass supplied with POME final discharge in a constructed wetland system. In addition, this study also attempts to determine the effect of POME final discharge towards the concentration of biosugar in the Napier grass constructed wetland after saccharification.

Figure 1: Napier grass's juice according to the cultivars and treatment

Figure 2: Grinded sample (Above from left: Common control stem, Common treatment stem, Common control leaves, Common treatment leaves; Below from left: Red control stem, Red treatment stem, Red control leaves, Red treatment leaves).

NURUL HAZIQAH ALIAS
MSc (ENVIRONMENTAL BIOTECHNOLOGY)

MASTER STUDENT

nhaziqahalias95@gmail.com Supervisor: Associate Professor Dr. Mohamad Faizal Ibrahim

Fed-batch saccharification of sago hampas into fermentable sugars for biobutanol production

The recent increases in energy demand and crisis on depletion of fossil fuel worldwide have diverted attention among researchers all around the world towards the utilisation of renewable sources for bio-based fuels. The sago agricultural waste or better known as sago hampas is a starchy, lignocellulosic residue that has produced from sago starch processing industries. It has been recognised as one of the alternative raw materials due to its availability, free and abundantly found in Sarawak. The high content of starch (58-60%) and lignocellulosic components (35.9%) in sago hampas can contributes to environmental problem without a proper treatment. Therefore, sago hampas was used in this study as a substrate for saccharification process to produce fermentable sugars in order to be consumed by ***Clostridium acetobutylicum*** ATCC 824 for biobutanol production. Fed-batch type of saccharification along with optimisation study was conducted in this study and were focused on feeding time, substrate loading, agitation speed and initial enzyme loading.

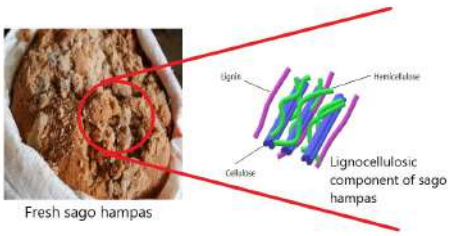


Figure 1: Close-up of lignocellulosic composition of sago hampas

NURUL SABRENA HANAFI @ MOHD HANAFI
MSc (INDUSTRIAL BIOTECHNOLOGY)

MASTER STUDENT

sabrena95@gmail.com Supervisor: Professor Dr. Suraini Abd-Aziz

The potential use of *Calophyllum inophyllum* L. seed oil and used cooking oil mixture as environmentally friendly biolubricant

Calophyllum inophyllum L. is one of the most potential plants for biodiesel feedstock because of its high oil content. Mechanical extraction using screw press is one method to get oil from ***C. inophyllum L.*** seed. The future prospect the uses of lubricant petroleum on the vehicle's engine is predicted to have a bad prospect. Thus, began research to identify suitable materials to replace petroleum-based lubricants. It can produce from vegetable oils and animals's oils by chemical modification. But, biolubricant properties are easily damaged, so research to improve the shelf life of the biolubricant must be done to improve the characteristics such as addition of biolubricant additive or mixture of bio-oil. With the collaboration with Universitas Indonesia, the project objectives are to characterise the ***C. inophyllum L.*** oil and use cooking oil properties for the formulation of biolubricant and to optimise the formulation of biolubricant and to optimise the formulation of biolubricant properties to replace the petroleum-based lubricants.

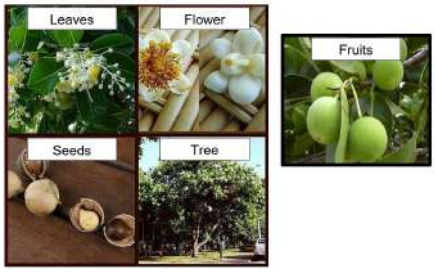


Figure 1: Nyamplung ***(Calophyllum inophyllum L.)***

SHOBANAH MENON BASKARAN
MSc (ENVIRONMENTAL BIOTECHNOLOGY)

MASTER STUDENT

shobanahlcw@gmail.com Supervisor: Associate Professor Dr. Mohd Rafein Zakaria

Biosurfactant production by *Pseudomonas aeruginosa* RS6 using biodiesel side stream waste glycerol as a substrate

The growth and production of rhamnolipid by ***Pseudomonas aeruginosa*** using waste glycerol from biodiesel production as a carbon source is carried in this study. The optimisation is conducted in a laboratory scale and will be tested in a pilot- scale. Majority of the surfactants present these days are derived from petrochemical sources that might lead to environmental issues due to their low biodegradability and toxicity. Physical and chemical properties like emulsification, highly biodegradable, low surface tension, antimicrobial and antifungal properties, and less toxicity make biosurfactant is more attractive than a chemical-based surfactant. Although there are numerous studies exhibited the advantages of biosurfactants, cost-effective, relatively high raw-material prices and sustainable production of biosurfactant will be the major concern for large-scale production. This study aims to produce rhamnolipid at a laboratory and pilot-scale with low production cost.

Figure 1: Fermentation of biosurfactant in 2L bioreactor.

SITI SHAZRA SHAZLEEN SHAMSUDIN
MSc (MATERIAL SCIENCE)

MASTER STUDENT

shazra.shazleen@yahoo.com Supervisor: Associate Professor Dr. Hidayah Ariffin

Cellulose nanofiber as nucleating agent for polylactic acid biopolymer

This study is conducted to investigate the nucleation effect of cellulose nanofibers (CNF) on polylactic acid (PLA) biopolymer with the aim to improve its crystallisation behaviors such as crystallisation rate and crystal nucleation density. PLA, CNF and maleated PLA (compatibilizer) are compounded to determine the nucleation effect of CNF on isothermal and non-isothermal crystallisation of PLA. Nanocomposites obtained will be further characterised and compared with control samples which are neat biopolymer in terms of mechanical, morphological, thermal and barrier properties.

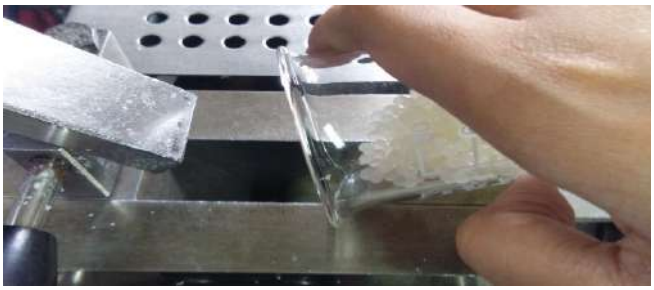


Figure 1: Preparation of PLA/CNF nanocomposite using internal mixer (Brabender)

NEW REGISTERED STUDENT

SITI SUHAILAH SHARUDDIN
Program : Phd (Environmental Biotechnology)
Supervisor : Associate Professor Dr. Norhayati Ramli
Research title : Development of biological indicator to indicate contamination in the river water due to palm oil mill effluent final discharge.

NUR LIYANA MOHD IZAN
Program : Msc (Environmental Biotechnology)
Supervisor : Dr. Ezyana Kamal Bahrin
Research title : Characterization of mycelium based oil palm biomass composite produced using different local fungi.

ALUMNI 2019

Dr. Diana Mohd Nor

Title of project:
Bacterial and Methanogenic Archaeal Community Changes during Treatment of Palm Oil Mill Effluent and Biological Indicators for Final Discharge

Former supervisor:
Associate Professor Dr. Norhayati Ramli

Nurul Hanisah Md Badrul Hisham

Title of project:
Production of Biosurfactant from Used Cooking Oil by Local Bacterial Isolates for Heavy Metals Removal

Former supervisor:
Professor Dr. Suriani Abd Aziz

Muhammad Siddiq Mohamed Salleh

Title of project:
Simultaneous Saccharification and Fermentation with Delayed Yeast Extract Feeding and In-situ Recovery for Biobutanol Production from Oil Palm Empty Fruit Bunch

Former supervisor:
Associate Professor Dr. Mohamad Faizal Ibrahim

Marahaini Md Mokhtar

Title of project:
Elucidation of Uncharacterised Pseudogene of Biohydrogen Production

Former supervisor:
Dr. Mohd Zulkhairi Mohd Yusoff

Nurshazana Mohamad

Title of project:
Feasibility Study on the Extraction Methods of Essential Oil from Pineapple Peel

Former supervisor:
Associate Professor Dr. Mohamad Faizal Ibrahim

Mohamad Farhan Mohamad Sobri

Title of project:
Characterisation and Expression of Recombinant Beta-glucosidase 2 from *Trichoderma Asperellum* UPM1

Former supervisor:
Associate Professor Dr. Norhayati Ramli

Enis Natasha Noor Arbaain

Title of project:
Biological Pretreatment of Oil Palm Empty Fruit Bunch by a Local Isolate of *Schizophyllum Commune* ENN1 for Production of Fermentable Sugar

Former supervisor:
Dr. Ezyana Kamal Bahrin

LIST OF ALUMNI 2007-2018

YEAR	ALUMNI	PLACEMENT	CURRENT POSITION	DEGREE	FORMER SUPERVISOR
2007	Dr. Cheong Weng Chung	Ministry of Science, Technology and Innovation (MOSTI)	Principal Assistant Secretary	PhD	Professor Dato' Dr. Mohd Ali Hassan
	Dr. Shahrakbah Yacob	Sime Darby Plantation Berhad, Selangor	Principal Agronomist	PhD	Professor Dato' Dr. Mohd Ali Hassan
	Dr. Majd Khalid Eshtaya	An-Najah National University, Palastine	Lecturer	MSc	Professor Dato' Dr. Mohd Ali Hassan
2008	Associate Professor Dr. Tengku Elida Tengku Zainal Mulok	Faculty of Applied Sciences, UiTM Shah Alam	Associate Professor	PhD	Professor Dato' Dr. Mohd Ali Hassan
	Zulkarami Berahim	Institute of Tropical Agriculture & Food Security, UPM	Research Officer	PhD	Professor Dr. Suraini Abd Aziz
2009	Associate Professor Dr. Hidayah Ariffin	Faculty of Biotechnology and Biomolecular Sciences, UPM	Associate Professor	PhD	Professor Dr. Yoshihito Shirai
	Dr. Mei-Ling Chong	Technology Park Malaysia	Research Officer	PhD	Professor Dato' Dr. Mohd Ali Hassan
	Dr. Meisam Tabatabei	Agricultural Biotechnology Research Institute of Iran (ABRII), Iran	Assistance Professor	PhD	Professor Dato' Dr. Mohd Ali Hassan
	Zatilfarihiah Rasdi	Faculty of Dentistry, UiTM Sungai Buloh	Senior Lecturer	MSc	Associate Professor Dr. Nor'Aini Abdul Rahman
2010	Associate Professor Dr. Norjan Yusof	Faculty of Science &Mathematics, Universiti Pendidikan Sultan Idris (UPSI)	Associate Professor	PhD	Professor Dr. Yoshihito Shirai
	Dr. Khanom Simarani	Faculty of Sciences, UM	Senior Lecturer	PhD	Professor Dr. Yoshihito Shirai
	Dr. Azahari Samsu Baharuddin	Faculty of Engineering, UPM	Senior Lecturer	PhD	Professor Dato' Dr. Mohd Ali Hassan
	Dr. Alawi Sulaiman	Faculty of Plantation and Agrotechnology, Universiti Teknologi Mara (UiTM), Shah Alam	Senior Lecturer	PhD	Professor Dato' Dr. Mohd Ali Hassan
	Dr. Mohd Zulkhairi Mohd Yusoff	Faculty of Biotechnology and Biomolecular Sciences, UPM	Senior Lecturer	MSc	Professor Dato' Dr. Mohd Ali Hassan
2011	Dr. Tabassum Mumtaz	Microbiology and Industrial Irradiation Division, IFRB , Bangladesh.	Principal Scientific Officer	PhD	Professor Dato' Dr. Mohd Ali Hassan
	Dr. Nazlina Haiza Mohd Yasin	Faculty Engineering and Built Environment, UKM, Selangor	Senior Lecturer	MSc	Associate Professor Dr. Nor'Aini Abdul Rahman
	Dr. Ahmad Muhaimin Roslan	Faculty of Biotechnology and Biomolecular Sciences, UPM	Senior Lecturer	MSc	Professor Dato' Dr. Mohd Ali Hassan

LIST OF ALUMNI 2007-2018

YEAR	ALUMNI	PLACEMENT	CURRENT POSITION	DEGREE	FORMER SUPERVISOR
2011	Farah Nadia Omar	Faculty of Engineering, UPM	Postdoctoral Researcher	Msc	Associate Professor Dr. Nor'Aini Abdul Rahman
	Halimatun Saadiah Hafid	KYUTECH, Japan	Postdoctoral Researcher	Msc	Associate Professor Dr. Nor'Aini Abdul Rahman
	Isnazunita Ismail	Environmental Technology Research Centre, SIRIM Berhad, Shah Alam, Selangor	General Manager	Msc	Professor Dato' Dr. Mohd Ali Hassan
	Lim Siong Hock	Self Employed	Self Employed	Msc	Professor Dato' Dr. Mohd Ali Hassan
	Nurul Kartini Abu Bakar	Malaysian Technology Development Corporation, Kuala Lumpur	Head of Unit Processing TAF/CRDF	Msc	Professor Dr. Suraini Abd Aziz
2012	Associate Professor Dr. Norhayati Ramli	Faculty of Biotechnology and Biomolecular Sciences, UPM	Associate Professor	PhD	Professor Dr. Suraini Abd Aziz
	Dr. Mitra Mohammadi	Khedgarayan Mohatar Institute of Higher Education	Assistant Professor	PhD	Professor Dato' Dr. Mohd Ali Hassan
	Dr. Ahmad Amiruddin Mohd Ali	KYUTECH, Japan	Postdoctoral Researcher	PhD	Professor Dr. Yoshihito Shirai
	Dr. Nurul Asyifah Mustapha	KYUTECH, Japan	Postdoctoral Researcher	Msc	Professor Dr. Suraini Abd Aziz
	Associate Professor Dr. Mohd Rafein Zakaria	Faculty of Biotechnology and Biomolecular Sciences, UPM	Senior Lecturer	Msc	Professor Dato' Dr. Mohd Ali Hassan
	Mohd Najib Ahmad	Malaysia Palm Oil Board	Research Officer	Msc	Professor Dato' Dr. Mohd Ali Hassan
2013	Dr. Mior Ahmad Khushairi Mohd Zahari	Universiti Malaysia Pahang (UMP), Pahang	Senior Lecturer	PhD	Professor Dato' Dr. Mohd Ali Hassan
	Associate Professor Dr. Mohamad Faizal Ibrahim	Faculty of Biotechnology and Biomolecular Sciences, UPM	Senior Lecturer	PhD	Professor Dr. Suraini Abd Aziz
	Dr. Ezyana Kamal Bahrin	Centre of Foundation Studies for Agricultural Science, UPM	Senior Lecturer	PhD	Professor Dr. Suraini Abd Aziz
	Dr. Mohd Zulkhairi Mohd Yusoff	Faculty of Biotechnology and Biomolecular Sciences, UPM	Senior Lecturer	PhD	Associate Professor Dr. Toshinari Maeda
	Fairouz Jahaan Mohd Aanifah	Malaysian Qualifications Agency (MQA), Selangor	Assistant Director	Msc	Professor Dr. Suraini Abd Aziz
	Siren Linggang	Department of Agriculture Sarawak, Sarawak	Research Officer	Msc	Professor Dr. Suraini Abd Aziz

LIST OF ALUMNI 2007-2018

YEAR	ALUMNI	PLACEMENT	CURRENT POSITION	DEGREE	FORMER SUPERVISOR
2014	Dr. Saleha Samsudin	School of Bioprocess, Universiti Malaysia Perlis (UniMAP), Perlis	Senior Lecturer	PhD	Professor Dato' Dr. Mohd Ali Hassan
	Dr. Nor Asma' Abdul Razak	Biomolecule Medicine Laboratory, Institute of Bioscience, UPM	Research Officer	PhD	Professor Dato' Dr. Mohd Ali Hassan
	Dr. Ahmad Muhaimin Roslan	Faculty of Biotechnology and Biomolecular Sciences, UPM	Senior Lecturer	PhD	Professor Dr. Yoshihito Shirai
	Sheril Norliana Suhaimi	Segi University Kota Damansara, Selangor	Junior Lecturer	Msc	Associate Professor Dr. Phang Lai Yee
	Mohamad Nafis Abdul Razak	Johor Bahru District Office, Johor	Admin Executive	Msc	Professor Dr. Suraini Abd Aziz
	Mohd Azwan Jenol	Biomass Technology Laboratory, UPM	PhD Student	Msc	Professor Dr. Suraini Abd Aziz
	Mohd Nor Faiz Norrahim	Research Center for Chemical Defence, UPNM	Postdoctoral Researcher	Msc	Associate Professor Dr. Hidayah Ariffin
	Nur Amelia Azreen Adnan	Monash University Malaysia, Selangor	Research Assistant	Msc	Associate Professor Dr. Phang Lai Yee
2015	Dr. Dayang Salwani Awang Adeni	UNIMAS, Sarawak	Senior Lecturer	PhD	Professor Dr. Suraini Abd Aziz
	Dr. Juferi Idris	UiTM, Sarawak	Senior Lecturer	PhD	Professor Dato' Dr. Mohd Ali Hassan
	Dr. Mohd Huzairi Mohd Zainudin	Institute of Tropical Agriculture & Food Security, UPM	Research Officer	PhD	Professor Dato' Dr. Mohd Ali Hassan
	Dr. Sharifah Soplah Syed Abdullah	UniKL, Malacca	Senior Lecturer	PhD	Professor Dr. Yoshihito Shirai
	Che Mohd Hakiman Che Maail	Danio Assay Laboratories Sdn Bhd	CEO	Msc	Associate Professor Dr. Hidayah Ariffin
	Nur Falia Shazana Manja Farid	Lynas Malaysia Sdn. Bhd., Pahang	Lab Analysts	Msc	Associate Professor Dr. Hidayah Ariffin
	Mohd Rahimi Zakaria @ Mamat	Malaysia Rubber Board, Selangor	Research Officer	Msc	Associate Professor Dr. Hidayah Ariffin

LIST OF ALUMNI 2007-2018

YEAR	ALUMNI	PLACEMENT	CURRENT POSITION	DEGREE	FORMER SUPERVISOR
2016	Dr. Zuraidah Zanirun	Self Employed	Self Employed	PhD	Professor Dr. Suraini Abd Aziz
	Dr. Noor Ida Amalina Adamad Nordin	Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang	Senior Lecturer	PhD	Associate Professor Dr. Hidayah Ariffin
	Dr. Rozaimi Abu Samah	Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang	Senior Lecturer	PhD	Professor Dr. Suraini Abd Aziz
	Izzudin Ibrahim	KYUTECH, Japan	PhD Student	Msc	Professor Dato' Dr. Mohd Ali Hassan
	Nur Sharmila Sharip	Institute of Tropical Forestry and Forest Products (INTROP), UPM	PhD Student	Msc	Associate Professor Dr. Hidayah Ariffin
	Mohd Ridzuan Othman	Biomass Technology Laboratory, UPM	Science Officer	Msc	Professor Dato' Dr. Mohd Ali Hassan
2017	Dr. Nur Ain Zamzuri	Self Employed	Self Employed	PhD	Professor Dr. Suraini Abd Aziz
	Dr. Dhurga Devi Rajaratanam	Self Employed	Self Employed	PhD	Associate Professor Dr. Hidayah Ariffin
	Mohammed Abdillah Ahmad Farid	Biomass Technology Laboratory, UPM	PhD Student	Msc	Professor Dato' Dr. Mohd Ali Hassan
	Muhammad Nazmir Mohd Warid	Biocon Sdn Bhd	QCM Associate	Msc	Associate Professor Dr. Hidayah Ariffin
	Zulnaim Dzulkurnain	Biocon Sdn Bhd	QCA Trainee	Msc	Professor Dato' Dr. Mohd Ali Hassan
	Aisyah Zulkarnain	Institut Penyelidikan Halal, UPM	Research Assistant	Msc	Professor Dr. Suraini Abd Aziz
	Iffah Nabilah Mohd Ariff	Biocon Sdn Bhd	QCA Sr. Associate	Msc	Professor Dr. Suraini Abd Aziz
	Siti Suhailah Sharuddin	Faculty of Biotechnology & Biomolecular Sciences, UPM	PhD Student	Msc	Associate Professor Dr. Norhayati Ramli
2018	Dr. Tengku Arisyah Tengku Yasim Anuar	Faculty of Biotechnology and Biomolecular Sciences, UPM	Postdoctoral Researcher	PhD	Associate Professor Dr. Hidayah Ariffin
	Dr. Mohd Nor Faiz Norrahim	Research Center for Chemical Defence (CHEMDEF), UPNM	Postdoctoral Researcher	PhD	Associate Professor Dr. Hidayah Ariffin
	Dr. Noor Farisha Abd Rahim	Putra Business School, UPM	Student Service Centre Executive	PhD	Associate Professor Dr. Hidayah Ariffin
	Muhammad Azman Zakaria	Biocon Sdn Bhd	Microbiologist (Associate)	Msc	Dr. Mohd Zulkhairi Mohd Yusoff

LIST OF ALUMNI 2007-2018

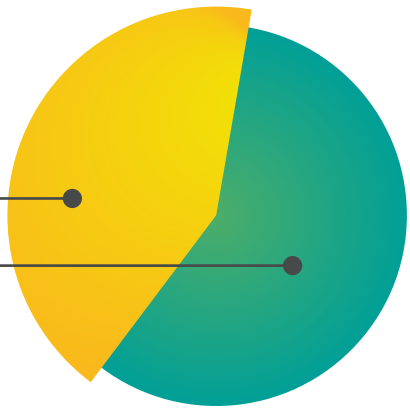
YEAR	ALUMNI	PLACEMENT	CURRENT POSITION	DEGREE	FORMER SUPERVISOR
2018	Mohd Hafif Samsudin	Biomass Technology Laboratory,UPM	PhD Student	Msc	Professor Dato' Dr. Mohd Ali Hassan
	Khairiatul Nabilah Jansar	Sweet Heart Food Industries Sdn Bhd	Senior Quality Assurance Executive	Msc	Professor Dato' Dr. Mohd Ali Hassan
	Dr. Nahrul Hayawin Zainal	Biomass Technology Unit, Engineering and Processing Division, MPOB	Senior Research Officer	PhD	Professor Dr. Suraini Abd Aziz
	Nurhajirah Mohamed Biran	Pahang Pharmacy Sdn Bhd	QA Executive	Msc	Dr. Mohd Zulkhairi Mohd Yusoff
	Hazwani Husin	Self Employed	Self Employed	Msc	Associate Professor Dr. Mohamad Faizal Ibrahim
	Nur Atheera Aiza Md Razali	Self Employed	Self Employed	Msc	Professor Dr. Suraini Abd Aziz
	Norlailiza Amad	Pahang Pharmacy Sdn Bhd	QA Officer	Msc	Associate Professor Dr. Mohd Rafein Zakaria
	Nur Fatin Athirah Ahmad Rizal	FastGrow Fertilizer (M) Sdn Bhd	Senior Agronomist	Msc	Associate Professor Dr. Mohamad Faizal Ibrahim
	Azam Fikri Taifor	Wangsa Maju	Freelance	Msc	Associate Professor Dr. Mohd Rafein Zakaria

EB GRADUATES

76 TOTAL GRADUATED STUDENTS

PhD : 35

MSc : 41



ASSOCIATE PROFESSOR DR. MIOR AHMAD KHUSHAIRI MOHD ZAHARI

Associate Professor Dr. Mior Ahmad Khushairi Mohd Zahari (Zahari, M.A.K.M. or better known as Dr. Mior) is working at the Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang (UMP). Born and raised in Batu Gajah, Perak, Malaysia, he completed his primary education at Sekolah Rendah Kebangsaan Sultan Yussof, Batu Gajah, Perak and continued his secondary school at Sekolah Menengah Sains Teluk Intan, Perak.

He obtained a bachelor's degree in Chemical Engineering from Universiti Teknologi Malaysia back in 1999. An interest in studying about the manipulation of microbes for beneficial products led him to continue his MSc in Chemistry - Biotechnology at Universiti Teknologi Malaysia under the supervision of Professor Dr. Wan Azlina Ahmad. His research during his time as a master's degree candidate involved the recovery of gold from mine tailings. As a part of his study, knowledge on heavy metal leaching by consortium of bacteria was successfully applied for the pretreatment of mine tailings. Upon the completion of his master's degree in 2003, he joined the Malaysian Department of Environment (DOE) as an Environmental Control Officer. Two years later, he joined Universiti Malaysia Pahang as a lecturer in 2005.

He started pursuing his doctorate degree under the supervision of Professor Dato' Dr. Mohd Ali Hassan in November 2008 and obtained his PhD in Bioprocess Engineering from Universiti Putra Malaysia (UPM) in May 2013. His research interest is in the field of Environmental Biotechnology and Bioprocess Engineering in which he specializes on the utilization of oil palm biomass for the production of value-added products such as biosugars, biopolymers and biofuels.

To date, he has led various research projects with the total amount of funding received so far to be approximately RM 300,000 in which he is the project leader. He also actively contributes as a co-researcher for other research grants. His success in securing various research grants is largely due to his excellent track record in completing all his projects which are mostly within the interest of the country and have large potential for future benefits. Dr. Mior has a Scopus H-index of 6 with more than 20 publications and has been cited 150 times in Scopus. Dr. Mior is a graduate member of the Board of Engineers Malaysia, an associated member of the Energy Institute, UK and a member of the Asian Federation of Biotechnology.

ACTIVITIES

MAJLIS PERUTUSAN NAIB CANSELOR UPM ON 15TH FEB 2019 AT DEWAN BESAR PKKSSAAS, UPM

KOREAN- ASEAN BIOMASS SYMPOSIUM AT UNIVERSITAS AIRLANGGA, SURABAYA, INDONESIA FROM 7TH - 9TH AUGUST, 2019

MoA SIGNING CEREMONY BETWEEN WORLDWIDE LANDFILL SDN BHD AND UPM ON 6TH AUGUST 2019

FERTILIZER AND FERTIGATION COLLABORATIVE PROGRAMME ON 14TH - 16TH AUGUST 2019 AT BIOMASS TECHNOLOGY LABORATORY, UPM

EB RAYA ON 18TH JUNE 2019 AT BIOREFINERY COMPLEX, UPM

NATIONAL EXPERTS FOR BIOMASS TO BIOFUELS AND BIOMATERIALS GATHERING
ON 30TH AUGUST 2019 AT BIOREFINERY COMPLEX, UPM

TECHNICAL TALK BY ASSOCIATE PROFESSOR DR.HIDAYAH ARIFFIN ON
THE POTENTIAL FOR MASS PRODUCTION OF NANOCELLULOSE FROM OIL PALM BIOMASS
IN MALAYSIA ON 28TH SEPTEMPER 2019 AT WISMA IEM, PETALING JAYA

AFOB MALAYSIA CHAPTER : INTERNATIONAL SYMPOSIUM 2019 ON
20TH - 23RD OCTOBER 2019 AT THE EVERLY HOTEL PUTRAJAYA, MALAYSIA

10TH INTERNATIONAL GREENTECH & ECO PRODUCTS EXHIBITION & CONFERENCE MALAYSIA
ON 9TH - 11TH OCTOBER 2019 AT KUALA LUMPUR CONVENTION CENTRE

NANOTECHNOLOGY IN FORESTRY & NATURAL RESOURCES SEMINAR ON 10TH OCTOBER 2019
AT MALAYSIAN GLOBAL INNOVATION & CREATIVITY CENTRE (MAGIC), CYBERJAYA

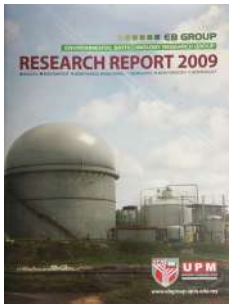
7TH INTERNATIONAL SYMPOSIUM ON APPLIED ENGINEERING AND SCIENCES (SAES2019)
ON 11TH - 12TH NOVEMBER 2019 AT UNIVERSITI PUTRA MALAYSIA, SERDANG

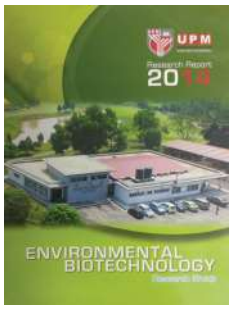
2ND WOOD & BIOFIBRE INTERNATIONAL CONFERENCE
ON 3RD - 5TH DECEMBER 2019 AT PROMENADE HOTEL
KOTA KINABALU, SABAH

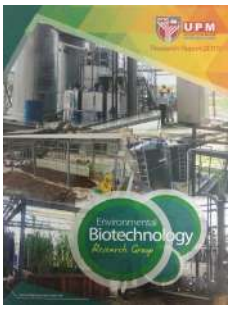
EB BOWLING ON 21ST DECEMBER 2019
AT WANGSA BOWLING IOI CITY MALL

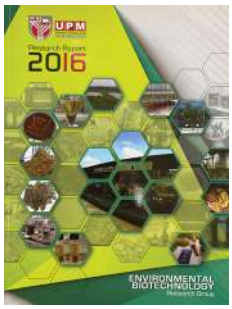
A SEMINAR TALK BY TN HJ IR ZULKIFLI TAMBY CHIK FROM SWCORP
ON 19TH DEC 2019 AT SEMINAR ROOM, BIOREFINERY COMPLEX

EDITORIAL BOARD







ENVIRONMENTAL BIOTECHNOLOGY RESEARCH GROUP

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