

CELEBRATING  
COMMERCIALISATION  
YEAR 2014

# iiindex 2014

AN INTERNATIONAL EXPOSITION ON RESEARCH AND INNOVATION

invention  
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& design  
exposition 2014

INNOVATEUR  
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2014

27<sup>th</sup> - 30<sup>th</sup>  
APRIL 2014  
DEWAN AGUNG TUANKU CANSELOR (DATC)  
UNIVERSITI TEKNOLOGI MARA  
MALAYSIA

*Bridging  
the valley of death :  
advancing the  
commercialisation  
of research*

RESEARCH BOOK

# iiindex2014

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innovation  
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## FOREWORD

The Honourable Minister of Science, Technology and Innovation (MOSTI) has launched 2014 as Malaysia Commercialisation Year 2014 (MCY2014) with the theme Science Technology and Innovation (STI) for Wealth Creation. In line with this theme, Invention, Innovation, Design & Exposition 2014 (iidex2014) is an annual exposition organized by UiTM and is the ultimate platform to highlight and commercialise new inventions and innovations. Researchers and inventors will exhibit their products which cater to the needs and wants of the community and the country.

The iidex2014 creates a new dimension by fusing two competitive concepts, a competition among innovative products and a competition to invite Innovateur Wannabes to perform live pitching of their products to the audience. The iidex2014 focuses on comprehensive commercialization and creating opportunities for entrepreneurs to carry out R&D as well as to provide avenue to commercialise their products. Through expositions such as iidex2014, MOSTI hopes to inculcate the culture of commercialisation of new technology designed and created by Malaysians.

I wish to congratulate all the participants of the iidex2014 and this is the opportunity for all researchers to show their ideas and exhibits their products and creativity. Apart from showcasing their products, innovators will have the opportunity to provide a window to the industry for business matching during the exposition.

Tan Sri Dato' Sri Sallehuddin Mohamed  
Pro-Chancellor, Universiti Teknologi MARA

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## PRODUCTION OF XYLANASE BY XYLANOLYTIC MICROORGANISM USING OIL PALM LEAF AS SUBSTRATE

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Photosynthetic algae comprise the trophic base of many ecosystems and have significant potential in contributing to sustainable bio-fuel production, carbon dioxide (CO<sub>2</sub>) mitigation, and waste remediation. Rapid industrialization, increase in population and changes in consumption pattern directly and indirectly result in the generation of a large amount of municipal and industrial wastes, ranging from biodegradable to synthetic. In Malaysia, solid waste management has become a major environmental problem. Over 23,000 tonnes of waste is produced daily in Malaysia. By 2020, the amount is expected to have risen to 30,000 tonnes. The amount of waste generated continues to increase due to the rising population and development of the country. Less than 5% of the waste is recycled. Sanitary land filling has been the most popular methods of solid waste disposal in many countries, including Malaysia. There are more than 296 landfills throughout Malaysia. Most of the landfills are open dumping grounds, and they pose serious environmental and social threats. Landfills have been accepted as the most economical and environment friendly way for the disposal of solid waste compared with other disposal methods, such as composting, incineration, and gasification. However, a major concern associated with this disposal method is the leachate produced from the landfills. Landfills produce liquid leachates, which must be managed and remediate to prevent long-term community health impacts. Leachate is the water that contains dissolved and suspended solids resulting from the percolation of water that drains through the waste in the landfill. The constituents of the leachate include organic matters and inorganic matters which depend on the age of landfill and type of the waste. In the remediation of landfill leachate, fossil energy is expended to ensure continuing environmental quality. These considerable anthropogenic deposits and the leachates which ensue, embody unutilized elemental resources. Photosynthetic algae provide a remediation alternative, which simultaneously produces bio-resources with societal value from the biological assimilation of elemental nutrients within landfill leachate. In this study, a closed municipal solid waste landfill was bio-prospected for native algae with potential in remediating landfill leachate and bio-resource production. A previous study determined that the growth of the algae *Chlorella protothecoides*, well-known in literature for its high lipid content, in various concentrations of leachate is possible on a lab-scale. This is likely due to the high concentrations of nutrients such as nitrogen and phosphorous in the leachate that provides for a nutritive growth media. However, further analysis is necessary on a lab-scale to determine optimal conditions for growth and lipid content, which will affect the quantity of biodiesel produced. Elemental analysis shows that leachate contains all required elements for photosynthetic growth; however, in cultivation experiments leachate exhibited a strong inhibitory effect on algae growth correlated with concentration. Through investigative experimentation, toxicity within landfill leachate was attributed to the presence of unionized ammonia. Growth of algae on leachate without pH control is inhibited above a 10 percent landfill leachate concentration. Algae growth is supported only under the appropriate conditions of pH regulation, which can be accomplished by the addition of carbon dioxide or hydrochloric acid to the algae culture. If pH regulation is applied, growth is possible in municipal solid waste (MSW) landfill leachate concentrations of 100 percent, a value not reported in the current literature. Once the preliminary results are confirmed, scale-up to an industrial level will be developed using this data with environmental analysis. The expectation is to develop an industrial process for algal biodiesel production at the site that may be translated to facilities under similar circumstances.