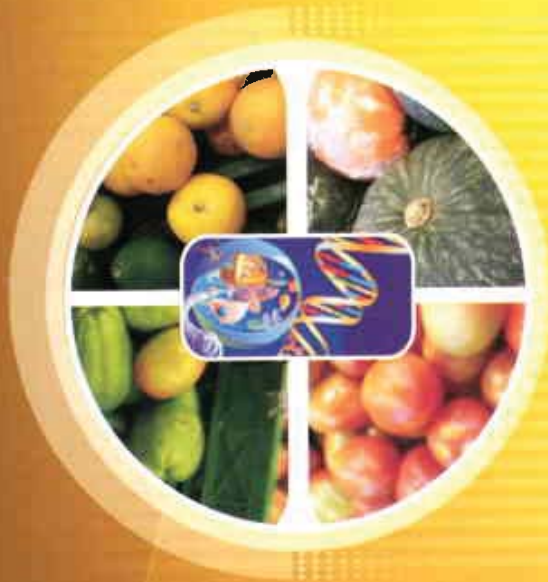




UNIVERSITAS  
ATMA JAYA YOGYAKARTA  
Fakultas Teknobiologi



# PROCEEDING



1<sup>st</sup> International Seminar on  
**“Natural Resources Biotechnology:  
From Local to Global”**

September 8<sup>th</sup> – 9<sup>th</sup> 2015  
Faculty of Biotechnology  
Universitas Atma Jaya Yogyakarta

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## **Welcome Speech Chair of the Seminar Committee**

Distinguished Guests,  
Honorable Speakers,  
Ladies and Gentlemen,

It is a great pleasure to welcome all of you to the International Seminar "Natural Resources: From Local to Global". The Faculty of Biotechnology of Universitas Atma Jaya Yogyakarta runs this seminar to commemorate the 50<sup>th</sup> Anniversary of the Universitas Atma Jaya Anniversary and the 25<sup>th</sup> Anniversary of the Faculty of Biotechnology. Your presence is your present for the anniversary of our university and faculty as well.

The Anniversary is not the only reason to run this seminar. A greater reason is behind the seminar. Indonesia is rich in biodiversity. It is a challenge for us, as scientist, to maintain the biodiversity and to develop the potential of the biodiversity for the common good. Through this seminar, the scientific research on Indonesian biodiversity can be shared and probably the finding of the new research can inspire us for further exploration. Therefore, the seminars goal is to facilitate the spread of the research on local potential of biodiversity to the global level. Hopefully, it can attract more researchers to explore the wealth of local biodiversity.

The committee invites speakers who are expertise in the research concerning biodiversity. Our invited speakers are Assoc. Prof. Dr. Michael Murkovic from Graz University of Technology Austria (food scientist), Assoc. Prof. Worawidh Wajjwalku from Kasetsart University Bangkok Thailand (Veterinary disease biotechnology), Dr. Kathryn McMahon from Edith Cowan University Australia (Seagrass biotechnology), Prof. Marco Nemesio E. Montano, PhD from University of the Philippines (Seaweed biotechnology), Prof. Jun Kawabata from Hokkaido University Japan (food biochemist), Endang Semiarti, PhD from Universitas Gadjah Mada, Indonesia (Plant biotechnology), Ign. Pramana Yudha, PhD from Universitas Atma Jaya Yogyakarta (Conservation genetics), Dr Machmud Thohari from Technical Team for Environmental Biosafety, Ministry of Enviroment & Forestry Indonesia (Environmental Biosafety), Dr Harvey Glick from Asia Regulatory Policy & Scientific Affairs Monsanto Company (Regulatory Policy & Scientific Affairs Monsanto). It is a good opportunity to learn from the speakers to enhance and to update our knowledge. I hope this seminar is of benefit to all of us.

In conclusion, I wish you a successful seminar and a pleasant stay in Yogyakarta.

With kind regard  
Coordinator of conference program

Dr. rer. nat. Yuliana Reni Swasti, S.TP., MP.

**WELCOME SPEECH  
DEAN  
FACULTY OF BIOTECHNOLOGY  
UNIVERSITAS ATMA JAYA YOGYAKARTA**

Distinguished Guests,  
Honorable Speakers,  
Ladies and Gentlemen,

On behalf of the Faculty of Biotechnology, Universitas Atma Jaya Yogyakarta and the Committee of the International Seminar, I would like to first of all to extend our heart-felt thanks for your presence at this Seminar. This seminar is so significant in a sense that it focuses on natural resources with local content but by utilizing biotechnology they will become global and worldwide products and services as well.

Biotechnology has been developed very rapidly and it is believed to be "a new wave in the economic world". Biotechnology has contributed in all aspects of humans' life, such as food production, health, industry, environment, etc. The role of biotechnology for the betterment of human beings, however, is still need to be improved. Indonesia, with its huge biodiversity, has a potency to develop and applied biotechnology nationwide.

The role of biotechnology has increased rapidly. Many are believed that biotechnology has become an integral part of modern industries with high economic values. On the other hand, it needs to be closely managed in order to avoid its negative impacts. There are some examples of negative impacts with relate to biotechnology application, such as intellectual property rights, genetically modified organisms (GMOs), environmental degradations, biodiversity issues, indigenous people knowledge, biosafety, etc.

The Seminar covers topics such as: Functional Foods, Food Biotechnology, Biopharmacy, Health/Medical Biotechnology, Environmental Biotechnology, Legal Aspect of Biotechnology, Bioinformatics, and Social-Economic Aspects of Biotechnology. This Seminar will be presented nine (9) invited speakers with different topics and expertise. There will be some papers and posters to be presented also in this Seminar from some participants from the Philippines and Indonesia.

Henceforth, in commemorating its 50<sup>th</sup> anniversary Universitas Atma Jaya Yogyakarta (UAJY) and 25<sup>th</sup> anniversary of Faculty of Biotechnology, Universitas Atma Jaya Yogyakarta (UAJY) on September 2015, it is worthy and appropriate to explore the newest innovations in the field of research and development of biotechnology to be applied in many aspects for the betterment of human beings. The Seminar takes this opportunity to discuss and hopefully find ways to solve problems faced by human beings in the world.

I would like to take this opportunity to express my sincere thanks and gratitude to the Committee and in particular to the honorable speakers. Before closing this remarks, allow me to ask the Rector of Universitas Atma Jaya Yogyakarta to open this Seminar officially.

Finally, this is an opportune time for me to wish you all in the two (2) fruitful days of interesting and beneficial programs and hope you have a pleasant stay in Yogyakarta.

Thank you very much and may God bless us all. Amen.

Yogyakarta, 8 September 2015

Dean

Drs. B. Boy Rahardjo Sidharta, M.Sc

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## The Character of Biogas Fermentation on Simple Sugars by *Enterobacter ludwigii* Mutants

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### Abstract

Bio-hydrogen is one of promising alternative energy nowadays. Pure-wild type bacteria commonly produce biohydrogen in a low level. In this research, we aim to carry on transposon mutagenesis of *Enterobacter ludwigii*, the isolate obtained from sediments of Kalimas River Surabaya, to produce more biohydrogen. The second aim was to characterize the properties of wild type and its mutants in biogas fermentation growing on simple sugars. Fermentations were performed anaerobically at 37°C and shaken at 200 rpm under dark condition. There were two target conjugant obtained, mutant A24-16 and B24-37. The *E. ludwigii* wild type, mutant A24-16 and B24-37 grew on M9 minimal medium containing glucose, xylose or arabinose without any differences between strains. All strains grew faster on glucose and arabinose compare to growth on xylose. Biogas was appeared since late logarithmic phase for glucose and arabinose or early stationary phase for xylose. The mutant A24-16 and B24-37 produced more biogas on all these sugars compared to its wild type. At the end of fermentation, sugars content of the cultures were diminished, which were determined as total reducing sugars. The pHs were decreased. It gave impressions that the sugars were consumed. The biogas produced during fermentations contained hydrogen. Ethanol and acetate were detected in the cultures at the end of fermentation. It can be concluded that the transposon mutagenesis of *E. ludwigii* generated two mutants, A24-16 and B24-37. The wild type and both mutants' cells could grow and produce biohydrogen on glucose, xylose or arabinose substrates in M9 minimal medium.

Keywords: *Enterobacter ludwigii*, mutant A24-16 and B24-37, biohydrogen, glucose, xylose, arabinose.

### 1. INTRODUCTION

Nowadays, the availability of conventional energy stock in the world is delimited, especially petroleum, is only enough for 30 – 50 years (Nugroho, 2006). In the other side, the demand is increased 7% each year (Kementerian Energi dan Sumber Daya Mineral, 2012). If there is no effort to decelerate, it was predicted that this energy sources will be deprived in 18 years. In spite of its usefulness, the utilization of fossils and petroleum for energy can cause pollution which then resulted to global warming.

The global warming and energy deprivation issues push the experts to seek the alternative, renewable and eco-friendly energy. Bio-hydrogen, H<sub>2</sub>, is one of promising alternative energy nowadays. The energy generated by hydrogen is large without