

THE EDUCATION UNIVERSITY OF HONG KONG
FACULTY OF LIBERAL ARTS AND SOCIAL SCIENCES

Research Output/Impact Prize for the Dean's Research Fund 2017-18

**Brief Introduction of Awardee's
Research Publication/Study and Future Research Development**

Awardee (Dept): Dr. Tsang Yiu Fai, Associate Professor (SES)

Publication Title: Inhibitory Effects of Phenolic Compounds of Rice Straw Formed by Saccharification during Ethanol Fermentation by Pichia Stipitis

A. *Briefly introduce your research publication/study for which you have received the prize.*

Lignocellulose is the most abundant natural source of organic carbon worldwide. The biofuel production from lignocellulosic biomass represents a largely under-utilized sustainable resource but is becoming a global priority, necessitated by the continuous depletion of petroleum reserves and the mitigation of climate change. Rice straw mainly contains 35% cellulose, 30% hemicellulose, and 15% lignin. It also contains a wide range of phenolic acids, such as ferulic acid and p-coumaric acid. Phenolic acids in rice straw exist as free, soluble conjugate, and insoluble bound forms. In our previous study, the phenolic acids derived from rice straw exhibited high antioxidant and anti-microbial activities, resulting in prolongation of lag phase and decreased productivity of lactic acid. Therefore, the phenolic acids derived from rice straw may exhibit significant inhibition on microbial activities of ethanol producer, and consequently reduce the bioconversion efficiency. To date, bioethanol is not economically competitive. One way to overcome this limitation is the co-production of ethanol and high value-added products, as an integrated process.

This paper describes the new findings from the research study on bioethanol production from rice straw. To the best of our knowledge, this study is the first to evaluate the effect of phenolic compounds released during saccharification on ethanol fermentation. In this study, the inhibitory effect of phenolic acids on ethanol fermentation with rice straw was comprehensively investigated and evaluated. Pichia stipitis was used as ethanol producer because it is a highly efficient xylose-fermenting strain. Different cellulases produced different ratios of free phenolic acids to soluble conjugated phenolic acids, resulting in different fermentation efficiencies. The results of this study provided a theoretical basis for identifying inhibitors and promoters associated with ethanol fermentation and lactic acid production using lignocellulosic biomass as well as for developing a cost-effective pretreatment process to increase the economic value of rice straw, which will be important for exploiting lignocellulosic biomass resources.

B. How you used/will use your prize and perhaps its usefulness to your research development?

The prize will be used to recruit a research assistant to conduct follow-up experiments about this topic.

C. Expected research outcomes/outputs/impacts arising from this prize.

I expect that a referred international journal will be published.