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Bacterial Community Shift as Potential Bioindicator for Monitoring the Performance of Palm Oil Mill Effluent Treatment System

Diana Mohd Nor[1&2], Norhayati Ramli[1*], Mohd Ali Hassan[1],Toshinari Maeda[2], Yoshihito Shirai[2], Kenji Sakai[3] and Tashiro Yukihiro[3]

[1]Department of Bioprocess Technology, Faculty of Biotechnology and Biomolecular Sciences, Universiti Putra Malaysia, 43400, Serdang, Selangor.

[2]Department of Biological Function and Engineering, Graduate School of Life Science and System Engineering, Kyushu Institute of Technology, 2-4 Hibikino-cho, Wakamatsu-ku, Fukuoka 808-0196, Japan.

[3]Department of Bioscience and Biotechnology, Graduate School of Bioresources and Bioenviromental Sciences, Kyushu University, 6-10-1, Higashi-ku, Fukuoka 812-8581, Japan.

***Corresponding author's email: yatiramli@upm.edu.my**

Abstract. The growing demand for palm oil has caused a substantial increase in the generation of palm oil mill effluent (POME). POME has been known to give the adverse environmental impacts including land and aquatic ecosystem contamination and the biodiversity loss if it is not properly treated. In Malaysia, the biological ponding system is commonly being used to treat POME because of the low cost and less maintenance is required. However, the current wastewater treatment system for POME regularly fails to treat the effluent efficiently. To meet the standard discharge limit proposed by the Malaysian Department of the Environment, the POME must be treated effectively before being released into the receiving water bodies, hence monitoring a correct operation of POME treatment system is crucial. However, to date, only few studies have been conducted on the microbial aspects of POME and little is known about microbial diversity involved in the POME treatment system, either in terms of their community structure and function or their response to the environment. Therefore, the study on the microbial community composition of POME treatment system has been carried out which later can be used as potential bioindicator to monitor the performance of the treatment system. Sampling from POME treatment system was done by collecting samples from raw POME, anaerobic tanks, as well as from facultative and algae ponds. The shift of microbial community composition at each stage of POME treatment system has been shown by using PCR-Denaturing Gradient Gel Electrophoresis (DGGE) and Illumina Miseq. As a conclusion, a sensitive and accurate monitoring approach of POME treatment system using bacterial community shift is proposed to ensure a correct operation for POME treatment, hence can be used to complement the current physicochemical assessment method.

Keywords: community; palm oil mill effluent; PCR-DGGE, Illumina Miseq