

Optimisation of oil palm trunk sap fermentation to bioethanol

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1. Introduction

Malaysia has an abundant amount of oil palm biomass (approx. 15 million tons annually) arising from replanting activities involving old oil palm tree aged above 20 years-old which has lower productivity. In some cases, the outer hard portion of the oil palm trunk is utilised for plywood manufacturing, but the soft inner portion is normally discarded. This soft inner portion contains a huge amount of sugar-rich sap that can be fermented into bioethanol¹.

Limited study on oil palm trunk sap (OPTS) fermentation using various ethanol-producing strains in exception of those by Norhazimah and Faizal². However, no study concerning OPTS fermentation to bioethanol using *Kluyveromyces marxianus* ATCC 46537, *Saccharomyces cerevisiae* ATCC 9763 and *Saccharomyces pastorianus* ATCC 26602 is available in the literature, and hence screening their suitability is one of the objectives of this work. Furthermore,

limited study on the effect of micronutrient addition to bioethanol yield during OPTS fermentation is available in the literature. Thus, the primary objective of the current work is to study the effects of multiple nutrient additions to the bioethanol yield. Subsequently, optimization of the amount of nutrient addition was studied using response surface methodology.

2. Experimental

The oil palm trunk sap was obtained from a 30-year old tree from Jengka, Pahang. All the microbial strain was obtained from the American Type Culture Collection, USA, except the baker's yeast, which was obtained from AB MAURI, Malaysia. The inoculum was prepared via incubation in a sterile broth for 18h. The standard optical density of 1.5-1.7 corresponds to a stationary phase in the microbial growth deduced by studying the microbial growth curve³. The fermentation