

ABSTRACT

Azzahdhia Al Khansa, 24020221140070. *Potential of Yeast for Ethanol Fermentation from Derived Substrates Carbon Dioxide (CO₂) (under the guidance of Endang Kusdiyantini and Radityo Pangestu).*

*The intensifying impacts of climate change have accelerated the development of sustainable bioenergy based on carbon emissions. One promising approach is Carbon Capture and Utilization (CCU) technology, which converts CO₂ into C1 compounds such as methanol and sodium formate. These compounds can be utilized by methylotrophic yeasts such as *Ogataea* to produce bioethanol. The research was conducted using four *O. philodendri* strains (Y504, Y505, Y506, Y507) precultured on glucose as a carbon source, followed by fermentation on three different substrates: methanol, sodium formate, and glucose. Incubation was carried out at 30°C, and the results were analyzed using HPLC for ethanol quantification and SEM for cell morphology observation. The results showed that all strains were able to grow on all three substrates, with the best growth generally observed on glucose, reaching an OD_{600nm} of around 7. However, the highest ethanol yield was obtained from methanol fermentation, with an average yield of 0.185 g/g, significantly higher than that from glucose and sodium formate. In contrast, the highest carbon consumption efficiency was achieved with glucose at around 73%, indicating efficient carbon utilization despite the low ethanol production. SEM observations revealed that glucose resulted in intact cell morphology, while methanol and sodium formate induced morphological stress. In conclusion, methanol and sodium formate show potential as alternative substrates for bioethanol production from CO₂-derived compounds, with methanol providing the highest ethanol yield. Glucose remains superior in carbon consumption efficiency and cell morphology stability. These findings support the development of CCU technology based on methylotrophic yeasts.*

Keywords: *Ogataea philodendri*, glucose, methanol, sodium formate, ethanol.