

ABSTRACT

DELIGNIFICATION OF SUGARCANE BAGASSE USING MICROWAVE-ASSISTED ALKALINE METHOD FOR BIOETHANOL PRODUCTION

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*The depletion of fossil fuel reserves and the growing demand for sustainable energy have driven the search for alternative energy sources in Indonesia. Sugarcane bagasse, a lignocellulosic waste rich in cellulose, holds great potential as a raw material for bioethanol production but remains underutilized by local industries. This study investigates the delignification process of sugarcane bagasse using the Microwave-Assisted Alkaline (MAA) Pretreatment method to improve bioethanol production efficiency. The research analyzes the effects of microwave power (380 W, 500 W, and 700 W) and NaOH concentration (0.5 M, 0.6 M, and 0.7 M) on cellulose, hemicellulose, and lignin content after pretreatment, as well as the resulting bioethanol yield. The methodology includes stages of pretreatment, hydrolysis, fermentation, and distillation. Cellulose, hemicellulose, and lignin contents were analyzed using the Chesson-Datta method, while bioethanol content was measured using a refractometer. Pretreatment was conducted for 20 minutes, followed by hydrolysis using 0.7 M H₂SO₄, fermentation with *Saccharomyces cerevisiae* for 5 days, and distillation. The results showed that increasing NaOH concentration at each microwave power level reduced lignin content and increased cellulose content. The highest cellulose content (35.9%) and bioethanol yield (17%) were obtained at 0.7 M NaOH and 500 W microwave power, indicating that the microwave-assisted alkaline pretreatment is effective in enhancing delignification and bioethanol production efficiency.*

This method demonstrates significant potential in optimizing the use of sugarcane bagasse as a renewable energy source and contributes to environmental sustainability.

Keywords: *sugarcane bagasse, delignification, alkaline pretreatment, microwave-assisted alkaline, lignocellulose, NaOH, bioethanol, renewable energy*