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MIXOTROPHIC CULTIVATION OF CHLORELLA VULGARIS USING PLANTAIN (MUSA PARADISIACAE) PEEL EXTRACT FOR BIOETHANOL PRODUCTION

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Statement of problem: The first generation bioethanol production involves the exploitation of agricultural products which has raised a competition of limited agricultural logistics in arable land for food and fuel. The second generation considered lignocellulosic material as a potential feedstock but raised a conflict due to difficulty in hydrolyzing lignin and the crystalline nature of the material. Microalgal biomass emerged as an alternative and sustainable promising feedstock to overcome these challenges. Furthermore, mixotrophic cultivation of Chlorella species with organic carbon source such as glucose yielded improved higher carbohydrate biomass than its autotrophic cultivation. Many researchers reported several inexpensive carbon substrates such as residual glycerol, industrial, agricultural and animal waste. In this study, the feasibility nutrient uptake of Chlorella vulgaris with a cheap carbon substrate, plantain peel extract was studied and its biomass utilized for bioethanol production.

Methodology and theoretical orientation: Unripe plantain peels were processed, infused for 48hrs, extracted and cultivated with Chlorella species for a period of fourteen days. The optical density and biomass concentration values were measured at three day intervals. The carbohydrate content was hydrolyzed and fermented with 10% concentration of Saccharomyces cerevisiae and Aspergillus niger at 30oc and pH 4.5 using SHF and SHCF techniques. Findings: Results show that maximum cell growth of 1.56(OD) and biomass concentration of 19g/l was obtained with the bloom. The highest reducing sugar of 0.63mg/ml was obtained after hydrolysis of the biomass while the ethanol yield percentage increased to 10.82% v/v with increased fermentation time.

Conclusion and significance: Result indicated that C vulgaris utilizes PPE medium as sole carbon source to stimulate biomass secretion for bioethanol production. Recommendations are made for a feasible route of reducing cost of microalgal biomass production from a cheap carbon substrate.

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