Converting Tropical Feedstocks into Bio-Ethanol via Enzymatic Hydrolysis and Fermentation by Saccharomyces cerevisiae

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Biofuels are promising green energy sources often derived from biomass feedstocks. Employing tropical agricultural byproducts as feedstocks, including coconut shells, plantain peels, and cocoa pods, for the production of bio-ethanol, has promising applications as clean, domestic energy that is feasible in equatorial regions. For experimentation, each feedstock was pulverized to expose internal cellulosic structures. The feedstock was then placed in a vial with 25 ml. of water and .5 g cellulase enzymes to undergo enzymatic hydrolysis. 1g of yeast was then added to the glucose-rich aqueous blend and left to ferment for 24 hours. The ethanol level of each mixture was measured. Ultimately, this experimental process was conducted 20 times per feedstock. Analysis of the data revealed that cocoa pods were significantly different (<.05%) in GPH when compared to both plantain peels and coconut shells, with the p-values of 2E-17 and 5.5E-11, respectively. While coconut shells had the highest mean GPF value of 12 mg/dL, when compared to cocoa pods (11.58 mg/dL) and plantain peels (11 mg/dL), there was no significant statistical difference in GPF. Finally, cocoa pods had the EPF content of 3%. Cocoa pods were significantly different when compared to the other feedstocks, as the p-value between cocoa pods and and coconut shells was 2.8E-14 , and the p-value between cocoa pods and plantain peels was 6.4E-17. Cocoa pods had the highest glucose yield after hydrolysis of 46.5 mg/dL. Similarly, cocoa pods had the highest ethanol yield of 3% by volume.

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