

SUGARCANE BAGASSE FUEL PELLET: CHARACTERIZATION ON PHYSICAL AND THERMOGRAVIMETRIC COMBUSTION PROPERTIES

ABSTRACT

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Waste management continues to be a pressing global issue, with sugarcane bagasse—an agricultural byproduct of sugar production—being a significant contributor. Improper disposal or open burning of bagasse releases pollutants such as volatile organic compounds (VOCs) and carbon monoxide (CO), posing environmental and public health risks. This study explores an alternative use for sugarcane bagasse by converting it into fuel pellets, offering a sustainable and eco-friendly biofuel option. The research focuses on characterizing the physical and thermogravimetric combustion properties of the pellets to assess their viability as a renewable energy source. The study adopted a quantitative experimental research design and utilized purposive and stratified sampling techniques. Ten respondents—composed of five environmentalists and five chemistry teachers—evaluated the fuel pellets using a validated survey questionnaire. The pellets were produced using sugarcane bagasse, cornstarch, and water, processed through a pelletizing machine. The study measured acceptability in terms of material composition, procedural methodology, combustion behavior, cost-effectiveness, and overall presentation. Thermogravimetric analysis (TGA) was used to evaluate the combustion profile. Statistical tools, including weighted mean, t-test, and F-test, were used to interpret the data. Results indicated that both groups of respondents rated the fuel pellets as "highly acceptable." Environmentalists gave an overall weighted mean of 3.50 with a variance of 0.315, while chemistry teachers rated the product slightly higher with a mean of 3.80 and a variance of 0.019. A t-computed value of 0.368 was recorded against a t-critical value of 2.306 at a 0.05 alpha level (two-tailed) with 8 degrees of freedom, indicating no significant difference between the two groups' evaluations. Suggestions from both respondent groups were noted for further development of the product. Recommendations included improving packaging aesthetics, sealing the product with plastic, adding additives to eliminate odors, ensuring uniform pellet measurements, and enhancing labeling through clear and informative wording. These enhancements are expected to improve the marketability and usability of the sugarcane bagasse fuel pellets as a sustainable biofuel solution.

RECOMMENDED CITATION

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