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FROM PEANUT OIL TO BIODIESEL: A SCHOOL-BASED EXPERIMENT FOR RENEWABLE ENERGY EDUCATION

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ABSTRACT: This study investigated biodiesel production from peanut (*Arachis hypogaea L.*) oil as an experimental strategy for Education for Sustainable Development in a Brazilian public high school. Students investigated the local peanut production chain, extracted the oil using a low-cost adapted method, and produced biodiesel through alkaline transesterification. Biodiesel yields ranged from 42.8% to 46.4%. The project promoted scientific inquiry, critical thinking, collaborative learning, and discussions on renewable energy, sustainability, climate change, and the valorization of local agricultural resources.

Keywords: Renewable energy, Chemistry education, Education for Sustainable Development

INTRODUCTION

The transition to renewable energy requires both technological innovation and quality science education. Biodiesel is a sustainable alternative to fossil diesel and offers opportunities for contextualized learning in Chemistry. In Sergipe, peanut is not only an important oilseed crop but also part of the state's cultural heritage. This study aimed to produce biodiesel from peanut oil in a school laboratory while promoting discussions on sustainability, renewable energy, and climate change through inquiry-based learning.

METHODOLOGY

Local Peanut Production Chain

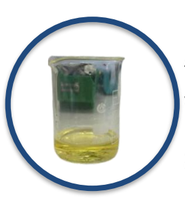
Students visited local peanut farmers in Salgado, Sergipe, Brazil, to investigate cultivation, harvesting, and the socioeconomic importance of peanut production.

Peanut Oil Extraction

Raw peanuts (1.0 kg) were roasted at 180 ºC for 10 min, manually peeled, ground, mixed and mechanically pressed to obtain the oil using an adapted low-cost procedure.

Biodiesel Production

Biodiesel was produced by alkaline transesterification using 25 g (~28 mL) of peanut oil, 10 mL methanol, and 0.28–0.30 g NaOH at 60 ºC under magnetic stirring for 2 h.



Purification and Evaluation

After 2 h of phase separation, biodiesel was washed three times, dried at 120 ºC for 30 min, and evaluated by yield determination and a qualitative flame test.

RESULTS

Local Peanut Production Chain

Students visiting local peanut farmers in Salgado, Sergipe, Brazil, to investigate cultivation, harvesting and post-harvest practices prior to the experimental production of biodiesel.

Peanut Oil Extraction

Approximately 30.1 g of peanut oil was obtained from 1.0 kg of peanuts, corresponding to an extraction yield of 3.3% (w/w).

Biodiesel Production

The adapted transesterification protocol produced 12 and 13 mL of biodiesel, with yields of 42.8% and 46.4%, respectively.

Educational Outcomes

Students actively participated in all research stages, strengthening scientific inquiry, critical thinking, teamwork, scientific communication, and problem-solving.

CONCLUSIONS

The proposed low-cost protocol enabled biodiesel production and demonstrated that public schools can effectively integrate experimental Chemistry with Education for Sustainable Development.

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