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Graduation Project II: **Valorisation of Low-Grade Dates through Bioethanol Production: A Sustainable Solution for Palestine**

Abstract

The successful cultivation of date palm trees significantly benefits Palestinian agriculture, particularly in the Jordan Valley and the Gaza Strip. However, this agricultural practice encounters challenges under Israeli occupation, leading to the production of low-quality dates that are unsuitable for consumption or export and are often discarded as waste. This study aimed to explore the potential for producing bioethanol from these low-grade dates and introduced a novel method for determining ethanol concentration using a density meter by establishing a correlation between density and ethanol concentration. The study successfully achieved three objectives: establishing the relationship between solution density and alcohol content, examining the impact of sugar concentration on alcohol yield post-fermentation, and exploring the feasibility of ethanol production from low-grade dates. The results revealed a non-linear relationship between sugar concentration and ethanol yield, with initial increases followed by declines due to the inhibition of yeast cells by higher sugar concentrations. Thermal extraction of sugars from 100 grams of dates followed by a 5-day fermentation produced a 9.49% yield, indicating a promising feedstock for ethanol. Furthermore, the average ethanol concentration obtained from 150 grams of dates after fermentation was 34.95% (by volume), and a second distillation revealed a remarkable maximum achievable ethanol concentration of 77.79% (by volume).