

COMPARATIVE STUDY OF BIOETHANOL PRODUCTION
FROM ROTTEN GRAPE AND APPLE FRUITS AS RENEWABLE
ENERGY AND WASTE MANAGEMENT

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ABSTRACT

Biomass of various sources such as those of cellulosic and hemicellulosic contents were proven to produce bioethanol. This study focused on the production of bioethanol from waste fruits of grapes and apples using yeast *Saccharomyces cerevisiae*, which is viewed as a means of reducing environmental pollution. High bioethanol production was obtained using yeast loading of 4 g/L at 32°C after 3 days of fermentation time producing bio-ethanol 13.1% (v/v) and 9.2% (v/v) in rotten grapes and apples respectively. Bioethanol yield was observed to decrease with increasing fermentation time beyond 3 days, probably due to microbial wastes such as CO₂ that accumulates in the fermentation media, that tends to reduce the media pH thereby inhibiting microbial growth by cytotoxicity effect. Among the parts of fruits used as substrates, pulp was observed to produce more ethanol (13% ±0.2) as compared to the skin, probably due to low lignin content of the pulp. Comparing enzymatic hydrolysis of the fruits' cellulosic content to simple sugars, amylase was observed to produce high glucose yield (8.5 ± 0.2 mg/mL) as compared to cellulase (7.5 ± 0.2 mg/mL).

The obtained bioethanol was subjected to engine test and revealed a remarkable reduction of hazardous gases (NO_x, CO₂, CO, SO_x and HC) in the blends of bioethanol (E10, 90% pure fuel + 10% bio-ethanol). The emission tests were performed on Proton Gen 2 Multicylinder engine, with less greenhouse gas emission in grape waste than in apple waste.

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