

## Transesterification method of microalgae biomass to produce fatty acid methyl esters

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### ABSTRACT

**Background:** This study investigated the effect of different solvents on the production of fatty acid methyl esters (FAMEs) from *Chlorella vulgaris* using two different methods of transesterification: direct transesterification (d-trans) and extraction transesterification (ext-trans). Different solvents were expected to lead to different amounts of FAMEs. Two solvents (methanol and ethanol) with volumes of each of 10, 12 and 14 mL were selected to produce higher amounts of FAMEs. **Results:** The findings indicate that the highest amounts of palmitic and palmitoleic acids were extracted in 12 mL of methanol, but none of the components of FAMEs was discovered in ethanol when FAMEs were produced using d-trans. It is shown that FAMEs that are extracted by methanol contain more components as compared to FAMEs extracted by ethanol based on gas chromatography– mass spectrometry analysis. Overall, the highest amount of FAMEs was produced when extracted using 12 mL of methanol for both methods. For ext-trans, palmitic acid was found in all components of FAMEs that were extracted using both solvents. **Conclusions:** The results indicate that d-trans showed a higher FAME amount than ext-trans which is explained by the presence of free fatty acids and glycerides that resulted in higher yield of FAMEs in the d-trans process. Overall, dry biomass is the best substrate for the d-trans process to produce a higher amount of FAMEs than wet biomass because directly transesterified algal biomass, including water, resulted in losses of FAME composition.

### KEYWORDS

Microalgal biomass; *Chlorella vulgaris*; Solvent; Direct transesterification; Extraction transesterification; Fatty acid methyl ester

## **ACKNOWLEDGEMENTS**

Heartful thanks and appreciation to Universiti Malaysia Pahang (UMP) for providing an Internal Fundamental Research Grant (grant no. RDU1903138) for financial support throughout the research work.