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Synthesis of fatty acid diethanolamides from microalgal biomass

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The demand for various synthetic chemicals is continuously increasing in the modern world to produce various consumer products. Currently, petroleum sources provide the precursor compounds for most of the synthetic chemicals. Due to depletion of petroleum resources as well as health and environmental concerns, alternative renewable resources are preferred. In the recent past, microalgae have emerged as a lucrative alternative since they grow fast and do not compete with food supply chains. Further, microalgae exhibit a high lipid content and variety that can be easily utilized to produce precursor compounds for chemical industry. This study was focused on using microalgae isolated from natural water bodies in Sri Lanka to produce fatty acid alkanol amides (FAAAs) to be used as biosurfactants. Four microalgae species namely, *Uronema* sp., *Monoraphidium* sp., *Chlorella* sp., and *Chlorococcum* sp., were selected and cultivated under laboratory conditions. Lipids were subjected to transesterification to obtain fatty acid methyl esters (FAMEs) and FAMEs were subjected to amidation with diethanol amine to obtain fatty acid diethanolamide (FADEAs) either in a two-step process or a tandem process. In two-step process, transesterification was carried out to convert microalgal lipids to FAMEs and separated FAMEs were converted to FADEAs. In tandem process, transfesterification and amidation reactions were carried out concurrently without separating FAMEs. The four microalgal species showed average lipid content of 17 – 18% of the dry biomass and varied as *Uronema* sp. < *Monoraphidium* sp. < *Chlorococcum* sp. < *Chlorella* sp. Further, microalgal fatty acids were successfully converted to FAMEs and FADEAs in the two step process as well as tandem process. Among the above species, *Chlorococcum* sp. and *Chlorella* sp. showed the highest yields for FAMEs and FADEAs.

Keywords: microalgae, lipids, biosurfactants and fatty acid alkanol amides

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