

## Lipid from Activated Sludge as a Feedstock for the Production of Biodiesel

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**Abstract :** There is increasing interest in utilising low grade or waste biomass for the production of renewable bioenergy vectors i.e. waste to energy. In this study we have chosen to assess, activated sludge, which is a microbial biomass generated during the second stage of waste water treatment as a source of lipid for biodiesel production. To date a significant proportion of biodiesel is produced from used cooking oil and animal fats. It was reasoned that if activated sludge proved a viable feedstock it has the potential to support increase biodiesel production capacity. Activated sludge was obtained at different times of the year and from two different sewage treatment works in the UK. The biomass within the activated sludge slurry was recovered by filtration and the total weight of material calculated by combining the dry weight of the total suspended solid (TSS) and the total dissolved solid (TDS) fractions. Total lipids were extracted from the TSS and TDS using solvent extraction (Folch methods). The classes of lipids within the total lipid extract were characterised using high performance thin layer chromatography (HPTLC) by referencing known standards. The fatty acid profile and content of the lipid extract were determined using acid mediated-methanolysis to obtain fatty acid methyl esters (FAMES) which were analysed by gas chromatography and HPTLC. The results showed that there were differences in the total biomass content in the activated sludge collected from different sewage works. Lipid yields from TSS obtained from both sewage treatment works differed according to the time of year (between 3.0 and 7.4 wt. %). The lipid yield varied slightly within the same source of biomass but more widely between the two sewage treatment works. The neutral lipid classes identified were acylglycerols, free fatty acids, sterols and wax esters while the phospholipid class included phosphatidylcholine, lysophosphatidylcholine, phosphatidylethanolamine and phosphatidylinositol. The fatty acid profile revealed the presence of palmitic acid, palmitoleic acid, linoleic acid, oleic acid and stearic acid and that unsaturated fatty acids were the most abundant. Following optimisation, the FAME yield was greater than 10 wt. % which was required to have an economic advantage in biodiesel production.

**Keywords :** activated sludge, biodiesel, lipid, methanolysis

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