Extraction and characterization of lipids from three Gulf of Maine macroalgae

Increased human population growth has led to an increased demand and consumption of fossil fuels. This increased consumption of fossil fuels has increased carbon emissions and helped lead to anthropogenic global warming. New sources of energy need to be invested in to help mitigate this trend. Algae are an attractive source of energy, and particularly biodiesel, due to their high growth rate and high lipid content. This study looked specifically at three Gulf of Maine macroalgae as potential sources of lipids for biodiesel. Both wild harvest and cultured *Saccharina latissima* were used, along with wild harvest *Ulva sp.,* and cultured *Palmaria palmata*. Extraction was carried out using a chloroform:methanol (v:v 2:1) solution, a 0.02% $CaCl_2$ wash, and a final chloroform:methanol:water (v:v 2:50:50) wash, followed by evaporating the remaining solvent off. The remaining lipid product was examined by percent lipid by dry mass and Fourier Transform Infrared Spectrophotometer (FTIR) analysis. *Ulva sp.* had the lowest lipid fraction with 6.49 $\pm$ 3.26%. Lipid percentages increased through cultured *Saccharina latissima* and wild harvest *Saccharina latissima*, with 7.35 $\pm$ 3.39% and 7.84 $\pm$ 2.87% respectively. The highest lipid percentage was seen in *Palmaria palamta* with 11.32 $\pm$ 2.30%. None of the species sampled showed high enough lipid fractions to be economical for biodiesel fuel production. FTIR spectra showed a strong relative peak in the 2955 cm^{-1} to 3850 cm^{-1} for all samples, suggestive of majority carbon hydrogen single bonds. Other prominent peaks occurred in the 1700 cm^{-1} to 1740 cm^{-1}, indicative of carbon oxygen double bonds, and at 1462 cm^{-1} and 1377 cm^{-1}, indicative of carbon bonded to two hydrogen and nitrogen oxygen double bonds respectively. All spetra, except for cultured *S. lattisima*, showed a broad depression between 3430 cm^{-1} to 3370 cm^{-1}, indicative of alcohol groups and suggesting that accessory pigments or vitamins with predominant non-polar components and periphery polar groups may have also came out as part of the extraction.