EVALUATION AND COMPARISON OF ROUTES FOR OBTAINING LIPIDS AND MONOSACCHARIDES FROM MICROALGAE Navicula sp.

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Introduction

For reducing CO_2 emissions that contributes to global warming, is necessary to replace fossil fuels with clean and renewable energy. Microalgae biomass is presented as a promising alternative to solve this problem through its ability to use CO_2 as carbon source for growth. Additionally, this same biomass has the capacity to produce fuels such as biodiesel and bioethanol due to the amount of lipids and polysaccharides in their cell structure.

The biomass from algae has a high growth rate, making it a great source of lipids In addition to their rapid reproduction, require only 0.1 m^2 of growing area to produce 121104 kg of biodiesel by year, equivalent to 70% by weight dry biomass, obtaining a performance for the production of biodiesel, about 25 times greater than biodiesel obtained by a traditional crop like palm oil.

The production of biodiesel from microalgae oil involves removal of lipids from biomass, followed by conversion to alkyl esters and glycerol. Polysaccharides, mainly composed of cellulose, can be hydrolyzed for reducing sugars which are subject to the fermentation process to produce bioethanol.

Results and Conclusions

This study defined and assessed various routes for obtaining monosaccharides and lipids from the microalgae *Navicula* sp. implementing methods of acid hydrolysis, Soxhlet extraction, Organosolv pretreatment, *in situ* transesterification.

The routes defined were Acid Hydrolysis - Soxhlet Extraction, Organosolv - Soxhlet Extraction and multi-functional system. the latter route was evaluated using ethanol and methanol, in order to produce sugars, lipids and alkyl esters directly from the biomass into a single-step reaction unit and under the same operating conditions. The routes were compared based on the percentage of lipids and monosaccharides obtained. For the acid hydrolysis - Soxhlet extraction route, different times of hydrolysis and extraction were evaluated, getting two and sixteen hours as the best times respectively to obtain high lipid yield. By Organosolv - Soxhlet extraction route, lipidic efficiency was 47.96% while for the multifunctional system using methanol, total reducing sugar

percentage was 1.75%. In addition, it was determined the kinetic parameters for TRS production over time for the multifunctional system using *Navicula* sp. Different scenarios were studied for this model, varying the temperature and acid concentration ranges from 298 to 413 K and 10 to 30 mg/mL respectively. With increasing temperature and decreasing the concentration of acid, increases the production of TRS in time. For multifunctional system by Infrared spectrophotometry the absorption peak of carbonyl group, characteristic of biodiesel, was compared over time. the band appears at a wavelength of 1750 cm^{-1}. Using methanol, the shape of the peak begins to change after one hour of reaction. Using ethanol, after four hours. Organosolv - Soxhlet extraction showed the highest lipid efficiency and multifunctional system showed more monosaccharides yield.

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Author publications

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