MICROALGAE BIOMASS AS FERMENTATION SUBSTRATE FOR HYDROGEN AND BUTYRIC ACID PRODUCTION BY *Clostridium tyrobutyricum*

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Abstract

Fossil fuels are a limited type of feedstock, increasingly expensive, and carrying strong polluting properties. The search for alternative sources which can replace fossil fuels without the severe disadvantages that its use conveys is therefore of paramount importance. Microalgae biomass represents an example of such non-food renewable biomass that can be regarded as a valid alternative to fossil fuels. As biomass, microalgae are highly desirable since they are photosynthetic organisms with a very fast growth rate in comparison to higher plants, and their production does not require arable land or potable water. Furthermore, some microalgae are able to store large amounts of oil or sugars, prime materials for the production of biofuels and bulk-chemicals [1]. *Scenedesmus obliquus* is a microalgae with the referred properties, easily produced at large scale and capable of storing a high amount of sugars under nitrogen shortage. The objective of the present work was to investigate the production of hydrogen and butyrate from *S. obliquus* hidrolysate by four hydrogen- and butyrate-producing bacterial strains previously isolated by us and identified as *Clostridium tyrobutyricum* 1T, 2T, 3T and 9P.

S. obliquus biomass was produced locally in air-lifts. After harvest, all biomass was submitted to acid pre-treatment [2] resulting in a microalgae hydrolysate with a final concentration of 10.3 g/l of glucose, xylose, arabinose, mannose and galactose. The hydrolysate was used as carbon and energy source for hydrogen and butyrate production by the four *C. tyrobutyricum* isolates. Hydrogen yields ranged from 0.63, 1.29, 1.36 and 1.24 of mol H_2/ mol sugars by strains 1T, 2T, 3T and 9P, respectively. Hydrogen production was accompanied by the production of carbon dioxide and organic acids, mainly butyrate. Butyrate yields were 0.29, 0.49 and 0.48 mol butyric acid/ mol sugars, respectively by *C. tyrobutyricum* strains 1T, 2T and 3T, and 9P. The best *C. tyrobutyricum* isolate for combined hydrogen and butyrate production from *S. obliquus* hydrolysate will be used in further studies of energetic valorisation of spent algal biomass available from both biodiesel and bioethanol processes.

References

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