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Acid hydrolysis as a strategy to increase the extraction of carbohydrates from macroalgae

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Introduction

Brown macroalgae

Extraction

Pretreatments
- Biological
- Physical
- Chemical

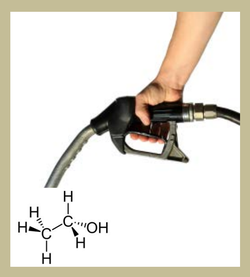
LAMINARIN

Linear β-1,3 glucan chain with occasional β-1,6 linkages.
Depending on the harvesting period, its concentration can attain up to 30%.

MANNITOL

6-carbon sugar alcohol obtained from the reduction of the mannose sugar.
Its concentration varies from 3 to 21% of dry weight.

Fermentation



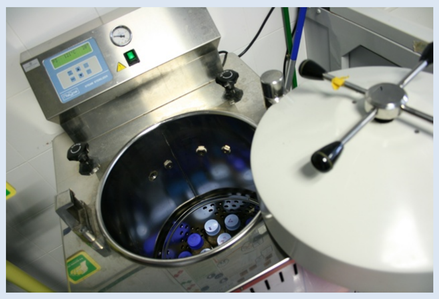
Bioethanol

Objective

Selecting acid hydrolysis conditions able to maximize the extraction of total carbohydrates from the brown macroalgae *Laminaria japonica*.

Material and Methods

Brown seaweeds (*L. japonica*) were collected on the Atlantic coast and dried at 45 °C for 24 h



Hydrolysis conditions:

1st stage	2nd stage
120 ºC	120 ºC
1% (w/w) H_2SO_4 solution	1, 2, 5, and 10% (w/w) H_2SO_4 solution
10, 15, 20 and 60 min	60 min

Total sugar content was determined by the phenol-sulfuric acid method (Dubois et al., 1956)

Results

Table 1. Content of total sugars in hydrolysates after acid pretreatments (120 ºC, 1% w/w H_2SO_4 and different times of hydrolysis)

Time (min)	Total sugar content (g/L)
10	3.31
15	4.42
20	4.64
60	5.01

Table 2. Content of total sugars in hydrolysates after acid pretreatments (120 ºC, 60 min and different concentrations of H_2SO_4)

H_2SO_4 (% w/w)	Total sugar content (g/L)
1	5.01
2	9.37
5	8.45
10	7.91

Conclusions

Chemical pretreatment using sulfuric acid as catalyst is an efficient technique for the extraction of carbohydrates from macroalgae.

Conditions of acid hydrolysis (residence time and H_2SO_4 concentration) need to be optimized for maximizing the recovery of total sugars from *L. japonica*.

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