



# Decoding bioactive polar lipid profile of the macroalgae *Codium tomentosum* from a sustainable IMTA system using a lipidomic approach



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## ARTICLE INFO

### Article history:

Received 8 May 2015

Received in revised form 13 August 2015

Accepted 28 September 2015

Available online xxxx

### Keywords:

Lipidomics

Glycolipids

Phospholipids

Seaweed

Mass spectrometry

HILIC–ESI–MS

## ABSTRACT

Biotechnological applications of marine macroalgae have gained new interest due the added-value of their chemical constituents. This is the case of glycerolipids, phospholipids and glycolipids that display several commercial applications in food, pharmaceutical and cosmetic industries. This study is the first report on the isolation and characterization of the polar lipids of *Codium tomentosum* originating from a land-based integrated multi-trophic aquaculture (IMTA) using a lipidomic-based approach employing hydrophilic interaction liquid chromatography–electrospray ionization mass spectrometry (HILIC–ESI–MS). The polar lipid profile of *C. tomentosum* revealed the presence of over two hundred species, corresponding to glycolipids (sulfoquinovosyldiacylglycerols, sulfoquinovosylmonoacylglycerols, di- and monogalactosyldiacylglycerols), glycerophospholipids (lyso- and phosphatidylcholines, phosphatidylinositols, phosphatidic acids, lyso- and phosphatidylglycerols), and di- and monoacyl betaine lipids. Phosphatidylinositols, sulfoquinovosylmonoacylglycerols and some species of monoacyl betaine lipids were reported for the first time in green algae. Some of these polar lipids contain polyunsaturated fatty acids (PUFAs), namely 20:5 and 22:6 species, revealing the ability of *C. tomentosum* to synthesize larger PUFAs. Also hydroxy-PUFAs of DGDG species were identified, inferring the occurrence of oxylipins. As several of the lipids identified have been reported to have nutritional and health benefits, the present study unravels the potential of *C. tomentosum* from IMTA to a range of new applications.