Aqueous antimicrobial extracts of *Ascophyllum nodosum* using microwave technology

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Introduction

Research efforts are increasingly directed towards seaweed (SW) and the antimicrobial compounds it's comprised of, i.e. polysaccharides such as alginate, fucoidan and laminarin, fucoxanthin, pigments et al. [1].

Objectives

- Determination of the **optimal solubilization conditions** using Response Surface Methodology
  → efficiency (Eff.) ↑, energy per solubilized seaweed biomass (E/SSW)↓
- Assessment of **zeta potential (ZP)** for determining **antimicrobial characteristics ↔ Optical Density ($O.D._{600}$)** antimicrobial experiments

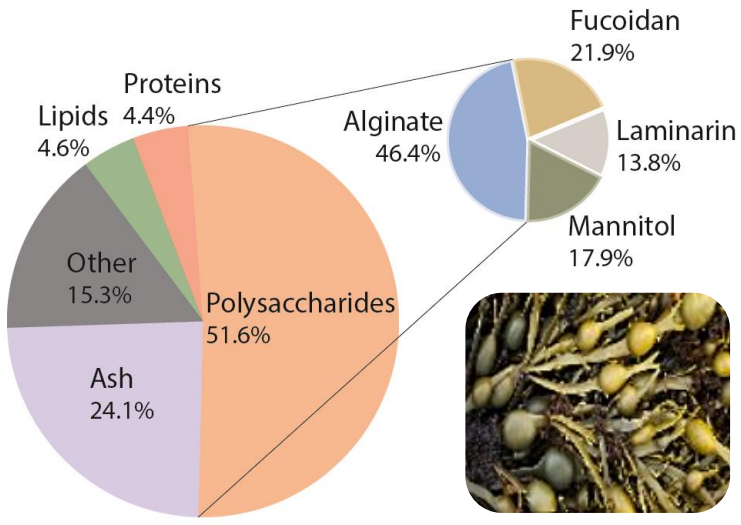


Fig. 1: Chemical composition of *Ascophyllum nodosum*

Materials & methods

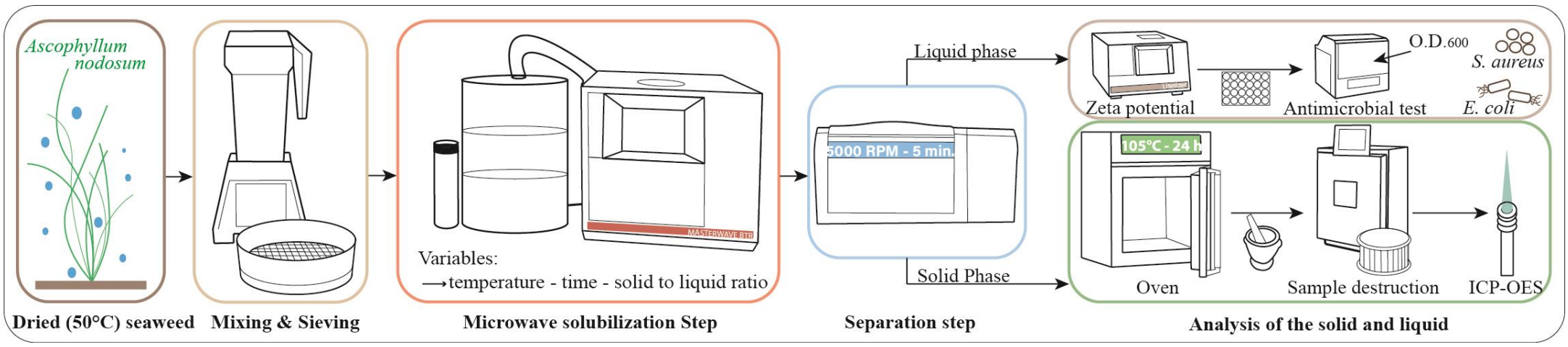


Fig. 2: Schematic overview of the applied method and used equipment

Results

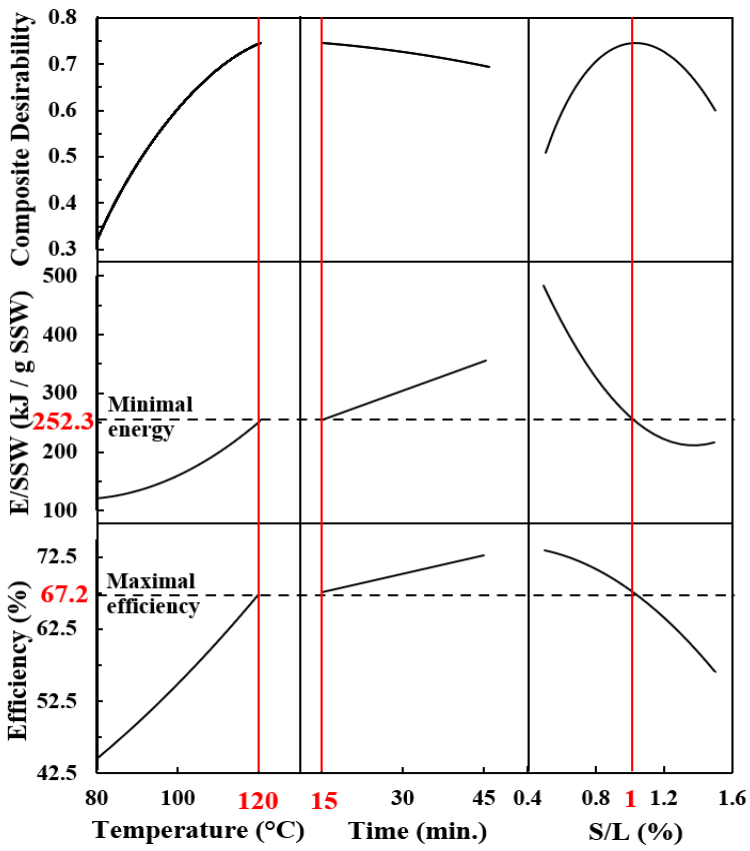
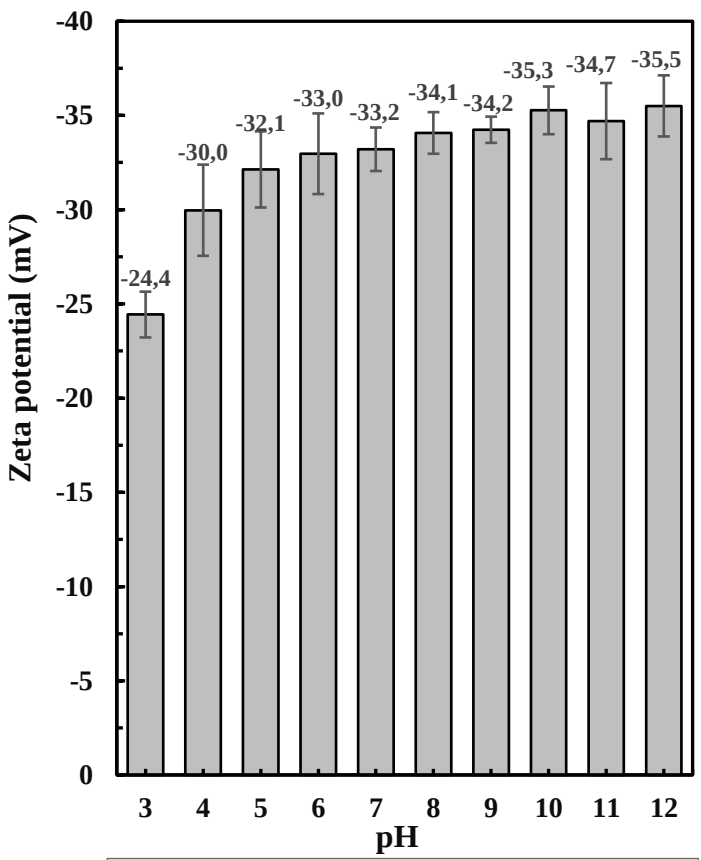


Fig. 3: Optimization plot and optimal conditions **(red)**



Positive ZP = antimicrobial [2]
Protein removal → ZP↑?

Fig. 4: ZP in function of pH

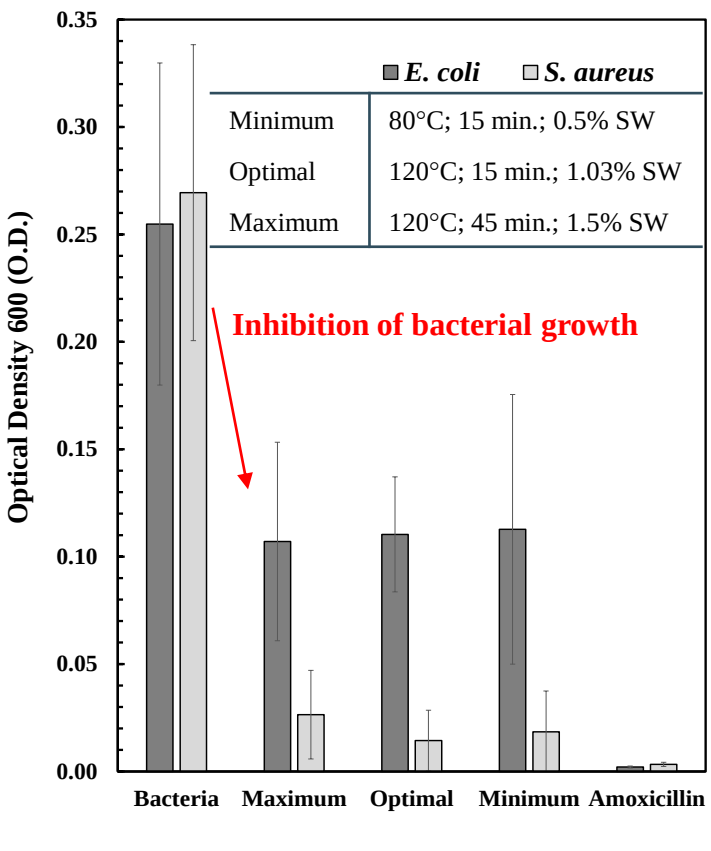


Fig. 5: O.D. 600 @ 8h for extracts at maximal, optimal and minimal conditions inoculated with *E. coli* (gram-) or *S. aureus* (gram+). O.D. 600 for bacteria without extract (left) and with antibiotic (right).

Conclusion

- Model predicts maximalization of solubilization efficiency (67.2%) and minimalization of applied energy (252 kJ/g SSW).
- All negative values for the ZP ↔ nevertheless, antimicrobial characteristics were observed
- Extracts are more effective against *S. aureus* (gram+) → inhibition of 97%

[1] H. U. Dahms and S. Dobretsov, "Antifouling compounds from marine macroalgae," Marine Drugs, vol. 15, no. 9. MDPI AG, Sep. 01, 2017. doi: 10.3390/md15090265

[2] Chang, S. H., Lin, H. T. V., Wu, G. J., & Tsai, G. J. (2015). pH Effects on solubility, zeta potential, and correlation between antibacterial activity and molecular weight of chitosan. Carbohydrate Polymers, 134, 74–81. https://doi.org/10.1016/J.CARBPOL.2015.07.072

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