

Bioethanol a by-product of agar and carrageenan production industry from the tropical red seaweeds, *Gracilaria manilaensis* and *Kappaphycus alvarezii*

Hessami M.J.¹; Salleh A.¹; Phang S.M.^{1,2*}

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Abstract

The two red seaweeds, *Gracilaria manilaensis* and *Kappaphycus alvarezii* are cultivated in Malaysia for producing agar and carrageenan, respectively. The residues of these seaweeds after removing agar and carrageenan by dilute acid treatment were subjected to enzymatic hydrolysis using cellulase (Cellic CTec 2). In the optimization of enzymatic hydrolysis, highest glucose concentration was achieved in the sample with liquid: residue ratio of 7.5:1 and enzyme loading of 10 % w w⁻¹ residue. The resulting glucose was converted to bioethanol using *Saccharomyces cerevisiae* where bioethanol yields from *G. manilaensis* and *K. alvarezii* were 56.26±1.10 g L⁻¹ and 51.10±1.21 g L⁻¹, respectively, which corresponded to 91 % and 95 % of the theoretical yield. The results of this study indicate that the residues of these seaweeds can be efficiently converted to bioethanol and besides environmental benefits, additional profit can be achieved in the phycocolloid industry.

Keywords: Bioethanol, Cellulase, Agar residues, *Gracilaria manilaensis*, *Kappaphycus alvarezii*

1-Institute of Biological Sciences, University of Malaya, 50603 Kuala Lumpur, Malaysia

2-Institute of Ocean and Earth Sciences, University of Malaya, 50603 Kuala Lumpur, Malaysia

*Corresponding author's Email: phang@um.edu.my