Optimization of an Innovative Hydrothermal Processing on Prebiotic Properties of *Eucheuma denticulatum*, A Tropical Red Seaweed

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Abstract: Seaweed is a sustainable source of marine oligosaccharides potentially could be used as a prebiotic ingredient for the functional food development. The study aims to optimize the oligosaccharide preparation through thermal hydrolysis of an under-utilized red seaweed, *Eucheuma denticulatum*. Response Surface Methodology (RSM) applying the Box-Behnken Design (BBD) was used on three parameters including temperature (105ºC-135ºC), hydrolysis time (15-35 min) and sulfuric acid concentration (0.05-0.2M). Optimized fractions with good prebiotic activity were characterized using HPLC-SEC and FT-IR. Oligosaccharides fraction ED-F1 was shown to promote the growth of beneficial gut microbiota including *Lactobacillus plantarum, L. casei, L. acidophilus, Bifidobacterium animalis* and *B. longum* with the highest prebiotic activity score of 1.64±0.17. The optimization studies showed that hydrolysis time was the most significant parameter for the oligosaccharides yield. Optimal hydrolysis conditions for ED-F1 were 120ºC, 21 min, 0.12M H_2SO_4 with the highest yield achieved (11.15 g/100 g of dry weight). Molecular weight of ED-F1 was determined at 1025 Da while FT-IR analysis revealed the presence of sulfated oligosaccharides with similar characteristics of *i*-carrageenan. These findings signify the innovative method for the efficient production of seaweed derived prebiotic oligosaccharides, which could be a promising source of functional food ingredients for the development of health foods and beverages.

Keywords: optimization, lactobacillus, bifidobacterium, *Eucheuma denticulatum*, seaweed oligosaccharide