

# Cellulase-enhanced fermented edible seaweed extracts as liquid organic fertilizers for lettuce (*Lactuca sativa* L. var. *crispa*)

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## Abstract

The utilization of seaweeds as an agricultural bioresource, such as liquid organic fertilizers, posed opportunities in organic farming due to their potential plant growth-promoting contents. The Philippines has numerous species of edible seaweeds, such as *Gracilaria bursa-pastoris* (Rhodophyta), *Acanthophora spicifera* (Rhodophyta), and *Sargassum ilicifolium* (Phaeophyceae), which served to be fertilizer potential in high-value crops. The three edible seaweed species were formulated into cellulase-enhanced fermented extracts and applied to lettuce as liquid organic fertilizers. Results showed that lettuce applied with *G. bursa-pastoris*, *A. spicifera*, and *S. ilicifolium* extracts produced longer plants (52.60 mm, 28.56 mm, and 54.90 mm), heavier fresh weights (33.30 g, 20.28 g, and 19.74 g), and heavier dry weights (4.85 g, 2.47 g, and 3.42 g), respectively as compared to the unfertilized plants. Moreover, higher nitrogen, potassium, and iron contents were detected in the lettuce plants applied with *G. bursa-pastoris* (0.11% N, 0.60% K, and 1.38 mg kg<sup>-1</sup> Fe), *A. spicifera* (0.59% N, 0.56% K, and 0.89 mg kg<sup>-1</sup> Fe), and *S. ilicifolium* (0.94% N, 0.44% K, and 1.32 mg kg<sup>-1</sup> Fe) extracts as compared to unfertilized plants. The promotive effects of cellulase-enhanced fermented *G. bursa-pastoris*, *A. spicifera*, and *S. ilicifolium* extracts were due to their nutrient and possible phytohormone contents. Results indicated that the fermented seaweed extracts can be applied as an alternative organic liquid fertilizers in growing lettuce.

Keywords: *Acanthophora spicifera* (M. Vahl) Borgesen, *Gracilaria bursa-pastoris* (S.G. Gmelin) P.C. Silva, Growth, Nutritional content, *Sargassum ilicifolium* (Turner) C. Agardh