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Alginate from the macroalgae *Sargassum sinicola* as a novel source for microbial immobilization material in wastewater treatment and plant growth promotion

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Alginate extracted from the macroalgae *Sargassum sinicola* was used as the raw material for co-immobilization of the microalgae *Chlorella sorokiniana* and growth-promoting bacterium *Azospirillum brasilense* for wastewater treatment and as an inoculant carrier of *A. brasilense* for plant growth promotion. The composition, structure, viscosity, color, and phenolic compound content of the alginate were analyzed and compared with commercially available alginate produced from the macroalgae *Macrocystis pyrifera*. From ¹H NMR analysis of alginate, *S. sinicola* was found to have more guluronic acid ($F_g=0.64$) than it had mannuronic acid ($F_m=0.38$) and had a viscosity of 13.5 m Pa s compared to 50 m Pa s for *M. pyrifera*. The *S. sinicola* alginate had dark brown color, reducing light penetration, with more phenolic compounds than *M. pyrifera* alginate. Nonetheless, growth of *C. sorokiniana* and *A. brasilense* in *S. sinicola* alginate was not significantly different than the growth in *M. pyrifera* alginate beads. Nutrient removal from wastewater by the co-immobilized microorganisms was similar for both types of alginate beads, and so was the growth enhancement of tomato plants inoculated with microbeads containing *A. brasilense*. This study shows the potential use of *S. sinicola* alginate as a raw material for cell immobilization for wastewater treatment and plant growth promotion.

Palabras clave: alginate, *Sargassum sinicola*, *Macrocystis pyrifera*, Algae, Immobilization, Plant growth promoting bacteria, Wastewater treatment

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