Novel Utilizations of Globally Invasive Algal Species: Environmental and Economical Implementations of Fermented Macroalgae

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Invasive macroalgae impacts coasts, ecosystems, and communities on a global scale, but utilizing this wasteful substance can fulfill future demands and need for sustainable resources. The green algal species Avrainvillea amadelpha and the red algal speices Eucheuma spinosum were fermented using methanogenic bacteria from cow manure, another organic pollutant. Both species were then tested for their nitrate, nitrite, ammonia, and total khejaldal nitrogen contents before and after fermentation. Additional analyses prior to fermentation include tests for fiber, lignin, cellulose, and hemicellulose. Based on these results, it was determined that the two species can be utilized towards four specific sub-projects. Avrainvillea amadelpha shows promise for ethanol production and is a viable resource for lignin extraction. Through Scanning Electron Microscopy, it was found that fermentation managed to break down the cell wall of the red algal species. Then, this lignin can then be used to create a variety of paper products but most importantly, carbon nanofibers - the future of technology. Conversely, Eucheuma spinosum should be used as fertilizer and animal feed. Further testing proved that this species is a superior fertilizer in comparison to today's four most commonly used products. Non-fermented Eucheuma sp. can also be used as animal feed, reducing the need to rely on vast amounts of land and water to sustain the animal agriculture industry. Thus, this series of experiments helped reveal novel environmentally friendly and cost-sustainable ways to utilize various types of macroalgae through the process of fermentation.

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