Biotechnological processing of seaweed for value added products

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E. Nordberg Karlsson[I], L. Allahgholi[II], M. Jönsson[I], G.O. Hreggvidsson[III]

[I]Division of Biotechnology, Lund University, P.O. Box 124, Lund, SE-221 00, Sweden, Lund, Sweden, [II]Biotechnology, Dept of Chemistry, Lund University, Lund, Sweden, [III]Matis ohf, Reykjavik, Iceland

The increasing depletion of fossil fuels, rising greenhouse gas emissions, and a growing global population have increased the need for sustainable food and energy sources. Traditional industrial biotechnology, which relies on plant-based feedstocks, is competing with food production for arable land. Marine macroalgae, or seaweeds, are a promising alternative due to their rapid growth and high carbohydrate content, without requiring cultivable land, fresh water or fertilisers. In this presentation, the potential of brown macroalgae as a sustainable source to produce value-added chemicals, food products, and ingredients is shown. Extracted carbohydrate fractions from *Laminaria digitata* showed potential as carbohydrate source for cultivating thermophilic bacteria, demonstrating suitability of the extracts for replacing terrestrial carbohydrates for bacterial cultivation. Lactic acid bacteria showed the ability to ferment brown seaweeds e.g. *Alaria esculenta*, showing utilization possibilities in production of novel foods, enhancing the shelf life of the seaweed, serving as an alternative to current storage techniques.

To valorize carbohydrate polymers from the seaweeds, laminarin, (a β-1,3 linked glucan with occasional β-1,6 linkages) that serves as a storage carbohydrate in brown seaweed, is an interesting example of a polymer, that can be was enzymatically modified to laminari-oligosaccharides using novel GH17 enzymes identified in the marine bacterium *Muricauda lutaonensis*, and produced β-1,3-linked oligosaccharides with DP above 5 with introduced β-1,6 linkages either in branched or kinked structure, resulting in potential bioactive properties.

These findings collectively offer valuable insights into the potential of brown macroalgae as a renewable, sustainable source for biofuels and value-added compounds.