Alireza Naseri et al., J Food Process Technol 2018, Volume 9
DOI: 10.4172/2157-7110-C8-098

Protein extraction from seaweed in industrial scale

Alireza Naseri, Susan L Holdt and **Charlotte Jacobsen**
DTU Food, Denmark

The global demand for protein is increasing and is expected to escalate further in the coming decades - mostly due to population growth, which must be matched by increased food production. There is a good reason to develop new technologies for the industrial extraction of proteins from seaweed since some species of seaweed have an interesting amino acid profile close to that of animal protein (high amino acid score). The global carrageenan production was 60,000 ton with a value of US$ 626 million in 2014. From this, it can be estimated that the total dried seaweed consumption for this production was at least 300,000 ton/year. The protein content of these types of seaweed is 5–25%. If just half of this total amount of protein could be extracted, 18,000 ton/year of a new high-value protein product would be obtained. The main focus of this study was on *Eucheuma denticulatum* (spinosum) as main seaweed used in carrageenan production and on *Palmaria palmata* as industrial red seaweed with high protein content. The overall aim of this study was to develop new technologies that make it possible to increase the sustainability of carrageenan production by further utilization of the red seaweed raw materials, as a source for other high-value bio products. Different mechanical, chemical and enzymatic approaches were evaluated in laboratory scale and the most promising were optimized and tested on a larger scale. The results showed that by using the new multi-extraction process (submitted patent), it is possible to extract up to 90% of total protein. The amino acid composition of the protein is similar to animal proteins and the total amount of Branched-Chain Amino Acids (BCAA) is higher than other sources. Further work will be carried out in order to improve properties such as color, solubility and taste.

Recent Publications

1. Cian R E, Drago S R, De Medina F S and Martínez Augustin O (2015) Proteins and carbohydrates from red seaweeds: evidence for beneficial effects on gut function and microbiota. Marine Drugs 13(8):5358–5383.
2. Fleurence J, Massiani L, Guyader O and Mabeau S (1995) Use of enzymatic cell wall degradation for improvement of protein extraction from *Chondrus crispus, Gracilaria verrucosa* and *Palmaria palmata*. Journal of Applied Phycology 7(4):393–397.
3. Galland Irmouli A V, Fleurence J, Lamghari R, Luçon M, Rouxel C, Barbaroux O and Guéant J L (1999) Nutritional value of proteins from edible seaweed Palmaria palmata (dulse). Journal of Nutritional Biochemistry 10(6):353–359.
4. Holdt S L and Kraan S (2011) Bioactive compounds in seaweed: functional food applications and legislation. Journal of Applied Phycology 23:543–597.
5. Rhein Knudsen N, Tutor Ale M and Meyer Anne S (2015) Seaweed hydrocolloid production: an update on enzyme assisted extraction and modification technologies. Marine Drugs 13:3340-3359.

Biography

Alireza Naseri is working on the extraction of bioactive compounds (mainly protein) from red seaweed in industrial scale for more than four years at the Technical University of Denmark. He has 10 years of working experience in food and pharmaceutical industry. He started as a Research Assistant and then as a PhD student under the supervision of Professor Charlotte Jacobsen. The obtained results in the lab and large scale are promising and based on the newly defined extraction method, the first patent filed as "Method of treating seaweed for extraction of carrageenan and non-carrageenan bioactive compounds". Now, he is trying to optimize this process for different red seaweeds in the large scale. The main aim of his applied research is to better utilize the valuable compounds in seaweed and thereby achieve a higher return, since at present, companies only extract specific stabilizing agents/ingredients from seaweed and several valuable compounds go to waste.

alinas@food.dtu.dk