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Valorization of Sea Urchins Waste: Antioxidant Pigments Extraction Strategies

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Abstract

Around 75,000 tons of sea urchins are sold annually worldwide for the gonad consumption and in recent decades the demand for sea urchins has increased. Most of the marketed sea urchins come from natural stocks, hence resulting in a large environmental impact and a reduction in sea urchin population in many parts of the world. A valid alternative to the removal of natural stocks could be sea urchin aquaculture, which however is still underdeveloped worldwide and in Europe in particular (Stefánsson et al., 2017). In this framework, CIRCULAr and BRITEs projects aim to fully reuse waste from the sea urchin food industry to convert them, according to the logic of the circular economy, into products with high added value, including animal feed supplements. For this purpose, sea urchins wastes from some Milan's restaurants were finely grinded to produce a powder that could be a valuable addition to the feed for animals requiring high doses of carbonates, like laying hens and sea urchins themselves. The powder was characterized in its mineral and pigments content. In fact, the pigments contained in Paracentrotus lividus, the sea urchin species under investigation, are of high interest. They belong to the family of polyhydroxynaphthoquinones, a class of small polyphenols, and are natural antioxidant products with potential health benefits. Pigments were obtained from sea urchin powder by solvent-based extraction procedures, performing initially a treatment with an aqueous acidic solution to decompose the carbonates matrix, and then counter extracting pigments with selective organic solvents (Powell et al., 2014). A high content of polyphenols in the extracted pigments was confirmed by a Folin-Ciocalteau assay. An ABTS assay confirmed a potent antioxidant activity, comparable to the one of Trolox®, an effective antioxidant used as a reference in the literature. No evidence of cytotoxicity was observed, through a MTT assay in vitro using human dermal fibroblasts. The extract was then characterized by UPLC-MS and the presence of Spinochrome A and Spinochrome B was confirmed. The developed extraction strategy allows to obtain a product of high added value useful to be employed as feed additive or even in other biochemical applications.

References

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