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ENVIRONMENTAL IMPACT OF NATURAL AND SYNTHETIC ASTAXANTHIN PIGMENTS USING LIFE CYCLE ASSESSMENT

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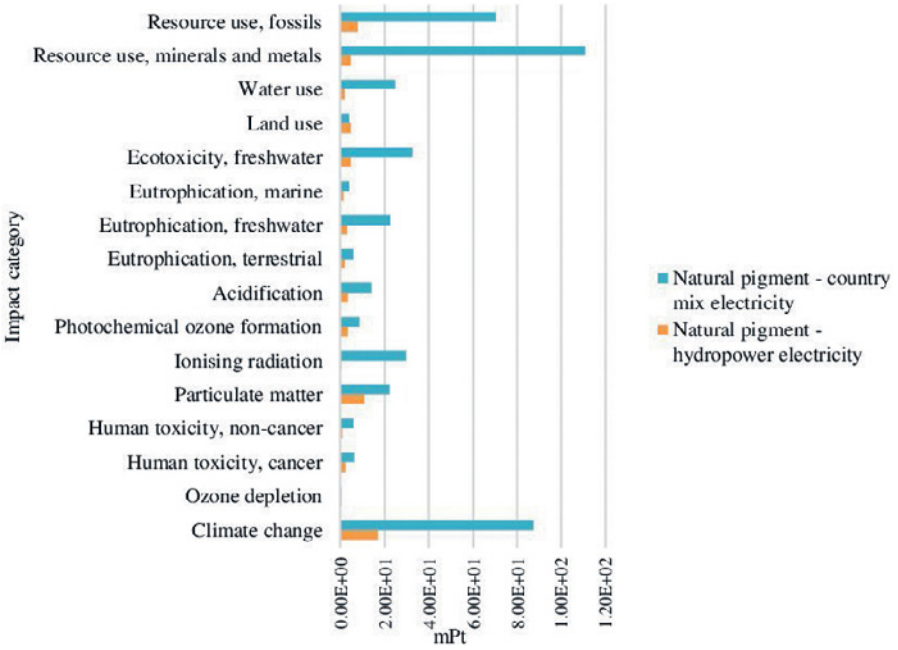
Abstract – The growing demand for fish and the development of the industry raise concerns about environmental impact. As fish production increases, so does the consumption of fish feed. One of the ingredients in fish feed is pigment, which improves the nutritional value and visual appearance of the product, increasing their marketability. Astaxanthin is a red pigment that also has high antioxidant activity. Natural pigment from microalgae or synthetic pigment may be used in feed. The advantage of natural pigment from microalgae is ecological benefits, as the microalgae culture can sequester carbon and release oxygen. The advantage of synthetic pigment is the economic aspect. The Life Cycle Assessment (LCA) method was used to determine the environmental impact of natural and synthetic pigments. The results obtained from the LCA are expressed according to the impact categories defined by the Product Environmental Footprint Category Rules (PEFCR). Sensitivity analysis was performed for natural pigment, and changes were made only to electricity – electricity is produced by hydropower in Norway, or a country mix from Norway was used. Total single score value for natural pigment is 6.85E+01 mPt, and the largest impact is from preparation of the culture medium phase – from sodium nitrate and magnesium sulfate. Sensitivity analysis results for electricity from a country mix is 4.50E+02 mPt. Total single score value for synthetic pigment is 1.07E-01 mPt. The largest impact is from methanol and electricity consumption. Synthetic pigments have a lower environmental impact than natural pigments; however, a sensitivity analysis shows that the environmental impact can be reduced by choosing an alternative to electricity. It should be noted that the comparison presented reflects a general comparison of alternatives, as the input data is derived from a literature review.

Keywords – Fish feed; LCA; pigment sustainability



Natural pigment weighted results for impact categories for hydropower electricity and country mix electricity

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