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# Low pressure supercritical $CO_2$ extraction of astaxanthin from *Haematococcus pluvialis* demonstrated on a microfluidic chip

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ABSTRACT

This study demonstrates the efficacy of low pressure supercritical $CO_2$ extraction of astaxanthin from disrupted *Haematococcus pluvialis.* A microfluidic reactor was employed that enabled excellent control and allowed direct monitoring of the whole process at the single cell level, in real time. Astaxanthin extraction using $ScCO_2$ achieved 92% recovery at 55 °C and 8 MPa applied over 15 hours. With the addition of co-solvents, ethanol and olive oil, the extraction rates in both experiments were significantly improved reaching full recovery within a few minutes. Notably, for the ethanol case, the timescales of extraction process are reduced 1800-fold from 15 hours to 30 seconds at 55 °C and 8 MPa, representing the fastest complete astaxanthin extraction at such low pressures.

KEYWORDS: Supercritical $CO_2$ extraction, astaxanthin, microalgae, microfluidics, co-solvent

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