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A NaDES Biphasic biorefinery approach for the one-step valorization of Arthospira plantensis polar and non-polar bio-compounds.

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PURPOSE OF THE ABSTRACT

To meet the criteria of modern extraction, it is essential to use solvents that simultaneously reach the standards of green chemistry and allow the extraction of a wide spectrum of bio-compounds. Natural Deep Eutectic Solvents (NaDES), as a green solution, meet this difficult task and represent a satisfactory alternative to organic solvents. Microalgae are recognized as a sustainable resource for the production of polar and non-polar metabolites, such as carotenoids, free fatty acids and phycobilliproteins. Among them, spirulina (Arthrospira plantensis) is one of the most studied, due to its high potential for food, feed and cosmetic. Our laboratory has already demonstrated the interest of NaDES for the valorization of spirulina bio-compounds [1,2]. Non-polar NaDES, based on fatty acid and menthol, has shown impressive selectivity towards FFAs leading to an enriched extract based on NaDES. Glycerol-based NaDES have proven to be a sustainable alternative for extracting and stabilizing phycocyanin, the blue protein in spirulina. In this work, an innovative biphasic approach was investigated to upgrade polar and non-polar metabolites in a single step using a biphasic NaDES system. Multiple NaDES were used in this study to screen and identify the best pair of NaDES for maximum compound extraction. According to our results, the use of a biphasic approach represents a gain in time and productivity, compared to monophasic extraction. If the biphasic extraction for most of the pairs of NaDES used improved the yield of fatty acids, carotenoids and chlorophyll, it is also interesting to note that the polar fraction enriched in phycocyanin reaches levels of purity much higher than that of the corresponding single-phase extraction, which was confirmed by colorimetric analysis.

FIGURES

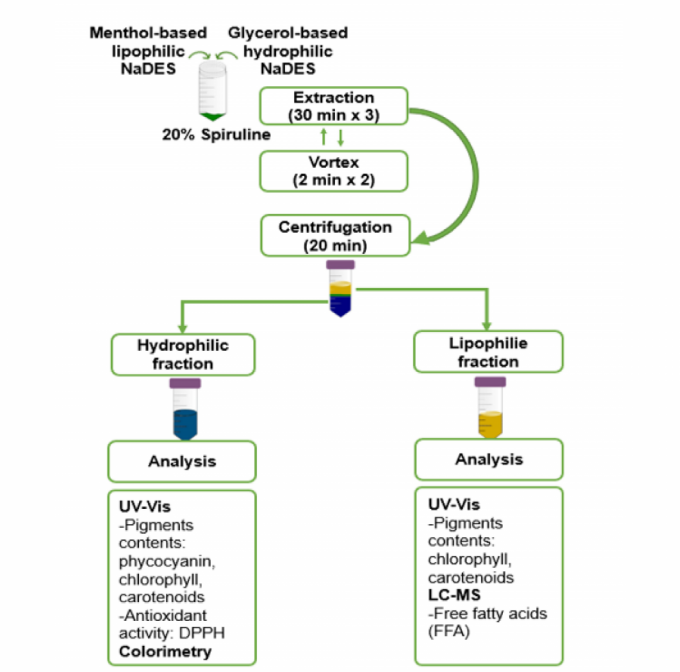

FIGURE 1

Biphasic extraction protocol

Biphasic extraction protocol

FIGURE 2

KEYWORDS

biphasic extraction | Natural Deep Eutectic Solvents | pigments | Free Fatty acids

BIBLIOGRAPHY