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Extraction of RuBisCO from spinach leaves using aqueous solutions of biocompatible ionic liquids

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PURPOSE OF THE ABSTRACT

The search for new sources of proteins has been suffering a boom in the past years. Vegetable biomass is a promising source since it is a low-cost and continuous source of proteins [1]. RuBisCO (Ribulose-1,5-bisphosphate carboxylase/oxygenase) is the most abundant protein on the planet and is naturally found in plants and other photosynthetic organisms. Furthermore, this enzyme can be applied in the most diverse areas, such as pharmaceutical, cosmetic, and feed industries with the potential to be integrated into the food industry [2]. Nevertheless, the current methods applied in the extraction and purification of this protein are not efficient since they do not allow simultaneous high purity and yield [3]. Therefore, there is the need for the development of an efficient and selective RuBisCOs' extraction method. In this work, aqueous solutions of biocompatible ionic liquids (ILs) were applied for RuBisCO extraction from spinach leaves. Response surface methodology was applied to optimize the experimental conditions during RuBisCO extraction. Under the optimum conditions, extraction yields of (10.92 ± 0.01) and (10.57 ± 0.67) mg of RuBisCO/ g of biomass were obtained with the ILs cholinium acetate ([Ch][Ac]) and cholinium chloride ([Ch]Cl), respectively. When compared with a conventional solvent (NH4OH), the extraction yield results are better with the IL solutions. Moreover, Circular Dichroism spectroscopy results show that the secondary structure of RuBisCO is better preserved in IL solutions when compared to the commonly used extraction solvent. In conclusion, cholinium-based ILs demonstrate to be a promising and viable alternative to conventional solvents.

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FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

Ribulose-1,5-biphosphate carboxylase/oxygenase | spinach | solid-liquid extraction | biocompatible ionic liquids

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