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APPLICATION OF PULSED ELECTRIC FIELD AND HIGH PRESSURE HOMOGENIZATION IN THE BIOREFINERY OF MICROALGAE (*CHLORELLA VULGARIS*)

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In this study, the effect of pulsed electric fields (PEF, E = 20 kV/cm; W_T = 100 kJ/$kg_{SUSP.}$) and high pressure homogenization (HPH, P = 150 MPa; n_P = 5) treatments, applied alone or in a cascade approach, on the disintegration degree of microalgae of *Chlorella vulgaris*cells, was investigated. Suspensions of *Chlorella vulgaris* (c_X = 1.2 g/100mL) were subjected to single and combined PEF and HPH treatments and their effect on the extraction yields of intracellular compounds (proteins, carbohydrates and lipids) were evaluated and compared.
Results clearly showed the potential of the combined PEF-HPH treatment to selectively and efficiently recover carbohydrates (CHO) from microalgae, with higher yields with respect to those obtained after a single PEF or HPH treatment ($\eta_{CHO,Combined}$ = 48.6%).
The recovery yield of water soluble proteins (WSP) from combined effect ($\eta_{WSP,Combined}$ = 30%), instead, resulted to be comprised between those detected after either single PEF or HPH treatments. Moreover, from the spectra measurements of both aqueous and organic extracts, the combined treatment showed higher selectivity than the single HPH treatment, which instead lead to a non selective release of different classes of compounds in the external medium.
This preliminary study suggests the possibility to apply PEF and HPH technologies in hurdle approach, in which the former acts as a permeabilisation pre-treatment, while the latter may be used as a final disruption step, with the aim to valorise microalgal biomass by significantly reducing costs of separation/purification in downstream processing.