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Application of ultrasound for corn starch processing by-products pretreatment and enzymatic hydrolysis intensification

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There is emerging interest in the effective use of renewable sources for development of novel bio-stimulant formulations in order to improve crop yield in sustainable EU agriculture. By-product from starch processing industry, such as corn steep liquor (CSL), is an optimal nitrogen feedstock relevant for the development of new bio-stimulants. This study describes the integration of non-traditional treatment to increase the efficiency of corn steep liquor (CSL) protein hydrolysate's production. Low- and high- frequency ultrasound (US) treatment was applied for the treatment of CSL before enzymatic hydrolysis with industrially produced alkaline protease. Efficiency of US and enzymatic treatment was characterized according to the kinetics of hydrolysis (degree of hydrolysis (DH), hydrolyzed protein (HP) concentration, Michaelis-Menten constant (KM) and apparent break-down rate constant (kA)). Additionally, changes in free amino acid (FAA) profile was characterized. Obtained results show a significant positive effect of 37kHz US pre-treatment for CSL enzymatic hydrolysis. The highest HP concentration (17.5g/L) using lowest enzyme concentration (2.1g/L) and shortest hydrolysis time (60 min) can be achieved with low frequency US pre-treatment. This pre-treatment resulted in 2.3 time higher content of FAA, compared to traditional hydrolysis. The decrease in KM value (on average by 33.5%) reveals that US pre-treatment improves the affinity between enzyme and substrate. Obtained CSL protein hydrolysate's biostimulatory effect was tested on wheat grains seeds germination in vivo. The results confirm that by using a 10% of PH's for wheat grain seeds "priming" germination parameters (root and stem length and biomass) can be improved. These findings indicates that ultrasound treatment is promising technology which can be included to non-traditional methods of by-products valorization to bioactive compounds in the agriculture industry.

Keywords: CSL protein hydrolysate's, ultrasound treatment, biostimulants.

Biography:

Bachelor degree in Food Science and Technology and Master degree in Food Product Technology. Working experience in the international food processing company as well as Junior Researcher and Project Engineer experience at the University. Both, industrial and academical knowledge gained through last 10 years provides a possibility to combine science and business in order to develop novel products, enriched with bioactive compounds by valorization of by-products from food industry to ensure a sustainable agrifood chain.