BIOTRANS
LA ROCHELLE 2023

N□61 / PC
TOPIC(s) : (Chemo)enzymatic strategies / Industrial biocatalysis

Enzymatic Crosslinking of Yeast Derived Proteins by Laccase and Effects on Emulsification Properties

AUTHORS
Kelly LIGHT / MCGILL UNIVERSITY, 21111 LAKESHORE, SAINTE-ANNE-DE-BELLEVUE
Corresponding author : Salwa KARBOUNE / salwa.karboune@mcgill.ca

PURPOSE OF THE ABSTRACT

Laccase has shown great potential in the cross-linking or conjugation of protein, contributing to the modulation of the protein-containing biopolymer matrix. Yeast derived cytoplasmic proteins and yeast cell wall mannoproteins have been investigated for their promising emulsification potential. In this work, laccase from two fungal sources is being used to cross link yeast derived proteins from saccharomyces cerevisiae in order to improve their characteristics and broaden their applications.

Commercial laccase from Trametes versicolor and laccase produced in house from Coriolus hirsutus were combined with yeast cytoplasmic protein to achieve varying extents of cross linking based on reaction time course. Ferulic acid was included as a phenolic mediator to enhance the extent of cross linking. Reaction kinetics were monitored by fluorescence spectroscopy and the resulting curves were fitted with Michaelis-Menten and Hill models. Emulsification properties of native and modified proteins were evaluated turbidimetrically. Particle size and zeta potential were evaluated by DLS and solubility was evaluated by precipitation with PEG-8000.

Reaction with laccase from T. versicolor resulted in greater extent of crosslinking at 3h than laccase from C. hirsutus, and addition of ferulic acid enhanced the crosslinking reaction. The end-product profile with or without ferulic acid mediator was dependent on the reaction time and the type of biocatalysts. Reactions run with laccase from T. versicolor and ferulic acid up to 24h showed significant increase in the molecular weight fraction above 150 kDa. Modeled reaction kinetics fitted very similarly with both applied models, with slightly better fit for the Hill model. Protein modified with ferulic acid showed improved emulsion activity index at pH 8 and decreased emulsion particle size at pH 4.

Yeast derived proteins can be successfully crosslinked using laccase from T. versicolor with the addition of a phenolic mediator and extent of cross linking can be controlled by varying the reaction conditions. These modified proteins show promising improvements in emulsification potential and may be used as green biopolymer based emulsifiers in food and pharmaceutical applications. The understanding of the relationship between the extent of cross-linking by laccase and the functional properties will provide the capability to generate enhanced protein-containing biopolymer matrix.

FIGURES

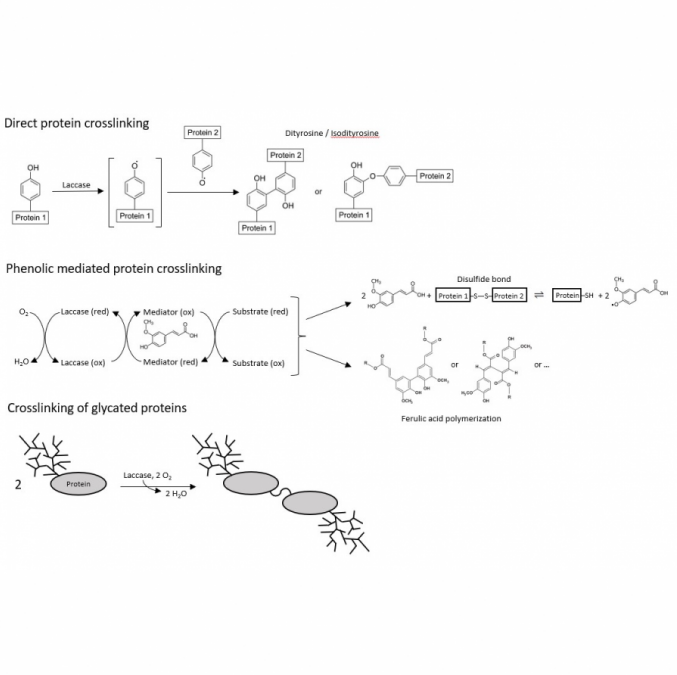

FIGURE 1

Laccase mediated cross linking of yeast derived proteins

FIGURE 2

KEYWORDS

Laccase | Phenolic mediator | Yeast protein | Emulsion

BIBLIOGRAPHY

[1] light, k., karboune, s., crit. rev. food sci. nutr. 2021, 62, 8199-8229.

[2] li, m., karboune, s., light, k., & kermasha, s., innov. food sci. emerg. technol. 2021, 71, 102723.

[3] v□llez-erazo, e. m., saturno, r. p., marson, g. v., & hubinger, m. d., food res. int. 2021, 140, 109853.