Targeted enzymatic hydrolysis: towards a more efficient utilization of corn feedstock as animal feed

Christina Ferousi, Anastasia Zerva, Evangelos Topakas

*1Industrial Biotechnology & Biocatalysis Group, Biotechnology Laboratory, School of Chemical Engineering, National Technical University of Athens, Athens, Greece*

Corn is among the most widely grown crops worldwide and its associated agroindustrial byproducts are, therefore, of high abundance. Corn bran ⸻being one of those⸻ is made from the outer layer of corn kernels and, apart from cellulose, it is mainly composed of highly branched hemicellulose that is additionally complexed with lignin. Although corn bran is already being utilized in animal feed, the recalcitrant nature of its hemicellulosic fraction renders it an inefficient carbon source, since animals are incapable of harvesting its full potential. On the contrary, microorganisms of both bacterial and fungal origin have been shown to code for an arsenal of lignocellulolytic enzymatic machineries that could be exploited for biotechnological purposes. The focus of this study is the investigation of the synergistic effect of major hemicellulase activities upon addition of specific accessory enzymes. To this end, selected xylan-debranching enzymes are recombinantly expressed in suitable hosts and their potential towards the in vitro hydrolysis of highly branched corn arabinoglucuronoxylan is being assessed. Ultimately, an optimized enzyme mixture will be designed that will not only increase the yield of the released sugars from corn bran, but also reduce the overall process cost. Moreover, hydrolysis with enzymes presenting selected specificities will enable the release of prebiotic xylo-oligosaccharides and antioxidant components from corn feedstock.

Keywords: corn bran, lignocellulose, hemicellulose, recalcitrance, glycosyl hydrolases, carbohydrate esterases