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Development of lignocellulosic biomass adapted hemicellulases pretreatment

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The objective of the BABET-REAL5 project is to develop an alternative solution for the production of 2G ethanol, competitive at smaller industrial scale and therefore applicable to a large numbers of countries, rural areas and feedstocks such as sweet corn cob (SCC) and barley straw (BS). These substrates are recalcitrant to enzymatic hydrolysis and numerous factors such as the presence of hemicelluloses and lignins are known to be responsible of the biomass recalcitrance to fractionation. These later ones are known to impede the access of cellulases to the cellulose part by forming physical barriers. A physico-chemical pretreatment is thus necessary to improve enzymes efficiency. Another challenge is to hydrolyze both cellulose and xylans component from biomass and to further ferment glucose and xylose into ethanol.
In this context, our goal is to develop efficient hemicellulasic cocktails adapted to the lignocellulosic biomasses. A thermophilic and hemicellulolytic bacterium (*Thermobacillus xylanilyticus*) was used to develop performant hemicellulasic cocktails for improving xylose and also glucose release from different lignocellulosic biomasses by acting in combination with cellulases. For this, we first evaluate the enzyme productions of this bacterium while growing on SCC, BS and wheat bran. The enzymatic cocktails produced were used to perform hydrolysis of extruded SCC and extruded BSS at different substrate loading (low to high consistency). The performance of the hemicellulasic cocktails were benchmarked with commercial cocktails. We showed that *T. xylanilyticus* was able to produce complete hemicellulases cocktails (containing xylanase, arabinosidase, xylosidase and esterases activities). The composition of enzymatic activities produced depends on the biomass used showing an adaptation of the bacterium to the chemical composition of the lignocellulose. Our results demonstrate that *T. xylanilyticus* cocktails are efficient for pentoses release from lignocellulosic biomasses.

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