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Ballesteros, I.; Oliva, J.M.; Manzanares, P.; Negro, M.J.; Ballesteros, I.; Kádár, Zsófia; Nagy, I.; Réczey, K.

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I. Ballesteros, J. M. Oliva, P. Manzanares, M.J. Negro, M. Ballesteros
Renewable Energies Department - CIEMAT
Avda. Complutense, 22 28040-Madrid, Spain

Zs. Kádár[1,2]*, I. Nagy[2], K. Réczey[1]
[1]Department of Applied Biotechnology and Food Science
Budapest University of Technology and Economics
Szent Gellért tér 4., 1111 Budapest, Hungary
[2]Pólus Plus Co.
Hunyadi János út 9., 1117 Budapest, Hungary

*Corresponding Author: Zsófia Kádár Phone: +36-463-2269
Fax: +36-463-2598
E-mail: zsofia_kadar@mkt.bme.hu

Among the possible alternatives to produce biofuels, bioethanol production from agricultural by-products and wastes or dedicated energy crops using a microbial biotechnology is seen as an attractive approach to produce vehicle fuel in large amounts already today.
Although agricultural residues as cereal straw and corn stover are the most widely studied substrates for second generation biofuel production there are other biomass residues that could be used for this purpose. This work was focused on industrial hemp utilisation as a native in Hungary, which has a significant role of the improvement of the underdeveloped area as a modest, fast growing plant with a high biomass yield.
Although lots of pretreatment methods have been shown to be very effective, not all techniques are applicable on an industrial scale, due to the high costs or technical difficulties involved. For these reasons this study was focused on steam explosion (SE) which has been proposed as an efficient pretreatment of lignocellulosic materials and has the advantage to be developed at commercial scale.
SE pretreatment was carried out in a batch pilot plant with a capacity to treat 150 g dry lignocellulosic biomass per batch. According to a factorial design different pretreatment conditions: residence time (2-10 min), temperature (180-220 ºC) and use of acid catalyst was assayed to enhance fermentable sugars production from hemp. Pretreated material (slurry) was separated into liquid (prehydrolysate) and solid fraction and analyzed for carbohydrates and toxic compounds. Pretreatment was evaluated in terms of hemicellulose-derived sugars recovery in the prehydrolysate, cellulose recovery in the solid fraction, and enzymatic hydrolysis yield using commercial cellulases.
In general steam explosion seems to be a suitable method for hemp to produce an easily degradable cellulose rich biomass for ethanol production. Preliminary results show that the effect of temperature is more significant than duration time on enzymatic hydrolysis results when pertreatment is carried out without acid. Result from this study will be presented.
Future studies needs to address ethanol fermentation experiments on pretreated hemp, to optimize the pretreatment method with a view on maximizing ethanol production.