

Biológiai úton előkezelt búzakorpa alkoholos erjesztése mono- és vegyes kultúrák alkalmazásával

Fermentation experiments on biological pretreated wheat bran with mono- and co-cultures

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Summary

In Hungary, lignocellulosic materials from agro industrial activities (corn cob, sunflower stalk, wheat straw, wood-chips etc.) with a high content of carbohydrates are generated annually in large quantities, which may serve potential sources for production of bio-fibres, enzymes, antioxidants, ruminant feed, bio-pulp or even of bio-fuels. The carbohydrate polymers, mainly cellulose and hemicellulose, as well as aromatic lignin components in plant cell walls form heterogeneous and resistant structure. Among the pre-treatment processes, the most popular are combined methods for effective digestibility of the materials, though the pure biological pre-treatment is safer and more environmentally. However, it requires more time and the efficiency of bio-degradation is lower than at others. The aim of this study was to improve the reduced soluble carbohydrates content using lignocellulolytic filamentous fungal consortium of *Aspergillus niger* NCAIM F.00632, *Penicillium chrysogenum* NCAIM F.00913, *Trichoderma viride* NCAIM F.00795 on wheat bran, as model substrate and examine the efficiency of ethanol production by yeast and bacteria strains, as Levuline Fb type dried *Saccharomyces cerevisiae*, *Kluyveromyces marxianus* NCAIM Y.00959 and *Zymomonas mobilis subsp. mobilis* NCAIM B.01327^T. The results indicate that filamentous fungal consortium showed the highest soluble carbohydrates content with 196 g.l-1 in 24-48 hours of bio-degradation at 10 % (w/v) wheat bran, 60:25:15 percent of initial conidia ratio with 10⁵ conidia per gram dry substrate, liquid to solid ratio of 5:1, pH 5.0 and 30°C. Further increase in fermentable sugar content was reached after enzymatic saccharification using industrial enzymes, as cellulase and cellobiase (Sigma-Aldrich, Austria) in ratio of 3:3, at pH 5.5 and 55 °C. The reduced carbohydrates content was about 2-3 times more, and glucose content was 87.82 g.l-1, approximately. The mono-culture fermentation of pretreated wheat bran by *Kluyveromyces marxianus* NCAIM Y.00959 reached 5.6 %, V/V of ethanol at 144 hours. An increased ethanol concentration was obtained by co-culture of two yeast strains in ratio of 1:1, where ethanol concentration was about 6.7%, V/V. Although the experiments showed promising results, we still need further research in this area.