APPLICATION AND OPTIMIZATION OF THE ASPERGILLUS NIGER EXTRACELLULAR ENZYME SYSTEM FOR THE DEGRADATION OF SUGAR BEET PULP (SBP)

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One of the main challenges in agrofood sector waste is the lignocellulosic material and its environmental impact. Traditional disposal methods such as open burning or landfilling contribute to air and soil pollution [1]. Effective management of this waste stream is essential to minimize its negative impact on the environment. Long chain carbohydrates in lignocellulose can be broken down through enzymatic hydrolysis or thermochemical conversion to produce simple sugars and other bio-compounds. Sugar beets are one of the main crop for sugar production with approximately 260 Mt produced globally in 2022 with Europe contributing nearly 176 Mt of the global production. Sugar beet pulp (SBP) is a lignocellulosic by-product of the sugar industry that has traditionally been used for animal feed [2]. On a dry-weight basis, SBP consists primarily of polymeric carbohydrates (75–85% w/w), including 20–25% cellulose, 25–36% hemicelluloses, and 20–25% pectin, and low lignin content (1–3%) [3-5].

In this research *Aspergillus niger* extracellular enzyme system was explored for potential application in simple sugars production from SPB long chain carbohydrates and their further conversion into bioethanol. Using SPB biomass hydrolysis by inoculation with *A. niger* was carried out for 168 h at 20°C–35°C. A significant increase in the SBP degradation was noticed from 96 h of processing and reaching its highest at 132 h, e.g. the highest RS amounts were produced by *A. niger*at 25°C (22.30–38.08 g/100 g d.w.). The fungi secreted large amounts of total cellulase, endoglucanase(131.56±2.11 EGU/100g d.w.), β -glucosidase (78.08±1.36 EGU/100g d.w.) activities in the SBP substrate.*A. niger* produced the highest total cellulase activity (212.33±2,09 FPU/100g d.w). These results suggest that SPB can be effectively utilized for the production of simple sugars through enzymatic hydrolysis by *A. niger*.SPB biomass conversion into simple sugars holds promising implications for bioethanol production in further steps of this research.

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