Enzymatic and thermal treatment of coffee spent ground for fermentable sugars release

Michel Brienzo[1], Maria G. Aparicio[1], Tania Jooste[2], Emile van Zyl[2], Johann F. Görgens[1]*
Departments of Process Engineering and Microbiology, Stellenbosch University, Stellenbosch 7600, South Africa *jgorgens@sun.ac.za

Abstract
The spent coffee grounds (SCG) are the main residue generated during the production of instant coffee by thermal water extraction from roasted coffee beans. This waste is composed mainly by polysaccharides that remain unextractable during the process production such as cellulose and galactomannans. In this context, the application of an enzyme cocktail that acts synergistically (mannanase, endoglucanase, exoglucanase, xylanase) is regarded as a promising strategy to add value to this residue, either increasing the soluble solids yield of instant coffee or as raw material for production of bioethanol and food additives (manitol).
In this study wild fungi were isolated from both SCG and coffee beans and screened for enzyme production. The enzymes produced from the selected wild fungi and recombinant fungi were then evaluated for enzymatic hydrolysis of SCG and further compared with commercial enzyme preparations. In general the application of mannanases enzymes gave better yields than when only cellulase or xylanase were added in the hydrolysis media. The recombinant mannanase (Man1) provided the higher increments in total sugar yield (17%) even when compared with commercial preparations at the same protein concentration (57 mg/100 g SCG). The combination of Man1 with other enzyme activities revealed an additive effect on the hydrolysis yield, but not synergistic interaction. It can therefore be concluded that the highest total sugar yields was mainly due to the hydrolysis action of mannanase.