# Setting up a new Enzymatic Cocktail for the Valorization of Carbohydrates from Lignocellulosic Waste Biomasses

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The increasing demand for recycling food waste products across multiple industrial sectors to advance the circular bioeconomy and convert lignocellulosic wastes has recently gained substantial attention. Among these biomasses, Spent Coffee Grounds (SCG), composed of galactomannan, arabinogalactan II, and cellulose [1], stand out as an excellent source of high-value saccharides. These include manno-oligosaccharides (MOSs), galacto-oligosaccharides (GOSs), mannose, galactose, arabinose, and glucose, which are well-suited for bioethanol production, fermentation, synthesis of biodegradable polymers and materials, and other high-value products [2]. In this context, (hyper)thermostable and thermoactive (hemi)cellulases, due to their stability, play a pivotal role in the saccharification of recalcitrant polysaccharides and oligosaccharides under harsh industrial conditions [3]. In this study, we effectively selected thermophilic and thermostable enzymes based on pH, thermal stability, and activity to set up an enzymatic cocktail for the hydrolysis of SCG. We used pod SCG from Italian Borbone coffee as the raw biomass for hydrolysis. Compositional analysis of this raw material revealed that it is composed of 50% carbohydrates, 40% lignin, and 10% other extractives. Various mild delignification pretreatments were applied on the raw SCG, resulting in SCG-derived biomass with reduced lignin content and enhanced accessibility for enzymatic hydrolysis. The enzymatic hydrolysis of the SCG-derived biomasses demonstrated the conversion of over 30% w/w of the biomass (equivalent to 50-60% w/w of cellulose and hemicellulose content) into reducing sugars.

References

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(3) Cobucci-Ponzano B et al. (2015) Enzyme Microb Technol 78, 63–73.