Pretreatment of switchgrass by steam explosion in a semi-continuous pre-pilot reactor

Switchgrass (Panicum virgatum) is a perennial grass highly valued as an energy crop resource for the production of bioethanol due to its high carbohydrate content, fast growth, and ability to grow in lands that cannot support crop or food production. In the present study, this biomass was submitted to steam explosion pretreatment in a semi-continuous pre-pilot reactor with the aim of obtaining a pretreated solid with high digestibility for enzymatic hydrolysis. Different conditions of temperature (170–200 °C) and residence time (5–15 min), leading to different severity factors (2.76–4.12) were used for steam explosion pretreatment, which were combined through a 2^2 central composite design. The results revealed that both variables had great influence in the process, affecting both the biomass structure and the saccharification yield, as a consequence. However, in the range of values evaluated in this study, the effect of the temperature was more prominent than the effect of the residence time. The best saccharification yield (88.3%) was obtained when using the biomass pretreated at 200 °C for 10 min. Similar result was obtained using a commercial cellulose pulp as feedstock for enzymatic hydrolysis, confirming that the best conditions for switchgrass pretreatment in the pre-pilot scale were successfully established.