Influence of the brewers spent grains (BSGs) concentration on the rheological properties of suspension added of alkaline hydrogen peroxide (AHP)

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During brewery, the generation and management of the by-products is still challenging. Brewer's spent grains (BSGs) is the main residue produced in, with high potential to be converted into bioethanol and plant-based proteins, for example. However, adequate pre-treatments need to take place to reduce the biomass recalcitrance. Understanding how the rheological behavior of alkaline suspension of brewer's spent grain is essential for the design of bioethanol production and extraction process. Thus, this work aimed at determining and modelling the rheological behavior of alkaline suspensions in different concentrations of BSGs. The dried raw material was firstly ground and sieved (Tyler mesh 100). Alkaline solution of alkaline hydrogen peroxide (PHA) was prepared at a concentration of 6% (g of PHA per 100g of dispersant). Different concentrations of BSGs were added to these solutions to obtain suspensions with final solids concentrations of 0, 2, 4, 6, 8 and 10% (g of BSG per 100 g of suspension). Steady-state flow were performed in triplicate in a AR-G2 rotational rheometer (TA Instruments, New Castle, USA) coupled with the SPC (Starch Pasting Cell) geometry and shear rate ranging from 1 to 265 $s^{?1}$. The rheological experiments were carried out at 278.13, 283.15, 293.15 and 303.15 K. The models of Newton, Bingham, Ostwald-de Waele and Herschel-Bulkley were fitted to the experimental data. The flow curves were better described by the Herschel-Bulkley model (R^2?0.994) with a behavior index (n) ranging from 0.81 to 1 and significant yield stress. Newtonian behavior was observed at concentrations up to 6% (g of BSG per 100 g of suspension) and shear-thinning properties at concentrations of 8 and 10%. Apparent viscosity increased with increasing solids concentration and decreasing temperature, with higher flow resistance at these conditions. An Arrhenius-type equation could be use satisfactorily to describe the effect of temperature (R^2?0.992). This, the concentration played an important role on the rheological behavior, being this information needed to design further conversion processes.