Effect of temperature and alkaline hydrogen peroxide concentration on the rheological behavior of suspensions containing brewer's spent grains

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Brewer’s spent grains (BSG) is a byproduct that represents 85% of the total waste generated by the brewing industry. Its sustainable use has been attributed toto the production of bioethanol, biogas, plant-based proteins, and other value-added products. In order to make the conversion processes of this raw material into value-added products easier, alkaline hydrogen peroxide (AHP) has been studied as a low pollutant chemical pre-treatment to reduce the recalcitrance of the lignocellulosic biomass. In this sense, the knowledge about the influence of AHP concentration on the rheological behavior of suspensions containing BSG was assessed to provide essential information for the design the unit operations associated to the conversion processes: e.g. mixing and pumping. For this, powdered samples of BSG at a concentration of 6% (g of BSG/100 g of suspension) were dispersed in aqueous suspensions containing different concentrations of AHP (0, 2, 4, 6, 8, and 10 g of AHP per 100 g of dispersant). The suspensions were subjected to steady-state flow using an AR-G2 rotational rheometer with the Starch Pasting Cell (SPC) geometry over a wide range of shear rates (1-265 $s^{?1}$), at temperatures of 288.15; 298.15, and 308.15K. In general, flow resistance increased with increasing AHP concentration and decreasing the assay temperature. The flow curves were well described by the Herschel-Bulkley model (R_{adj}^2 ? 0.99), showing a shear-thinning behavior. The flow behavior index (n) ranged between 0.85 and 1, decreasing as the AHP concentration increased, but no temperature effect was noticeable. Under the conditions studied, the suspensions showed properties similar to liquids, which facilitate the mass transport and the access of enzymes when compared to high concentrate suspensions. The reported information can help predicting changes in the rheological behavior of BSG suspensions, in addition to the optimization of its conversion processes into value-added products.