Rheological Behavior of Sugarcane Wine at Different Temperatures

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Sugar wine is the term commonly used to describe ethanol that is made through the process of fermenting sugarcane juice using yeast. In previous years, sugarcane, either in the form of cane juice or cane molasses, has been widely used as feedstock for producing ethanol fuel in tropical and sub-tropical countries. The sugarcane ethanol has the advantage of generating energy from a clean and renewable resource and contributes to reduce both air pollution and greenhouse gas emission, when compared to fossil fuels. So, one important focus in current research and development applied in fuel ethanol production is the engineering of process to improve the productivity, by optimizing the unit operations involved in the productive chain. Indeed, in preliminary steps of ethanol production, numerous unit operations requiring the knowledge of fluid rheology (for example pumping, heating, cooling, sedimentation, etc.) are applied. Based on this, the objective of this work was to investigate the rheological behavior of sugarcane wine at temperatures between 293 and 353 K. The wine, which presented 88.45 % and 7,72 % of moisture and alcoholic content, respectively, was collected directly from production line in an industry of Olimpia-SP and stored at 273 K until the time of the rheological tests. Flow curves were obtained in duplicate in a rheometer AR-2000ex (*TA Instruments*), using concentric cylinder geometry and shear rate ramps from 1 to 1000 s^{-1}. Newton, Bingham, Power Law and Herschel-Bulkley models were fitted to the experimental data. The rheological behavior of wine was Newtonian ($n \approx 1$) at 293 K, becoming dilatant ($n>1$) from 303 to 353 K. The curves were better fitted by Power Low model ($R^2>0.999$). The consistency index values (k) decreased with temperature increasing. The temperature influence on the consistency index was expressed by an Arrhenius type equation ($R^2=0.998$) and the activation energy was 95.968 kJ/mol·K.