87

Influence of Temperature and Concentration on The Rheological Properties of Edible Hydrocolloids / Gums

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Abstract

Functional food hydrocolloids are the most commonly used ingredients in the food industry today, primarily for their ability to bind water enabling them acting as thickening agents. The rheological properties of several food hydrocolloids (guar gum, xanthan gum, gellan gum, sodium alginate and carrageenan) were evaluated using a Brookfield DV-3T+ rheometer at different concentrations (0.4; 0.6; 0.8; 1.0; 1.5; 2; 3; 4; 5 and 6%) and four temperatures (25, 40, 60 and 80°C). Considering the apparent viscosity at increasing shear rates from 30 – 100 s^{-1}, all solutions investigated displayed non-Newtonian, shear thinning (pseudoplastic) flow behaviour as decreases in viscosity were observed at increased shear rates. Increasing the concentration of the various hydrocolloids in a solution resulted in an expected increased thickening potential, although the different hydrocolloids resulted in different degrees of thickening. Through model fitting, the various solutions' yield stress and flow index behaviour was determined, best fitted to the power law and the Herschel-Bulkley rheological models. Clear differences in the various solutions' yield stress and apparent viscosity were observed. Specifically, in most instances guar gum showed to be significantly less ($p<0.05$) effective as a thickening agent in comparison to the other investigated hydrocolloids. Other than concentration, temperature showed to, in some instances, have a considerable influence on the rheological properties displayed by a hydrocolloidal solutions.