Effect of oleogel:hydrogel ratio on rheological properties of bigel produced with potato starch and glycerol monostearate

ALVES BARROSO L. (1), GROSSI BOVI KARATAY G. (1), DOMINGUES DOS SANTOS CARVALHO J. (1), DUPAS HUBINGER M. (1)

1 Department of Food Engineering and Technology, School of Food Engineering, University of Campinas (UNICAMP), Campinas, Brazil

Bigels are a promising structured system for the food industry. This work aimed to develop and study rheological properties of bigels obtained from six different oleogel:hydrogel (O:H) ratios, using potato starch (PS) as structuring agent for the H-phase and glycerol monostearate as structuring agent of the O-phase. First, a gelation evaluation of PS was evaluated to define the aqueous phase concentration to be used. All rheological measurements were carried out using a stress-controlled rheometer equipped with a Peltier system. Strain sweeps were performed to determine the linear viscoelastic region of bigel. The frequency-dependent behavior of bigel was accessed by recording storage (G') and loss (G'') modulus as a function of frequency. The behavior of the elastic (G') and viscous (G'') modulus was investigated during cooling and heating stages, disclosing sol-gel and gel-sol transitions, respectively. Bigel was stable formed even with a small addition of O-phase, although a ratio of 20:80 formed a harder structure system. The maximum limit of linear viscoelastic region was between 0.01% and 0.1%, although system with more H-phase was more susceptible to the application of mechanical forces. Above these strain values, dynamic modulus showed pronounced decay and the sample response was dependent on the magnitude of deformation. At this stage, a crossover point occurred, indicating that gels underwent permanent deformation caused by the rupture of the structural network. All the samples, showed a dominate storage modulus (representing the elastic property) over the loss modulus (depicting the viscous property), pointing to a gel-like behavior. All bigels showed a typical abrupt phase transition at 50 ºC demonstrating an application limit of this system. After three months of production was realized a visual analysis and not observed any phase separation in the system with higher O-phase, while the ratio 20:80 shows a little water liberation. Thus, this study unveiled the potential of PS for the development of low cost bigel to form systems with tailored textures for application as trans-fat substitute in food. For future studies, the best formulation of bigels is going to be selected for curcumin vehiculation, aiming at improving antioxidant and antibacterial activity to the system.