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Effect of Microcrystalline Cellulose and Cellulose Nanofiber on the Pasting Properties of Teff and Maize Starches

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Abstract

Starch, a natural biopolymer produced by plants, is commonly utilized in a major food component and as a food additive in several foods as a thickener to enhance their texture, flow, and stability. However, several processing conditions adversely affect normal starch in food products and are usually chemically and/or physically altered to enhance its properties. However, these methods are costly, energy-intensive, and can generate a lot of industrial wastewaters. Hydrocolloids can be utilized in starch modification with little or no industrial waste generated. This objective is to investigate the interaction of microcrystalline cellulose (MCC) and cellulose nanofibers (CNF) as hydrocolloid sources with teff, maize, and potato starches during pasting.

Starch suspensions with MCC and CNF at different concentrations (0%, 0.2%, 0.5%, 2% and 5%) were pasted for 30 minutes. Treating maize and teff starch with increasing hydrocolloid concentrations significantly increased ($P<0.05$) the peak and final viscosity of the starches. Starches treated with CNF had a higher peak and final viscosities. Gel strength decreased with an increase in hydrocolloid concentration. The viscoelastic properties showed that an increase in hydrocolloid concentration increased the loss modulus (G") of the starch pastes. Hydrocolloids through intra and inter-molecular hydrogen bonds form a network with the continuous phase of the starch matrix. This increases the resistance to flow within that matrix which is reflected by the increased paste viscosity in the presence of hydrocolloids. Also, the entanglement of the leached amylose molecules within these hydrocolloid networks makes them unavailable during gel formation. As a result, the gel strength is significantly reduced.

Modified starch produced by the addition of MCC and CNF to starch is a possible environmentally safe replacement of chemically and physically modified starches in the food industry because of their increased viscosity and non-gelling properties.

Biography: Reagan Kawuma