

Rheological properties and emulsifying activity of gum karaya (*Sterculia urens*) in aqueous system and oil in water emulsion: heat treatment and microwave modification

ABSTRACT

Gum karaya is a polysaccharide gum from *Sterculia urens* tree. It is used as an emulsifier and thickening agent in cosmetics and pharmaceuticals. However, it has very strong swelling properties, high viscosity, and low solubility, providing the restricted applications in the food industry. The main objective of this study was to investigate the effects of different heat treatment and microwave variables (i.e., time: 8, 10, and 12 min; power: 700 and 1000 W) on the functional properties of gum karaya in the aqueous system and oil-in-water emulsion. In this regard, the rheological properties, emulsifying activity, average droplet size, and surface morphology of the native- and microwave-treated gums were analyzed and compared. Dynamic oscillatory test indicated that the microwave-treated gum karaya had more gel-like behavior than viscous-like behavior ($G' > G''$) at a relatively high concentration (20% or 20 g/100 g). When gum karaya was treated by microwave for 8-12 min, both elastic (G') and viscous (G'') moduli were declined. The native- and microwave-treated gum karaya exhibited a shear-thinning (pseudoplastic) behavior in the aqueous system and oil-in-water emulsion. The results showed that the microwave-treated gum karaya had smaller particles than the native gum in the aqueous system. On the other hand, the emulsion containing the microwave-treated gum karaya had finer emulsion droplets than the control containing the native gum karaya. This confirmed that the application of microwave treatment led to significantly ($p < 0.05$) improve the emulsifying activity of gum karaya.

Keyword: Emulsifying activity; Gum karaya; Microwave treatment; Rheological properties; Shear thinning behavior