Characterisation of physicochemical properties of gum arabic powder at various particle sizes

ABSTRACT

Plant gum exudate, such as gum arabic, is extensively used in a variety of industrial applications due to their emulsification, microencapsulation and stabilisation properties. The present study is aimed to investigate the effect of particle size on the proximate composition, the density and the physicochemical properties of the gum arabic powder. The classification of particle size based on the mean diameter (d50) ranged between 30 to 800 µm. Based on the proximate composition results, the coarse (414 µm) and very coarse (790 µm) particles yielded a similar moisture content of 13.8%, which was higher than that of the commercial gum (11.1%). Meanwhile, the medium coarse (208 µm) particles contain higher fiber content (97.9%) as compared to other particle sizes. The bulk and tapped density of the gum were significantly affected by the particle size. Water activity analysis indicated that the gum arabic is microbiologically safe, as it has poor condition or environment for microbial growth. From the hygroscopicity analysis, it was found that the very fine (37 µm) particles obtained the highest hygroscopicity value of 40%. The swelling index of medium coarse (208 µm) particles was closed to that of the commercial gum. The emulsion capacity (EC) and emulsion stability (ES) analyses observed that the very coarse (790 µm) and very fine (37 µm) particles recorded the highest EC and ES values of 93% and 89%, respectively. The glass transition temperature was not significantly affected by the particle size. The colour analysis indicated that the commercial gum is lighter (71.4) than the other particle sizes. Meanwhile, the very fine (37 µm) and fine (85 µm) particles exhibited similar redness (a*) value with that of the commercial gum, with a value recorded at 3.7. The morphology analysis observed that the gum exhibited irregular shape with rough granule surfaces. The present work revealed that coarse (208 to 414 µm) particles showed better characteristics compared to that of the commercial gum arabic that is available in the market.

Keyword: Gum arabic; Gelatin; Powder; Particle size; Density; Morphology