

Consumers are focusing more and more on health benefits of functional products. The aim of this work is to formulate and characterize novel functional powder obtained by freeze-drying yoghurt supplemented concomitantly with pomegranate peel powder (0–10%) and honey (0–5%). In order to examine the powdered yoghurt, it was subjected to measurements of physicochemical, physical, microbiological and antioxidant properties. The experimental data of freeze-drying were fitted to four models and results showed that Page model was the most suitable thin-layer drying model according to R² and RMSE as statistical comparison indexes. There was no significant difference ($p > 0.05$) among the powder samples in terms of moisture content and flow properties. The bulk and tapped densities values of yoghurt samples were slightly affected ($p < 0.05$) by the addition of pomegranate peel and honey. The results also demonstrated that powder particles exhibit an amorphous structure with mean diameter ($D_{4.3}$) values that varied from 106.68 to 143.37 μm . Moreover, the addition of pomegranate peel and honey increased the glass transition temperature (T_g) value of yoghurt powder, and this could improve its stability during storage. Total lactic acid bacteria in all yoghurt powders remained over 10^7 cfu/g of dry matter after the freeze-drying. All the fortified yoghurt displayed higher phenolic contents and, consequently, exhibited higher antioxidant activities than control powder sample. It is concluded that, the freeze-drying of yoghurt with pomegranate peel and honey, at the fortification levels tested, is feasible, and the obtained powder has acceptable physicochemical and physical properties which could improve its shelf-life. Thus, the formulated yoghurt powder could be considered as a potential functional powder with antioxidant properties.