Title Influence of internal and external resistances to mass transfer on the constant drying rate period in high-moisture foods

Author Sergio A. Giner

Citation Biosystems Engineering, Volume 102, Issue 1, January 2009, Pages 90-94

Keywords External resistances; internal resistances; mass transfer; drying kinetics

Abstract

Food drying kinetics is usually studied by measuring the product average moisture content as a function of time, known as the drying curve, for constant air conditions. The slope of this curve is the drying rate. Most food drying studies consider that the drying rate decreases from the start, and propose the use of diffusion models. However, some authors have observed that in high-moisture foods there is an initial period with a constant drying rate and a linear drying curve which is assumed to be externally controlled. A model similar to that used for pure water evaporation is usually proposed but this does not consider internal moisture gradients. Here, drying curves were recorded for fruit pectic gels and an initial linear variation of the drying curve was observed. By applying an analytical solution of diffusion for mass transfer Biot number = 2, (the internal resistance is twice the external) in plane sheets, the linear behaviour was predicted for the average moisture content at early stages in the drying curve. However, a variant of this solution, which predicts moisture content as a function of time for the surface and several positions within the plane sheet, was utilised. Under the same conditions, it was found that all curves differed one to the other (internal gradients) and none was linear. Linear drying behaviour therefore appears to be restricted to the average moisture content only and for a limited period, and thus the constant rate period of drying in high-moisture foods does not follow convective, purely external controls.