A "TRUE" BICOMPARTIMENTAL MODEL FOR DATES THIN-LAYER DRYING KINETICS

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The Deglet-Noor date is constituted of two parts, the pulp and the kernel. Thin-layer drying of this fruit was studied in an instrumented hot air loop dryer, with controlled conditions for temperature (40 to 70 °C), relative humidity (30 to 60 %) and velocity (1 to 2 m/s) of the pulsed air. The kinetics of dehydration was described using a " true compartmental " model (two embedded compartments), by opposition to the so-called bicompartmental one, based on the biexponential empirical modelling: the migration of water from the kernel to the pulp (with its own initial water content) is considered as an irreversible process, with a first-order time dependency. The water of the both origins crosses the epicarp as a flux also assumed as a first-order irreversible process. Data submitted to kinetic analysis were the evolution of the moisture ratio (MR), weight (M) and water content (W) of the product. In all experimental situations and correlative equations, the fit was perfect, even for the very early and late phases with similar values of transfer constants. Interesting correlation were derived between these last and operating conditions. Numerical derivation of kinetic data and analytical derivation of the kinetic expressions both allowed the drawing of the plots of drying velocity as function of water content. These last were modelled through an original equation. Data points on the graph of this equation well showed that the drying process was mainly governed by diffusion. Attempts were made to evaluate the diffusivity of water, after some simplifying hypotheses.