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Vacuum drying of rosehip leathers: Modelling of coupled moisture content and temperature curves as a function of time with simultaneous time-varying ascorbic acid retention

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1 **Vacuum drying of rosehip leathers: Modelling of coupled moisture content and**  
 2 **temperature curves as a function of time with simultaneous time-varying ascorbic**  
 3 **acid retention**

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19  
 20 **Abstract**

21  
 22 Vacuum drying kinetics, thermal histories and quality kinetics of two rosehip leather  
 23 formulations were determined, at tray temperatures between 40 and 70°C. Data was  
 24 simultaneously modelled as an ordinary differential equations system encompassing a  
 25 transient water balance, a transient energy balance, and a variable-order quality kinetics  
 26 equation, coupled to heat and mass transfer. A set of parameters was fitted for each  
 27 formulation and satisfactory representations of the experimental data were obtained.  
 28 Differences in drying rate compensated for the effect of the tray temperature on quality  
 29 loss, so vacuum drying at 70 °C was recommended for rosehip leathers due to the  
 30 shorter drying time required. In particular, the reaction order for ascorbic acid  
 31 degradation was found to be dependent on the tray temperature.

32  
 33 **Keywords:** rosehip leather; vacuum drying; quality; mathematical modelling.

34  
 35 **Nomenclature**

$AA$	ascorbic acid
$a_w$	water activity
$C_p$	product specific heat (J/kg dry matter °C)
$D$	water diffusion coefficient (m <sup>2</sup> /s)
$D_0$	pre-exponential factor in Eq. (4) (m <sup>2</sup> /s)
$e_0$	initial product thickness (m)
$E_a$	activation energy for drying (J/mol)
$E_{aq}$	activation energy for quality loss (J/mol)
$F$	statistic value from Snedecor distribution

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