

**Title** Influence of drying temperature on drying kinetics and physico-chemical properties of two chestnut varieties (*Castaenea sativa* Mill.)

**Author** D. Velić, D. Ačkar, I. Mujić, D. Ćubarić, M. Bilić and S. Jokić

**Citation** ISHS Acta Horticulturae 866:635-645. 2010.

**Keyword** drying; chestnut; mathematical model; effective diffusivity; colour; digestibility of starch

### Abstract

The convective air-drying of two chestnut varieties was evaluated in a laboratory drying oven, at different drying air temperatures (40, 50, 60 and 70°C) and airflow velocities of 2.80 m s<sup>-1</sup>. The drying kinetics were compared and the effect of different air-drying temperatures on colour stability, effective diffusivity and starch digestibility was analysed. The two varieties of chestnut used in this study were of the type *Castanea sativa* (Istrian marron and Italian chestnut). The kinetic equations were estimated using an exponential mathematical model (Page). The results of the estimation have exhibited correspondence to the experimental results. The rate constants,  $k$  and  $n$ , of the exponential and Page's model for thin-layer drying were established by regression analysis of the experimental data which were found to be affected by drying air temperature. It can be seen that a good agreement between the experimental data and the chosen mathematical model (Page's) exists, which is confirmed by high values of correlation coefficient (0.99) in all run. The influence of temperature on the drying process is an important aspect and should be taken into consideration when choosing the optimal operation conditions. Results show that certain temperatures had a significant effect on the drying rates of chestnut. The drying air temperature significantly influenced the total drying time, which is strongly related to the total energy requirement for drying. The values of effective diffusivity were found to vary in the range of  $1,64 \cdot 10^{-9}$  to  $7,88 \cdot 10^{-9}$  m<sup>2</sup> s<sup>-1</sup> for Istrian marron samples and in the range of  $8,65 \cdot 10^{-10}$  to  $4,40 \cdot 10^{-9}$  m<sup>2</sup> s<sup>-1</sup> for Italian chestnut samples. Colour change of both varieties was generally increased with the increase of the drying temperature, with the exception of Istrian marron, where colour change was larger after drying at 50°C than after drying at 60°C (probably due to longer exposure to elevated temperature). Digestibility of starch, determined by AOAC 2002.02 method, was increased by drying for both chestnut varieties (Istrian marron and Italian chestnut).