Computational modelling and energy consumption of turbulent 3D drying process of olive-waste cake

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Olive-waste cake has the potential to be used as source material in many agroindustry applications once dried. In this study, a tridimensional model including heat and mass transfer for olive-waste cake dehydration was implemented. The ? - ? model was used to describe turbulent air flow around the cake. Olive-waste cake was treated as a porous material with variable thermophysical properties. The classical Finite Volume Method (FVM) was used. The drying kinetics of three olive-waste cake varieties was explored during turbulent drying at 333 K and 363 K. Results for velocity, temperature and moisture of air flow are presented, as well as temperature and moisture of olive-waste cakes. Computer simulations were performed, showing that the predictive model was able to appropriately describe experimental olive-waste cake drying curves obtained from a previous work. These numerical values were compared with experimental values, obtaining errors between 0.62% and 2.7%. The calculated effective moisture diffusivity values were in the range of 1.66E-8 to 1.63E-7 m2s?1 for a drying temperature of 333 K, and in the range of 2.34E-8 to 3.39E-7 m2s?1 for a drying temperature of 363 K. Finally, in order to reach a final moisture content below 10%, the energy consumption varied between 24 and 29 kJ kg?1 and drying times between 700 and 1200 s.