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Title:

Analysis of the drying kinetics and the energy efficiency of the ElectroHydroDynamic (EHD) drying of Mushroom Slices

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Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

Several recent studies have investigated alternative techniques in order to enhance heat and mass transfer in food processes and to reduce their energy consumption. This is particularly true for the drying process which is a very energy-intensive process. One of the most promising alternatives consists in combining low velocity convection with ElectroHydroDynamic (EHD) enhancement by corona wind. An electric wind is generated by electrodes and leads to secondary flows that may improve the surface heat and mass exchanges. In this study, the drying kinetics of mushroom slices and the energy efficiency of the drying process were analyzed for different EHD conditions. Air was blown in a tunnel (15×15×190 cm) at 45°C 10% RH at two different primary air velocities (0.4 and 2.2 m/s). Mushrooms were placed on a grounded perforated plate. The ionic wind was generated by a wire electrode suspended horizontally at 6 cm above the mushrooms (Figure 1). Experiments were conducted during 5 hours with four levels of applied voltage at the electrode (0, 20, 25 and 30 kV). During drying, the voltage and current of the EHD system, the weight changes of mushroom slices over time were recorded. We investigated drying rates, final moisture content and energy consumption of the EHD system, of the convective system and of the combined process. The energy analysis of the convective system was based on the modelling of the air handling unit. Results indicated that the combination of 30 kV voltage with the air velocity of 0.4 m/s could significantly increase the drying rate. However, a cross-flow with the high velocity of 2.2 m/s diminished the effect of corona wind. As expected, the total energy consumption is greatly affected by the primary air velocity. The combination of low air velocity and high electric field intensity shows the potential for industrial applications.

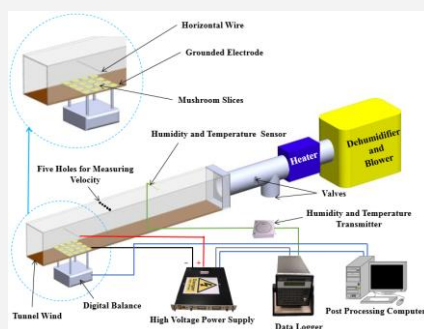


Figure 1: sketch of the experimental set-up