Abstract

A theoretical diffusion model for a single maize (*Zea mays* L.) kernel has been developed to describe moisture migration during drying and tempering stages. The effective diffusivity was determined experimentally at a range of temperatures between 90°C and 170°C with initial moisture contents of 37% and 43% dry-basis. The functional relationship between the diffusivity and temperature is analogous to a modified Arrhenius equation.

Two-stage drying including tempering between stages provides not only faster removal of moisture, but also a reduced number of stress cracks when compared to single-stage drying. However, the colour of the maize appears darker and more intense with longer tempering periods. To maintain maize quality and to reduce energy consumption, the results from the experiments and simulations are limited to temperatures of less than 150°C; high-moisture maize should be dried to 23% dry-basis and then tempered for 40 min.

The ambient-air velocity for cooling the tempered maize in a range between 0.075 and 0.375 m/s does not affect the maize quality as measured by the number of stress cracks and colour.