ABSTRACT

Green bell peppers are highly perishable due to a very high moisture content of 90 – 94 % (w.b.), leading to high losses during storage and transportation. A novel drying method namely, vacuum assisted microwave (VAM) drying was used to obtain effective process technology for production of good quality dried product in a short time. Green bell pepper with initial moisture content of 92.5% (w.b.) was dried up to a final moisture content of approximately 6% (w.b.) using hot air drying (60 – 80 °C) and VAM drying (microwave power 100 to 300 W; vacuum level 200 to 600 mmHg). Drying characteristics and effective moisture diffusivity were studied for all the drying experiments. Drying time reduced by four to five times in the VAM drying as compared to hot air drying. The logarithmic model was found to have the best fit and was used to evaluate effective moisture diffusivity. VAM drying process was optimized using response surface methodology. Analysis of variance showed that quadratic model best fitted the experimental data. The microwave power level had greater effect on the drying time than vacuum, nevertheless at higher vacuum level the dried products had better quality. The optimum drying conditions were determined to be 284.4 W microwave power, 600 mm Hg vacuum level. Validation experiment was carried out at derived optimum condition to verify the prediction and adequacy of the models and close agreement was obtained. Shrinkage was modeled as a linear function of volume change of material and its moisture content. Kinetic modeling of color change in dried sample was evaluated using zero-order and first-order equations. Numerical modeling of the temperature profile and moisture concentration inside the sample dried under optimized VAM drying conditions was done using finite element based CFD software COMSOL Multiphysics 4.4. Both temperature and moisture profile were obtained and validated with experimental data. Sensory analysis was performed using fuzzy sensory analysis for dried and fresh samples. Moisture sorption studies were conducted to evaluate desorption isotherms of differently dried samples, by using gravimetric method. Four different models viz. GAB equation, Oswin equation, Iglesias and Chirife equation and Peleg equation were fitted to sorption isotherm data of dried GBP. GAB models was evaluated as the best fit model for predicting equilibrium moisture content of the sample on the basis of R^2 values, root mean square error (*RMSE*) and Chi-square value (χ^2).

Keywords: Green bell pepper, Vacuum assisted microwave drying, Color kinetics, Rehydration, Shrinkage, Modeling