Optimization of process parameters for development of osmotic dehydrated Carambola (*Averrhoa carambola* L.) powder

ABSTRACT

Optimization of processing conditions that yield maximum water loss and weight reduction and minimum solid gain and water activity is done during osmotic dehydration of carambola slice of 8mm thick. RSM has been used for optimizing the process parameters for osmotic dehydration under different conditions of temperature (ranging from 20-60°C), concentration of salt (NaCl) (0-20g/100ml), time (ranging from 60-300min) and initial fruit: solution ratio (ranging from 1:2.5-1:12.5) against various responses viz. weight reduction, water loss, solid gain and water activity according to a complete 2^4 central composite design. Sucrose concentration has been fixed to 50°Brix. For each response, quadratic models are developed using multiple linear regression analysis. ANOVA is used to check the adequacy of fitted models. The optimized value for Time, temperature, solute conc. and fruit: syrup ratio has been found to be 240 mins., 35.17°C, 15% and 1:10 respectively. Moisture and solute diffusivity were also studied for 8mm thick slices of carambola by using equations for diffusivity of infinite slab. The average value of moisture and solute diffusivities (D_{eff}) were found to be 0.144×10^{-9} and 0.42×10^{-9} m^2/s respectively. Also, the diffusion (D_0) when the temperature goes to infinity has been calculated as 3.8×10^{-6} and 4.6×10^{-6} m^2/s respectively. The corresponding activation energy of moisture and solute diffusivities has been calculated to be 27552.6 and 12670.53 J/mol respectively. The OD carambola slices are made into paste and then subjected to vacuum at 15 KPa and tray drying at 60°C by adding maltodextrin (0.6g/100g paste) and powder is made out of it. The powder is then studied for various physico-chemical and sensorial properties. Ascorbic acid content was found highest in control (0.261±0.010 mg/g) and then in OD vacuum dried sample (0.136±0.014mg/g). TPC was also found highest in control (30.20±0.010 mg/g) whereas it has been found very low in the other two samples. DPPH activity shows different trend as highest value was found in OD tray dried samples (84.12±0.42mgAA/g) and lowest in case of raw sample (33.45±0.49mgAA/g). Raw juice (control) scored highest for color and appearance and mouth feel followed by OD vacuum dried carambola powder. In case of flavor, taste and overall acceptability OD vacuum dried carambola powder scored highest.

Key words: Carambola, osmotic dehydration, diffusivity, carambola powder