Title: STUDIES ON OPTIMIZATION OF PRECONDITIONING TREATMENT FOR MICROWAVE PUFFED RICE

Abstract:

Puffed rice is very popular in India as a low cost RTE breakfast cereals as well as snack because of its crispness and lightness. Puffing of grains results from the sudden expansion of moisture present in the inside of the starch granules during the high-temperature-short-time (HTST) heating of the grains. Microwave was used for puffing of rice for its higher efficiency over other heating process and because of its quicker start up time, faster heating, energy efficiency, space saving, selective heating and final product with improved nutritive quality. Fluidized bed dryer was used for drying of soaked samples because of uniform drying and significant reduction in drying time. Optimization of fluidized bed drying process was made with three processing variables salt concentration, air temperature, air velocity for 3-5%, 50-80 ^{0}C, 2.8-3.2m/s respectively. Optimized processing conditions of 4.28 % of salt, 86.83 ^{0}C air temperature and 3.45 m/s air velocity for drying of soaked samples was obtained for maximum expansion ratio and.percentage puffing of puffed rice by application of genetic algorithm. Drying kinetics of fluidized bed drying was studied at 4 different temperatures using 8 different commonly used drying models. Diffusion approach model was found to give best fitting of the drying process with R square value of 0.99973 and having very low average chi square value. Diffusivity of drying was also calculated for all the 4 temperatures and the range was found to be 5.6E-11 to 7.78333E-11 m^2/s. On the basis of sensory analysis by fuzzy logic salt substituted puffed rice was produced and the optimized formulation of salt substitute is the combination of 1.83% of Sodium chloride, 0.61 % of potassium chloride, 1.52 % of Calcium chloride and 0.04% of L-alginine. The moisture migration inside the rice kernel during fluidized bed dryer was also analyzed using COMSOL multiphysics 4.2.

Key words: Microwave puffing, genetic algorithm, Fuzzy logic.