PHYSICO-CHEMICAL AND FUNCTIONAL PROPERTIES OF PULLULANASE-MODIFIED RICE STARCH AS FAT REPLACER

Abstract

Enzyme modified MR219 rice starch (EMS) prepared via an enzymatic debranching process and its potential use as a fat replacer in mayonnaise was studied. The physical parameters for the optimization of enzymatic debranching process were conducted using Response Surface Methodology (RSM), by employing Central Composite Design (CCD). The pH (3.6, 4.6 and 5.6), enzyme concentration [2, 6 and 10% (v/v)] and starch concentration [5, 10 and 15% (w/v)] were selected as the model factors. At $\alpha = 0.05$, the model found was significant in the prediction of amylose amount. The 3D response surface in this study showed that the highest amylose amount was 19.9% at pH 3.6, 2% (v/v) of enzyme concentration and 15% (w/v) of starch concentration. Polydispersity index increased significantly in EMS compared to native rice starch at $p<0.05$. Degrading of rice starch was found to be more pronounced and fissures on the granule surface. EMS samples showed slight changes in swelling power but increased in solubility value compared to control samples. There were slight difference in T_o but delayed value of T_p and T_c in EMS. This showed that internal structure of granule was strengthened. Lower peak viscosity (3309 cP), higher trough viscosity (2226 cP) and final viscosity (4413 cP) were observed in EMS compared to its native counterpart. EMS retained its A-pattern crystalline structure after debranching process. Enzyme modified rice starch slurry was used in the preparation of mayonnaise at 40% substitution of soybean oil to produce reduced fat mayonnaise (RF). From back extrusion test in texture analysis, RF mayonnaise with substitution 40% EMS gave higher firmness and adhesiveness values compared to the mayonnaise that substituted with native starch (NM). The amount of calories was found to decrease by 183 kcal in reduced fat mayonnaise

compared to control mayonnaise mayonnaise. These results indicated the potential ability of the EMS to behave as fat mimetics in food products such as mayonnaise.