Abstract

In comparing the film forming properties among three rice materials including rice flour, native rice starch and hydrothermal treated rice starch with 31.04-33.75% amylose content, hydrothermal treated rice starch exhibited the best film forming properties as it gave the gel with the highest strength and clarity. In order to formulate and optimize the formulation of film, film suspension was prepared from 2.5% w/w hydrothermal treated rice starch, as the main film forming agent. The eleven film formulas based on central composite design were employed to study the effect of two additives, glycerol (10, 20 and 30% starch) and carrageenan (0.5, 1.0 and 1.5% starch) on physical and mechanical properties of film. Results showed that glycerol and carrageenan did not affect morphology of the derived film as observed by neither SEM nor XRD. The polynomial equations obtained from Multiple Regression Analysis showed the significant effects of the two additives on physical and functional properties including moisture content (R^2=79.56%) lightness (L*) (R^2=78.67%) redness (a*) (R^2=95.11%) total color difference (R^2=78.57%) thickness (R^2=68.31%) tensile strength (R^2=90.51%) elongation (R^2=78.97%) and water vapor transmission rate (R^2=74.37%). However, glycerol and carrageenan posed no significant effects on yellowness, opacity, transparency and gas transition rate of film. The Response Surface Methodology was used to obtain the optimal film formulation with maximum tensile strength and elongation. The optimum combination between the two additives was glycerol 16.14% starch and carrageenan 1.29% starch. The derived film showed the good protective property against oxygen. However, the film had a poor protective property against water vapor when compared to plastic films, polyethylene, polypropylene and cellophane. Therefore, the potential uses of the film were to be applied for dried food in particular food with high fat content. The film might possibly help in retarding lipid oxidation from the surrounding oxygen. The derived film needed to be improved on the protective properties against water and moisture to be applicable for various food products.