Abstract

Sinin rice becomes very popular among consumers as it contains many nutrients and natural antioxidants that are benefits to health. Many personal care products containing sinin rice extract such as shampoo and hair conditioner are available in the market. However, use of sinin rice flour in processed foods is rare and little is known about properties of sinin rice flour. The objectives of this research were 1) to study chemical and physical properties of sinin rice flour and 2) to develop white pan bread product using sinin rice flour to partially substitute wheat flour. Results showed that sinin rice flour contained higher lipid, ash, and carbohydrate contents, but lower protein and amylose contents than wheat flour ($p \leq 0.05$). Sinin rice flour also exerted an antioxidant activity that was 2.6 times greater than that of wheat flour, as measured by the 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging activity test. Solubility of sinin rice flour was lower than that of wheat flour; however, swelling power of both flours was not different ($p > 0.05$). Pasting properties of composite flour samples with varying proportions of sinin rice flour to wheat flour from 0:100 to 50:50 (by weight) were studied using Rapid Visco Analyzer (RVA). Results showed that pasting temperature of all composite flour samples was higher than that of wheat flour. In addition, composite flour samples retrograded to a greater extent than pure wheat flour and the degree of retrogradation increased as the proportion of sinin rice flour increased. Qualities of dough samples prepared from the composite flours were investigated using Farinograph and Extensograph. Results showed that water absorption, resistance to extension and extensibility of dough decreased as the proportion of sinin rice flour increased. Sinin rice flour was then used to substitute wheat flour in white pan bread at 0-50 % levels and qualities of the bread were studied. As substitution levels increased, specific volume decreased and the bread had a harder, chewier, and gummier texture. Additionally, bread formulated with the flour blends had more intense yeasty and grain flavors than that formulated with pure wheat flour. Acceptance scores also decreased with increased substitution levels. The highest substitution level that still yielded an acceptable product was 30 %. Results of internal preference mapping showed that sensory attributes that had high impact on preference of the bread were

mostly texture attributes. Consequently, the effectiveness of 3 dough conditioners (sodium-stearoyl-2-lactylate (SSL) at 0.5 %, xanthan gum at 1.5 %, and KS 505 at 1.5 % based on flour weight) in improving texture and volume of the bread containing 30 % sinin rice flour was investigated. Results indicated that KS 505 was more effective than other dough conditioners in increasing specific volume and decreasing hardness and chewiness of the bread. Subsequently, the optimum level of KS 505 was studied by varying its content at 3 levels (1, 1.5 and 2 % based on flour weight). Results showed that the optimum level of KS 505 was 1.5 % as it yielded the bread with highest specific volume, most desired texture characteristics, and highest liking scores. Therefore, the final formulation of the bread was consisted of 39.49 % bread wheat flour, 16.92 % sinin rice flour, 0.85 % KS 505, and other ingredients including shortening, milk powder, sugar, salt, instant dried yeast, and water at 2.82, 2.26, 2.26, 0.85, 0.33, and 34.22 %, respectively. Bread formulated with such flour blends exerted an antioxidant activity that was 1.3 times greater than that of bread made from pure wheat flour. Results of consumer test using 200 participants indicated that the obtained bread product was liked slightly to moderately. The product was well accepted by 79 % of the participants; and 53.5 % would buy the product. After the consumers had been informed about health benefits of sinin rice flour that was used in the bread formulation, their acceptance and purchase intent increased to 96.5 and 76.5 %, respectively. Results of shelf life study indicated that the bread with sinin rice flour and wheat flour blend could be kept for 3 days at room temperature.