Phantipha Charoenthaikij 2010: Development of Bread from Composite Wheat-Germinated Brown Rice Flour. Doctor of Philosophy (Agro-Industrial Product Development), Major Field: Agro-Industrial Product Development, Department of Product Development. Thesis Advisor: Associate Professor Kamolwan Jangchud, Ph.D. 175 pages.

The objectives of this study were to determine the effect of germination conditions on physicochemical properties of germinated brown rice flour and incorporate those flours into bread formulations that were acceptable to consumers. A 4x3 factorial arrangement in a completely randomized design (CRD) with four pH levels of steeping water (3, 5, 7 and as-is: DI, distilled water) and three levels of steeping time (24, 48, and 72 h for brown rice, GBRF; 24, 36 and 48 h for glutinous brown rice, GNBRF) was investigated. Pasting profiles, α-amylase activity, and free GABA were identified as variables that discriminated among germinated brown rice. GBRFs from germination conditions (pH 3 or 6.8; 24 or 48 h) contained a higher GABA concentration (14.8–67.0 mg/100g flour), and exhibited lower peak-viscosity and set-back than the control. Bread could be formulated with composite flour containing 40% germinated flour obtained from steeping at pH 3 for 24 h [GBRF(30):GGNBRF(10)] without negatively affecting sensory acceptability. Combination of microcrystalline cellulose [Fibrotech^{TM} at 0, 0.5, 1.0%, w/w] and diacetyl tartaric acid ester of monoglyceride [DATEM at 0, 1.0, 2.0%, w/w] were used to improve the quality of composite flour bread following a 3 x 3 factorial in the CRD. The bread formulation with 0.5% Fibrotech^{TM} and 1.0% DATEM yielded breads with softer texture than the one without additives. The developed bread contained free GABA content of 1.91 mg/serving (2 pieces of bread, 54g). Regarding consumer acceptability (n = 114 and 116 for Thai and the U.S. consumers, respectively), mean overall liking score of the fresh bread containing germinated flour was slightly lower than the wheat bread (6.7 vs. 6.3 and 7.1 vs. 7.6 for Thai and US. consumers, respectively). At least 75% of both Thai and US. consumers would purchase the fresh formulated bread if commercially available. Bread was stored for 0, 3, and 5 days and evaluated for physicochemical properties and consumer acceptability (US. consumers) compared to the control (0-day stored wheat bread). During storage, moisture content drastically decreased with increasing crumb hardness (from 4.16 N to 10.37 N) of composite flour breads. Consumer liking of all sensory attributes significantly decreased as storage time increased. In conclusion, this study demonstrated the feasibility of incorporating of germinated flour in bread formulation up to 40% that was acceptable to both Thai and US consumers. However, the quality of developed bread, particularly texture-related attributes, was less desirable with increasing storage time.

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