

Jirapa Pongjanta 2008: Enzyme-Resistant Starch Type III Production from High Amylose Rice Starch and Application in Low Glycemic Index Butter Cake. Doctor of Philosophy (Tropical Agriculture), Major Field Tropical Agriculture, Interdisciplinary Graduate Program. Thesis Advisor: Assistant Professor Anchanee Uthapattanacheep, D.Sc. 248 pages.

The purposes of this study were to investigate the production of enzyme-resistant starch type III (RS III) from high amylose rice starch (HARS) and application in low glycemic index butter cake. HARS composed of 95.21% dried weight basis of total starch, 1.18% protein, 0.91% fat, 0.82% ash, 13% moisture content and 32.10% amylose content. The effects of preheated treatments of 15% HARS and enzyme concentration on physicochemical properties of RS III samples were also examined. A debranching enzyme (Pullulanase, EC. 232-983-9P, 8 unit/g starch at 55°C for 0 to 48 hr) was introduced to modify the amylopectin molecules of 15% HARS, which were preheated at 75°C, 95°C and 121°C for 30 min. The retrogradation of debranched starches with different degrees of hydrolysis (0.14 to 3.10%) were heated in boiling bath for 30 min then induced at 4°C for 16 hr. Afterwards, the one cycle of freeze-thaw process (-10/30°C) was applied to promote syneresis of the retrograded starches. The resistant starch content increased from 4.12% to 19.31% of dried weight basis from control to 48 hr debranched of preheated rice starch at 121°C. Effect of pullulanase enzyme concentration (8, 10, 12, 14 and 16 unit/g starch debranched of 121°C preheated 15% HARS and incubated at 55°C for 16 hr) was investigated. Result had shown that the enzyme concentration at 12 unit/g of starch was an optimum for pullulanase hydrolysis (4.54%) allowed more rearrangement and ordered structures of retrograded starches that characterized as V-type pattern, which was 19.81% resistant starch content. The RS III sample formed a coarse honeycomb-like and filamentous network structure was observed by Scanning Electron Micrograph. The estimated hydrolysis index and glycemic index value of the selected RS III sample were 39.50% and 61.43% of GI values, respectively. The effect of using RS III as flour replacement and high fructose corn syrup (HFCS-55) with sucrose substituted on the physiochemical properties and sensory evaluation of the resultant cakes were studied. Results revealed that an optimum formula of butter cakes were 29.79% cake flour, 3.31% RS III, 16.08% HFCS, 10.72% sucrose, 25.13% butter, 0.21% baking powder, 0.10% salt, 1.34% corn flour and 13.40% eggs. The butter cake was accepted by 30 panelists at level of moderately like and the physicochemical properties were not significantly difference from the control cake. The estimated glycemic index of the developed butter cake was 68.16% of GI value and classified as a medium glycemic index food, while the control cake was classified as high glycemic index food (77.10% of GI value).

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Thesis Advisor's signature

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