Title	EFFECT OF RAW MATERIAL AND PROCESSING-AID AGENTS ON RICE CRACKER QUALITIES
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ABSTRACT

Rice cracker is made of rice flour as value-added snack product. Unlike wheat cracker, rice cracker is crumbly, brittle, and has rough surface. Primary research suggested that selection of raw material and processing aids could improve qualities of baked rice products. Thus, this research focused on the effects of Thai rice cultivars, primary processing (milling type), particle size of rice flour and hydrocolloid addition on qualities of rice cracker.

Rice cracker samples used rice flour as wheat flour substitute in the formulated flour blend, which consisted of rice flour, wheat flour, waxy rice flour and pregelatinize tapioca starch. Flours from various Thai rice cultivars including Chainat1 (CN), Pathumthani1 (PN) and Surin1 (SR) were used for rice cracker. Then, various milling types of rice flour including dry milling (DM) and wet milling (WM) were employed to make rice cracker. Then, rice flour of 4 different rice flour particle sizes, were prepared by sieved flour through a series of standard sieves at 50, 100, 140 and 230 mesh, were prepared for making rice crackers samples. Product qualities including color, moisture content, water activity, hardness, puffiness and dough rheological properties were determined and used to select the suitable raw material in the experiments. All samples were compared with two controls of 100% commercial rice flour (CRF) and 100% wheat flour (WF). Hydrocolloids including hydroxypropylmethylcellulose (HPMC), carboxymethylcellulose (CMC) and xanthan

gum (XN) were added at 1.5%, 3.0% and 4.5% w/w (rice flour basis) in cracker samples. In this part, additional control (FF) made of formulated flour blend without adding hydrocolloid was used besides CRF and WF. Then rice cracker samples prepared from the selected treatments above versus wheat crackers were subjected to the acceptance test by 150 consumers using just-about-right scale. Also, changes of product qualities for rice crackers and controls during shelf-life study of 6 months at 30°C were determined.

Control rice dough had the highest storage modulus value followed by those of Chainat1, Patumtanee1, Surin1 and wheat flours. Amongst all treatment samples, dough characteristic from Surin1 was close to wheat dough, which was more elastic and more extensible than the others. As of milling type, rice crackers from dry milling flour were less hard and puffier than the WM-rice-flour samples. A decrease in rice flour particle size increased moisture content, water activity and hardness ($p \leq 0.05$). Flour with particle size of 103-139 μm was selected since their product qualities were more desirable, and they were more practical based on the manufacturing cost aspect.

Adding CMC and HPMC at 1.5% and 3% significantly decreased sample hardness to be lower than those of FF ($p \leq 0.05$) and closer to WF. It was because hydrocolloid helped improving rice crackers by retaining sample moisture and gas in dough. However, using CMC and HPMC at 4.5% and all XN usage levels made rice crackers becoming much harder than WF and FF ($p \leq 0.05$). It was suggested that the usage level may be too high for these hydrocolloid types. Rice cracker with HPMC 1.5% was the most preferred amongst treatment samples. Therefore, 1.5% HPMC was selected for the next experiments.

From the above result, rice cracker samples made of dry-milled Surin1 flour with particle size of 139 μm (100 mesh) with 1.5% HPMC were compared with wheat crackers in sensory evaluation. The color of samples was just-right as consumers needed whereas its surface appearance was slightly rougher than wheat crackers. The sample butter odor and overall odor were slightly less than what they desired. For taste of both samples, the saltiness was just-right, but sweetness was not enough. Also, rice crackers should be less crumbly and crispier for this consumer group.

According to the shelf life study, all samples had their moisture content and water activity increased with increasing storage time. The hardness of wheat cracker and treatment sample increased when storage time increased however that of control rice cracker decreased. As for rancidity indicator, the TBA no. of all samples increased in first month then decreased continuously with storage time. This correlated with result from judges that samples were still acceptable after 1-month storage.

In summary, using rice flour made from low amylose content cultivar, dry milling rice flour with particle size of 103-139 μm, and 1.5% HPMC could be used at to improve rice cracker texture and helped achieving desirable rice cracker qualities. The qualities of samples were still acceptable after being stored for 1 month in polypropylene bags at 30°C.