



CHAPTER III

MATERIALS AND METHODS

3.1 MATERIALS

Egg (Charoen Pokphand Foods Public Co., Ltd., Thailand), skimmed milk powder (Nestle Co., Ltd., Thailand), evaporated milk (Nestle Co., Ltd., Thailand), cake flour (United Flour Mill Public Co., Ltd., Thailand), corn flour (CPC/AJI Co., Ltd., Thailand), butter (Thai Dairy Industry Co., Ltd., Thailand), sugar (Mitr Phol Co., Ltd., Thailand), vanilla flavour (Greathill Co., Ltd., Thailand), yeast (GB Ingredients, England), baking powder (Imperial General Foods Industry Co., Ltd., Thailand), salt (Thai Refined Salt Co., Ltd., Thailand), shortening (Lam Soon Public Co., Ltd., Thailand) and SP[®] cakes emulsifier (UFM Food Centre Co., Ltd., Thailand), were purchased from local supermarkets in Bangkok.

Calcium propionate (Caltech Co., Ltd., Thailand), glycerol (Ajax finechem, Netherlands), fructose (Union Chemical Co., Ltd., Thailand), lactic acid (Bangkok Science Center Co., Ltd., Thailand), PVDC bag (Janjaras Chem Supply Co., Ltd., Thailand) and oxygen absorber (Kepttogether Co.,Ltd., Thailand) were obtained from various local retailers.

3.2 METHODS

3.2.1 Effect of humectants on a_w and sensory qualities of custard cream filling

Custard cream was prepared according to the adjusted recipe shown in Appendix A (Table A.1) which sugar from basic recipe (Suan Dusit International Culinary School, 2006) was reduced to half because both humectants affect sweetness of custard cream. Glycerol and fructose were added at 0, 2.5 and 5% of total adjusted recipe weight. The mixture was mixed using an electric hand mixer (Airlux, HA3127, Canada) at low speed for 5 min and steamed at 100^oC for 15 min by electric steamer (Hanabishi, HEP-1900S, Thailand). The custard cream was

cooled at room temperature to 25-30 °C (about 30 minutes) prior to a_w measurement (Appendix B.1) and sensory evaluation. The acceptance test was carried out using 25 untrained panelists recruited amongst the students of the Faculty of Science, Chulalongkorn University. The panelists evaluated the samples using the preference test (0 = dislike very much; 10 = like very much) for sweetness, texture and overall acceptance (OAA) (Appendix C). The experiment was done in 2 replicates according to three-level factorial design (Gacula and Singh, 1984) and the samples were determined for a_w and sensory qualities. The data was tested according to ANOVA and multiple range comparison (Appendix B.5). Response surface methodology was used to determine the optimum level of humectants.

The above experiment was repeated by changing the concentration of glycerol and fructose to 3, 6 and 9% weight as the concentration of humectants were found to be inappropriate.

Verification of the optimum level of humectants for producing custard cream was performed. Custard cream prepared from the optimum humectant levels (6% of both glycerol and fructose) was determined for a_w and sensory qualities. The data was statistically compared with the predicted values from the mathematical model according to independent sample t-test (Appendix B.5).

3.2.2 Effects of humectants and lactic acid on a_w , pH, and sensory qualities of Chinese steamed bun

Chinese steamed bun was prepared according to the recipe (Suan Dusit International Culinary School, 2006) shown in Appendix A (Table A.2). The preparation was performed in two steps. For the first step, wheat flour, yeast, sugar and water were mixed and kneaded using a laboratory type mixer (Kenwood, Major KM620, U.S.A.) at medium speed (no. 5) for 10 min to form sponge which was further proofed at 38 °C for 90 min in an incubator (WTC Binder, BD, Germany). The second step, the proofed sponge was mixed with the remaining wheat flour and ingredients. Glycerol (0, 2.5, 5% w/w) and lactic acid (0, 0.25 and 0.5%w/w) were added and the sponge was kneaded at medium speed for 10 min. The dough was divided into 25 grams per piece before forming into a round shape by rolling. The formed dough was proofed at 38 °C for 60 min in an incubator and steamed at 100 °C for about 10 min by an electric steamer. The steamed bun was cooled at room temperature to 25-30 °C prior to a_w and pH

measurements (Appendices B.1-B.2) and sensory evaluation. The acceptance test was done similarly to section 3.2.1 to evaluate for appearance, flavour, texture and OAA of sample (Appendix C). The experiment was carried out in 2 replicates and the data of a_w , pH and sensory qualities were analyzed as in section 3.2.1

3.2.3 Effect of preservative on shelf-life of Chinese steamed bun

Chinese steamed bun with the appropriate level of glycerol and lactic acid chosen in section 3.2.2 was prepared as in section 3.2.2. A control sample was also prepared according to the recipe in Appendix A (Table A.2). Calcium propionate was added in the second step of preparation of both samples at 0, 0.1 and 0.2%. Both treated and control samples were cooled at room temperature to 25-30 °C, packed in 13x17 cm. PVDC pouch individually and stored in an incubator at 30 ± 2 °C until they spoiled.

The samples were taken every 2 days for a_w and pH measurements (Appendices B.1-B.2) and microbial analysis including aerobic plate counts and yeast and mould plate counts (Appendix B.4). The experiment was done in 2 replicates according to 2x3 factorial design in randomized complete block design (RCBD). ANOVA and multiple range comparison were used to analyze the data (Appendix B.5). The appropriate preservative concentration that gives the longest shelf-life product was chosen for further study.

The Chinese steamed bun of chosen conditions was prepared and stored in an incubator at 30 ± 2 °C. The samples were steamed and cooled at room temperature to 25-30 °C before the analysis. The textural measurement (Appendix B.3) and sensory evaluation using 30 untrained panelists were done every 4 days. The panelists evaluated the difference between the hurdle treated sample and control (freshly prepared sample) using pair comparison test. The preference test (9 point Hedonic scale; 1 = dislike extremely; 9 = like extremely) was also performed (Appendix C).

3.2.4 Effect of packaging conditions on shelf-life of CCSB

The dough was prepared according to the chosen condition found in section 3.2.3. The custard cream filling prepared according to the optimum condition obtain from section 3.2.1

and filled before second proofed. The custard cream filled dough was steamed, cooled at room temperature to 25-30 °C, packed individually in 13x17 cm. PVDC pouch, sealed with and without O₂ absorber and stored in an incubator at 30±2 °C until they spoiled.

The samples were taken every 2 day for a_w , and pH measurements and microbial analysis. The experiment was carried out in 2 replicates. Independent sample t-test was used to analyze the data (Appendix B.5). The condition giving the longest shelf-life product was chosen for further study.

The optimum hurdle samples were prepared, steamed and cooled at room temperature to 25-30 °C before the analysis. The textural measurement (Appendix B.3) was done every 4 day to predict the shelf-life.

3.2.5 Verification

In this section, the optimization procedure was performed to validate the results based on previous optimization conditions in sections 3.2.1-3.2.4. The CCSB was prepared according to the conditions chosen in section 3.2.4. The samples were taken at 8 days for a_w , pH and textural measurement, microbial analysis and sensory evaluation. The acceptance test was carried out using 30 untrained panelists. The panelists evaluated the samples using the preference test to evaluated appearance, flavour, texture, and OAA (9 point Hedonic scale; 1 = dislike extremely; 9 = like extremely) (Appendix C). The experiment was done in 2 replicates and the results were statistically compared to the values from previous studies in sections 3.2.1-3.2.4 according to independent sample t-test (Appendix B.5).