

Chapter 3 Methodology

3.1 Materials

3.1.1 Raw materials

1. Plain Yogurt Dutchie (Dutch milk company, Thailand)
2. Fermented milk Betagen (Betagen company, Thailand)
3. Maltitol (MC-Towa international sweetener co., Ltd, Thailand)
4. Sorbitol (Northern chemical, Thailand)
5. Honey (Lumphun, Thailand)
6. Glucose syrup (Yok intertrade, Thailand)
7. Sweetened condensed milk Palace (Dairy food Co., Ltd, Thailand)
8. Sugar (Mitrpol company, Chaiyapoom, Thailand)
9. Salt (Prung thip, Nakornratchasima, Thailand)
10. Shoetening (Yok intertrade, Thailand)
11. Lecithin (O.V. Chemical and Supply, Chiang Mai, Thailand)
12. Deionized water

3.1.2 Chemicals

1. Phenolphthalein (Fischer scientific, England)
2. Sodium hydroxide (Lab scan asia co., Ltd, Thailand)
3. Zinc acetate dehydrate (Fischer scientific, England)
4. Glacial acetic acid (Merck, Germany)
5. Potassium ferrocyanide (Ajax finechem, Australia)
6. Copper sulphate (Fischer scientific, England)
7. Potassium tartrate (Ajax finechem, Australia)
8. Hydrochloric acid (Merck, Germany)
9. Methylene blue (BDH laboratory supplies, England)
10. Petroleum ether (Lab scan asia co., Ltd, Thailand)
11. Sulfuric acid (Merck, Germany)
12. Sodium sulphate (Merck, Germany)
13. Selenium dioxide (Merck, Germany)
14. Boric acid (Merck, Germany)
15. Methyl red (BDH laboratory supplies, England)
16. Bromocresol green (Ajax finechem, Australia)
17. Ethanol (The united drug company, Thailand)
18. Maximum recovery diluent (Oxoid Co., Ltd, England)
19. Potato dextrose agar (Merck, Germany)
20. Tartaric acid (Ajax finechem, Australia)
21. Wort medium agar (Merck, Germany)
22. Plate count agar (Merck, Germany)

3.1.3 Packaging materials

1. Aluminum foil bag (Siam pack, Chiang Mai, Thailand)
2. Laminate plastic bag (Siam pack, Chiang Mai, Thailand)
3. Oriented polypropylene (OPP) (Siampack, Chiang Mai, Thailand)

3.2 Equipment

3.2.1 Equipment to produce soft candy

1. Hotplate (IKA C-mcg HS7, Germany)
2. Beakers of 50ml, 100ml and 500 ml
3. Aluminum tray
4. Knife
5. Stirrer
6. Analytical balance (Satorius model cp2245, Germany)

3.2.2 Equipment for analysis

1. Hot air oven (Mettler, Germany)
2. Colorimeter (Minolta CR-300, Japan)
3. Water activity (a_w) (Aqua lab Model series 3, USA)
4. Hand refractometer (Atago type N2E, Japan)
5. Muffle furnace (Gallenkamp model 98423F, England)

3.2.3 Statistical analysis hardware and software

1. Statistical analysis software of Statistix version 7 (Statistix Co., Ltd, USA.)
2. Microsoft excel version 2003 (Microsoft Office 2003, USA.)

3.3 Method

3.3.1 Production of soft candy

In this section, a soft candy was produced by following the formula and processing conditions of Chaiseri (2543). This soft candy was used as a soft candy prototype for future study. The ingredients to produce soft candy were as followed;

- sucrose	25.0% (w/w)
- water	8.8% (w/w)
- glucose syrup	34.8% (w/w)
- sweetened condensed milk	26.2% (w/w)
- shortening	5.0% (w/w)
- lecithin	0.1% (w/w)
- salt	0.1% (w/w)

Processing

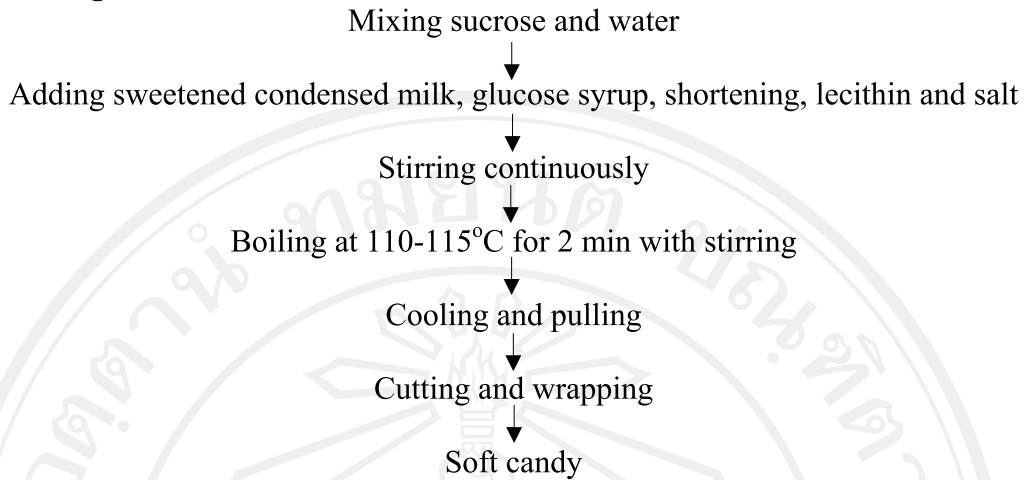


Figure 3.1 A production process of soft candy prototype

Source: a modification method from Chaiseri (2543)

3.3.2 Production of soft yogurt candy prototype

This section produced the soft yogurt candy prototype using drinking yogurt, stirred yogurt and a combination of drinking yogurt: stirred yogurt (1:1) to replace water in the soft candy formula (section 3.2.1). Each formula was produced in 3 replications. The product was analyzed as followed;

3.3.2.1 Proximate analysis

- protein by AOAC no. 920.176 (AOAC, 2000)
- fat by AOAC no. 920.177 (AOAC, 2000)
- carbohydrate by difference
- moisture content by AOAC no. 925.45a (AOAC, 2000)
- ash by AOAC no. 900.02a (AOAC, 2000)

3.3.2.2 Physical characteristics

- color by a colorimeter (Minolta CR-300, Japan)
- Texture by Texture Analyzer (TA.XT plus)
- a_w by a_w meter (Aqua lab Model series 3, USA)

3.3.2.3 Chemical characteristics

- total solids by AOAC no. 932.14 (AOAC, 2000)
- total soluble solids by a hand refractometer
- reducing sugars by AOAC no. 930.36 (AOAC, 2000)
- sucrose by AOAC no. 925.48 (AOAC, 2000)
- moisture content by AOAC no. 925.45a (AOAC, 2000)
- total sugars (Rujanagrakan and Rattanapanon, 2544)
- total titratable acidity (Rujanagrakan and Rattanapanon, 2544)

3.3.2.4 Microbiological characteristics

- Total plate counts (Wiriyajaree, 2545a)
- Yeast and mold (Wiriyajaree, 2545a)
- Osmophilic yeast (Wiriyajaree, 2545a)

3.3.2.5 Sensory evaluation

The soft yogurt candy prototype was assessed by a sensory panel containing 10-15 panelists. The sensory analysis was done using an ideal ratio profile technique (Wiriyajaree, 2545b). The data were analyzed using one sample t-test in SPSS program (version 10).

3.3.3 Effect of sugar alcohols on the soft yogurt candy quality

Soft yogurt candy was made using sugar alcohols (maltitol and sorbitol) to replace sucrose. The other ingredients of soft candy were similar to the prototype (section 3.3.2). The treatments were as followed :

Treatments	Sucrose (%)	Maltitol (%)	Sorbitol (%)
1	100	0	0
2	0	50	50
3	0	100	0
4	0	0	100

Each formula was produced in 3 replications. The products were analyzed as in the sections 3.3.2.2 and 3.3.2.3.

The data were statistically analyzed using ANOVA in Statistix program (version 7) to determine the effect of sugar alcohols on soft yogurt candy quality.

3.3.4 Effect of honey on the soft yogurt candy quality

Soft yogurt candy was made using honey to substitute sucrose in the formula. The proportion of sucrose and honey are 100:0, 50:50 and 0:100. Each formula was produced in 3 replications.

The products were analyzed as in the sections 3.3.2.2 and 3.3.2.3.

3.3.5 Effect of packaging material and storage temperatures on the soft yogurt candy quality

One of the best milk candy formula from the section 3.3.2 was studied in this section. Soft yogurt candies were produced and wrapped with different packaging materials, such as aluminum foil, laminated plastic bag and oriented polypropylene (OPP) bag, and stored in incubators (to control the storage temperature) at room temperature (30°C) or at elevated temperature (45°C). Representative samples was analyzed every 2 weeks for 3 months storage period.

The products were analyzed for :

3.3.5.1 Physical characteristics

- color by a colorimeter (Minolta CR-300, Japan)
- Texture by Texture Analyzer (TA.XT plus, England)
- a_w by a_w meter (Aqua lab Model series 3, USA)

3.2.5.2 Chemical characteristics

- total solids by AOAC no. 932.14 (AOAC, 2000)
- moisture content by AOAC no. 925.45a (AOAC, 2000)
- total soluble solids by a hand refractometer
- reducing sugars by AOAC no. 930.36 (AOAC, 2000)
- sucrose by AOAC no. 925.48 (AOAC, 2000)
- total sugars (Rujanagrikan and Rattanapanon, 2544)
- total titratable acidity (Rujanagrikan and Rattanapanon, 2544)

3.3.5.3 Microbiological characteristics

- Total plate count (Wiriyajaree, 2545a)
- Yeast and mold (Wiriyajaree, 2545a)
- Osmophilic yeast (Wiriyajaree, 2545a)

Physical, chemical and microbiological data were analyzed using Statistix (version 7). ANOVA was performed using a factorial model in order to identify the effect of packaging materials, storage temperatures and interaction between the 2 factors on the keeping quality of soft yogurt candy.

3.3.5.4 Sensory evaluation

Different soft yogurt candy samples were assessed by a sensory panel containing 50 panelists. The sensory analysis was done using 9 points hedonic scale (Wiriyajaree, 2545b). The data were analyzed using ANOVA to find out the effect of packaging materials and storage temperatures on the sensory quality of soft yogurt candy.