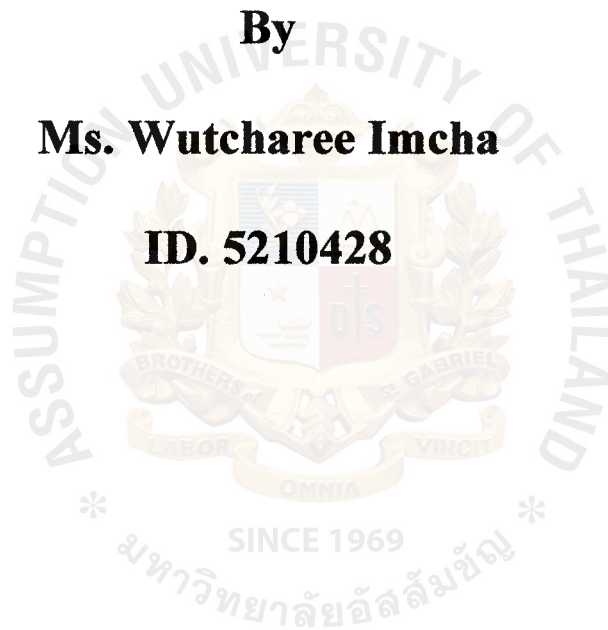# Descriptive Analysis and Product Profiling on Developed Coconut Milk Fresh Cheese

By

Ms. Wutcharee Imcha

ID. 5210428

A special project submitted to

School of Biotechnology, Assumption University

In part fulfillment of the requirements of the Degree of Bachelor of

Science in Biotechnology

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2

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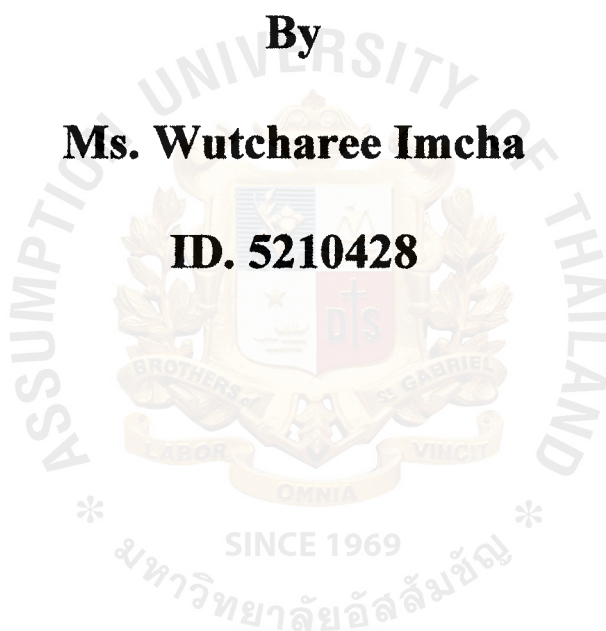
Science in Biotechnology

2013

Title: Descriptive analysis and product profiling on developed coconut milk fresh cheese

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Level of Study: Bachelor of Science

Department: Food Technology

Faculty: Biotechnology

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ACKNOWLEDGEMENT

ABSTRACT

As Thailand is the state of the major producer for coconut milk, the valuable cost for exporting is over the 2000 million baths per year. There were, however, few researches attempted to produce innovative product from coconut milk. Any attempted has been made on coconut milk cheese production, unfortunately, the researcher has been reported that coconut milk could not produce cheese because it does not contain casein. However, our previous trial on the production of coconut cheese-like from coconut milk was successfully developed by partly addition of skim milk powder which helps to enrich casein source (Tipvarakarnkoon, 2009; Sorn-saard and Tipvarakarnkoon, 2012). According to the previous work, four formulations' coconut milk cheese product have been developed and presented variety taste and characteristics. Therefore, this study was aimed to conduct a qualitative descriptive analysis in terms of the sensory perception. The product was profiling and used to compare with commercial cow's milk cheeses. Four different formulas were; 0:100:0 (0%), 10:75:15 (25%), 20:50:30 (50%), and 30:25:45 (75%), (coconut milk powder: pasteurized milk: water). The results showed that developed coconut milk's cheese showed high smoothness, dense and watery in appearance. The texture was less hardness, but firm, high moistness of mass and low adhesive and low grainy texture. It could be classified into 2 groups which are firm products (0% and 25%) and low firm product (50% and 75%). In particularly, 75% coconut milk in cheese gave lowest firmness, high moistness of mass with high degree of dissolving as well as lowest in adhesiveness. Comparing to the commercial products, developed coconut milk fresh cheese showed a similar appearance and texture to cream cottage cheese, excepts they were lower in graininess and adhesiveness texture than cottage cheese. The developed products clearly induced coconut milk odor and flavor which compliance in cheese overall flavor and preferred by consumers (6.8 – 7.0 out of 9-point hedonic scale). This, however, lowers the cheese aroma and flavor in products. The texture profile analysis (TPA) has been also evaluated to correlate with sensory data. The results showed that higher coconut milk content in cheese lower hardness firmness of final products.

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1. INTRODUCTION

The Descriptive Analysis or DA is the study of the profiling method, this method is the more popular in the term of product research and development. It is the research that analytical the food product, therefore measurement and determination that how the product is different from others. Moreover, the Descriptive Analysis can use to measure the shelf- life of the products, the different between each formula and ingredients and the development of the product too. By the same way, the Descriptive Analysis on coconut milk fresh cheese which is the product from the research and development on food would to measure its consumer's preference also would to classify in cheese's group. The coconut milk fresh cheese is the product that produce by using the coconut milk which is the ingredient that simple found in Thai dished. If it can use to create the new product like cheese, it will make more valuable. In addition, it is useful to classify this new product into categories of the cheese production by using the different ingredients to produce. This is because to improve and develop the new product of food in nowadays, it needs to create the product that corresponds to the consumer demand and consumer preference. As Thailand is the state of the major producer for coconut milk, the valuable cost for exporting is over the 2000 million baths per year. And even Thailand is the tropical country; some people prefer and interest the product from the cold country like cheese which is the popular daily product. In order to import this product into the country it spends a lot of money in the term of economic in the ingredients of the cheese processing. This makes the country lost the benefit. However, if the country can save this purchasing, it would be the better way. According to the previous work, the coconut milk fresh cheese has been developing in several formulas. It presents the different taste and different characteristic. Following the way in development, it induces the Descriptive Analysis method that helpful to group its own characteristic on the coconut milk fresh cheese comparing with the commercials cheese product. Otherwise, it gains the benefit for the consumer perception to try the new production of cheese.

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OBJECTIVE

To study the Descriptive Analysis (DA) on developed coconut milk fresh cheese and comparative to commercial cheese product in the market by sensory perception.

2. LITERATURE REVIEW

2.1 Descriptive Analysis research (Ann Lewins)

Descriptive Analysis (DA) is the range of processes and procedures whereby we move from the qualitative data that have been collected into some form of explanation, understanding or interpretation of the people and situations we are investigating. Descriptive analysis is usually based on an interpretative philosophy. The idea is to examine the meaningful and symbolic content of qualitative data.

The process of descriptive analysis usually involves two things, writing and the identification of themes. Writing of some kind is found in almost all forms of descriptive analysis. In contrast, some approaches, such as discourse analysis or conversation analysis may not require the identification of themes. Nevertheless finding themes is part of the overwhelming majority of descriptive analysis carried out today.

2.1.1 Writing

Writing involves writing about the data. In many cases the writing may be analytic ideas. In other cases it may be some form of précis or summary of the data, though this usually contains some analytic ideas.

2.1.2 Coding into themes

Looking for themes involves coding. This is the identification of passages of text (or other meaningful phenomena, such as parts of images) and applying labels to them that indicate they are examples of some thematic idea. At its simplest, this labelling or coding process enables researchers quickly to retrieve and collect together all the text and other data that they have associated with some thematic idea so that they can be examined together and different cases can be compared in that respect.

2.1.3 Interpreting

It is easy, when starting descriptive analysis both to write and code in ways that are nothing more than descriptive summaries of what participants have said or done. Inevitably even description involves some level of interpretation though the trick is to move away from the

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kinds of descriptions and interpretations that people would use in the milieu, community or setting or may be investigating to a categorisation and analytic understanding that begins to explain why things are as you have found them.

2.1.4 Organising

The data sets used in descriptive analysis tend to be very large. Though samples may be quite small compared with those used in quantitative approaches such as surveys, the kinds of meaningful data collected (field notes, video recordings and interviews, for example) tend to be very lengthy and require the kind of intensive examination, understanding and reading that only humans can do. In order to keep a clear mind and not become overwhelmed by the sheer amount of data and analytic writings, the analyst needs to be organised.

Researchers tend to approach this organisation in one of two ways.

2.1.4.1 Manual methods

Notes and interviews are transcribed and transcripts and images etc. are copied. The researcher then uses folders, filing cabinets, wallets etc. to gather together materials that are examples of similar themes or analytic ideas. This facilitates easy retrieval of such linked material, but necessitates two things:

1. Making multiple copies of the original data as the same data may represent two or more themes or analytic ideas.
2. A careful method of labelling the material in the folders or files so that it is possible to check back and examine the broader context in which that data occurred. The analyst needs to know where the snippets of data in the files came from so that they can be re-contextualised.

2.1.4.2 Noticing, Collecting and Thinking model

Seidel (1998) developed a useful model to explain the basic process of qualitative data analysis. The model consists of 3 parts: Noticing, Collecting, and Thinking about interesting things. These parts are interlinked and cyclical. For example while thinking about things you notice further things and collect them. Seidel likens the process to solving a jigsaw puzzle.

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Noticing interesting things in the data and assigning 'codes' to them, based on topic or theme, potentially breaks the data into fragments. Codes which have been applied to the data then act as sorting and collection devices.

2.1.4.3 Noticing and Coding

In Kelle and Seidel (1995) codes are differentiated in two basic ways; they can act as "objective, transparent representations of facts" or they are heuristic tools to enable further investigation and discovery. At one level the codes are acting as collection points for significant data. At another level the code labels themselves are acting as markers or pointers to the way you rationalise what it is that you think is happening. At a third level they enable you to continue to make discoveries about deeper realities in the data that is referenced by the codes.

2.1.4.4 Development of codes

The way codes are developed and the timing of this process will depend on whether the research project and your approach are inductive or deductive. This will be one implication of the methodology used in the research project.

2.2 Coconut milk (Loha-unchit)

Coconut milk is not the juice found inside a coconut, but the diluted cream pressed out from the thick, white flesh of a well-matured coconut.

Coconut milk is the base of most Thai curries. Contrary to western ideas of working with cream, to make the curry sauce, coconut cream is first reduced over fairly high heat to break down the cream and allow the oil to separate. The coconut milk is added to make the sauce. Finished Thai curries will have a thin layer of oil floating on top of the sauce. This oil picks up the color of the curries – bright red for red curry, glistening green for green curry, and so on – giving them a lovely appearance rather than a dull, whitish sameness. The color serves as a reminder of their true nature – spicy hot from red and green chilies and not creamy and bland.

2.2.1 Coconut milk powder

It is an ingredient in most Southeast Asian cooking and is not the liquid inside a coconut. It is prepared by soaking the grated flesh of a coconut in hot water or scalded milk, then straining the combination. Coconut milk is classified as thick, thin, or coconut cream. Thick coconut milk is the result of the first soaking and squeezing. If this milk is refrigerated it separates, and the top layer is the cream. Thin coconut milk is what is produced when one steeps the coconut meat a second time and then strains.

Powder-like, fine texture, and white, coconut milk powder is manufactured through the spray drying process of raw unsweetened coconut cream. Very different from the more widely available and coarser desiccated coconut made from the white coconut meat, coconut milk powder is a good substitute for fresh coconut milk and an alternative to animal milk for those who would like a completely vegan food. However, many commercially available coconut milk powders list milk or casein, a milk protein, on their ingredient lists.[1] Vegans and those with milk allergy may need to prepare their own at home.

2.3 Cheeses (K., 2012)

Cheese is a generic term for a diverse group of milk-based food products. Cheese is produced in wide-ranging flavors, textures, and forms. Cheese consists of proteins and fat from milk, usually the milk of cows, buffalo, goats, or sheep. It is produced by coagulation of the milk protein casein. Typically, the milk is acidified and addition of the enzyme rennet causes coagulation. The solids are separated and pressed into final form. Some cheeses have molds on the rind or throughout. Most cheeses melt at cooking temperature.

Hundreds of types of cheese are produced. Their styles, textures and flavors depend on the origin of the milk (including the animal's diet), whether they have been pasteurized, the butterfat content, the bacteria and mold, the processing, and aging. Herbs, spices, or wood smoke may be used as flavoring agents. The yellow to red color of many cheeses, such as Red Leicester, is formed from adding annatto.

For a few cheeses, the milk is curdled by adding acids such as vinegar or lemon juice. Most cheeses are acidified to a lesser degree by bacteria, which turn milk sugars into lactic acid, and then the addition of rennet completes the curdling. Vegetarian alternatives to rennet are

available; most are produced by fermentation of the fungus *Mucor miehei*, but others have been extracted from various species of the *Cynara* thistle family.

Cheese is valued for its portability, long life, and high content of fat, protein, calcium, and phosphorus. Cheese is more compact and has a longer shelf life than milk, although how long a cheese will keep may depend on the type of cheese; labels on packets of cheese often claim that a cheese should be consumed within three to five days of opening. Generally speaking, hard cheeses last longer than soft cheeses, such as Brie or goat's milk cheese. Cheese- makers near a dairy region may benefit from fresher, lower-priced milk, and lower shipping costs. The long storage life of some cheese, especially if it is encased in a protective rind, allows selling when markets are favorable. Additional ingredients may be added to some cheeses, such as black peppers, garlic, chives or cranberries.

A specialist seller of cheese is sometimes known as a *cheesemonger*. To become an expert in this field, like wine or cooking, requires some formal education and years of tasting and hands-on experience. This position is typically responsible for all aspects of the cheese inventory; selecting the cheese menu, purchasing, receiving, storage, and ripening.

According to the texture and basic manufacturing procedures, cheese can be divided into 7 families:

2.3.1 Acid –coagulated fresh cheese

The original is in North America. Fresh cheese normally refers to cheese produce by acid coagulation by LAB at 30-32 °C with little or no added rennet. Some fresh cheese may also be produced by direct acidification with glucono-delta-lactone. Moreover, fresh cheese is also made via rennet coagulation and procedure known as heat-acid precipitation. The varieties are Cottage, Quark and Cream cheese. Most other American and European cheese also use lactic acid culture, but gelation is induced by coagulation enzyme at pH 6.5-6.7, before acid development has taken place. The pH control of acid –coagulated fresh cheese controlled by after cutting, the cured is cooked to 52 °C to in activate the culture and prevent further acid development. Acidity is also reduced by washing the curd before salting. Curd moisture is reduced by syneresis during cooking but remains high about 60-70% in the finished cheese. Its shelf life is only 2-3 weeks.

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2.3.2 Rennet-coagulated fresh cheese

Original in Latin America, Middle Eastern and some European counties, fresh rennet cheese is produced with little or no culture. This cheese is without acid production by LAB. Cheese pH remains high and resulting cheese does not melt when use in stir fry or other cooked recipes. For reasons of safety and quality, must be handled with extra attention to sanitation and refrigeration. The varieties are Queso Blanco, Queso fresco, Italian fresh cheese, Halloumi (sheep milk cheese). The pH control of rennet–coagulated fresh cheese, if no culture is used, pH remains in the range of 6.5-6.7, but in some Queso Blanco varieties a small amount of culture is used to induces the pH to 5.8 which reduced the growth pH of both spoilage (increases shelf life) and pathogenic (increases food safety) microorganisms. Further acidification is inhibited by cooling and salting. In addition, too much acidification below pH less than 5.8 will produce a melt-able cheese which is unsuitable for frying. Rennet-coagulated fresh cheese has 50-70% moisture content and shelf life only 2-4 weeks.

2.3.3 Heat-Acid precipitated cheese

Heat- Acid precipitation cheese is primarily acid induced, but no fermentation. The acid is added to hot milk at temperature in the range of 75- 100 °C. Heat treatment denatures the whey protein which can then be coagulated along with the casein and recovered in the cheese. Whey protein have a great capacity to blind water so high moisture but firm cheese can be produced and also whey protein can prevent cheese melting (produce frying and cooking cheese). The acid coagulation of Heat-Acid precipitate occurred at high temperature requires less acidification, so the final cheese is much less acid (pH 5.2-6.0). Mostly, final pH is normally in the range of 5.3-5.8. Any organic acid can be used, but lactic and citric acids are most common. The varieties are Ricotta (Italy), Channa and Paneer (India), some varieties of Latin American white cheese. Moisture is generally high (55-80%) due to the high water holding capacity of whey protein. Heat-Acid precipitate cheese should consume fresh except Mizithra, a type of Ricotta cheese which is cured, dried, and consume as a grating cheese. Moreover, possible in some cases for extend shelf life it required to hot packing.

2.3.4 Soft-Ripened cheese

The varieties of Soft-Ripened cheese are Feta, Camembert, Brie and Blue. The coagulation is rennet which reacted by the amount of lactic acid bacteria inoculum is large and the ripening

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period before renneting is extended. The acidification influence on the development of curd structure during setting and decrease demineralization of curd and also due to the cutting time increased the cutting is delays to further encourage acidification and demineralization before cutting. Cutting is accomplished with large knives to minimize moisture and fines losses before filling the forms. Then, acidification continues until the accumulation of lactic acid inhibits culture growth. Acid development is also influence by the time and amount of salting. Its pH is 4.3-4.6 on the day following manufacture and in the case of Feta remains low during curing. The pH of mould ripened varieties increases during curing, especially Camembert and Brie. The moisture content is 45-60% and the curing time is about 2-8 weeks.

2.3.5 Semi-hard washed cheese

It is the largest and the most diverse group of cheese which varieties are Gouda, Edam, Colby, Brick, Montasio, Oka, Muenster and many others. Cheese is washed to remove lactose, part or all of the whey is removed and replaced with water to leach lactose from the curd, therefore to limit the amount of lactose to produce a minimum pH of 5.0-5.2. The moisture content is about 40-50% and the curing time is 2 weeks to 9 months.

2.3.6 Hard cheese: Low temperature

Lower moisture permits removal of sufficient lactose by syneresis to avoid the necessity of washing. The low moisture is achieved by high temperature of cooking or by controlled fermentation and curd handling. The varieties are Cheddar types, and Pasta Filata types (Mozzarella and Pizza cheese). Cheddar and Pasta Filata manufacture are similar in the early stages. Pasta Filata varieties are distinct in that they are worked and stretched in hot water and brine salted. While Cheddar types are salted before hooping and pressing. The acid development is controlled by the amount of syneresis which pH of 5.0-5.2 within 1-3 days after manufacture. The moisture is controlled by cooking temperature and time, stirring out after draining, cheddaring, amount of culture and salting treatments. Its moisture content is 35-39% for Cheddar types and up to 52% for Pasta Filata types. The curing time is 1-36 months.

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2.3.7 Hard cheese: High temperature

The varieties are Romano, Parmesan and Swiss cheese. The pH controlled by type of culture, time-temperature profile during pressing until cooking, lactose removed by syneresis and amount of acid development before draining. The moisture controlled by rapid syneresis induced by high renneting temperature and high cooking temperature. The curing time is 1-36 months.

3. MATERIALS AND METHODS

Part I: Production of developed coconut milk fresh cheese

3.1 Materials

3.1.1 Coconut milk powder   807 e·1

Coconut milk powder (Choa-Thai brand) was purchased from the market. It was packed in packaging of 60 gram with 16% of fat content.

3.1.2 Pasteurized cow's Milk

Pasteurized milk (Chock chai brand) was selected to use in this experiment, which is 100% cow's milk from local farm in Thailand.

3.1.3 Rennet powder

Rennet powder was kindly donated by BRENNTAG, Rennet powder extract NB, batch no. 2079865 for 15 grams.

3.1.4 CaCl$_2$

Calcium chloride dried granular was purchased from CARLO ERBA reagent.

3.1.5 Salt

Table salt (Proong-Thip brand) was used in this experiment which was purchased from Thai Refined Salt Co., Ltd.

3.2 Methods

3.2.1 The study of effect of coconut milk powder in ratio (50:50)

(Tipvarakarnkoon & Sorn-saard and Tipvarakarnkoon, 2009-2012)

3.2.1.1 Coconut milk powder (Coconut milk powder: milk: Water, 20:50:30)

Table 1: Formulation of coconut milk fresh cheese using coconut milk powder

Materials	%
Coconut milk powder	19.73
Water	29.60
Salt	0.99
CaCl$_2$	0.29
UHT cow's milk	49.34
Rennet	1 : 4500

3.2.2 Process of coconut milk fresh cheese

Coconut milk (20% fat fresh coconut milk, UHT or reconstituted coconut milk) was mixed with pasteurized cow's milk at a ratio of 50:50. The mixture was then homogenized at 13700 rpm, and then pasteurized at 72°C for 15 sec. Cooled down until 45°C, 0.3% prior CaCl$_2$ was added, and left it stand for 1 hour. After the temperature was cooled down to 40°C, rennet was added at ratio 1:4500 of raw material. Left it stand for 2 hours at 40°C, cut the curd to small brick, and left it drain for 30 minutes. The curd was drained and pressed using 2 kg. of rice bag for 2 hours. After 2 hours, 0.5% of salt was added, mixed well, and left it further for 30 minutes. Cheese was packed into plastic box and placed in refrigerator overnight.

Table 2: Formulation of coconut milk fresh cheese in different concentrations of coconut milk powder

Materials	Concentration (wt %) CM:M:W			
	A (0%) (0:100:0)	B (25%) (10:75:15)	C (50%) (20:50:30)	D (75%) (30:25:45)
Coconut milk powder	-	10%	20%	30%
Water	-	15%	30%	45%
Pasteurize milk (Chock-chai milk)	99.2%	74.2%	49.2%	25.2%
Salt	0.5%	0.5%	0.5%	0.5%
CaCl$_2$	0.3%	0.3%	0.3%	0.3%
Rennet(1 : 4500)	0.2 g in weight coconut milk solution			
TOTAL	100%			

1. Coconut milk mixed with Chock chai Milk	9. Stand for 2 hr
2. Homogenize at 13,700 rpm for 3 min	10. Cut the curd
3. Heat at 72 °C for 15 sec	11. Let it stand for 30 min
4. Let it stand at room temperature for 1 hr	12. Add salt, mixed well
5. Add 0.3% of $CaCl_2$	13. Drain and press for 30 min
6. Wait until 45 °C	14. Pack in plastic box
7. Cool down to 40 °C	15. Refrigerator
8. Add rennet	
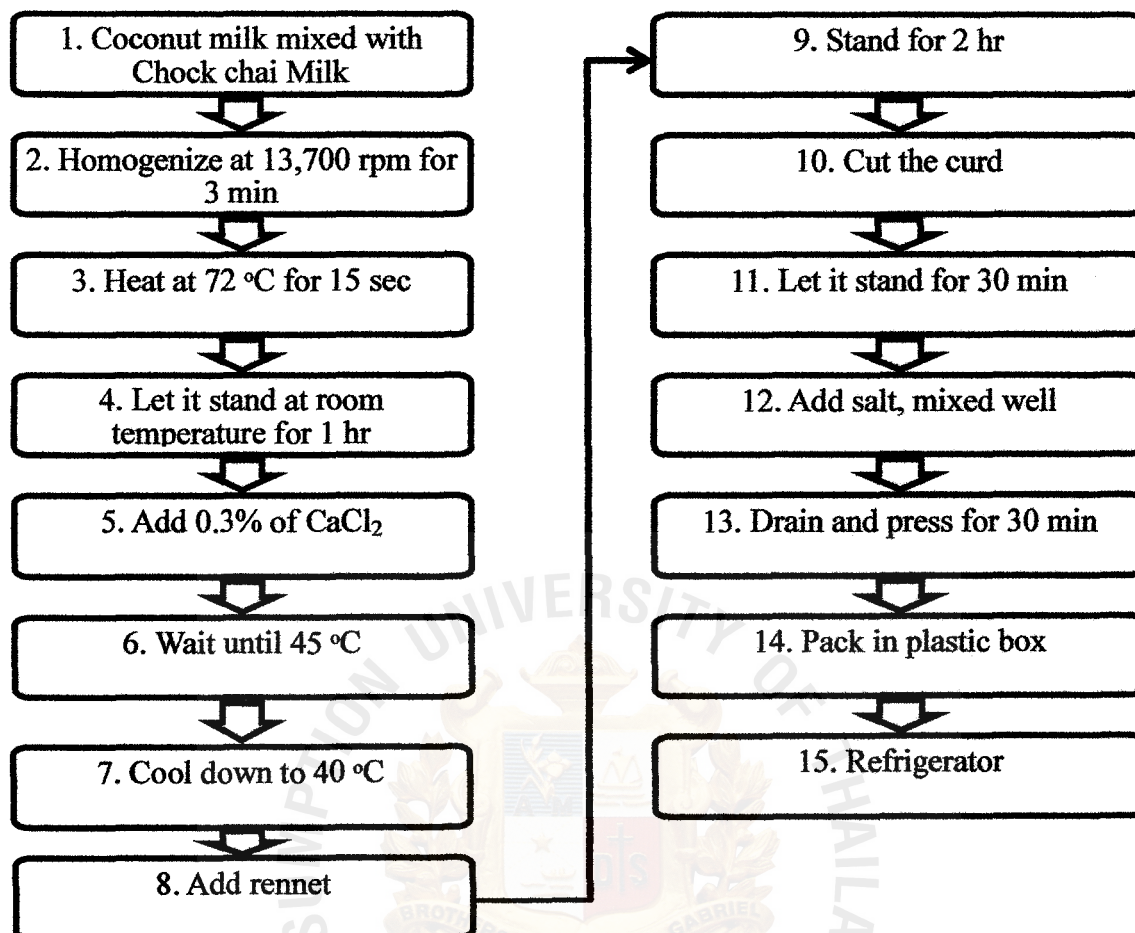
Fig.1: Flow chart of coconut milk fresh cheese making process.

3.2.3 Study of the texture analysis on development of coconut milk fresh cheese

3.2.3.1 Texture profile analysis

The samples were measured for hardness and adhesiveness at room temperature, using a texture analyzer (TA-XT plus, Charpa Techcenter Co., Ltd.) (Appendix D)

- Cylinder with 2.5 cm. diameter

- Test mode: Compression

- Test speed: 1mm/sec

- Distance: 10 mm
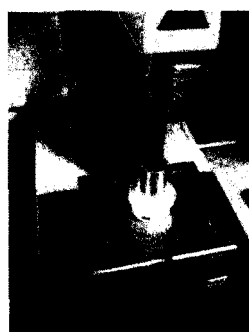
Fig.2 Texture analyzer (TA-XT plus)

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Part II: Product profiling of developed coconut milk fresh cheese

-Developments of the terms that will use to describe the profile of the commercial cheese product and developed coconut milk fresh cheese using focus group discussion method. It began with the choosing of panelist who familiar with cheese product and likely to consume cheese to discuss about cheese and cheese products. For example, what kind of cheese do you like?, where is the place that you normally buy cheese or consume cheese? etc. All panelist wrote down the answer and discussed between them to exchange some critical. During discussing all information were recorded to form the pre-screening question in the consumer behavior test.

-Line scale determination of the main attributes of each type of cheese (Appendix C). This method is applied by human sensation about 8-10 persons were trained for 4-5 times.

-Selected panelists

    -Time available

    -Familiar with cheese

    -Eat cheese regularly

-Semi-training by sensory evaluation

    -7 panelists were trained by Semi-training

    -Trained for 5 times (1-2 hr / each)

1. Study and analysis the different type of cheese product

⬇

2. Study the Descriptive Analysis or (DA)

⬇

3. Comparative profiling between commercial cheese product and developed coconut milk fresh cheese
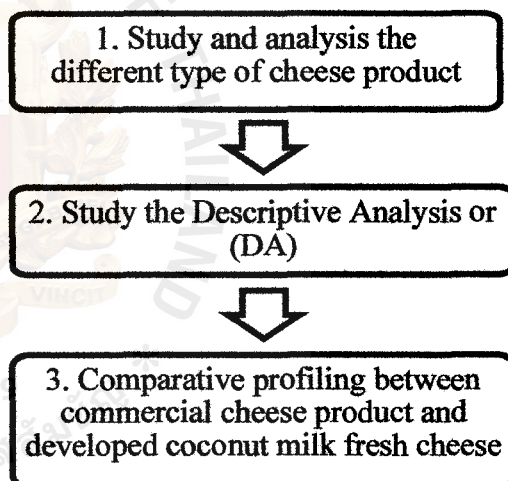
Fig.3 Steps of DA analysis

Part III: Sensory analysis

7 panelists were trained by using the semi-training method to evaluated 8 different types of chesses (including four developed coconut milk fresh cheese) at refrigerator temperature (4°C). Each attribute was evaluated on 0-15-point ballot scale using intensity scale and the criteria used to determination cheese sample. The major sensory attributes were appearance (color, smoothness, water, and denseness), odor (coconut milk and milky), flavor (coconut milk, milky and fermented), taste (sour and saltiness), texture (hardness, firmness, airiness,

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degree of dissolving, moistness of mass, adhesiveness and graininess). Example of ballot used in this experiment was shown in Appendix C. The semi-trained was taken about 1-2 hours for 5 times.

Part IV: Consumer test

Each attribute was evaluated on 9-point hedonic scale using liking preference test. The major sensory attributes were color, appearance, coconut aroma, texture, coconut flavor and overall liking....... The sample was then prepared to conduct the consumer test. Approximately 8 gram was packed into a small plastic cup and tightly sealed using plastic cover lid. 100 panelists including staffs and students businessman, housewife, and others at Assumption University and Ramkamheang University were evaluated coconut fresh cheese samples at refrigerator temperature ($4^{o}C$) using questionnaire. The questionnaire was divided into three parts; basic information of consumer's behavior on cheese in the market, information of consumer's behavior on coconut milk fresh cheese, and demographic information (Appendix B).

Part V: Experimental design and statistics analysis

Randomize Complete Block Design was used in this experiment to compare the treatment differences. The results from sensory analysis and consumer test of coconut milk fresh cheese were analyzed using statistical analysis program R version 2.13.0. Significance was declared at $P<0.05$. Duncan's test was also used to determine the group significantly different from each other (Appendix A)

4. RESULTS AND DISCUSSION

Part I: <u>Production of developed coconut milk fresh cheese</u>

4.1 Characteristics of raw materials

Reconstituted coconut milk from coconut milk powder was used to mix with pasteurized cow's milk in order to prepare coconut milk fresh cheese. As shown in Table 3, pH of coconut milk was approx. 6.37 with % acidity is 0.54. Protein content in coconut milk was quite high in coconut milk powder which contains sodium caseinate as in commercial grade which has comparable amount to protein content in cow's milk.

Table 3: Physiochemical properties of raw materials

Properties	Coconut milk powder	Cow's milk
pH	6.37	6.40-6.80
%Acidity	0.54	0.45
Density	N/A	N/A
%Crude protein	3.30	3.40

*N/A = cannot be measured within the available range of desired densitometer

4.2 Coconut milk fresh cheese from coconut milk powder type

4.2.1 Physiochemical properties

Physiochemical properties (pH and acidity) of coconut milk fresh cheese were evaluated. According to Table 4, range of pH of coconut milk fresh cheese prepared from coconut milk powder was 6.33 in accordance with raw materials. % Acidity of prepared products was 0.63%.

Table 4: Physical properties of coconut milk powder.

Sample	pH	% Acidity
Coconut milk powder	6.33+0.06	0.63+0.13

The coconut milk powder type was studied in term of sensory analysis and statistics ($P<0.05$). According to Table 5- 6, characteristics of coconut milk powder sample was white-creamy color with light coconut aroma but strong in flavor of natural coconut milk.

Table 5: Characteristics of coconut milk fresh cheese prepared from coconut milk powder

Attribute	Coconut milk powder
Color	Pale yellow
Appearance	Somewhat sandiness
Coconut aroma	Light coconut milk aroma
Coconut flavor	Strong coconut flavor but less salty than others
Texture	Low moisture than others and spreadability
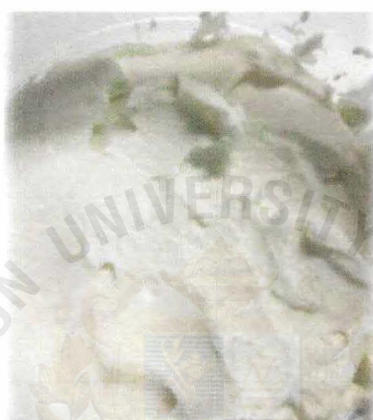
Fig. 4 Coconut milk fresh cheese made from coconut milk powder.

4.2.2 Characteristics of coconut milk fresh cheese at different concentrations coconut milk powder

(A)   (B)   (C)   (D)

Fig. 5. Characteristics of coconut milk fresh cheese at different concentrations of coconut milk powder, 0% (A.), 25% (B.), 50% (C.), 75% (D.) respectively.

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Table 6: Characteristics of fresh cheese at different concentrations of coconut milk

Concentration of coconut milk	A (0%) 0: 100: 0	B (25%) 10: 75: 15	C (50%) 20: 50: 30	D (75%) 30: 25:45
Color	yellow	pale yellow	white	white
Coconut milk aroma	none of coconut milk aroma	very slightly of coconut milk aroma	somewhat in coconut milk aroma	strong coconut milk aroma
Coconut milk flavor	sandiness	sandiness	smoothness, spreadability	smoothness, high moisture and spreadability
Overall texture	none of coconut milk flavor	very slightly of coconut milk flavor	moderate coconut milk flavor	strong coconut milk flavor

4.2.3 Texture profile analysis

Texture properties of coconut milk fresh cheese are shown in the Table 7 and Figure 6, according to the Figure 6, the four formulas of coconut milk fresh cheese were measured using a texture analyzer. The peak point above the X-axis of each line was the hardness. As the results shown, the 0% coconut milk was the most hardness, followed by 25%, 50% and 75% which was the less hardness respectively. In addition, the area under the curve was the firmness of each coconut milk cheese. It showed that, the 0% was the firmest, followed by 25%, 50% and 75% that was the less firmness respectively. Moreover, the area under the curve below the X-axis was showed the cohesiveness of the coconut milk fresh cheese. It showed that, 25% coconut milk was very cohesive, follow by 75%, 505 and 0% which was the slightly cohesiveness. All in all, the result of the texture profile on coconut milk fresh cheese showed that since the percentage of the coconut milk was increased, the hardness and firmness were decreased respectively. As well, when the percentage of the coconut milk was increased, the cohesiveness was also decreased.
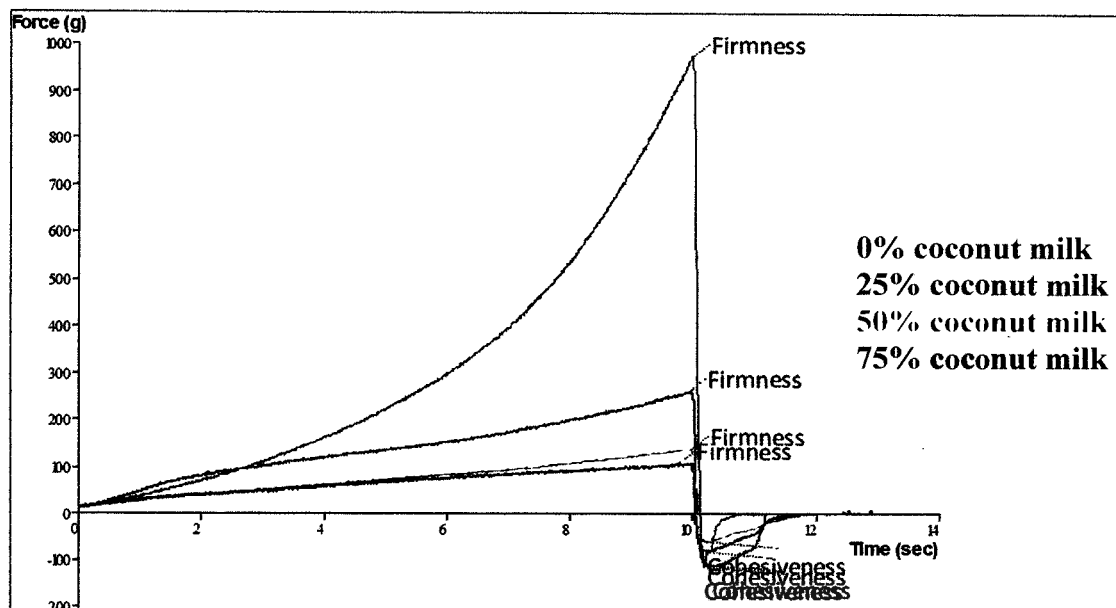
Fig. 6 Texture analyzer of the 4 formulas of fresh coconut milk cheese

Table 7 : Interpretation data texture analyzer for 4 formulas of fresh coconut milk cheese

Concentrations	Hardness (g)	Firmness (g.sec)	Cohesiveness (g.sec)
0% coconut milk	976.33	3119.66	-20.85
25% coconut milk	263.14	1408.98	-96.69
50% coconut milk	142.31	760.05	-50.44
75% coconut milk	109.92	679.52	-68.24

Part II: Product profiling of developed coconut milk fresh cheese

The product profiling of developed coconut milk fresh cheese and commercial cheese were determined using the descriptive analysis. Firstly, the sensory profile of 4 developed coconut milk fresh cheese in this experiment was explained in form of spider plot as shown in the Fig.7. There relative similar profiles of all samples were obtained. This can be categorized into three main groups the first group was 0% that was the control, second group was 25% and 50% were similar in most attributes and 75% was the last group which was quite different from the other in texture. Moreover, the sensory profile of 4 commercials cheese was shown in the Fig.8. There were cheddar cheese, cream cottage cheese, cream cheese and spread cheese. Their profile was different from each other in terms of appearance, odor, flavor, taste and texture.

Profiling of 4 formulas coconut milk fresh cheese in different attributes

Color
Graininess 15 Smoothness
Adhesiveness Watery
Moistness of mass
Degree of dissolving
Airiness
Firmness
Hardness
Saltiness
Sour
Fermented
Milky
Coconut milk
Milky
Coconut milk
Denseness
Watery

10

0

—♦—0% coconut cheese
—■—25% coconut cheese
—▲—50% coconut cheese
—■—75% coconut cheese
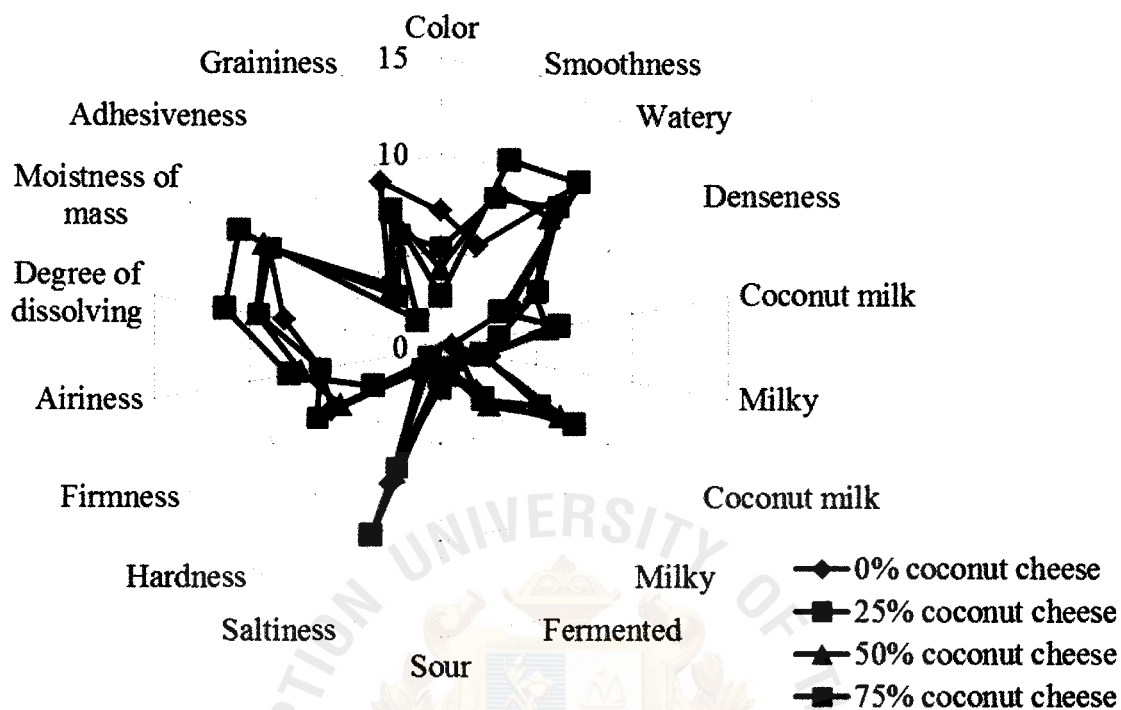
Fig.7 Coconut milk fresh cheese profiling in different attributes

Profiling of 4 commercials cheese in different attributes

Color
Graininess 15 Smoothness
Adhesiveness Watery
Moistness of mass
Degree of dissolving
Airiness
Firmness
Hardness
Saltiness
Sour
Fermented
Milky
Coconut milk
Milky
Coconut milk
Denseness

10

5

—♦—Cheddar cheese
—■—Cream cottage cheese
—▲—Cream cheese
—■—Spread cheese

Fig.8 Commercials cheese profiling in different attributes

20
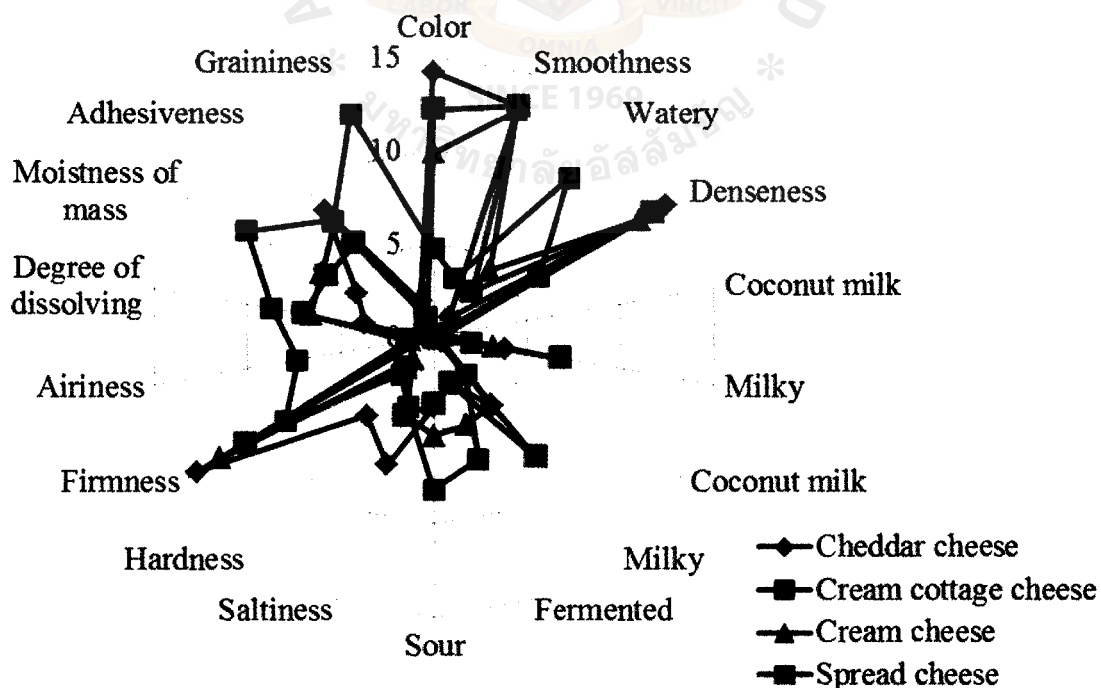
To compare the profile of the commercials cheese and coconut cheese, there were 18 attributes which can be classified into 3 main parts: Appearance part (color, smoothness, watery and denseness), Odor (coconut milk and milky)-Flavor (coconut milk, milky and fermented)-Taste (sour and saltiness), These parts showed in the same figure and texture part (hardness, firmness, airiness, degree of dissolving, moistness of mass, adhesiveness and graininess). Firstly, the appearance profile of the 4 commercials type of cheese. It showed in the Figure 9, Cheddar cheese presented more yellowish color, very smooth and denseness but less in watery. Cream cottage cheese was white color, less smoothness and denseness but very watery. Cream cheese and spread cheese were similar to each other, their color was white yellowish, very smooth and dens but quite low watery. So, for appearance profile the cheddar cheese, cream cheese and spread cheese showed the similar profile while the cream cottage is different.
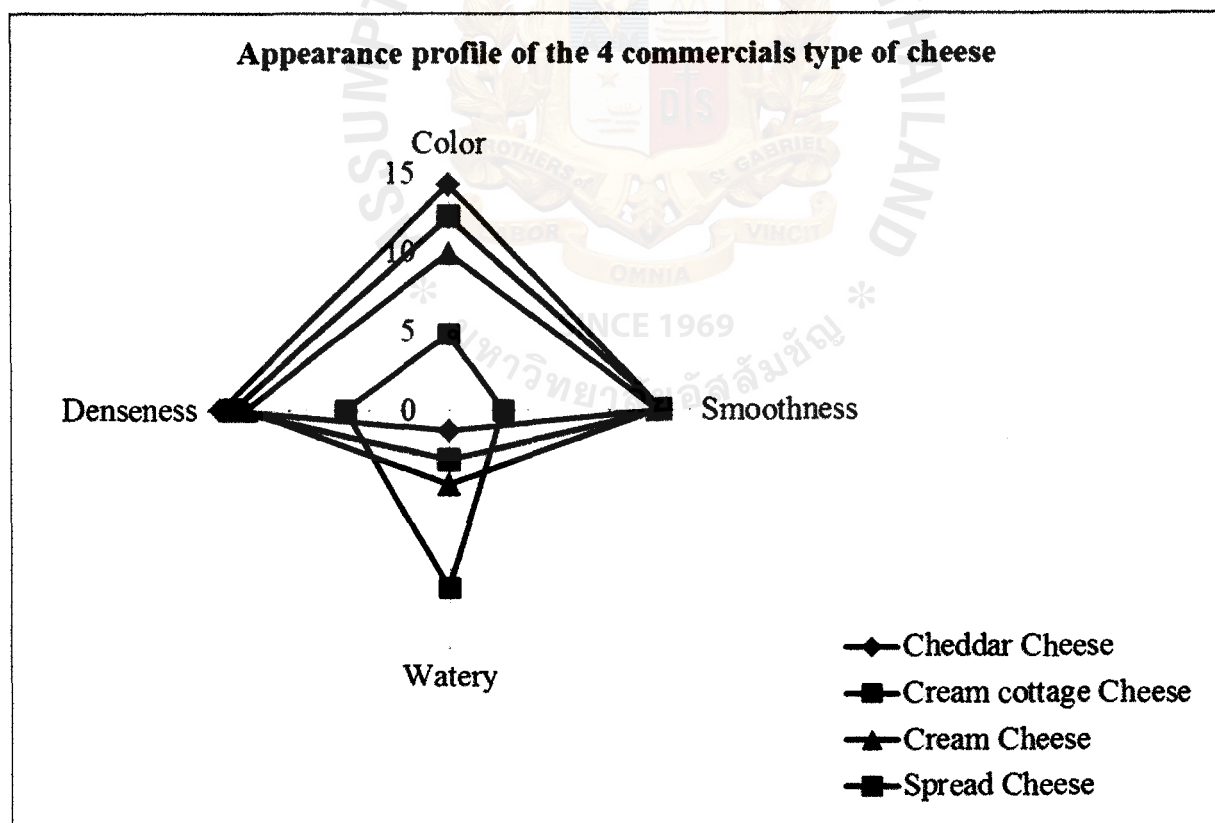
Fig.9 Appearance profile of 4 commercials cheese in different attributes

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Secondly, odor, flavor and taste profile of the 4 commercials type of cheese. It showed in the Figure 10, Cheddar cheese presented some of milky odor, less of milky and fermented flavor also more salty taste. Cream cottage cheese was less milky but more fermented smell and very salty. Cream cheese had no milky odor, it presented of some fermented and milky flavor but less than cream cottage cheese. Moreover, it was sour taste too. Spread cheese was very milky in odor and flavor, its taste was not salty and sour if compared with other cheese samples.

Odor, Flavor, and Taste profile of 4 commercials type of cheese
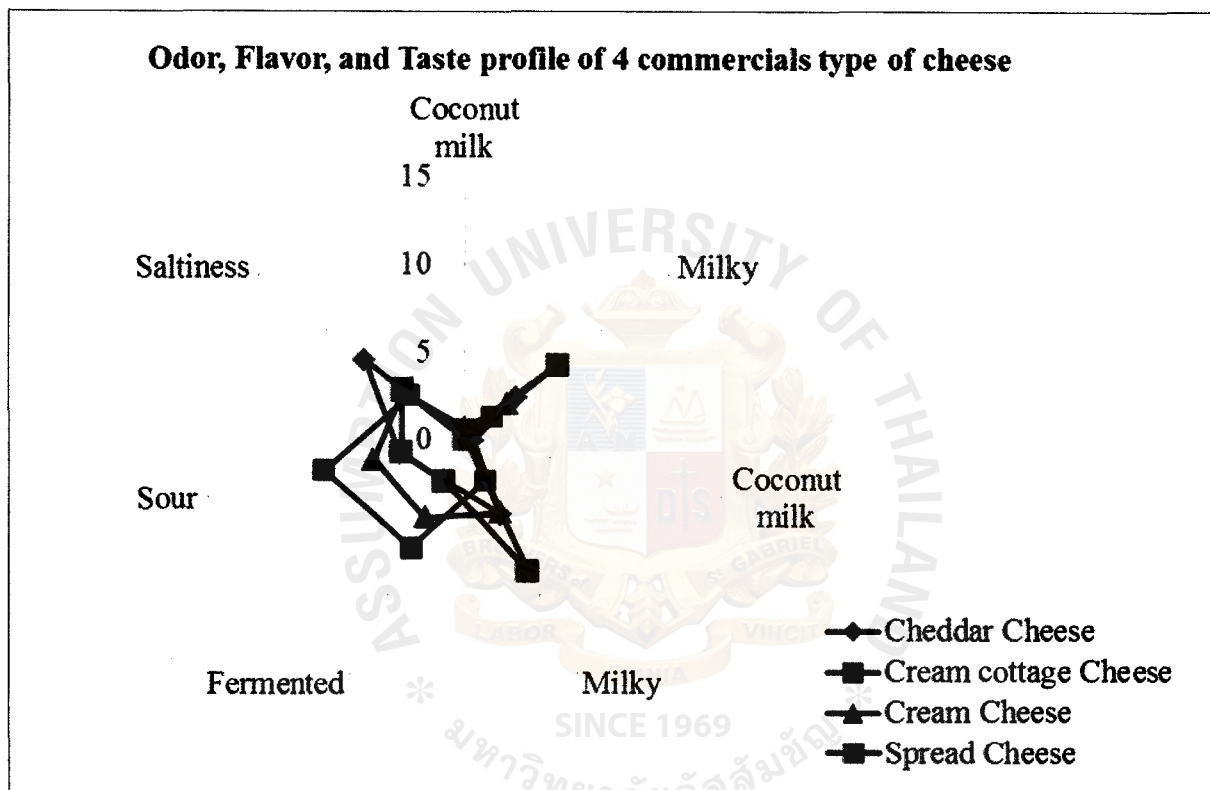
Fig.10 Odor, Flavor and Taste profile of 4 commercials cheese in different attributes

Thirdly, texture profile of the 4 commercials type of cheese sample showed in the Figure 11, Cheddar cheeses presented very hard texture, very firm and very adhere. Cream cottage cheese was not hard, less firm, very airy, easy to dissolve, very moist and very grainy. Cream cheese also was not hard, very firm, not airy and slightly adheres. Spread cheese was very firm, easy to dissolve and less adhesiveness.

Texture profile of 4 commercials type of cheese
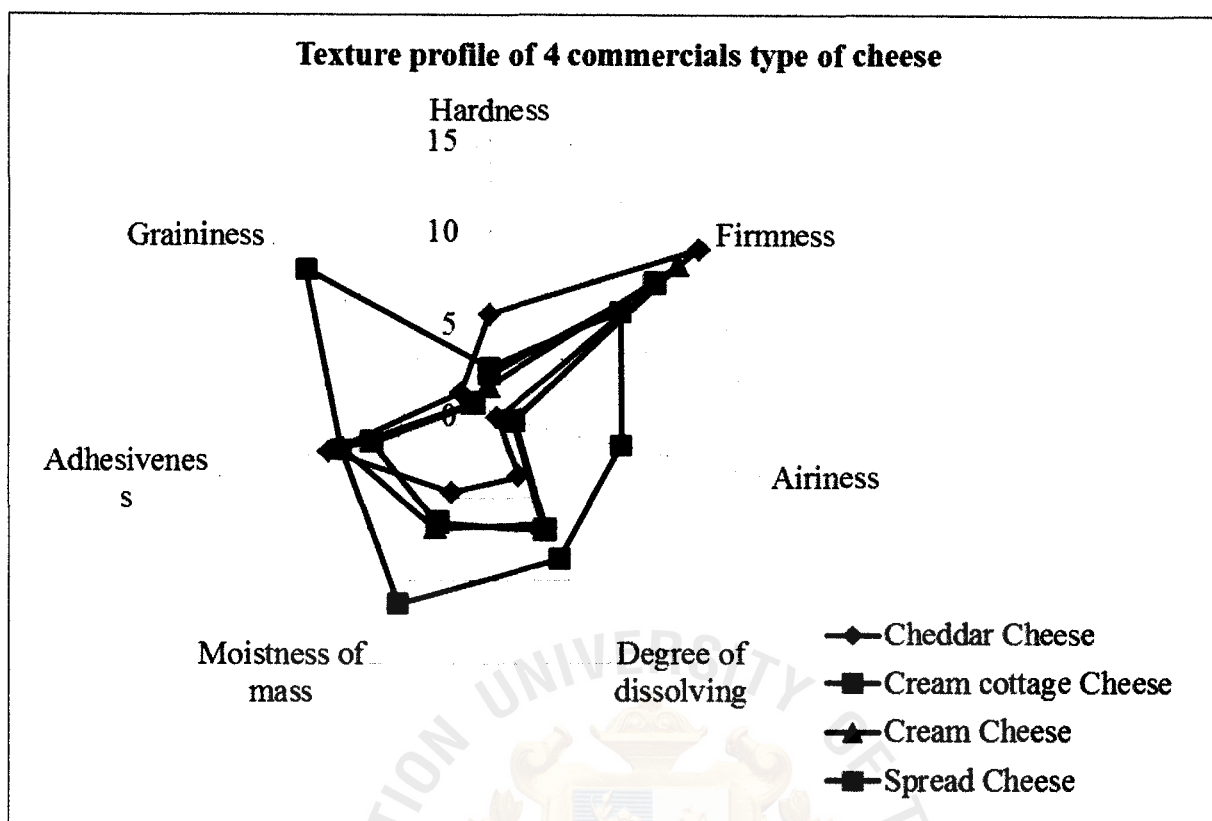
Fig.11 Texture profile of 4 commercials Cheese in different attributes

Part III: Sensory analysis

Comparison of the commercials cheese profile and the developed coconut milk fresh cheese profile in each formula, therefore classified the main characteristics of cheese to arrange into the cheese's group that available in the market. First comparison was showed in the graphs which were the comparison between 4 commercials cheese profile and 0% coconut cheese. In this formula, it did not add the coconut milk powder because it used as the control. For the appearance profile from the graph in the Figure 12, showed that the 0% coconut cheese was similar to cream cottage cheese but more yellower, it was watery like cream cottage but less denseness. Moreover, it was more smoothness than cream cottage cheese. Next, odor, flavor and taste from the Figure 13, showed that o% coconut cheese was similar to spread cheese but less milky smell, less milky and very less fermented flavor while the taste was very salty. Last, texture profile from the Figure 14, showed that 0% coconut cheese was look like cream cottage cheese but less grainy, less moistness and less adhesiveness.

Second comparison was the comparison between 4 commercials cheese profile and 25% coconut cheese profile. For the appearance profile from the Figure15, 25% coconut cheese

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was similar profile as cream cottage cheese but very high smoothness. For odor, flavor and taste in the Figure 16, it showed that coconut odor and flavor was high but less milky. This was because, the increased of the percentage of the coconut powder in the formula can be effect the odor of coconut cheese. For texture profile in the Figure 17, almost of attributes were present their profile similar to cream cottage cheese but less graininess, adhesive, moistness and airy.

Third comparison was the comparison between 4 commercials cheese profile and 50% coconut cheese profile. For appearance profile in the Figure 18, the color of 50% coconut cheese was white color that was similar to cream cottage cheese, it was high smoothness but less watery and less denseness. For odor, flavor and taste that showed in Figure 19, the 50% coconut cheese presented high in coconut milk odor and flavor and the taste of saltiness was similar to the spread cheese. For texture profile in the Figure 20, almost of attribute were close to cream cottage cheese, less grainy, adhesive, not hard and not firm but the degree of dissolve was higher than other even though compare to the commercials cheeses.

Fourth comparison was the comparison between 4 commercials cheese profile and 75% coconut cheese profile. For the appearance profile from Figure 21, the 75% coconut chees was similar to the cream cottage cheese appearance but it was very watery and very less in denseness. For odor, flavor and taste from the Figure 22, it presented of the strongly coconut milk smell and flavor and very salty. For texture profile in the Figure 23, its texture showed as a yogurt-like, very moist, very grainy, very airy, and too easy to dissolve. So, the texture in this formula was quite specific because of the effect of the ingredients that varied. The main effect of the texture was the water because if increase the water, the texture became more watery.
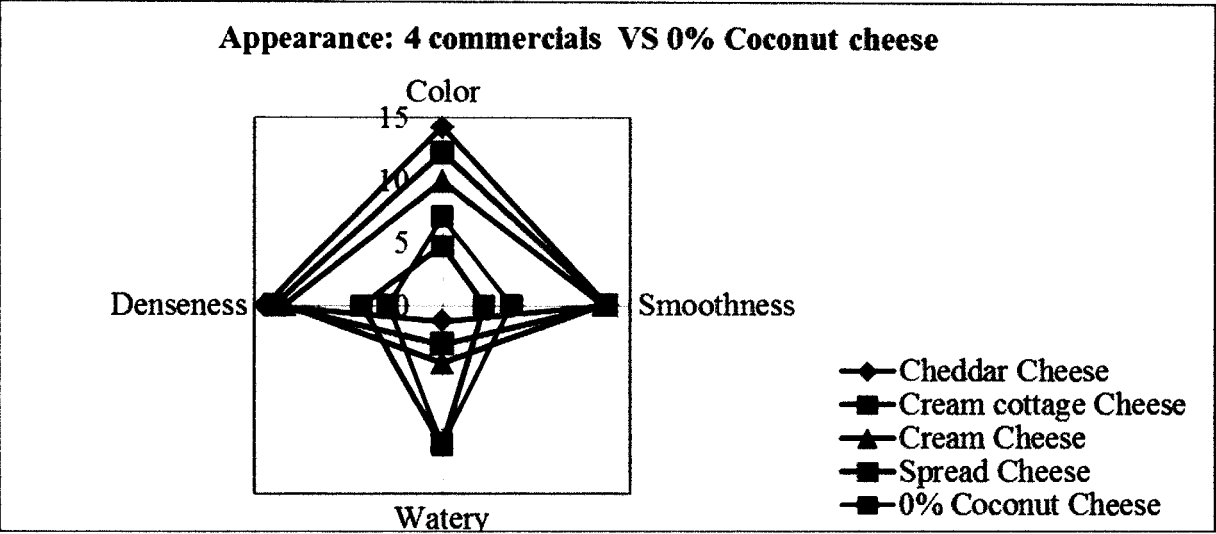
Fig.12 Appearance profile of 4 commercials cheese and 0% coconut cheese
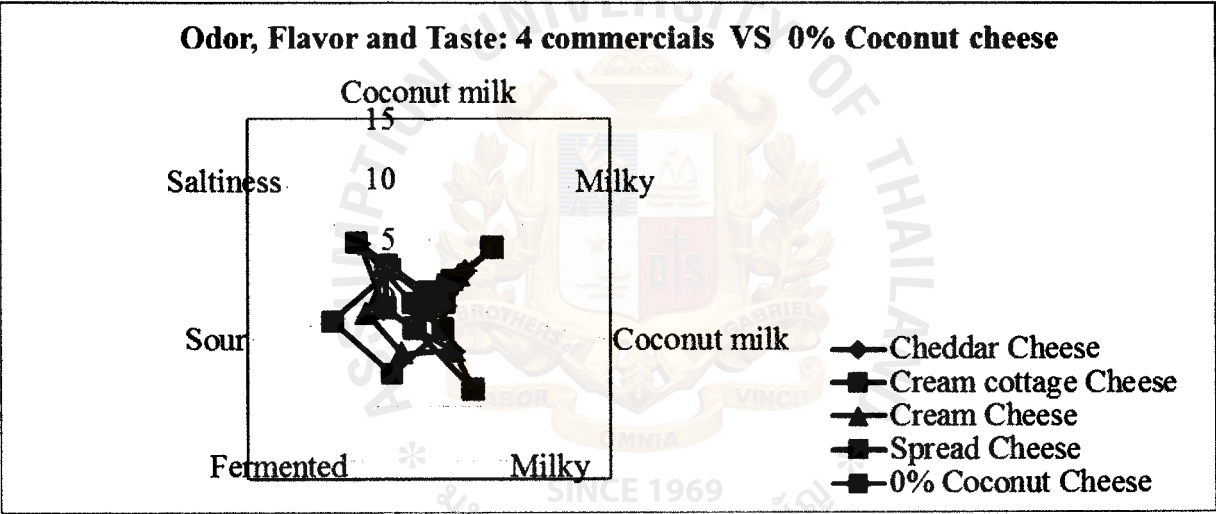
Fig.13 Odor, Flavor and Taste of 4 commercials cheese and 0% coconut cheese

Texture: 4 commercials VS 0% Coconut cheese

Fig.14 Texture profile of 4 commercials cheese and 0% coconut cheese

Appearance: 4 commercials VS 25% Coconut cheese

Fig.15 Appearance profile of 4 commercials cheese and 25% coconut cheese
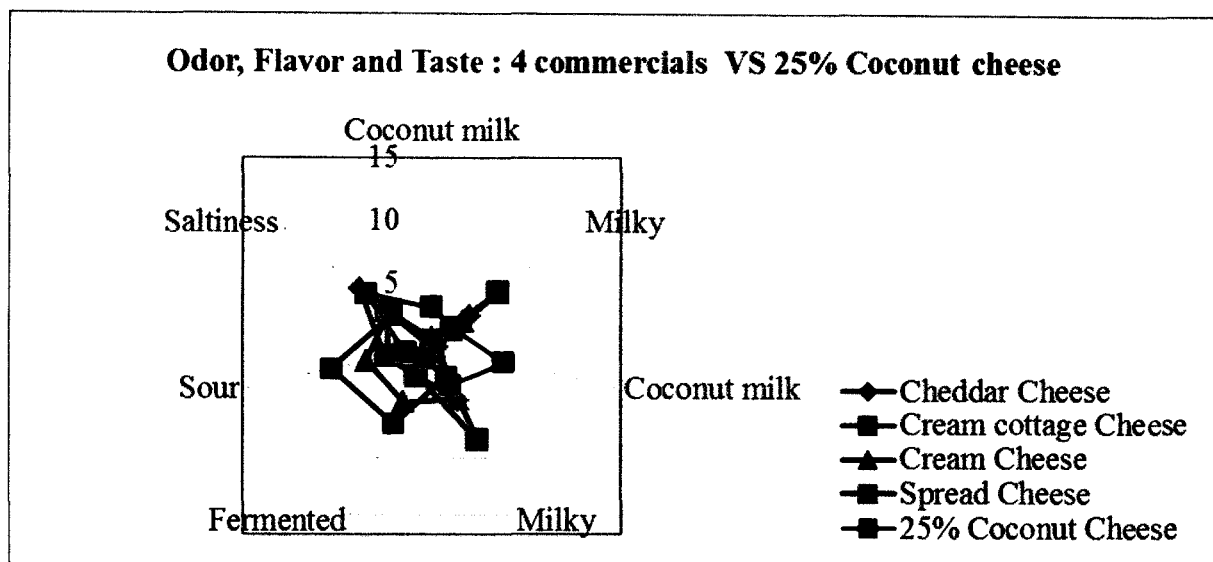
Fig.16 Odor, Flavor and Taste profile of 4 commercials cheese and 25% coconut cheese

Fig.17 Texture profile of 4 commercials cheese and 25% coconut cheese

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Fig. 18 Appearance profile of 4 commercials cheese and 50% coconut cheese
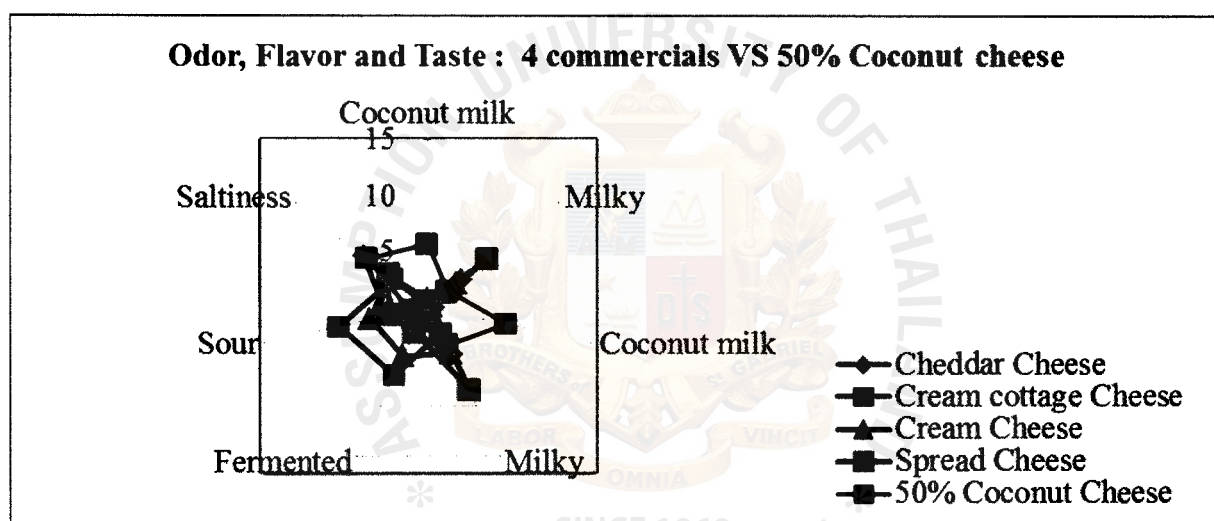
Fig.19 Odor, Flavor and Taste profile of 4 commercials cheese and 50% coconut cheese
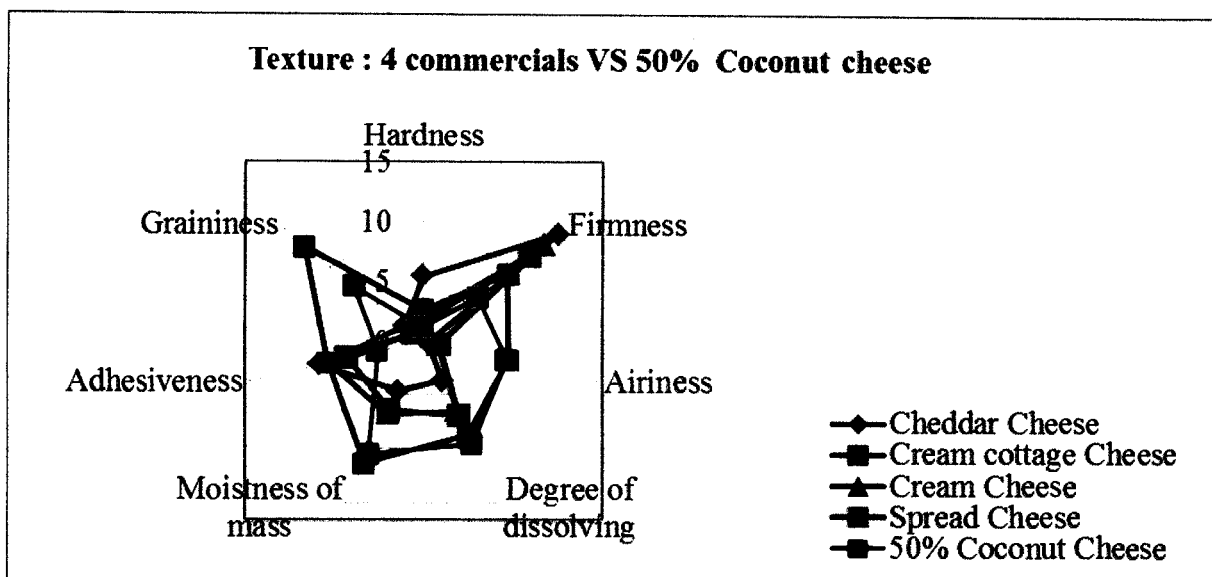
Texture : 4 commercials VS 50% Coconut cheese

Legend:
- Cheddar Cheese
- Cream cottage Cheese
- Cream Cheese
- Spread Cheese
- 50% Coconut Cheese

Axes: Hardness, Firmness, Airiness, Degree of dissolving, Moistness of mass, Adhesiveness, Graininess

Fig.20 Texture profile of 4 commercials cheese and 50% coconut cheese

Appearance: 4 commercials VS 75% Coconut cheese

Legend:
- Cheddar Cheese
- Cream cottage Cheese
- Cream Cheese
- Spread Cheese
- 75% Coconut Cheese

Axes: Color, Smoothness, Watery, Denseness

Fig.21 Appearance profile of 4 commercials cheese and 75% coconut cheese

Odor, Flavor and Taste : 4 commercials VS 75% Coconut cheese

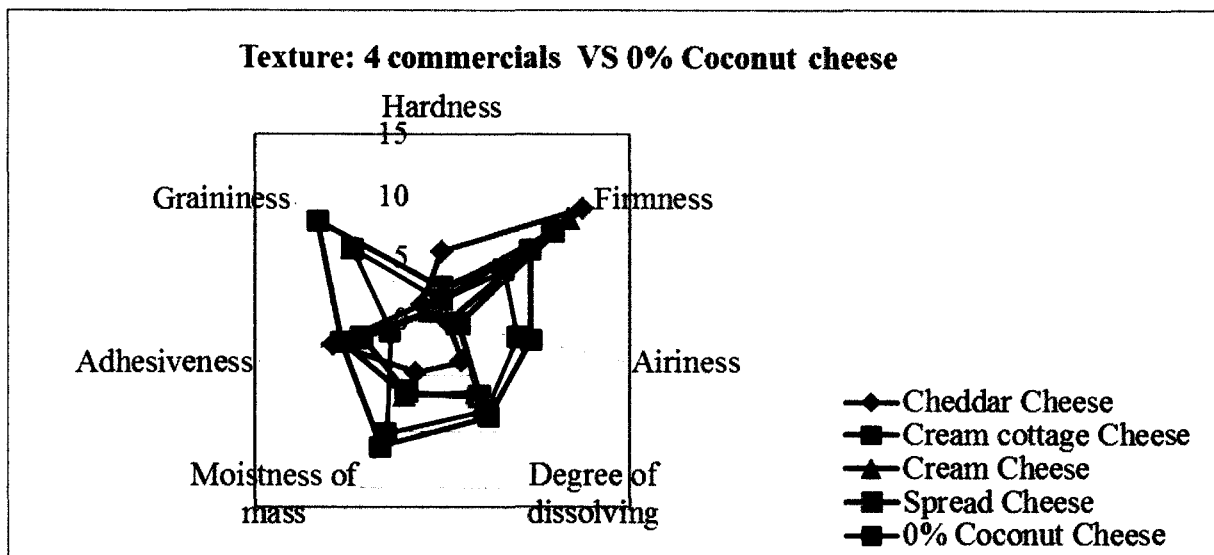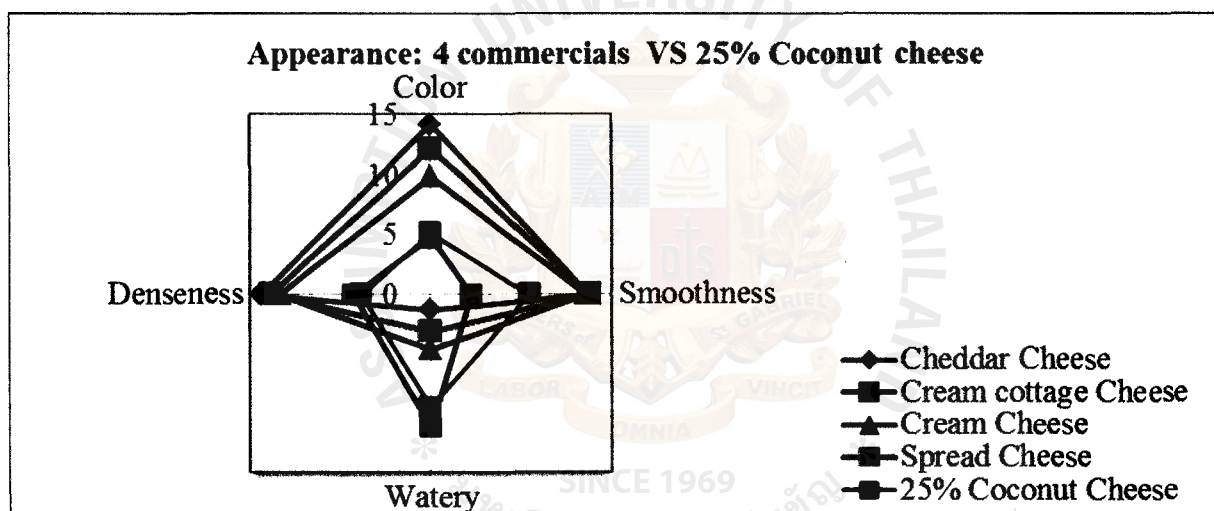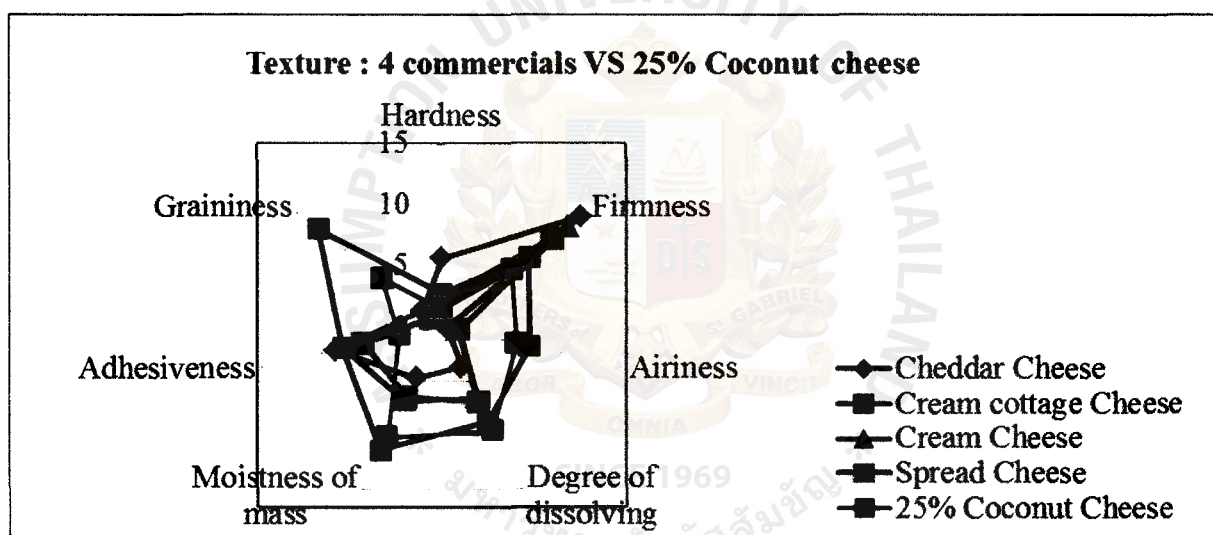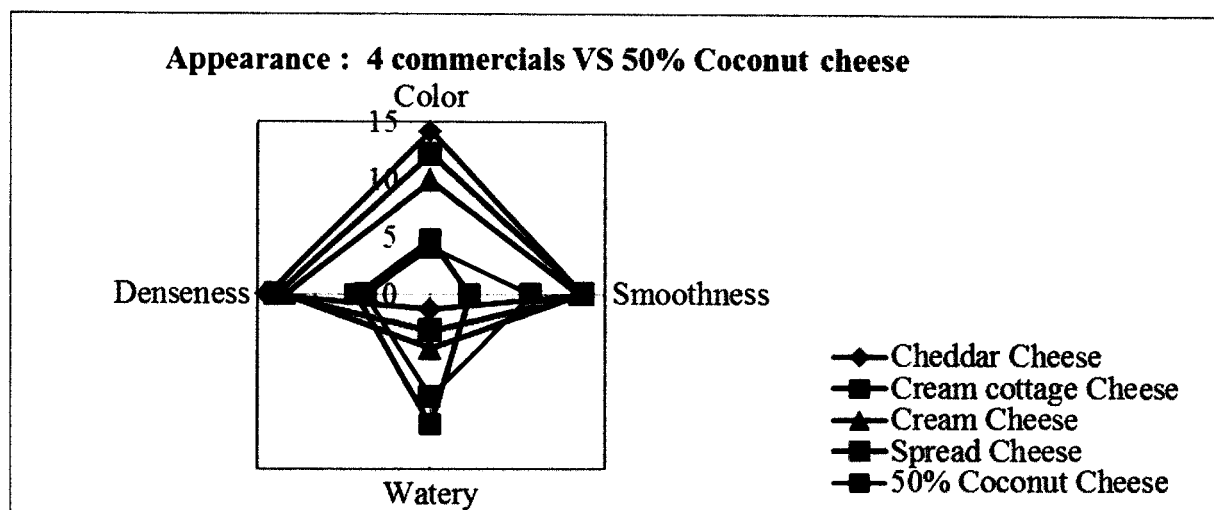Fig.22 Odor, Flavor and Texture profile of 4 commercials cheese and 75% coconut cheese

Texture : 4 commercials VS 75% Coconut cheese
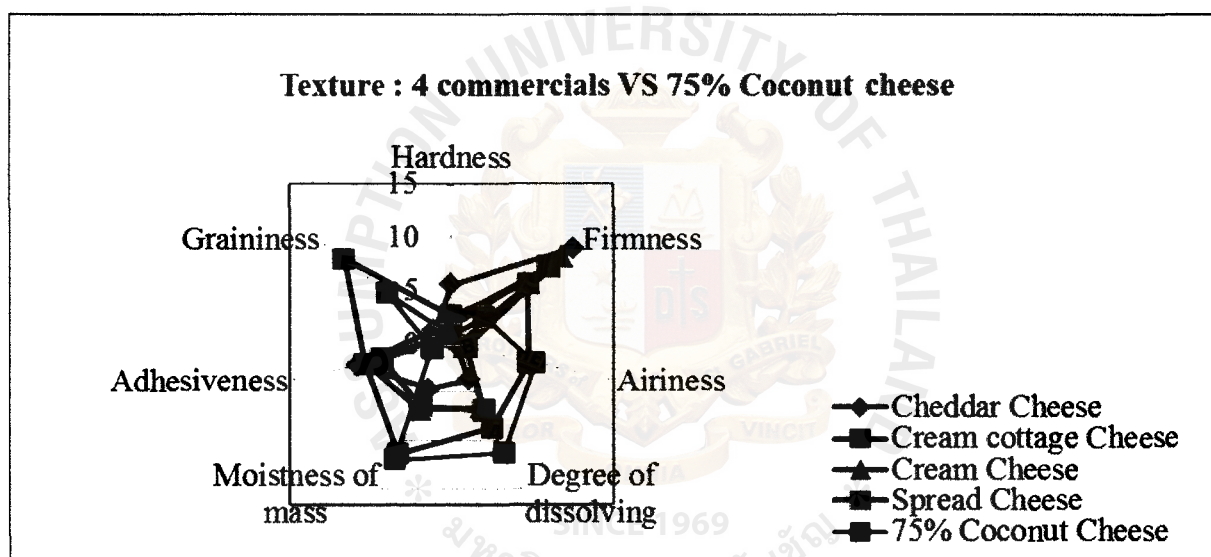
Fig.23 Texture profile of 4 commercials cheese and 75% coconut cheese

30

Result: Analysis of profiling sample in each attribute

Experimental plan: RCBD

DMRT's method

8 Rep.

Table 8: Statistic analysis: The liking score of cheese sample on different attributes

Trt	Attribute					
	1 Color	2 Smoothness	3 Watery	4 Denseness	5 Coconut milk	6 Milky
Sample 1	14.21 ± 0.87^a	13.17 ± 1.21^a	1.28 ± 1.69^d	14.14 ± 0.57^a	0.00 ± 0.00^e	3.82 ± 1.40^b
Sample 2	4.75 ± 1.93^e	3.34 ± 1.21^e	11.14 ± 2.24^{ab}	5.79 ± 2.21^b	0.53 ± 1.38^c	2.03 ± 1.39^c
Sample 3	2.64 ± 1.18^f	10.33 ± 2.03^b	11.75 ± 1.95^a	3.57 ± 1.13^c	6.27 ± 2.31^a	2.20 ± 1.83^c
Sample 4	9.89 ± 1.92^c	12.89 ± 1.08^a	4.50 ± 2.80^c	12.58 ± 0.93^a	0.64 ± 1.65^c	3.17 ± 1.89^{bc}
Sample 5	4.03 ± 1.52^e	8.69 ± 1.59^c	9.36 ± 2.63^b	5.61 ± 2.81^b	5.12 ± 2.75^a	2.19 ± 1.70^c
Sample 6	5.12 ± 1.68^e	8.21 ± 1.78^c	9.50 ± 2.49^b	5.76 ± 3.05^b	3.08 ± 1.98^b	2.25 ± 1.79^c
Sample 7	12.18 ± 1.28^b	13.25 ± 1.78^a	3.12 ± 1.82^{cd}	13.36 ± 0.91^a	0.33 ± 1.15^c	6.79 ± 1.96^a
Sample 8	7.08 ± 1.87^d	5.57 ± 1.48^d	11.04 ± 2.54^{ab}	4.25 ± 2.59^{bc}	0.60 ± 1.06^c	2.57 ± 1.79^{bc}

Remark: same letter in the same row means **no significant** different (P>0.05)

Trt	Attribute					
	7 Coconut milk	8 Milky	9 Fermented	10 Sour	11 Saltiness	12 Hardness
Sample 1	0.50 ± 1.87^c	4.83 ± 1.42^b	2.65 ± 1.73^c	3.77 ± 1.46^c	7.29 ± 1.20^b	5.50 ± 1.82^a
Sample 2	0.16 ± 0.44^c	2.69 ± 1.52^c	6.95 ± 1.93^a	8.18 ± 2.33^a	4.00 ± 1.37^c	2.65 ± 1.43^b
Sample 3	8.00 ± 2.32^a	3.41 ± 1.55^{bc}	1.21 ± 1.61^d	1.53 ± 1.23^d	10.38 ± 2.38^a	0.78 ± 1.37^d
Sample 4	0.26 ± 0.97^c	4.72 ± 1.74^b	5.04 ± 1.75^b	5.32 ± 2.81^b	4.39 ± 2.29^c	1.60 ± 1.23^{bcd}
Sample 5	7.16 ± 2.35^{ab}	3.91 ± 2.89^{bc}	1.53 ± 1.57^{cd}	1.58 ± 1.40^d	6.91 ± 2.68^b	1.20 ± 1.01^{cd}
Sample 6	5.95 ± 2.86^b	3.50 ± 2.45^{bc}	1.10 ± 1.50^d	2.10 ± 1.83^d	6.62 ± 2.10^b	1.42 ± 1.65^{bcd}
Sample 7	0.04 ± 0.14^c	8.41 ± 1.93^a	2.71 ± 1.58^c	3.62 ± 2.05^c	4.50 ± 1.72^c	2.25 ± 1.68^{bc}
Sample 8	1.32 ± 1.99^c	2.91 ± 1.78^c	1.14 ± 1.50^d	1.32 ± 1.34^d	7.54 ± 2.81^b	1.58 ± 1.02^{bcd}

Remark: same letter in the same row means **no significant** different (P>0.05)

Trt	Attribute					
	13 Firmness	14 Airiness	15 Degree of dissolving	16 Moistness of mass	17 Adhesiveness	18 Graininess
Sample 1	14.46±0.75^a	0.46±0.37^c	3.71±1.55^e	4.68±0.96^d	8.86±1.75^a	2.00±1.89^{de}
Sample 2	7.09±2.25^c	8.54±2.63^a	8.68±2.60^{bc}	11.39±1.71^{ab}	8.20±2.73^{ab}	12.73±0.99^a
Sample 3	3.95±2.80^d	7.90±2.82^{ab}	11.29±2.64^a	12.00±2.13^a	1.80±1.75^d	3.25±2.38^d
Sample 4	13.04±1.42^{ab}	1.32±0.75^c	6.57±1.69^d	6.78±1.27^c	8.12±1.05^{ab}	1.11±1.28^e
Sample 5	5.91±1.73^c	7.25±2.96^{ab}	9.58±1.94^{ab}	10.54±1.89^b	3.87±2.09^c	7.42±2.57^c
Sample 6	7.29±2.46^c	6.25±2.79^b	9.54±1.71^{ab}	10.12±2.08^b	3.45±2.04^c	6.19±1.73^c
Sample 7	12.27±1.37^b	1.39±0.63^c	6.96±1.97^{cd}	6.50±1.83^c	6.54±2.01^b	1.03±1.32^e
Sample 8	6.41±2.54^c	6.25±2.40^b	8.36±2.93^{bcd}	10.21±1.21^b	4.20±2.23^c	9.11±2.95^b

Remark: same letter in the same row means **no significant** different (P>0.05)

Correlation between objective and subjective measurement

Texture properties of coconut milk fresh cheese are shown in Table 7, and Figure 24-25. According from Figure 24, hardness of cheese made from 50% of coconut milk powder was significantly different from 0% and 25% of coconut milk powder. In the range of 25%-75% of coconut milk powder, texture and preference have slightly high correlative (R^2 = 0.7700). High firmness gave high hedonic score. The highest is at 25% of coconut milk powder in both of subjective and objective measurement. Coconut milk fresh cheese, made from 25% of coconut milk powder had the highest value of firmness whereas coconut milk fresh cheese, made from 0% of coconut milk powder had the lowest value of firmness (from the figure it was not presented). Hardness was measured by texture analyzer (Objective measurement) was compared with sensory analysis from panelist (Subjective measurement) the result found that both of them are correlated, 25% of coconut milk powder showed the highest value and gave the most preferred from panelists. Follow by, 50%, 75% and 0% respectively.

Samples made from 75% concentration of coconut milk powder had the lowest value of work of penetration. According to Table 7, the most preferred texture of coconut milk fresh cheese was 25%, panelists prefer 25% than 75% of coconut milk powder because it made them used more work to penetrate in their mouth while 75% was very watery and used very less force to chew in mouth. In the range of 25%-50% of coconut milk powder, texture and preference have high correlative (R^2 = 0.7700). High work of penetration gave high hedonic score. The

highest is at 75% of coconut milk powder in objective but subjective 25% of coconut milk powder gave the highest score, it's not exactly different from 75% of coconut milk powder. For firmness in Figure 25, sample made from 25% concentration of coconut milk powder showed the highest value of adhesiveness and this led the panelists to prefer it most. In the range of 25%-75% of coconut milk powder, texture and preference have high correlative (R^2 = 0.9074).
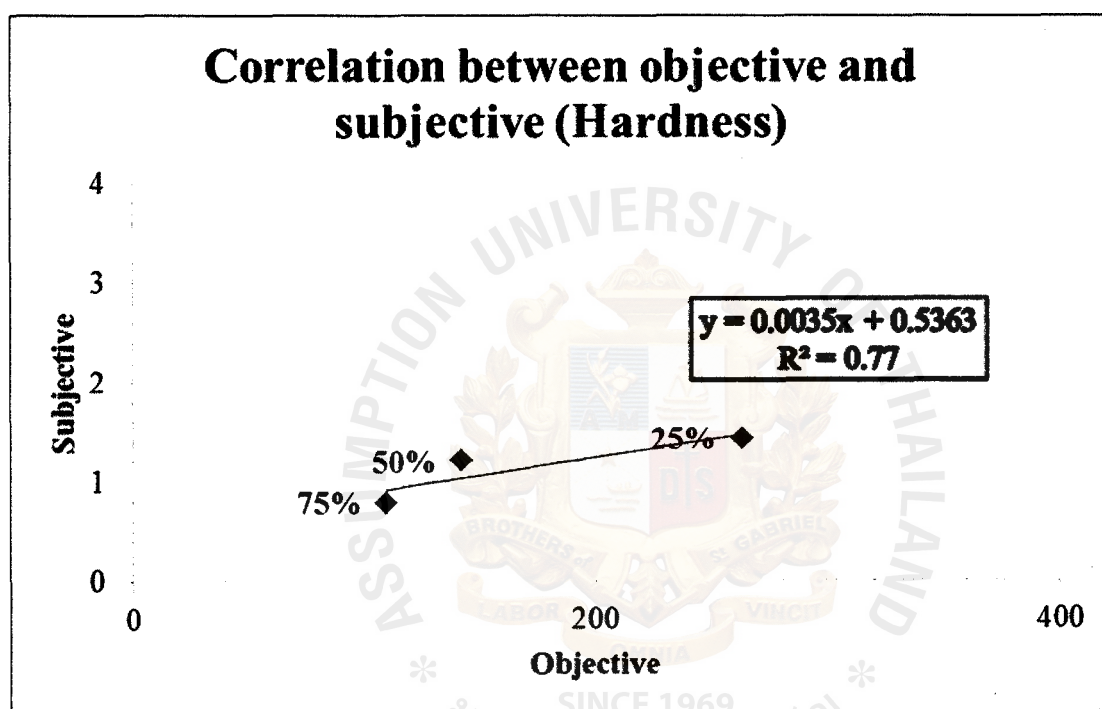
Fig. 24 Correlation between objective and subjective (Hardness)

Correlation between objective and subjective (Firmness)
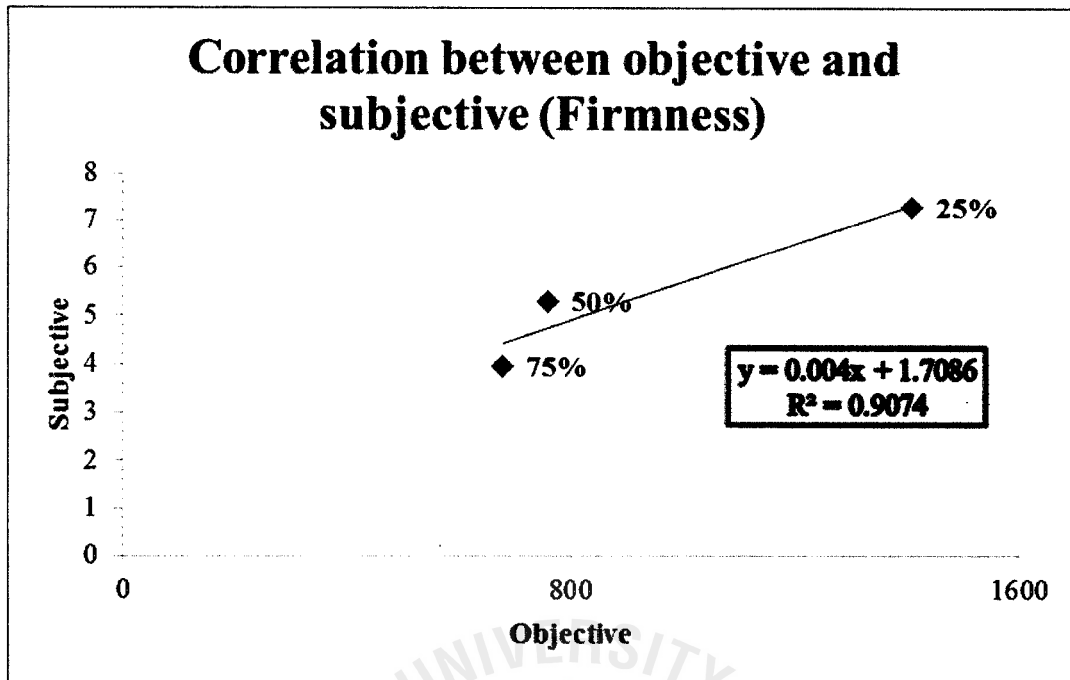
Fig.25 Correlation between objective and subjective (Firmness)

Part IV: Consumer test

Basic information of consumer's behavior on cheese in the market

From 100 consumers, 78% of consumers reported that they consumed cheese or cheese products in the last 6 months while some of them reported that they ever eat cheese in the last 6 months for 22%. For 29% of them consumed cheese or cheese products 2-3 times per week. 34% was cheddar cheese which is cheese that they most familiar and normally buy. 34% of consumers consumed cheese at free time. For food type that they consumed with cheese the most was pizza. 34% of consumers 2-3 pieces of cheese at one time. About 40% of consumers usually buy cheese or cheese products at hypermarket. And 30% of them spend 151-200 baht for cheese or cheese products in average per one time (Fig.26).

Have you ever consume cheese or cheese products in the last 6 months?

■ Yes ■ No
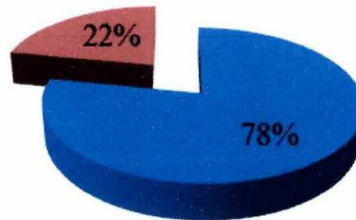
What Types of cheese do you familiar and normally buy?

■ Cheddar cheese ■ Ricotta cheese ■ Cottage cheese
■ Quark (fresh cheese) ■ Mozzarella cheese ■ Feta cheese
■ Cream cheese ■ Parmesan cheese ■ Others
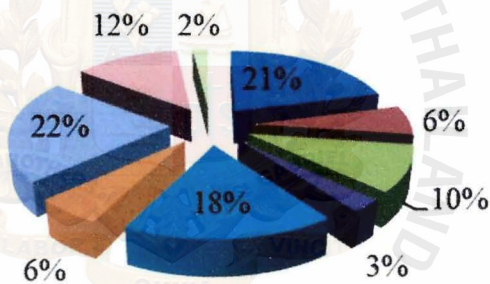
What are the important attributes that related to consume cheese?

■ Color ■ Smell ■ Flavor ■ Texture ■ Appearance ■ All
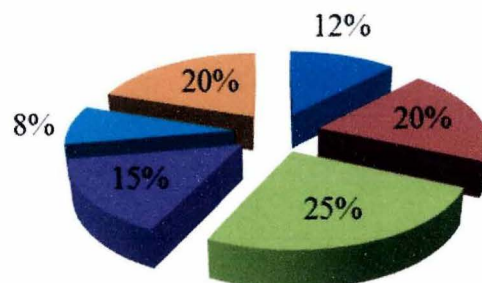
Which food type do you consume with cheese?

Legend: Bread, Cracker, Sausage, Pizza, Salad, Hamburger, Sandwich, Fruit, Wine, Others, None

15%, 12%, 12%, 18%, 8%, 14%, 13%, 3%, 4%, 1%
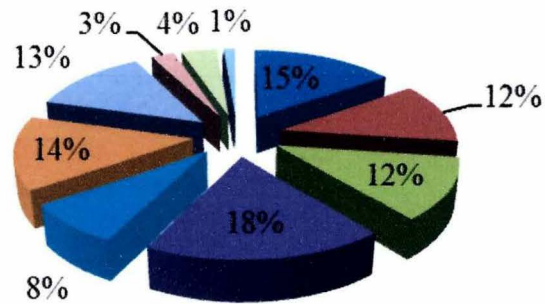
How often do you consume cheese?

Legend: Everyday, 2-3 times per week, Once a week, 2-3 times per month, Once a month, Less than once a month, None

4%, 20%, 14%, 26%, 18%, 18%

How many packs of cheese do you usually buy at one time?

- 1 pack
- 2-3 packs
- 4-5 packs
- Never buy it, just consume
- Others

14%
28%
58%

Where do you usually buy cheese?

- Convenience store
- Supermarket
- Hypermarket
- Others

21%
40%
39%

What are the problems that you usually experience by consuming cheese or cheese products?

- Strong smell
- Short shelf-life
- Melting
- Hard texture
- Soft texture
- Too salty

23%
28%
10%
9%
7%
23%

Fig.26 Pie chart of consumer's Basic information of consumer's behavior on cheese

Table 9: Liking score of 4 formulas of coconut milk fresh cheese on different attributes

Trt	Attribute					
	1	2	3	4	5	6
	Color (creamy-white color)	Appearance	Smelling-coconut aroma	Taste-coconut flavor	Taste	Overall liking
0%	6.56 ± 1.49^{b}	6.08 ± 1.42^{c}	5.47 ± 1.67^{b}	5.23 ± 1.55^{c}	5.44 ± 1.52^{c}	5.72 ± 1.36^{c}
25%	7.36 ± 1.36^{a}	$6.79\pm1.40a^{b}$	6.81 ± 1.45^{a}	6.88 ± 1.51^{a}	6.73 ± 1.39^{a}	7.19 ± 1.32^{a}
50%	7.51 ± 1.09^{a}	7.10 ± 1.31^{a}	6.95 ± 1.32^{a}	6.85 ± 1.35^{a}	6.79 ± 1.32^{a}	7.30 ± 1.19^{a}
75%	7.23 ± 1.38^{a}	6.69 ± 1.41^{b}	6.69 ± 1.70^{a}	6.06 ± 1.59^{b}	6.17 ± 1.60^{b}	6.25 ± 1.31^{b}

Remark: Same letter in the same row means **no significant different** ($P>0.05$)

Information of consumer's behavior on developed coconut milk fresh cheese

Consumer were asked to rate the coconut cheese, product acceptance, buying decision, the reason why they accept this product and reasonable price of this product. (Fig. 27). For product acceptance, 98% of panelists accept this product and 2% remaining panelists thought that they preferred cheese that has hard texture than fresh cheese. On factor affecting the buyer's decision, 50% of consumers thought. That they will surely buy this product, 49% may be buying and only 1% thought that they will not buy this product because they preferred the original cheese. For the reason why they wanted to buy this product, the coconut aroma was the most preference with 23%, followed by taste 26%, coconut flavor 24%, texture 10%. If this product sells in the market the most acceptable price of the 125g of the product was 151-200 bahts.

Product Acceptance

■ Accept ■ Not accept

2%

98%
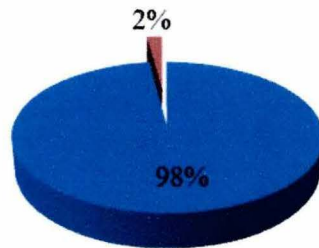
Buying Decision

■ Yes ■ Maybe ■ No

1%

49%

50%
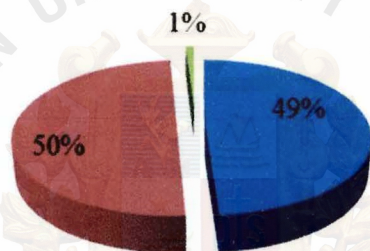
Attributes that pursuasive to buy the product

■ Color ■ Coconut flavor ■ Coconut aroma ■ Texture ■ Taste ■ All

9%   8%

26%

24%

23%

10%
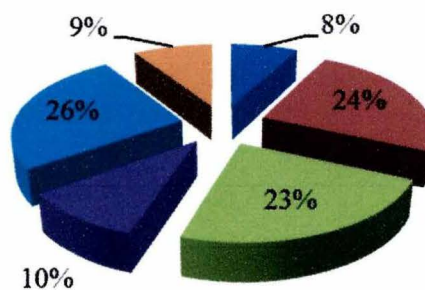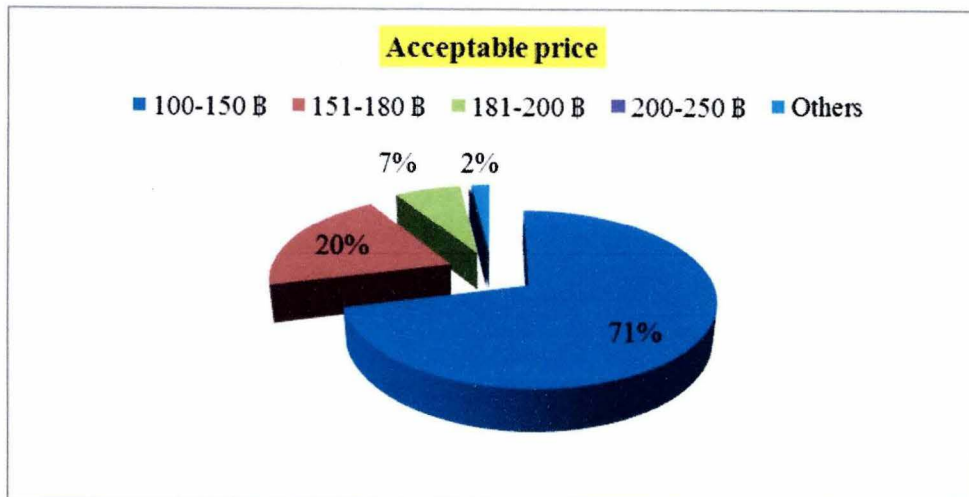
Fig.27 Pie chart of consumer's behavior on developed coconut milk fresh cheese

Demographic Information

Consumer test was conducted on 100 consumers; the ratio of gender of male was 61% and female was 39%. Most consumers who conducted this test were students at the age about 20-30. The highest nationality was Thai which is 78% of customer (Fig. 28).

Age

■ < 20 ■ 20 – 30 ■ 30 – 40 ■ > 40

6% 3%
23%
68%

Nationality

■ Thai ■ Asian ■ American ■ European ■ Others

3% 1%
18%
78%

Income

■ Under 5000 ฿ ■ 5000-10000 ฿ ■ 10000-5000 ฿ ■ Over 15000 ฿

13%
13%
43%
31%

41
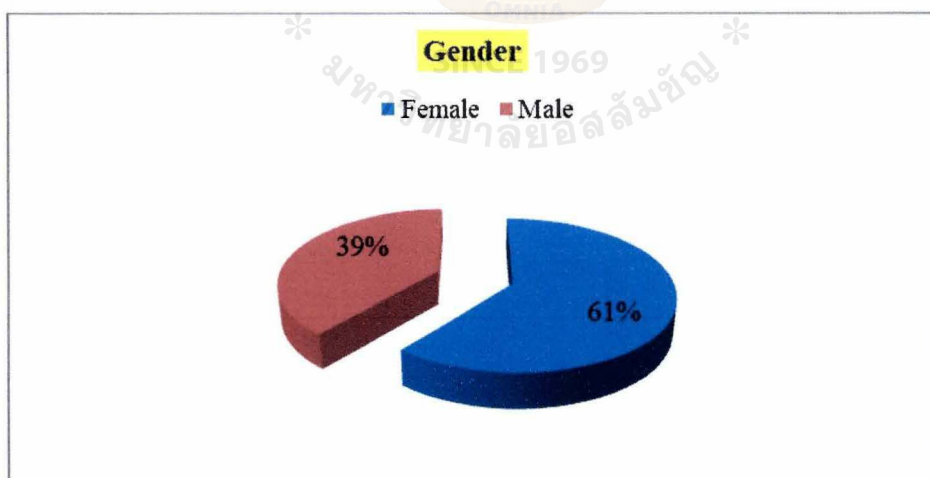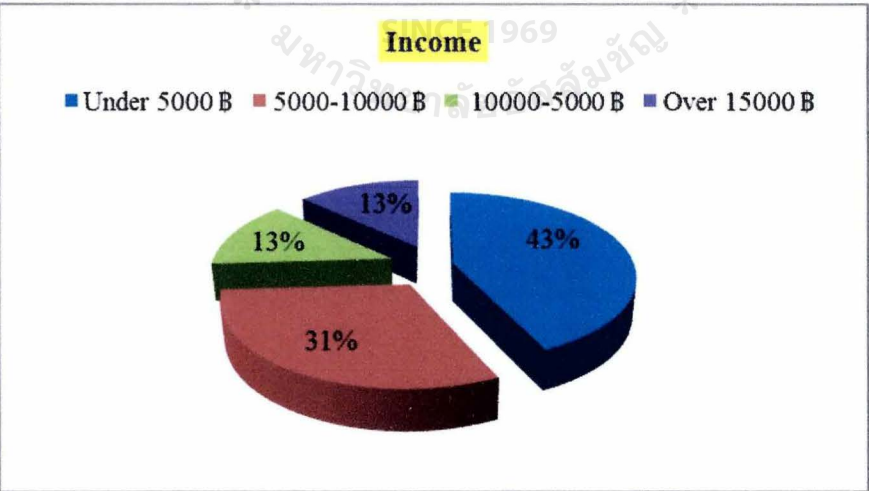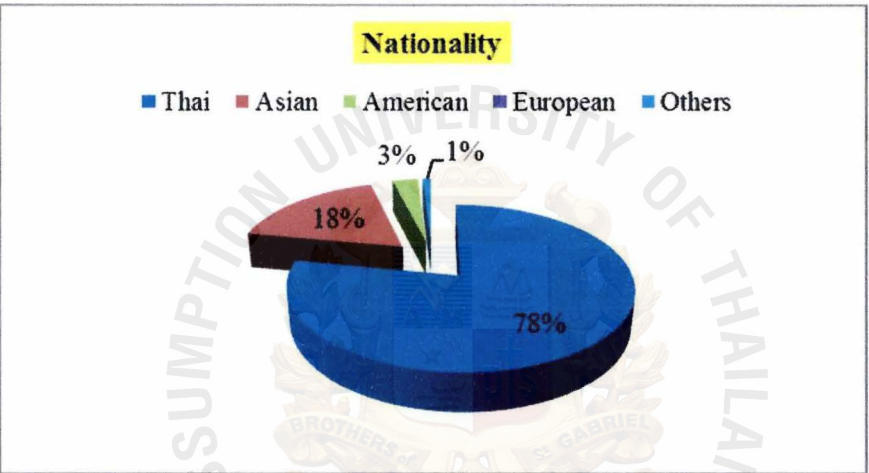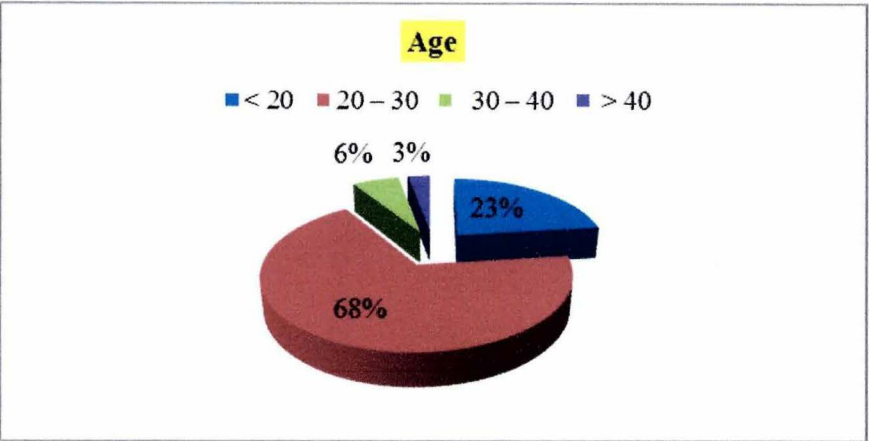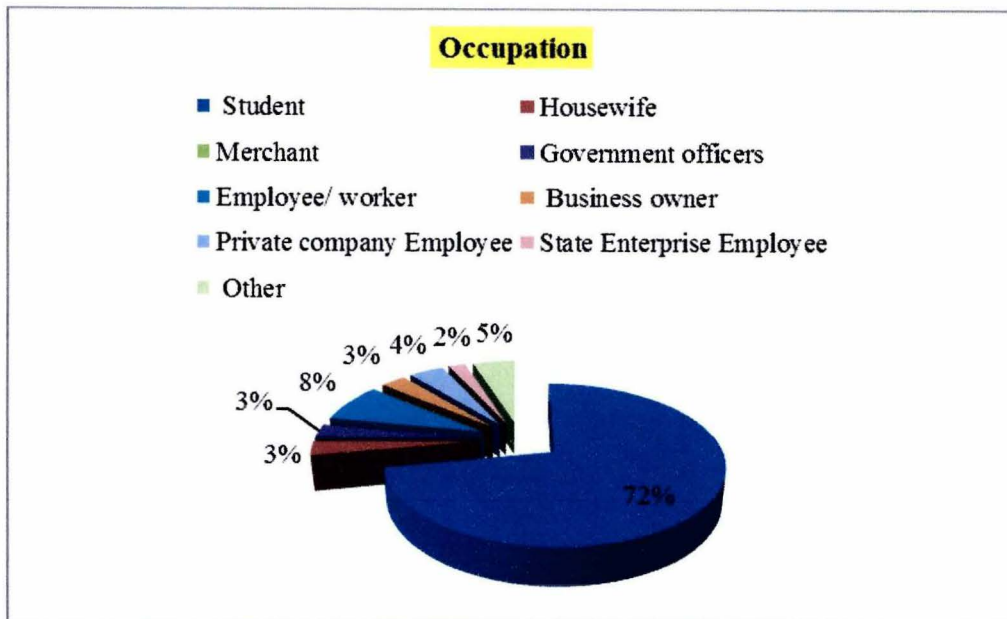
Fig.28 Pie chart Demographic information of consumers on developed coconut milk fresh cheese

5. CONCLUSION

1. Most preferred product of coconut milk fresh cheese developed in this experiment were 25% and 50% because of the texture and flavor attributes.

2. Each of developed coconut milk fresh cheese cloud be comparative to commercial cheese according to sensory profile as follows:

- 0% developed cheese → Cottage cheese

- 25% developed cheese → Cottage cheese+ Spread cheese

- 50% developed cheese → Cottage cheese

- 75% developed cheese → Cottage cheese (Yogurt-like)

3. As a result from sensory data obtained in this experiment, developed coconut milk fresh cheese in each formulas was significantly different in terms of coconut milk odor and flavor which compliance in cheese overall flavor and preferred by consumers (6.8 – 7.0 out of 9-point hedonic scale), which determine to like slightly to like moderately.

5. As the result from texture profile analysis (TPA) showed that higher coconut milk content in cheese lower hardness firmness of final products.

4. According to the texture comparison, developed coconut milk fresh cheese obviously shown different texture profile which could be classified as follows:

- Firm products (0% and 25%): less moist, grainy, adhesiveness and slightly airiness.
- Low firm product (50% and 75%): very moist, less firmness, easy to dissolve.
- In particularly, 75% coconut milk in cheese gave lowest firmness, high moistness of mass with high degree of dissolving as well as lowest in adhesiveness.

6. RECOMENDATION

1. Sensory profile of more commercial fresh cheese could be conducted and summarized in order to compare to the developed products. The preference mapping could be further developed in order to clearly inform sensory data for this type of product.

2. The semi-trained for descriptive analysis of product profiling, especially for color used in this experiment cover only 5 scales. The color scale comparing could be more specific differentiate color data.

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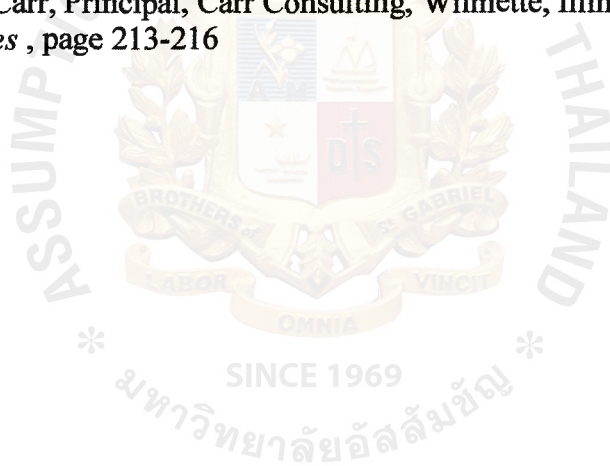
Appendix A

Statistic analysis in Market Survey and Sensory Evaluation

1. Effect of coconut milk on liking score of coconut milk fresh cheese

```
attach(Dataset)
Dataset
 RCBD<-aov(y~trt+rep,data=Dataset)
summary(RCBD)

library(agricolae)
 attach(Dataset)
Dataset
model<-aov(y~trt, data=Dataset)
duncan.test(model,"trt",alpha=0.05)
```

1.1 Color (creamy-white color)

```
> RCBD<-aov(y1~trt+rep,data=Dataset)
> summary(RCBD)
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
trt	3	52.73	17.5767	25.4933	1.055e-14 ***
rep	99	501.61	5.0668	7.3489	< 2.2e-16 ***
Residuals	297	204.77	0.6895		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Groups, Treatments and means

a	3	7.51
a	2	7.36
a	4	7.23
b	1	6.56

1.2 Appearance

```
> RCBD<-aov(y2~trt+rep,data=Dataset)
> summary(RCBD)
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
trt	3	54.77	18.2567	17.0655	2.983e-10 ***
rep	99	442.61	4.4708	4.1791	< 2.2e-16 ***
Residuals	297	317.73	1.0698		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Groups, Treatments and means

a	3	7.1
ab	2	6.79
b	4	6.69
c	1	6.08

1.3 Smelling – coconut aroma

```
> RCBD<-aov(y3~trt+rep,data=Dataset)
> summary(RCBD)
          Df Sum Sq Mean Sq F value    Pr(>F)
trt        3 139.40  46.467 29.2634 < 2.2e-16 ***
rep       99 470.84   4.756  2.9952 2.943e-13 ***
Residuals 297 471.60   1.588
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Groups, Treatments and means

a	3	6.95
a	2	6.81
a	4	6.69
b	1	5.47

1.4 Taste-coconut flavor

```
> RCBD<-aov(y4~trt+rep,data=Dataset)
> summary(RCBD)
          Df Sum Sq Mean Sq F value    Pr(>F)
trt        3 183.33  61.110 36.9896 < 2.2e-16 ***
rep       99 405.99   4.101  2.4823 1.613e-09 ***
Residuals 297 490.67   1.652
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Groups, Treatments and means

a	2	6.88
a	3	6.85
b	4	6.06
c	1	5.23

1.5 Texture

```
> RCBD<-aov(y5~trt+rep,data=Dataset)
> summary(RCBD)
          Df Sum Sq Mean Sq F value    Pr(>F)
trt        3 118.03  39.342 30.4510 < 2.2e-16 ***
rep       99 461.33   4.660  3.6067 < 2.2e-16 ***
Residuals 297 383.72   1.292
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Groups, Treatments and means

a	3	6.79
a	2	6.73
b	4	6.17
c	1	5.44

1.6 Overall liking

```
> RCBD<-aov(y6~trt+rep,data=Dataset)
> summary(RCBD)
          Df Sum Sq Mean Sq F value    Pr(>F)
trt        3 173.41  57.803 50.1112 < 2.2e-16 ***
rep       99 326.71   3.300  2.8609 2.817e-12 ***
```

Residuals 297 342.59 1.154

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Groups, Treatments and means
a   3   7.3
a   2   7.19
b   4   6.25
c   1   5.72

1. The liking score of 8 cheese samples on different attributes

```
attach(Dataset)
Dataset
 RCBD<-aov(y~trt+rep,data=Dataset)
summary(RCBD)

library(agricolae)
 attach(Dataset)
Dataset
model<-aov(y~trt, data=Dataset)
duncan.test(model,"trt",alpha=0.05)
```

1.7   Color

```
> RCBD<-aov(y1~trt+rep,data=Dataset)
> summary(RCBD)
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
trt	7	1691.51	241.645	117.2437	< 2.2e-16	***
rep	6	51.81	8.635	4.1898	0.0008888	***
Residuals	94	193.74	2.061			

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Groups, Treatments and means
a   1   14.21
b   7   12.18
c   4   9.893
d   8   7.083
e   6   5.125
e   2   4.75
e   5   4.036
f   3   2.643

1.8   Smoothness

```
> RCBD<-aov(y2~trt+rep,data=Dataset)
> summary(RCBD)
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
trt	7	1251.42	178.775	77.6486	<2e-16	***
rep	6	7.02	1.171	0.5085	0.8005	
Residuals	91	209.51	2.302			

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Groups, Treatments and means
a   7   13.25
a   1   13.17
a   4   12.89
b   3   10.33
c   5   8.692
c   6   8.214
d   8   5.577
e   2   3.346

1.9   Watery

```
> RCBD<-aov(y3~trt+rep,data=Dataset)
> summary(RCBD)
          Df  Sum Sq Mean Sq F value  Pr(>F)
trt        7 1492.37 213.196 45.4442 < 2e-16 ***
rep        6   64.42  10.737  2.2886 0.04305 *
Residuals 82  384.69   4.691
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Groups, Treatments and means
a   3   11.75
ab   2   11.14
ab   8   11.04
b   6   9.5
b   5   9.364
c   4   4.5
cd   7   3.125
d   1   1.286

1.10   Denseness

```
> RCBD<-aov(y4~trt+rep,data=Dataset)
> summary(RCBD)
          Df  Sum Sq Mean Sq F value   Pr(>F)
trt        7 1813.07 259.010 89.2451 < 2.2e-16 ***
rep        6  113.94  18.990  6.5431 9.273e-06 ***
Residuals 90  261.20   2.902
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Groups, Treatments and means
a   1   14.14
a   7   13.36
a   4   12.58
b   2   5.792
b   6   5.769
b   5   5.615
bc   8   4.25
c   3   3.577

1.5   Coconut milk

```
> RCBD<-aov(y5~trt+rep,data=Dataset)
> summary(RCBD)
          Df Sum Sq Mean Sq F value    Pr(>F)
```

50

```
trt         7 497.78  71.112 28.8127 < 2.2e-16 ***
rep         6  51.64   8.607  3.4872 0.003887 **
Residuals  87 214.72   2.468
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Groups, Treatments and means

```
a    3    6.273
a    5    5.125
b    6    3.083
c    4    0.6429
c    8    0.6071
c    2    0.5385
c    7    0.3333
c    1    0
```

1.6   Milky

```
> RCBD<-aov(y6~trt+rep,data=Dataset)
> summary(RCBD)
         Df  Sum Sq Mean Sq F value   Pr(>F)
trt       7 218.371 31.1959 10.6191 1.131e-09 ***
rep       6  20.849  3.4749  1.1829   0.3226
Residuals 90 264.395  2.9377
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Groups, Treatments and means

```
a    7    6.792
b    1    3.821
bc   4    3.179
bc   8    2.571
c    6    2.25
c    3    2.208
c    5    2.192
c    2    2.038
```

1.7   Coconut milk

```
> RCBD<-aov(y7~trt+rep,data=Dataset)
> summary(RCBD)
         Df  Sum Sq Mean Sq F value  Pr(>F)
trt       7 1008.31 144.044 44.3383 < 2e-16 ***
rep       6   36.01   6.002  1.8474 0.09932 .
Residuals 86  279.39   3.249
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Groups, Treatments and means

```
a    3    8
ab   5    7.167
b    6    5.958
c    8    1.321
c    1    0.5
c    4    0.2692
c    2    0.1667
```

c   7   0.04167

1.8   Milky

```
> RCBD<-aov(y8~trt+rep,data=Dataset)
> summary(RCBD)
          Df Sum Sq Mean Sq F value    Pr(>F)
trt        7 284.12  40.589 10.1279 4.544e-09 ***
rep        6  11.66   1.943  0.4849    0.8178
Residuals 82 328.62   4.008
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Groups, Treatments and means
a    7    8.417
b    1    4.833
b    4    4.727
bc   5    3.917
bc   6    3.5
bc   3    3.417
c    8    2.917
c    2    2.692
```

1.9   Fermented

```
> RCBD<-aov(y9~trt+rep,data=Dataset)
> summary(RCBD)
          Df Sum Sq Mean Sq F value    Pr(>F)
trt        7 383.87  54.838 20.4347 4.081e-16 ***
rep        6  15.89   2.649  0.9871    0.4389
Residuals 89 238.84   2.684
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Groups, Treatments and means
a    2    6.955
b    4    5.042
c    7    2.714
c    1    2.65
cd   5    1.536
d    3    1.214
d    8    1.143
d    6    1.107
```

1.10   Sour

```
> RCBD<-aov(y10~trt+rep,data=Dataset)
> summary(RCBD)
          Df Sum Sq Mean Sq F value  Pr(>F)
trt        7 476.73  68.105 21.5917 <2e-16 ***
rep        6  54.65   9.109  2.8879 0.01288 *
Residuals 88 277.57   3.154
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Groups, Treatments and means
a    2    8.182
```

b	4	5.321
c	1	3.773
c	7	3.625
d	6	2.107
d	5	1.583
d	3	1.536
d	8	1.321

1.11 Saltiness

```
> RCBD<-aov(y11~trt+rep,data=Dataset)
> summary(RCBD)
          Df Sum Sq Mean Sq F value    Pr(>F)
trt        7 405.66  57.951 20.3277 5.474e-16 ***
rep        6 138.21  23.036  8.0803 5.819e-07 ***
Residuals 88 250.87   2.851
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Groups, Treatments and means

a	3	10.38
b	8	7.542
b	1	7.292
b	5	6.917
b	6	6.625
c	7	4.5
c	4	4.393
c	2	4

1.12 Hardness

```
> RCBD<-aov(y12~trt+rep,data=Dataset)
> summary(RCBD)
          Df  Sum Sq Mean Sq F value    Pr(>F)
trt        7 212.519 30.3599 14.2183 1.984e-12 ***
rep        6   9.508  1.5847  0.7422    0.6171

Residuals 93 198.580  2.1353
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Groups, Treatments and means

a	1	5.5
b	2	2.654
bc	7	2.25
bcd	4	1.607
bcd	8	1.583
bcd	6	1.429
cd	5	1.208
d	3	0.7857

1.13 Firmness

```
> RCBD<-aov(y13~trt+rep,data=Dataset)
> summary(RCBD)
```

53

```
              Df  Sum Sq Mean Sq F value    Pr(>F)
trt          7 1225.69 175.099 58.2497 < 2.2e-16 ***
rep          6  103.36  17.227  5.7309 5.476e-05 ***
Residuals   79  237.47   3.006
---
```
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Groups, Treatments and means

```
a    1    14.46
ab   4    13.04
b    7    12.27
c    6    7.292
c    2    7.091
c    8    6.417
c    5    5.917
d    3    3.95
```

1.14   Airiness

```
> RCBD<-aov(y14~trt+rep,data=Dataset)
> summary(RCBD)
          Df Sum Sq Mean Sq F value Pr(>F)
trt        7 975.18 139.311 35.1577 < 2e-16 ***
rep        6  67.24  11.207  2.8282 0.01464 *
Residuals 86 340.77   3.962
---
```
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Groups, Treatments and means

```
a    2    8.545
ab   3    7.909
ab   5    7.25
b    6    6.25
b    8    6.25
c    7    1.393
c    4    1.321
c    1    0.4643
```

1.15   Degree of dissolving

```
> RCBD<-aov(y15~trt+rep,data=Dataset)
> summary(RCBD)
          Df Sum Sq Mean Sq F value  Pr(>F)

trt        7 517.04  73.864 18.0180 1.2e-14 ***
rep        6  75.95  12.659  3.0879 0.00862 **
Residuals 88 360.75   4.099
---
```
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Groups, Treatments and means

```
a    3    11.29
ab   5    9.583
ab   6    9.542
bc   2    8.682
bcd  8    8.364
```

cd   7   6.964
d   4   6.571
e   1   3.714

1.16   Moistness of mass

```
> RCBD<-aov(y16~trt+rep,data=Dataset)
> summary(RCBD)
        Df Sum Sq Mean Sq F value  Pr(>F)
trt      7 623.45  89.064  33.163 < 2e-16 ***
rep      6  34.40   5.734   2.135 0.05687 .
Residuals 90 241.70   2.686
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Groups, Treatments and means
a   3   12
ab   2   11.39
b   5   10.54
b   8   10.21
b   6   10.12
c   4   6.786
c   7   6.5
d   1   4.682

1.17   Adhesiveness

```
> RCBD<-aov(y17~trt+rep,data=Dataset)
> summary(RCBD)
        Df Sum Sq Mean Sq F value    Pr(>F)
trt      7 586.77  83.824 24.2121 < 2.2e-16 ***
rep      6  70.47  11.744  3.3923  0.004871 **
Residuals 82 283.89   3.462
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```
Groups, Treatments and means
a   1   8.864
ab   2   8.208
ab   4   8.125
b   7   6.542
c   8   4.208
c   5   3.875
c   6   3.458
d   3   1.808

1.18   Graininess

```
> RCBD<-aov(y18~trt+rep,data=Dataset)
> summary(RCBD)
        Df  Sum Sq Mean Sq F value Pr(>F)
trt      7 1638.84 234.121 64.1924 < 2e-16 ***
rep      6   51.04   8.506  2.3323 0.03875 *
Residuals 89  324.60   3.647
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Groups, Treatments and means

a	2	12.73
b	8	9.115
c	5	7.423
c	6	6.192
d	3	3.25
de	1	2
e	4	1.115
e	7	1.036

Appendix B:

Questionnaire for Consumer's acceptance survey
Consumers' Acceptance Survey
"Fresh Coconut Milk Cheese"

This survey is a part of a special project under a title **"Development of fresh coconut milk cheese"** for fulfillment of my Bachelor's degree. This survey will do in order to study the consumer's behaviors, attitudes, and needs toward a development of fresh coconut milk cheese. Please kindly complete the questions by checking √ in the provided spaces.

แบบสอบถามนี้เป็นส่วนหนึ่งของวิชาโครงงานพิเศษ คณะเทคโนโลยีชีวภาพ สาขาวิทยาศาสตร์การอาหาร มหาวิทยาลัยอัสสัมชัญภายใต้หัวข้อ **"การพัฒนาผลิตภัณฑ์ชีสจากกะทิสด"**. โดยแบบสอบถามชุดนี้จัดทำขึ้นเพื่อศึกษา พฤติกรรมการบริโภค, ทัศนคติ, และความต้องการของผู้บริโภคที่มีต่อการพัฒนาผลิตภัณฑ์ชีสจากกะทิสด กรุณาตอบ แบบสอบถามด้านล่างนี้เพื่อเป็นข้อมูลสำคัญสำหรับผู้วิจัยเพื่อใช้เป็นกรณีศึกษาต่อไป

Part 1: Basic information of consumer's behavior on cheese in the market
ส่วนที่ 1 ข้อมูลทั่วไปเกี่ยวกับพฤติกรรมการบริโภคผลิตภัณฑ์ชีสในท้องตลาด

1. Have you ever consume cheese or cheese products (pizza, cheese hamburger, sausage cheese stick, etc.) **in the last 6 months**? คุณเคยทานชีสหรือผลิตภัณฑ์ที่ทำจากชีสหรือไม่ (พิชซ่า, ชีสเบอเกอร์, ไส้กรอกชีส, เป็นต้น) **ภายในระยะเวลา 6 เดือนที่ผ่านมา**

☐ Yes (เคย)   ☐ No (ไม่เคย)

2. What kinds of cheese do you familiar and normally buy? (Please choose **only three** types) ชีสประเภทใดที่คุณคุ้นเคยและซื้อบริโภคเป็นประจำ (**กรุณาเลือกมา 3ข้อ**)

☐ Cheddar cheese (เนยแข็งเชดดาร์)   ☐ Ricotta cheese (เนยแข็งริคอตต้า)

☐ Cottage cheese (คอตเทจชีส)   ☐ Quark (fresh cheese) (ชีสสดควากค์)

☐ Mozzarella (เนยแข็งมอสซาเรลล่า)   ☐ Feta cheese (เนยแข็งฟีต้า)

☐ Cream cheese (ครีมชีส)   ☐ Parmesan cheese (เนยแข็งพาร์เมซาน)

☐ Others (please specify) (อื่นๆ โปรดระบุ) _____

3. What are the important attributes that related to consume cheese? (Can choose more than one) คุณลักษณะใดที่คุณคิดว่าสำคัญในการบริโภคชีส (ตอบได้มากกว่า 1 ข้อ)

☐ Color (สี)   ☐ Smell (กลิ่น)

☐ Flavor (รสชาติ)   ☐Texture (เนื้อสัมผัส)

☐Appearance (ลักษณะปรากฏ)   ☐All (ทั้งหมด)

☐ Others (please specify) (อื่นๆ โปรดระบุ) _____

4. Which food type do you consume with cheese? (Can choose more than one)
อาหารประเภทใดที่คุณมักรับประทานพร้อมกับชีส (ตอบได้มากกว่า 1 ข้อ)

☐ Bread (ขนมปัง)   ☐ Cracker (แครกเกอร์)   ☐ Sausage (ไส้กรอก)   ☐ Pizza (พิซซ่า)

☐ Salad (สลัด)   ☐ Hamburger (แฮมเบอเกอร์)   ☐ Sandwich (แซนด์วิช)   ☐ Fruit (ผลไม้)

☐ Wine (ไวน์)   ☐ Others (please specify) (อื่นๆ โปรดระบุ) _____

☐ None (ไม่มี-ทานชีสอย่างเดียว)_____

5. How often do you consume cheese?
คุณบริโภคชีสบ่อยแค่ไหน

☐ Everyday (ทุกวัน)   ☐ 2-3 times per week (2-3 ครั้งต่อสัปดาห์)

☐ Once a week (1 ครั้งต่อสัปดาห์)   ☐ 2-3 times per month (2-3ครั้งต่อเดือน)

☐ Once a month (1 ครั้งต่อเดือน)   ☐ Less than once a month (น้อยกว่า1 ครั้งต่อเดือน)

☐ None, consume only cheese products (Skip to Question no.9) (ไม่เลย- บริโภคเฉพาะผลิตภัณฑ์ที่ทำ
จากชีสเท่านั้น) ข้ามไป คำถามข้อที่ 9

6. How many packs of cheese do you usually buy at one time?
ปกติแล้วคุณซื้อชีสกี่แพคต่อครั้ง

☐ One pack (1 แพค)   ☐ 2-3 packs (2-3 แพค)   ☐ 4-5 packs (4-5 แพค)

☐ I never buy it, just consume (Skip to **Part 2**) (ไม่เคยซื้อ) ข้ามไป ส่วนที่ 2

☐ Others (please specify) (อื่นๆ โปรดระบุ) _____

7. Where do you usually buy cheese? (Can choose more than one)
ปกติแล้วคุณซื้อชีสที่ไหน (ตอบได้มากกว่า 1 ข้อ)

☐ Convenience store (e.g. 7-11, Family Mart) (ร้านสะดวกซื้อ เช่น เซเว่น, แฟมิลี่มาร์ท)

☐ Supermarket (e.g. Tops Supermarket, Home Fresh Mart) (ซุปเปอร์มาร์เก็ต เช่น ท็อป, โฮร์มเฟ
ชมาร์ท)

☐ Hypermarket (e.g. Tesco Lotus, Big-C, Food land, Villa market) (ไฮเปอร์มาร์เก็ต เช่น เทสโกโลตัส
, บิ๊กซี, ฟู้ดแลนด์, วิลล่ามาร์เกต)

☐ Others (please specify) (อื่นๆ โปรดระบุ) _____

8. How much do you spend for cheese product in average per one time purchasing?
โดยเฉลี่ยแล้วคุณจ่ายเงินจำนวนเท่าใดในการซื้อผลิตภัณฑ์ชีสต่อครั้ง

_____ Baht (บาท)

9.What are the problems that you usually experience by consuming cheese or cheese products? (Can choose more than one)

ปัญหาใดที่คุณมักพบบ่อยๆจากการบริโภคชีสหรือผลิตภัณฑ์ที่ทำจากชีส (ตอบได้มากกว่า 1 ข้อ)

☐ Strong smell (กลิ่นฉุน) ☐ Short shelf-life (ระยะเวลาในการเก็บสั้น)

☐ Melting (การละลาย) ☐ Hard texture (เนื้อสัมผัสแข็ง)

☐ Soft texture (เนื้อสัมผัสเละ) ☐ Too salty (รสเค็มเกินไป)

☐ Others (please specify) (อื่นๆ โปรดระบุ) _____

Part 2: Information of consumer's behavior on Fresh coconut milk cheese
ส่วนที่2 : ข้อมูลเกี่ยวกับพฤติกรรมการบริโภคของชีสจากกะทิสด

Instructions: Please taste this Fresh coconut milk cheese and answer the following questions.

คำแนะนำ: กรุณาทดสอบตัวอย่างชีสจากกะทิสดและตอบแบบสอบถามข้างล่าง

Objectives of this project are to develop new product for cheese, coconut milk-based cheese and also increase value of coconut milk which has a lot in Thailand.

(จุดประสงค์ของโครงการนี้คือต้องการพัฒนาผลิตภัณฑ์ชีสสดโดยใช้กะทิและเพื่อเป็นการเพิ่มมูลค่าของกะทิของไทย)

2.1. How would you rate this product using 9-point Hedonic scale
คุณจะให้คะแนนเท่าใดสำหรับผลิตภัณฑ์ตัวอย่างนี้โดยใช้การทดสอบความชอบแบบ 9 ระดับ

Instruction: 1. Please **rinse** your mouth with water before testing each sample.
2. Taste samples and evaluate each sample by rating the score in each attribute according to 9-point hedonic scale.

คำแนะนำ : 1.กรุณาล้างปากด้วยน้ำเปล่าก่อนทำการทดสอบผลิตภัณฑ์ในแต่ละตัวอย่าง

2.ทดสอบผลิตภัณฑ์**แต่ละตัวอย่าง**และทำแบบประเมินโดยให้คะแนนในแต่ละคุณลักษณะที่ระบุโดย

ใช้การทดสอบความชอบแบบ 9 ระดับ

Score for rating:
เกณฑ์การให้คะแนน

1 = dislike extremely (ไม่ชอบมากที่สุด) 6 = like slightly (ชอบเล็กน้อย)

2 = dislike very much (ไม่ชอบมาก) 7 = like moderately (ชอบปานกลาง)

3 = dislike moderately (ไม่ชอบปานกลาง) 8 = like very much (ชอบมาก)

4 = dislike slightly (ไม่ชอบเล็กน้อย) 9 = like extremely (ชอบมากที่สุด)

5 = neither like nor dislike (เฉยๆ)

Attribute (คุณลักษณะ)	142	314	565	937
Color (Creamy-white color) (สี-สีขาวครีม)				
Appearance (ลักษณะปรากฏ)				
Smelling-Coconut aroma (กลิ่นกะทิ-จากการดม)				
Taste-Coconut flavor (กลิ่นรสกะทิ-ในปาก)				
Texture (เนื้อสัมผัส)				
Overall liking (ความชอบโดยรวม)				

**Which sample would you like the most? (Please circle ONLY one sample)
กรุณาวงกลมล้อมรอบผลิตภัณฑ์ตัวอย่างที่คุณชอบมากที่สุด (กรุณาเลือก1 ตัวอย่างเท่านั้น)

142   **314**   **565**   **937**

Comment (ข้อเสนอแนะ)

....
....
....
....
....

10. From the Question 2.1, do you accept this product?
จากคำถามข้อ 2.1 คุณยอมรับผลิตภัณฑ์นี้หรือไม่

☐ Accept (ยอมรับ)

☐ Not accept, why (Please specify) (ไม่ยอมรับ เพราะ)_____

11. Will you buy this product if it sells in the market with the reasonable price?
คุณมีความต้องการที่จะซื้อผลิตภัณฑ์นี้หรือไม่ถ้ามีจำหน่ายในท้องตลาดในราคาที่เหมาะสม

☐ Yes (ซื้อ)

☐ Maybe (อาจจะซื้อ)

☐ No, because (ไม่ซื้อ เพราะ) _____

12. Which following characteristic is/are the reason why you accept this product?
คุณลักษณะใดที่คุณจะใช้เป็นเกณฑ์การตัดสินใจเลือกซื้อผลิตภัณฑ์นี้

☐ Color (สี) ☐ Coconut flavor (กลิ่นรสกะทิ)

☐ Coconut aroma (smell) (กลิ่นกะทิ) ☐ Texture (เนื้อสัมผัส)

☐ Taste (รสชาติ) ☐ All (ทั้งหมด)

☐ Others (please specify) (อื่นๆ โปรดระบุ) _____

13. How much will be the acceptable price for the 125 grams of the product?
ราคาเท่าไหร่ที่คุณคิดว่าเป็นราคาที่เหมาะสมสำหรับผลิตภัณฑ์ขนาด 125 กรัม

☐ 100-150 Baht (100-150 บาท) ☐ 151-180 Baht (151-180 บาท)

☐ 181-200 Baht (181-200 บาท) ☐ 200-250 Baht (200-250 บาท)

☐ Others (please specify) (อื่นๆ โปรดระบุ) _____

Comment (ข้อเสนอแนะ)

....
....
....

Part3: Demographic Information
ส่วนที่ 3 : ลักษณะทั่วไปของผู้ตอบแบบสอบถาม

14. Gender (เพศ)

☐ Female (หญิง) ☐ Male (ชาย)

15. Age (อายุ)

☐< 20 years (ต่ำกว่า20 ปี) ☐ 20 – 30 years (20-30 ปี)

☐ 30 – 40 years (30-40 ปี) ☐> 40 years (สูงกว่า40 ปีขึ้นไป)

16. Nationality (เชื้อชาติ/สัญชาติ)

☐Thai (ไทย) ☐Asian (เอเชีย)

☐American (อเมริกัน) ☐European (ยุโรป)

☐Others (อื่นๆ) _____

17. Highest Education (การศึกษาสูงสุดที่ได้รับ)

☐ Under High school (ต่ำกว่ามัธยมปลาย)

☐ High school (มัธยมปลาย)

☐Vocational/technical school (ปวช./ ปวส.)

☐ Bachelor's degree (ปริญญาตรี)

☐ Higher than Bachelor's degree (สูงกว่าปริญญาตรี)

18. Income (รายได้ต่อเดือน)

☐Under 5,000 ฿ (ต่ำกว่า5,000 บาท)

☐5000-10000 ฿ (5,000 – 10,000 บาท)

☐10000-15000฿ (10,000 – 15,000 บาท)

☐Over 15000 ฿ (สูงกว่า15,000 บาทขึ้นไป)

19. Career (อาชีพ)

☐Student (นิสิต/ นักศึกษา)　　　　☐Housewife (แม่บ้าน)

☐Merchant (แม่ค้า/ พ่อค้า)　　　　☐Government officers (ข้าราชการ)

☐Employee/ worker (ลูกจ้าง)　　　☐Business owner (เจ้าของกิจการ)

☐Private company Employee (พนักงานบริษัทเอกชน)

☐State Enterprise Employee (พนักงานรัฐวิสาหกิจ)

☐ Others (อื่นๆ) ………………………

Thank you for your co-operation
ขอขอบพระคุณอย่างสูง

Appendix C:
Criteria used for product profiling analysis (Semi-trained)

Color Comparing Attribute

	0		3
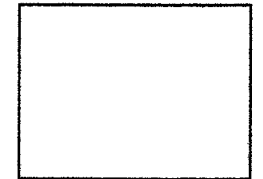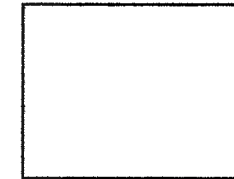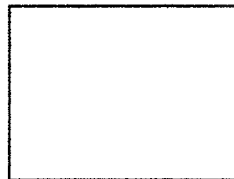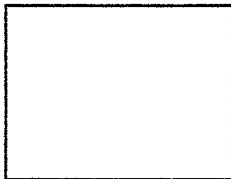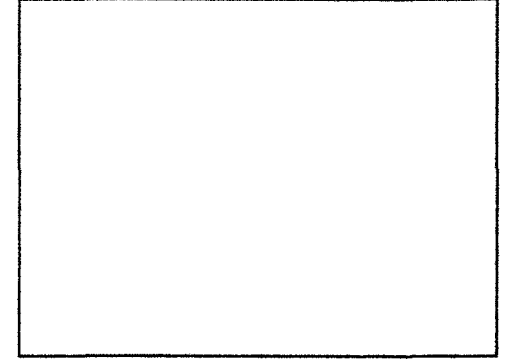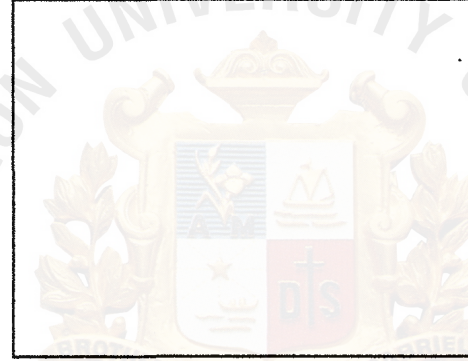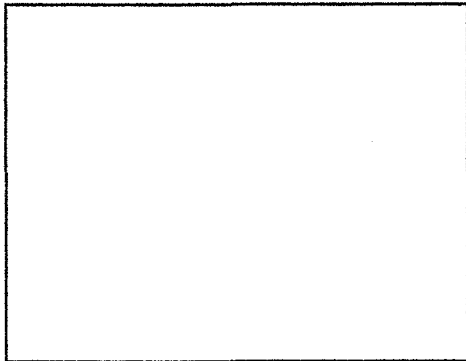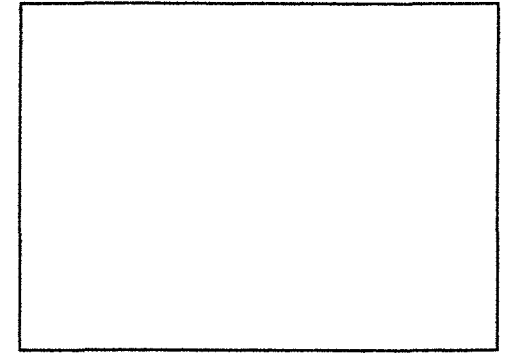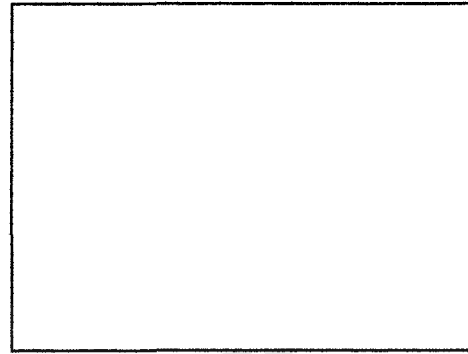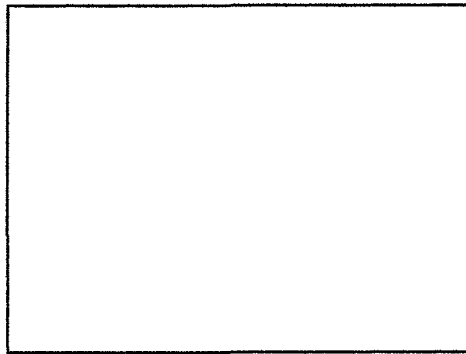
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G=255
B=255

RGB: R=255
G=255
B=221

	6		9

RGB: R=255
G=255
B=211

RGB: R=255
G=255
B=197

	12		15

RGB: R=255
G=255
B=179

RGB: R=255
G=255
B=159

Cheese Product Attribute Ballot

64

Panelist: _____   Sample code/no._____   Date: _____

-Please make the ( ) surround the attribute score that match with the sample product.

Appearance

Color   0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15

Smoothness   0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 **14** 14.5 15

Watery   0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15

Denseness   0 0.5 **1** 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 **13** 13.5 14 14.5 15

Odor

Coconut milk 0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15

Milky   0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15

Flavor

Coconut milk 0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15

Milky   0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15

Fermented   0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15

Taste

Sour   0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 **5** 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15

Saltiness   0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12 12.5 13 13.5 14 14.5 15

Texture and Mouth feel

	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15
Hardness	0	0.5	**1**	1.5	2	2.5	3	3.5	4	**4.5**	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15
Firmness	0	0.5	1	1.5	2	2.5	**3**	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	**14**	14.5	15
Airiness	0	0.5	**1**	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	**13**	13.5	14	14.5	15
Degree of dissolving	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	**6**	6.5	7	7.5	8	8.5	9	9.5	10	10.5	**11**	11.5	12	12.5	13	13.5	14	14.5	15
Moistness of mass	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	**5**	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15
Adhesiveness	0	0.5	1	1.5	2	**2.5**	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	**8**	8.5	9	9.5	10	10.5	11	11.5	12	12.5	**13**	13.5	14	14.5	15
Graininess	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15

Attributes		Definition	Measurement- Product criteria			Ref.
			Observed by	Criteria		
APPEA-RANCE	Color	Yellowish white color of cheese product	visual check with the color comparing paper	White - Yellow	visual	Color paper (yellowish white)
	Smoothness	Lack of bumbs, cracks or sandiness on the sample surface	Visual check with different aspects, evaluate the degree to which the sample appears rough and/or sandy as opposed to smooth and free of lumps/particulates.	Coarse - smooth	visual	Hilland sour cream (14)
	Watery	The degree of water release	Amount of the water release by compressing with two fingers	Low-High	manual	
	Denseness	The degree of compactness of the sample	Rotate product between fingers, evaluate the degree at which the sample compact	Airy - dense	manual	-whipped cream (1.0) -cream cheese(13.0)
ODOR	Coconut milk	Coconut milk odor of sample	Smell the sample, evaluate the degree of order intense	Low-High	smell	Rehydrated coconut milks (ratio) Rehydrated coconut milks (dilute)
	Milky	Milky odor of sample	Smell the sample, evaluate the degree of order intense	Low-High	smell	-American cheese –Kraft (3) Processed milk (from pack) Processed milk (dilute)
FLAVOR	Coconut milk	Coconut milk flavor of sample	Taste the sample and evaluate the degree of flavor intense	Low-High	Oral	-Rehydrated coconut milks (ratio) -Rehydrated coconut milks (dilute)
	Milky	Dairy sweet aromatics found in products made from cow's milk, excluding any butter fat aromatics	Taste the sample and evaluate the degree of flavor intense	Low-High	Oral	Processed milk (from pack) Processed milk (dilute)
	Fermented	A combination of aromatics that are sweet, slightly brown aromatics and somewhat sour and can have a cheesy notes.	Taste the sample and evaluate the degree of flavor intense	Low-High	Oral	
TASTE	Sour	Sour taste	Compress sample between tongue and palate, evaluate sample	Low-High	Oral	-American cheese –Kraft (5)=sour
	Saltiness	Salty taste	Compress sample between tongue and palate, evaluate sample	Low-High	Oral	-American cheese –Kraft (7)=salt

Attributes		Definition	Measurement- Product criteria			Ref.
			Observed by	Criteria		
TEXTURE	Hardness/Firmness (First bite)	The force required to bite completely through the sample placed between the front teeth.	Bite down on sample with even pressure using front teeth, evaluate the force required to bite through the sample	Soft-Hard	Oral	-cream cheese(1.0) -cheese (4.5)
	Firmness (first compression)	Force requires to compress sample to palate	Compress sample, evaluate force required to bite through the sample using molar teeth	Not firm-Firm	Oral	-whipped cream (3.0) -cream cheese (14.0)
	Airiness (first compression)	Amount of air expressed as material is compressed between tongue and palate	Compress sample between tongue and palate, evaluate the degree of compactness of sample	Not airy- Extremely airy	Oral	-whipped cream (13.0) -cream cheese(1.0)
	Degree of dissolving	Amount of sample that dissolves rather than remains as a semi-solid	Compress sample between tongue and palate, evaluate the amount of dissolves rather than remains as semi-solid, after 6 manipulations with the tongue. Use 1/2 teaspoon of product	Low-High	oral	'Philadelphia Fat Free Brick Cream Cheese= 6.0 'Land O' Lakes Sour Cream = 11.0
	Moistness of mass (breakdown)	Amount of moistness/oiliness/ Wetness perceived in the mass	Compress sample between tongue and palate, move tongue across palate 3-5 times, evaluate moisture release	Dry- Wet	oral	'Kraft Mild Cheddar Cheese=5.0(1/2" cube)
	Adhesiveness	Degree to which sample sticks to mouth surfaces or teeth	-Bite through sample once with molars, evaluate oral cavity the degree at which sample sticks to the mouth surfaces during mastication. Judged at its highest intensity	Not sticky-Very sticky	oral	Jif Creamy Peanut Butter= 13.0 Kraft Part Skim Mozzarella Cheese = 2.5 Philadelphia Cream Cheese (Brick) = 8.0
	Graininess (Breakdown)	Degree to which distinct, gritty, sand-like particles are perceives	Compress sample between tongue and palate, move tongue across palate 3-5 times, evaluate amounts of small, round particles, relatively harder than the surrounding product.	Not grainy- Extremely grainy	oral	Philadelphia cream cheese(low) Malt O Meal= 12.0

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Appendix D:

Texture Profile Analysis (TPA)

Test ID	Batch		Hardness g Force 1	Firmness/density g.sec Area F-T 1:2	Force 2 g Force 2	Adhesion g.sec Area F-T 2:3
Start Batch 0%coconut milk	0%coconut milk					
0%coconut milk1	0%coconut milk		999.782	3278.916	-118.456	-40.864
0%coconut milk2	0%coconut milk		829.407	3094.121	-107.984	-22.539
End Batch 0%coconut milk	0%coconut milk					
Average:	0%coconut milk (F)	AVERAGE("BATCH")	914.594	3186.518	-113.22	-31.702
S.D.	0%coconut milk (F)	STDEV("BATCH")	120.473	130.67	7.404	12.957
Coef. of Variation	0%coconut milk (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100	13.172	4.101	-6.54	-40.873
Start Batch cheese spread	cheese spread					
cheese spread2	cheese spread		482.225	3225.514	-159.106	-43.114
cheese spread1	cheese spread		316.794	1832.746	-178.299	-73.937
End Batch cheese spread	cheese spread					
Average:	cheese spread (F)	AVERAGE("BATCH")	399.509	2529.13	-168.702	-58.526
S.D.	cheese spread (F)	STDEV("BATCH")	116.977	984.835	13.572	21.795
Coef. of Variation	cheese spread (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100	29.28	38.94	-8.045	-37.241
Start Batch 25%coconut milk	25%coconut milk					
25%coconut milk1	25%coconut milk		1041.885	3976.642	-424.411	-178.213
25%coconut milk2	25%coconut milk		695.135	2946.407	-284.904	-128.129
25%coconut milk3	25%coconut milk		611.802	2601.503	-260.253	-152.821
End Batch 25%coconut milk	25%coconut milk					

25%coconut milk batch 1-	batch 1-						
Average:	25%coconut milk batch 1- (F)	AVERAGE("BATCH")	266.739	1466.621		-124.973	-102.677
S.D.	25%coconut milk	STDEV("BATCH")	5.089	81.504		14.651	8.459
	batch 1- (F)						
Coef. of Variation	25%coconut milk batch 1- (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100	1.908	5.557		-11.723	-8.238
Start Batch 50%coconut milk batch 1-	50%coconut milk batch 1-						
50%coconut milk batch 1-1	50%coconut milk batch 1-		144.275	719.392		-80.153	-45.318
50%coconut milk batch 1-2	50%coconut milk batch 1-		142.312	760.055		-62.923	-50.441
End Batch 50%coconut milk batch 1-	50%coconut milk batch 1-						
Average:	50%coconut milk batch 1- (F)	AVERAGE("BATCH")	143.293	739.723		-71.538	-47.88
S.D.	50%coconut milk batch 1- (F)	STDEV("BATCH")	1.388	28.753		12.184	3.623
Coef. of Variation	50%coconut milk batch 1- (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100	0.969	3.887		-17.031	-7.566
Start Batch 75%coconut milk	75%coconut milk batch 1-						
batch 1-							
75%coconut milk batch 1-1	75%coconut milk batch 1-		194.111	1114.286		-163.141	-131.322
75%coconut milk batch 1-2	75%coconut milk batch 1-		109.924	679.522		-83.751	-68.242
End Batch 75%coconut milk batch 1-	75%coconut milk batch 1-						
Average:	75%coconut milk	AVERAGE("BATCH")	152.017	896.904		-123.446	-99.782

	batch 1- (F)					
S.D.	75%coconut milk batch 1- (F)	STDEV("BATCH")	59.53	307.425	56.137	44.604
Coef. of Variation	75%coconut milk batch 1- (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100	39.16	34.276	-45.475	-44.702
Start Batch 50%coconut milk batch 2-	50%coconut milk batch 2-					
50%coconut milk batch 2-1	50%coconut milk batch 2-		126.936	847.723	-88.877	-85.242
50%coconut milk batch 2-2	50%coconut milk batch 2-		119.411	816.055	-92.803	-83.521
50%coconut milk batch 2-3	50%coconut milk batch 2-		131.08	923.09	-104.58	-95.884
End Batch 50%coconut milk batch 2-	50%coconut milk batch 2-					
Average:	50%coconut milk batch 2- (F)	AVERAGE("BATCH")	125.809	862.289	-95.42	-88.216
S.D.	50%coconut milk batch 2- (F)	STDEV("BATCH")	5.915	54.984	8.172	6.697
Coef. of Variation	50%coconut milk batch 2- (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100	4.702	6.376	-8.565	-7.592
Start Batch 75%coconut milk batch 2-	75%coconut milk batch 2-					
75%coconut milk batch 2-1	75%coconut milk batch 2-		76.772	546.968	-66.63	-58.477
75%coconut milk batch 2-2	75%coconut milk batch 2-		81.243	606.59	-69.575	-63.447
75%coconut milk batch 2-3	75%coconut milk batch 2-		69.793	505.992	-61.614	-58.397
End Batch 75%coconut milk batch 2-	75%coconut milk batch 2-					

75%coconut milk_1	75%coconut milk_		60.755	1687.895	-32.504	-11.176
End Batch 75%coconut milk_	75%coconut milk_					
Average:	75%coconut milk_ (F)	AVERAGE("BATCH")	60.755	1687.895	-32.504	-11.176
S.D.	75%coconut milk_ (F)	STDEV("BATCH")				
Coef. of Variation	75%coconut milk_ (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100				
Start Batch 0%coconut milk batch 1-	0%coconut milk batch 1-					
0%coconut milk batch 1-1	0%coconut milk batch 1-		1178.408	3583.036	-152.017	-31.993
0%coconut milk batch 1-2	0%coconut milk batch 1-		976.336	3119.66	-115.376	-20.859
End Batch 0%coconut milk batch 1-	0%coconut milk batch 1-					
Average:	0%coconut milk batch 1- (F)	AVERAGE("BATCH")	1077.372	3351.348	-133.697	-26.426
S.D.	0%coconut milk batch 1- (F)	STDEV("BATCH")	142.886	327.656	25.909	7.873
Coef. of Variation	0%coconut milk batch 1- (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100	13.263	9.777	-19.379	-29.791
Start Batch 25%coconut milk	25%coconut milk batch 1-					
batch 1-						
25%coconut milk batch 1-1	25%coconut milk batch 1-		270.338	1524.253	-135.333	-108.658
25%coconut milk batch 1-2	25%coconut milk batch 1-		263.141	1408.989	-114.613	-96.696
End Batch	25%coconut milk					

Average:	25%coconut milk (F)	AVERAGE("BATCH")	782.941	3174.85		-323.189	-153.054
S.D.	25%coconut milk (F)	STDEV("BATCH")	228.09	715.466		88.523	25.043
Coef. of Variation	25%coconut milk (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100	29.133	22.535		-27.39	-16.362
Start Batch 50%coconut milk	50%coconut milk						
50%coconut milk1	50%coconut milk		134.708	1065.144		-103.076	-18.529
50%coconut milk2	50%coconut milk		120.31	974.399		-91.514	-92.111
50%coconut milk3	50%coconut milk		128.272	1014.627		-87.042	-86.444
End Batch 50%coconut milk	50%coconut milk						
Average:	50%coconut milk (F)	AVERAGE("BATCH")	127.763	1018.057		-93.877	-65.695
S.D.	50%coconut milk (F)	STDEV("BATCH")	7.212	45.47		8.274	40.945
Coef. of Variation	50%coconut milk (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100	5.645	4.466		-8.814	-62.326
Start Batch 75%coconut milk	75%coconut milk						
75%coconut milk1	75%coconut milk		80.388	661.58		-66.427	-61.97
75%coconut milk2	75%coconut milk		82.352	623.817		-69.154	-63.398
75%coconut milk3	75%coconut milk		278.796	1622.851		-182.592	-109.74
End Batch 75%coconut milk	75%coconut milk						
Average:	75%coconut milk (F)	AVERAGE("BATCH")	147.179	969.416		-106.057	-78.369
S.D.	75%coconut milk (F)	STDEV("BATCH")	113.988	566.206		66.295	27.177
Coef. of Variation	75%coconut milk (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100	77.449	58.407		-62.508	-34.678
Start Batch 75%coconut milk_	75%coconut milk_						

Average:	75%coconut milk batch 2- (F)	AVERAGE("BATCH")	75.936	553.183	-65.94	-60.107
S.D.	75%coconut milk batch 2- (F)	STDEV("BATCH")	5.771	50.586	4.025	2.893
Coef. of Variation	75%coconut milk batch 2- (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100	7.6	9.145	-6.104	-4.813
Start Batch cottage cheese	cottage cheese					
cottage cheese 1	cottage cheese		134.46	851.676	-69.248	-49.63
cottage cheese 2	cottage cheese		121.919	742.473	-47.983	-36.092
cottage cheese 3	cottage cheese		131.407	885.44	-62.814	-26.061
End Batch cottage cheese	cottage cheese					
Average:	cottage cheese (F)	AVERAGE("BATCH")	129.262	826.53	-60.015	-37.261
S.D.	cottage cheese (F)	STDEV("BATCH")	6.54	74.727	10.905	11.828
Coef. of Variation	cottage cheese (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100	5.059	9.041	-18.171	-31.744
Start Batch philadephia cream cheese	philadephia cream cheese					
philadephia cream cheese1	philadephia cream cheese		963.468	6917.947	-302.072	-83.068
philadephia cream cheese2	philadephia cream cheese		1003.054	6993.235	-334.896	-97.016
philadephia cream cheese3	philadephia cream cheese		945.038	6729.227	-251.145	-57.906
End Batch philadephia cream cheese	philadephia cream cheese					
Average:	philadephia cream cheese (F)	AVERAGE("BATCH")	970.52	6880.136	-296.038	-79.33
S.D.	philadephia cream cheese (F)	STDEV("BATCH")	29.644	136.005	42.2	19.821
Coef. of Variation	philadephia cream cheese (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100	3.054	1.977	-14.255	-24.986

Start Batch cheddar cheese	cheddar cheese					
cheddar cheese1	cheddar cheese		3919.303	23929.685	-149.182	-16.249
cheddar cheese2	cheddar cheese		5760.088	29908.215	-43.73	-3.421
cheddar cheese3	cheddar cheese		3759.325	24977.224	-118.866	-12.397
End Batch cheddar cheese	cheddar cheese					
Average:	cheddar cheese (F)	AVERAGE("BATCH")	4479.572	26271.708	-103.926	-10.689
S.D.	cheddar cheese (F)	STDEV("BATCH")	1111.841	3192.565	54.291	6.582
Coef. of Variation	cheddar cheese (F)	STDEV("BATCH") / AVERAGE("BATCH")* 100	24.82	12.152	-52.24	-61.577
End of Test Data						